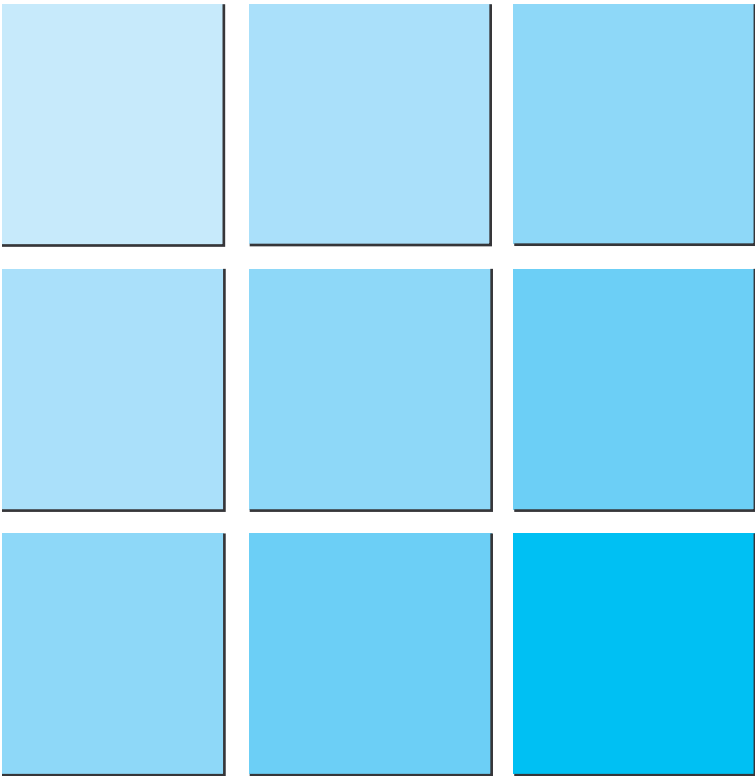


2008.10
Product Guide
[Microcomputer]



Technical Documentation of Electronic Devices

DATA BOOK
(DVD)

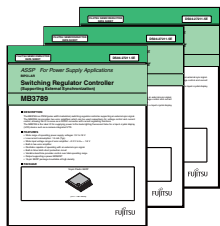


PRODUCT GUIDE
(GENERAL)



[ASSP·Memory·ASIC]

DATA SHEET

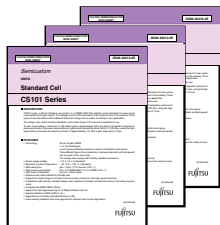
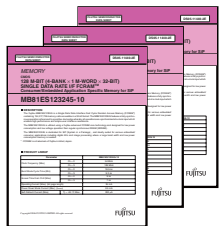


MANUAL

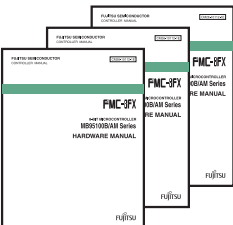
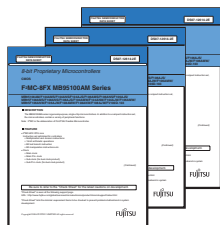
ASSP

Memory

ASIC

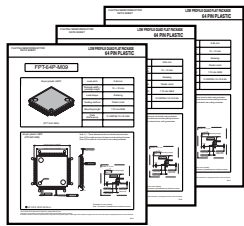


Microcontroller



[Microcomputer]

Package



Product Line-up

Product Line-up

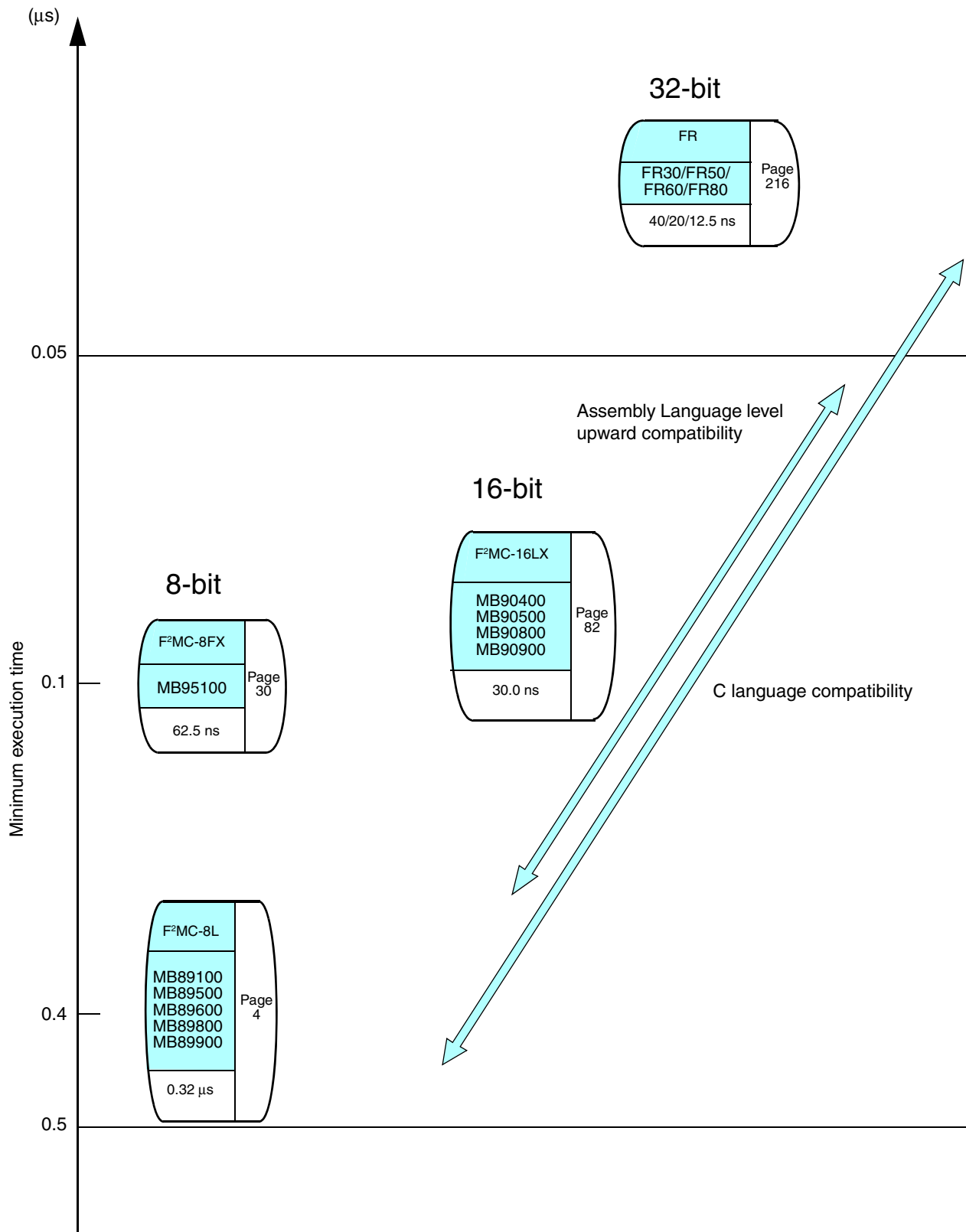
					Page no.	
Microcomputers	Microcontrollers	8-bit	Proprietary	F ² MC-8L Family	4	F ² MC-8L/8FX Family
				F ² MC-8FX Family	30	
				Support tools	50	F ² MC-16LX/16FX Family
		16-bit	Proprietary	F ² MC-16LX Family	82	
				F ² MC-16FX Family	140	
				Support tools	144	FR Family
		32-bit		FR Family	216	
				Support tools	268	
				Microcontroller product list	328	
				Support Hardware	360	

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Microcomputer Range

Microcomputer Migration Path



32-bit Microcontrollers

- FR (FR30 Series, FR50 Series, FR60 Series, FR80 Series)
A proprietary Fujitsu Microelectronics product developed for embedded applications
A microcontroller with a 32-bit RISC architecture
-

16-bit Microcontrollers

- F²MC-16LX (MB90400 series, MB90500 series, MB90800 series, MB90900 series)
Features: Supports high-performance, low-power consumption, large memory space
Applications: For applications including consumer information products and telecommunications instruments

8-bit Microcontrollers

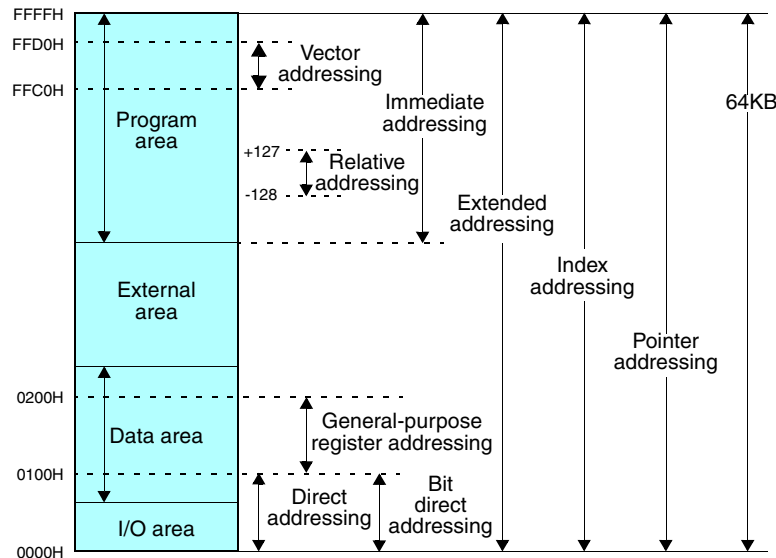
- F²MC-8L (MB89100 series, MB89500 series, MB89600 series, MB89800 series, and MB89900 series)
Features: Low voltage (+2.2V to +6.0V), low-power consumption
Applications: 8-bit microcontrollers for consumer markets
 - F²MC-8FX (MB95100 series)
Features: Low voltage (+1.8V to +5.5V), low-power consumption
Applications: consumer markets
-

8-bit Proprietary F²MC-8L Family Features

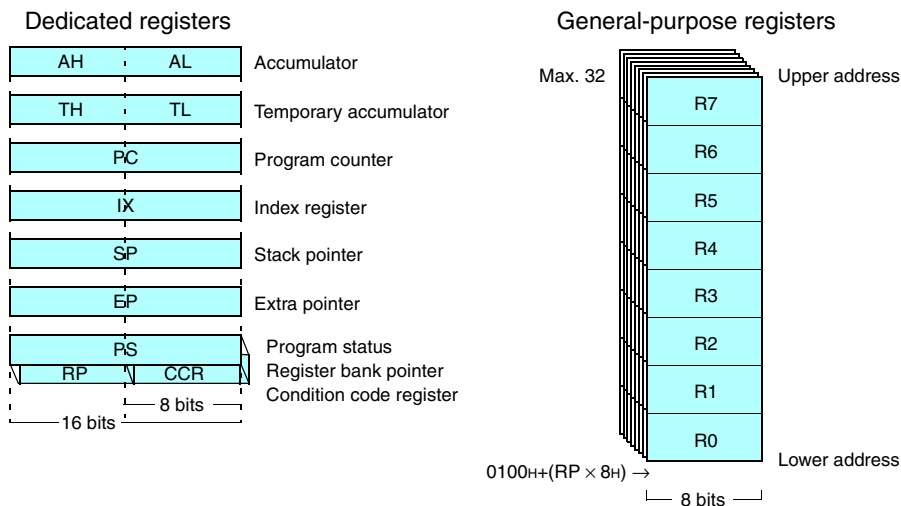
F²MC-8L Family Features

- Minimum execution time: 0.32μs/12.5MHz, 0.4 μs/10MHz, 0.95 μs/4.2 MHz
- Operating voltage: +2.2 V to +6.0 V, operating frequency: 1 MHz to 10 MHz
- Software-switchable instruction cycle (4 speeds) provides low voltage, low-power consumption operation (clock gear function)
- Backup voltage in stop mode (voltage required to maintain RAM data): Min. +1.5 V
- Bitwise selectable pull-up resistors for each I/O port
- One-time PROM products support (by programming data) the same option settings as mask ROM products (the option settings are mask options for some products).
- Memory space: Max. 64 Kbytes

Memory space



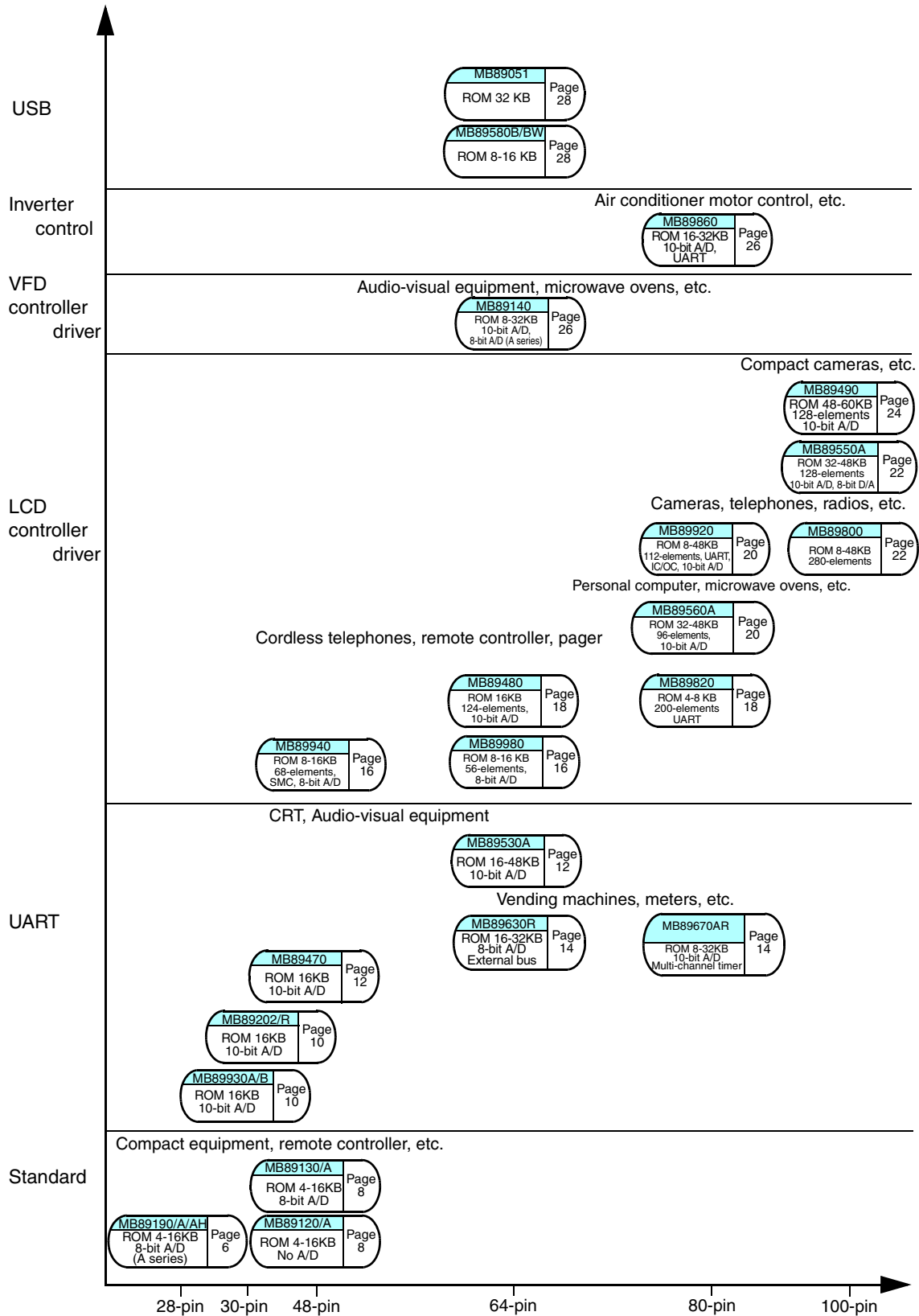
- Memory mapped I/O
 - Registers
- Dedicated registers
- General-purpose registers: 8 × 8-bit per bank, Max. 32 banks



- Enhanced interrupt function (prioritized multiple interrupts)
 - Powerful operation and transfer functions
- Multiplication and division instructions: 8-bit × 8-bit = 16-bit (7.6μs/10MHz), 16-bit ÷ 8-bit = 8-bit (8.4μs/10MHz)
- Data transfer: Max. 16-bit
- Number of instructions: 136

8-bit Proprietary F²MC-8L Family Product Range

F²MC-8L Family Product Range



8-bit Proprietary F²MC-8L Family

Standard Products

F²MC-8L Family Standard Products

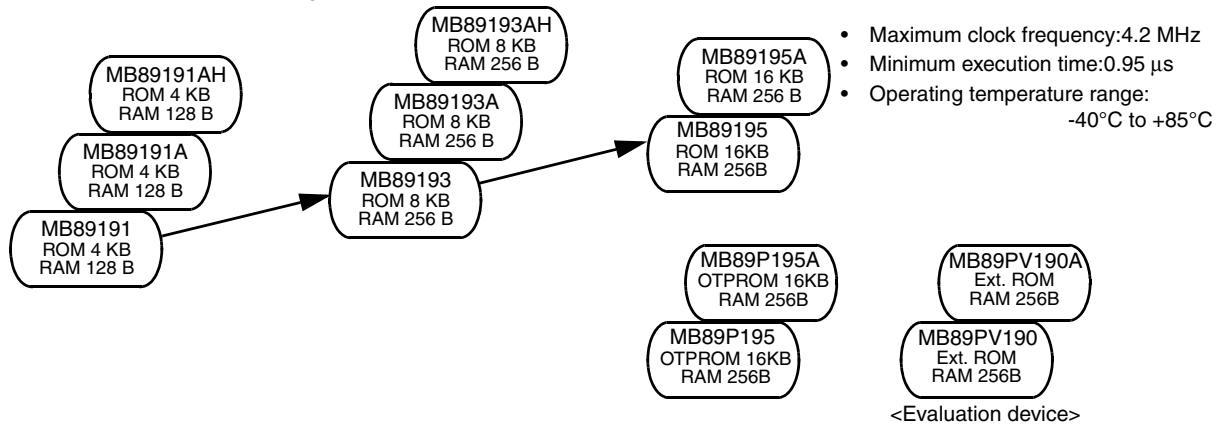
	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
F ² MC-8L Family Standard Products	28	Small package, timer/counter (8-bit × 2ch.), SIO(8-bit × 1ch.), A/D converter (only on A series) (8-bit × 8ch.)	MB89190/A/AH series	MASK	4 KB	128 B	MB89191
							MB89191A
							MB89191AH
					8 KB	256 B	MB89193
							MB89193A
							MB89193AH
					16 KB	256 B	MB89195
							MB89195A
				OTPROM	16 KB	256 B	Equivalent device MB89190/A series
							MB89P195
							MB89P195A
				Evaluation device	32 KB (Ext.)	256 B	Evaluation target device MB89190/A series
							MB89PV190
							MB89PV190A

(Continued)

Standard Products

■ MB89190/190A/190AH Series

Standard products (small package)



Part number	Operating power supply voltage* (V)	Package				Functions
		SH-DIP	DIP	SOP	MQFP	
MB89191	+2.2 to +6.0	28P	28P	28P	-	I/O ports: 22 (20 on MB89190A series) Timebase timer (WDT): 20-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) A/D converter: 8-bit × 8ch. (MB89190A series only) Remote controller carrier generator SIO: 8-bit × 1ch. Buzzer output Interrupts: 5 internal, 11 external Low-power consumption (stand-by functions) modes: Sleep, stop
MB89191A		28P	28P	28P	-	
MB89191AH		28P	28P	28P	-	
MB89193		28P	28P	28P	-	
MB89193A		28P	28P	28P	-	
MB89193AH		28P	28P	28P	-	
MB89195		28P	28P	28P	-	
MB89195A		28P	28P	28P	-	
MB89P195	+2.7 to +6.0	-	28P	28P	-	
MB89P195A		-	28P	28P	-	
MB89PV190		-	-	-	48C	
MB89PV190A		-	-	-	48C	

*: A/D = 3.5V to 6.0V

Packages: P - plastic, C - ceramic

8-bit Proprietary F²MC-8L Family Standard Products

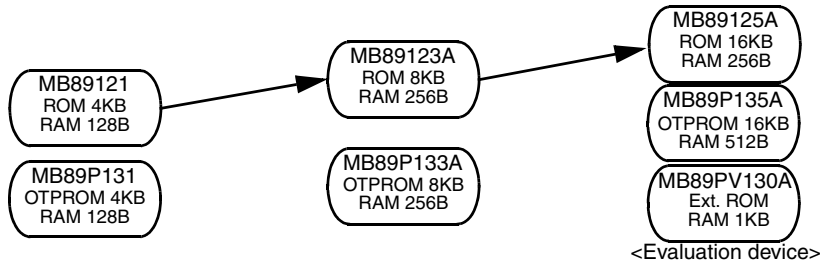
(Continued)

	Main functions	Series name	Type	ROM	RAM	Part number	
48	Timer/counter (8-bit × 2ch.), SIO(8-bit × 1ch.)	MB89120/A series	MASK	4 KB	128 B	MB89121	
				8 KB	256 B	MB89123A	
				16 KB	256 B	MB89125A	
			OTPROM	4 KB	128 B	MB89121	MB89P131
				8 KB	256 B	MB89123A	MB89P133A
				16 KB	512 B	MB89125A	MB89P135A
			Equivalent device				
			Evaluation target device				
			Evaluation device	32 KB (Ext.)	1 KB	MB89120/A series	MB89PV130A
	A/D converter (8-bit × 4ch.), timer/counter (8-bit × 2ch. or 16-bit × 1ch.), SIO(8-bit × 1ch.)	MB89130/A series	MASK	4 KB	128 B	MB89131	
				8 KB	256 B	MB89133A	
				16 KB	256 B	MB89135A	
			OTPROM	4 KB	128 B	MB89131	MB89P131
				8 KB	256 B	MB89133A	MB89P133A
				16 KB	512 B	MB89135A MB89135L	MB89P135A
			Equivalent device				
			Evaluation target device				
			Evaluation device	32 KB (Ext.)	1 KB	MB89130/A series	MB89PV130A

8-bit Proprietary F²MC-8L Family Standard Products

■ MB89120/120A Series

Standard products (low cost)



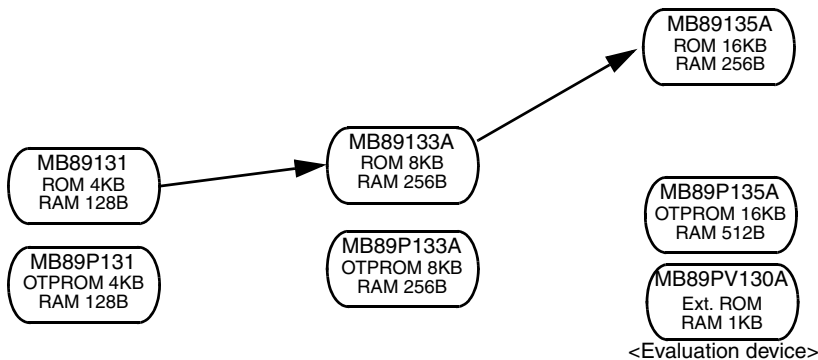
- Maximum clock frequency:
4.2 MHz (32.768 kHz)
- Minimum execution time:
0.95 μs to 1.53 μs (61 μs)
- Operating temperature range:
-40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	MQFP	
MB89121	+2.2 to +6.0	48P	-	I/O ports: 36 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) Remote control carrier generator (on MB89123A/125A/P133A, not included on MB89121/P131) SIO: 8-bit × 1ch. Clock prescaler: 15-bit Buzzer output Interrupts: 4 internal, 3 external (MB89121/P131) 4 internal, 11 external (MB89123A/125A/ P133A) Low-power consumption (stand-by functions) modes: Sleep, watch, stop, sub
MB89123A		48P	-	
MB89125A		48P	-	
MB89P131	+2.7 to +6.0	48P	-	
MB89P133A		48P	-	
MB89P135A		48P	-	
MB89PV130A		-	48C	

Packages: P - plastic, C - ceramic

■ MB89130/130A Series

Standard products (built-in A/D converter, low cost)



- Maximum clock frequency:
4.2 MHz (32.768 kHz)
- Minimum execution time:
0.95 μs to 1.53 μs (61 μs)
- Operating temperature range:
-40°C to +85°C

Part number	Operating power supply voltage* (V)	Package			Functions
		SH-DIP	QFP	MQFP	
MB89131	+2.2 to +6.0	-	48P	-	I/O ports: 36 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit × 1ch.) A/D converter: 8-bit × 4ch. Remote control carrier generator (on MB89133A/135A/P133A, not included on MB89131/P131) SIO: 8-bit × 1ch. Clock prescaler: 15-bit Buzzer output Interrupts: 5 internal, 3 external (MB89131/P131) 5 internal, 11 external (MB89133A/135A/P133A) Low-power consumption (stand-by functions) modes: Sleep, watch, stop, sub
MB89133A		48P	48P	-	
MB89135A		-	48P	-	
MB89P131	+2.7 to +6.0	-	48P	-	
MB89P133A		48P	48P	-	
MB89P135A		-	48P	-	
MB89PV130A		-	-	48C	

*: A/D = 3.5 V to 6.0 V

Packages: P - plastic, C - ceramic

8-bit Proprietary F²MC-8L Family Internal UART Products

F²MC-8L Family UART Products

	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
F ² MC-8L Family Internal UART Products	30	A/D converter (10bit × 8ch.) UART/SIO PWM timer (8bit × 1ch.) PPG timer (12bit × 1ch.) Timer counter with 8/16 bit capture	MB89930A/B series	MASK	16 KB	512 B	MB89935B
				OTPROM	16 KB	512 B	MB89P935B
				Evaluation device	16 KB (Ext.)	512 B	MB89PV930A
	32/ 34	A/D converter (10 bit × 8 ch) , 8/16 bit timer counter with capture (1 ch) , UART/SIO (1 ch) , Interrupts (11ch) , PWM timer (8 bit × 1 ch) , PPG timer (12 bit × 1 ch) , Buzzer output	MB89202/R series	MASK	16 KB	512 B	MB89202
							MB89202Y
				Flash	16 KB	512 B	MB89F202
							MB89F202RA
							MB89F202Y
							MB89F202RAY
				Evaluation device		512 B	MB89V201

(Continued)

8-bit Proprietary F²MC-8L Family Internal UART Products

■ MB89930A/B Series

Standard products (built-in UART, compact type)

MB89935B
ROM 16KB
RAM 512B

MB89P935B
OTPROM 16KB
RAM 512B

MB89PV930A
Ext. ROM
RAM 512B

<Evaluation device>

- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 μs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		SSOP	MQFP	
MB89935B	+2.2 to +5.5	30P	-	I/O ports: 21 A/D converter: 10-bit × 8 ch. UART/SIO: 1 ch.
MB89P935B	+3.0 to +5.5	30P	-	PWM timer: 8-bit × 1 ch. PPG timer: 12-bit × 1 ch. Timer counter with 8/16-bit capture
MB89PV930A	+2.7 to +5.5	-	48C	Timebase timer: 21-bit × 1 ch. Interrupts: 11 external Low-power consumption (stand-by functions) modes: Sleep, stop

Packages: P - plastic, C - ceramic

■ MB89202/R Series

Compact type

MB89202/Y
ROM 16KB
RAM 512B

MB89F202/RA
ROM 16KB
RAM 512B

MB89F202Y/RAY
ROM 16KB
RAM 512B

MB89V201
Ext. ROM
RAM 512B

<Evaluation device>
(with MB2144-230)

- Maximum clock frequency: 12.5 MHz
- Minimum execution time: 0.32 μs
- Operating temperature range: -40 to +85 °C

Part number	Operating power supply voltage (V)	Package			Functions
		SH-DIP	SSOP	QFP	
MB89202	+2.2 to +5.5	32P	—	—	I/O ports: 27
MB89202Y		—	34P	—	A/D converter: 10-bit × 8 ch. Timer counter with 8/16-bit capture : 1 ch.
MB89F202	+3.5 to +5.5	32P	—	—	Timebase timer: 21 bit × 1 ch.
MB89F202RA		32P	—	—	PWM timer: 8-bit × 1 ch.
MB89F202Y		—	34P	—	PPG timer: 12-bit × 1 ch.
MB89F202RAY		—	34P	—	UART/SIO : 1 ch.
MB89V201		—	—	64P	Interrupts: 11 external Buzzer output : 1 ch. Low-power consumption (stand-by functions) modes: Sleep, stop Evaluation device: with MB2144-230

Packages: P - plastic

8-bit Proprietary F²MC-8L Family

Internal UART Products

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
48	A/D converter (10bit × 8ch.) Timer/counter (8 bit × 4 ch., can operate as 16-bit) UART/SIO (2 ch.) Interrupts (9 ch.) PWM timer (8 bit × 1 ch.) PWC timer (8 bit × 1 ch.) Clock prescaler Buzzer output	MB89470 series	MASK	16 KB	512 B	MB89475
			OTEPROM	16 KB	512 B	Equivalent device MB89475 MB89P475
			Evaluation device	16 KB (Ext.)	1 KB	Evaluation target device MB89470 series MB89PV470
64	UART, SIO, UART/SIO, I ² C bus interface (MB89537AC/538AC/P538/PV530), PWM timer (8-bit × 2ch.), timer/counter (16-bit × 1ch.), PWC timer (8-bit × 2ch.), PPG timer (12-bit × 2ch., 6-bit × 1ch.), A/D converter (10-bit × 8ch.)	MB89530A series	MASK	16 KB	512 B	MB89535A
				32 KB	1 KB	MB89537A
						MB89537AC
				48 KB	2 KB	MB89538A
						MB89538AC
			OTEPROM	48 KB	2 KB	Equivalent device MB89530A series MB89P538
			Flash	48 KB	2 KB	MB89530A series MB89F538 MB89F538L
			Evaluation device	48 KB (Ext.)	2 KB	Evaluation target device MB89530A series MB89PV530
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8-bit Proprietary F²MC-8L Family Internal UART Products

■ MB89470 Series

Standard products (built-in UART, compact type)



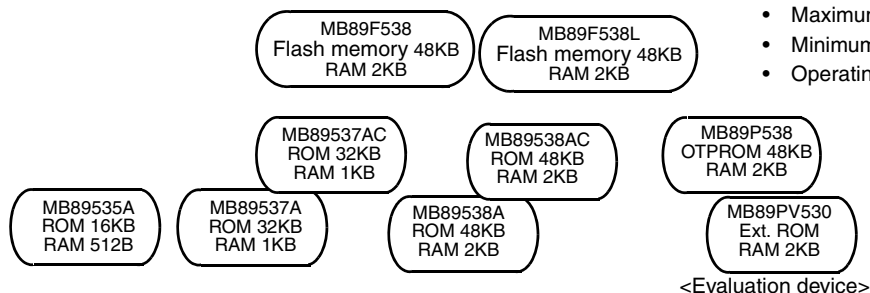
- Maximum clock frequency: 12.5 MHz (32.768 kHz)
- Minimum execution time: 0.32 μ s (61 μ s)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	MQFP	
MB89475	+2.2 to +5.5	48P	-	I/O ports: 39 A/D converter: 10-bit $\times$ 8 ch. Timer/counter: 8-bit $\times$ 4 ch. (16-bit $\times$ 2ch.) Timebase timer (WDT): 21-bit $\times$ 1 ch. PWM timer: 8-bit $\times$ 1 ch. PWC timer: 8-bit $\times$ 1 ch. UART/SIO: 2ch. Interrupts: 5 ch. (Level) + 4 ch. (edges) Clock prescaler Buzzer output Low-power consumption (stand-by functions) modes: Sleep, stop, sub, clock
MB89P475	+3.5 to +5.5	48P	-	
MB89PV470	+2.7 to +5.5	-	48C	

Packages: P - plastic, C - ceramic

■ MB89530A Series

Standard products (telephones, mobileproducts, etc.)



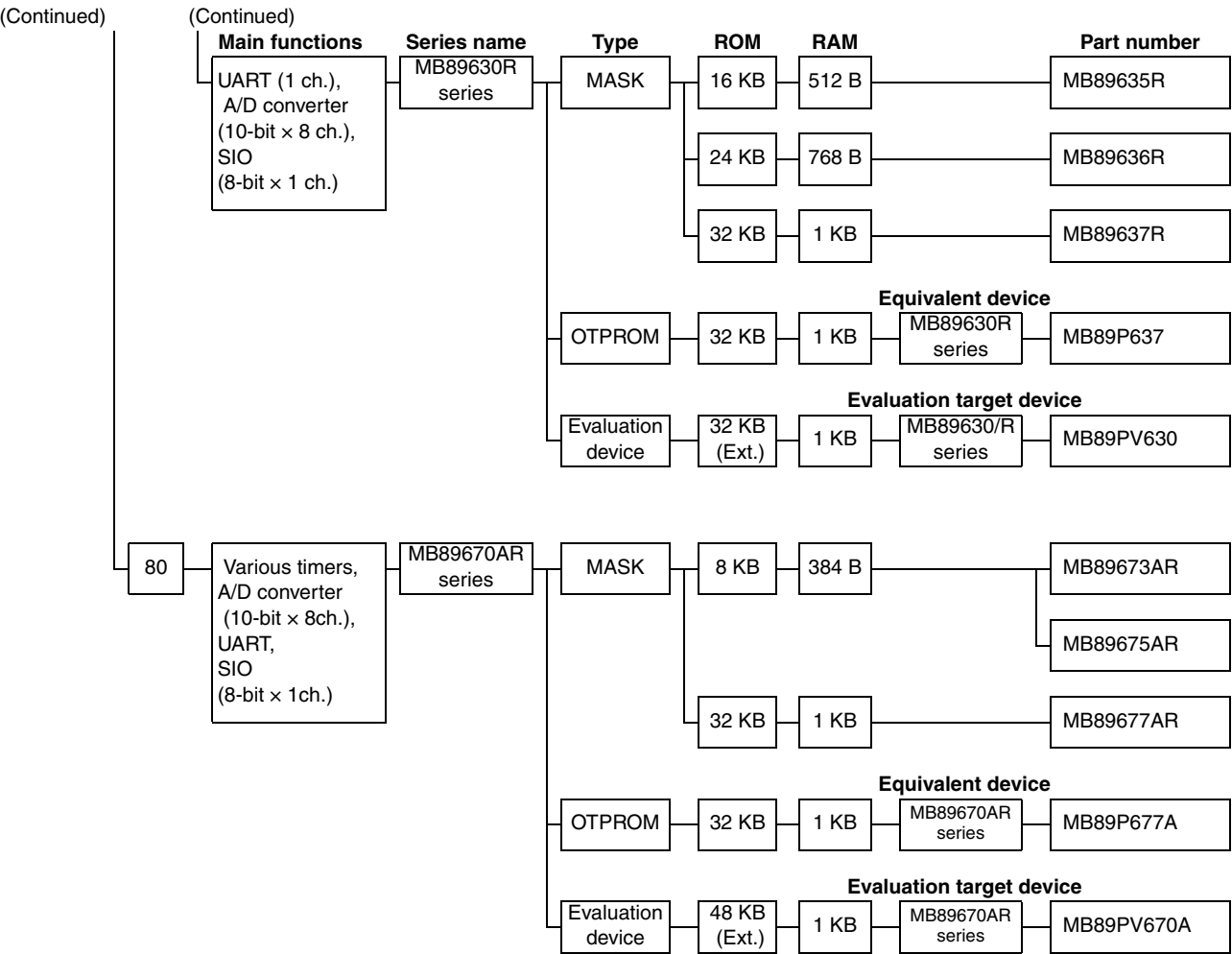
- Maximum clock frequency: 12.5 MHz (32.768 kHz)
- Minimum execution time: 0.32 μ s (61 μ s)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package					Functions
		SDIP	QFP	LQFP	BCC	MQFP	
MB89535A	+2.2 to +5.5	64P	64P	64P (0.5 mm pitch, 0.65 mm pitch)	64P	-	I/O ports: 53 (52: MB89F538/F538L) Timebase timer (WDT): 21-bit $\times$ 1ch. Timer/counter: 16bit $\times$ 1ch. PWM timer: 8-bit $\times$ 2ch. PWC timer: 8-bit $\times$ 1ch. PPG timer: 12-bit $\times$ 2ch., 6-bit $\times$ 1ch. A/D converter: 10-bit $\times$ 8ch. I ² C bus interface (built into MB89537AC/538AC/P538/F538/F538L/PV530) SIO/UART $\times$ 1ch., SIO $\times$ 1ch., UART $\times$ 1ch UART/Serial interface Interrupts: 12 external Low-power consumption (stand-by functions) modes: Sleep, stop, watch, sub
MB89537A		64P	64P		-	-	
MB89537AC		64P	64P		-	-	
MB89538A		64P	64P		-	-	
MB89538AC		64P	64P		-	-	
MB89F538	+3.5 to +5.5	64P	64P	64P (0.65 mm pitch)	-	-	
MB89F538L	+2.4 to +3.6	64P	64P		64P	-	
MB89P538	+2.7 to +5.5	64P	64P		-	-	
MB89PV530		64C	-	-	-	64C	

Packages: P - plastic, C - ceramic

8-bit Proprietary F²MC-8L Family

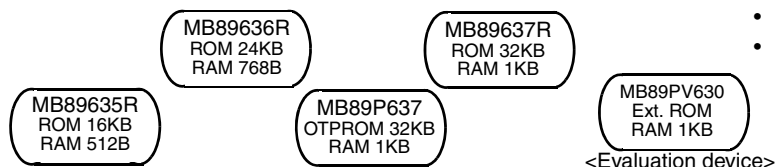
Internal UART Products



8-bit Proprietary F²MC-8L Family Internal UART Products

MB89630R Series

Standard products (A/D converter, built-in UART)



- Maximum clock frequency: 10 MHz (32.768 kHz)
- Minimum execution time: 0.4 μs to 6.4 μs (61 μs)
- Operating temperature range: -40°C to +85°C

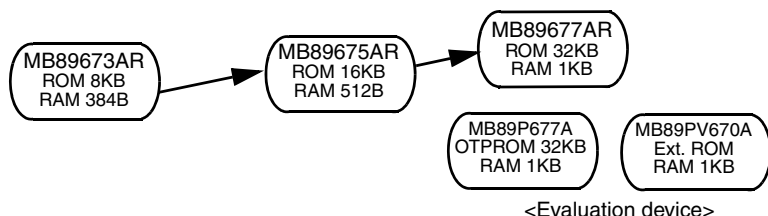
Part number	Operating power supply voltage* (V)	Package					Functions
		SH-DIP	QFP	LQFP	MDIP	MQFP	
MB89635R	+2.2 to +6.0	64P	64P	64P	-	-	I/O ports: 53 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 16-bit × 1ch. PWM timer: 8-bit × 2ch. PWC timer: 8-bit × 1ch. A/D converter: 10-bit × 8ch. SIO: 8-bit × 1ch. UART: 8-bit × 1ch. (switchable between two I/O ports) Clock prescaler: 15-bit Buzzer output Interrupts: 10 internal, 4 external Low-power consumption (stand-by functions) modes: Sleep, watch, stop, sub
MB89636R		64P	64P	64P	-	-	
MB89637R		64P	64P	64P	-	-	
MB89P637	+2.7 to +6.0	64P	64P	-	-	-	
MB89PV630		-	-	-	64C	64C	

*: A/D = 3.5V to 6.0V

Packages: P - plastic, C - ceramic

MB89670AR Series

Standard products (multi function timer)



- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 μs to 6.4 μs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package			Functions
		QFP	LQFP	MQFP	
MB89673AR	+2.2 to +6.0	80P	80P	-	I/O ports: 69 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 16-bit × 2ch. (16-bit × 1ch. + 8-bit × 2ch.) Buzzer output PWM timer: 8-bit × 6ch. (MB89673AR/675AR/P677A) Up/down counter: 8-bit × 2ch. (16-bit × 1ch.) A/D converter: 10-bit × 8ch. SIO: 8-bit × 1ch. UART: 8-bit × 1ch. (switchable between two I/O ports) Interrupts: 10 internal, 8 external Low-power consumption (stand-by functions) modes: Sleep, stop
MB89675AR		80P	80P	-	
MB89677AR		80P	80P	-	
MB89P677A	+2.7 to +6.0	80P	80P	-	
MB89PV670A		-	-	80C	

*: A/D = 3.5V to 6.0V

Packages: P - plastic, C - ceramic

F²MC-8L Family Internal LCD Controller/Driver Products

	Pin count	Main functions	Series name	Type	ROM	RAM	Part number				
F ² MC-8L Family Internal LCD Controller/Driver Products	48	LCD controller/driver (4com. × 17seg.), stepping motor-control(8-bit PWM timer× 2ch.), PWM timer (8-bit × 2ch.), interval timer (8-bit × 2ch.or16-bit × 1ch.), A/D converter (8-bit × 2ch.), low-voltage detection reset, external voltage watch interrupt	MB89940 series	MASK	8 KB	512 B	MB89943				
					16 KB	512 B	MB89945				
				OTPROM	16 KB	512 B	Equivalent device MB89943	MB89P945			
				Evaluation device	32 KB (Ext.)	1 KB	Evaluation target device MB89940 series	MB89PV940			
	64	LCD controller/driver (14seg. × 4com.), A/D converter (8-bit × 4ch.), Buzzer output, Timer/counter (8-bit× 2ch.) (16-bit× 1ch.), PWM timer, (8-bit× 2ch.), Remote controlled carrier generator	MB89980 series	MASK	8 KB	256 B	MB89983				
					16 KB	512 B	Equivalent device MB89980 series	MB89P985			
				OTPROM							
				Evaluation device	32 KB (Ext.)	512 B	Evaluation target device MB89980 series	MB89PV980			

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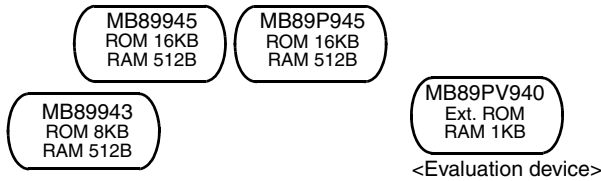
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■ MB89940 Series

Standard products (LCD controller/driver, built-in stepping motor controller)



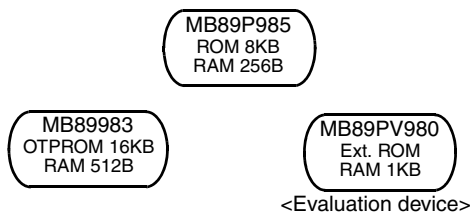
- Maximum clock frequency: 8 MHz
- Minimum execution time: 0.5 μs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	MQFP	
MB89943	+3.5 to +5.5	48P	-	I/O ports: 37 Timebase timer (WDT): 21-bit × 1ch. Interval timer: 8-bit × 2ch. (can operate as 16-bit × 1ch.) PWM timer: 8-bit × 2ch. Stepping motor control: 8-bit PWM timer × 2ch. A/D converter: 8-bit × 2ch. LCD controller/driver: 68 elements, 2 to 4 common, 10 to 17 segments 17 × 4-bit LCD display RAM Low-voltage detection reset External voltage watch interrupt Interrupts: 5 internal, 3 external Low-power consumption (stand-by functions) modes: Sleep, stop
MB89945		48P	-	
MB89P945		48P	-	
MB89PV940		-	48C	

Packages: P - plastic, C - ceramic

■ MB89980 Series

Standard products (built-in LCD controller/driver)



- Maximum clock frequency: 4.2 MHz (32.768 kHz)
- Minimum execution time: 0.95 μs
- Operating temperature range: - 40°C to +85 °C

Part number	Operating power supply voltage * (V)	Package		Functions
		LQFP	MQFP	
MB89983	+2.2 to +6.0	64P	-	I/O ports: 47 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch.(can operate as 16-bit × 1ch.) PWM timer: 8-bit × 2ch. Buzzer output Remote controlled carrier generator LCD controller/driver: 56 elements, 2 to 4 common, 4 to 14 segments 7 × 8-bit LCD display RAM Interrupts: 12 external Low-power consumption (stand-by functions) modes: Sleep, watch, stop, sub
MB89P985	+2.7 to +6.0	64P	-	
MB89PV980		-	64C	

*: A/D = 3.5V to 6.0V

Packages: P - plastic, C - ceramic

(Continued)	(Continued)						
		Main functions	Series name	Type	ROM	RAM	Part number
		LCD controller/driver (31seg. × 4com.), A/D converter (10-bit × 4ch.), Timer/counter (8-bit× 4ch. can operate as 16-bit) , UART/SIO (1ch.) , Interrupts (12ch.) , PWM timer, (8-bit× 1ch.), PWC timer, (8-bit× 1ch.), PPG timer, (6-bit× 1ch.), Clock prescaler, Buzzer output	MB89480 series	MASK	16 KB	512 B	MB89485
							MB89485L
				OTPROM	16 KB	512 B	Equivalent device MB89980 series MB89P485
					16 KB	512 B	MB89980 series MB89P485L
				Evaluation device	Evaluation target device		
						1 KB	MB89480 series MB89PV480
			MB89820 series	MASK	4 KB	128 B	MB89821
					8 KB	256 B	MB89823R
					16 KB	256 B	MB89825
				OTPROM	Equivalent device		
					16 KB	256 B	MB89820 series MB89P825
				Evaluation device	Evaluation target device		
					32 KB (Ext.)	1 KB	MB89820 series MB89PV820
			80	UART (1ch.), LCD controller/driver (50seg. × 4com.), PWM timer (8-bit × 1ch.), PWC timer (8-bit × 1ch.)			
(Continued)	(Continued)						

MB89480 Series

Standard products (built-in LCD controller/driver)



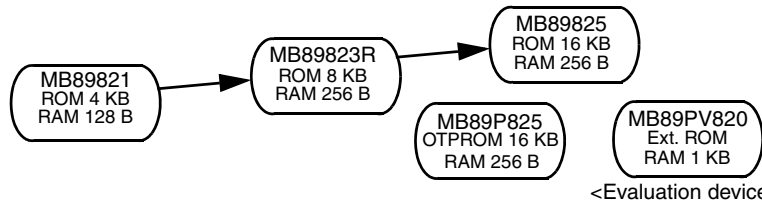
- Maximum clock frequency: 12.5 MHz (32.768 kHz)
- Minimum execution time: 0.32 μ s (61 μ s)
- Operating temperature range: - 40°C to +85 °C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	SH-DIP	
MB89485L	+2.2 to +3.6	64P (0.65 mm pitch)	64P	I/O ports: 42 LCD controller/driver: 124 elements, 2 to 4 common, 8 to 31 segments, 4 bias power supplies, 31 $\times$ 4-bit LCD display RAM Selectable as a mask option A/D converter: 10-bit $\times$ 4ch. Timer/counter: 8-bit $\times$ 4ch. (16-bit $\times$ 2ch.) Timebase timer (WDT): 21-bit $\times$ 1ch. PWM timer: 8-bit $\times$ 1ch. PWC timer: 8-bit $\times$ 1ch. PPG timer: 6-bit $\times$ 1ch. UART/SIO: 1ch. Interrupts: 8ch. (Level) +4ch. (edges) Clock prescaler Buzzer output Low-power consumption (stand-by functions) modes: Sleep, stop, sub, watch
MB89485	+2.2 to +5.5		64P	
MB89P485L	+2.7 to +3.6		64P	
MB89P485	+3.5 to +5.5		64P	
MB89PV480	+2.7 to +5.5	-	64C	

Packages: P - plastic, C - ceramic

MB89820 Series

Standard products (LCD controller/driver, built-in UART)



- Maximum clock frequency: 5 MHz
- Minimum execution time: 0.8 μ s
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	MQFP	
MB89821	+2.2 to +6.0	80P	-	I/O ports: 32 Timebase timer (WDT): 20-bit $\times$ 1ch. PWM timer: 8-bit $\times$ 1ch. PWC timer: 8-bit $\times$ 1ch. LCD controller/driver: 200 elements, 2 to 4 common, 34 to 50 segments, 3 bias power supplies, 8-bit $\times$ 25 LCD display RAM
MB89823R		80P	-	
MB89825		80P	-	
MB89P825	+2.7 to +6.0	80P	-	SIO: 8-bit $\times$ 1ch. UART: 5-, 7-, 9-bit $\times$ 1ch. Interrupts: 5 internal, 2 external Low-power consumption (stand-by functions) modes: Sleep, stop
MB89PV820		-	80C	

Packages: P - plastic, C - ceramic

(Continued)

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Main functions	Series name	Type	ROM	RAM	Part number
A/D converter (10-bit × 8ch.) UART, UART/SIO, I ² C bus interface, PWM timer (8-bit × 2ch.), timer/counter (8-bit × 2ch.), PWC timer (8-bit × 1ch.), PPG timer (6-bit × 1ch., 12-bit × 1ch.), LCD controller/driver (24seg. × 4 com.)	MB89560A series	MASK	32 KB	1 KB	MB89567A
					MB89567AC
		OTPROM	48 KB	1 KB	Equivalent device MB89560A series MB89P568
		Evaluation device	56 KB (Ext.)	1 KB	Evaluation target device MB89560A series MB89PV560
LCD controller/driver (28 seg. × 4 com.), low-voltage detection circuits, real time I/O, A/D converter (8-bit × 8ch.), UART, PWM timer (8-bit × 2ch.), SIO(8-bit × 1ch.)	MB89920 series	MASK	8 KB	256 B	MB89923
			16 KB	512 B	MB89925
		OTPROM	48 KB	1 KB	Equivalent device MB89920 series MB89P928
		Evaluation device	48 KB (Ext.)	1 KB	Evaluation target device MB89920 series MB89PV920

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8-bit Proprietary F²MC-8L Family

Internal LCD Controller/Driver Products

F²MC-8L Family

MB89560A Series

Standard products (personal computer, microwave ovens, etc.)

MB89567A/AC
ROM 32KB
RAM 1KB

MB89P568
OTPROM 48KB
RAM 1KB

MB89PV560
Ext. ROM
RAM 1KB

<Evaluation device>

- Maximum clock frequency: 12.5 MHz (32.768kHz)
- Minimum execution time: 0.32 μ s (61 μ s)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package				Functions
		QFP	LQFP (0.5 mm, 12 × 12 mm)	LQFP (0.65 mm, 14 × 14 mm)	MQFP	
MB89567A	+2.2 to +5.5	80P	80P	80P	-	I/O ports: 50 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (can operate as 16-bit) PWM timer: 8-bit × 2ch. PWC timer: 8-bit × 1ch. PPG timer: 6-bit × 1ch., 12-bit × 1ch. A/D converter: 10-bit × 8ch. I ² C bus interface (built into MB89567AC/P568/PV560) UART: 6, 7, 8-bit × 1ch. SIO: 8-bit × 1 ch. UART/SIO: 1 ch. LCD controller/driver: 96 elements, 2 to 4 common, 8 to 24 segments, 12 × 8-bit LCD display RAM, static, duty Booster circuit (Selected as an option) Interrupts: 10 internal, 12 external Low-power consumption (stand-by functions) modes: Sleep, watch, stop, sub
MB89567AC		80P	80P	80P	-	
MB89P568	+2.7 to +5.5	80P	80P	80P	-	
MB89PV560		-	-	-	80C	

Packages: P - plastic, C - ceramic

MB89920 Series

Standard products (LCD controller/driver, built-in A/D converter)

MB89923
ROM 8KB
RAM 256B

MB89P928
OTPROM 48KB
RAM 1KB

MB89925
ROM 16KB
RAM 512B

MB89PV920
Ext. ROM
RAM 1KB

<Evaluation device>

- Maximum clock frequency: 8 MHz
- Minimum execution time: 0.5 μ s
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage* (V)	Package		Functions
		QFP	MQFP	
MB89923	+2.2 to +6.0	80P	-	I/O ports: 69 Timebase timer (WDT): 20-bit × 1ch. PWM timer: 8-bit × 2ch. A/D converter: 10-bit × 8ch. LCD controller/driver: 112 elements, 2 to 4 common, 16 to 28 segments, 3 bias power supplies, 8-bit × 14 LCD display RAM
MB89925		80P	-	
MB89P928	+2.7 to +6.0	80P	-	UART: 7 to 8-bit × 1ch. Low-voltage detection reset SIO: 8-bit × 1ch. Buzzer output Interrupts: 10 internal, 4 external Realtime I/O Low-power consumption (stand-by functions) modes: Sleep, stop
MB89PV920		-	80C	

*: A/D = 3.5V to 6.0V

Packages: P - plastic C - ceramic

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
100	UART, PWM timer (8-bit × 1ch.), PWC timer (8-bit × 1ch.), Timebase timer (21-bit × 1ch.), LCD controller/ driver(70 seg. × 4 com.)	MB89800 series	MASK	8 KB	256 B	MB89803
				16 KB	512 B	MB89805
			OTPROM	48 KB	2 KB	Equivalent device MB89800 series MB89P808
			Evaluation device		2 KB	Evaluation target device MB89800 series MB89PV800
	A/D converter (10-bit × 8ch.), D/A converter (8-bit × 2ch.), UART or SIO, UART/SIO, PWM timer (8-bit × 2ch.), timer/counter (8-bit × 2ch.) × 2 (16-bit × 1ch.), PWC timer (8-bit × 1ch.), PPG timer (6-bit × 1ch.), LCD controller (32seg. × 4 com.)	MB89550A series	MASK	32 KB	1 KB	MB89557A
				48 KB	2 KB	MB89558A
			OTPROM	48 KB	2 KB	Equivalent device MB89557A MB89558A MB89P558A
			Evaluation device	32 KB (Ext.)	2 KB	Evaluation target device MB89550A series MB89PV550A

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8-bit Proprietary F²MC-8L Family

Internal LCD Controller/Driver Products

F²MC-8L Family

MB89800 Series

Standard products (LCD controller/driver)



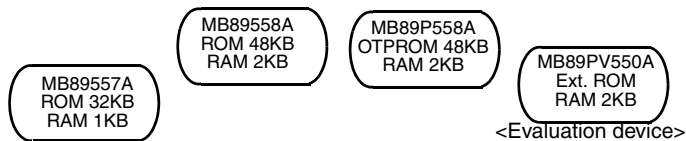
- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 μs/5V
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	MQFP	
MB89803	+2.2 to +6.0	100P	100P	-	I/O ports: 32 Timebase timer (WDT): 21-bit × 1ch. PWM timer: 8-bit × 1ch. PWC timer: 8-bit × 1ch. UART: 1ch. LCD controller/driver: 280 elements, 4 common, 70 segments, 4-bit × 70 LCD display RAM, vias supply 3 Interrupts: 5 external Low-power consumption (stand-by functions) modes: Sleep, stop
MB89805		100P	100P	-	
MB89P808	+2.7 to +6.0	100P	100P	-	
MB89PV800		-	-	100C	

Packages: P - plastic C - ceramic

MB89550A Series

Standard products (compact camera, etc.)



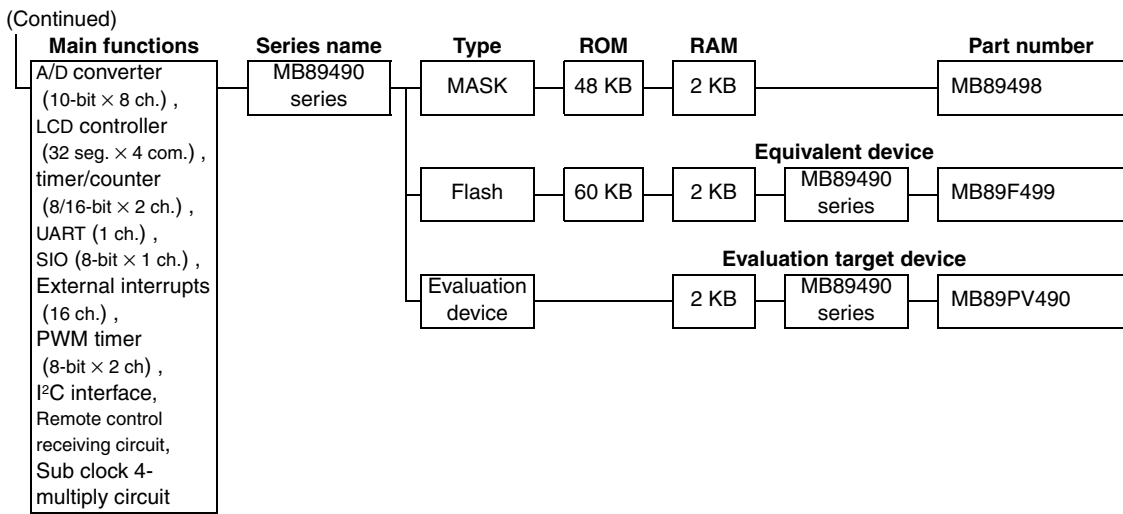
- Maximum clock frequency: 12.5 MHz (32.768kHz)
- Minimum execution time: 0.32 μs (61μs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	TQFP	MQFP	
MB89557A	+2.2 to +3.6 ^{*1} +2.2 to +5.5 ^{*2}	100P	100P	-	I/O ports: 66 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit×4ch.(16-bit × 2ch.),16-bit×1ch. PWM timer: 8-bit × 2ch. PWC timer: 8-bit × 1ch. PPG timer: 16-bit × 1ch. A/D converter: 10-bit × 8ch. D/A converter: 8-bit × 2ch. LCD controller/driver: 128 elements, 2 to 4 common, 8 to 32 segments, 1/2, 1/3 bias power supplies, 32 × 4-bit LCD display RAM, booster circuit (selected as an option), static, duty UART/SIO: 8-bit × 2ch. Interrupts: 10 internal, 5 external Low-power consumption (stand-by functions) modes: Sleep, watch, sub
MB89558A		100P	100P	-	
MB89P558A	+2.7 to +5.5	100P	100P	-	
MB89PV550A		-	-	100C	

*1: Power supply for logic at Vcc1

*2: Power supply for I/O at Vcc2

Packages: P - plastic, C - ceramic



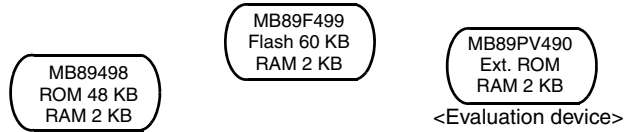
8-bit Proprietary F²MC-8L Family

Internal LCD Controller/Driver Products

F²MC-8L Family

■ MB89490 Series

Standard products (Remote control receiving circuit, Sub clock multiply circuit)



- Maximum clock frequency: 12.5 MHz
- Minimum execution time: 0.32 μ s
- Operating temperature range: -40°C to +85 °C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	MQFP	
MB89498	+2.2 to +3.6	100P	100P	-	I/O ports: 66 A/D converter: 10-bit $\times$ 8 ch. Timer/counter: 8-bit $\times$ 2 ch. (16-bit $\times$ 1 ch.) Timebase timer (WDT): 21-bit $\times$ 1 ch. Watch timer: 1 ch. PWM timer : 8-bit $\times$ 2 ch.
MB89F499	+2.7 to +3.6	100P	100P	-	LCD controller/driver: 128 elements, 2 to 4 common, 16 to 32 segments, 1/2, 1/3 bias power supplies, 32 $\times$ 4-bit LCD display RAM
MB89PV490		-	-	100C	UART : 8-bit $\times$ 1 ch. SIO : 8-bit $\times$ 1 ch. I ² C interface: 1 ch. Interrupts: edge 8 ch./level 8 ch. Remote control receiving circuit Sub clock 4-multiply circuit Low-power consumption (stand-by functions) modes: Sleep, stop, watch, sub

Packages: P - plastic, C - ceramic

F²MC-8L Family VFDC Driver Products

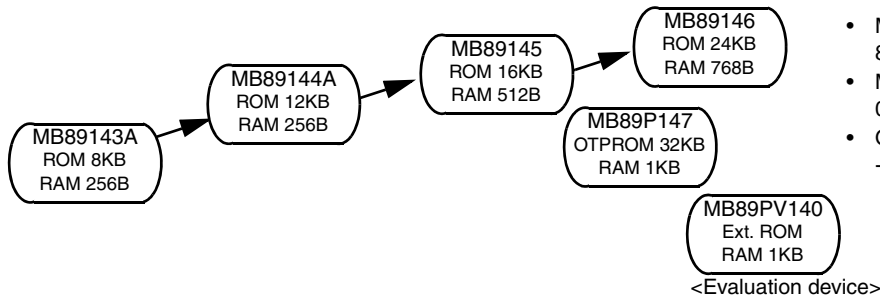
	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
F ² MC-8L Family VFDC Driver Products	64	Vacuum fluorescent display driver, A/D converter (10-bit × 12ch.), PWM timer (8-bit × 1ch.), MPG timer (12-bit × 1ch.), timer/counter (8-bit × 2ch., can operate as 16-bit), SIO(8-bit × 1ch.)	MB89140 series	MASK	8 KB	256 B	MB89143A
					12 KB	256 B	MB89144A
					16 KB	512 B	MB89145
					24 KB	768 B	MB89146
				OTPROM	32 KB	1 KB	MB89P147
				Equivalent device			
				Evaluation device	32 KB (Ext.)	1 KB	MB89PV140

F²MC-8L Family Inverter Motor Control Products

	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
F ² MC-8L Family Inverter Motor Control Products	80	Inverter control circuit, A/D converter (10-bit × 8ch.), PWM timer, UART, SIO	MB89860 series	MASK	16 KB	512 B	MB89865
					32 KB	1 KB	MB89867
				OTPROM	32 KB	1 KB	MB89P867
				Evaluation device	32 KB	1 KB	MB89W867
				Equivalent device			
				Evaluation device	32 KB	1 KB	MB89W867

MB89140 Series

Standard products (vacuum fluorescent display driver, 10-bit A/D converter, built-in inverter macro)



- Maximum clock frequency: 8 MHz (32.768 kHz)
- Minimum execution time: 0.5 μs to 8.0 μs (61 μs)
- Operating temperature range: -40°C to +85°C

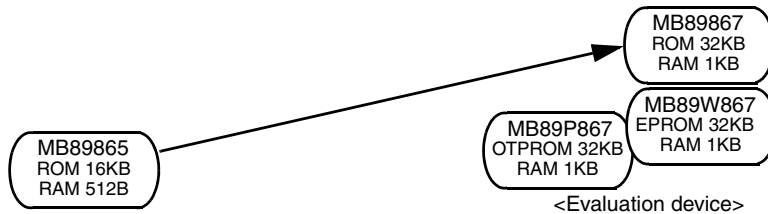
Part number	Operating power supply voltage (V)	Package				Functions
		SDIP	QFP	MDIP	MQFP	
MB89143A	+4.0 to +6.0	64P	-	-	-	I/O ports: 55 High withstand voltage ports: 25 Timebase timer (WDT): 21-bit × 1ch. Timer/counter: 8-bit × 2ch. (16-bit × 1ch.) PWM timer: 8-bit × 1ch. (MB89143 except) MPG timer: 12-bit × 1ch. (MB89143 except) A/D converter: 10-bit × 12ch. (MB89143: 8-bit × 8ch.) SIO: 8-bit × 1ch. Clock prescaler: 15-bit Buzzer output Interrupts: 10 internal, 2 external Low-power consumption (stand-by functions) modes: Sleep, watch, stop, sub
MB89144A		64P	-	-	-	
MB89145	+2.7 to +6.0 *	64P	64P	-	-	
MB89146		64P	64P	-	-	
MB89P147		64P	64P	-	-	
MB89PV140		-	-	64C	64C	

*: A/D = 3.5V to 6.0V

Packages: P - plastic, C - ceramic

MB89860 Series

ASMC (1) (inverter motor control, built-in high-speed pulse output)



- Maximum clock frequency: 10 MHz
- Minimum execution time: 0.4 μs
- Operating temperature range: -40°C to +85°C

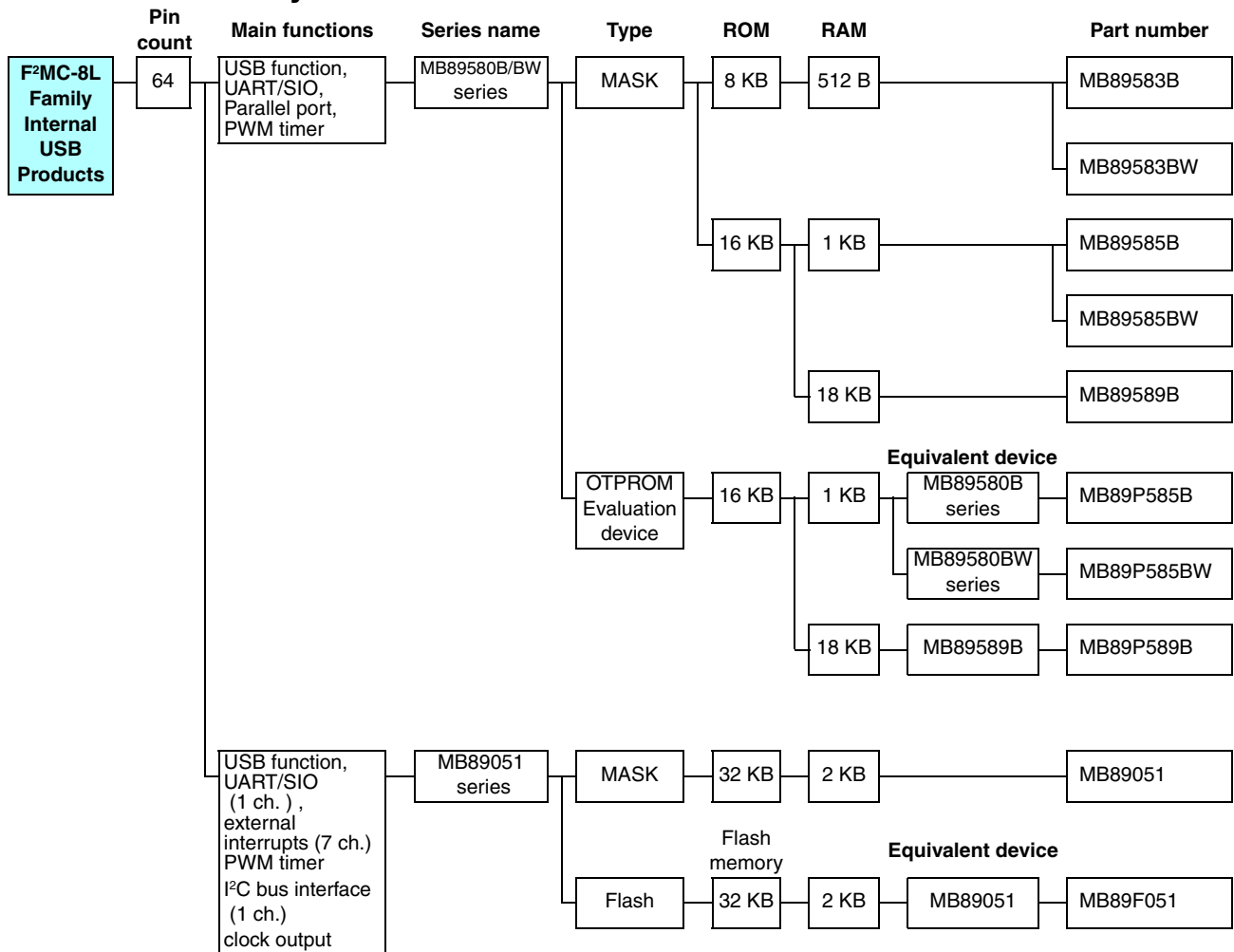
Part number	Operating power supply voltage (V)	Package	Functions
		QFP	
MB89865	+2.7 to +6.0 *1	80P	I/O ports: 68 Timebase timer (WDT): 20-bit × 1ch. PWM timer: 8-bit × 2ch. (with reload timer function) Timer unit: 10-bit up/down count timer × 1ch., output compare registers × 4 (with buffer), (0.4 μs min. resolution), real time waveform output pins × 7ch. Dead time timer: 4-bit load timers × 3ch. (non-overlap 3-phase waveform output for AC inverter motor control.), includes a function to disable output on detection of over-current (edge or level input)
MB89867		80P	
MB89P867	+2.7 to +5.5 *2	80P	A/D converter: 10-bit × 8ch. SIO: 8-bit × 1ch. UART: 8-bit × 1ch. Interrupts: 9 internal, 4 external Low-power consumption (stand-by functions) modes: Sleep, stop
MB89W867		80C	

*1: A/D = 3.5 V to 6.0 V

*2: A/D = 3.5 V to 5.5 V

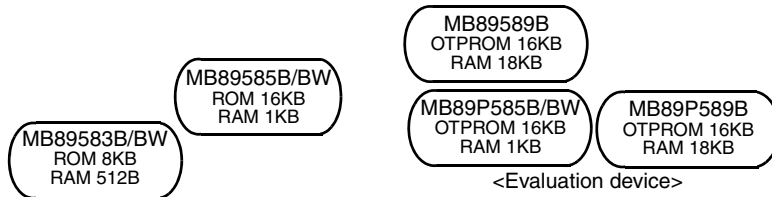
Package: P - plastic, C - ceramic

F²MC-8L Family Internal USB Products



■ MB89580B/580BW Series

Standard products (Internal USB function)



- Maximum clock frequency: 12 MHz
- Minimum execution time: 0.33 μs
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm pitch)	LQFP (0.65 mm pitch)	
MB89583B	+3.0 to +5.5	64P	-	I/O ports: 53 Timebase timer: 21-bit × 1ch. PWM timer: 8-bit × 2ch. (also used as PPG timer × 1ch.) USB function UART/SIO: 1ch. Parallel port State of terminal RPVP(D+) and RPVM(D-) until starting USB connection: High-Z: MB89593B/595B/P595B Low-level output: MB89593BW/595BW/P595BW Interrupts: 8 external Low-power consumption (stand-by functions) modes: Sleep, stop
MB89583BW		64P	-	
MB89585B		64P	-	
MB89585BW		64P	-	
MB89589B		-	64P	
MB89P585B		64P	-	
MB89P585BW		64P	-	
MB89P589B		-	64P	

Package: P - plastic

■ MB89051 Series

Standard products (Internal USB function)



- Maximum clock frequency: 12 MHz
- Minimum execution time: 0.33 μs
- Operating temperature range: -40°C to +85°C (USB operation: 0°C to +70°C)

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB89051	+3.0 to +5.5	64P	I/O ports: 41 USB function (endpoint: 4) Timebase timer: 21-bit × 1 ch. PWM timer: 8-bit × 2 ch. UART/SIO: 1 ch. Interrupts: 7 external I ² C bus interface (1 ch.) Clock output: 6 MHz, 12 MHz Low-power consumption (stand-by functions) modes: Sleep, stop
MB89F051		64P	

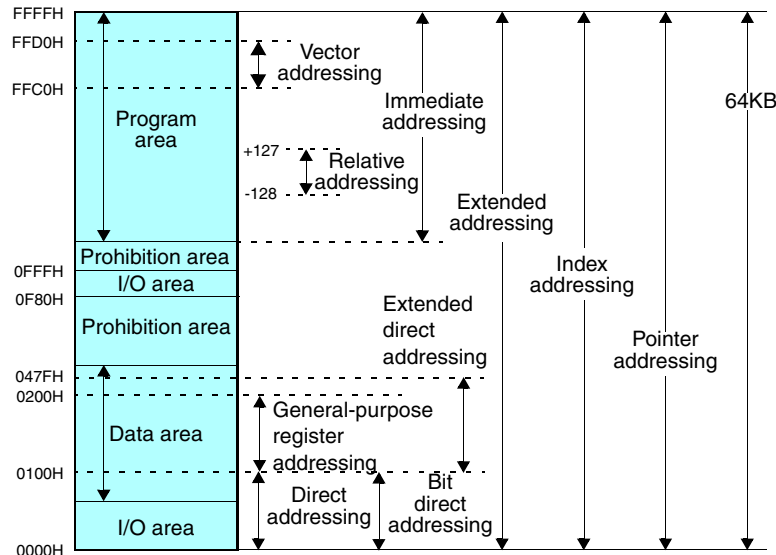
Package: P - plastic

8-bit Proprietary F²MC-8FX Family Features

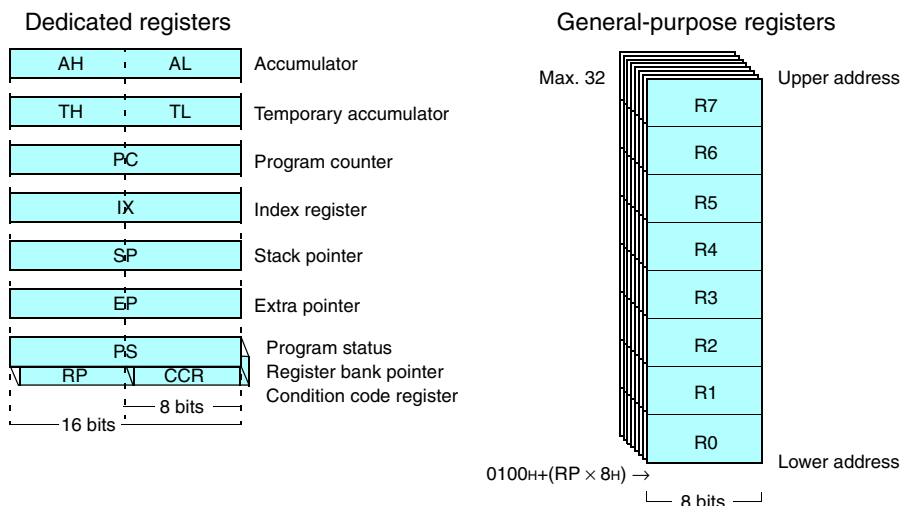
F²MC-8FX Family Features

- Minimum execution time: 62.5 ns/16 MHz
- Operating voltage: +1.8 V to +3.6 V or +2.5 V to +5.5 V, external clock: 32.768 kHz to 32.5 MHz
- Software-switchable instruction cycle provides low voltage, low-power consumption operation (clock gear function)
- Backup voltage in stop mode (voltage required to maintain RAM data): Min. +1.5 V (3 V products)
- Bitwise selectable pull-up resistors for each I/O port
- Memory space: Max. 64 Kbytes

Memory space



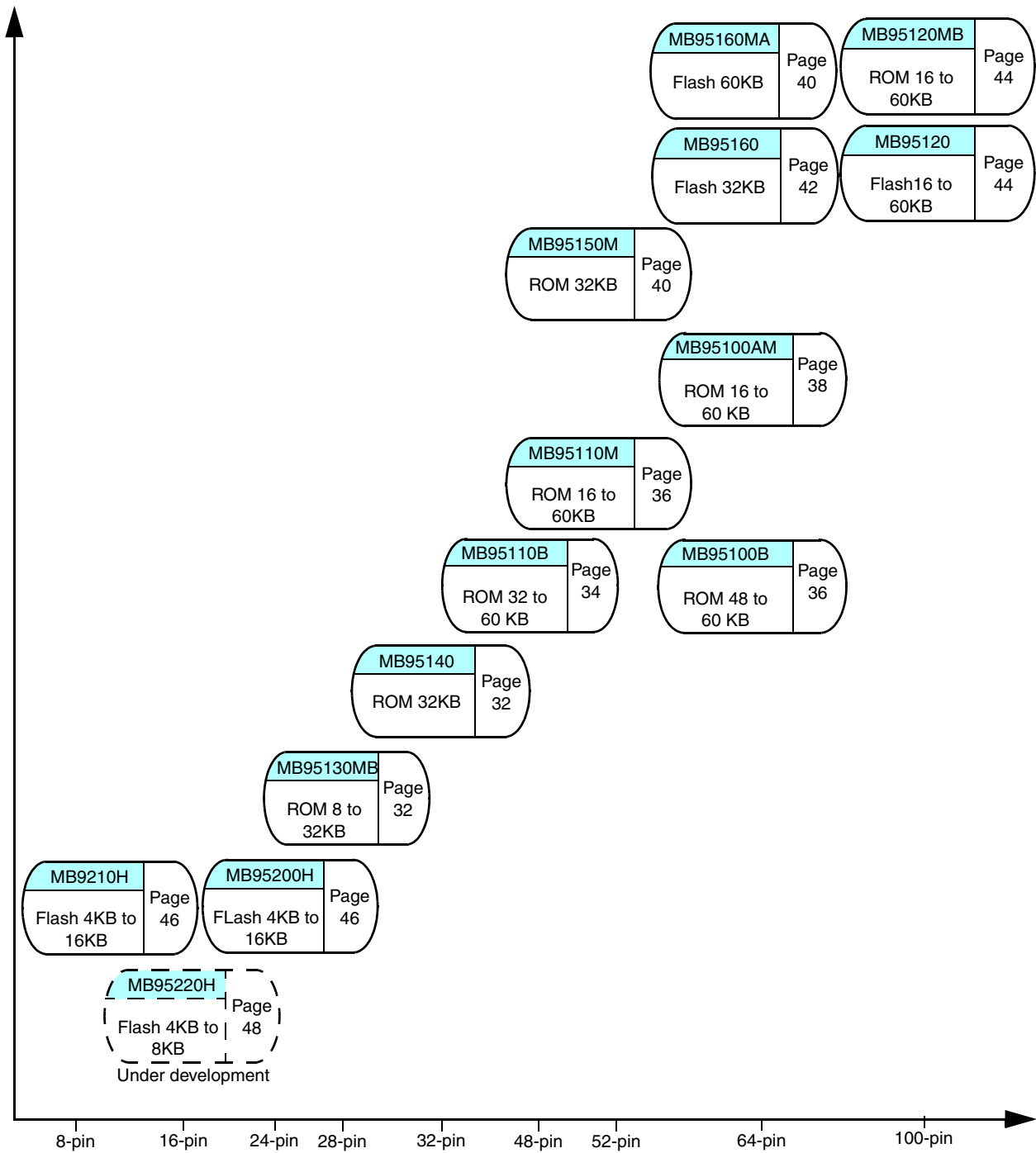
- Memory mapped I/O
 - Registers
- Dedicated registers
General-purpose registers: 8 × 8-bit per bank, Max. 32 banks



- Enhanced interrupt function (prioritized multiple interrupts)
 - Powerful operation and transfer functions
- Multiplication and division instructions: 8-bit × 8-bit = 16-bit (0.5 μs/16 MHz), 16-bit ÷ 16-bit = 16-bit (1.1 μs/16 MHz)
Data transfer: Max. 16-bit
- Number of instructions: 136

8-bit Proprietary F²MC-8FX Family Product Range

F²MC-8FX Family Product Range



8-bit Proprietary F²MC-8FX Family

F²MC-8FX Family

	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
F²MC-8FX Family	28/30	UART/SIO (1 ch.) , LIN UART (1 ch.) , 8/16-bit compound timer (1 ch.) , 8/16-bit PPG (1 ch.) , 16-bit PPG (1 ch.) , A/D converter (10-bit × 8 ch.) , external interrupts (8 ch.) , watch prescaler, watch counter	MB95130MB series	MASK	32 KB	1 KB	MB95136MB
				One sector Flash	8 KB	256 B	MB95F133J
					16 KB	512 B	MB95F134J
					32 KB	1 KB	MB95F136MB
				Evaluation device	60 KB	3.75 KB	MB95FV100D-103
	32	UART/SIO (1 ch.) , LIN UART (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (1 ch.) , A/D converter (10-bit × 8 ch.) , external interrupts (8 ch.) , watch prescaler, watch counter	MB95140 series	One sector Flash	32 KB	1 KB	MB95F146
				Evaluation device	60 KB	3.75 KB	MB95FV100D-101

(Continued)

8-bit Proprietary F²MC-8FX Family

■ MB95130MB Series

Built-in A/D converter, UART, etc.

MB95136MB ROM 32 KB RAM 1 KB	MB95F133J One-sector Flash memory 8 KB RAM 256 B	MB95F134J One-sector Flash memory 16 KB RAM 512 B	MB95F136MB One-sector Flash memory 32 KB RAM 1 KB	MB95FV100D-103 Dual operation Flash memory 60 KB RAM 3.75 KB <Evaluation device>

- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package			Functions
		SOP (1.27 mm pitch)	SSOP (0.65 mm pitch)	FBGA	
MB95F136MB	+2.5 to +5.5 *1	28P	30P	—	I/O ports: 20 Max. (single-clock) 18 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. 8/16-bit compound timer : 16-bit × 1 ch. (8-bit × 2 ch.) 8/16-bit PPG timer : 16-bit × 1 ch. (8-bit × 2 ch.) 16-bit PPG timer : 1 ch A/D converter : 10-bit × 8 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupt : 8 ch.
MB95F133J		28P	—	—	
MB95F134J		28P	—	—	
MB95136MB		28P	30P	—	
MB95FV100D-103	+2.7 to +5.5	—	—	224P	Watch prescaler, watch counter Low-voltage detection reset (option) *2 Clock Supervisor (option) *2 Low-power consumption modes : Sleep, stop, sub, watch mode

Package: P - plastic

*1: The range of the voltage is different depending on the frequency.

*2: MB95F134J and MB95F133J have Low-voltage detection reset and Clock Supervisor.

■ MB95140 Series

Built-in A/D converter, UART, etc.

MB95F146 One sector Flash memory 32 KB RAM 1 KB	MB95FV100D-101 Dual operation Flash memory 60 KB RAM 3.75 KB <Evaluation device>

- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range: -40 °C to +85 °C *

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.8 mm pitch)	FBGA	
MB95F146	+1.8 to +3.3 *	32P	—	I/O ports: 24 Max. (single-clock) 22 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 1 ch A/D converter : 10-bit × 8 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupt : 8 ch. Watch prescaler, watch counter Low-power consumption modes : Sleep, stop, sub, watch mode
MB95FV100D-101	+2.6 to +3.6	—	224P	

Package: P - plastic

*: The range of the voltage is different depending on the temperature and the frequency.

8-bit Proprietary F²MC-8FX Family

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
48 52	UART/SIO (1 ch.) , LIN UART (1 ch.) , I ² C bus interface (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (1 ch.) , A/D converter (10-bit × 8 ch.) , external interrupts (8 ch.) , watch prescaler, watch counter	MB95110B series	Mask	32 KB	1 KB	MB95116B
			Dual operation Flash	60 KB	2 KB	MB95F118B
			Evaluation device	60 KB	3.75 KB	MB95FV100D-101

(Continued)

8-bit Proprietary F²MC-8FX Family

■ MB95110B Series

Built-in A/D converter, UART, etc.

MB95116B
ROM 32 KB
RAM 1 KB

MB95F118B
Dual operation
Flash memory 60 KB
RAM 2 KB

MB95FV100D-101
Dual operation
Flash memory 60 KB
RAM 3.75 KB
<Evaluation device>

- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range: -40 °C to +85 °C *

Part number	Operating power supply voltage (V)	Package				Functions
		LQFP (0.5 mm pitch)	BCC (0.5 mm pitch)	LQFP (0.65 mm pitch)	FBGA	
MB95116B	+1.8 to +3.6 *1	48P	48P	*2	—	I/O ports: 40 Max. (single-clock) 38 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch.
MB95F118B	+1.8 to +3.3 *1	48P	48P	52P	—	I ² C bus interface : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 1 ch A/D converter : 10-bit × 8 ch.
MB95FV100D-101	+2.6 to +3.6	—	—	—	224P	Timebase timer (WDT) : 21-bit × 1 ch. External interrupt : 8 ch. Watch prescaler, watch counter Low-power consumption modes : Sleep, stop, sub, watch mode

Package: P - plastic

*1: The range of the voltage is different depending on the temperature and the frequency.

*2: Under development

8-bit Proprietary F²MC-8FX Family

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
52	UART/SIO (1 ch.) , LIN UART (1 ch.) , I ² C bus interface (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (1 ch.) , A/D converter (10-bit × 8 ch.) , external interrupts (8 ch.) , watch prescaler, watch counter	MB95110M series	Mask	48 KB	2 KB	MB95117M
			Dual operation Flash	60 KB	2 KB	MB95F118M
			Flash	16 KB	512 B	MB95F114J *
				32 KB	1 KB	MB95F116J *
			Evaluation device	60 KB	3.75 KB	MB95FV100D-103

*: Under development

64	UART/SIO (1 ch.) , LIN UART (1 ch.) , I ² C bus interface (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (2 ch.) , 16-bit reload timer (1 ch.) , A/D converter (10-bit × 12 ch.) , external interrupts (12 ch.) , watch prescaler, watch counter	MB95100B series	Mask	48 KB	2 KB	MB95107B
			Dual operation Flash	60 KB	2 KB	MB95F108B
			Evaluation device	60 KB	3.75 KB	MB95FV100D-101

(Continued)

(Continued)

8-bit Proprietary F²MC-8FX Family

■ MB95110M Series

Built-in A/D converter, UART, etc.

MB95117M ROM 48 KB RAM 2 KB	MB95F114J Flash memory 16 KB RAM 512 B	MB95F116J Flash memory 32 KB RAM 1 KB	MB95F118M Dual operation Flash memory 60 KB RAM 2 KB	MB95FV100D-103 Dual operation Flash memory 60 KB RAM 3.75 KB <Evaluation device>	- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4) - Minimum execution time: 62.5 ns (7.63 μs) - Operating temperature range: -40 °C to +85 °C
	Under development				

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.65 mm pitch)	FBGA	
MB95117M	+2.5 to +5.5 *1	52P	–	I/O ports: 40 Max. (single-clock) 38 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. I ² C bus interface : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 1 ch. 16-bit reload timer : 1 ch. A/D converter : 10-bit × 8 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupt : 8 ch. Watch prescaler, watch counter Low-voltage detection reset (option) *2 Clock supervisor (option) *2 Low-power consumption modes : Sleep, stop, sub, watch mode
⊙ MB95F114J		52P	–	
⊙ MB95F116J		52P	–	
MB95F118M		52P	–	
MB95FV100D-103	+2.7 to +5.5	–	224P	

Package: P - plastic

⊙: Under development

*1: The range of the voltage is different depending on the frequency.

*2: MB95F114J and MB95F116J have Low-voltage detection reset and Clock supervisor.

■ MB95100B Series

Built-in A/D converter, UART, etc.

MB95107B ROM 48 KB RAM 2 KB	MB95F108B Dual operation Flash memory 60 KB RAM 2 KB	MB95FV100D-101 Dual operation Flash memory 60 KB RAM 3.75 KB <Evaluation device>	- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4) - Minimum execution time: 62.5 ns (7.63 μs) - Operating temperature range: -40 °C to +85 °C *

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm pitch)	BCC (0.5 mm pitch)	FBGA	
MB95107B	+1.8 to +3.6 *	64P	64P	–	I/O ports: 55 Max. (single-clock) 53 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. I ² C bus interface : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 2 ch. A/D converter : 10-bit × 12 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupt : 12 ch. Watch prescaler, watch counter Low-power consumption modes : Sleep, stop, sub, watch mode
MB95F108B	+1.8 to +3.3 *	64P	64P	–	
MB95FV100D-101	+2.6 to +3.6	–	–	224P	

Package: P - plastic

*: The range of the voltage is different depending on the temperature and the frequency.

8-bit Proprietary F²MC-8FX Family

(Continued)	(Continued)						
	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
	64	UART/SIO (1 ch.) , LIN UART (1 ch.) , I ² C bus interface (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (2 ch.) , 16-bit reload timer (1 ch.) , A/D converter (10-bit × 12 ch.) , External interrupts (12 ch.) , watch prescaler, watch counter	MB95100AM series	Mask	60 KB	2 KB	MB95108AM
				Dual operation Flash	60 KB	2 KB	MB95F108AM
				Flash	16 KB	512 B	MB95F104AJ
					32 KB	1 KB	MB95F106AJ
				Evaluation device	60 KB	3.75 KB	MB95FV100D-103
(Continued)							

8-bit Proprietary F²MC-8FX Family

■ MB95100AM Series

Built-in A/D converter, UART, etc.

MB95108AM ROM 60 KB RAM 2 KB	MB95F104AJ Flash memory 16 KB RAM 512 B	MB95F106AJ Flash memory 32 KB RAM 1 KB	MB95F108AM Dual operation Flash memory 60 KB RAM 2 KB	MB95FV100D-103 Dual operation Flash memory 60 KB RAM 3.75 KB

<Evaluation device>

- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm pitch)	LQFP (0.65 mm pitch)	FBGA	
MB95108AM	+2.5 to +5.5 *1	64P	64P	—	I/O ports: 54 Max. (single-clock) 52 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. I ² C bus interface : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 2 ch. 16-bit reload timer : 1 ch. A/D converter : 10-bit × 12 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupts : 12 ch. Watch prescaler, watch counter Low-voltage detection reset (option) *2
MB95F104AJ		64P	64P	—	Clock supervisor (option) *2
MB95F106AJ		64P	64P	—	Low-power consumption modes : Sleep, stop, sub, watch mode
MB95F108AM		64P	64P	—	
MB95FV100D-103	+2.7 to +5.5	—	—	224P	

Package: P - plastic

*1: The range of the voltage is different depending on the frequency.

*2: MB95F104AJ and MB95F106AJ have Low-voltage detection reset and Clock supervisor.

8-bit Proprietary F²MC-8FX Family

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
48 52	UART/SIO (1 ch.) , LIN UART (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (1 ch.) , A/D converter (10-bit × 8 ch.) , external interrupts (8 ch.) , LCD controller, watch prescaler, watch counter	MB95150M series	Mask	32 KB	1 KB	MB95156M
			One sector Flash	32 KB	1 KB	MB95F156M
			Evaluation device	60 KB	3.75 KB	MB95FV100D-103
64	UART/SIO (1 ch.) , LIN UART (1 ch.) , I ² C bus interface (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (1 ch.) , 16-bit reload timer (1 ch.) , A/D converter (10-bit × 8 ch.) , external interrupts (8 ch.) , LCD controller, watch prescaler, watch counter	MB95160MA series	One sector Flash	60 KB	2 KB	MB95F168MA
			Evaluation device	60 KB	3.75 KB	MB95FV100D-103

(Continued)

8-bit Proprietary F²MC-8FX Family

■ MB95150M Series

Built-in A/D converter, UART, LCD controller, etc.

MB95156M
ROM 32 KB
RAM 1 KB

MB95F156M
One sector
Flash memory 32 KB
RAM 1 KB

MB95FV100D-103
Dual operation
Flash memory 60 KB
RAM 3.75 KB

<Evaluation device>

- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm pitch)	LQFP (0.65 mm pitch)	FBGA	
MB95156M	+2.5 to +5.5 *	48P	52P	–	I/O ports: 39 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 1 ch.
MB95F156M		48P	52P	–	A/D converter : 10-bit × 8 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupts : 8 ch. LCD controller: 16 elements, 16 seg × 4 com 16 × 4-bit LCD display RAM
MB95FV100D-103	+2.7 to +5.5	–	–	224P	Watch prescaler, watch counter Low-voltage detection reset (option) Clock supervisor (option) Low-power consumption modes : Sleep, stop, sub, watch mode

Package: P - plastic

*: The range of the voltage is different depending on the frequency.

■ MB95160MA Series

Built-in A/D converter, UART, LCD controller, etc.

MB95F168MA
One sector
Flash memory 60 KB
RAM 2 KB

MB95FV100D-103
One-sector
Flash memory 60 KB
RAM 3.75 KB

<Evaluation device>

- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range:
 - 40 °C to +85 °C (No low-voltage detection reset)
 - 40 °C to +85 °C (Low-voltage detection reset)

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm pitch)	QFP (0.65 mm pitch)	FBGA	
MB95F168MA	+2.5 to +5.5 *	64P	64P	–	I/O ports: 53 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. I ² C bus interface : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 1 ch.
MB95FV100D-103		–	–	224P	A/D converter : 10-bit × 8 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupts : 8 ch. LCD controller: 128 elements, 32 seg × 4 com 32 × 4-bit LCD display RAM Watch prescaler, watch counter Low-voltage detection reset (option) Clock supervisor (option) Low-power consumption modes : Sleep, stop, sub, watch mode

Package: P - plastic

*: The range of the voltage is different depending on the frequency.

8-bit Proprietary F²MC-8FX Family

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
64	UART/SIO (1 ch.) , LIN UART (1 ch.) , I ² C bus interface (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (1 ch.) , 16-bit reload timer (1 ch.) , A/D converter (10-bit × 8 ch.) , external interrupts (8 ch.) , LCD controller, watch prescaler, watch counter	MB95160 series	One sector Flash	32 KB	1 KB	MB95F166D
			Evaluation device	60 KB	3.75 KB	MB95FV100D-101

(Continued)

8-bit Proprietary F²MC-8FX Family

■ MB95160 Series

Built-in A/D converter, UART, LCD controller, etc.

MB95F166D
One sector
Flash memory 32 KB
RAM 1 KB

MB95FV100D-101
One-sector
Flash memory 60 KB
RAM 3.75 KB

<Evaluation device>

- Maximum internal clock frequency : 16 MHz (32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm pitch)	QFP (0.65 mm pitch)	FBGA	
MB95F166D	+2.0 to +3.3 *	64P	64P	—	I/O ports: 53 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. I ² C bus interface : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 1 ch.
MB95FV100D-101	+2.6 to +3.6	—	—	224P	A/D converter : 10-bit × 8 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupts : 8 ch. LCD controller: 128 elements, 32 seg × 4 com 32 × 4-bit LCD display RAM Watch prescaler, watch counter Low-power consumption modes : Sleep, stop, sub, watch mode

Package: P - plastic

*: The range of the voltage is different depending on the frequency.

8-bit Proprietary F²MC-8FX Family

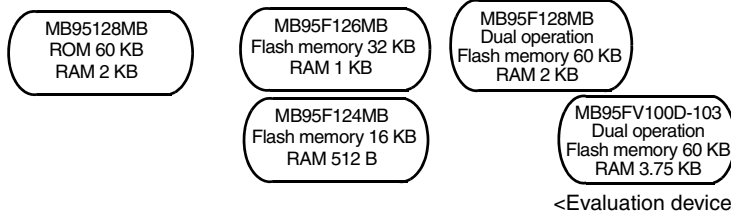
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Pin count	Main functions	Series name	Type	ROM	RAM	Part number
100	UART/SIO (1 ch.) , LIN UART (1 ch.) , I ² C bus interface (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (2 ch.) , 16-bit reload timer (1 ch.) , A/D converter (10-bit × 12 ch.) , external interrupts (12 ch.) , LCD controller, watch prescaler, watch counter	MB95120MB series	Dual operation Flash	60 KB	2 KB	MB95F128MB
			Flash	16 KB	512 B	MB95F124MB
				32 KB	1 KB	MB95F126MB
			Mask	60 KB	2 KB	MB95128MB
			Evaluation device	60 KB	3.75 KB	MB95FV100D-103
	UART/SIO (1 ch.) , LIN UART (1 ch.) , I ² C bus interface (1 ch.) , 8/16-bit compound timer (2 ch.) , 8/16-bit PPG (2 ch.) , 16-bit PPG (2 ch.) , 16-bit reload timer (1 ch.) , A/D converter (10-bit × 12 ch.) , External interrupts (12 ch.) , LCD controller, watch prescaler, watch counter	MB95120 series	Dual operation Flash	60 KB	2 KB	MB95F128D
			Evaluation device	60 KB	3.75 KB	MB95FV100D-101

8-bit Proprietary F²MC-8FX Family

■ MB95120MB Series

Built-in A/D converter, UART, LCD controller, etc.



- Maximum internal clock frequency : 16 MHz
(32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm pitch)	QFP (0.65 mm pitch)	FBGA	
MB95F124MB	+2.5 to +5.5 *1	100P	100P	—	I/O ports: 87 Max. (single-clock) 85 Max. (dual-clock) UART/SIO : 1 ch. LIN UART : 1 ch. I ² C bus interface : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 2 ch. 16-bit reload timer : 1 ch. A/D converter : 10-bit × 12 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupts : 12 ch. LCD controller: 160 elements, 40 seg × 4 com 40 × 4-bit LCD display RAM
MB95F126MB		100P	100P	—	
MB95F128MB		100P	100P	—	
MB95128MB		100P	100P	—	
MB95FV100D-103	+2.7 to +5.5	—	—	224P	Watch prescaler, watch counter Low-voltage detection reset (option) *2 Clock supervisor (option) *2 Low-power consumption modes : Sleep, stop, sub, watch mode

Package: P - plastic

*1: The range of the voltage is different depending on the frequency.

*2: MB95F124JB and MB95F126JB have Low-voltage detection reset and Clock supervisor.

■ MB95120 Series

Built-in A/D converter, UART, LCD controller, etc.



- Maximum internal clock frequency : 16 MHz
(32.768 kHz × 4)
- Minimum execution time: 62.5 ns (7.63 μs)
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm pitch)	LQFP (0.65 mm pitch)	FBGA	
MB95F128D	+1.8 to +3.6 *	100P	100P	—	I/O ports: 86 Max. UART/SIO : 1 ch. LIN UART : 1 ch. I ² C bus interface : 1 ch. 8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/16-bit PPG timer : 16-bit × 2 ch. (8-bit × 4 ch.) 16-bit PPG timer : 2 ch. 16-bit reload timer : 1 ch. A/D converter : 10-bit × 12 ch. Timebase timer (WDT) : 21-bit × 1 ch. External interrupts : 12 ch. LCD controller: 160 elements, 40 seg × 4 com 40 × 4-bit LCD display RAM Watch prescaler, watch counter Low-power consumption modes : Sleep, stop, sub, watch mode
MB95FV100D-101	+2.6 to +3.6	—	—	224P	

Package: P - plastic

*: The range of the voltage is different depending on the frequency.

8-bit Proprietary F²MC-8FX Family

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
20 24	LIN UART (1 ch.) , 8/10-bit A/D converter (6 ch.) , 8/16-bit compound timer (2 ch.) , External interrupts (6 ch.) , Watch prescaler, Wild register, Clock supervisor, Low-voltage detection reset , CR oscillator	MB95200H series	One sector Flash, On chip debugger	4 KB	240 B	MB95F202H
						MB95F202K
				8 KB	496 B	MB95F203H
						MB95F203K
				16 KB	496 B	MB95F204H
						MB95F204K
8	8/10-bit A/D converter (2 ch.) , 8/16-bit compound timer (1 ch.) , External interrupts (2 ch.) , Watch prescaler, Wild register, Clock supervisor, Low-voltage detection reset, CR oscillator	MB95210H series	One sector Flash, On chip debugger	4 KB	240 B	MB95F212H
						MB95F212K
				8 KB	496 B	MB95F213H
						MB95F213K
				16 KB	496 B	MB95F214H
						MB95F214K

(Continued)

8-bit Proprietary F²MC-8FX Family

■ MB95200H Series

Built-in A/D converter, LIN-UART, CR oscillator, etc.

MB95F202H/K ROM 4 KB RAM 240 B	MB95F203H/K ROM 8 KB RAM 496 B	MB95F204H/K ROM 16 KB RAM 496 B

- Maximum internal clock frequency : 16.25 MHz
- Minimum execution time: 61.5 ns
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package		Functions
		SDIP (1.778 mm pitch)	SOP (1.27 mm pitch)	
MB95F202H	+2.4 to +5.5 *	24P	20P	I/O ports : 17 Max. (dual-clock) LIN UART : 1 ch.
MB95F202K		24P	20P	8/16-bit compound timer : 16-bit × 2 ch. (8-bit × 4 ch.) 8/10-bit converter : 6 ch.
MB95F203H		24P	20P	External interrupt : 6 ch.
MB95F203K		24P	20P	Timebase timer Hardware/software watch dog timer
MB95F204H		24P	20P	wild register Watch prescaler
MB95F204K		24P	20P	Low-voltage detection reset (MB95F202K/203K/204K) clock supervisor On chip debug CR oscillator Standby mode : Sleep, stop, Timebase timer mode, watch mode

Package: P - plastic

* : +4.0V to +5.5V (at A/D operation)

■ MB95210H Series

Built-in A/D converter, CR oscillator, etc.

MB95F212H/K ROM 4 KB RAM 240 B	MB95F213H/K ROM 8 KB RAM 496 B	MB95F214H/K ROM 16 KB RAM 496 B

- Maximum internal clock frequency : 16.25 MHz
- Minimum execution time: 61.5 ns
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package		Functions
		DIP (2.54 mm pitch)	SOP (1.27 mm pitch)	
MB95F212H	+2.4 to +5.5*	8P	8P	I/O ports : 5 Max. (single-clock) 8/16-bit compound timer : 16-bit × 1ch. (8-bit × 2 ch.)
MB95F212K		8P	8P	8/10-bit converter : 2 ch.
MB95F213H		8P	8P	External interrupt : 2 ch.
MB95F213K		8P	8P	Timebase timer Hardware/software watch dog timer
MB95F214H		8P	8P	wild register Watch prescaler
MB95F214K		8P	8P	Low-voltage detection reset (MB95F212K/213K/214K) clock supervisor On chip debug CR oscillator Standby mode : Sleep, stop, Timebase timer mode, watch mode

Package: P - plastic

* : +4.0V to +5.5V(at A/D operation)

8-bit Proprietary F²MC-8FX Family

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
16	LIN UART (1 ch) , 8/10bit A/D converter (5 ch) , 8/16-bit compound timer (1 ch) , External interrupts (6 ch) , Watch prescaler, Wild register, Clock supervisor, Low-voltage detection reset, CR oscillator	MB95220H series	One sector Flash, On chip debugger	4 KB	240 B	MB95F222H *
						MB95F222K *
				8 KB	496 B	MB95F223H *
						MB95F223K *

*: Under development

8-bit Proprietary F²MC-8FX Family

■ MB95220H Series

Built-in A/D converter, UART, CR oscillator, etc.

MB95F222H/K
ROM 4 KB
RAM 240 B

<Evaluation device>

MB95F223H/K
ROM 8 KB
RAM 496 B

<Evaluation device>

- Maximum internal clock frequency : 16.25 MHz
- Minimum execution time : 61.5 ns
- Operating temperature range : -40 to +85 °C

Part number	Operating power supply voltage (V)	Package		Functions
		DIP	SOP	
⊙ MB95F222H	+2.4 to +5.5*	16P	16P	I/O ports: 13 Max. (dual-clock) LIN UART : 1 ch. 8/16-bit compound timer : 16-bit × 1 ch. (8-bit × 2 ch.)
⊙ MB95F222K		16P	16P	8/10 bit A/D converter : : 5 ch. External interrupt : 6 ch. Timebase timer (WDT) Hardware/software watch dog timer
⊙ MB95F223H		16P	16P	wild register Watch prescaler Low-voltage detection reset (MB95F222K/223K)
⊙ MB95F223K		16P	16P	clock supervisor On chip debug CR oscillator Standby mode : Sleep, stop, Timebase timer mode, watch mode

Package: P - plastic

* : +4.0V to +5.5V (at A/D operation)

⊙: Under development

■ F²MC-8L/8FX Family Support Tools

Environment Development Features

(1) Development efficiency enhancement

- Provides integrated total environment
SOFTUNE V3 Workbench (Manager + Debugger)
SOFTUNE V3 Workbench (Manager + Debugger) integrates language tools and debugger tools, further facilitating the repeated process of coding, compiling and debugging.
- High programming efficiency
C compiler support
Structured assembly language support
- High programming development efficiency
Provides C library
Supports C language and assembly source debugging function
- Easy operation by multi windows
SOFTUNE V3 Workbench (manager + debugger)
SOFTUNE V3 C checker
SOFTUNE V3 C analyzer

(2) Efficient system development tools

- Provides realtime debugging using real target board
Evaluation tool + SOFTUNE V3 Workbench emulator debugger
- Provides software debugging without target board

(3) Total development environment

- Personal computer (IBM-PC)
- In Circuit Emulator tool (MB2140 series)

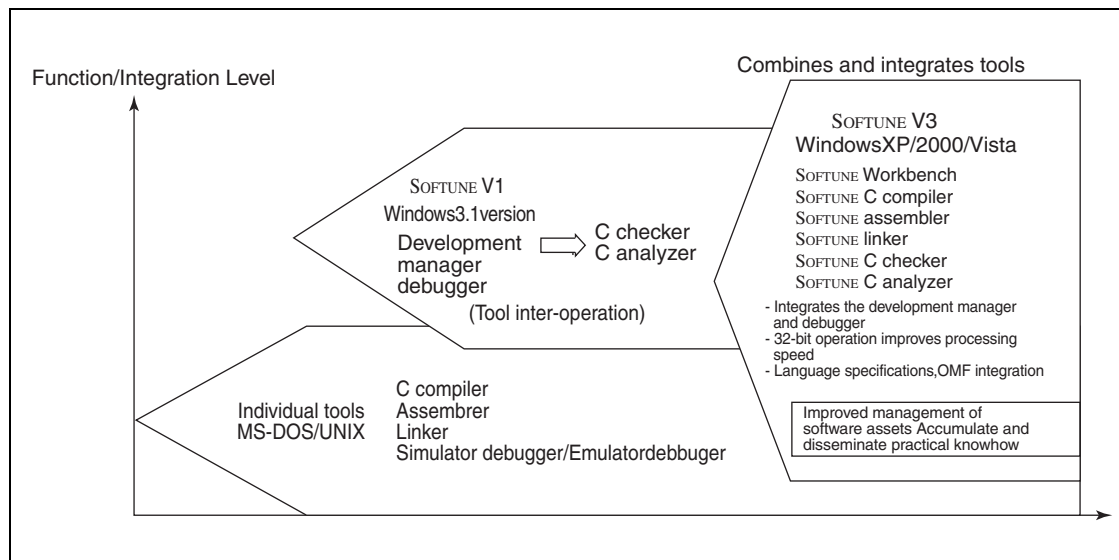
(4) Conformity with standards

Improves versatility and portability of software resources

- C language: Conforms to ANSI standard
- C library: Conforms to ANSI standard

SOFTUNE V3

1. The SOFTUNE Integrated Development Environment



2. SOFTUNE V3 Features and Structure

Workbench integrated project manager and two debugger modules

Errors can be corrected on the “fly”, as they are discovered, and the resulting code can be debugged on the spot.

A variety of tools to support C-language coding are available

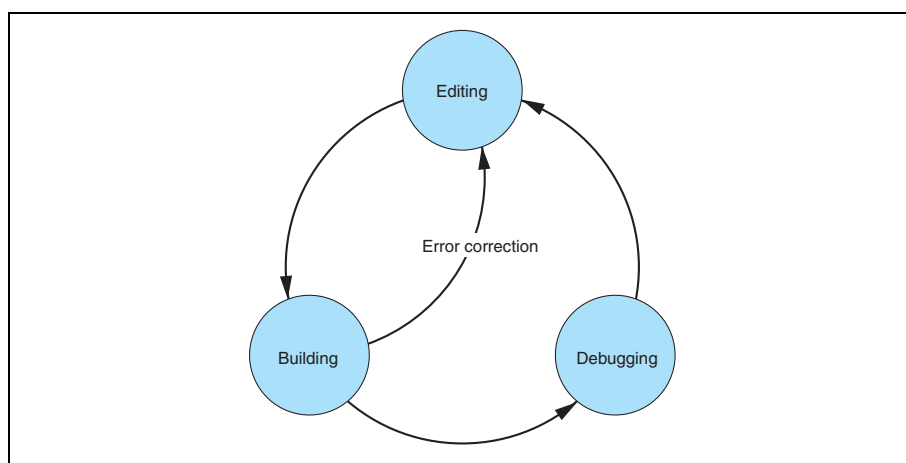
“C Checker” confirms code operation and “C Analyzer” analyzes the code’s structure.

(1) Removing the Annoying Settings which are Part of Program Development

Developing programs for different systems requires the programmer to edit source code, perform actual builds and confirm program operations (debug). Finally, the programmer returns to the editing process to incorporate necessary changes, as indicated by debugging results.

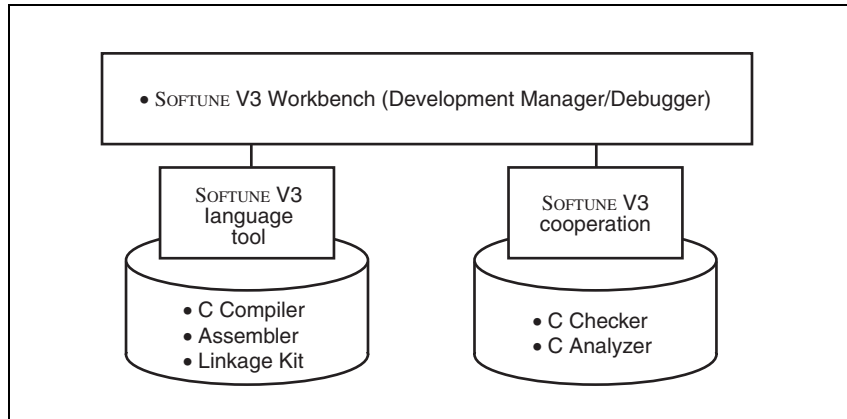
SOFTUNE V3 is an integrated developing environment which is designed to perform such repetitive processes smoothly and efficiently. It is the third generation of SOFTUNE, which has evolved to meet various needs of our customers.

(2) Program Flow



8-bit Proprietary F²MC-8L/8FX Family Support Tools

(3) Structure of SOFTUNE V3

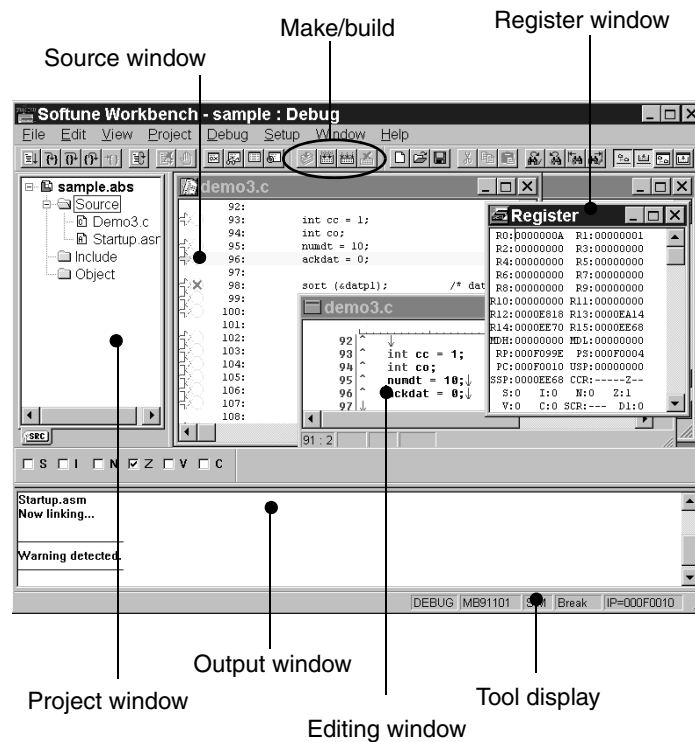


(4) Environment with SOFTUNE V3

The Efficient and Easy-to-Use Integrated Developing Environment.

Program development requires repeated editing, make/build, and debugging operations. Performing these functions smoothly and effectively contributes to improved efficiency.

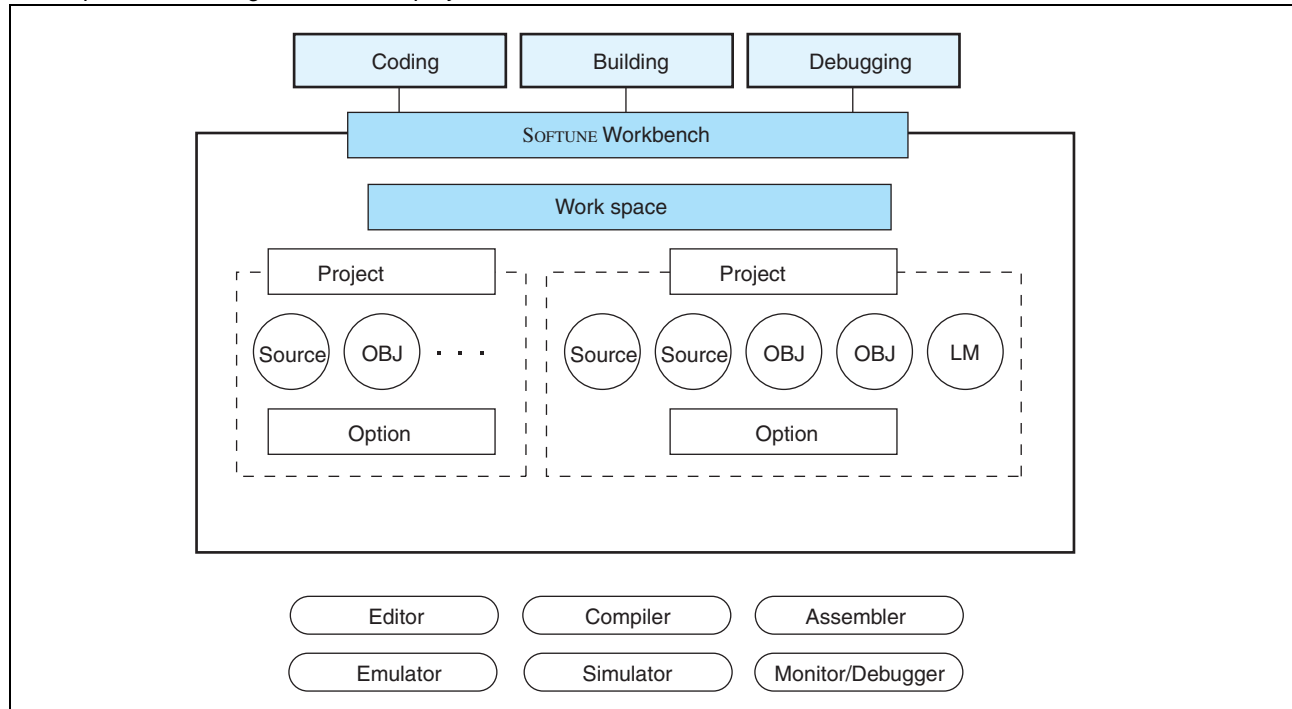
The SOFTUNE V3 integrated developing system is designed to meet program developers' numerous demands, while ensuring ease of use.



3. Manager Functions

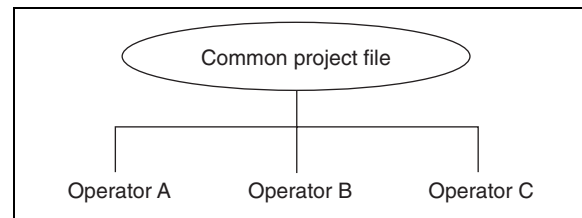
Software programming proceeds according to the “project file”, which contains all the information needed for program development.

Work space can manage two or more projects.



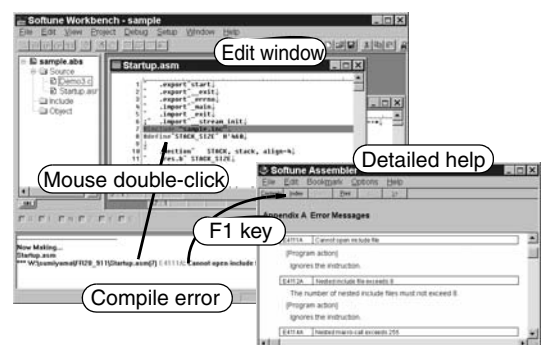
(1) Effective Project Usage

Whether working alone on several projects simultaneously or developing a project as a group, project files can be used to create a simple developing environment.



(2) Extremely Easy to Use

- Built-in Editor
The built-in editor comes complete with many useful functions, such as visual keyword emphasis and auto-indent.
- Error Jump and On-line Help
Errors that occur during builds are displayed in the output window at the bottom of the screen.
To make a “Tag-jump” Double-click Mouse. Once on the error press “F1 key” for a more detailed error display.
- Cooperation with Commercially Available Editors
To meet developers’ requests to use editors to which they are accustomed, SOFTUNE can be configured to use the following commercially available editors: (Codewright32, TextPAD32 and others)



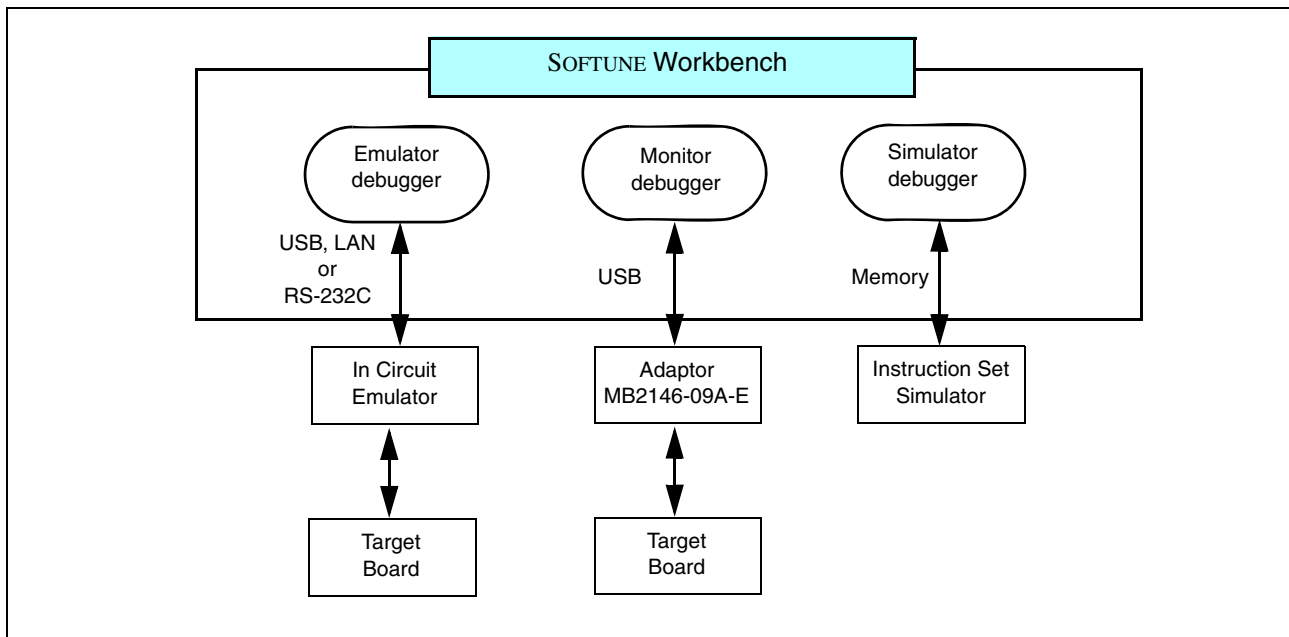
(3) Customizable Environment

When sharing files, cooperation with source generation management tools is assured, and file type conversion tools are called up, so that each person can operate in his or her own customized developing environment.

8-bit Proprietary F²MC-8L/8FX Family Support Tools

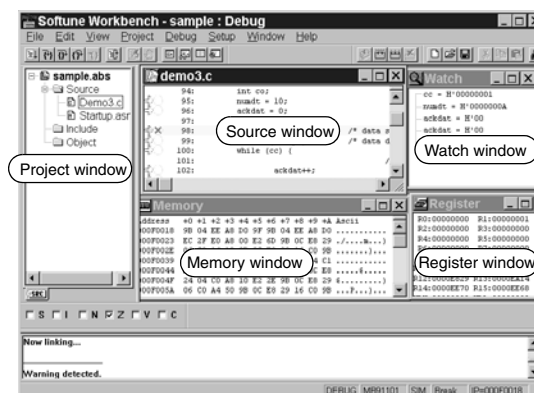
4. Debugger Function

SOFTUNE Workbench supports three debuggers that are needed at various stages of development. The appropriate debugger environment can be selected to match the situation.



(1) Easy-to see Screen Information

The user can freely change the screen layout by selecting the necessary windows. In addition, the displayed information can be selected to provide only the information that is necessary.



(2) Simple Environment Setting

- Debugging Environment: Setup "Wizard"
The setup "wizard" supports the selection of communication lines with emulator and boards, as well as window settings.
- MCU Operating Environment
The so-called "CPU information file," which contains the information required to support all MCUs, is provided as standard. Necessary information such as I/O port locations, ROM/RAM capacity and initial addresses can be set automatically.
- Saving and Restoring the Debugging Environment
Previous debugging environment specification, such as window locations, breakpoint settings, and memory mapping information, are saved, so that these settings are restored the next time the program is initiated.

5. Cooperation

In cooperation with SOFTUNE Workbench, the following SOFTUNE components help improve the quality of C-language programming, which greatly increases reviewing and documentation efficiency.

1)SOFTUNE V3 C Checker

Designed to meet the following requests from beginners through to advanced users:

- Eliminate all coding mistakes.
- Review programs quickly and efficiently.
- Enable even C-language beginners to create quality code.
- Maximize coding skills.
- Use software assets on Fujitsu Microelectronics CPUs.

The SOFTUNE C Checker checks code for maintainability, methods of expanding specifications and transportability; indicates areas where quality and performance could be improved, and reports these results to the user. The user can then review the C-language code.

(1) Outline

Recently software for embedded microcontrollers has been developed in the C language. However, it is difficult to understand the message output from a compiler unless the language specifications are well known.

This development support tool checks C-source programs to display and print advice for better quality and performance. It also has a facility for selecting necessary advice carefully.

(2) Features

- Outputs advised to be suitable for these objectives: Portability, coding error performance, porting to Fujitsu Microelectronics CUP's.
- Allows customization according to the programmers level.
- Works with C compilers (fcc911/fcc911s, cc907/fcc907s, fcc896s) for Fujitsu microcontrollers (FR family, F²MC-16 family, and F²MC-8L/8FX family).
- Provides easy operation and simple display over a GUI.

(3) Advising Function

The following pieces of advice are given. "Reason of check", "Example of program", "Suggestion of correction", and "One-point advice" are displayed and explained for each check item.

- Portability

This tool makes a close check on the items "processing-defined operation" and "undefined operation" which can be problems in portability within the ANSI standard.

It also gives an explanation of the operation of C compilers (Fcc911, Fcc907 and Fcc896) for Fujitsu microcontrollers.

For example, the tool gives the user proper advice on many problems (such as a data type acceptable to a structure, code, and its arrangement) at the time of porting.

- Coding error

This tool indicates the items which are not wrong in the language specifications but may cause an error and the items which are logically inconsistent.

For example, the equivalent expression "if (a==0)" in the if statement is likely to be typed as the assignment expression "if (a=0)" by mistake. Most compilers cannot detect such an error.

- Performance

This tool indicates the items generally providing better performance and the items essential and effective for the FR family, F²MC-16 family and F²MC-8L/8FX family.

Stress is especially, put on the detection of object size reduction which can be a problem in software for embedded microcontrollers.

For example, if a function return value is structure of the double type, an area is reserved for the return value and an object which is to be transferred to the area is output.

This tool advises the user to transfer the function return value by a pointer and largely reduce the object size.

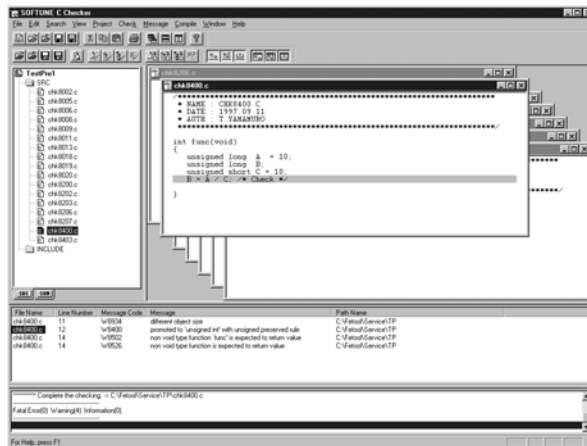
- Porting to Fujitsu Microelectronics CPU

This tool advises the user what to consider in porting existing software from other makers' CPU to Fujitsu CPU in the FR family, F²MC-16 family and F²MC-8L/8FX family.

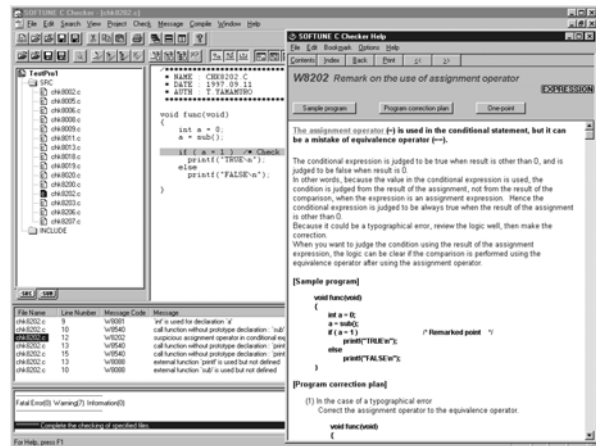
For example, in porting software resources created for the F²MC-16 family to the FR family, this tool advises the user to delete the expansion specifications (`__far`, `__near`, and `__direct` etc.) inherent to the F²MC-16 family.

8-bit Proprietary F²MC-8L/8FX Family Support Tools

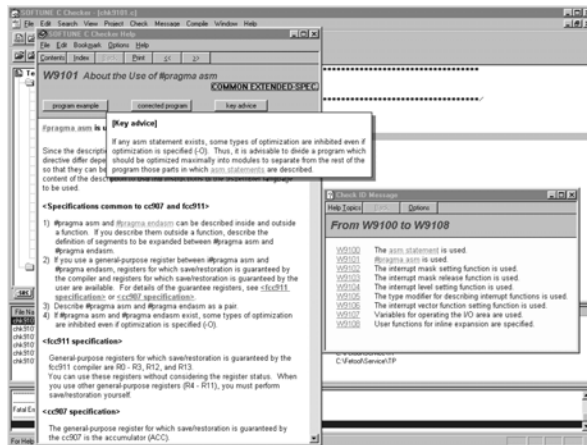
- Indicated messages output



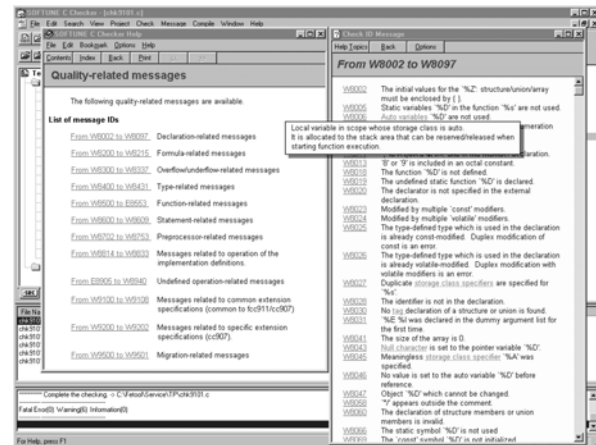
- Coding error indicated and advice displayed



- Advice of porting to Fujitsu C compilers displayed



- Quality-related messages listed



2) SOFTUNE V3 C Analyzer

Designed to meet the following user situations:

- One wishes to examine a program's structure or processing, but the programmer is absent or documentation is unavailable.
- During program development, one wishes to create a structural program while taking into account structure and processing.
- One wishes to examine the range of effects caused by program modification.
- One wishes to create a program's internal documentation.
- One wishes to explore the possibilities of a more efficient program.

The structure and usage of data in a C-language source program are displayed visually, and the internal data structure, functional tree, stack usage and other information can be acquired and stored in a file.

(1) Outline

Recent software (ROM) for embedded microcontrollers is increasingly extending its development scale. This situation is created from development by many programmers, diversion of existing resources, and use of package programs. This development support tool statically analyzes the C-source program to visually display and print the function-to-function structure, reference data, and statistical data. In addition to generating the information required for design and maintenance, the development support tool also provides functions for development aimed at embedded applications. These functions (maximum stack size calculation) are specific to the C compilers (fcc911s, fcc907s, fcc896s) used for Fujitsu microcontrollers (FR family, F²MC-16 family, and F²MC-8L/8FX family).

(2) Features

- Displays and prints the function-to-function structure, reference data, and statistical data.
- Supports the embedded capability of C compilers (fcc911/fcc911s, cc907/fcc907s, and fcc 896s) for Fujitsu microcontrollers (FR family, F²MC-16 family and F²MC-8L/8FX family).
- Provides easy operation and simple display over a GUI.

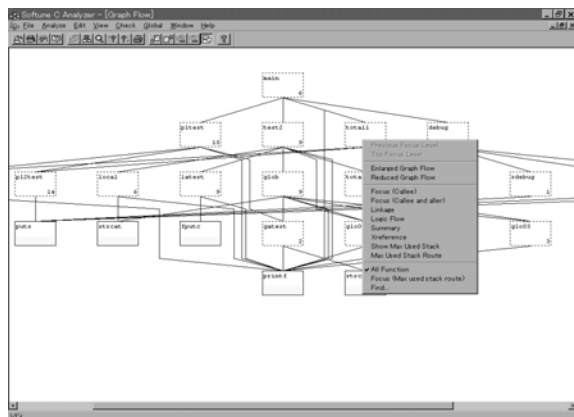
(3) Explanation of Features

The following data is enabled for development, maintenance, and higher porting efficiency.

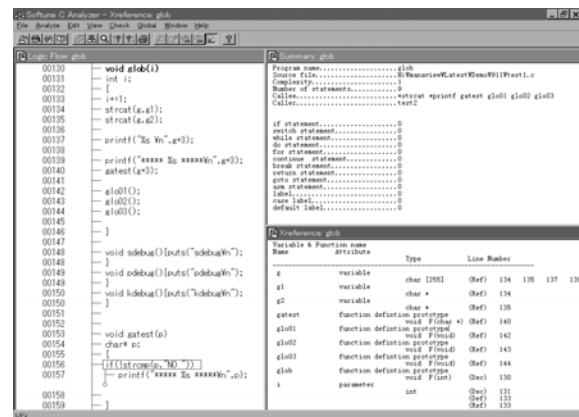
- Graphic flow
This feature displays the "call" function in the block structure way. It also allows the display of the entire function and calls from any function and the retrieval of functions.
- Logic flow
This feature visually displays the internal structure of the C-source program.
For example, it shapes the control structure of `for` and `switch` statements and structure declarations. A jump feature for retrieval by functions, variable, tag, and macro names is also provided.
- Displaying statistical data
This feature displays the complexity and line count of a programs every function, the source of destination function name, and the count of appearances of `if`, `for` and `asm` statements, etc.
- Displaying argument data
This feature displays data about the function-called file name and line number, the return value of the declared function, and the type of argument. It also checks the adjustability of dummy arguments with actual arguments.
- Displaying cross-reference data
This feature displays functions, variables, tag and macro declarations in its function and its line number.
- Displaying global data
This feature displays the functions using global variables. It also detects unused global variables.
- Program checking
This feature checks and displays the adjustability of dummy arguments with actual arguments.
- Calculating the maximum amount of stacks used
This feature calculates and displays the amount of stacks used in the entire function, as well as in any other functions. This calculation is made on the basis of the output of C compilers (fcc911/fcc911s, fcc907/fcc907s, and fcc896s) for Fujitsu microcontrollers (FR family, F²MC-16 family and F²MC-8L/8FX family).

8-bit Proprietary F²MC-8L/8FX Family Support Tools

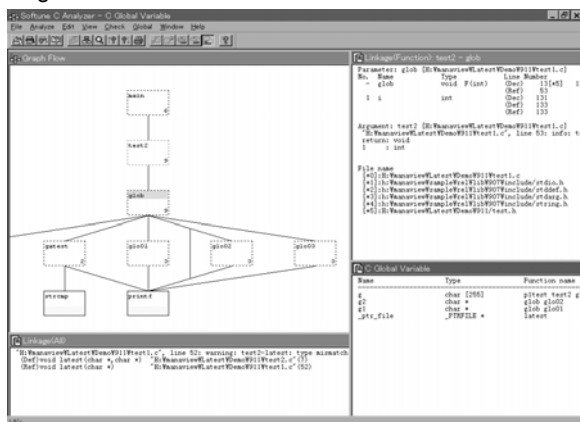
• Displaying graphic flow



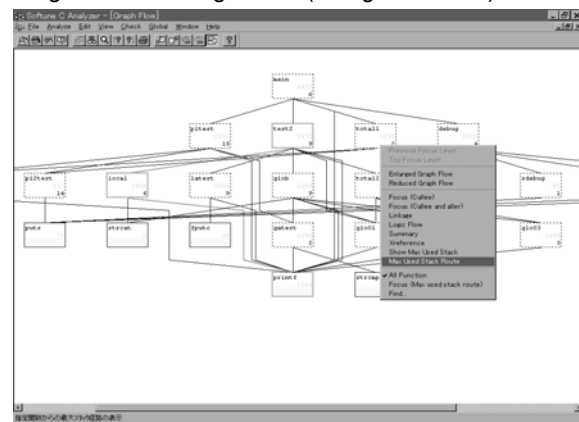
• Displaying logic flow, statistical and cross-reference data



• Displaying logic flow (focus), argument and global data



• Displays stack use volume (green numbers) and largest stack configuration (orange numbers)



SOFTUNE V3 Support Software Product List (F²MC-8L/8FX Family)

Software	Part number *1 (Maintenance number)	Operating machine	Operating OS	Media	Remarks
Pack Products					
SOFTUNE V3 Professional Pack	SP3603Z008-P01 (SP3603Z008-P01-M)	FMV and similar IBM compatibles	WindowsVista WindowsXP Windows2000	CD-ROM *2	SOFTUNE V3 workbench SOFTUNE V3 C compiler SOFTUNE V3 assembler pack SOFTUNE V3 analyser SOFTUNE V3 checker
Compatible emulator hardware	MB2140 series - MB2141A/B - MB2144-505/508				-

*1: The product code suffix (Pxx) indicates the number of licenses.

The part number is an ordered number of the newest version.

Please contact us if purchasing the previous version as a different part is used.

*2: An electronic manual (PDF format) is provided with each product (Japanese and English).

Printed manuals are sold separately. Licensing of each product is available in a number of forms (3, 5 or 10 copies).

8-bit Proprietary F²MC-8L/8FX Family Support Tools

Support Hardware and F²MC- Family Evaluation Tools

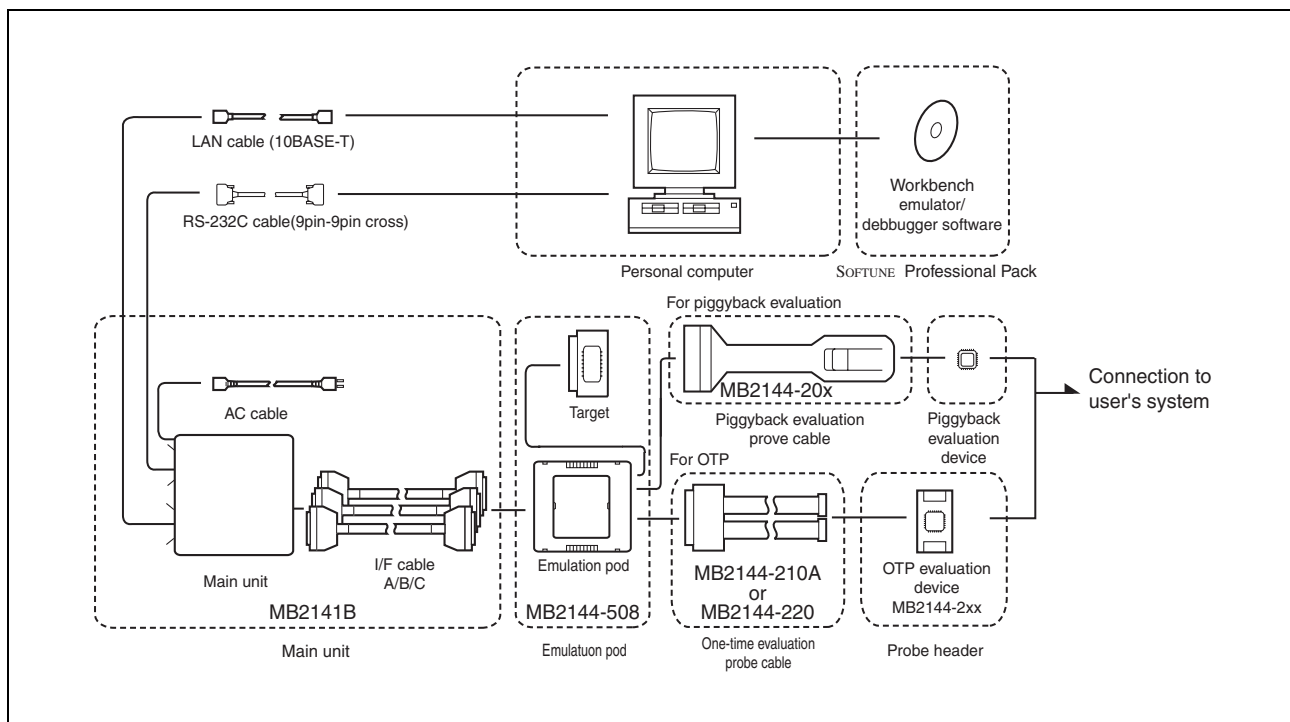
MB2140 Series

- Microcontroller operating voltage: +2.7V to +5.5V
The range (Max. and Min.) of Microcontroller operating voltage and operating frequency depend on each Microcontroller.
See the document including Data Sheet and check the range of Microcontroller operating voltage and operating frequency.
- Supports debugging of source level (in assembly, C languages, a mixed indicaton)
- Simplified GUI operation using pull-down menu and buttons
- On-The-FLY function (commands can be run during microcontroller execution and reference memory)
- Powerful real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Event trigger allows a wide range of conditions to be specified (× 8)
- Sequential control in 8 conditions and 8 levels
- Performance measurement function (measurement of execution speed between two points, iteration count measurement)
- C₀ coverage measurement function (program execution coverage rate measurement)
- Host I/F (standard accessories) : RS-232C (max 115 Kbps) , LAN (10BASE-T)

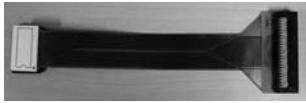
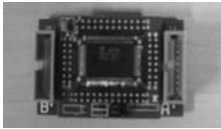
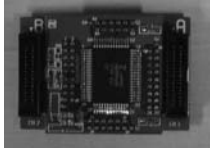
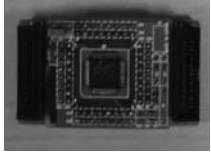
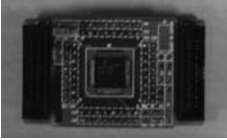
System Overview



System configuration



8-bit Proprietary F²MC-8L Family Support Tools

Name	Part number	Remarks	Overview
Main unit	MB2141B	For the F ² MC-8L family Power supply voltage: 100 V or 200 V. Host I/F: RS-232C(115 Kbps) , LAN (10BASE-T) Dimensions: W210 × D297 × H77 mm Weight: 2.9 kg Includes: manual	
Emulation pod *6	MB2144-508	For the F ² MC-8L family Dimensions: 158mm(with) × 126mm(depth) × 38mm(height), Weight: 0.5kg Includes: simple target (MB89T625) , manual	
Piggyback/evaluation (PV) probe cable	MB2144-201	For DIP-28, piggyback/evaluation package: MDIP-64C-P02	
	MB2144-202	For LCC-32 rectangular, piggyback/evaluation package: MQP-64C-P01, MQP-80C-P01, MQP-100C-P02	
	MB2144-203	For LCC-32 square, piggyback/evaluation package: MQP-48C-P01, MQP-100C-P02	
One-time evaluation probe cable	MB2144-210A or MB2144-220	Use in conjunction with the probe header for each product type.	
One-time evaluation probe header	MB2144-211-01A *1	For the MB89860 series (QFP-80), standard options are mounted on MB89P867	
	MB2144-214-01A *2	For the MB89810A series (QFP-64), default options are mounted on MB89P817A	
	MB2144-217-01 *4	For the MB89P585B (LQFP-64), default options are mounted on MB89P585B	
One-time evaluation probe header	MB2144-224-01 *7	For the MB89P589B (LQFP-64), default options are mounted on MB89P589B	
	MB2144-225-01 *4	For the MB89P585BW (LQFP-64) , default options are mounted on MB89P585BW	
	MB2144-227-01 *7	For the MB89F051 (LQFP-64), default options are mounted on MB89F051	

*1: Includes one Q-pack for QFP-80 (model: TQPACK080RA: made by Tokyo Eletech Ltd.)

Note: Care is required in printed circuit board pattern design because the position of the board connector part (the flat section at the pin tips) of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).

8-bit Proprietary F²MC-8L Family Support Tools

- Includes one Q-socket for QFP-80 (model: TQSOCKET080RAG: made by Tokyo Eletech Ltd.)
- *2: Includes one Q-pack for QFP-64 (model: TQPACK064RZ: made by Tokyo Eletech Ltd.)
 Note: Care is required in printed circuit board pattern design because the position of the board connector part (the flat section at the pin tips) of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).
 Includes one Q-socket for QFP-64 (model: TQSOCKET064RZG: made by Tokyo Eletech Ltd.)
- *3: Includes one IC socket for SH-DIP-64 (model: IC83-64075-GS4: made by Yamaichi Electronics Inc.)
- *4: Includes one Q-pack for LQFP-64 (model: TQPACK064SD: made by Tokyo Eletech Ltd.)
 Note: Care is required in printed circuit board pattern design because the size of the foot pattern of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).
 Includes one Q-socket for LQFP-64 (model: TQSOCKET064SDW: made by Tokyo Eletech Ltd.)
- *5: Includes one Q-pack for QFP-64 (model: TQPACK064SA: made by Tokyo Eletech Ltd.)
 Includes one Q-socket for QFP-64 (model: TQSOCKET064SAW: made by Tokyo Eletech Ltd.)
 Note: Care is required in printed circuit board pattern design because the size of the foot pattern of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).
- *6: Interchangeability to MB2114-505.
- *7: Includes one NQ-pack for LQFP-64 (model: NQPACK064SB: made by Tokyo Eletech Ltd.)
 Includes one HQ-pack for LQFP-64 (model: HQPACK064SB140: made by Tokyo Eletech Ltd.)
 Note: Care is required in printed circuit board pattern design because the size of the foot pattern of the Q-pack differs from the mass production product package (the Q-pack pins are shifted a few millimeters inwards).
- *8: Includes a pair of Q-pack and Q-socket for QFP-48 (model: TQPACK048SA, TQSOCKET048SAW: by Tokyo Eletech Ltd.)
 Note: The dimension of foot patterns is somewhat different between Q-pack and mass production IC packages.
 Be careful in designing patterns of print-circuit board.

Contact for details:

*1, *2, *4, *5, *7, *8

- USA: OESS Co. San Jose Office TEL(408)437-1582
- Europe Germany: OESS GmbH TEL(06106)2857890
- Tokyo Eletech Co, Ltd. TEL(81)3-3820-7141

*3

- USA: Yamaichi Electronics Inc. TEL(408)4520797
- Europe Denmark: Elmatok A. S. TEL(65)351446
- England: Radiatron Components Ltd. TEL(01)8911221
 AB Connector Ltd. TEL(0604)712000
- Finland: Dualtek Oy TEL(80)8019911
- France: Manudax-France TEL(1)4342-2050
- Germany: Macrotron AG TEL(089)4208148
 Glyn GmbH TEL(49)61278077
 Connector Service GmbH TEL(089)429277
- Italy: Eurosab International s.r.l TEL(02)93169781
- Spain: S.A Generalde Imporciones Electronicas TEL(1)416-92-61
- Sweden: Bexab Electronics TEL(08)7680560
- Switzerland: Slcovend AG TEL(01)8303161
- Asia Singapore: Yamco Electronics Pt. Ltd. TEL(336)6522
- Korea: Asia Yamaichi Electronics, Inc. TEL(02)482-7263
- Taiwan: Sing Way Co. TEL(02)718-5971
 Joung Lai Trading Co. Ltd. TEL(02)754-1022

- Select the probe cable to match the microcontroller being evaluated.
- Use this evaluation tool by connecting to the user system or to the evaluation device on the user system.
- When using a piggyback/evaluation (PV) device, obtain the piggyback/evaluation (PV) device separately.
- A one-time evaluation or EPROM evaluation type evaluation device is mounted in the one-time evaluation or EPROM evaluation probe cable.

8-bit Proprietary F²MC-8L Family Support Tools

Emulator specification for F²MC-8L

Emulator series		MB2140 series emulator	
Main unit		Main unit: MB2141B	
Pod		MB2144-508	MB2144-505
Target microcontroller		F ² MC-8L	F ² MC-8L
Operating power supply voltage of micro-controller *		2.7 to 5.5 V	2.7 to 5.5 V
Operating frequency of microcontroller *		Internal: 32 kHz to 20 MHz External: 8 kHz to 5 MHz	Internal: 32 kHz to 16 MHz External: 8 kHz to 4 MHz
Debugger / OS		SOFTUNE V3 Workbench WindowsXP/2000/Vista	SOFTUNE V3 Workbench WindowsXP/2000/Vista
Simple target		Attachment (MB89T625)	No
Memory area		- User's memory area - Emulation memory area - Undefined area	
User's memory area		- Max 20 area - Unrestricted of area size - READ, WRITE: an access attribute setup is possible.	
Emulation area	Size	64 Kbyte	
	Mapping unit	1 byte unit, 20area	
	Access attribute	READ, WRITE, GUARD, NOGUARD	
Mirror area: It is used at on-the-fly.		It is 5 area in all about copy area of user's memory area and emulation memory area.	
Execution control		- Continuous execution- The automatic change by sauce display - Step execution- 1 step execution of a sub routine and a function - Machine language command unit- Permission/prohibition of interrupt - C language sauce line unit- Permission/prohibition of a watch dog reset function	
Break		- Instruction execution break: 64 K point - Data access break: 64 K point - Sequential end break - Garded access break - Trace buffer full break - Performance buffer full break - Forced break	
Trace capacity		- Single trace: 32 K cycles (ON/OFF of trace by the event trigger and the sequencer is possible.) - Multi trace: 2 K blocks (1 block is 8 cycles before and after an event trigger.)	
Trace data		- Address - Data - Status - Access status: READ, WRITE, CODE - Inside status of a device: reset, a hold, and data are effective/invalid. - External probe data - The execution level of a sequencer	
Display form of trace data		- Machine cycle - Instruction mnemonic - Sauce line	
Event trigger condition setup	The number of points	8	
	Trigger conditions	- The AND conditions of address, data, external probe and status. - All conditions can be specified of don't care per 1 bit.	
	Sequential level	8	
	Trigger path	Max 16M time	

(Continued)

8-bit Proprietary F²MC-8L Family Support Tools

(Continued)

Emulator series		MB2140 series emulator	
Main unit		Main unit: MB2141B	
Pod		MB2144-508	MB2144-505
Target microcontroller		F ² MC-8L	F ² MC-8L
On-the-fly function (Command execution at the MCU operation)		Yes	
Execution time measurement		- Performance measurement function : 4 domains - Measurement domain : event trigger condition setting domain - Measurement of the minimum, the maximum, and average time is possible. - It is 1μs unit (initial value) is a maximum of 70 minutes. - It is 100 ns unit and is a maximum of 7 minutes.	
Co coverage (Rate measurement of program execution complete coverage)		The range of a debugging domain setup : A maximum of 32 domain An access attribute (R/W) setup is possible.	
Host computer		Personal computer	
Host interface		- RS-232C (115 Kbps) - LAN (10BASE-T)	
Dimensions, weight (A projection part and a cable part remove.)	Main unit	W210 × D297 × H78 mm, 2.9 kg	
	Pod	W160 × D128 × H40 mm, 0.5 kg	
Power supply for emulator : MB2141B		AC 100-120 V and AC 200-220 V are switched automatically.	

*: The range (Max. and Min.) of Microcontroller operating voltage and operating frequency depend on each Microcontroller.
See the document including Data Sheet and check the range of Microcontroller operating voltage and operating frequency.

8-bit Proprietary F²MC-8L Family Support Tools

F²MC-8L Family Adaptors

(1) Programming Adaptors for F²MC-8L One-Time PROM Microcontrollers and EPROM Microcontrollers

OTPROM microcontrollers	Package (lead pitch, body size)	Package code	Adaptor socket
MB89F051	LQFP-64 (0.65 mm, □12×12 mm)	FPT-64P-M09	FLASH-64QF2-32DP-8LF3 *6
MB89P131PFM MB89P133APFM MB89P135APFM	QFP-48 (0.80 mm, □10×10 mm)	FPT-48P-M13(new) FPT-48P-M04	ROM-48QF2-28DP-8L *1
MB89P147-V1P-SH MB89P147-V2P-SH	SH-DIP-64 (1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L4 *1
MB89P147-V1PF MB89P147-V2PF	QFP-64 (1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L4 *1
MB89W147-V1C-SH MB89W147-V2C-SH	SH-DIP-64 (1.778 mm, □56.9×18.75 mm)	DIP-64C-A06	ROM-64SD-28DP-8L4 *1
MB89P155-10XPF MB89P155-20XPF	QFP-80 (0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L3 *1
MB89P155-10XPFM MB89P155-20XPFM	LQFP-80 (0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L2 *1
MB89P155-10XPFV MB89P155-20XPV	LQFP-80 (0.50 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-28DP-8L *1
MB89P165-10XPF MB89P165-20XPF	QFP-80 (0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L3 *1
MB89P165-10XPFM MB89P165-20XPFM	LQFP-80 (0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L2 *1
MB89P165-10XPV MB89P165-20XPV	LQFP-80 (0.50 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-28DP-8L *1
MB89P185-xxxPF	QFP-64 (1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L3 *1
MB89P185-xxxPFM	LQFP-64 (0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-28DP-8L2 *1
MB89P195-xxxPF	SOP-28 (1.27 mm, □17.75×8.6 mm)	FPT-28P-M17	ROM-28SOP-28DP-8L *3
MB89P195-xxxP	DIP-28 (2.54 mm, □35.73×13.8 mm)	DIP-28P-M05	ROM-28DP-28DP-8L *3
MB89P195A-xxxPF	SOP-28 (1.27 mm, □17.75×8.6 mm)	FPT-28P-M17	ROM-28SOP-28DP-8L *3
MB89P195A-xxxP	DIP-28 (2.54 mm, □35.73×13.8 mm)	DIP-28P-M05	ROM-28DP-28DP-8L *3
MB89F202P-SH	SH-DIP-32 (1.778 mm, □28×8.9 mm)	DIP-32P-M06	TEF110-89F202-PSH *7 (ROM3-DIP32P-M06-8L: for serial programmer)
MB89F202YPFV	SSOP-34 (0.65 mm, □11×6.1 mm)	FPT-34P-M03	TEF110-89F202-PFV *7 (ROM3-FPT34P-M03-8L: for serial programmer)
MB89P485P-SH MB89P485LPFM	LQFP-64 (0.65 mm, □12×12 mm)	FPT-64P-M09	ROM2-64QF2-32DP-8LA3 *6
MB89P485PFM MB89P485LP-SH	DH-DIP-64 (1.778 mm, □58×17 mm)	DIP-64P-M01	ROM2-64SD-32DP-8LA3 *6
MB89F499	QFP-100 (0.65 mm, □14×20 mm)	FPT-100P-M06	FLASH-100QF-32DP-8LF2 *6
MB89P538P-SH	SH-DIP-64 (1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-32DP-8LA2 *2
MB89P538PF	QFP-64 (1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-32DP-8LA2 *2
MB89P538PFM	LQFP-64 (0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-32DP-8LA *2
MB89F538P-SH	SH-DIP-64 (1.778 mm, □58×17 mm)	DIP-64P-M01	FLASH-64SD-32DP-8LF *6
MB89F538PF	QFP-64 (1.00 mm, □14×20 mm)	FPT-64P-M06	FLASH-64QF-32DP-8LF *6
MB89F538PFM	LQFP-64 (0.65 mm, □12×12 mm)	FPT-64P-M09	FLASH-64QF2-32DP-8LF2 *6
MB89P558APFV	LQFP-100 (0.5 mm, □14×14 mm)	FTP-100P-M05	ROM-100SQF-32DP-8LA2*2
MB89P558APFT	TQFP-100 (0.4 mm, □12 × 12 mm)	FTP-100-M18	ROM-100TQF-32DP-8LA*2
MB89P568PF	QFP-80 (0.8 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-32DP-8LA2 *2
MB89P568PFM	LQFP-80 (0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-32DP-8LA2
MB89P568PFV	LQFP-80 (0.5 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-32DP-8LA *2
MB89P585B/BW	LQFP-64 (0.5 mm, □10×10 mm)	FPT-64P-M03	ROM-64LQF-32DP-8LA *4
MB89P589B	LQFP-64 (0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-32DP-8LA *4

(Continued)

8-bit Proprietary F²MC-8L Family Support Tools

(Continued)

OTPROM microcontrollers	Package (lead pitch, body size)	Package code	Adaptor socket
MB89W637C-ES-SH	SH-DIP-64 (1.778 mm, □57×18 mm)	DIP-64C-A06	ROM-64SD-28DP-8L *1
MB89P665P-SH	SH-DIP-64 (1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L *1
MB89P665PF	QFP-64 (1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L *1
MB89P677APF	QFP-80 (0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L2 *1
MB89P677APFM	LQFP-80 (0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L *1
MB89P689PF	QFP-100 (0.65 mm, □14×20 mm)	FPT-100P-M06	ROM-100QF-32DP-8LA *2
MB89P689PFV	LQFP-100 (0.50 mm, □14×14 mm)	FPT-100P-M20	ROM-100SQF-32DP-8LA *2
MB89P808PF	QFP-100 (0.65 mm, □14×20 mm)	FPT-100P-M06	ROM-100QF-32DP-8LA2 *2
MB89P808PFV	LQFP-100 (0.50 mm, □14×14 mm)	FPT-100P-M20	ROM-100SQF-32DP-8LA3 *2
MB89P817APF	QFP-64 (1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L*1
MB89P825PFM	LQFP-80 (0.65 mm, □14×14 mm)	FPT-80P-M11	ROM-80QF2-28DP-8L3*1
MB89P857P-G	SH-DIP-64 (1.778 mm, □58×17 mm)	DIP-64P-M01	ROM-64SD-28DP-8L*1
MB89P857PF	QFP-64 (1.00 mm, □14×20 mm)	FPT-64P-M06	ROM-64QF-28DP-8L*1
MB89W857	QFP-64 (1.00 mm, □14×20 mm)	FPT-64C-A02	ROM-64QF-28DP-8L5
MB89W857C-ES-SH	SH-DIP-64 (1.778 mm, □56.9×18.75 mm)	DIP-64C-A06	ROM-64SD-28DP-8L*1
MB89P867PF	QFP-80 (0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-28DP-8L2*1
MB89W867CF-ES	QFP-80 (0.80 mm, □14×20 mm)	FPT-80C-A02	ROM-80QF-28DP-8L2*1
MB89P899PF	QFP-100 (0.65 mm, □14×20 mm)	FPT-100P-M06	ROM-100QF-32DP-8LA*2
MB89P928PF	QFP-80 (0.80 mm, □14×20 mm)	FPT-80P-M06	ROM-80QF-32DP-8LA*2
MB89P935BPFV	SSOP-30 (0.65 mm, □9.7×5.6 mm)	FPT-30P-M02	ROM3-FPT30M02-8L*5 (Only the Serial on the programmer corresponds.)
MB89P945PF	QFP-48 (0.80 mm, □12×12 mm)	FPT-48P-M16	ROM-48QF-28DP-8L3*1
MB89P979PFV	Under planning LQFP-80 (0.50 mm, □12×12 mm)	FPT-80P-M05	ROM-80SQF-32DP-8LA2*2
MB89P985PFM	LQFP-64 (0.65 mm, □12×12 mm)	FPT-64P-M09	ROM-64QF2-28DP-8L4*1
MB89P985PFV	LQFP-64 (0.50 mm, □10×10 mm)	FPT-64P-M03	ROM-64SQF-28DP-8L3*1

Contact for details: Tokyo Japan: Sunhayato Corp. TEL +81-3-3984-7791, FAX +81-3-3971-0535

Advanced Interconnectics: <http://www.advantest.co.jp/en-index.shtml>

Notes: Use a general-purpose EPROM programmer that is able to program a MBM27C256A or MBM27C1000.

A gang EPROM programmer is not recommended. Also, contact Fujitsu Microelectronics for programming mounted devices.

The recommended screening practice before mounting is high-temperature aging (+150°C, 48H).

*1:MBM27C256A equivalent.

Recommended EPROM programmer: UNISITE, 3900, 2900 (Data I/O FAX (81) 3-3779-2203)
1890A, 1891 (Minato Electronics FAX (81) 45-591-6451)

*2:MBM27C1000 equivalent.

Recommended EPROM programmer: same as *1

*3:MODEL 1890A (Ver. 2.1) + MOS unit OU-910 (Ver. 4.07): Minato Electronics FAX (81) 45-591-6451

AF9708 (Ver. 1.40 or higher), AF9709 (Ver. 1.40 or higher), AF9723 (Ver 1.50 or higher): Flash Support Group, Inc.

*4:MODEL 1890A + MOS unit (Ver. 4.32r) + 3V board (ML01-781): Minato Electronics FAX (81) 45-591-6451

AF9708, AF9709/B, AF9723: Flash Support Group, Inc. <http://www.j-fsg.co.jp/e/top.html>

*5:Serial programming mode only: Yokogawa Digital Computer Co.

Interface

*6:MODEL 1890A + OU910 (Ver 4.32t1 or higher) , Conversion board : H910-1148 : Minato Electronics

AF9708, AF9709/B: Flash Support Group, Inc. <http://www.j-fsg.co.jp/e/top.html>

*7:Flash Support Group, Inc. <http://www.j-fsg.co.jp/e/top.html>

8-bit Proprietary F²MC-8L Family Support Tools

(2) IC Package Conversion Adaptors for the F²MC-8L Family

Target microcontroller	Package conversion (up → down)	IC package conversion adaptor model
MB89610 series MB89630R series	SH-DIP-64 → QFP-64 (1.00 mm pitch)	64SD-64QF-8L
	SH-DIP-64 → QFP-64 (0.65 mm pitch)	64SD-64QF2-8L
	SH-DIP-64 → SQFP-64 (0.5 mm pitch)	64SD-64SQF-8L
MB89120/A series MB89130/A series	QFP-48 (0.80 mm pitch) → SQFP-48 (0.50 mm pitch)	48QF-48SQF-8L-UP 48QF-48SQF-8L-DWN
MB89190/A series	QFP-48 (0.80 mm pitch) → SOP-28	48QF-28SOP-8L
	QFP-48 (0.80 mm pitch) → DIP-28 (2.54 mm pitch)	48QF-28DP-8L
	QFP-48 (0.80 mm pitch) → SHDIP-28 (1.778 mm pitch)	48QF-28SD-8L
MB89150/A series MB89160/A series MB89560A series	QFP-80 (0.80 mm pitch) → QFP-80 (0.65 mm pitch)	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN
MB89150/A series MB89160/A series MB89560A series	QFP-80 (0.80 mm pitch) → LQFP-80 (0.5 mm pitch)	80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN
MB89550A series	LQFP-100 (0.50 mm pitch) → TQFP-100 (0.4 mm pitch)	100SQF-100TQF-8L
MB89650A series	LQFP-100 (0.50 mm pitch) → QFP-100 (0.65 mm pitch)	100SQF-100QF-8L
MB89863	SH-DIP-64 → QFP-48(0.80 mm pitch)	64SD-48QF-8L
MB89930 series	QFP-48 (0.8 mm pitch) → SSOP-30 (0.65 mm pitch)	48QF-30SOP-8L

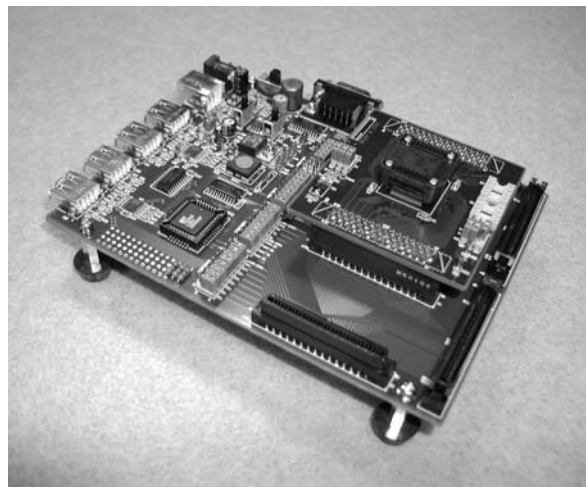
Contact for details: Tokyo Japan: Sunhayato Corp. TEL +81-3-3984-7791, FAX +81-3-3971-0535
Advanced Interconnections Corp.: <http://www.advantest.co.jp/en-index.shtml>

8-bit Proprietary F²MC-8L Family Support Tools

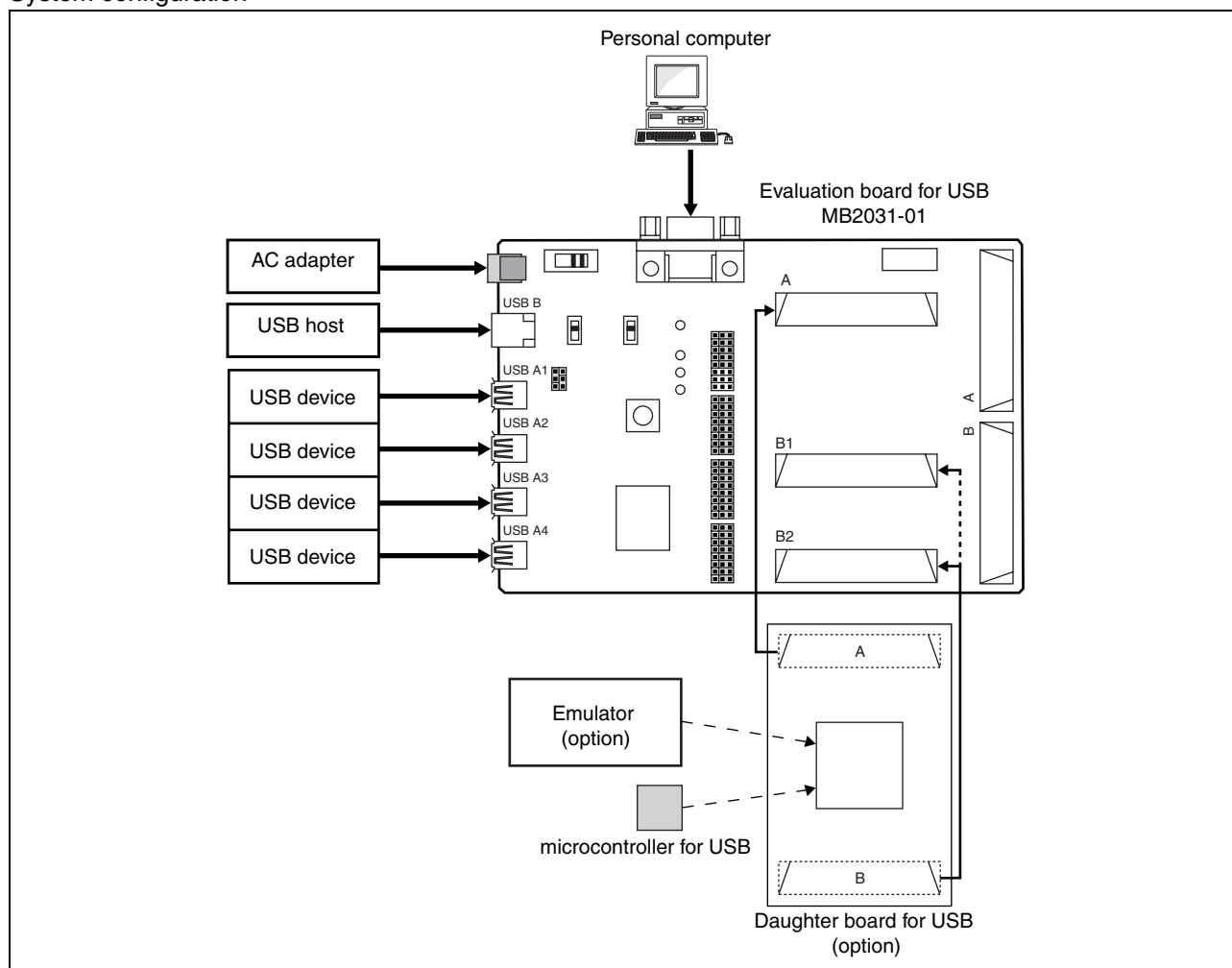
■ Evaluation Board for USB

It is an evaluation board corresponding to microcontroller for USB. It contributes to the rise of that the simple evaluation of operation before including in a visitor's system is possible, and development efficiency.

It is constituted by evaluation board for USB, and a main board and a daughter board. A main board is common to each microcontroller products. By changing a daughter board, debugging by In Circuit Emulator combined with the emulator debugger for microcontroller can be performed.

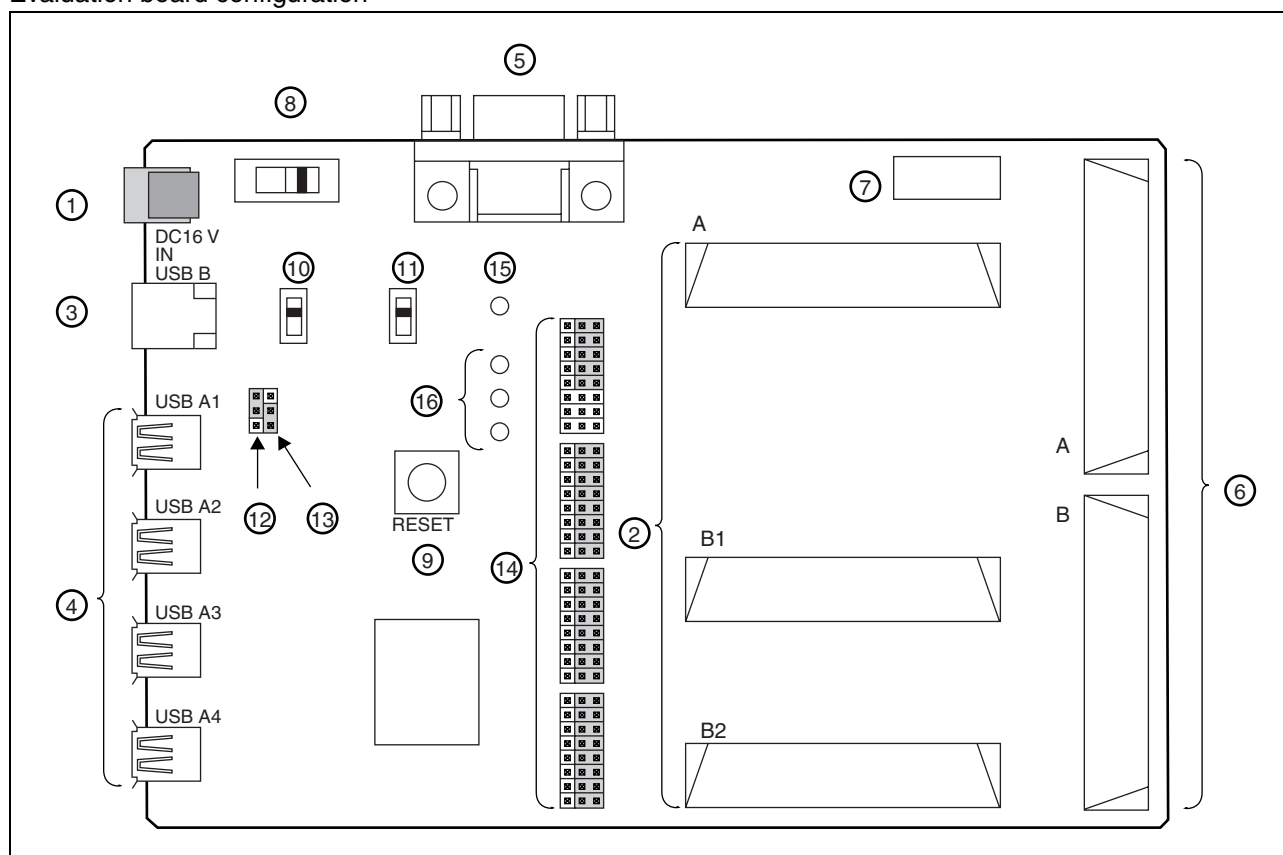


System configuration



8-bit Proprietary F²MC-8L Family Support Tools

Evaluation board configuration



- ① Power connector
- ② Daughter I/F connector

Part number	Target microcontroller	Package
MB2031-10	MB89P585B/BW	LQFP-64 (0.5 mm, □10 mm × 10 mm)
MB2031-11	MB89P589B	LQFP-64 (0.65 mm, □12 mm × 12 mm)
MB2031-20	MB90F334A	LQFP-120 (0.4 mm, □14 mm × 14 mm)

- ③ USB-B connector
- ④ USB-A connector
- ⑤ RS-232C connector
- ⑥ General I/F connector
- ⑦ IC socket for clock mounting
- ⑧ Power switch
- ⑨ Reset switch
- ⑩ USB transmission speed setting switch
- ⑪ USB transmission speed control switch
- ⑫ Short plug for a Power Mode setup (selection of a self-power supply or bus power supply)
- ⑬ Short plug for a MCU Power setup (selection of 3.3 V or 5 V)
- ⑭ Short plug for a functional setup
- ⑮ MCU power LED
- ⑯ USB-LED

8-bit Proprietary F²MC-8L Family Support Tools

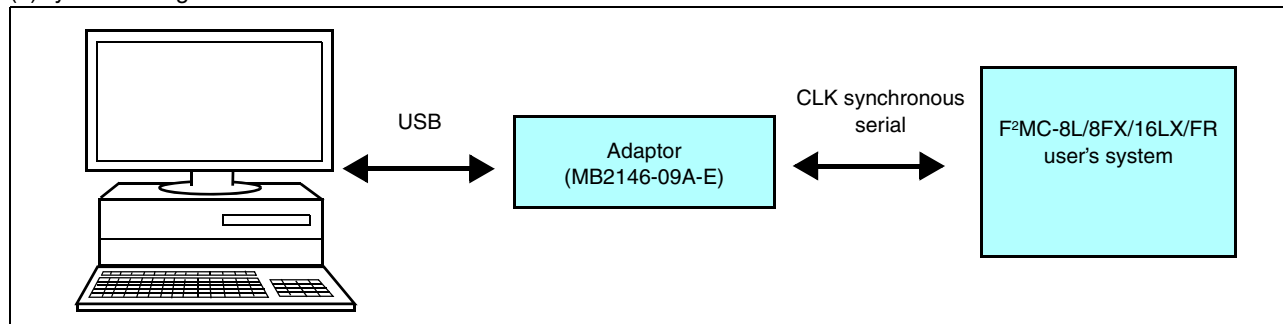
Serial on board programmer

The serial on board programming (Fujitsu Microelectronics standard) in Flash memory of the F²MC-16LX family or OTPROM of the F²MC-8L family is supported as the following programmer.

FLASH USB Programmer : Fujitsu Microelectronics

This is a FLASH USB Programmer which feature is the small size and low price, and it allows to program by using the microcontroller with Flash memory, personal computer and adapter (MB2146-09A-E) at the Flash ROM of microcontroller.

(1) System configuration



(2) Product configuration

Product name	Part number	Description
Adaptor (programmer)	MB2146-09A-E	F ² MC-8FX ICE and using combinedly (with USB cable)
FLASH USB Programmer	-	Software (download from Web(registration))

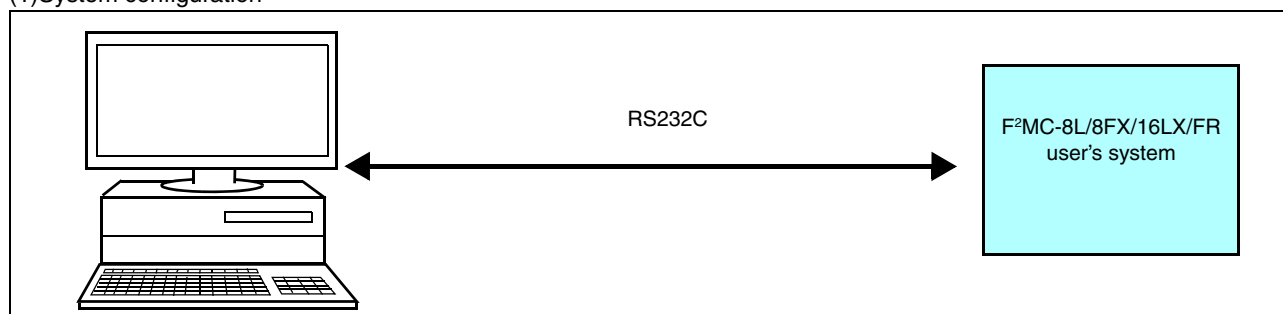
(3) Target microcontroller

Version	Target microcontroller
FLASH USB Programmer for 8L/8FX/16LX/FR	MB89F202, MB89F499, MB95F108, MB95F118, MB95F128, MB95F136, MB95F146, MB95F156/M, MB95F168/M

FLASH MCU Programmer : Fujitsu Microelectronics

This is a FLASH MCU Programmer which feature is the small size and low price, and it allows to program by connection the microcontroller with Flash memory and personal computer at the Flash ROM of microcontroller.

(1) System configuration



(2) Product configuration

Product name	Part number	Description
FLASH MCU Programmer	-	Software (download from Web(registration))

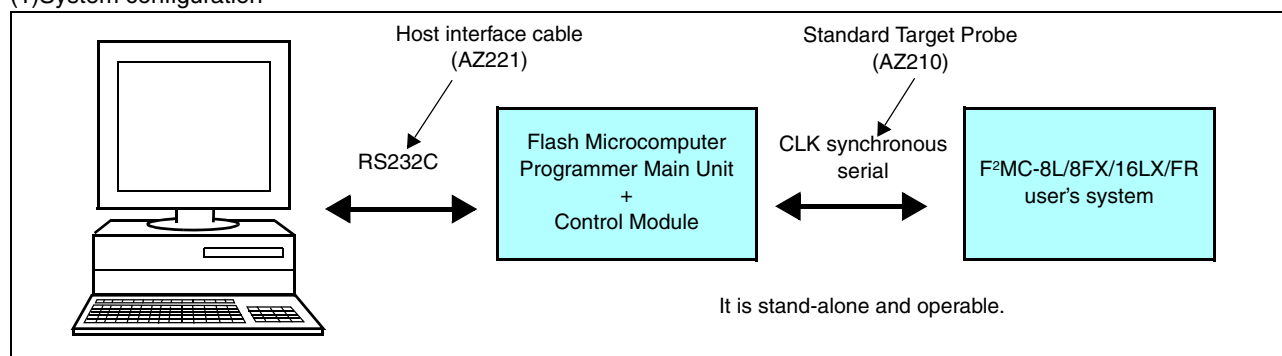
(3) Target microcontroller

Version	Target microcontroller
F2MC-8L family FLASH MCU Programmer (FLASH)	MB89F051, MB89F217, MB89F499, MB89F538/L
F2MC-8L family FLASH MCU Programmer (MB89F202)	MB89F202
F2MC-8L family OTP Programmer	MB89P215, MB89P935B
F2MC-8FX family FLASH MCU Programmer	MB95F108/H, MB95F118/H, MB95F128H, MB95F146, MB95F156/M, MB95F168/M

8-bit Proprietary F²MC-8L Family Support Tools

AF220/AF210/AF120/AF110 (Flash microcontroller programmer): Yokogawa Digital Computer

(1) System configuration



(2) Product configuration

Product name	Part number	Description
Flash Microcontroller Programmer Main Unit	AF220/AC4P	with Ethernet(10Base-T) Interface /100V to 220V Power supply adaptor
	AF210/AC4P	Basic Model /100V to 220V Power supply adaptor
	AF120/AC4P	Single Operation Model with Ethernet Interface /100V to 220V Power supply adaptor
	AF110/AC4P	Single Operation Model /100V to 220V Power supply adaptor
Host Interface Cable	AZ221	Writer exclusive use. RS232C cable for PC/AT
Standard Target Probe	AZ210	Standard Target Probe (a): 1 m
Control Modules	FF002 or FF004A	Control modules for F ² MC-8L OTP microcontroller made by Fujitsu Microelectronics.
Remote Controller	AZ290	Remote Controller
Memory card	/P2	2 MB PC Card
	/P4	4 MB PC Card

Contact for details: Yokogawa Digital Computer Corporation

Although AF200 (Yokogawa Digital Computer) has ceased, the conventional system configuration is also possible for serial onboard writing (a standard for Fujitsu Microelectronics) .

(3) OTPROM microcontroller for programming

OTPROM microcontroller (OTPROM size)	Control Module	Status
MB89F051 (32 KB)	FF201	Supported
MB89F499 (60 KB)	FF201	Supported
MB89F538/L (48 KB)	FF201	Supported
MB89P558A (48 KB)	FF002	Supported
MB89P585B/BW (16 KB)	FF004A	Supported *
MB89P935B (16 KB)	FF004A	Supported *

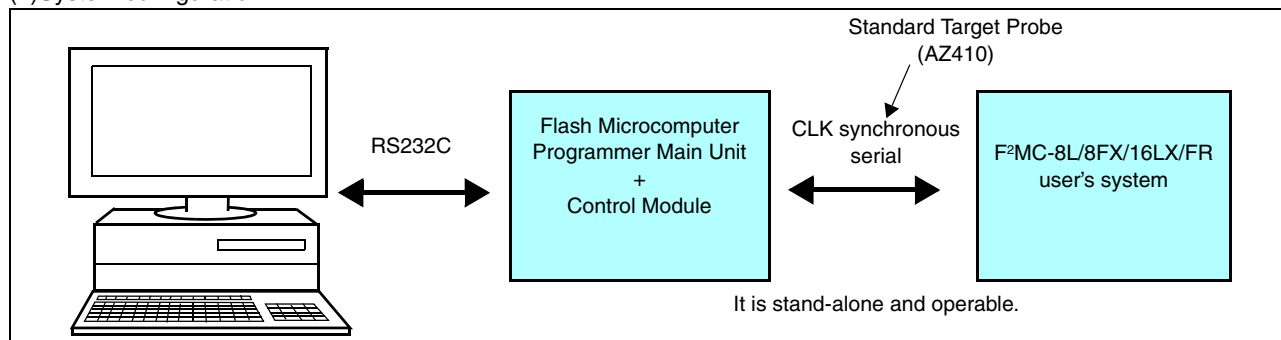
*: In control module FF004A, AF200 (cereal programmer of an old version) is available.

The AF2XX/AF1XX series will terminate the sales in the end of March, 2007 (The maintenance and repair service will be available for the next 5 years after the end of sale). We have the alternative version (AF400/300, AF600/500 series) which includes the enhanced functions of the AF2XX/AF1XX series. For more information, please contact Yokogawa Digital Computer Corporation. We will continuously provide you the technical support for the subsequent version of Fujitsu Microelectronics microcontrollers.

8-bit Proprietary F²MC-8L Family Support Tools

AF420/AF620/AF320/AF520 (serial programmer) : Yokogawa Digital Computer

(1) System configuration



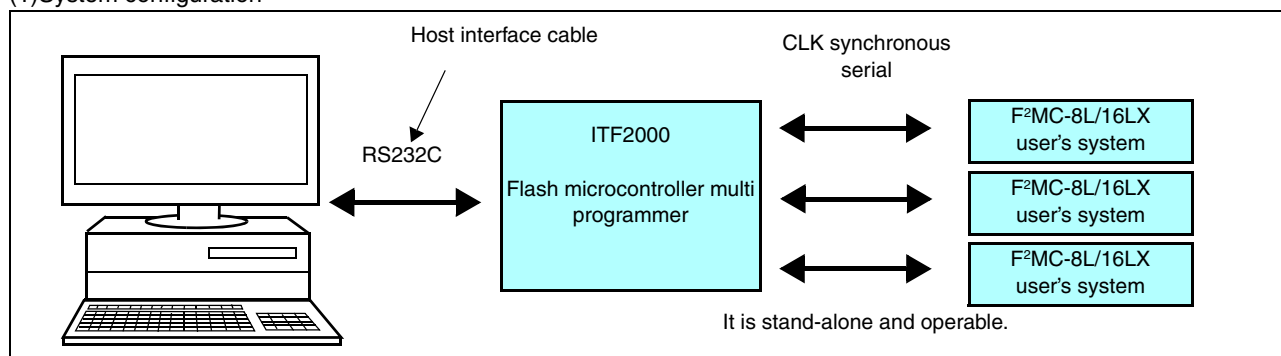
(2) Product configuration

Product name	Part number	Description
Flash Microcontroller Programmer Main Unit	AF420/AC4P	FULL KEY model 100BASE-TX host interface
	AF620/AC4P	FULL KEY model CAN interface 100BASE-TX host interface
	AF320/AC4P	Single KEY model 100BASE-TX host interface
	AF520/AC4P	Single KEY model CAN interface 100BASE-TX host interface
Standard Target Probe	AZ410	Standard Target Probe (a): 1 m
Compact Modules	FF801	Control modules for Fujitsu Microelectronics microcontroller
Remote Controller	AZ490	Remote Controller
Memory card	-	PC Card

Contact for details: Yokogawa Digital Computer Corporation

ITF2000 (Serial Gang programmer): Interface

(1) System configuration



(2) Product configuration

Product	Function
ITF2000	Main unit of Flash microcontroller multi programmer (with remote software)
ISP2000	Adaptor for on board programming (with main cable)
CF002(for F ² MC-8L family)	Control software
WF001/F001(for MB89P935B)	Microcontroller module

(3) Programming adaptor

Part number	Package	Programming adaptor
MB89P935B	SSOP-30	TOP2000/SSOP30TP1/P1 (single) TOP2000/SSOP30TP1/P10 (10 sets)

8-bit Proprietary F²MC-8FX Family Support Tools

■ Evaluation tool for F²MC-8FX MB95100 Series (MB2146-09 Series)

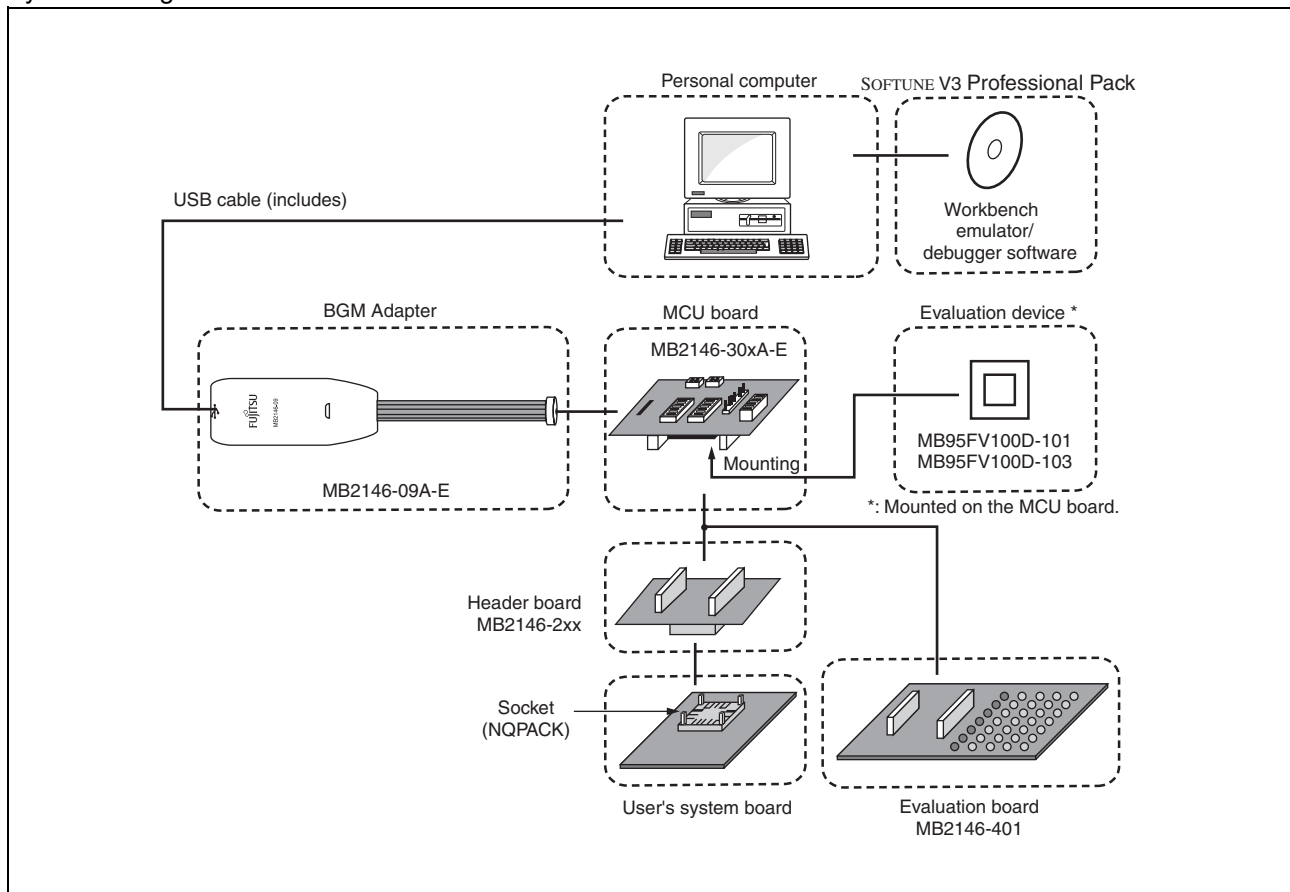
Features

- Microcontroller operating voltage: +2.7 to +5.5 V
The range (Max. and Min.) of Microcontroller operating voltage and operating frequency depend on each Microcontroller.
See the document including Data Sheet and check the range of Microcontroller operating voltage and operating frequency.
- Compact development environment and a light and small BGM adapter
- Since a monitor program is performed in exclusive memory space, it does not consume user memory area.
- Continuation execution, Step execution, a command break, a data break, Sequential break
- Measurement at time
- RAM monitoring
- Instruction trace is possible. (max. 16 branches)
- Host I/F : USB

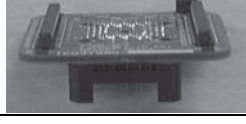
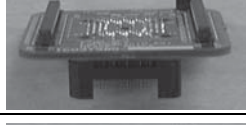
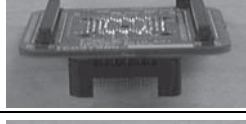
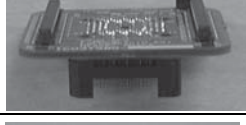
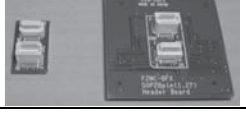
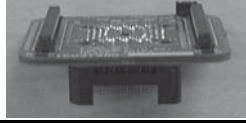
System Overview



System configuration



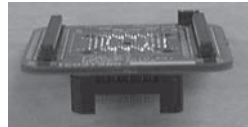
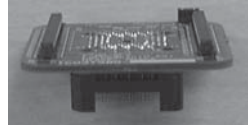
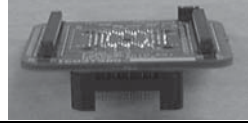
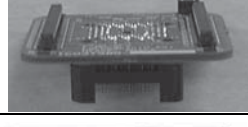
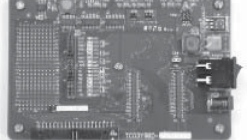
8-bit Proprietary F²MC-8FX Family Support Tools

Name	Part number	Remarks	Overview
BGM adapter	MB2146-09A-E	For MB95100 series USB connection (USB bus power) Includes : USB cable (1.8 m)	
MCU board	MB2146-301A-E	For 3 V products Built-in MB95FV100D-101 (3 V type) For the LCDC division resistance type	
	MB2146-303A-E	For 5 V products Built-in MB95FV100D-103 (5 V type)	
Header board LQFP-48P (0.5 mm pitch, □ 7 × 7 mm)	MB2146-210	Products : MB95110B series Package code: FPT-48P-M26 Includes : NQPACK048SD * × 1, HQPAC048SD * × 1	
Header board LQFP-64P (0.5 mm pitch, □ 10 × 10 mm)	MB2146-220	Products : MB95110B/AM series Package code: FPT-64P-M03 Includes : NQPACK064SD * × 1, HQPAC064SD * × 1	
Header board LQFP-64P (0.65 mm pitch, □ 12 × 12 mm)	MB2146-221	Products : MB95110B/AM series Package code: FPT-64P-M09 Includes : NQPACK064SB * × 1, HQPAC064SB140 * × 1	
Header board LQFP-100P (0.5 mm pitch, □ 14 × 14 mm)	MB2146-250	Products : MB95120/MB series Package code: FPT-100P-M20 FPT-100P-M24 Includes : NQPACK100SD-ND * × 1, HQPAC100SD * × 1	
Header board QFP-100P (0.65 mm pitch, □ 14 × 20 mm)	MB2146-251	Products : MB95120/MB series Package code: FPT-100P-M06 FPT-100P-M23 Includes : NQPACK100RB179 * × 1, HQPAC100RB179 * × 1	
Header board LQFP-52P (0.65 mm pitch, □ 10 × 10 mm)	MB2146-260	Products : MB95110B/M series Package code: FPT-52P-M01 Includes : NQPACK052SB * × 1, HQPAC052SB * × 1	
Header board/conversion board SOP-28P (1.27 mm pitch, □ 8.6 × 17.75 mm)	MB2146-270	Products : MB95130M series Package code: FPT-28P-M17 Includes : SSA-28YR1-M17 (Tokyo Eletech)	
Header board LQFP-32P (0.8 mm pitch, □ 7 × 7 mm)	MB2146-200	Products : MB95140 series Package code: FPT-32P-M21 Includes : NQPACK032SA * × 1, HQPAC032SA * × 1	

(Continued)

8-bit Proprietary F²MC-8FX Family Support Tools

(Continued)

Name	Part number	Remarks	Overview
Header board LQFP-48P (0.5 mm pitch, □ 7 × 7 mm)	MB2146-213	Products : MB95150M series Package code: FPT-48P-M26 Includes : NQPACK048SD * × 1, HQPACK048SD * × 1	
Header board LQFP-52P (0.65 mm pitch, □ 10 × 10 mm)	MB2146-261	Products : MB95150M series Package code: FPT-52P-M01 Includes : NQPACK052SB * × 1, HQPACK052SB * × 1	
Header board LQFP-64P (0.5 mm pitch, □ 10 × 10 mm)	MB2146-222	Products : MB95160MA series Package code: FPT-64P-M24 Includes : NQPACK064SD * × 1, HQPACK064SD * × 1	
Header board LQFP-64P (0.65 mm pitch, □ 12 × 12 mm)	MB2146-223	Products : MB95160MA series Package code: FPT-64P-M23 Includes : NQPACK064SB * × 1, HQPACK064SB * × 1	
Evaluation board	MB2146-401	For F ² MC-8FX family - Operating power supply voltage: 5 V or 3.3 V (selectable) - Function of LED lightning for output port (16 LED) - Locating signal check pin to all terminals - Includes: AC adapter	

*: The header board requires NQPACK.

Contact for details:

- USA: OESS Co. San Jose Office TEL(408)437-1582
- Europe Germany: OESS GmbH TEL(06106)2857890
- Tokyo Eletech Co, Ltd. TEL(81)3-3820-7141

Emulator specification for F²MC-8FX MB95100 Series

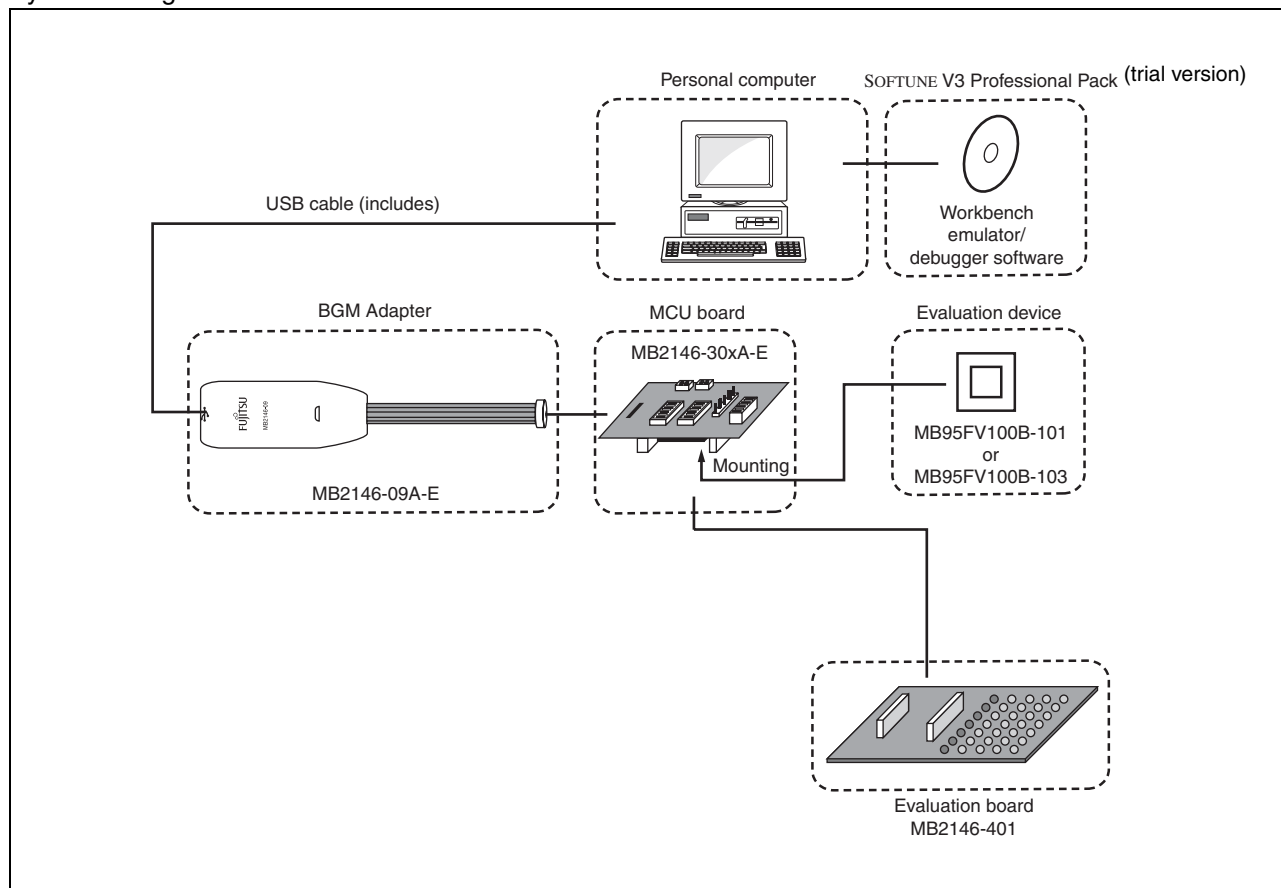
Emulator series	MB2146-09 series emulator
Main unit	MB2146-09A-E
Target microcontroller	F ² MC-8FX Family
Operating power supply voltage of micro-controller	2.7 V to 5.5 V
Operating frequency of microcontroller	External : 32 kHz to 21.0 MHz Internal : 16 kHz to 10.5 MHz
Dimensions, weight	W 40 × D 100 × H 25 mm (A projection part and a cable part remove.) Interface cable length : 100 mm 55 g
Host interface (download speed)	USB2.0 : 12 Mbps (125 Kbps@4 MHz or more)
Power supply	USB bus power
Execution control function	Continuous execution Step execution
Instruction execution break function	256 points
Data break function	2 points
Execution time measurement function	Yes
Internal ROM emulation memory function	Evaluation device Flash memory size (60 KB)
Trace function	Instruction trace (max. 16 branches)
Sequential Break function	2 levels (only code)
RAM monitoring function	Yes

8-bit Proprietary F²MC-8FX Family Support Tools

F²MC-8FX MB95100 Series starter kit

As the F²MC-8FX MB95100 series starter kit consists of a BGM adapter, an MCU board, an evaluation board, and SOFTUNE V3 (trial version), it is best suited for evaluating the performance and functions of microcontrollers and for verifying its operations before incorporating it into your system. By additionally purchasing a header board, you can use the existing BGM adapter and MCU board to evaluate your system.

System configuration



Product configuration

Product name	Part number	Product configuration
F ² MC-8FX MB95100 series starter kit (3 V)	MB2146-401-01A	BGM Adapter (MB2146-09A-E) 3 V edition MCU board (MB2146-301A-E) Evaluation board (MB2146-401) SOFTUNE V3 Professional Pack (trial version) Setup Guide
F ² MC-8FX MB95100 series starter kit (5 V)	MB2146-401-03A	BGM Adapter (MB2146-09A-E) 5 V edition MCU board (MB2146-303A-E) Evaluation board (MB2146-401) SOFTUNE V3 Professional Pack (trial version) Setup Guide

8-bit Proprietary F²MC-8FX Family Support Tools

■ Adaptor Socket for MB95100 Series Flash Microcomputer

5V-product

Flash Microcontrollers	Package (lead pitch, Body size) (mm)	Package code	Flash Support Group, Inc.
			AF9708 AF9709/B AF9710 AF9723
MB95F108AM *	LQFP-64P (0.5mm, 10mm × 10mm)	FPT-64P-M03	TEF110-108F35AP
	LQFP-64P (0.65mm, 12mm × 12mm)	FPT-64P-M09	TEF110-108F36AP
MB95F118M	LQFP-52P (0.65 mm, 10 mm × 10 mm)	FPT-52P-M01	TEF110-95118PMC
MB95F128MB	LQFP-100P (0.5 mm, 14 mm × 14 mm)	FPT-100P-M05	TEF110-95F128HSPFV
	QFP-100P (0.65 mm, 14 mm × 20 mm)	FPT-100P-M06	TEF110-95F128HSPF
MB95F136M	SOP-28P (1.27 mm, 8.6 mm × 17.75 mm)	FPT-28P-M17	TEF110-95F136HSPF
MB95F156M	LQFP-48P (0.5 mm, 7 mm × 7 mm)	FPT-48P-M26	TEF110-95F156HPFV
	LQFP-52P (0.65 mm, 10 mm × 10 mm)	FPT-52P-M01	TEF110-95F156HPMC
MB95F168MA	LQFP-64P (0.5 mm, 10 mm × 10 mm)	FPT-64P-M24	TEF110-95F168HPMC1
	LQFP-64P (0.65 mm, 12 mm × 12 mm)	FPT-64P-M23	TEF110-95F168HPMC

*: Under development

3V-product

Flash Microcontrollers	Package (lead pitch, Body size) (mm)	Package code	Flash Support Group, Inc.
			AF9708 AF9709/B AF9710 AF9723
MB95F108B *	LQFP-64P (0.5mm, 10 mm × 10 mm)	FPT-64P-M03	TEF110-108F35AP
	LQFP-64P (0.65mm, 12 mm × 12 mm)	FPT-64P-M09	TEF110-108F36AP
MB95F118B *	LQFP-48P (0.5mm, 7 mm × 7 mm)	FPT-48P-M26	TEF110-118F37AP
	BCC-48P (0.5mm, 7 mm × 7 mm)	LCC-48P-M09	TEF110-118F41AP
MB95F128D	LQFP-100P (0.5mm, 14 mm × 14 mm)	FPT-100P-M24	TEF110-95F128HSPFV
	QFP-100P (0.65mm, 14 mm × 20 mm)	FPT-100P-M23	TEF110-95F128HSPF
MB95F146	LQFP-32P (0.8 mm, 7 mm × 7 mm)	FPT-32P-M21	TEF110-95F146
MB95F166D	LQFP-64P (0.65mm, 12 mm × 12 mm)	FPT-64P-M23	TEF110-95F168HPMC
	LQFP-64P (0.5mm, 10 mm × 10 mm)	FPT-64P-M24	TEF110-95F168HPMC1

*: Under development

■ Parallel Programmer for Flash Microcontroller

The parallel programmer in Flash memory of the F²MC-8FX MB95100 series family is supported as the following programmer.

Flash Support Group, Inc.

URL: <http://www.j-fsg.co.jp/e/top.html>

• Flash Programmer

AF9708, AF9709/B: 3 V-products, 5 V-products.



AF9708



AF9709



AF9710

• Gang programmer

AF9723/AF9845: 3 V-products, 5 V-products



AF9723



AF9845

8-bit Proprietary F²MC-8FX Family Support Tools

Evaluation tool for F²MC-8FX MB95200 Series (MB2146-08 Series)

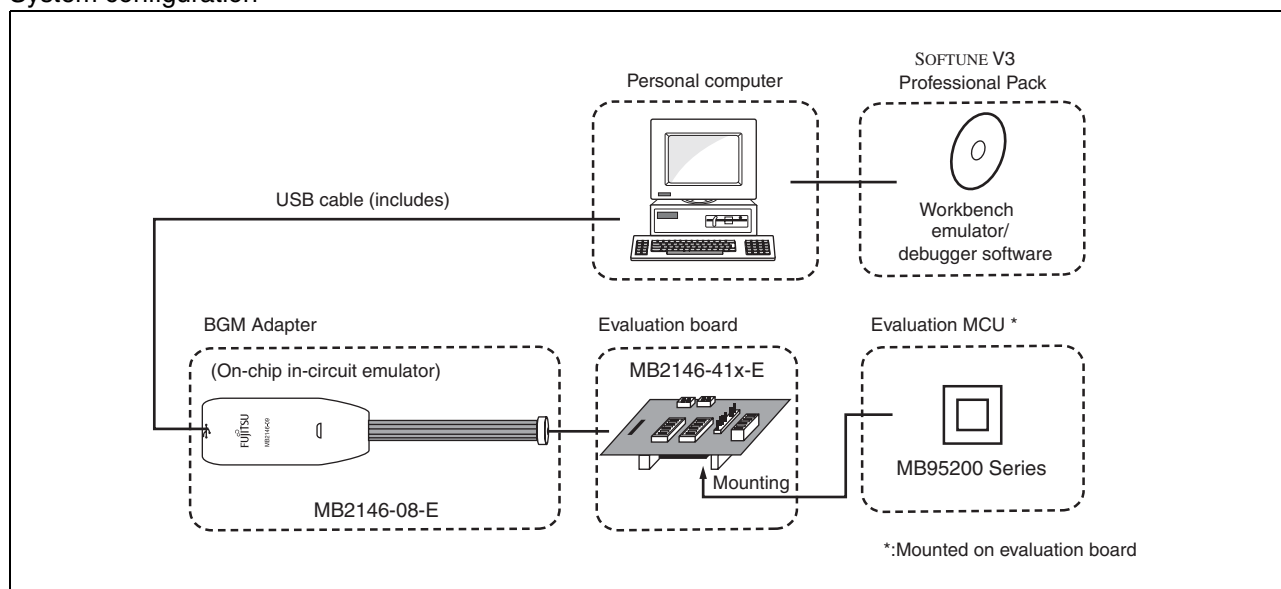
Features

- Microcontroller operating voltage: +2.9 to +5.5 V
(The range (Max. and Min.) of Microcontroller operating voltage and operating frequency depend on each Microcontroller.
See the document including Data Sheet and check the range of Microcontroller operating voltage and operating frequency.)
- Compact development environment and a light and small BGM adapter
- Can be debugged with a single serial wire
- Since a monitor program is performed in exclusive memory space, it does not consume user memory area.
- Continuation execution, Step execution, a forced break
- Software break point: 256 points
- Host I/F: USB

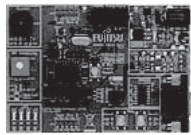
System Overview



System configuration



List of system

Name	Part number	Remarks	Overview
BGM adapter	MB2146-08-E	F ² MC-8FX MB95200 series USB connection (USB bus power) Includes: USB cable (1.0 m)	
Evaluation board	MB2146-410A-E	MB95F204K mounted Various peripheral resources installed	

8-bit Proprietary F²MC-8FX Family Support Tools

Emulator specification for F²MC-8FX MB95200 series

Emulator series	MB2146-08 series emulator
Main unit	MB2146-08-E
Target microcontroller	F ² MC-8FX MB95200 series
Operating power supply voltage of micro-controller	2.9 V to 5.5 V
Operating frequency of microcontroller	External: 32 kHz to 16.25 MHz Internal: 100kHz to 10MHz
Dimensions, weight	W 55.7 × D 127 × H 30 mm (A projection part and a cable part remove.) Interface cable length: 100 mm 169 g (including USB cable)
Host interface	USB1.1 : 12 Mbps
Power supply	USB bus power
Execution control function	Continuous execution Step execution
Instruction execution break function	256 points (software break point)
Execution time measurement function	None
Trace function	None
RAM monitoring function	None

<Caution>

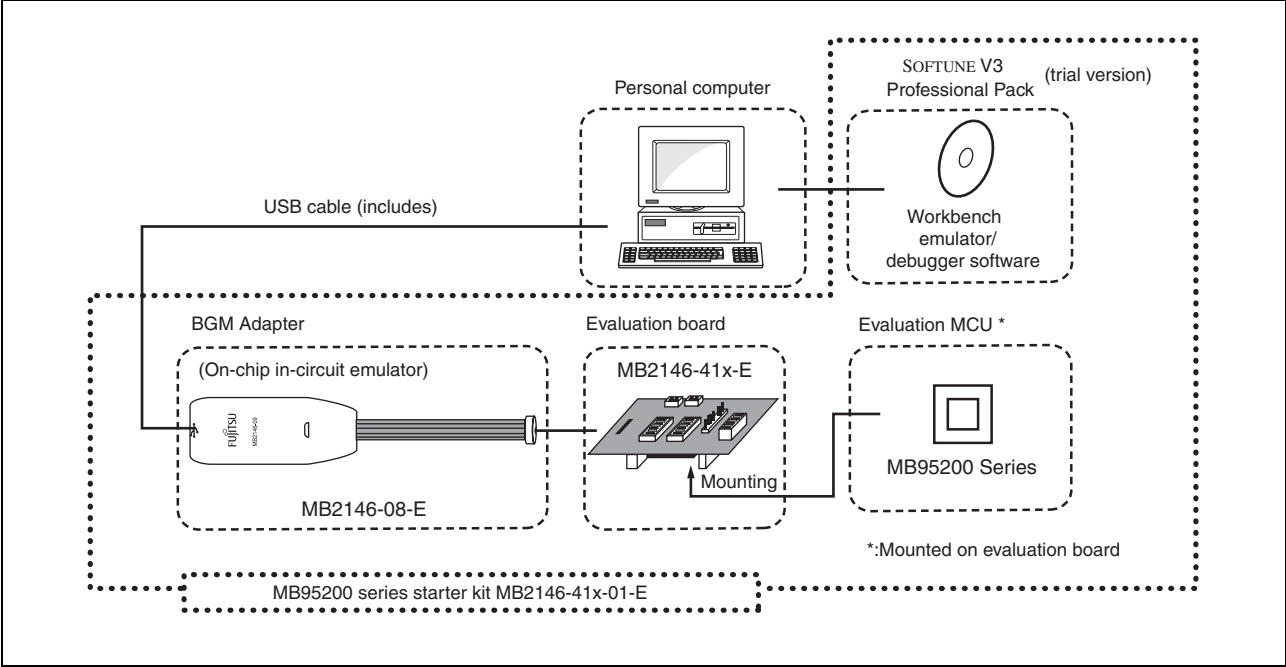
The MB95200 series BGM adapter (MB2146-08-E) is not compatible with the F²MC-8FX family BGM adapter (MB2146-09, MB2146-09A-E) or the optional devices. Connecting between an incompatible MCU and BGM adapter or optional devices may cause malfunction or damage to equipment. Do not combine use with a different type of BGM adapter or equipment.

8-bit Proprietary F²MC-8FX Family Support Tools

■ MB95200 series starter kit

As the MB95200 series starter kit consists of a BGM adapter, an evaluation board, and SOFTUNE V3 (trial version), it is best suited for evaluating the performance and functions of microcontrollers and for verifying its operations before incorporating it into your system.

System configuration



Product configuration

Product name	Part number	Product configuration
MB95200H series starter kit	MB2146-410A-01-E	BGM Adapter (MB2146-08-E) Evaluation board (MB2146-410A-E) SOFTUNE V3 Professional Pack (trial version) USB cable (For connection between BGM adapter and PC) Sample program (CD-ROM)

8-bit Proprietary F²MC-8FX Family Support Tools

■ MB95200 series Adaptor Socket for Flash Microcomputer

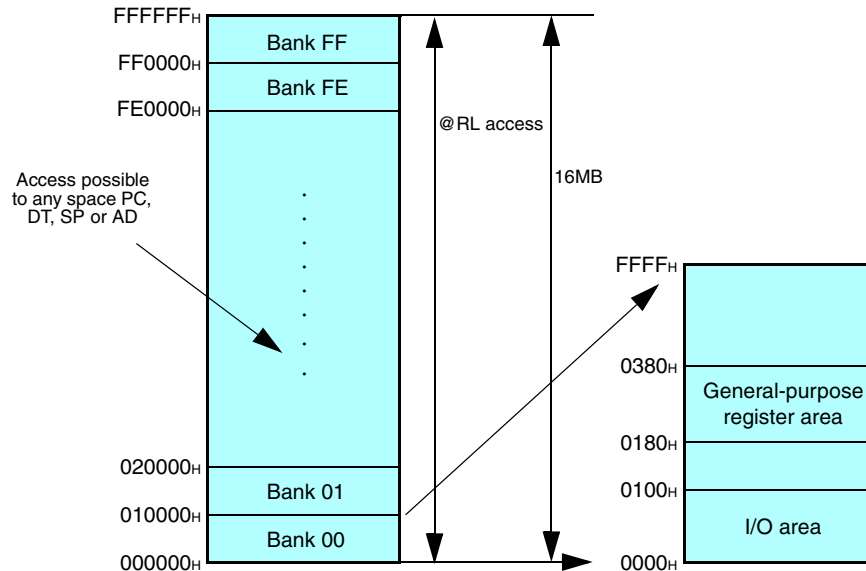
Flash Microcontrollers	Package (lead pitch, Body size)	Package code	Manufacturer Writer	Adapter
MB95F204K	DIP-24 (1.778 mm, 6.4 mm × 22.86 mm)	DIP-24P-M07	Hi-Lo Systems Co., Ltd. ALL-100	ADP-MB95F204-SD
			TOYO Corporation (Data I/O) Optima Sprint	715DSR61422
			Xeltek Inc. Superpro/IS01	SA653
	SOP-20 (1.27 mm, 7.5 mm × 12.7 mm)	FPT-20P-M09	Hi-Lo Systems Co., Ltd. ALL-100	ADP-MB95F204-S
			TOYO Corporation (Data I/O) Flash PAK II	941DSR30328
			BP Microsystems, Inc. BP-1710(Single)/BP-2710(Multisite)	SM20SM
			BP Microsystems, Inc. BP-3710(Automated)/BP-4710(Auto- mated)	ASM20SM
			Xeltek Inc. Superpro/IS01	SA404
MB95F214K	DIP-8 (2.54 mm, 6.35 mm × 9.4 mm)	DIP-8P-M03	Hi-Lo Systems Co., Ltd. ALL-100	ADP-MB95F214-DP8
			TOYO Corporation (Data I/O) Flash PAK II	941DSR32551
	SOP-8 (1.27 mm, 5.3 mm × 5.24 mm)	FPT-8P-M08	Hi-Lo Systems Co., Ltd. ALL-100	ADP-MB95F214-S
			TOYO Corporation (Data I/O) Flash PAK II	941DSR32552
			Xeltek Inc. Superpro/IS01	SA605B

16-bit Proprietary F²MC-16LX Family Features

F²MC-16LX Family Features

- F²MC-16LX family is a high-performance 16-bit microcomputer having the upward compatibility with the F²MC-16L family.
- Supporting 16-Mbyte memory space.

Memory space

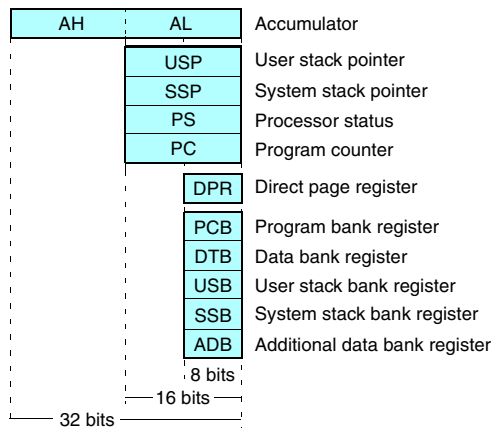


Registers

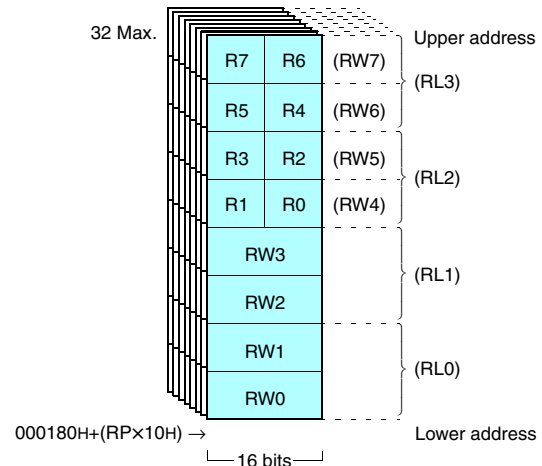
Dedicated registers

General-purpose registers: 10 × 16-bit per bank, 32 banks Max.

Dedicated registers



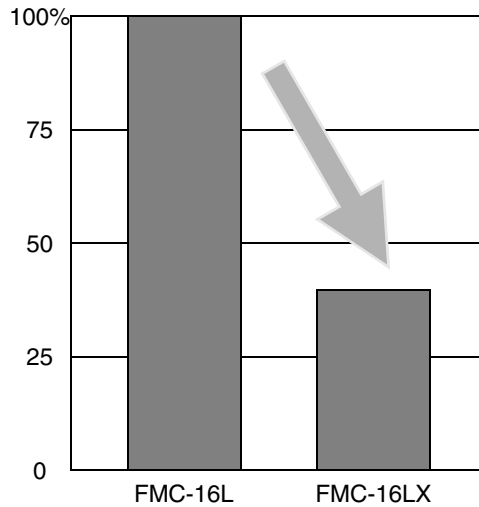
General-purpose registers



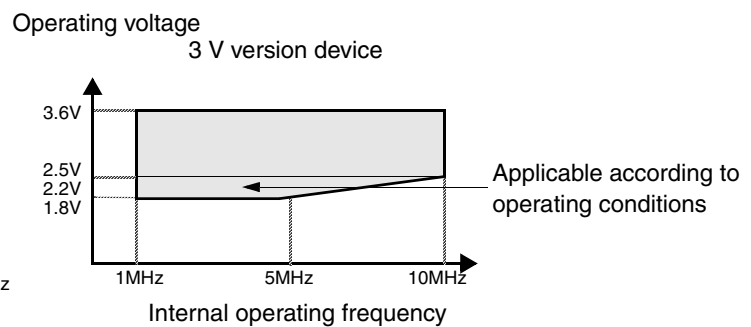
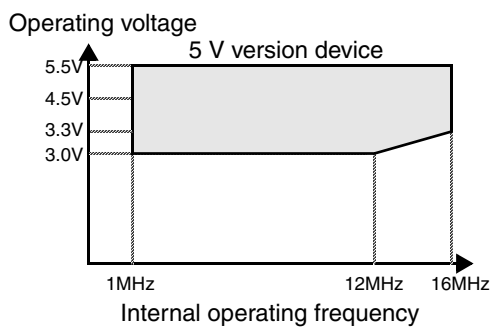
- Clock multiplier circuit ($\times 1/2$, $\times 2$, $\times 3$, and $\times 4$) to protect your surrounding environment
Reducing the radiation interference
High-speed operation using the inexpensive low-speed oscillator (external 4 MHz; internal 16 MHz max.)
- Power management capabilities to contribute to the conservation of energy:
STOP, SLEEP, subclock, hardware standby
- AL 2 layers 0.5 μm (reducing the chip footprint)
- Low-voltage, low-power voltage dissipation
Supporting large memory (up to 256 Kbytes for ROM; up to 10 Kbytes for RAM)
- Power dissipation reduced by 60% as compared to the earlier product (5 V compatible product)

16-bit Proprietary F²MC-16LX Family Features

- **Reduced power dissipation (5 V compatible products)**



- Noise protection
 - Adaptation of multiplier circuit
 - Circuit optimization
 - Built-in noise filters for all pins
- Bus control
 - Bus sizing function: 8-bit or 16-bit bus width selectable
 - Software switching between non-multibus and multibus (device)
 - Supporting 8 ch. chip select (device)
- Built-in extended intelligent I/O service function (simple DMA function)
- Program patch processing function
 - Avoiding bugs by applying patches on a masked ROM
- Addition of signed multiplication and division instruction
- High-speed interrupt transition
 - High-speed transition achieved at the time of multiple interrupts
 - Expansion achieved to low-voltage and high-speed operation
 - 5.0 V: Minimum machine clock of 62.5 ns/16 MHz
 - 2.2 V: Minimum machine clock of 100 ns/10 MHz

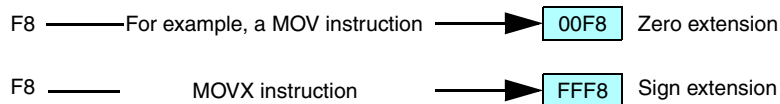


■ Main Addressing Modes (Can be used by transfer and arithmetic instructions)

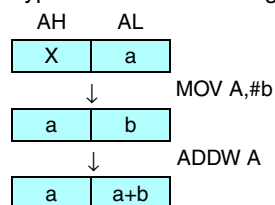
- Bit addressing
Direct bit: I/O area (2Kbits) + area inside DPR page (2Kbits)
Any bit within 64 Kbytes may be specified.
- Indirect addressing
@RWi, @RWi+, @RWi+disp16, @RLi+disp8, @RWj+disp8 (i = 0 to 3), (j = 0 to 7)
@RW0+RW7
@RW1+RW7
@PC+disp16
@A
- Direct addressing
R0 to R7, RW0 to RW7, RL0 to RL3
dir, addr16, io

■ Super Accumulator

- 32-bit accumulator using AH:AL (16 bits:16 bits) as a pair.
- Data precision verification function



- Data keep function (available for data types of 16-bit word length and less)



■ Fields for Product Expansion

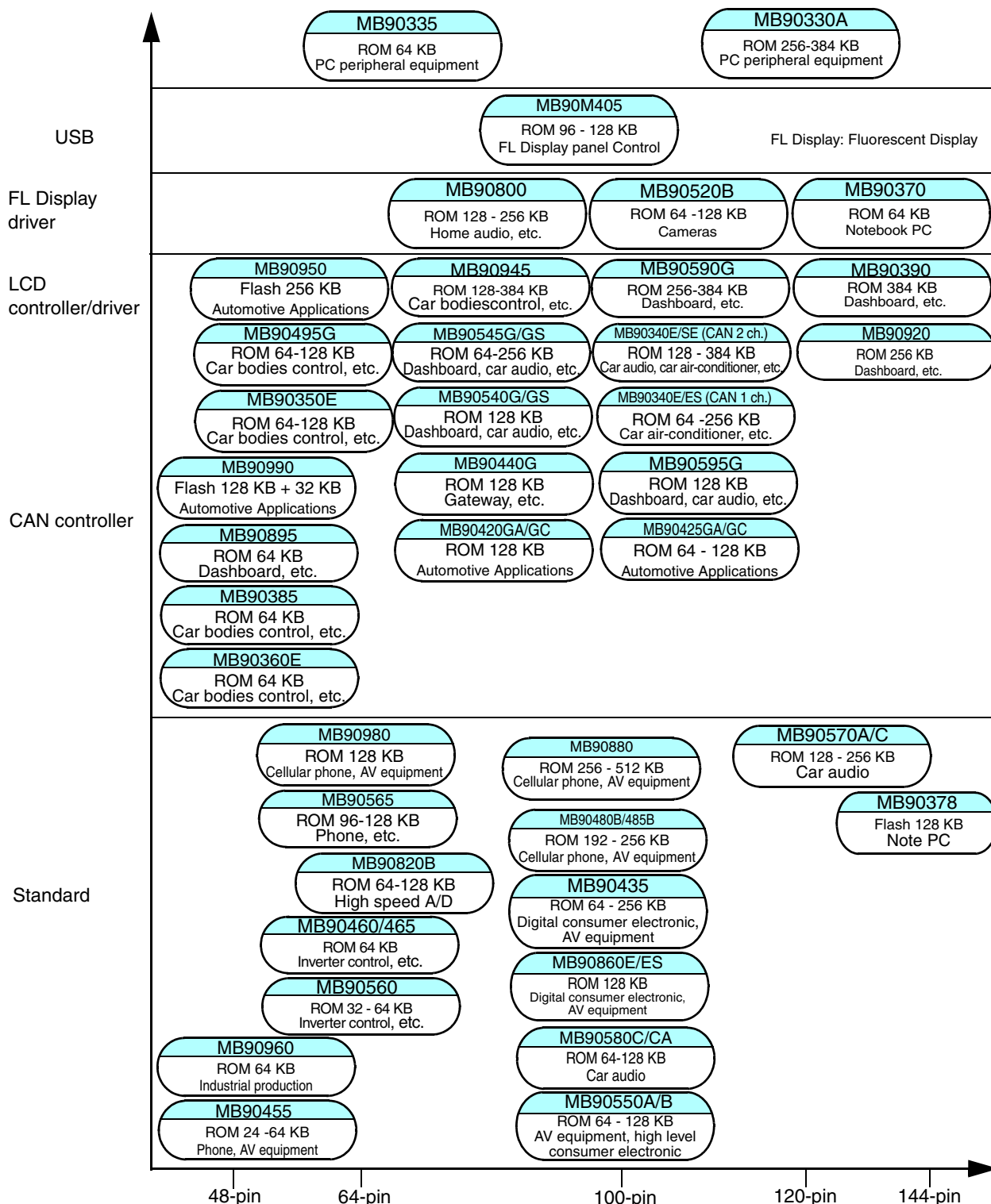
Applicable to the following fields:

- Digital AV system→ (Serial communication enhancement, large size)
- Mobile equipment system→ (Low-power dissipation)
- File-related system→ (Signal processing enhancement)
- Network system→ (Telecommunication macro enhancement)

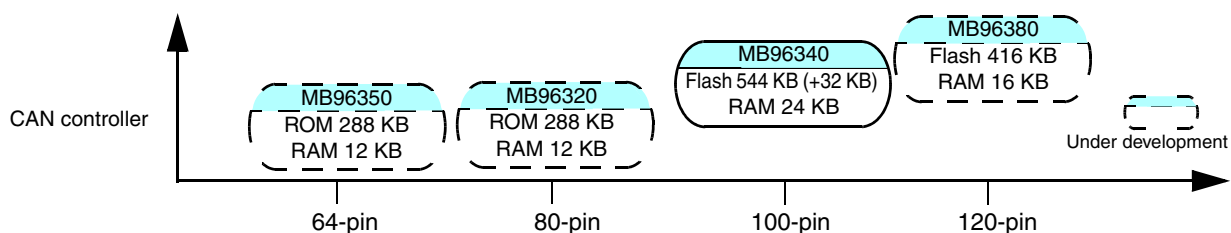
16-bit Proprietary F²MC-16LX/FX Family Product Range

F²MC-16LX/FX
Family

F²MC-16LX Family Product Range

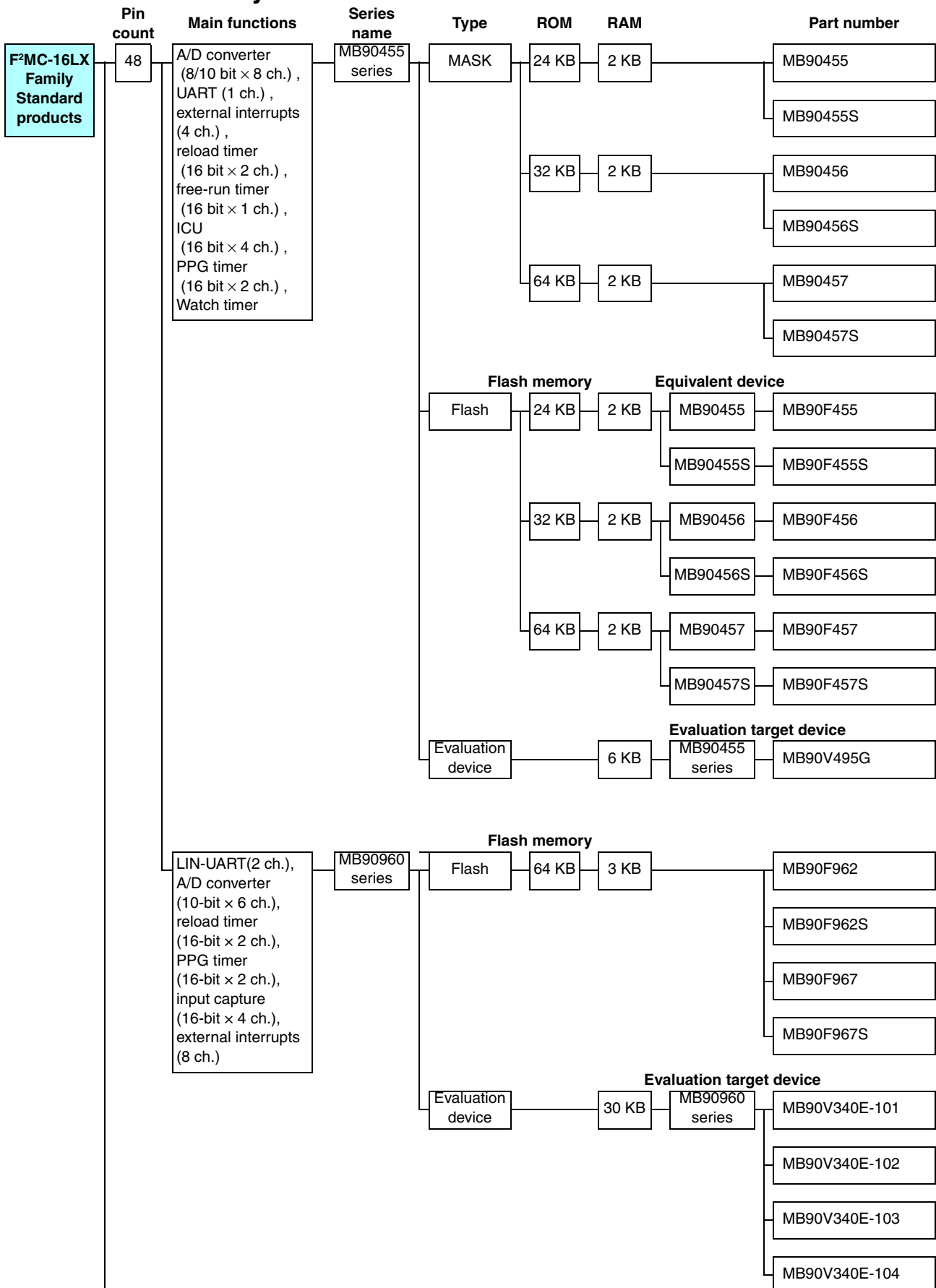


F²MC-16FX Family Product Range



16-bit Proprietary F²MC-16LX Family Standard Products

F²MC-16LX Family Standard Products

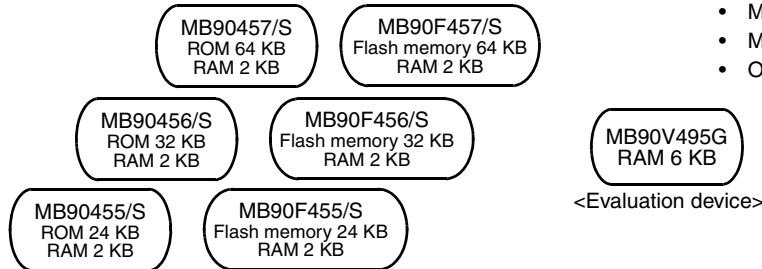


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16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90455 series

For AV equipment, high level consumer electronic, industrial applications, etc.



- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90455	+3.5 to +5.5	48P	—	I/O ports: 36 Max. (single clock) 34 Max. (dual clock) Timebase timer (WDT): 18-bit × 1 ch. Watch timer, PPG timer: 16-bit × 2 ch. (8-bit × 4 ch.) A/D converter: 8/10-bit × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1 ch. UART: 1 ch. For single clock: MB90455S/456S/457S/F455S/F456S/F457S For dual clock: MB90455/456/457/F455/F456/F457V495G External interrupts: 4 ch. Low-power consumption modes: Sleep, stop, time base timer, CPU intermittent operation, sub, watch mode
MB90455S		48P	—	
MB90456		48P	—	
MB90456S		48P	—	
MB90457		48P	—	
MB90457S		48P	—	
MB90F455		48P	—	
MB90F455S		48P	—	
MB90F456		48P	—	
MB90F456S		48P	—	
MB90F457		48P	—	
MB90F457S		48P	—	
MB90V495G		—	256C	

Packages: P - plastic, C - ceramic

■ MB90960 series

For industrial applications, etc.



- Maximum clock frequency: 24 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90F962 *2	+3.5 to +5.5	48P	—	I/O ports: 36 Max. (MB90F962S/F967S) 34 Max. (MB90F962/F967) A/D converter: 8/10-bit × 16 ch. LIN-UART: 2 ch. Reload timer: 16-bit × 2 ch. PPG timer: 16-bit × 2 ch. Input capture unit (ICU): 16-bit × 4 ch. Free-run timer: 16-bit × 1 ch. External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, sub, sub sleep, watch, CPU intermittent operation, time base timer mode
MB90F962S *1		48P	—	
MB90F967 *2		48P	—	
MB90F967S *1		48P	—	
MB90V340E-101 *1	+4.5 to +5.5	—	299C	
MB90V340E-102 *2		—	299C	
MB90V340E-103 *1		—	299C	
MB90V340E-104 *2		—	299C	

Packages: P - plastic, C - ceramic

*1: Single clock, *2: Dual clock

16-bit Proprietary F²MC-16LX Family Standard Products

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
64	A/D converter (10-bit × 8ch.), UART(2ch.), external interrupts (8ch.), input capture (16-bit × 4ch.), output compare (16-bit × 6ch.), PPG timer (8-bit × 6ch.) reload timer (16-bit × 2ch.), free-run timer (16-bit × 1ch.), wave generator (1ch.)	MB90560 series	MASK	32 KB	1 KB	MB90561A
				64 KB	2 KB	MB90562A
			Flash memory		Equivalent device	
			Flash	64 KB	2 KB	MB90560 series MB90F562B
			Evaluation target device			
			Evaluation device		4 KB	MB90560 series MB90V560
	UART (2 ch.) , A/D converter (10-bit × 8ch.), external interrupts (8 ch.) , PWC timer (2 ch.) , PPG timer (16 bit × 3 ch.) , reload timer (16 bit × 2 ch.) , ICU (4 ch.) , OCU (6 ch.) , free-run timer (16 bit × 1 ch.) , multi-pulse generator	MB90460/465 series	MASK	64 KB	2 KB	MB90462
						MB90467
			Flash memory		Equivalent device	
			Flash	64 KB	2 KB	MB90460 series MB90F462
				128 KB	2 KB	MB90460 series MB90F462 A
						MB90F463A
			Evaluation target device			
			Evaluation device		8 KB	MB90460 series MB90V460

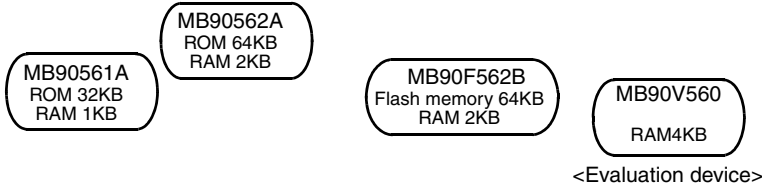
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16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90560 series

For inverter control, etc.



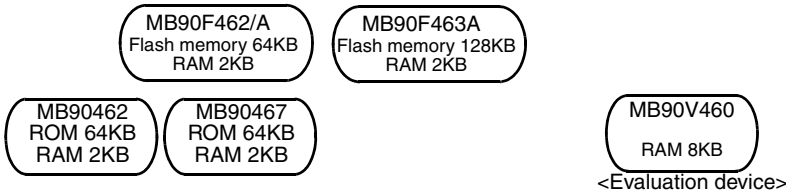
- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package				Functions
		QFP	LQFP	SH-DIP	PGA	
MB90561A	+3.0 to +5.5	64P (14 × 20 mm)	64P (12 × 12 mm)	64P	—	I/O ports: 51 Max. Timebase timer (WDT): 18-bit × 1ch. UART: 2ch. Analog section: 10-bit A/D converter × 8ch. Real time I/O: 16-bit input capture unit (ICU) × 4ch. 16-bit output compare unit (OCU) × 6ch. 16-bit free-run timer × 1ch.
MB90562A		64P (14 × 20 mm)	64P (12 × 12 mm)	64P	—	
MB90F562B	+4.5 to +5.5	64P (14 × 20 mm)	64P (12 × 12 mm)	64P	—	PPG timer: 8-bit × 6ch. (16-bit × 3ch.) Reload timer: 16bit × 2ch. Wave generator: 1 ch. External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, time base timer, CPU intermittent operation mode
MB90V560	+3.0 to +5.5	—	—	—	256C	

Packages: P - plastic, C - ceramic

■ MB90460/465 series

For inverter control, etc.



- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package				Functions
		QFP	LQFP	SH-DIP	PGA	
MB90462	+4.5 to +5.5	64P (14 × 20 mm)	64P (12 × 12 mm)	64P	—	I/O ports: 51 Max. Timebase timer (WDT): 18-bit × 1ch. Analog section: 10-bit A/D converter × 8ch. UART: 2 ch. PWC timer: 2 ch. (1 ch.: MB90467) Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 6 ch. 16-bit free-run timer × 1 ch. PPG timer: 16 bit × 3 ch. (16 bit × 2 ch.: MB90467) Reload timer: 16 bit × 2 ch. Multi-pulse generator (not built in MB90467.) External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, CPU intermittent operation mode, time base timer mode
MB90467		64P (14 × 20 mm)	64P (12 × 12 mm)	64P	—	
MB90F462		64P (14 × 20 mm)	64P (12 × 12 mm)	64P	—	
MB90F462A		64P (14 × 20 mm)	64P (12 × 12 mm)	64P	—	
MB90F463A		64P (14 × 20 mm)	64P (12 × 12 mm)	64P	—	
MB90V460		—	—	—	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family Standard Products

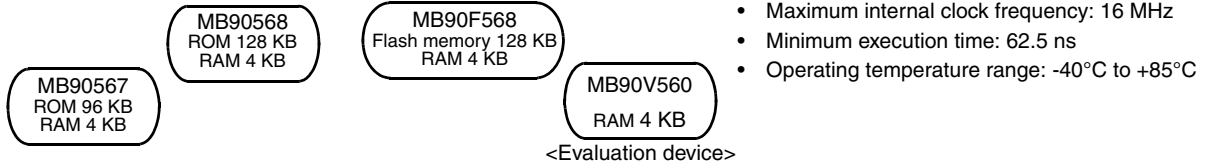
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	Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
	64	UART(2 ch.), A/D converter (8/10-bit × 8 ch.), External interrupts (8 ch.) , ICU (2 ch.) , OCU (6 ch.) , PPG timer (8-bit × 6 ch.) free-run timer (16 bit × 1 ch.) , reload timer (16-bit × 2 ch.)	MB90565 series	MASK	96 KB	4 KB	MB90567	
128 KB					4 KB	MB90568		
Flash memory				Equivalent device				
Flash				128 KB	4 KB	MB90565 series	MB90F568	
Evaluation device				Evaluation target device				
Evaluation device					4 KB	MB90565 series	MB90V560	
		UART/SIO (1 ch.), SIO (2 ch.), A/D converter (8/10-bit × 8 ch.), external interrupts (8 ch.) , ICU (16-bit × 2 ch.) , OCU (16-bit × 4 ch.) , PPG timer (8-bit × 4 ch.) , U/D counter (8-bit × 2 ch.) , reload timer (16-bit × 1 ch.) , free-run timer (16 bit × 1 ch.) , I ² C (1 ch.), PWC (2 ch.), μDMAC (16 ch.)	MB90980 series	MASK	128 KB	10 KB	MB90982	
				Flash memory		Equivalent device		
				Flash	192 KB	12 KB	MB90980 series	MB90F983
				Evaluation device		Evaluation target device		
				Evaluation device		16 KB	MB90980 series	MB90V485B

(Continued)

16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90565 series

For phone, etc.



Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90567	+2.7 to +3.6	64P (14 × 20 mm)	64P (12 × 12 mm)	—	I/O ports: 51 Max. Timebase timer (WDT): 18-bit × 1 ch. Reload timer: 16-bit × 2 ch. PPG timer: 8-bit × 6 ch. (16-bit × 3 ch.) Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch.
MB90568		64P (14 × 20 mm)	64P (12 × 12 mm)	—	
MB90F568		64P (14 × 20 mm)	64P (12 × 12 mm)	—	
MB90V560	+3.0 to +5.5	—	—	256C	UART: 2 ch. External interrupts: 8 Low-power consumption modes: Sleep, hardware standby, time base timer mode, CPU intermittent operation

Packages: P - plastic, C - ceramic

■ MB90980 series

For Cellular phone, AV equipment, etc.



Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm pitch)	PGA	
MB90982	+2.7 to +3.6	64P	—	I/O ports: 48 Max. Timebase timer (WDT): 18-bit × 1 ch. U/D counter: 8-bit × 2 ch. PPG timer: 8-bit × 4 ch. (16-bit × 2 ch.) SIO: 2 ch. Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch.
MB90F983		64P	—	
MB90V485B		—	299C	

UART/SIO: 1 ch.
I²C bus interface: 1 ch.
PWC: 2 ch.
Reload timer: 16-bit × 1 ch.
μDMAC: 16 ch.
External interrupts: 8 ch.
Low-power consumption modes: Sleep, stop, sub, watch, CPU intermittent operation, timebase timer mode

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family Standard Products

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
80	A/D converter (8/10-bit × 16 ch.), D/A converter (8-bit × 2 ch.), Multifunction timer, UART(2 ch.), External interrupts (8 ch.), Reload timer (16-bit × 2 ch.), PWC timer (16-bit × 2 ch.), PPG timer (16-bit × 3 ch.)	MB90820B series	MASK	64 KB	4 KB	MB90822B
				128 KB	4 KB	MB90823B
			Flash	Flash memory		Equivalent device
				64 KB	4 KB	MB90820B series MB90F822B
				128 KB	4 KB	MB90820B series MB90F823B
					8 KB	MB90820B series MB90F828B
			Evaluation device	Evaluation target device		
				16 KB	MB90820B series	MB90V820B
100	A/D converter (10-bit × 8ch.), UART(1 ch.), I ² C bus interface (2ch.), external interrupts (8ch.), input capture (16-bit × 4ch.), output compare (16-bit × 4ch.), PPG timer (8-bit × 6ch.)	MB90550A/B series	MASK	64 KB	2 KB	MB90552A
						MB90552B
				128 KB	4 KB	MB90553A
						MB90553B
			No ROM		2 KB	MB90T552A
					4 KB	MB90T553A
			OTPROM	128 KB	4 KB	MB90550A/B series MB90P553A
			Flash	Flash memory		Equivalent device
				128 KB	4 KB	MB90550A/B series MB90F553A
			Evaluation device	6 KB	MB90550A/B series	MB90V550A

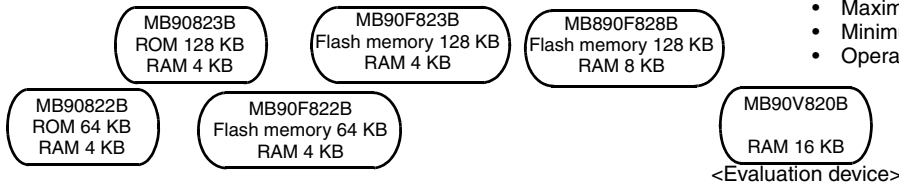
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16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90820B series

High speed A/D converter



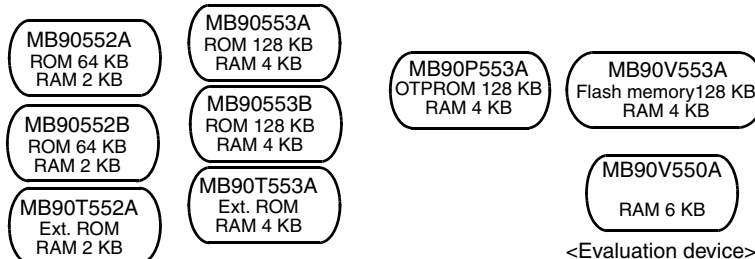
- Maximum internal clock frequency: 24 MHz
- Minimum execution time: 41.6 ns
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package				Functions
		LQFP (0.5 mm pitch)	LQFP (0.65 mm pitch)	QFP (0.8 mm pitch)	PGA	
MB90822B	+3.5 to +5.5	80P	80P	80P	—	I/O ports: 66 Max. Analog section: 10-bit A/D converter × 16 ch. 8-bit D/A converter × 2 ch. Timebase timer (WDT): 18-bit × 1 ch. Reload timer : 16-bit × 2 ch. Multifunction timer: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 6 ch. 16-bit free-run timer × 1 ch. 16-bit PPG timer × 1 ch. Waveform generation circuit PWC timer: 16-bit × 2 ch. PPG timer: 16-bit × 3 ch. UART: 2 ch. External interrupts: 8 ch. Clock Supervisor (MB90F828B) Low-power consumption modes: Sleep, stop, CPU intermittent operation
MB90823B		80P	80P	80P	—	
MB90F822B		80P	80P	80P	—	
MB90F823B		80P	80P	80P	—	
MB90F828B		80P	80P	80P	—	
MB90V820B	+4.5 to +5.5	—	—	—	299C	

Packages: P - plastic, C - ceramic

■ MB90550A/550B series

For AV equipment, high level consumer electronic, industrial applications, etc.



- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90552A	+3.5 to +5.5	100P	100P	—	I/O ports: 83 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 1 ch. SIO: 1 ch. I ² C bus interface: 2 ch. Analog section: 10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch. PPG timer: 8-bit × 6 ch. (16-bit × 3 ch.) Reload timer : 16-bit × 2 ch. External interrupts: 8 Low-power consumption modes: Sleep, time base timer, stop, CPU intermittent operation
MB90552B		100P	100P	—	
MB90T552A		100P	100P	—	
MB90553A		100P	100P	—	
MB90553B		100P	100P	—	
MB90T553A		100P	100P	—	
MB90P553A	+4.5 to +5.5	100P	100P	—	
MB90F553A		100P	100P	—	
MB90V550A		—	—	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family Standard Products

(Continued)	(Continued)						
Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
100	A/D converter (10-bit × 24 ch.), UART for LIN (4 ch.), OCU (16-bit × 8 ch.), ICU (16 bit × 8 ch.), reload timer (16-bit × 4 ch.), PPG timer (16-bit × 8 ch.), 16 bit × 1 ch.), external interrupts (16 ch.), WDT	MB90860E/ ES series	MASK	128 KB	6 KB	MB90867E	
						MB90867ES	
			Flash memory			Equivalent device	
			Flash	128 KB	6 KB	MB90867E	MB90F867E
						MB90867ES	MB90F867ES
			Evaluation device			Evaluation target device	
					30 KB	MB90860E series	MB90V340E-102
						MB90860ES series	MB90V340E-101
	A/D converter (10-bit × 8ch.), D/A converter (8-bit × 2ch.), UART (5ch.), external interrupts (8ch.), input capture (16-bit × 4ch.), output compare (16-bit × 4ch.), PPG timer (8-bit × 2ch.), reload timer (16-bit × 3ch.), free-run timer (16-bit × 1ch.), PWC timer (16-bit × 1ch.), IE bus	MB90580C /CA series	MASK	64 KB	4 KB	MB90587C	
						MB90587CA	
				128 KB	6 KB	MB90583C	
						MB90583CA	
			Flash memory			Equivalent device	
			Flash	128 KB	6 KB	MB90583C	MB90F583C
						MB90583CA	MB90F583CA
				256 KB	6 KB	MB90F584C	
						MB90F584CA	
			Evaluation device			Evaluation target device	
					6 KB	MB90580 series	MB90V580B
(Continued)	(Continued)						

16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90860E/860ES series

For Digital consumer electronic, AV equipment, etc.

MB90867E/ES
ROM 128 KB
RAM 6 KB

MB90F867E/ES
Flash memory 128 KB
RAM 6 KB

MB90V340E
RAM 30 KB

<Evaluation device>

- Maximum internal clock frequency: 24 MHz (32.768 kHz)
- Minimum execution time: 42.0 ns (122.1 μs)
- Operating temperature range: -40°C+105°C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	PGA	
MB90867E	+3.5 to +5.5	100P	100P	—	I/O ports: 82 Max. (MB90867ES/F867ES: Single clock) 80 Max. (MB90867E/F867E: Dual clock) Timebase timer (WDT): 18-bit × 1 ch. PPG timer: 8-bit × 16 ch. (16-bit × 8 ch.) Analog section: 10-bit A/D converter × 24 ch. Real time I/O: 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 8 ch. 16-bit free-run timer × 2 ch. UART for LIN : 4 ch. I ² C: 2 ch. Reload timer: 116 bit × 4 ch External interrupts: 16 ch. Low-power consumption modes: Sleep, stop, watch, sub, time base timer, CPU intermittent operation mode
MB90867ES		100P	100P	—	
MB90F867E		100P	100P	—	
MB90F867ES		100P	100P	—	
MB90V340E-101	+4.5 to +5.5	—	—	299C	
MB90V340E-102		—	—	299C	

Packages: P - plastic

■ MB90580C/580CA series

For car audio, etc.

MB90587C/CA
ROM 64 KB
RAM 4 KB

MB90583C/CA
ROM 128 KB
RAM 6 KB

MB90F583C/CA
Flash memory 128 KB
RAM 6 KB

MB90F584C/CA
Flash memory 256 KB
RAM 6 KB

MB90V580B
RAM 6 KB

<Evaluation device>

- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90583C	+3.0 to +5.5	100P	100P	—	I/O ports: 77 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 5 ch. Analog section: 10-bit A/D converter × 8 ch. 8-bit D/A converter × 2 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 2 ch. 16-bit free-run timer × 1 ch.
MB90583CA		100P	100P	—	
MB90587C		100P	100P	—	
MB90587CA		100P	100P	—	
MB90F583C	+4.5 to +5.5	100P	100P	—	PPG timer: 8-bit × 2 ch. (16-bit × 1 ch.) PWC timer: 16-bit × 1 ch. Reload timer: 16-bit × 3 ch. IE bus (MB90583C/CA, MB90F583C/CA, MB90V580B) For single clock: MB90583C/587C/F583C/F584C/V580B For dual clock: MB90583CA/587CA/F583CA/F584CA/V580B External interrupts: 8 Low-power consumption modes: Sleep, stop, watch, sub, time base timer, CPU intermittent operation mode
MB90F583CA		100P	100P	—	
MB90F584C		100P	100P	—	
MB90F584CA		100P	100P	—	
MB90V580B	+3.0 to +5.5	—	—	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family Standard Products

(Continued)	(Continued)						
Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
100	A/D converter (8/10 bit × 8 ch.) , UART (2 ch.) , SIO (1 ch.) , external interrupts (8 ch.) , reload timer (16 bit × 2 ch.) , free-run timer (16 bit × 1 ch.) , ICU (16 bit × 8 ch.) , OCU (16 bit × 4 ch.) , PPG timer (16 bit × 4 ch.)	MB90435 series	MASK	64 KB	2 KB	MB90437L	
						MB90437LS	
				128 KB	4 KB	MB90438L	
						MB90438LS	
				256 KB	6 KB	MB90439	
						MB90439S	
			Flash	Flash memory		Equivalent device	
				128 KB	4 KB	MB90437L MB90438L	MB90F438L
						MB90437LS MB90438LS	MB90F438LS
				256 KB	6 KB	MB90439 MB90439S	MB90F439 MB90F439S
			Evaluation device	Evaluation target device		MB90435 series	MB90V540G
					8 KB		
(Continued)	(Continued)						

16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90435 series

For Digital consumer electronic, AV equipment, etc.

MB90439/S
ROM 256 KB
RAM 6 KB

MB90F439/S
Flash memory 256 KB
RAM 6 KB

MB90438L/S
ROM 128 KB
RAM 4 KB

MB90F438L/S
Flash memory 128 KB
RAM 4 KB

MB90V540G
RAM 8 KB

<Evaluation device>

MB90437L/S
ROM 64 KB
RAM 2 KB

- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	PGA	
MB90437L *2	+3.5 to +5.5	100P	100P	—	I/O ports: 80 Max. Timebase timer (WDT): 18-bit × 1 ch. 8/16 bit PPG timer: 4 ch. SIO : 1 ch A/D converter: 8/10-bit × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare (OCU) × 4 ch. 16-bit free-run timer × 1 ch. UART: 2 ch. Reload timer : 16-bit × 2 ch. For Single clock: MB90437LS/438LS/439S/F438LS/F439S For Dual clocks: MB90437L/438L/439/F438L/F439/V540G External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, time base timer, CPU intermittent operation , sub, watch mode
MB90437LS *1		100P	100P	—	
MB90438L *2		100P	100P	—	
MB90438LS *1		100P	100P	—	
MB90439 *2	+4.5 to +5.5	100P	100P	—	
MB90439S *1		100P	100P	—	
MB90F438L *2	+3.5 to +5.5	100P	100P	—	
MB90F438LS *1		100P	100P	—	
MB90F439 *2	+4.5 to +5.5	100P	100P	—	
MB90F439S *1		100P	100P	—	
MB90V540G *2		—	—	256C	

Packages: P - plastic, C - ceramic

*1: Single clock

*2: Dual clock

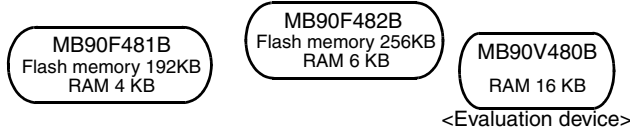
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(Continued)		(Continued)					
	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
	100	UART (1 ch.) , SIO (2 ch.) , A/D converter (8/10-bit × 8 ch.) , μDMAC (16 ch.) , external interrupts (8 ch.) , input capture (16-bit × 2 ch.) , output compare (16-bit × 6 ch.) , PPG timer (8-bit × 6 ch.) , up/down counter (8-bit × 2 ch.) , reload timer (16-bit × 1 ch.) , free-run timer (16-bit × 1 ch.)	MB90480B series	Flash	Flash memory		
					192 KB	4 KB	MB90F481B
					256 KB	6 KB	MB90F482B
				Evaluation device	16 KB	MB90480B series	MB90V480B
						Evaluation target device	
		UART (1 ch.) , SIO(2 ch.) , A/D converter (8/10-bit × 8 ch.) , μDMAC (16 ch.) , external interrupts (8 ch.) , input capture (16-bit × 2 ch.) , output compare (16-bit × 6 ch.) , PPG timer (8-bit × 6 ch.) , up/down counter (8-bit × 2 ch.) , reload timer (16-bit × 1 ch.) , free-run timer (1 ch.) , I ² C bus interface (1 ch.) , PWC (3 ch.) , μPG (1 ch.)	MB90485B series	MASK	192 KB	10 KB	MB90487B
	256 KB				10 KB	MB90488B	
					16 KB	MB90483C	
						Flash memory	
				Flash	256 KB	10 KB	MB90F488B
					384 KB	24 KB	MB90F489B
				Evaluation device	16 KB	MB90485B series	MB90V485B
						Evaluation target device	
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16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90480B series

For AV equipment, high level consumer electronic, industrial applications, etc.



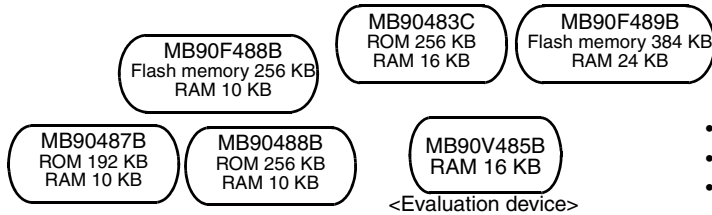
- Maximum internal clock frequency: 25 MHz(32.768 kHz)
- Minimum execution time: 40 ns(125 μs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90F481B	+2.7 to +3.6	100P	100P	–	I/O ports: 84 Max. Timebase timer (WDT): 18 bit × 1 ch. Up/down counter: 8 bit × 2 ch. (16bit × 1 ch.) PPG timer: 8 bit × 6 ch. (16bit × 3 ch.) SIO: 2 ch. Analog section: 8/10bit A / D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 6 ch. 16-bit free-run timer × 1 ch. UART: 1 ch. Reload timer: 16 bit × 1 ch. μDMAC : 16 ch. External interrupts: 8 ch. Low-power consumption modes: Sleep, stop (hardware), watch, sub, CPU intermittent operation, time base timer mode
MB90F482B		100P	100P	–	
MB90V480B		–	–	299C	

Packages: P - plastic, C - ceramic

■ MB90485B series

For AV equipment, high level consumer electronic, industrial applications, etc.



- Maximum internal clock frequency: 25 MHz (32.768 kHz)
- Minimum execution time: 40 ns (125 μs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90483C	+2.7 to +3.6	100P	100P	–	I/O ports: 84 Max. Timebase timer (WDT): 18-bit × 1 ch. Up/down counter: 8-bit × 2ch. PPG timer: 8-bit × 6 ch. (16-bit × 3 ch.) SIO: 2 ch. Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 6 ch. 16-bit free-run timer × 1 ch. UART: 1 ch. I ² C bus interface: 1 ch. μPG: 1 ch. PWC: 3 ch. Reload timer μDMAC: 16 ch. External interrupts: 8 Low-power consumption modes: Sleep, stop, sub, time base timer, watch, CPU intermittent operation mode
MB90487B		100P	100P	–	
MB90488B		100P	100P	–	
MB90F488B		100P	100P	–	
MB90F489B		100P	100P	–	
MB90V485B		–	–	299C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family Standard Products

(Continued)	(Continued)									
	Pin count	Main functions	Series name	Type	ROM	RAM	Part number			
	100	Multi function serial (UART/SIO/I ² C mode can be switched. 7 ch.) , A/D converter (8/10-bit × 20 ch.) , external interrupts (24 ch.) , input capture (16-bit × 2 ch.) , output compare (16-bit × 6 ch.) , free-run timer (16-bit × 1 ch.) PPG timer (16-bit × 8 ch.) , up/down counter (8-bit × 2 ch.) , base timer (reroad timer/ PWC/PPG/PWM mode can be switched. 4 ch.) , μDMAC (16 ch.)	MB90880 series	MASK	256 KB	16 KB	MB90882 *			
							MB90882S *			
							384 KB	24 KB	MB90883 **	
									MB90883S **	
							512 KB	30 KB	MB90884 **	
									MB90884S **	
						Flash memory				
					Flash		256 KB	16 KB	MB90F882A	
									MB90F882AS	
								384 KB	24 KB	MB90F883B
									MB90F883BS	
									MB90F883BH	
									MB90F883BHS	
								512 KB	30 KB	MB90F884B
									MB90F884BS	
									MB90F884BH	
						MB90F884BHS				
				Evaluation device						
						30 KB	MB90880 series	MB90V880A-101		
								MB90V880A-102		

*: Under development
 **: Under planning

(Continued)

16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90880 series

For AV equipment, high level consumer electronic, industrial applications, etc.

- Maximum internal clock frequency:
33 MHz (MB90882/882S/883/883S884/884S/F882A/F882AS/
F883BH/F883BHS/F884BH/F884BHS)
25 MHz (MB90F883B/F883BS/F884B/F884BS)
- Minimum execution time:
30.3 ns (MB90882/882S/883/883S884/884S/F882A/F882AS/
F883BH/F883BHS/F884BH/F884BHS)
40.0 ns (MB90F883B/F883BS/F884B/F884BS)
- Operating temperature range: -40°C to +85°C

MB90F882A/AS Flash memory 256 KB RAM 16 KB	MB90F883B/BS MB90F883BH/BHS Flash memory 384 KB RAM 24 KB	MB90F884B/BS MB90F884BH/BHS Flash memory 512 KB RAM 30 KB	
MB90882/S ROM 256 KB RAM 16 KB	MB90883/S ROM 384 KB RAM 24 KB	MB90884/S ROM 512 KB RAM 30 KB	MB90V880A-101/102 RAM 30 KB <Evaluation device>
Under development	Under planning	Under planning	

Part number	Operating power supply voltage (V)	Package		Functions
		QFP (0.65 mm pitch)	LQFP (0.5 mm pitch)	
⊙ MB90882 *2	+2.7 to +3.6	100P	100P	I/O ports: 83 Max. (single clock) 81 Max. (dual clock) Timebase timer (WDT): 18 bit × 1 ch. Up/down counter: 8 bit × 2 ch. PPG timer: 16-bit × 8 ch. Multi function serial: 7 ch. (UART/SIO/I2C mode can be switched.) A/D converter: 8/10-bit × 20 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 6 ch. 16-bit free-run timer × 1 ch. Base timer: 4 ch. (16-bit reroad timer/PWC/PPG/PWM mode can be switched.) External interrupts: 24 ch. μDMAC : 16 ch. Flash security (MB90F882A/F882AS) Mis-writing prevention function (MB90F882A/F882AS) Low-power consumption modes: Sleep, stop, sub, watch, CPU intermittent operation, time base timer mode
⊙ MB90882S *1		100P	100P	
○ MB90883 *2		100P	100P	
○ MB90883S *1		100P	100P	
○ MB90884 *2		100P	100P	
○ MB90884S *1		100P	100P	
MB90F882A *2		100P	100P	
MB90F882AS *1		100P	100P	
MB90F883B *2		100P	100P	
MB90F883BS *1		100P	100P	
MB90F883BH *2		100P	100P	
MB90F883BHS *1		100P	100P	
MB90F884B *2		100P	100P	
MB90F884BS *1		100P	100P	
MB90F884BH *2		100P	100P	
MB90F884BHS *1		100P	100P	
MB90V880A-101 *1		—	—	
MB90V880A-102 *2		—	—	

Packages: P - plastic, C - ceramic

○: Under planning

⊙: Under development

*1: Single clock

*2: Dual clock

16-bit Proprietary F²MC-16LX Family Standard Products

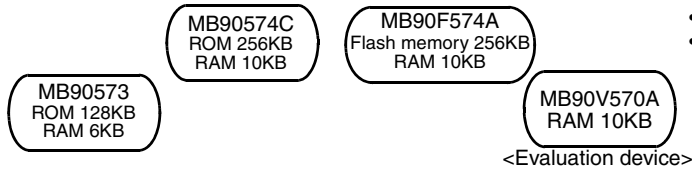
(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
120	A/D converter (10-bit × 8ch.), D/A converter (8-bit × 2ch.), UART (2ch.), SIO(3ch.), external interrupts (8ch.), input capture (16-bit × 2ch.), output compare (16-bit × 4ch.), I ² C bus interface, PPG timer (8-bit × 2ch.), up/down counter (8-bit × 2ch.), free-run timer, timer (1ch.)	MB90570A/C series	MASK	128 KB	6 KB	MB90573	
				256 KB	10 KB	MB90574C	
			Flash memory		Equivalent device		
			Flash	256 KB	10 KB	MB90573/ 574C	MB90F574A
			Evaluation device		10 KB	MB90570A/C series	MB90V570A
144	A/D converter (8/10-bit × 12 ch.) , D/A converter (8-bit × 2 ch.) , LCDC (9 seg × 4 com) , LPC interface, PS/2 interface, UART/SIO (3 ch.) , I2C (1 ch.) , multi address I ² C (1 ch.) , bridge circuit, external interrupts (24 ch.) , key on wake up (8 ch.) , 8/16-bit PPG timer (8-bit × 4 ch. or 16-bit × 2 ch.) , 16-bit PPG timer (16-bit × 3 ch.) , reload timer (16-bit × 6 ch.)	MB90378 series	Flash memory				
			Dual Flash	128 KB	6 KB	MB90F378	
			Evaluation device		16 KB	MB90378 series	MB90V378
			Evaluation target device				

16-bit Proprietary F²MC-16LX Family Standard Products

■ MB90570A/570C series

For car audio



- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90573	+3.0 to +5.5	120P (14 × 14 mm)	120P	—	I/O ports: 97 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 2ch. Analog section: 10-bit A/D converter × 8 ch. 8-bit D/A converter × 2 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch.
MB90574C		120P (14 × 14 mm)	120P (20 × 20 mm)	—	
MB90F574A	+4.5 to +5.5	120P (14 × 14 mm) (16 × 16 mm)	120P (20 × 20 mm)	—	PPG timer: 8-bit × 2 ch. (16-bit × 1 ch.) I ² C bus interface Up/down counter: 8-bit × 2ch.(16-bit × 1 ch.) SIO: 3 ch. External interrupts: 8 Clock timer: 1 ch. Low-power consumption modes: Sleep, stop, sub, time base timer, watch, CPU intermittent operation mode
MB90V570A	+3.0 to +5.5	—	—	256C	

Packages: P - plastic, C - ceramic

■ MB90378 series

For note PC



- Maximum internal clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.4 mm pitch)	PGA	
MB90F378	+3.0 to +3.6	144P	-	I/O ports: 125 Max. LPC interface PS/2 interface I ² C bus interface : 1 ch. Multi address I ² C bus interface : 1 ch. Bridge circuit LCD controller/driver : 9 SEG × 4 COM Watch timer 8/16-bit PPG timer : 8-bit × 4 ch. or 16-bit × 2 ch. 16-bit PPG timer : 3 ch. 16-bit reload timer : 6 ch. Analog section : 8/10-bit A/D converter × 12 ch. 8-bit D/A converter × 2 ch. UART/SIO : 3 ch. External interrupts : 24 ch. Key on wake up : 8 ch. Timebase timer (WDT) : 18-bit × 1 ch. Low-power consumption modes : Sleep, stop, sub, watch, CPU intermittent operation, time base timer mode
MB90V378		-	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family CAN Controller Products

F²MC-16LX Family CAN Controller Products

	Pin count	Main functions	Series name	Type	ROM	RAM	Part number					
F ² MC-16LX Family CAN Controller Products	48	CAN interface (1ch.), UART for LIN (2 ch) , A/D converter (10 bit × 8 ch) , Reload timer (16 bit × 2 ch) , PPG timer (16 bit × 2 ch) , ICU (16 bit × 4 ch) , external interrupts (8 ch)	MB90360E series	MASK	64 KB	3 KB	MB90362E					
							MB90362TE					
							MB90362ES					
							MB90362TES					
							MB90367E					
							MB90367TE					
							MB90367ES					
							MB90367TES					
								Flash memory		Equivalent device		
								Flash	64 KB	3 KB	MB90360E series	MB90F362E
											MB90F362TE	
											MB90F362ES	
											MB90F362TES	
											MB90F367E	
											MB90F367TE	
											MB90F367ES	
											MB90F367TES	
								Evaluation device		Evaluation target device		
										30 KB	MB90360E series	MB90V340E-101
												MB90V340E-102
												MB90V340E-103
												MB90V340E-104

(Continued)

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16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90360E series

For car bodies control, etc.

MB90362E/TE
MB90362ES/TES
ROM 64 KB
RAM 3 KB

MB90F362E/TE
MB90F362ES/TES
Flash memory 64 KB
RAM 3 KB

MB90367E/TE
MB90367ES/TES
ROM 64 KB
RAM 3 KB

MB90F367E/TE
MB90F367ES/TES
Flash memory 64 KB
RAM 3 KB

MB90V340E
RAM 30 KB
<Evaluation device>

- Maximum clock frequency: 24 MHz
- Minimum execution time : 41.6 ns
- Operating temperature range : -40 to +105 °C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm pitch)	PGA	
MB90362E *2	+3.5 to +5.5	48P	—	I/O ports: 36 Max. (single clock) 34 Max. (dual clock) CAN interface : 1ch Timebase timer (WDT) : 18bit × 1ch Reload timer : 16bit × 2ch PPG timer : 8bit × 2ch or 16bit × 2ch 16bit input/output timer : input capture unit (ICU) × 4ch free-run timer × 1ch UART for LIN : 2ch A/D converter : 8/10bit × 16ch External interrupt : 8ch Clock monitoring function Low voltage/CPU operation detection reset (MB90362TE/362TES/367TE/367TES/F362TE/F362TES/F367TE/F367TES) Low-power consumption modes : Sleep, stop, sub, sub sleep, watch, CPU intermittent operation, time base timer mode
MB90362TE *2		48P	—	
MB90362ES *1		48P	—	
MB90362TES *1		48P	—	
MB90367E *2		48P	—	
MB90367TE *2		48P	—	
MB90367ES *1		48P	—	
MB90367TES *1		48P	—	
MB90F362E *2		48P	—	
MB90F362TE *2		48P	—	
MB90F362ES *1		48P	—	
MB90F362TES *1		48P	—	
MB90F367E *2		48P	—	
MB90F367TE *2		48P	—	
MB90F367ES *1		48P	—	
MB90F367TES *1		48P	—	
MB90V340E-101 *1	+4.5 to +5.5	—	299C	
MB90V340E-102 *2		—	299C	
MB90V340E-103 *1		—	299C	
MB90V340E-104 *2		—	299C	

Packages: P - plastic, C - ceramic

*1 : single clock, *2 : dual clock

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)	(Continued)						
	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
	48	CAN interface (1ch.), UART (1 ch.), A/D converter (8/10-bit × 8ch.), external interrupts (4 ch.), free-run timer (16-bit × 1ch.), input capture (16-bit × 4ch.), 8/16-bit PPG timer (2 ch.), Watch timer, Reload timer (16-bit × 2ch.)	MB90385 series	MASK	64 KB	2 KB	MB90387 MB90387S
				Flash memory		Equivalent device	
				Flash	64 KB	2 KB	MB90387 MB90F387 MB90F387S
				Evaluation device		Evaluation target device	
					6 KB	MB90385 series	MB90V495G
				Flash memory			
		A/D converter (8/10-bit × 8 ch.) , UART/SIO (2 ch) , CAN interface (1 ch.) , external interrupts (4 ch.) , ICU (16 bit × 4 ch) , PPG timer (8/16-bit × 2 ch.) , Reload timer (16-bit × 2 ch.) , WDT	MB90895 series	Flash	64 KB	2 KB	MB90F897 MB90F897S
				Evaluation device		Evaluation target device	
					6 KB	MB90890 series	MB90V495G
(Continued)	(Continued)						

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90385 series

For car bodies control, etc.

MB90387/S
ROM 64 KB
RAM 2 KB

MB90F387/S
Flash memory 64 KB
RAM 2 KB

MB90V495G
RAM 6 KB

<Evaluation device>

- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90387	+3.5 to +5.5	48P	–	I/O ports: 36 Max. (MB90387S/F387S) 34 Max. (MB90387/F387/V495G) CAN interface: 1ch. Timebase timer (WDT): 18-bit × 1 ch. Watch timer PPG timer: 16-bit × 2 ch. (8-bit × 4 ch.) A/D converter: 8/10-bit × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1 ch. UART: 1 ch. Reload timer: 16-bit × 2 ch. For single clock: MB90387S/F387S For dualclock: MB90387/F387/V495G External interrupts: 4ch. Low-power consumption modes: Sleep, stop, sub, watch, time base timer, CPU intermittent operation mode
MB90387S		48P	–	
MB90F387		48P	–	
MB90F387S		48P	–	
MB90V495G		–	256C	

Packages: P - plastic, C - ceramic

■ MB90895 series

Built-in dual operation Flash memory

MB90F897/S
Flash memory 64 KB
RAM 2 KB

MB90V495G
RAM 6 KB

<Evaluation device>

- Maximum clock frequency: 16 MHz(32.768 kHz)
- Minimum execution time: 62.5 ns(122.1 μs)
- Operating temperature range: -40 °C to +105 °C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90F897	+3.5 to +5.5	48P	–	I/O ports: 34 Max. (MB90F897: Dual clock) , 36 Max. (MB90F897S: Single clock) CAN interface: 1ch. Timebase timer (WDT): 18-bit × 1 ch. Watch timer PPG timer: 16-bit × 2 ch. (8-bit × 4 ch.) A/D converter: 8/10-bit × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. UART : 2 ch. Reload timer: 16-bit × 2 ch. External interrupts: 4ch. Low-power consumption modes: Sleep, stop, sub, watch, time base timer, CPU intermittent operation mode
MB90F897S		48P	–	
MB90V495G	+4.5 to +5.5	–	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)	(Continued)						
	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
	48	CAN controller (1 ch.) LIN-UART (2 ch.), UART (1 ch.) A/D converter (10-bit × 16 ch.), D/A converter (8-bit × 1 ch.), Reload timer (16-bit × 2 ch.), PPG timer (16-bit × 3 ch/8-bit × 6 ch.), Input capture (16-bit × 4ch.), Free-run timer (16-bit × 1 ch.), External interrupts (8 ch.)	MB90990 series	Flash	128 KB +32 KB	8 KB	MB90F997JA MB90F997JAS MB90F997MA MB90F997MAS
				Evaluation device		30 KB	Evaluation target device MB90F997JA — MB90V340F-104 MB90F997JAS — MB90V340F-103 MB90F997MA — MB90V340F-102 MB90F997MAS — MB90V340F-101
(Continued)							

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90990 series

For automotive products, etc.

MB90F997JA/JAS
Flash memory 128 KB + 32 KB
RAM 8 KB

MB90F997MA/MAS
Flash memory 128 KB + 32 KB
RAM 8 KB

MB90V340F-101/102
MB90V340F-103/104
RAM 30KB

<Evaluation device>

- Maximum internal clock frequency: 32 MHz
- Operating temperature range: -40°C to +105°C
- Operating power supply voltage: +3.0 V to 5.5 V

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90F997JA *2	+3.5 to +5.5	48P	—	Maximum operating frequency: 32 MHz I/O ports: 34 (MB90F997JA/F997MA), 36 (MB90F997JAS/F997MAS) Successive approximation A/D converter: 10-bit × 16 ch. 8-bit D/A converter: 1 ch. CAN interface: 1 ch. LIN-UART: 2 ch. UART: 1 ch. Reload timer: 16-bit × 2 ch. PPG timer: 16-bit × 3 ch. or 8-bit × 6 ch. External interrupt: 8 ch. Input capture: 16-bit × 4 ch. Free-run timer: 16-bit × 1 ch. External interrupts: 8 ch. Clock supervisor: (MB90F997JA/F997JAS)
MB90F997JAS *1		48P	—	
MB90F997MA *2		48P	—	
MB90F997MAS *1		48P	—	
MB90V340F-101 *1		—	299C	
MB90V340F-102 *2		—	299C	
MB90V340F-103 *1		—	299C	
MB90V340F-104 *2		—	299C	

Packages: P - plastic, C - ceramic

*1: single clock *2: dual clock

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
64	CAN interface (1 ch) , UART for LIN (2 ch) , I ² C (1 ch) , A/D converter (10 bit × 15 ch) , reload timer (16 bit × 4 ch) , PPG timer (16 bit × 6 ch) , ICU (16 bit × 6 ch) , IOU (16 bit × 4 ch) , external interrupts (8 ch)	MB90350E series	MASK	64 KB	4 KB	MB90351E
						MB90351ES
						MB90351TE
						MB90351TES
				128 KB	4 KB	MB90352E
						MB90352ES
						MB90352TE
						MB90352TES
			Flash	128 KB	4 KB	MB90F351E
						MB90F351ES
						MB90F351TE
						MB90F351TES
				128 KB	4 KB	MB90F352E
						MB90F352ES
						MB90F352TE
						MB90F352TES
			Evaluation device		30 KB	MB90V340E-101
						MB90V340E-102

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16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90350E series

For car bodies control, etc.

MB90352E/ES/TE/TES
ROM 128 KB
RAM 4 KB

MB90F352E/ES/TE/TES
Flash memory 128 KB
RAM 4 KB

- Maximum clock frequency : 24 MHz
- Minimum execution time : 41.6 ns
- Operating temperature range : -40 to +125 °C

MB90351E/ES/TE/TES
ROM 64 KB
RAM 4 KB

MB90F351E/ES/TE/TES
Flash memory 64 KB
RAM 4 KB

MB90V340E
RAM 30 KB

<Evaluation device>

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.65 mm pitch)	PGA	
MB90351E *2	+3.5 to +5.5	64P	—	I/O ports: 51 Max. (single clock) 49 Max. (dual clock) Flash memory : Dual operation Flash (MB90F351E/ES/TE/TES are excluded.) CAN interface : 1 ch. Timebase timer (WDT): 18-bit × 1 ch. Reload timer: 16-bit × 4 ch. PPG timer : 16-bit × 6 ch. (8-bit × 10 ch.) 16 bit input/output timer : input capture unit (ICU) × 6 ch output compare unit (OCU) × 4 ch free-run timer × 2 ch UART for LIN : 2 ch. A/D converter : 8/10-bit × 15 ch. I ² C: 1 ch External interrupt : 8 ch Low voltage/CPU operation detection reset (MB90351TE/351TES/352TE/352TES/F351TE/F351TES/F352TE/ F352TES) Low-power consumption modes: Sleep, stop, sub, sub sleep, watch, CPU intermittent operation, time base timer mode
MB90351ES *1		64P	—	
MB90351TE *2		64P	—	
MB90351TES *1		64P	—	
MB90352E *2		64P	—	
MB90352ES *1		64P	—	
MB90352TE *2		64P	—	
MB90352TES *1		64P	—	
MB90F351E *2		64P	—	
MB90F351ES *1		64P	—	
MB90F351TE *2		64P	—	
MB90F351TES *1		64P	—	
MB90F352E *2		64P	—	
MB90F352ES *1		64P	—	
MB90F352TE *2		64P	—	
MB90F352TES *1		64P	—	
MB90V340E-101 *1	+4.5 to +5.5	—	299C	
MB90V340E-102 *2		—	299C	

Packages: P - plastic, C - ceramic

*1 : single clock, *2 : dual clock

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
64	CAN interface (1 ch) , UART for LIN (2 ch) , I ² C (1 ch) , A/D converter (10 bit × 15 ch) , reload timer (16 bit × 4 ch) , PPG timer (16 bit × 6 ch) , ICU (16 bit × 6 ch) , IOU (16 bit × 4 ch) , external interrupts (8 ch)	MB90350E series	MASK	64 KB	4 KB	MB90356E
						MB90356ES
						MB90356TE
						MB90356TES
				128 KB	4 KB	MB90357E
						MB90357ES
						MB90357TE
						MB90357TES
			Flash	128 KB	4 KB	MB90F356E
						MB90F356ES
						MB90F356TE
						MB90F356TES
				128 KB	4 KB	MB90F357E
						MB90F357ES
						MB90F357TE
						MB90F357TES
			Evaluation device	30 KB	MB90350E series	MB90V340E-103
						MB90V340E-104

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16-bit Proprietary F²MC-16LX Family CAN Controller Products

MB90350E series

For car bodies control, etc.

MB90357E/ES/TE/TES
ROM 128 KB
RAM 4 KB

MB90F357E/ES/TE/TES
Flash memory 128 KB
RAM 4 KB

MB90356E/ES/TE/TES
ROM 64 KB
RAM 4 KB

MB90F356E/ES/TE/TES
Flash memory 64 KB
RAM 4 KB

MB90V340E
RAM 30 KB

<Evaluation device>

- Maximum clock frequency : 24 MHz
- Minimum execution time : 41.6 ns
- Operating temperature range : -40 to +125 °C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.65 mm pitch)	PGA	
MB90356E *2	+3.5 to +5.5	64P	—	I/O ports: 51 Max. (single clock) 49 Max. (dual clock) Flash memory : Dual operation Flash (MB90F356E/ES/TE/TES are excluded.) CAN interface : 1 ch. Timebase timer (WDT): 18-bit × 1 ch. Reload timer: 16-bit × 4 ch. PPG timer : 16-bit × 6 ch. (8-bit × 10 ch.) 16 bit input/output timer : input capture unit (ICU) × 6 ch output compare unit (OCU) × 4 ch free-run timer × 2 ch UART for LIN : 2 ch. A/D converter : 8/10-bit × 15 ch. I ² C: 1 ch External interrupt : 8 ch Low voltage/CPU operation detection reset (MB90356TE/356TES/357TE/357TES/F356TE/F356TES/F357TE/ F357TES) Low-power consumption modes: Sleep, stop, sub, sub sleep, watch, CPU intermittent operation, time base timer mode
MB90356ES *1		64P	—	
MB90356TE *2		64P	—	
MB90356TES *1		64P	—	
MB90357E *2		64P	—	
MB90357ES *1		64P	—	
MB90357TE *2		64P	—	
MB90357TES *1		64P	—	
MB90F356E *2		64P	—	
MB90F356ES *1		64P	—	
MB90F356TE *2		64P	—	
MB90F356TES *1		64P	—	
MB90F357E *2		64P	—	
MB90F357ES *1		64P	—	
MB90F357TE *2		64P	—	
MB90F357TES *1		64P	—	
MB90V340E-103 *1	+4.5 to +5.5	—	299C	
MB90V340E-104 *2		—	299C	

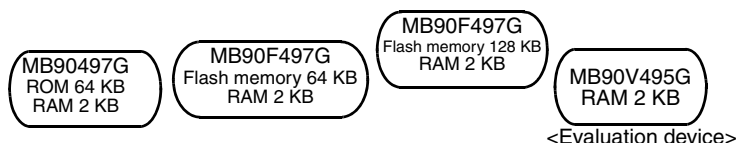
Packages: P - plastic, C - ceramic

*1 : single clock, *2 : dual clock

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90495G series

For car bodies control, etc.



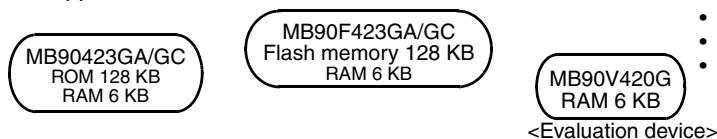
- Maximum clock frequency: 16 MHz(32.768 kHz)
- Minimum execution time: 62.5 ns(122.1 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90497G	+4.5 to +5.5	64P	64P	—	I/O ports: 49 Max. Timebase timer (WDT): 18-bit × 1 ch. PPG timer: 16-bit × 2 ch. (8-bit × 4 ch.) UART/SIO: 1ch. Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1 ch. Reload timer: 16-bit × 2 ch. CAN interface: 1 ch. Watch timer External interrupt: 8ch. Low-power consumption modes: Sleep, stop, sub, watch, CPU intermittent operation, time base timer mode
MB90F497G		64P	64P	—	
MB90F498G		64P	64P	—	
MB90V495G		—	—	256C	

Packages: P - plastic, C - ceramic
SMC: Stepper motor controller

■ MB90420GA/420GC series

Automotive applications, etc.



- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90423GA	+4.5 to +5.5	100P	100P	—	I/O ports: 58 Max. CAN interface: 2ch. Timebase timer (WDT): 18-bit × 1 ch. Watch timer, Sound generator PPG timer: (16-bit × 3 ch.) Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1 ch. UART: 2 ch., Reload timer: 16-bit × 2 ch. Stepper motor controller: 4 ch. LCD controller/driver: 96 elements, 2 to 4 common, 12 to 24 segments, 16 × 8-bit LCD display RAM For single clock : MB90423GA/F423GA For dual clock : MB90423GC/F423GC/V420G External interrupts: 8ch. Low-voltage detection reset (MB90423GA/F423GA) Low-power consumption modes: Sleep, stop, sub, watch, time base timer, CPU intermittent operation mode
MB90423GC		100P	100P	—	
MB90F423GA		100P	100P	—	
MB90F423GC		100P	100P	—	
MB90V420G		—	—	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family CAN Controller Products

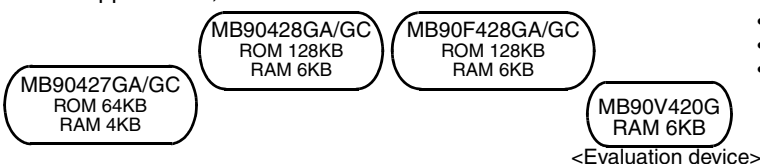
(Continued)	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
	100	CAN interface (1ch.), UART (2 ch.), A/D converter (8/10-bit × 8ch.), SMC (4 ch.), external interrupts (8 ch.), input capture (16-bit × 4 ch.), PPG timer (16-bit × 3 ch.), watch timer, reload timer (16-bit × 2 ch.), free-run timer (16-bit × 1 ch.), Sound generator, LCD controller/driver	MB90425 GA/GC series	MASK	64 KB	4 KB	MB90427GA MB90427GC
				MASK	128 KB	6 KB	MB90428GA MB90428GC
				Flash memory	128 KB	6 KB	Equivalent device MB90425GA MB90F428GA MB90425GC MB90F428GC
				Evaluation device		6 KB	Evaluation target device MB90425GA/ GC series MB90V420G
		CAN interface (3 ch.), UART (2 ch.), SIO (1ch.), A/D converter (8/10-bit × 8 ch.), external interrupts (8 ch.), input capture (16-bit × 8 ch), output compare (16-bit × 4ch), 8/16-bit PPG timer (4 ch.), Reload timer (16-bit × 2 ch.), free-run timer (16-bit × 1ch.), external bus interface	MB90440G series	MASK	128 KB	6 KB	MB90443G **
				Flash memory	128 KB	6 KB	Equivalent device MB90443G MB90F443G
				Evaluation device		14 KB	Evaluation target device MB90440G series MB90V440G

** : Under planning

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90425GA/425GC series

Automotive applications, etc.



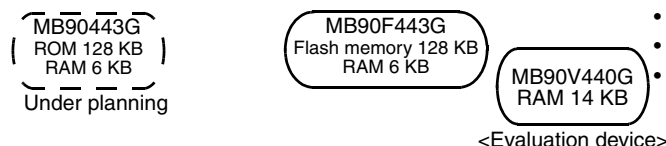
- Maximum clock frequency: 16 MHz(32.768 kHz)
- Minimum execution time: 62.5 ns(122.1 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90427GA	+4.5 to +5.5	100P	100P	—	I/O ports: 58 Max. CAN interface: 1ch. (2ch.: MB90V420) Timebase timer (WDT): 18-bit × 1ch. Watch timer (main clock) Sound generator PPG timer: 16-bit × 3 ch. Analog section: 8/10-bit A/D converter × 8ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit free-run timer × 1ch. UART: 2 ch. Reload timer: 16-bit × 2 ch. Stepper motor controller: 4 ch. LCD controller/driver: 96 elements, 2 to 4 common, 12 to 24 segments, 16 × 8-bit LCD display RAM For single clock : MB90427GA/428GA/F428GA For dual clock : MB90427GC/428GC/F428GC/V420G External interrupts: 8 ch. Low-voltage detection reset (MB90427GA/428GA/F428GA) Low-power consumption modes: Sleep, stop, sub, watch, time base timer, CPU intermittent operation mode
MB90427GC		100P	100P	—	
MB90428GA		100P	100P	—	
MB90428GC		100P	100P	—	
MB90F428GA		100P	100P	—	
MB90F428GC		100P	100P	—	
MB90V420G		—	—	256C	

Packages: P - plastic, C - ceramic

■ MB90440G series

For gateway, etc.



- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (125 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
○ MB90443G	+4.5 to +5.5	100P	—	I/O ports: 81 CAN interface: 3 ch. Timebase timer (WDT): 18-bit × 1 ch. 8/16-bit PPG timer: 4 ch. Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch. UART: 2 ch. SIO: 1 ch. Reload timer: 16-bit × 2 ch. External interrupts: 8 ch. external bus interface Low-power consumption modes: Sleep, stop, sub, watch, CPU intermittent operation, time base timer mode
MB90F443G		100P	—	
MB90V440G		—	256C	

Packages: P - plastic, C - ceramic

○: Under planning

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90595G series

For dashboard, car audio, etc.

MB90598G
ROM 128KB
RAM 4 KB

MB90F598G
Flash memory 128KB
RAM 4 KB

MB90V595G
RAM 6 KB

<Evaluation device>

- Maximum clock frequency: 16 MHz
- Minimum execution time: 62.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90598G	+4.5 to +5.5	100P	—	I/O ports: 78 Timebase timer (WDT): 18-bit × 1 ch. UART: 2 ch. Analog section: 10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch. 8/16-bit PPG timer: 6 ch. SIO: 1 ch. Reload timer: 16-bit × 2 ch. CAN interface: 1 ch. SMC: 4 ch. External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, time base timer, CPU intermittent operation mode
MB90F598G		100P	—	
MB90V595G		—	256C	

Packages: P - plastic, C - ceramic

SMC: Stepper motor controller

■ MB90540G/540GS series

For dashboard, car audio, etc.

MB90543G/GS
ROM 128 KB
RAM 6 KB

MB90F543G/GS
Flash memory 128KB
RAM 6 KB

MB90V540G
RAM 8 KB

<Evaluation device>

- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90543G	+3.5 to +5.5	100P	100P	—	I/O ports : 81 Max. Timebase timer (WDT) : 18-bit × 1 ch. CAN controller : 2 ch. 8/16-bit PPG timer : 4 ch. SIO : 1 ch. Analog section : 8/10-bit A/D converter × 8 ch. Real time I/O : 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch.
MB90F543G	+4.5 to +5.5	100P	100P	—	
MB90543GS	+3.5 to +5.5	100P	100P	—	
MB90F543GS	+4.5 to +5.5	100P	100P	—	UART : 2 ch. Reload timer : 16-bit × 2 ch. For single clock : MB90543GS/F543GS For dual clock : MB90543G/F543G/V540G External interrupts : 8 ch. Low-power consumption modes : Sleep, stop, sub, CPU intermittent operation, watch, time base timer mode
MB90V540G		—	—	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)	(Continued)						
Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
100	CAN controller (2 ch.) , UART for LIN (4 ch.) , A/D converter (10-bit × 16/24 ch.) , external interrupts (16 ch.) , ICU (16 bit × 8 ch.) , OCU (16 bit × 8 ch.) , 8 / 16-bit PPG timer (8 ch.) , reload timer (16-bit × 4 ch.)	MB90340E/ES series (CAN 1 ch.)	MASK	64 KB	2 KB	MB90346E	
						MB90346ES	
						MB90346CE	
						MB90346CES	
				128 KB	6 KB	MB90347E	
						MB90347ES	
						MB90347CE	
						MB90347CES	
				128 KB	16 KB	MB90348E **	
						MB90348ES **	
						MB90348CE **	
						MB90348CES **	
				256 KB	16 KB	MB90349E	
						MB90349ES	
						MB90349CE	
						MB90349CES	
				Flash memory		Equivalent device	
				Flash	64 KB	2 KB	MB90340E/ES series (CAN 1 ch.)
							MB90F346E
							MB90F346ES
							MB90F346CE
							MB90F346CES
				128 KB	6 KB	MB90340E/ES series (CAN 1 ch.)	MB90F347E
							MB90F347ES
							MB90F347CE
							MB90F347CES
				256 KB	16 KB	MB90340E/ES series (CAN 1 ch.)	MB90F349E
							MB90F349ES
							MB90F349CE
							MB90F349CES
				Evaluation target device		Evaluation target device	
				Evaluation device	30 KB	MB90340E/ES series (CAN 1 ch.)	MB90V340E-102
						MB90340E/ES series (CAN 1 ch.)	MB90V340E-101

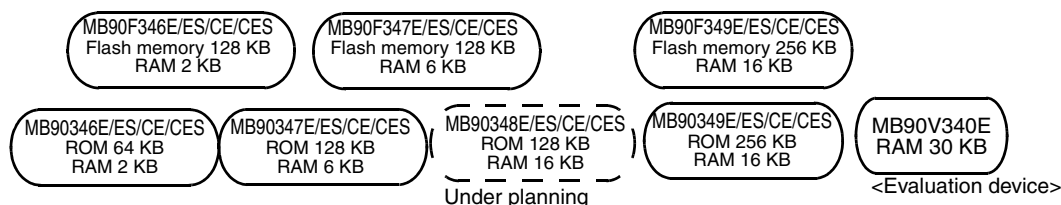
** : Under planning

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90340E/340ES series (CAN 1 ch.)

For car air-conditioner, etc.

- Maximum internal clock frequency: 24 MHz (32.768 kHz)
- Minimum execution time: 42.0 ns
- Operating temperature range: -40°C to +105 °C



Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	PGA	
MB90346E	+3.5 to +5.5	100P	100P	—	I/O ports : 80 (MB90346E/346CE/F346E/F346CE/347E/347CE/F347E/F347CE/348E/348CE/349E/349CE/F349E/F349CE/V340E-102: Dual clock) 82 (MB90346ES/346CES/F346ES/F346CES/347ES/347CES/F347ES/F347CES/348ES/348CES/349ES/349CES/F349ES/F349CES/V340E-101: Single clock) Timebase timer (WDT) : 18-bit × 1 ch. CAN controller : 1 ch. (MB90V340E-101/102: 3 ch.) 8/16-bit PPG timer : 16 bit × 8 ch. (16 bit × 16 ch.) Analog section : 8/10-bit A/D converter × 16 ch. (MB90346E/346ES/F346E/F346ES/347E/347ES/F347E/F347ES/348E/348ES/349E/349ES/F349E/F349ES) 8/10-bit A/D converter × 24 ch. (MB90346CE/346CES/F346CE/F346CES/347CE/347CES/F347CE/F347CES/348CE/348CES/349CE/349CES/F349CE/F349CES/V340E-101/V340E-102) Real time I/O : 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 8 ch. UART for LIN × 4 ch. (MB90V340E-101/102: 5 ch.) Reload timer : 16 bit × 4 ch. I ² C bus interface: 2 ch. (MB90346CE/346CES/F346CE/F346CES/347CE/347CES/348CE/348CES/349CE/349CES/F349CE/F349CES/V340E-101/V340E-102) External interrupts : 16 ch. Low-power consumption modes : Sleep, stop, sub, CPU intermittent operation, watch, time base timer mode
MB90346ES		100P	100P	—	
MB90346CE		100P	100P	—	
MB90346CES		100P	100P	—	
MB90F346E		100P	100P	—	
MB90F346ES		100P	100P	—	
MB90F346CE		100P	100P	—	
MB90F346CES		100P	100P	—	
MB90347E		100P	100P	—	
MB90347ES		100P	100P	—	
MB90347CE		100P	100P	—	
MB90347CES		100P	100P	—	
MB90F347E		100P	100P	—	
MB90F347ES		100P	100P	—	
MB90F347CE		100P	100P	—	
MB90F347CES		100P	100P	—	
○ MB90348E		100P	100P	—	
○ MB90348ES		100P	100P	—	
○ MB90348CE		100P	100P	—	
○ MB90348CES		100P	100P	—	
MB90349E		100P	100P	—	
MB90349ES		100P	100P	—	
MB90349CE		100P	100P	—	
MB90349CES		100P	100P	—	
MB90F349E		100P	100P	—	
MB90F349ES		100P	100P	—	
MB90F349CE		100P	100P	—	
MB90F349CES		100P	100P	—	
MB90V340E-101	+4.5 to +5.5	—	—	299C	
MB90V340E-102		—	—	299C	

Packages: P - plastic, C - ceramic

○: Under planning

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)	(Continued)	(Continued)	(Continued)	(Continued)	(Continued)	(Continued)	(Continued)
Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
100	CAN controller (1 ch.) , UART for LIN (4 ch.) , converter (10-bit × 16/24 ch.) , external interrupts (16 ch.) , ICU (16-bit × 8 ch.) , OCU (16-bit × 8 ch.) , 8 / 16-bit PPGtimer (8 ch.) , reload timer (16-bit × 4 ch.)	MB90340E/ES series (CAN 2 ch.)	MASK	128 KB	16 KB	MB90341E **	
						MB90341ES **	
						MB90341CE **	
						MB90341CES **	
				256 KB	16 KB	MB90342E	
						MB90342ES	
						MB90342CE	
						MB90342CES	
			Flash	256 KB	16 KB	MB90340E/ES series (2 ch.)	MB90F342E
							MB90F342ES
							MB90F342CE
							MB90F342CES
				384 KB	20 KB	MB90340E/ES series (2 ch.)	MB90F343E **
							MB90F343ES **
							MB90F343CE **
							MB90F343CES **
				512 KB	20 KB	MB90340E series	MB90F345E
							MB90F345ES
							MB90F345CE
							MB90F345CES
			Evaluation device		30 KB	MB90340E series (2 ch.)	MB90V340E-102
						MB90340ES series (2 ch.)	MB90V340E-101

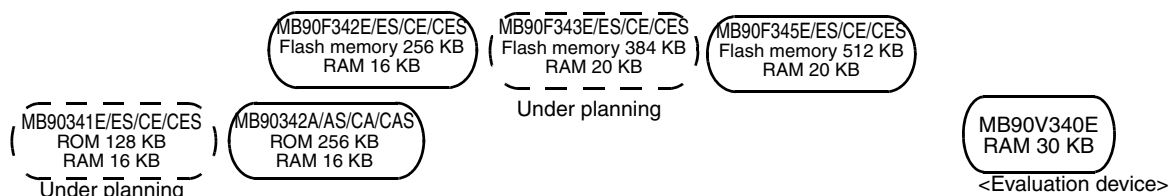
** : Under planning

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90340E/340ES series (CAN 2 ch.)

For car audio, etc.

- Maximum clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 42.0 ns
- Operating temperature range: -40 °C to +105 °C



Part number	Operating powersupply voltage (V)	Package			Functions
		LQFP	QFP	PGA	
○ MB90341E	+3.5 to +5.5	100P	100P	—	I/O ports: 80 (MB90341E/341CE/342E/342CE/F342E/F342CE/ F343E/F343CE/F345E/F345CE/V340E-102: Dual clock) 82 (MB90341ES/341CES/342ES/342CES/F342ES/ F342CES/F343ES/F343CES/F345ES/F345CES/V340E- 101: Single clock) Timebase timer (WDT): 18-bit × 1 ch. CAN controller : 2 ch. (MB90V340E-101/102: 3 ch.) PPG timer: 16-bit × 8 ch. (8-bit × 16 ch.) Analog section: 8/10-bit A/D converter × 16 ch (MB90341E/341ES/342E/342ES/F342E/F342ES/ F343E/F343ES/F345E/F345ES) 8/10-bit A/D converter × 24 ch (MB90341CE/341CES/342CE/342CES/F342CE/ F342CES/F343CE/F343CES/F345CE/F345CES/ V340E-101/V340E-102) Real time I/O: 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 8 ch. UART for LIN × 4 ch. (MB90V340E-101/102: 5 ch.) Reload timer: 16-bit × 4 ch. I ² C bus interface: 2 ch. (MB90341CE/341CES/342CE/342CES/ F342CE/F342CES/F343CE/F343CES/F345CE/ F345CES/V340E-101/V340E-102) External interrupts: 16 ch. Low-power consumption modes: Sleep, stop, sub, watch, time base timer, CPU intermittent operation mode
○ MB90341ES		100P	100P	—	
○ MB90341CE		100P	100P	—	
○ MB90341CES		100P	100P	—	
MB90342E		100P	100P	—	
MB90342ES		100P	100P	—	
MB90342CE		100P	100P	—	
MB90342CES		100P	100P	—	
MB90F342E		100P	100P	—	
MB90F342ES		100P	100P	—	
MB90F342CE		100P	100P	—	
MB90F342CES		100P	100P	—	
○ MB90F343E		100P	100P	—	
○ MB90F343ES		100P	100P	—	
○ MB90F343CE		100P	100P	—	
○ MB90F343CES		100P	100P	—	
MB90F345E		100P	100P	—	
MB90F345ES		100P	100P	—	
MB90F345CE		100P	100P	—	
MB90F345CES		100P	100P	—	
MB90V340E-101	+4.5 to +5.5	—	—	299C	
MB90V340E-102		—	—	299C	

Packages: P - plastic, C - ceramic

○: Under planning

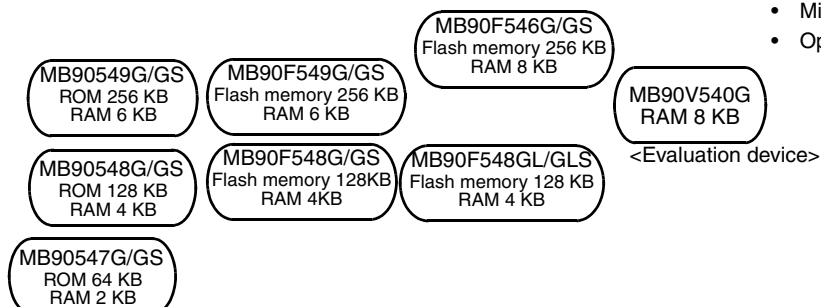
16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)	(Continued)						
Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
100	UART (2 ch.), SIO (1ch.), A/D converter (8/10-bit × 8ch.), external interrupts (8 ch.), input capture (16-bit × 8ch.), output compare (16-bit × 4ch.), 8/16-bit PPG timer (4 ch.), Reload timer (16-bit × 2ch.), free-run timer (16-bit × 1ch.), CAN controller (1ch.)	MB90545G/ GS series	MASK	64 KB	2 KB	MB90547G	
						MB90547GS	
				128 KB	4 KB	MB90548G	
						MB90548GS	
				256 KB	6 KB	MB90549G	
						MB90549GS	
			Flash	Flash memory		Equivalent device	
				128 KB	4 KB	MB90549G	MB90F548GL
							MB90F548G
						MB90549GS	MB90F548GLS
							MB90F548GS
				256 KB	6 KB	MB90549G	MB90F549G
						MB90549GS	MB90F549GS
					8 KB	MB90549G	MB90F546G
						MB90549GS	MB90F546GS
(Continued)	(Continued)		Evaluation device	Evaluation target device			
					8 KB	MB90545G/ GS series	MB90V540G

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90545G/545GS series

For dashboard, car audio, etc.



- Maximum clock frequency: 16 MHz(32.768 kHz)
- Minimum execution time: 62.5 ns(122.1 μs)
- Operating temperature range: -40°C to +105°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90547G	+3.5 to +5.5	100P	100P	—	I/O ports: 80 Max. Timebase timer (WDT): 18-bit × 1 ch. CAN controller: 1 ch. 8/16-bit PPG timer: 4 ch. SIO: 1ch. Analog section: 8/10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 8 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch. UART: 2 ch. Reload timer: 16-bit × 2 ch. For single clock : MB90549GS/F546GS/F548GS/F548GLS/547GS/548GS/F549GS For dual clock : MB90549G/F546G/F548G/F548GL/F549G/547G/548G/V540G External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, sub, CPU intermittent operation, watch, time base timer mode
MB90547GS		100P	100P	—	
MB90548G		100P	100P	—	
MB90548GS		100P	100P	—	
MB90549G	+4.5 to +5.5	100P	100P	—	
MB90549GS		100P	100P	—	
MB90F546G		100P	100P	—	
MB90F546GS		100P	100P	—	
MB90F548G	+3.5 to +5.5	100P	100P	—	
MB90F548GS		100P	100P	—	
MB90F548GL		100P	100P	—	
MB90F548GLS		100P	100P	—	
MB90F549G	+4.5 to +5.5	100P	100P	—	
MB90F549GS		100P	100P	—	
MB90V540G		—	—	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)	(Continued)						
Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
100	CAN controller (2 ch.), LIN-UART (7 ch.), A/D converter (10-bit × 24 ch.), D/A converter (8-bit × 2 ch.), I ² C bus interface (2 ch.), Reload timer (16-bit × 4 ch.), PPG timer (16-bit × 8 ch/8-bit × 16 ch.), Input capture (16-bit × 8 ch.), Output compare (16-bit × 8 ch.), Free-run timer (16-bit × 2 ch.), External interrupts (16 ch.)	MB90950 series	Flash	256 KB	16 KB	MB90F952JB	
						MB90F952JBS	
						MB90F952MB	
						MB90F952MBS	
			Evaluation device		30 KB	Evaluation target device	
						MB90F952JB	MB90V340F-104
						MB90F952JBS	MB90V340F-103
						MB90F952MB	MB90V340F-102
						MB90F952MBS	MB90V340F-101
(Continued)	UART for LIN (1 ch.) (MB90F946A: 2 ch.) , UART (1 ch.) , SIO (1 ch.) , I ² C (1 ch.) , CAN interface (1 ch.) , A/D converter (8/10-bit × 15 ch.) , external interrupts (8 ch.) , ICU (16-bit × 6 ch.) , OCU (16-bit × 4 ch.) , PPG timer (8/16-bit × 6 ch.) , Reload timer (16-bit × 1 ch.) , free-run timer (16-bit × 2 ch.) , μDMA (16 ch.) , clock modulation	MB90945 series	MASK	128 KB	6 KB	MB90947A	
			Flash	128 KB	6 KB	MB90F947A	
				256 KB	12 KB	MB90F949A	
				384 KB	16 KB	MB90F946A	
			Evaluation device		30 KB	Evaluation target device	
						MB90945 series	MB90V390HB
(Continued)	(Continued)						
(Continued)	(Continued)						

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90950 series

For automotive products, etc.

MB90F952JB/JBS
ROM 256 KB
RAM 16 KB

MB90F952MB/MBS
ROM 256 KB
RAM 16 KB

- Maximum internal clock frequency: 32 MHz
- Operating temperature range: -40°C to +105°C
- Operating power supply voltage: +3.0 V to 5.5 V

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP	QFP	PGA	
MB90F952JB *2	+4.0 to +5.5	100P	100P	—	Maximum operating frequency: 32 MHz I/O ports: 80 (MB90F952JB/F952MB), 82 (MB90F952JBS/F952MBS) Successive approximation A/D converter: 10-bit × 24 ch. 8-bit D/A converter: 2 ch. CAN interface: 2 ch. LIN-UART: 7 ch. I ² C bus interface: 2 ch. Reload timer: 16-bit × 4 ch. PPG timer: 16-bit × 8 ch. or 8-bit × 16 ch. External interrupt: 8 ch. Input capture: 16-bit × 8 ch. Output compare: 16-bit × 8 ch. Free-run timer: 16-bit × 2 ch. External interrupts: 16 ch. Clock supervisor: (MB90F952JB/F952JBS)
MB90F952JBS *1		100P	100P	—	
MB90F952MB *2		100P	100P	—	
MB90F952MBS *1		100P	100P	—	
MB90V340F-101 *1		—	—	299C	
MB90V340F-102 *2		—	—	299C	
MB90V340F-103 *1		—	—	299C	
MB90V340F-104 *2		—	—	299C	

Packages: P - plastic, C - ceramic
*1 : single clock, *2 : dual clock

■ MB90945 series

For car body control, etc.

MB90F947A
Flash memory 128 KB
RAM 6 KB

MB90F949A
Flash memory 256 KB
RAM 12 KB

MB90F946A
Flash memory 384 KB
RAM 16 KB

MB90947A
ROM 128 KB
RAM 6 KB

MB90V390HB
RAM 30 KB

<Evaluation device>

- Maximum clock frequency: 24 MHz
- Minimum execution time: 42 ns
- Operating temperature range: -40 to +105 °C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP (0.65 mm pitch)	PGA	
MB90947A	+3.5 to +5.5	100P	—	I/O ports: 82 Max. Timebase timer (WDT): 18-bit × 1 ch. UART for LIN : 1 ch. (only MB90F946A) Analog section: 8/10-bit A/D converter × 15 ch. Real time I/O: 16-bit input capture unit (ICU) × 6 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 2 ch. PPG timer: 8/16-bit × 6 ch. UART : 1 ch SIO : 1 ch Reload timer: 16-bit × 1 ch. CAN interface: 1 ch. External interrupts: 8 ch. μDMA : 16 ch Clock modulation : 1 ch Low-power consumption modes: Sleep, stop, sub, watch, CPU intermittent operation, time base timer mode
MB90F947A		100P	—	
MB90F949A		100P	—	
MB90F946A		100P	—	
MB90V390HB		—	299C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
	100	A/D converter (10-bit × 8 ch.), UART (3 ch.), SIO (1 ch.), CAN interface (2ch.), SMC (4 ch.), sound generator (1 ch.), external interrupts (8 ch.), input capture (16-bit × 6 ch.), output compare (16-bit × 6 ch.), 8/16-bit PPG timer (6 ch.), Reload timer (16-bit × 2 ch.), free-run timer (16-bit × 1 ch.), watch timer (1 ch.)	MB90590G series	MASK	256 KB	6 KB	MB90594G
					384 KB	8 KB	MB90591G
				Flash memory	256 KB	6 KB	MB90594G
					384 KB	8 KB	MB90591G
				Evaluation device		8 KB	MB90590G series
							MB90V590G
	120	CAN interface (2ch.), UART (3 ch.), SIO (1 ch.), A/D converter (8/10-bit × 15 ch.), SMC (6 ch.), external interrupts (8 ch.), input capture (16-bit × 6ch.), output compare (16-bit × 8 ch.), free-run timer (16-bit × 2 ch.), 8/16-bit PPG timer (6 ch.), Reload timer (16-bit × 2 ch.), sound generator (1 ch.)	MB90390 series	MASK	384 KB	10 KB	MB90394HA
				Flash memory	384 KB	10 KB	MB90394HA
				Evaluation device		30 KB	MB90390 series
							MB90V390HB

(Continued)

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90590G series

For dashboard, etc.

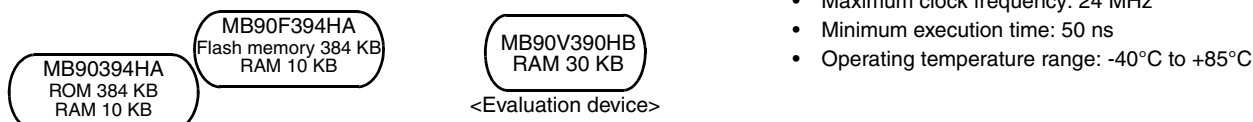


Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90591G	+4.75 to +5.25	100P	–	I/O ports: 78 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 3ch.
MB90594G	+4.5 to +5.5	100P	–	Analog section: 10-bit A/D converter × 8 ch. Real time I/O: 16-bit input capture unit (ICU) × 6 ch. 16-bit output compare unit (OCU) × 6 ch. 16-bit free-run timer × 1 ch.
MB90F591G	+4.75 to +5.25	100P	–	8/16-bit PPG timer: 6 ch. SIO: 1 ch. Reload timer: 16-bit × 2 ch. CAN interface: 2 ch.
MB90F594G	+4.5 to +5.5	100P	–	SMC: 4ch Sound generator: 1 ch. Watch timer: 1 ch.
MB90V590G		–	256C	External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, time base timer, CPU intermittent operation mode

Packages: P - plastic, C - ceramic
SMC: Stepper motor controller

■ MB90390 series

For dashboard, etc.



Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90394HA	+3.5 to +5.5	120P	–	I/O ports: 96 Max. CAN interface: 2 ch. Timebase timer (WDT): 18-bit × 1 ch. Real time watch timer: 1 ch. Sound generator: 1 ch.
MB90F394HA		120P	–	8/16-bit PPG timer: 6 ch. Analog section: 8/10-bit A/D converter × 15 ch. Real time I/O: 16-bit input capture unit (ICU) × 6 ch. 16-bit output compare unit (OCU) × 8 ch. 16-bit free-run timer × 2 ch.
MB90V390HB	+4.5 to +5.5	–	299C	UART: 3 ch. I ² C bus interface: 1 ch. (MB90394HA) Reload timer: 16-bit × 2 ch. SIO: 1 ch. SMC: 6 ch. External interrupts: 8 ch. Low-power consumption modes: Sleep, stop, time base timer, CPU intermittent operation mode

Packages: P - plastic, C - ceramic
SMC: Stepper motor controller

16-bit Proprietary F²MC-16LX Family CAN Controller Products

(Continued)		(Continued)					
Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
120	CAN controller (4 ch.), LIN-UART (4 ch.), A/D converter (10-bit × 8 ch.), stepper motor controller (4 ch.), LCD controller/driver (32seg. × 4com.), Sound generator (2 ch.), reload timer (16-bit × 4 ch.), PPG timer (16-bit × 6 ch.), input capture (16-bit × 8 ch.), free-run timer (16-bit × 1 ch.), external interrupts (8 ch.), real time clock	MB90920 series	MASK	256KB	10KB	MB90922NAS	
			Flash	256 KB	10 KB	MB90F922NB	
			Flash	384 KB	16 KB	MB90F923NA	
						MB90F923NAS	
			Flash	512KB	24 KB	MB90F924NA	
						MB90F924NAS	
			Evaluation device				30 KB
						MB90V920-102	

16-bit Proprietary F²MC-16LX Family CAN Controller Products

■ MB90920 series

For mobile products, etc.

MB90F922NB/NBS
ROM 256 KB
RAM 10 KB

MB90F923NA/NAS
ROM 384 KB
RAM 16 KB

MB90F924NA/NAS
ROM 512 KB
RAM 24 KB

MB90922NAS
MASK 256 KB
RAM 10 KB

MB90V920-101/102
RAM 30 KB

<Evaluation device>

- Maximum clock frequency: 32 MHz
- Operating temperature range: -40°C to +105°C
- Operating power supply voltage: +4.0 V to 5.5 V

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90922NAS *1	+4.0 to +5.5	120P	—	I/O ports: 93 Max. (MB90922NAS/F922NBS/F923NAS/F924NAS) 91 Max. (MB90F922NB/F923NA/F924NA) Analog section: 10-bit A/D converter × 8 ch. CAN interface (16 message buffer): 4 ch. LIN-UART: 4 ch. (LIN/SCI) Stepper motor controller: 4 ch. LCD controller: 32 segments, 4 common Sound generator: 2 ch. Reload timer: 16-bit × 4 ch. PPG timer: 16-bit × 6 ch. Input capture unit (ICU): 16-bit × 8 ch. Free-run timer: 16-bit × 1 ch. External interrupts: 8 ch. Real time clock
MB90F922NB *2		120P	—	
MB90F922NBS *1		120P	—	
MB90F923NA *2		120P	—	
MB90F923NAS *1		120P	—	
MB90F924NA *2		120P	—	
MB90F924NAS *1		120P	—	
MB90V920-101 *1		—	299C	
MB90V920-102 *2		—	299C	

Packages: P - plastic, C - ceramic

*1 : single clock, *2 : dual clock

16-bit Proprietary F²MC-16LX Family LCD Controller/Driver Products

F²MC-16LX Family LCD Controller/Driver Products

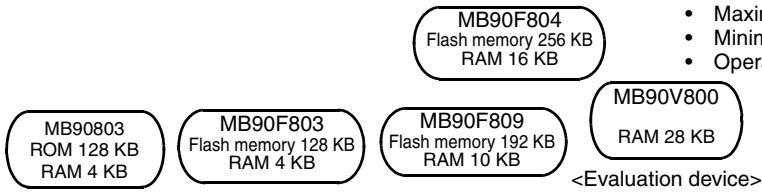
	Pin count	Main functions	Series name	Type	ROM	RAM	Part number	
F ² MC-16LX Family LCD Controller/ Driver Product	100	LCD controller (48 seg × 4 com.) , A/D converter (10 bit × 12 ch) , I ² C interface (1 ch.) , UART (2 ch.) , SIO (2 ch.) , external interrupts (4 ch.) , PPG timer (16-bit × 2 ch.) , reload timer (16-bit × 3 ch.) , WDT	MB90800 series	MASK	128 KB	4 KB	MB90803	
				Flash	Flash memory		Equivalent device	
					128 KB	4 KB	MB90800 series	MB90F803
					192KB	10 KB	MB90800 series	MB90F809
					256 KB	16 KB	MB90800 series	MB90F804
				Evaluation device	Evaluation target device		28 KB	MB90800 series
	120	A/D converter (10-bit × 8ch.) , D/A converter (8-bit × 2ch.) , UART (1ch.) SIO (2ch.) , external interrupts (8ch.) , input capture (16-bit × 2ch.) , output compare (16-bit × 8ch.) , PPG timer (8-bit × 2ch.) , up/down counter (8-bit × 2ch.) , reload timer (16-bit × 2ch.) , free-run timer (16-bit × 2ch.) , LCD controller/driver (32seg. × 4com.) , timer (1ch.)	MB90520B series	MASK	64 KB	4 KB	MB90522B	
					128 KB	4 KB	MB90523B	
				Flash	Flash memory		Equivalent device	
					128 KB	4 KB	MB90523B	MB90F523B
				Evaluation device	Evaluation target device		6 KB	MB90520B series

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16-bit Proprietary F²MC-16LX Family LCD Controller/Driver Products

■ MB90800 series

For home audio, electric power meter, compact camera, phone, etc.



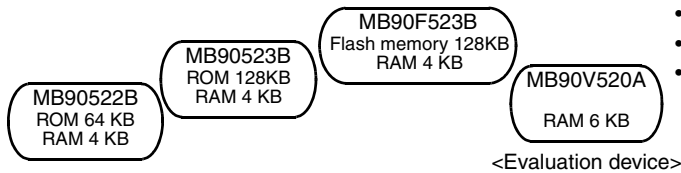
- Maximum internal clock frequency: 25 MHz (32.768 kHz)
- Minimum execution time: 40.0 ns (122.1 μs)
- Operating temperature range: -40 °C to +85 °C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90803	+3.0 to +3.6	100P	—	I/O ports: 70 Max. (sub clock : 68 Max.) Timebase timer (WDT) : 18-bit × 1 ch. UART : 2 ch. I ² C bus interface × 1 ch. Analog section: 10-bit A/D converter × 12 ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 2 ch. 16-bit free-run timer × 1 ch. PPG timer: 16-bit × 2 ch. SIO : 2 ch. Reload timer: 16-bit × 3 ch. LCD controller: 192 elements, 2 to 4 common, 12 to 48 segments, 24 × 8-bit LCD display RAM External interrupts: 4ch. Low-power consumption modes: Sleep, stop, watch, time base timer, sub, CPU intermittent operation mode
MB90F803		100P	—	
MB90F804		100P	—	
MB90F809		100P	—	
MB90V800		—	299C	

Packages: P - plastic

■ MB90520B series

For cameras



- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package			Functions
		QFP	LQFP	PGA	
MB90522B	+2.7 to +5.5	120P	120P	—	I/O ports: 85 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 1ch. Analog section: 10-bit A/D converter × 8 ch. 8-bit D/A converter × 2ch. Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 8 ch. 16-bit free-run timer × 2 ch. Up/down counter: 8-bit × 2ch. (16-bit × 1 ch.) PPG timer: 8-bit × 2ch. (16-bit × 1 ch.) SIO: 2 ch. Reload timer: 16-bit × 2 ch. LCD controller/driver: 128 elements, 2 to 4 common, 8 to 32 segments, 16 × 8-bit LCD display RAM
MB90523B		120P	120P	—	
MB90F523B	+3.3 to +5.5	120P	120P	—	Timer: 1 ch. External interrupts: 8 Low-power consumption modes: Sleep, stop, watch, time base timer, sub, CPU intermittent operation mode
MB90V520A		—	—	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family LCD Controller/Driver Products

(Continued)

Pin count	Main functions	Series name	Type	ROM	RAM	Part number
144	A/D converter (8/10-bit × 12ch.), D/A converter (8-bit × 2ch.) Comparator, LCDC (9 seg. × 4 com.), LPC interface, PS/2 interface (3ch) , UART (3ch.) , I ² C interface (1ch.) , multi address I ² C interface (1ch.) , bridge oscillation, external interrupts (6ch.), key on wake up (8ch.), reload timer (16-bit × 4ch.), PPG timer (16-bit × 3ch.), watch clock timer	MB90370 series	MASK	64 KB	6 KB	MB90372
			Flash memory		Equivalent device	
			Flash	64 KB	6 KB	MB90370 series MB90F372
			Evaluation target device			
			Evaluation device		15.7 KB	MB90370 series MB90V370

16-bit Proprietary F²MC-16LX Family LCD Controller/Driver Products

■ MB90370 series

For Notebook personal computer

- Maximum internal clock frequency: 16 MHz (32.768 kHz)
- Minimum execution time: 62.5 ns (122.1 μs)
- Operating temperature range: -40°C to +85°C

MB90372
ROM 64KB
RAM 6KB

MB90F372
Flash memory 64KB
RAM 6KB

MB90V370
RAM 15.7KB

<Evaluation device>

F²MC-16LX Family

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP	PGA	
MB90372	+3.0 to +3.6	144P	—	I/O ports: 120 Max. LPC interface PS/2 interface I ² C bus interface: 1 ch. Multi address I ² C bus interface: 1 ch. bridge oscillation LCD controller/driver: 9 segments × 4 common Watch clock timer PPG timer: 16-bit × 3 ch. Reload timer: 16-bit × 4 ch. Analog section: 8/10-bit A/D converter × 12 ch. 8-bit D/A converter × 2 ch. UART: 3ch. External interrupts: 4 ch. Key on wake up: 8 ch. Timebase timer (WDT): 18-bit × 1 ch. Low-power consumption modes: Sleep, stop, time base timer, CPU inter-mittent operation, sub, watch, mode
MB90F372		144P	—	
MB90V370		—	256C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family FL Controller Products

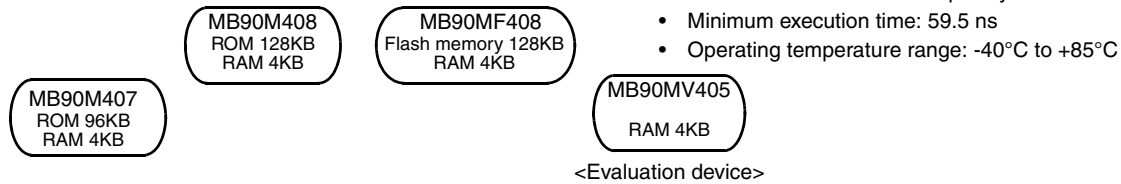
F²MC-16LX Family FL (Fluorescent) Display Controller Products

	Pin count	Main functions	Series name	Type	ROM	RAM	Part number
F ² MC-16LX Family FL Display Control Products	100	UART (2ch.), SIO (2ch.), A/D converter (8/10-bit × 16ch.), external interrupts (4ch.), reload timer (16-bit × 3ch.), input capture unit (2ch.), output compare unit (1ch.), free-run timer (16-bit × 1ch.), FL display driver, watch clock timer, I ² C (2ch.)	MB90M405 series	MASK	96 KB	4 KB	MB90M407
					128 KB	4 KB	MB90M408
				Flash memory		Equivalent device	
				Flash	128 KB	4 KB	MB90M405 series MB90MF408
				Evaluation device	Evaluation target device		4 KB MB90M405 series MB90MV405

16-bit Proprietary F²MC-16LX Family FL Controller Products

■ MB90M405 series

FL display panel control



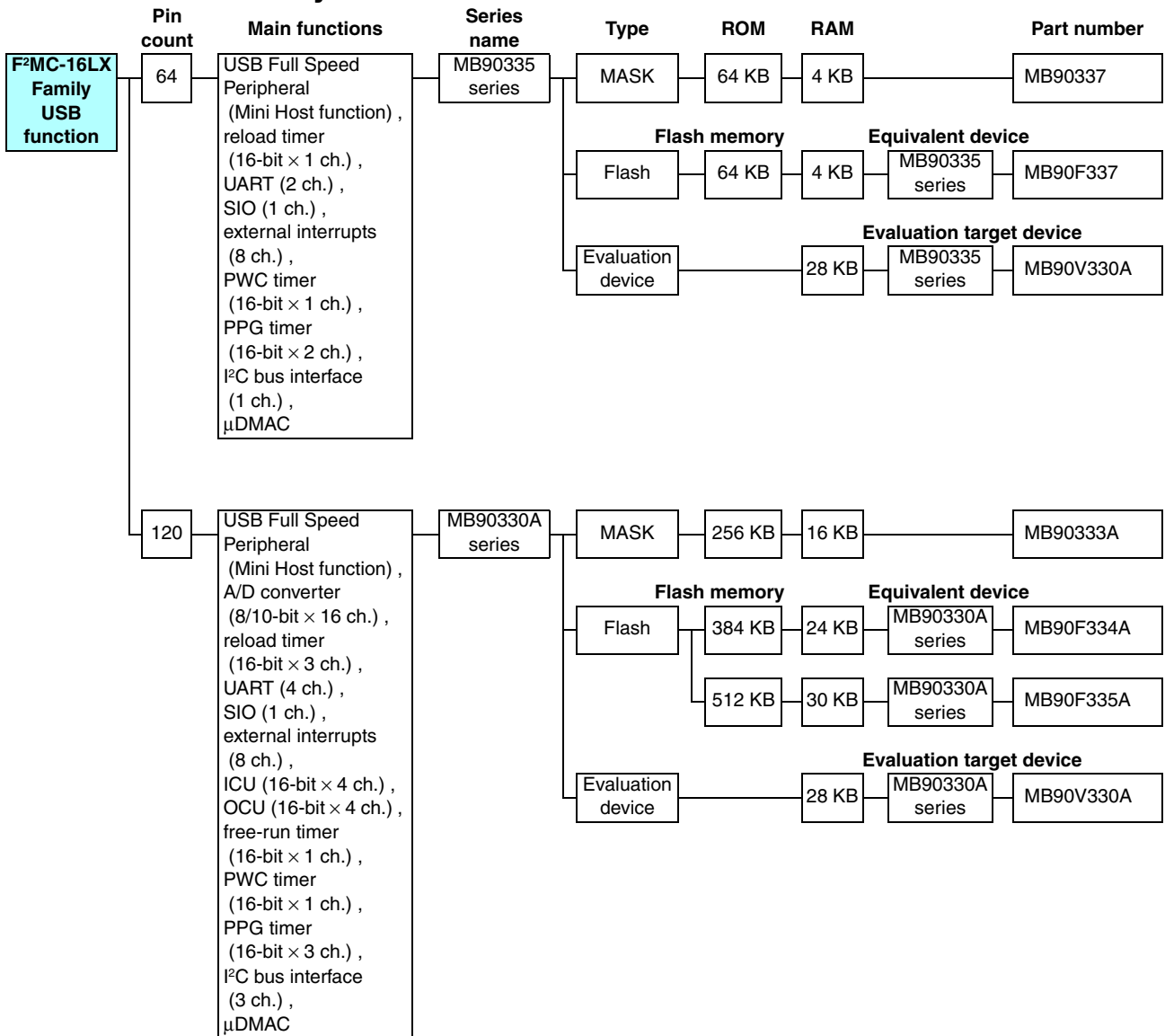
- Maximum internal clock frequency: 16.8 MHz
- Minimum execution time: 59.5 ns
- Operating temperature range: -40°C to +85°C

Part number	Operating power supply voltage (V)	Package		Functions
		QFP	PGA	
MB90M407	+3.0 to +3.6	100P	—	I/O ports: 26 Max. Timebase timer (WDT): 18-bit × 1 ch. UART: 2 ch. Analog section: 8/10-bit A/D converter × 16 ch.
MB90M408	+3.0 to +3.6	100P	—	Real time I/O: 16-bit input capture unit (ICU) × 2 ch. 16-bit output compare unit (OCU) × 1 ch. 16-bit free-run timer × 1 ch.
MB90MF408	+3.0 to +3.6	100P	—	SIO: 2 ch. I ² C interface: 1 ch. FL display driver controller Reload timer: 16-bit × 3 ch. Watch clock timer
MB90MV405	+3.0 to +3.6	—	256C	External interrupts: 4 Low-power consumption modes: Sleep, stop, time base timer, CPU intermittent operation mode

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16LX Family USB function Products

F²MC-16LX Family USB function



16-bit Proprietary F²MC-16LX Family USB function Products

■ MB90335 series

USB Full Speed Peripheral (Mini Host function)

MB90337
ROM 64KB
RAM 4KB

MB90F337
Flash memory 64KB
RAM 4KB

MB90V330A
RAM 28KB

Evaluation device

- Maximum internal clock frequency: 24 MHz
- Minimum execution time: 41.6 ns
- Operating temperature range: -40 °C to +85 °C (USB function : 0 °C to +70 °C)

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.65 mm pitch)	PGA	
MB90337	+3.0 to +3.6	64P	-	I/O ports: 45 Max. USB Full Speed Peripheral : Mini Host function (Hub not supported) Endpoint: 6 Max. μDMAC : 16 ch. Timebase timer (WDT): 18-bit × 1ch. PWC timer : 16-bit × 1 ch. PPG timer : 8-bit × 4 ch. (16-bit × 2 ch.) Reload timer: 16-bit × 2 ch. UART : 2 ch. SIO : 1 ch. I ² C bus interface : 1 ch. External interrupts: 8 Low-power consumption modes: Sleep, stop, CPU intermittent operation, time base timer, mode
MB90F337		64P	-	
MB90V330A		-	299C	

Packages: P - plastic, C - ceramic

■ MB90330A series

USB Full Speed Peripheral (Mini Host function)

MB90F334A
Flash memory 384KB
RAM 24KB

MB90F335A
Flash memory 512KB
RAM 30KB

MB90333A
ROM 256KB
RAM 16KB

MB90V330A
RAM 28KB

Evaluation device

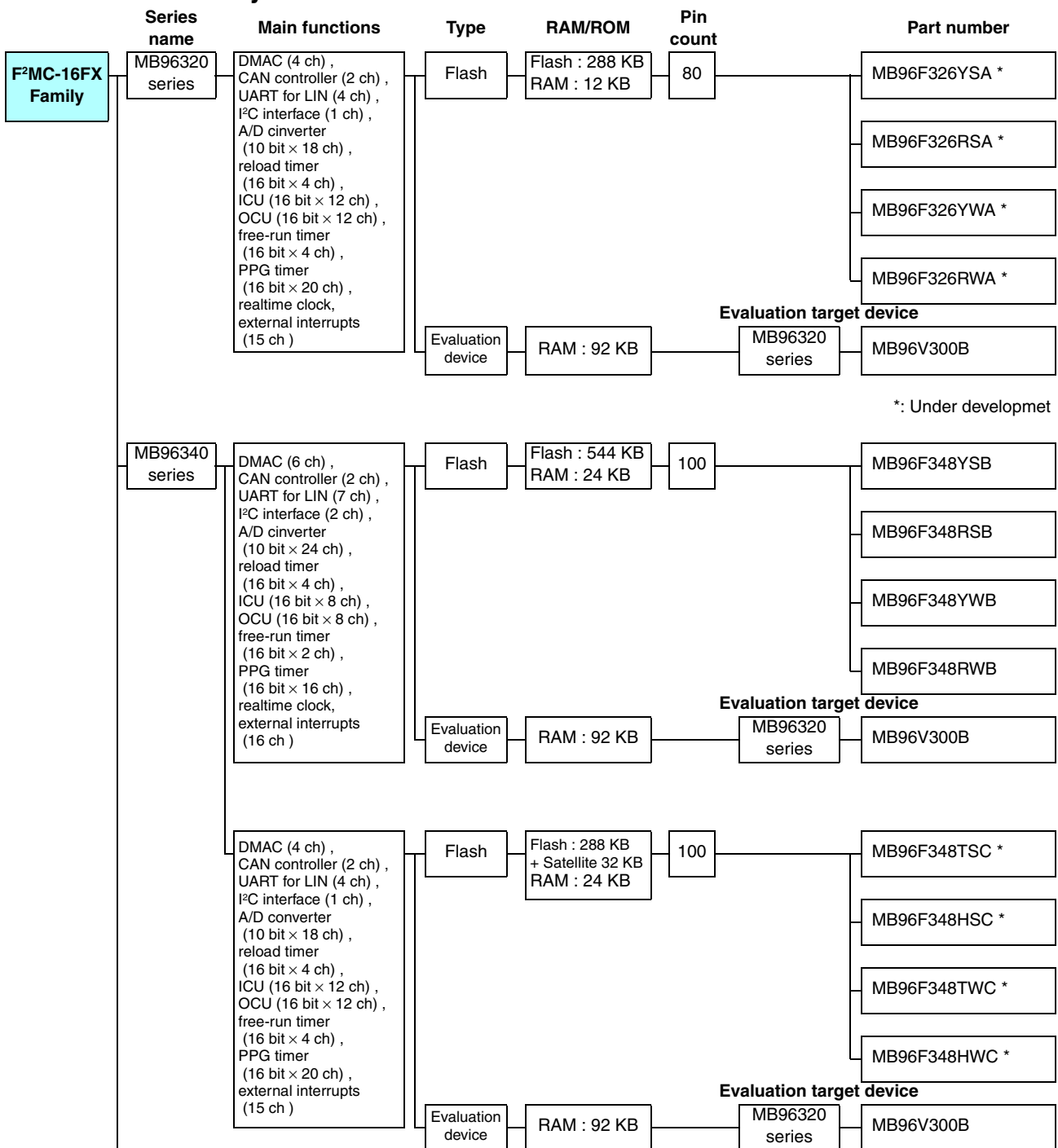
- Maximum internal clock frequency: 24 MHz (32.768 kHz)
- Minimum execution time: 41.6 ns (122.1 μs)
- Operating temperature range: -40 °C to +85 °C (USBfunction : 0 °C to +70 °C)

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.4 mm pitch)	LQFP (0.5 mm pitch)	PGA	
MB90333A	+3.0 to +3.6	120P	120P	-	I/O ports: 94 Max. USB Full Speed Peripheral : Mini Host function (Hub not supported) Endpoint: 6 Max. μDMAC : 16 ch. Analog section: 8/10-bit × 16 ch. Timebase timer (WDT): 18-bit × 1ch. Real time I/O: 16-bit input capture unit (ICU) × 4 ch. 16-bit output compare unit (OCU) × 4 ch. 16-bit free-run timer × 1 ch. PWC timer : 16-bit × 1 ch. PPG timer : 8-bit × 6 ch. (16-bit × 3 ch.) Reload timer: 16-bit × 3 ch. UART : 4 ch. SIO : 1 ch. I ² C bus interface : 3 ch. External interrupts: 8 ch. Watch timer Low-power consumption modes: Sleep, stop, watch, sub, CPU intermittent operation, time base timer mode
MB90F334A		120P	120P	-	
MB90F335A		120P	120P	-	
MB90V330A		-	-	299C	

Packages: P - plastic, C - ceramic

16-bit Proprietary F²MC-16FX Family

F²MC-16FX Family



*: Under developmet

Evaluation target device

Evaluation target device

*: Under developmet

(Continued)

16-bit Proprietary F²MC-16FX Family

■ MB96320 series

For mobile body control, air-conditioner, car audio, etc

MB96F326YSA/RSA/YWA/RWA
Flash : 288 KB
RAM : 12 KB
Under development

MB96V300B
RAM : 92 KB
<Evaluation device>

- Maximum clock frequency: 56 MHz
- Minimum execution time: 17.8 ns
- Operating temperature range: -40 °C to +125 °C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm)	BGA	
◎ MB96F326YSA	+3.0 to +5.5	80P	-	I/O ports: 64 Max. (MB96F326YWA/F326RWA: Single clock, "W" suffix) 66 Max. (MB96F326YSA/F326RSA: Dual clock, "S" suffix) DMAC : 4 ch. CAN : 2 ch. UART for LIN : 4 ch. I ² C bus interface : 1 ch. A/D converter : 8/10-bit × 18 ch. Reload timer : 16-bit × 4 ch. 16-bit I/O timer : ICU × 12 ch., OCU × 6 ch., free-run timer × 4 ch. PPG timer : 16-bit × 20 ch. External interrupts : 15 ch. Real time clock (MB96F326YWA/F326RWA) Low voltage detection reset (MB96F326YSA/F326YWA)
◎ MB96F326RSA		80P	-	
◎ MB96F326YWA		80P	-	
◎ MB96F326RWA		80P	-	
MB96V300B		-	416C	

Packages: P - plastic, C - ceramic

◎ : Under development

■ MB96340 series

For mobile body control, air-conditioner, car audio, etc.

MB96F348YSB/RSB/YWB/RWB
Flash : 544 KB
RAM : 24 KB
Under development

MB96F348TSC/HSC/TWC/HWC
Flash : 544 KB + 32 KB
RAM : 24 KB
Under development

MB96V300B
RAM : 92 KB
<Evaluation device>

- Maximum clock frequency: 56 MHz
- Minimum execution time: 17.8 ns
- Operating temperature range: -40 °C to +125 °C (MB96F348H/F348T : -40 °C to +105 °C)

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm)	QFP (0.65 mm)	BGA	
MB96F348YSB	+3.0 to +5.5	100P	100P	-	I/O ports: 80 Max. (MB96F348YWB/F348RWB/F348TWC/F348HWC : Dual clock) 82 Max. (MB96F348YSB/F348RSB/F348TSC/F348HSC : Single clock) Satellite Flash : 32 KB (MB96F348TSC/F348HSC/TWC/F348HWC) DMAC : 6 ch. CAN : 2 ch. Reload timer : 16-bit × 4 ch. PPG timer : 8-bit × 10 ch. or 16-bit × 16 ch. 16-bit I/O timer : ICU × 8 ch., OCU × 8 ch., free-run timer × 2 ch. UART for LIN : 7 ch. A/D converter : 8/10-bit × 24 ch. I ² C bus interface : 2 ch. External interrupts : 16 ch. Real time clock (MB96F348YWB/F348RWB) Low voltage detection reset (MB96F348YSB/F348YWB/F348TSC/F348TWC)
MB96F348RSB		100P	100P	-	
MB96F348YWB		100P	100P	-	
MB96F348RWB		100P	100P	-	
◎ MB96F348TSC		100P	100P	-	
◎ MB96F348HSC		100P	100P	-	
◎ MB96F348TWC		100P	100P	-	
◎ MB96F348HWC		100P	100P	-	
MB96V300B		-	-	416C	

Packages: P - plastic, C - ceramic

◎ : Under development

16-bit Proprietary F²MC-16FX Family

(Continued)

Series name	Main functions	Type	RAM/ROM	Pin count	Part number
MB96350 series	DMAC (4 ch.) , CAN controller (2 ch.) , UART for LIN (4 ch.) , I ² C interface (1 ch.) , A/D cinverter (10-bit × 15 ch.) , reload timer (16-bit × 4 ch.) , ICU (16-bit × 6 ch.) , OCU (16-bit × 4 ch.) , free-run timer (16-bit × 2 ch.) , PPG timer (16-bit × 20 ch.) , realtime clock, external interrupts (13 ch.)	Flash	Flash : 288 KB RAM : 12 KB	64	MB96F356YSB * MB96F356RSB * MB96F356YWB * MB96F356RWB *
		Evaluation device	RAM : 92 KB		Evaluation target device MB96350 series MB96V300B
					*: Under developmet
MB96380 series	DMAC (7 ch.) , CAN controller (2 ch.) , UART for LIN (5 ch.) , I ² C interface (1 ch.) , A/D cinverter (10-bit × 16 ch.) , reload timer (16-bit × 4 ch.) , ICU (16-bit × 8 ch.) , OCU (16-bit × 4 ch.) , free-run timer (16-bit × 2 ch.) , PPG timer (16-bit × 8 ch.) , realtime clock, external interrupts (16 ch.) , stepping motor controller (5 ch.) , sound generator (2 ch.) , LCD controller (4 com × 65 seg)	Flash	Flash : 416 KB RAM : 16 KB	120	MB96F387YSB * MB96F387RSB * MB96F387YWB * MB96F387RWB *
		Evaluation device	RAM : 92 KB		Evaluation target device MB96380 series MB96V300B
					*: Under developmet

16-bit Proprietary F²MC-16FX Family

■ MB96350 series

For mobile body control, air-conditioner, car audio, etc.

MB96F356YSB/RSB/YWB/RWB
Flash : 288 KB
RAM : 12 KB
Under development

MB96V300B
RAM : 92 KB
<Evaluation device>

- Maximum clock frequency : 56 MHz
- Minimum execution time : 17.8 ns
- Operating temperature range : -40 °C to +125 °C

Part number	Operating power supply voltage (V)	Package			Functions
		LQFP (0.5 mm)	LQFP (0.65 mm)	BGA	
◎ MB96F356YSB	+3.0 to +5.5	64P	64P	-	I/O ports : 49 Max. (MB96F356YWB/F356RWB : Dual clock) 51 Max. (MB96F356YSB/F356RSB : Single clock)
◎ MB96F356RSB		64P	64P	-	DMAC : 4 ch.
◎ MB96F356YWB		64P	64P	-	CAN : 2 ch.
◎ MB96F356RWB		64P	64P	-	Reload timer : 16-bit × 4 ch.
MB96V300B		-	-	416C	PPG timer : 16-bit × 20 ch.
					16-bit I/O timer : ICU × 6 ch., OCU × 4 ch., free-run timer × 2 ch.
					UART for LIN : 4 ch.
					A/D converter : 8/10-bit × 15 ch.
					I ² C bus interface : 1 ch.
					External interrupts : 13 ch.
					Real time clock (MB96F356YWB/F356RWB)
					Low voltage detection reset (MB96F356YSB/F356YWB)

Packages: P - plastic, C - ceramic

◎ : Under development

■ MB96380 series

For mobile body control, air-conditioner, car audio, etc.

MB96F387YSA/RSA/YWA/RWA
Flash : 416 KB
RAM : 16 KB
Under development

MB96V300B
RAM : 92 KB
<Evaluation device>

- Maximum clock frequency : 56 MHz
- Minimum execution time : 17.8 ns
- Operating temperature range : -40 °C to +125 °C

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm)	BGA	
◎ MB96F387YSB	+3.0 to +5.5	120P	-	I/O ports : 94 Max. (MB96F387YWA/F387RWA : Dual clock) 82 Max. (MB96F387YSA/F387RSA : Single clock)
◎ MB96F387RSB		120P	-	DMAC : 7 ch.
◎ MB96F387YWB		120P	-	CAN : 2 ch.
◎ MB96F387RWB		120P	-	Reload timer : 16-bit × 4 ch.
MB96V300B		-	416C	PPG timer : 8-bit × 10 ch. or 16-bit × 6 ch.
				16-bit I/O timer : ICU × 8 ch., OCU × 4 ch., free-run timer × 2 ch.
				UART for LIN : 5 ch.
				A/D converter : 8/10-bit × 16 ch.
				I ² C bus interface : 1 ch.
				External interrupts : 8 ch.
				Real time clock (MB96F387YWA/F387RWA)
				Low voltage detection reset (MB96F387YSA/F387YWA)
				Stepping motor controller : 5 ch.
				Sound generator : 2 ch.
				LCD controller : 4 com × 65 seg

Packages: P - plastic, C - ceramic

◎ : Under development

16-bit Proprietary F²MC-16LX Family Support Tools

■ F²MC-16LX Family Support Tools

Development Environment Features

(1) Enhancement of development efficiency

- Provides integrated total environment
SOFTUNE V3 Workbench (Manager + Debugger)
SOFTUNE V3 Workbench (Manager + Debugger) integrates programming language and debugging tools to improve the efficiency of the code-compile-debug cycle.
- High programming efficiency
C compiler support
SOFTUNE C checker and C analyzer support
Structured assembly language support
- High programming development efficiency
Provides real time OS (SOFTUNE REALOS/907)
Provides C library
Support C language and assembly source debugging function
- Easy operation by multi windows
SOFTUNE V3 Workbench (manager + debugger)
SOFTUNE C checker
SOFTUNE C analyzer
SOFTUNE REALOS configurator
SOFTUNE REALOS analyzer
SOFTUNE OSEK analyzer

(2) Efficient system development tools

- Provides real time debugging using real target board
Evaluation tool + SOFTUNE V3 Workbench emulator debugger
- Provides software debugging without target board
SOFTUNE V3 Workbench simulator debugger

(3) Total development environment

- Personal computer (IBM-PC)
- In Circuit Emulator tool (MB2140A series)

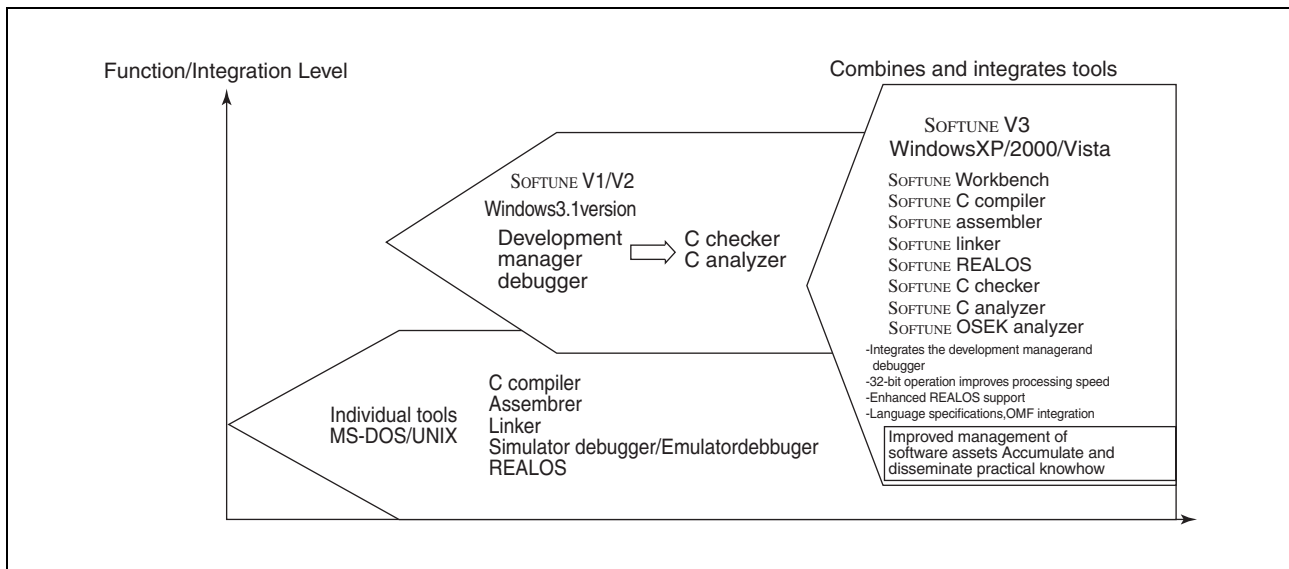
(4) Conformity with standards

- Improves versatility and portability of software resource
- C language: conforms to ANSI standard
 - C library: conforms to ANSI standard
 - Real time OS: conforms to μ ITRON specification

16-bit Proprietary F²MC-16LX Family Support Tools

■ SOFTUNE V3

1. The SOFTUNE Integrated Development Environment



2. SOFTUNE V3 Structure and Features

Workbench Integrated project manager and debugger modules

Errors can be corrected on the fly, as they are discovered, and the resulting code can be debugged on the spot.

A variety of tools to support C-language coding

“C Checker” confirms code operation and “C Analyzer” analyzes the code’s structure.

Includes such tools as Configurator and Analyzer to facilitate the use of REALOS, which conforms to the μ ITRON specifications (Analyzer: under development).

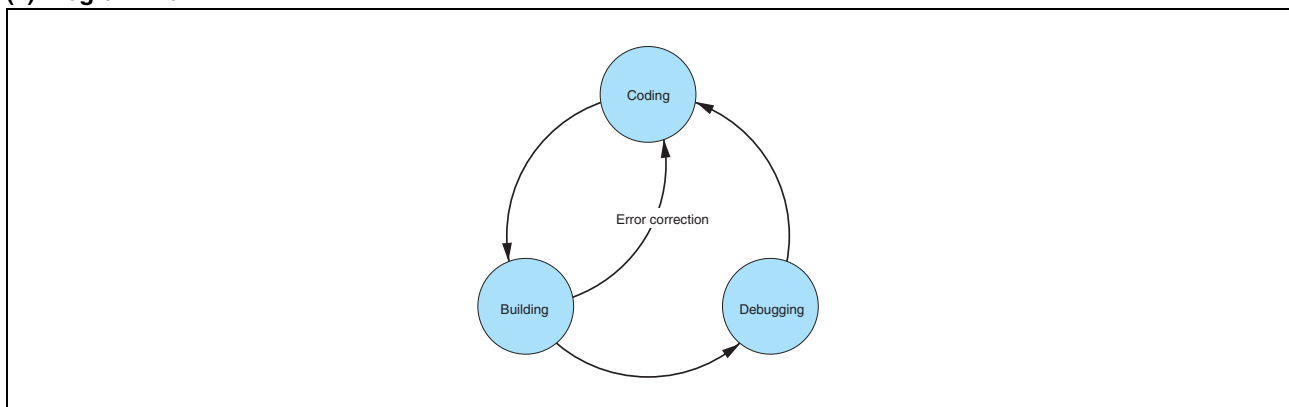
The tool that supports development using OSEK/VDX specification OS is prepared (OSEK analyzer).

(1) Removing the Annoying Settings which are Part of Program Development

Developing programs for different systems requires the programmer to edit source code, perform actual builds and confirm program operation (debug). Finally, the programmer returns to the editing process to incorporate necessary changes, as indicated by debugging results.

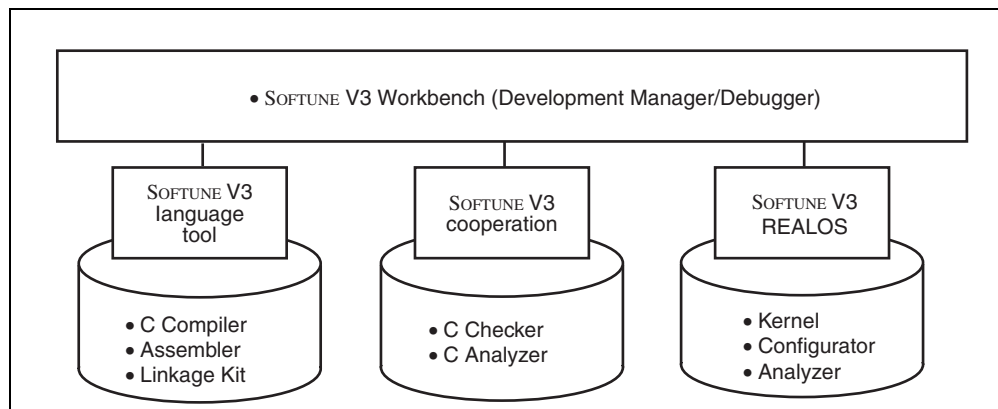
SOFTUNE V3 is an integrated developing environment which is designed to perform such repetitive processes smoothly and efficiently. It is the third generation of SOFTUNE, which has evolved to meet various needs of our customers.

(2) Program Flow



16-bit Proprietary F²MC-16LX Family Support Tools

(3) Structure of SOFTUNE V3

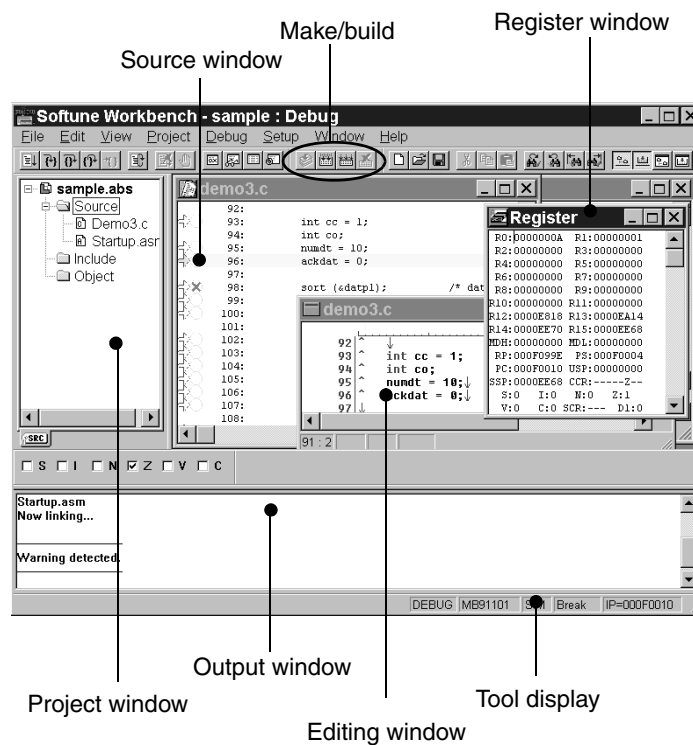


(4) Environment with SOFTUNE V3

The Efficient and Easy-to-Use Integrated Developing Environment

Program development requires repeated editing, make/build, and debugging operations. Performing these functions smoothly and effectively contributes to improved efficiency.

The SOFTUNE V3 integrated developing system is designed to meet program developers' numerous demands, while ensuring ease of use.

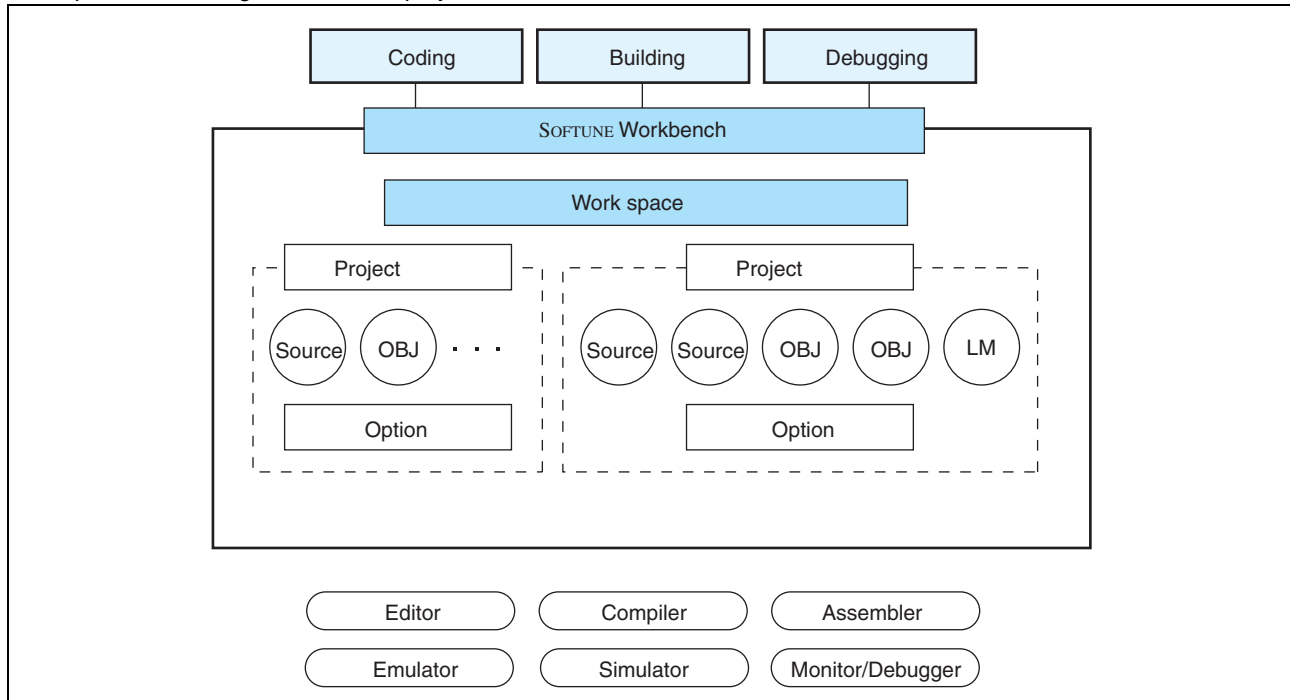


16-bit Proprietary F²MC-16LX Family Support Tools

3. Manager Functions

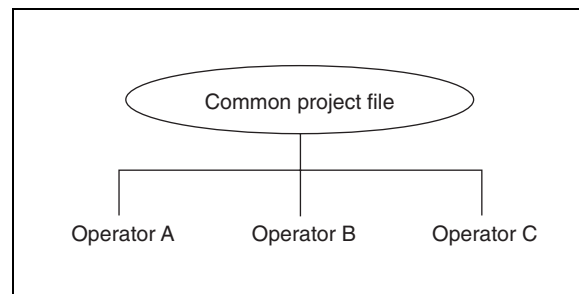
Software programming proceeds according to the “project file,” which contains all the information needed for program development.

Workspace can manage two or more projects.



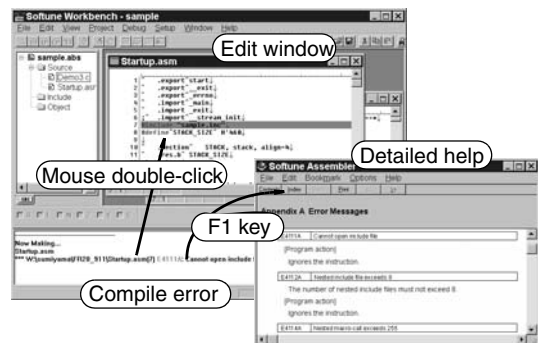
(1) Effective Project Usage

Whether working alone on several projects simultaneously or developing a project as a group, project files can be used to create a simple developing environment.



(2) Extremely Easy to Use

- Built-in Editor
The built-in editor comes complete with many useful functions, such as visual keyword emphasis and auto-indent.
- Error Jump and On-line Help
Errors that occur during builds are displayed in the output window at the bottom of the screen.
To make a “Tag-jump” Double-click Mouse. Once on the error press “F1 key” for a more detailed error display.
- Cooperation with Commercially Available Editors
To meet developers’ requests to use editors to which they are accustomed, SOFTUNE can be configured to use the following commercially available editors: (Codewright32, TextPAD32 and others)



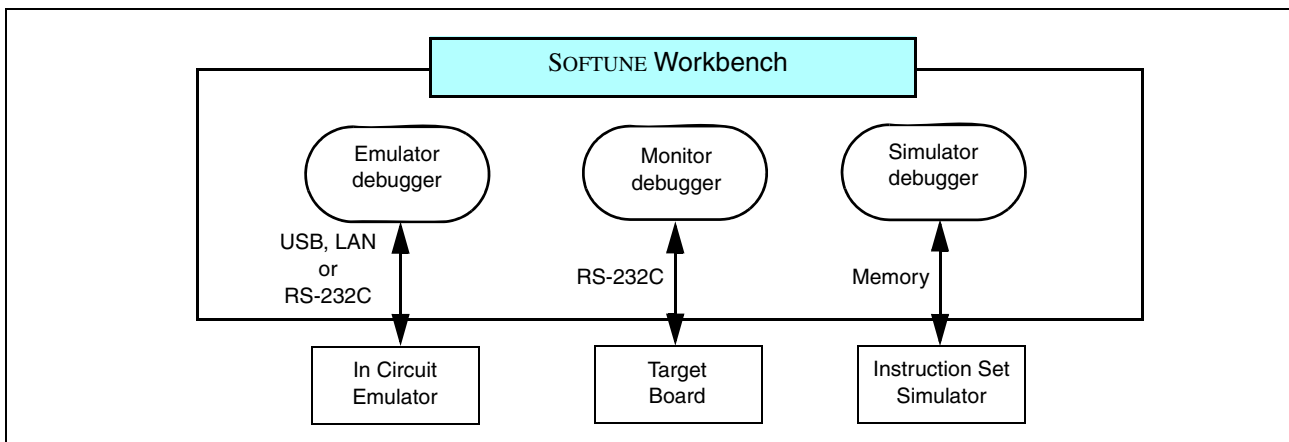
(3) Customizable Environment

When sharing files, cooperation with source generation management tools is assured, and file type conversion tools are called up, so that each person can operate in his or her own customized developing environment.

16-bit Proprietary F²MC-16LX Family Support Tools

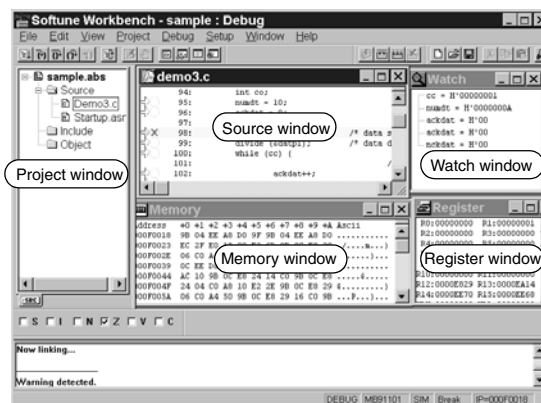
4. Debugger Function

SOFTUNE Workbench supports three debuggers that are needed at various stages of development. The appropriate debugger environment can be selected to match the situation.



(1) Easy-to see Screen Information

The user can freely change the screen layout by selecting the necessary windows. In addition, the displayed information can be selected to provide only the information that is necessary.



(2) Simple Environment Setting

- Debugging Environment: Setup Wizard
The setup wizard supports the selection of communication lines with emulator and boards, as well as window settings.
- MCU Operating Environment
The so-called "CPU information file," which contains the information required to support all MCUs, is provided as standard. Necessary information such as I/O port locations, ROM/RAM capacity and initial addresses can be set automatically.
- Saving and Restoring the Debugging Environment
Previous debugging environment specifications, such as window locations, breakpoint settings, and memory mapping information, are saved, so that these settings are restored the next time the program is initiated.

5. Cooperation

In cooperation with SOFTUNE Workbench, the following SOFTUNE components help improve the quality of C-language programming, which greatly increases reviewing and documentation efficiency.

1) SOFTUNE C Checker

Designed to meet the following requests from beginners through advanced users:

- Eliminate all coding mistakes.
- Review programs quickly and efficiently.
- Enable even C-language beginners to create quality code.
- Maximize coding skills.
- Use software assets on Fujitsu Microelectronics CPUs.

The SOFTUNE C Checker checks code for maintainability, methods of expanding specifications and transportability; indicates areas where quality and performance could be improved; and reports these results to the user. The user can then review the C-language code.

(1) Outline

Recent software for embedded microcontrollers has been developed in the C language. However, it is difficult to understand messages output from a compiler unless the language specifications are well known.

This development support tool checks C-source programs to display and print advice for better quality and performance. It also has a facility for selecting necessary advice carefully.

(2) Features

- Outputs advice suitable for objectives: Portability, coding error, performance, porting to Fujitsu Microelectronics CPU
- Allows customization to a programmer level.
- Works with C compilers for Fujitsu microcontrollers.
- Provides easy operation and simple display over a GUI.

(3) Advising Function

The following pieces of advice are given. “Reason of check”, “Example of program”, “Suggestion of correction”, and “One-point advice” are displayed and explained for each check item.

- Portability

This tool makes a close check on the items “processing-defined operation” and “undefined operation” which can be a problem in portability in the ANSI standard.

It also gives an explanation of the operation of C compilers (Fcc911, Fcc907 and Fcc896) for Fujitsu microcontrollers.

For example, the tool gives the user proper advice on many problems (such as a data type acceptable to a structure, code, and its arrangement at the time of porting).

- Coding error

This tool indicates the items which are not wrong in the language specifications but may cause an error and the items which are logically inconsistent.

For example, the equivalent expression “`if (a==0)`” in the if statement is likely to be typed as the assignment expression “`if (a=0)`” by mistake. Most compilers cannot detect such an error.

- Performance

This tool indicates the items which generally provide better performance and the items which are essential and effective for the FR family and F²MC-16 family.

Stress is especially, put on the detection of object size reduction which can be a problem in software for embedded microcontrollers.

For example, if a function return value is a structure of the double type, an area is reserved for the return value and an object to be transferred to the area is output.

This tool advises the user to transfer the function return value by a pointer and largely reduce the objects size.

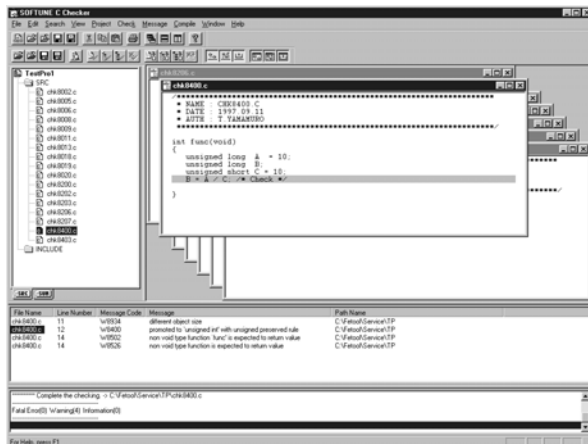
- Porting to Fujitsu Microelectronics CUP's

This tool advises the user what to consider in porting existing software from other makers' CPU to Fujitsu Microelectronics CPU in the FR family and F²MC-16 family.

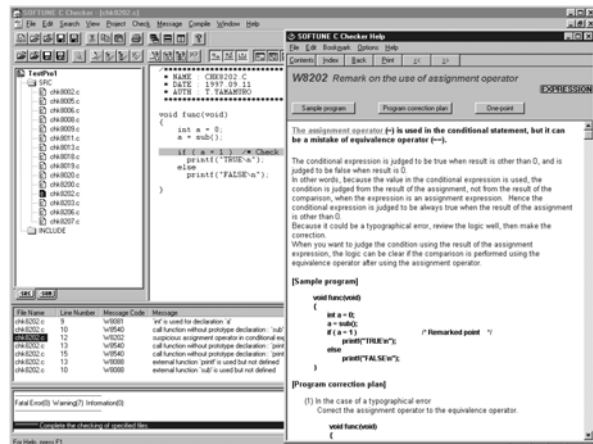
For example, in porting software resources created for the F²MC-16 family to the FR family, this tool advises the user to delete the expansion specifications (`__far`, `__near`, and `__direct` etc.) inherent to the F²MC-16 family.

16-bit Proprietary F²MC-16LX Family Support Tools

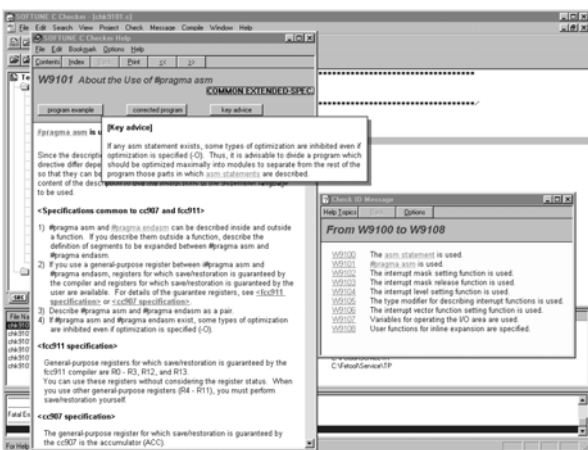
- Indicated messages output



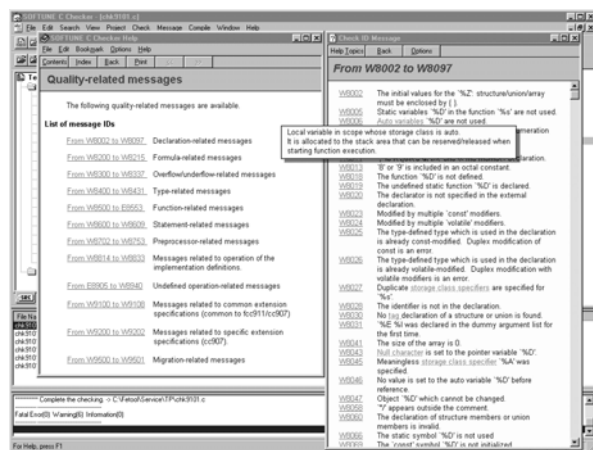
- Coding error indicated and advice displayed



- Advice for porting to Fujitsu C compilers displayed



- Quality-related messages listed



2) SOFTUNE C Analyzer

Designed to meet the following user situations:

- One wishes to examine a program's structure or processing, but the programmer is absent or documentation is unavailable.
- During program development, one wishes to create a structural program while taking into account structure and processing.
- One wishes to examine the range of effects caused by program modification.
- One wishes to create a program's internal documentation.
- One wishes to explore the possibilities of a more efficient program.

The structure and usage of data in a C-language source program are displayed visually, and the internal data structure, functional tree, stack usage and other information can be acquired and stored in a file.

(1) Outline

Recent software (ROM) for embedded microcontrollers is increasingly extending its development scale. This situation is created from development by many programmers, diversion of existing resources, and use of package programs.

This development support tool statically analyzes the C-source program to visually display and print the function-to-function structure, reference data, and statistical data. This tool creates data necessary for design and maintenance, as well as having a feature peculiar to C compilers for Fujitsu microcontrollers (a feature of calculating the maximum amount of stacks used), considering its embedded feature.

(2) Features

- Displays and prints the function-to-function structure, reference data, and statistical data.
- Supports the embedded capability of C compilers for Fujitsu microcontrollers.
- Provides easy operation and simple display over a GUI.

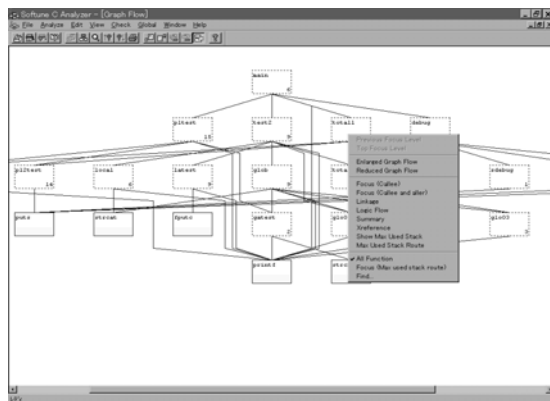
(3) Explanation of Features

The following data is enabled for development, maintenance, and higher porting efficiency.

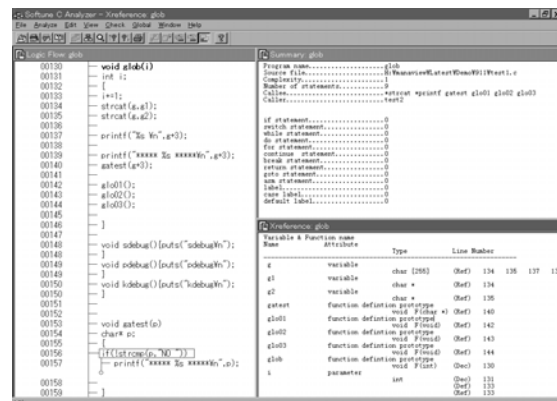
- Graphic flow
This feature displays the "call" function in the block structure way. It also allows the display of the entire function and calls from any function and the retrieval of functions.
- Logic flow
This feature visually displays the internal structure of the C-source program.
For example, it shapes the control structure of `for` and `switch` statements and structure declarations. A jump feature for retrieval by functions, variable, tag, and macro names is also provided.
- Displaying statistical data
This feature displays the complexity and line count of a programs every function, the source of destination function name, and the count of appearances of `if`, `for` and `asm` statements, etc.
- Displaying argument data
This feature displays data about the function-called file name and line number, the return value of the declared function, and the type of argument. It also checks the adjustability of dummy arguments with actual arguments.
- Displaying cross-reference data
This feature displays functions, variables, tag and macro declarations in its function and its line number.
- Displaying global data
This feature displays the function using global variables. It also detects unused global variables.
- Program checking
This feature checks and displays the adjustability of dummy arguments with actual arguments.
- Calculating the maximum amount of stacks used
This feature calculates and displays the amount of stacks used in the entire function, as well as in any function. This calculation is made on the basis of the output of C compilers (Fcc911s, Fcc907s and Fcc896s) for Fujitsu microcontrollers (FR family, F²MC-16 family and F²MC-8L family).

16-bit Proprietary F²MC-16LX Family Support Tools

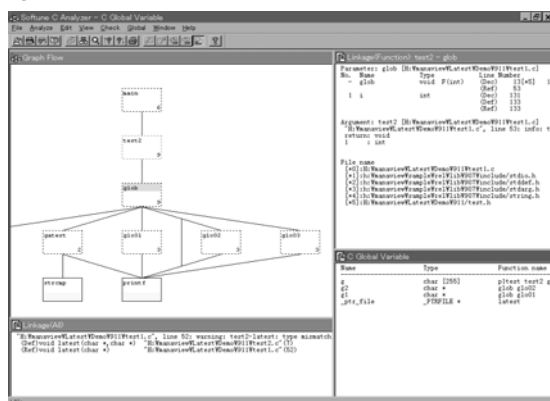
- Displaying graphic flow



- Displaying logic flow, statistical and cross-reference data



- Displaying logic flow (focus), argument and global data



16-bit Proprietary F²MC-16LX Family Support Tools

(2) Configuration

• Kernel

The kernel of the real time OS provides its basic functions. It is an event-driven, multitasking real time OS. The functions to be used by application programs can be selected as system calls.

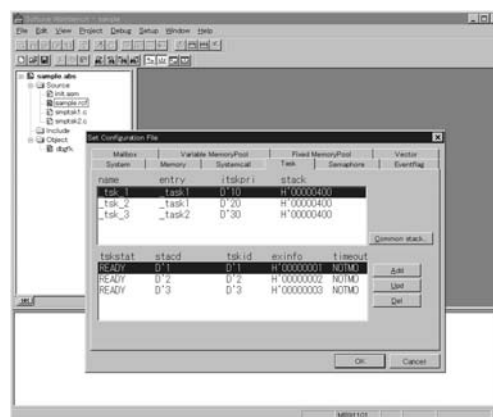
• System calls

Function	Instruction	Description
Task management functions	sta_tsk ext_tsk ter_tsk chg_pri rot_rdq get_tid tsk_sts	Start task Exit local task successfully Terminate remote task forcibly Change task priority Rotate task ready queue Get local task ID Reference task status
Task-supplied synchronization functions	sus_tsk rsm_tsk frsm_tsk slp_tsk wai_tsk wup_tsk can_wup	Move the task to the suspended state Resume the task in the suspended state Forcibly resume the task in the suspended state Move the task into the wait state Move the task into the wait state for a given time Wake up the task in the wait state Cancel the walk-up request of the task
Synchronization/transmission functions	set_flg set_flg clr_flg clr_flg wai_flg wai_flg cwai_flg pol_flg pol_flg cpol_flg flg_sts	Set a single-bit event flag Set a single-word event flag Clear a single-bit event flag Clear a single-word event flag Wait for a single-bit event flag (no clear) Wait for a single-word event flag Wait for a single-bit event flag (clear) Poll a single-bit event flag (no clear) Poll a single-word event flag Poll a single-bit event flag (clear) Reference event flag status
	sig_sem wai_sem preq_sem sem_sts	Signal operation to the semaphore (V instruction) Wait operation to the semaphore (P instruction) Poll and request the semaphore resources Reference the semaphore status
	snd_msg rcv_msg prcv_msg mbx_sts	Send data to the mailbox Wait for the receive from the mailbox Poll and receive message from the mailbox Reference the mailbox status
Interrupt management function	ret_int ret_wup chg_ilv ilv_sts	Return from interrupt handler Return to the interrupt processing for task walk-up Change the interrupt level Reference the interrupt level status
Memory pool management functions	get_blk pget_blk rel_blk mpl_sts	Wait for the receiving of the fixed length memory block Poll and get fixed length memory block Release the fixed length memory block Reference the memory pool status
Time management functions	set_tim get_tim def_cyc act_cyc cyh_sts def_alm alh_sts ret_tmr	Set system clock Reference system clock Define cyclic handler Activate/control cyclic handler Reference cyclic handler status Define alarm handler Reference alarm handler status Return from timer handler
System management function	get_ver	Get version number

16-bit Proprietary F²MC-16LX Family Support Tools

• REALOS Configurator

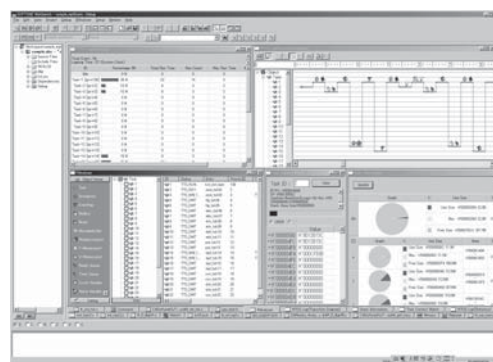
The configurator helps when setting conditions for creating the REALOS kernel. Necessary settings are made according to the display on the configurator screen, simplifying kernel configuration.



• REALOS Analyzer

The performance of the system by which REALOS is built in and the state transition of the task are analyzed and displayed by Graphic.

- Displaying object conditions
- OS break (execution break, access break, dispatcher break, service call/system call break)
- Issuing a service call/system call
- Task transition flow
- Stack status
- Task context watch



SOFTUNE V3 Support Software Product List

Software		Part number *1 (Maintenance number)	Remarks
Pack Products	SOFTUNE V3 Professional Pack	SP3607Z008-P01 (SP3607Z008-P01-M)	SOFTUNE V3 workbench SOFTUNE V3 C compiler SOFTUNE V3 assembler pack SOFTUNE V3 analyzer set SOFTUNE V3 checker
	SOFTUNE V3 OSEK analyzer	SP360831918QAC (—)	Analysis tool for OSEK Vector Japan Co., Ltd and Elektrobit Corporation.
	Real time OS SOFTUNE V3 REALOS/907 basic	SP3607M008BA (SP3607M008BA-M)	μITRON Ver.2.01 Specifications Kernel (source code provided) Configurator, analyzer Licence free
Individual Products	Real time OS SOFTUNE V3 REALOS/907 evaluation	SP3607M008EV (—)	μITRON Ver.2.01 Specifications Kernel (no source code) Configurator, analyzer For evaluation
	Compatible emulator hardware	MB2147 series - MB2147-01 - MB2147-10/20	—
Personal computers	Operating machine	FMV and similar IBM compatibles	—
	Operating OS *3	WindowsXP Windows2000 WindowsVista	—
	Media	CD-ROM *2	—

*1: The product code suffix (Pxx) indicates the number of licenses. Licensing of each product is available in a number of forms (3, 5 or 10 copies).

The part number is an ordered number of the newest version.

Please contact us if purchasing the previous version as a different part is used.

*2: An electronic manual (PDF format) is provided with each product (Japanese and English). Printed manuals are sold separately.

*3: Operating OS corresponds to Japanese and English.

16-bit Proprietary F²MC-16LX Family Support Tools

F²MC-16LX Family Evaluation Tools (MB2147-01 High speed version)

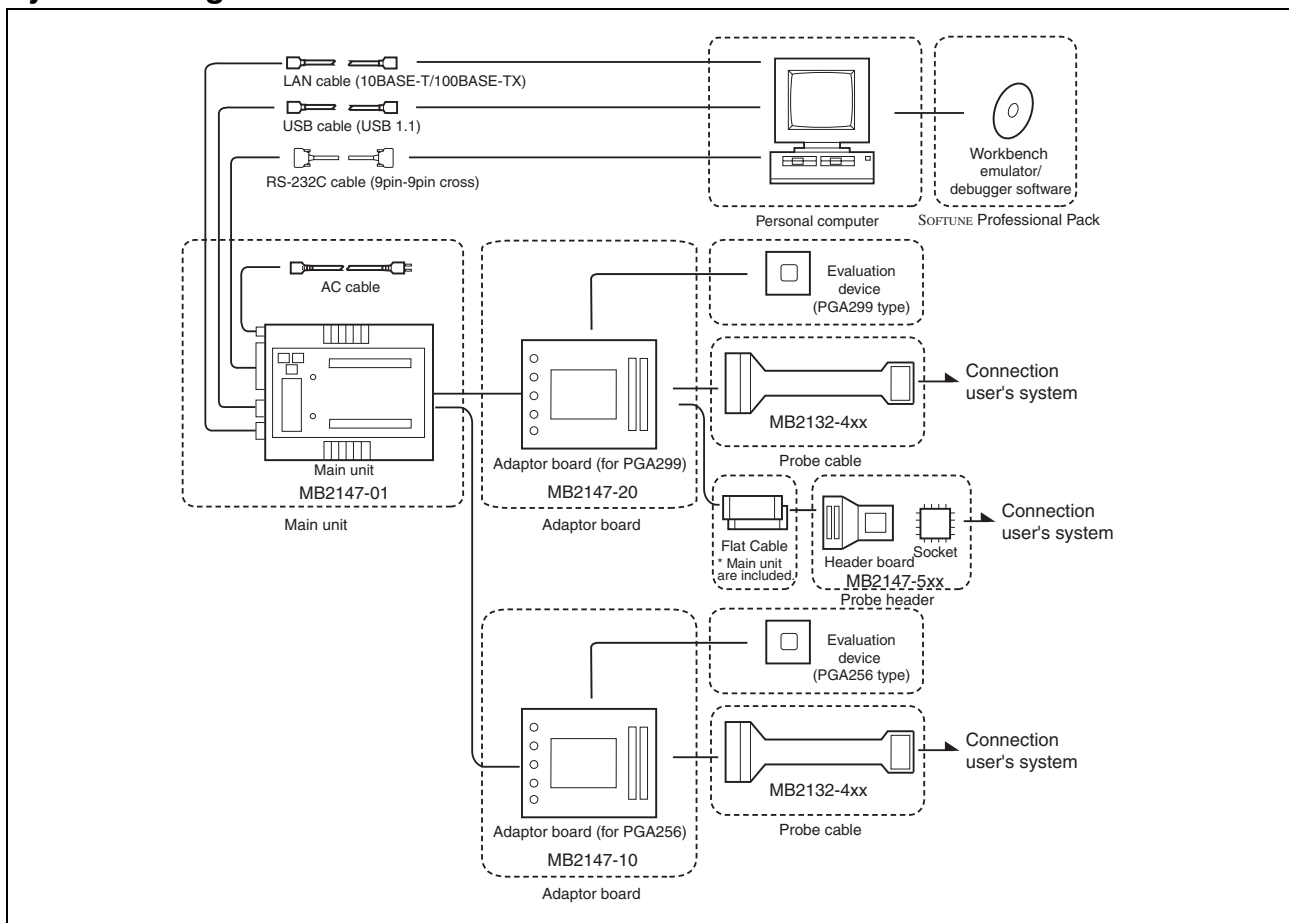
Features

- Microcontroller operating frequency: max 33 MHz
- Microcontroller operating voltage: +2.7V to +5.5V
The range (Max. and Min.) of Microcontroller operating voltage and operating frequency depend on each Microcontroller.
See the document including Data Sheet and check the range of Microcontroller operating voltage and operating frequency.
- Emulation memory: 1 M × 4 area
- Supports debugging of source level (assembly and C languages, a mixed indication)
- Simplified graphic interface operation execution using pull-down menu and buttons
- On-The-Fly function (commands can be run during microcontroller execution)
- Powerful real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Event trigger allows a wide range of conditions to be specified (code × 8 / data × 8)
- Sequential control in 4 conditions and 3 levels
- Performance measurement function (measurement of execution speed between two points, iteration count measurement)
- C₀ coverage measurement function (program execution coverage rate measurement)
- Host I/F (standard accessories) : RS-232C (max 115 Kbps) , LAN (10BASE-T, 100BASE-TX) , USB 1.1

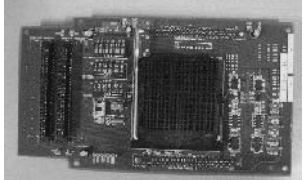
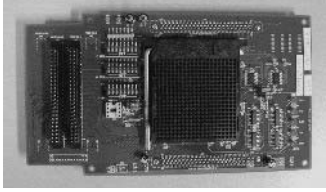
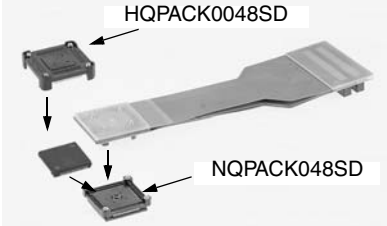
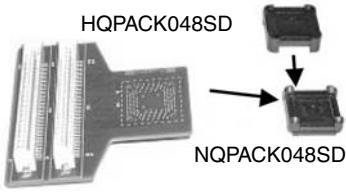
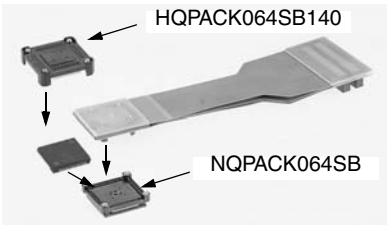
System Overview



System configuration



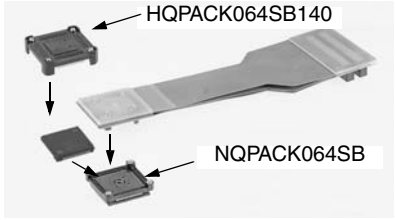
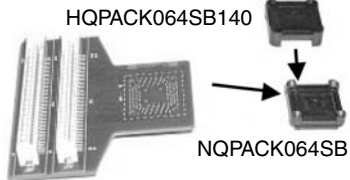
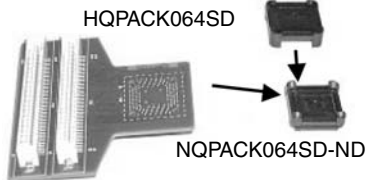
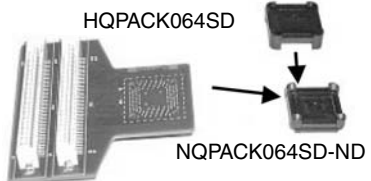
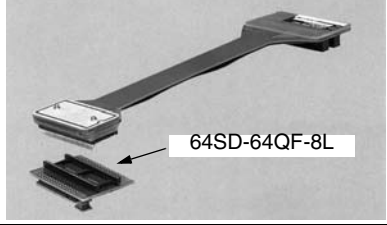
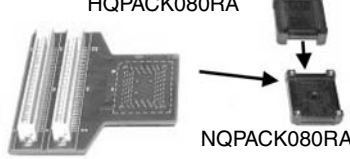
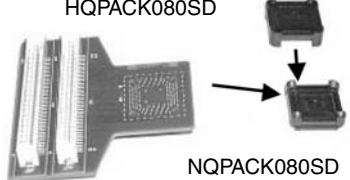
16-bit Proprietary F²MC-16LX Family Support Tools

Name		Part number	Remarks	Overview
High speed version main unit		MB2147-01	For all F ² MC-16LX family. (evaluation device: PGA256, PGA299) Power supply voltage: AC100V or AC200V Host I/F: RS-232C, LAN (10BASE-T, 100BASE-TX), USB 1.1 Dimensions: W150 × D210 × H46 mm Weight: 1.0 kg Includes: manual, AC cable × 1, flat cable(10/20cm) × 2	
Adaptor board (evaluation device : for PGA256)		MB2147-10	For F ² MC-16LX family (evaluation device: for PGA256) Dimensions: W110 × D199 × H20 mm Weight: 0.2 kg	
High speed version adaptor board (evaluation device : for PGA299)		MB2147-20	For F ² MC-16LXfamily high speed type (evaluation device: for PGA299) For MB90340E/350E/390/480/800/820/860E/880 series Dimensions: W110 × D199 × H20 mm Weight: 0.2 kg Includes: manual	
Probe cable	For LQFP-48 0.5mm pitch □7 × 7 mm	MB2132-466	For MB90385 series. Package code: FPT-48P-M26 Includes: - NQPACK048SD, HQPACK048SD *3 NQPACK048SD enables probe cable connection and mounted IC evaluation. - manual	
		MB2147-521	For MB90360E series, MB90960 series Package code: FPT-48P-M26 Includes: - NQPACK048SD, HQPACK048SD *3 NQPACK048SD enables probe cable connection and mounted IC evaluation. - manual	
	For SH-DIP-64	MB2132-434	For MB90460/560 series Package code: DIP-64P-M01 Includes: manual	
	For LQFP-64 0.65 mm pitch □12 × 12 mm	MB2132-461	For MB90460/495/560/565 series Package code: FPT-64P-M09 Includes: - NQPACK064SB, HQPACK064SB140 *3 NQPACK064SB enables probe cable connection and mounted IC evaluation. - manual	

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16-bit Proprietary F²MC-16LX Family Support Tools

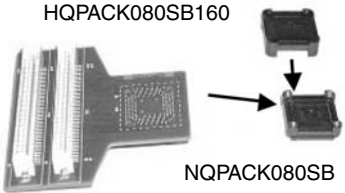
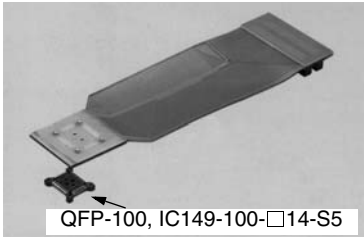
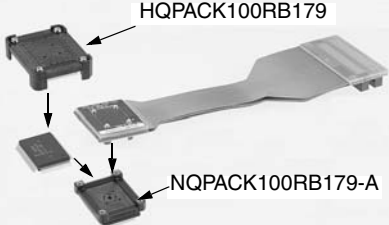
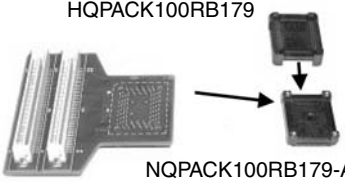
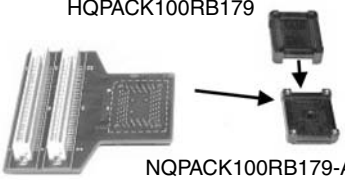
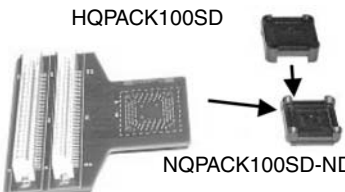
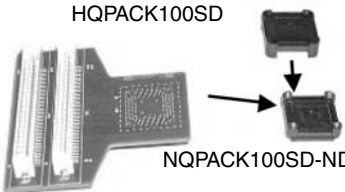
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Name	Part number	Remarks	Overview
Probe cable	For LQFP-64 0.65 mm pitch □12 × 12 mm	MB2132-493 For MB90335 series Package code: FPT-64P-M09 Includes: - NQPACK064SB, HQPACK064SB140 *3 NQPACK064SB enables probe cable connection and mounted IC evaluation. - manual	
		MB2147-540 For MB90350E series Package code: FPT-64P-M09 Includes: - NQPACK064SB, HQPACK064SB140 *3 NQPACK064SB enables probe cable connection and mounted IC evaluation. - manual	
	For LQFP-64 0.5 mm pitch □10 × 10mm	MB2147-541 For MB90980 series Package code: FPT-64P-M03 Includes: - NQPACK064SD-ND, HQPACK064SD NQPACK064SD-ND enables probe cable connection and mounted IC evaluation. - manual	
		MB2147-542 For MB90350E series Package code: FPT-64P-M24 Includes: - NQPACK064SD-ND, HQPACK064SD NQPACK064SD-ND enables probe cable connection and mounted IC evaluation. - manual	
	For QFP-64 1.0 mm pitch □14 × 20mm	MB2132-434 For MB90460/495G/560/565 series Package code: FPT-64P-M06 Conversion adapter (64SD-64QF-8L) is separately required. *2 Made by Sunhayato Corp. Includes: manual	
	For QFP-80 0.8 mm pitch □14 × 20 mm	MB2147-560 For MB90820B series Package code: FPT-80P-M06 Includes: - NQPACK080RA, HQPACK080RA *3 NQPACK080RA enables probe cable connection and mounted IC evaluation. - manual	
	For LQFP-80 0.5 mm pitch □12 × 12 mm	MB2147-561 For MB90820B series Package code: FPT-80P-M05 Includes: - NQPACK080SD, HQPACK080SD *3 NQPACK080SD enables probe cable connection and mounted IC evaluation. - manual	

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16-bit Proprietary F²MC-16LX Family Support Tools

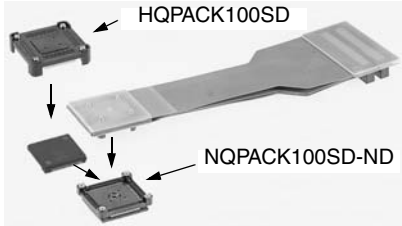
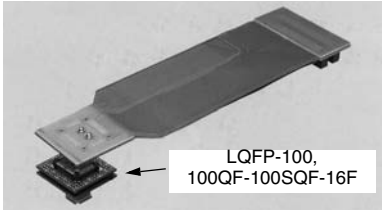
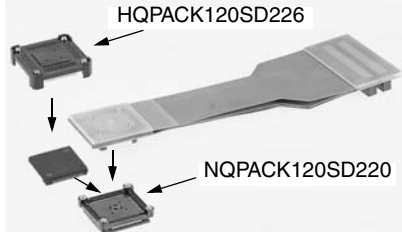
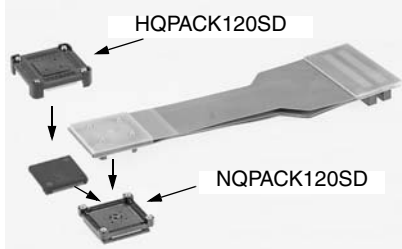
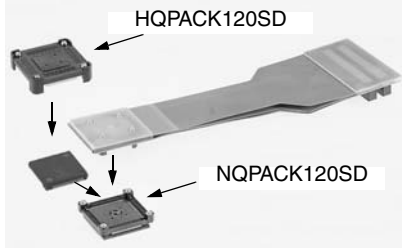
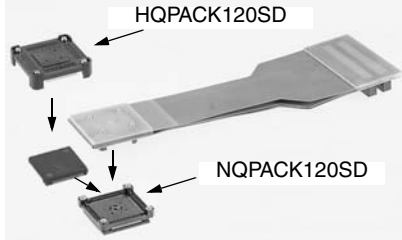
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Name	Part number	Remarks	Overview
Probe cable	For LQFP-80 0.65 mm pitch □14 × 14 mm	MB2147-562 For MB90820B series Package code: FPT-80P-M11 Includes: - NQPACK080SB, HQPACK080SB160 *3 NQPACK080SB enables probe cable connection and mounted IC evaluation. - manual	 HQPACK080SB160 NQPACK080SB
	For QFP-100 0.65 mm pitch □14 × 20 mm	MB2132-457 For MB904xx/5xx/6xx series Package code: FPT-100P-M06 IC149-100-□14-B5 is separately required. *1 Support power supply one system. Not support power supply two systems. Made by Yamaichi Electronics Inc. Includes: manual	 QFP-100, IC149-100-□14-S5
		MB2132-464 For MB904xx/5xx/6xx series Package code: FPT-100P-M06 Includes: - NQPACK100RB179-A, HQPACK100RB 179 *3 NQPACK100RB179-A enables probe cable connection and mounted IC evaluation. Support power supply one system and two systems. - manual	 HQPACK100RB179 NQPACK100RB179-A
		MB2147-582 For MB90340E/800/880 series Package code: FPT-100P-M06 Includes: - NQPACK100RB179-A, HQPACK100RB 179 *3 NQPACK100RB179-A enables probe cable connection and mounted IC evaluation. - manual	 HQPACK100RB179 NQPACK100RB179-A
		MB2147-583 For MB90945 series Package code: FPT-100P-M06 Includes: - NQPACK100RB179-A, HQPACK100RB 179 *3 NQPACK100RB179-A enables probe cable connection and mounted IC evaluation. - manual	 HQPACK100RB179 NQPACK100RB179-A
	For LQFP-100 0.5 mm pitch □14 × 14 mm	MB2147-581 For MB90340E/880 series Package code: FPT-100P-M20 Includes: - NQPACK100SD-ND, HQPACK100SD *3 NQPACK100SD-ND enables probe cable connection and mounted IC evaluation. - manual	 HQPACK100SD NQPACK100SD-ND
		MB2147-584 For MB90945 series Package code: FPT-100P-M20 Includes: - NQPACK100SD-ND, HQPACK100SD *3 NQPACK100SD-ND enables probe cable connection and mounted IC evaluation. - manual	 HQPACK100SD NQPACK100SD-ND

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16-bit Proprietary F²MC-16LX Family Support Tools

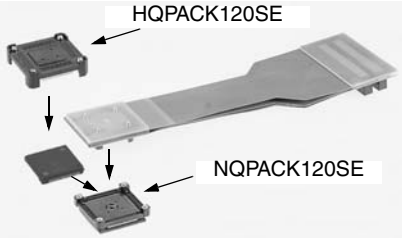
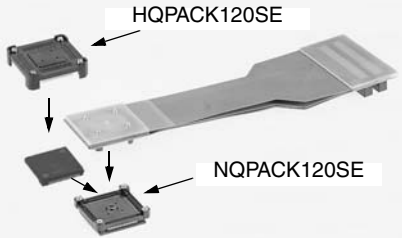
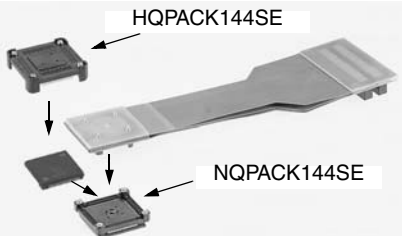
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Name	Part number	Remarks	Overview
Probe cable	For LQFP-100 0.5 mm pitch □14 × 14 mm	MB2132-496 For MB904xx/5xx/6xx series Package code: FPT-100P-M20 Includes: - NQPACK100SD-ND, HQPACK100SD *3 NQPACK100SD-ND enables probe cable connection and mounted IC evaluation. - manual	
	For LQFP-100 0.5 mm pitch □14 × 14 mm	MB2132-457 For MB904xx/5xx/6xx series Package code: FPT-100P-M20 Conversion adapter (100QF-100SQF-16F) is separately required.*2 Made by Sunhayato Corp. Support power supply one system. Not support power supply two systems. Includes: manual	
	For QFP-120 0.5 mm pitch □20 × 20 mm	MB2132-468 For MB90520/570 series Package code: FPT-120P-M13 Includes: - NQPACK120SD220 and HQPACK120SD220 are included. *3 NQPACK120SD220 enables probe cable connection and mounted IC evaluation. - manual	
	For QFP-120 0.5 mm pitch □16 × 16 mm	MB2132-497 For MB90570 series Package code: FPT-120P-M21 Includes: - NQPACK120SD, HQPACK120SD *3 NQPACK120SD enables probe cable connection and mounted IC evaluation. - manual	
		MB2132-469 For MB90390 series, MB90920 series Package code: FPT-120P-M21 Includes: - NQPACK120SD, HQPACK120SD *3 NQPACK120SD enables probe cable connection and mounted IC evaluation. - manual	
	For QFP-120 0.5 mm pitch □16 × 16 mm	MB2132-492 For MB90330A series Package code: FPT-120P-M21 Includes: - NQPACK120SD, HQPACK120SD *3 NQPACK120SD enables probe cable connection and mounted IC evaluation. - manual	

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16-bit Proprietary F²MC-16LX Family Support Tools

(Continued)

Name		Part number	Remarks	Overview
Probe cable	For LQFP-120 0.4 mm pitch □14 × 14 mm	MB2132-498	For MB90520/570 series Package code: FPT-120P-M24 Includes: - NQPACK120SE, HQPACK120SE *3 NQPACK120SE enables probe cable connection and mounted IC evaluation. - manual	
	For LQFP-120 0.4 mm pitch □14 × 14 mm	MB2132-491	For MB90330A series Package code: FPT-120P-M05 Includes: - NQPACK120SE, HQPACK120SE *3 NQPACK120SE enables probe cable connection and mounted IC evaluation. - manual	
	For LQFP-144 0.4 mm pitch □16 × 16 mm	MB2132-471	For MB90370/375/378 series Package code: FPT-144P-M12 Includes: - NQPACK144SE, HQPACK144SE *3 NQPACK144SE enables probe cable connection and mounted IC evaluation. - manual	

*1: The probe cable requires an IC socket from Yamaichi Electronics Inc.

For QFP-100 (lead pitch: 0.65 mm, body size: 14 × 20 mm): IC149-100-□14-B5 (□ = "0": No positioning post, □ = "1": positioning post provided)

Contact for details:

•USA:	Yamaichi Electronics Inc. TEL(408)4520797
•Europe	Denmark: Elmatok A.S. TEL(65)351446
	England: Radiatron Components Ltd. TEL(01)8911221
	AB Connector Ltd. TEL(0604)712000
	Finland: Dualtek Oy TEL(80)8019911
	France: Manudax-France TEL(1)4342-2050
	Germany: Macrotran AG TEL(089)4208148
	Glyn GmbH TEL(49)61278077
	Connector Service GmbH TEL(089)429277
	Italy: Eurosab International s.r.l. TEL(02)93169781
	Spain: S.A Generalde Imporcionas Electronicas TEL(1)416-92-61
	Sweden: Bexab Electronics TEL(08)7680560
	Switzerland: Slcovend AG TEL(01)8303161
•Asia	Singapore: Yamco Electronics Pte Ltd. TEL(336)6522
	Korea: Asia Yamaichi Electronics, Inc. TEL(02)482-7263
	Taiwan: Sing Way Co. TEL(02)718-5971
	Joung Lai Trading Co. Ltd. TEL(02)754-1022

*2: The probe cable requires a conversion adapter from Sunhayato Corp.

Conversion adapter for LQFP-100: QFP-100 (0.65 mm, 14 × 20 mm) → LQFP-100 (0.5 mm, 14 × 14 mm, product no. 100QF-100SQF-16F)

Conversion adapter for LQFP-64: SH-DIP-64 → LQFP-64 (0.65 mm, 12 × 12 mm, product no. 64SD-64QF2-8L)

Conversion adapter for QFP-64 (lead pitch: 1.0 mm): SH-DIP-64 → QFP-64 (1.0 mm, 14 × 20 mm, product no. 64SD-64QF-8L)

Contact for details: Tokyo Japan: Sunhayato Corp. TEL +81-3-3984-7791, FAX +81-3-3971-0535

*3: The probe cable requires TQ-pack or NQ-pack.

Note: Care is required in printed circuit board pattern design because the position of the board connector part (the flat section at the pin tips) of the TQ-pack differs from the mass production product package (the NQ-pack pins are shifted a few millimeters inwards).

Contact for details:

•USA:	OESS Co. San Jose Office TEL(408)437-1582
•Europe	Germany: OESS GmbH TEL(06106)2857890
Tokyo Eletech Co, Ltd.	TEL(81)3-3820-7141

16-bit Proprietary F²MC-16LX Family Support Tools

Evaluation Tools

MB90330A series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V330ACR-ES	PGA-299C	-
Probe cable	MB2132-491	For LQFP-120 (0.4 mm, 14 × 14 mm) FPT-120P-M24	Selectable
	MB2132-492	For LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board for USB	MB2031-01	Evaluation board	Option
	MB2031-20	Daughter board For LQFP-120 (0.4 mm, 14 × 14 mm)	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F334A	LQFP-120 (0.4 mm, 14 × 14 mm) FPT-120P-M24	TEF110-334F22AP	AF220/AF210 AF120/AF110
MB90F334A MB90F335A	LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	TEF110-334F26AP	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90335 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V330ACR-ES	PGA-299C	-
Probe cable	MB2132-493	For LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F337	LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	TEF110-337F31AP	AF220/AF210 AF120/AF110

16-bit Proprietary F²MC-16LX Family Support Tools

MB90340E series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V340E-101CR-ES	Single clock, PGA-299C	Selectable
	MB90V340E-102CR-ES	Dual clock, PGA-299C	
Probe cable	MB2147-581	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2147-582	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100CL2-NB	Daughter board Sunhayato For QFP-100 (0.65 mm, 14 × 20 mm)	
	BBF2004-100SCL-NB	Daughter board Sunhayato For QFP-100 (0.5mm, 14 × 14 mm)	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller		Package	Parallel programmer	Serial on board programmer	
			Flash Support Group, Inc. AF9708/AF9709B/ AF9723B	Yokogawa Digital Computer Corporation	Flash Support Group, Inc.
MB90F342EPFC MB90F342ESPF MB90F342CEPFC MB90F342CESPF MB90F343EPFC MB90F343ESPF MB90F343CEPFC MB90F343CESPF MB90F345EPFC MB90F345ESPF MB90F345CEPFC MB90F345CESPF	MB90F346EPFC MB90F346ESPF MB90F346CEPFC MB90F346CESPF MB90F347EPFC MB90F347ESPF MB90F347CEPFC MB90F347CESPF MB90F349EPFC MB90F349ESPF MB90F349CEPFC MB90F349CESPF	LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M20	TEF110-328F13AP-2	AF220/AF210 AF120/AF110	AF9101 (Under planning excluding MB90F347)
MB90F342EPF MB90F342ESPF MB90F342CEPF MB90F342CESPF MB90F343EPF MB90F343ESPF MB90F343CEPF MB90F343CESPF MB90F345EPF MB90F345ESPF MB90F345CEPF MB90F345CESPF	MB90F346EPF MB90F346ESPF MB90F346CEPF MB90F346CESPF MB90F347EPF MB90F347ESPF MB90F347CEPF MB90F347CESPF MB90F349EPF MB90F349ESPF MB90F349CEPF MB90F349CESPF	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	TEF110-328F12AP-2		

16-bit Proprietary F²MC-16LX Family Support Tools

MB90350E series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V340E-101CR-ES	Single clock, PGA-299C(90351/352)	Selectable
	MB90V340E-102CR-ES	Dual clock, PGA-299C(90351/352)	
	MB90V340E-103CR-ES	Single clock, PGA-299C(90356/357)	
	MB90V340E-104CR-ES	Dual clock, PGA-299C(90356/357)	
Probe cable	MB2147-540	For LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	Selectable
	MB2147-542	For LQFP-64 (0.5 mm, 10 × 10 mm) FPT-64P-M24	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2004-64CL-NB	For LQFP-64 (0.65 mm, 12 × 12 mm) Daughter board Sunhayato	
	BBF2004-64SCL-NB	For LQFP-64 (0.5 mm, 10 × 10 mm) Daughter board Sunhayato	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F351E MB90F351ES MB90F351TE MB90F351TES MB90F352E MB90F352ES MB90F352TE MB90F352TES MB90F356E MB90F356ES MB90F356TE MB90F356TES MB90F357E MB90F357ES MB90F357TE MB90F357TES	LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M23	TEF110-352F30AP	AF220/AF210 AF120/AF110
	LQFP-64 (0.5 mm, 10 × 10 mm) FPT-64P-M24	TEF110-90F352A	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90360E series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V340E-101CR-ES	Single clock, PGA-299C(MB90362)	Selectable
	MB90V340E-102CR-ES	Dual clock, PGA-299C(MB90362)	
	MB90V340E-103CR-ES	Single clock, PGA-299C(MB90367)	
	MB90V340E-104CR-ES	Dual clock, PGA-299C(MB90367)	
Probe cable	MB2147-521	For LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer	
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation	Flash Support Group, Inc.
MB90F362EPMT MB90F362TEPMT MB90F362ESPMT MB90F362TESPMT MB90F367EPMT MB90F367TEPMT MB90F367ESPMT MB90F367TESPMT	LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	TEF110-387F15AP-2	AF220/AF210 AF120/AF110	AF9101

16-bit Proprietary F²MC-16LX Family Support Tools

MB90370/375 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V370CR-ES	PGA-256C	-
Probe cable	MB2132-471	For LQFP-144 (0.4 mm, 16 × 16 mm) FPT-144P-M12	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	(Not supported)	Main board	Option
	(Not supported)	Daughter board	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F372 MB90F377	LQFP-144 (0.4 mm, 16 × 16 mm) FPT-144P-M12	TE110-372F17AP	(Not supported)

MB90378 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	For PGA299	-
Evaluation Device	MB90V378CR-ES	PGA-299C	-
Probe cable	MB2132-471	For LQFP-144 (0.4 mm, 16 × 16 mm) FPT-144P-M12	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	(Not supported)	Main board	Option
	(Not supported)	Daughter board	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F378	LQFP-144 (0.4 mm, 16 × 16 mm) FPT-144P-M12	TE110-372F17AP-2	(Not supported)

16-bit Proprietary F²MC-16LX Family Support Tools

MB90385 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V495GCR-ES	PGA-256C	-
Probe cable	MB2132-466	For LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F387 MB90F387S	LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	TEF110-387F15AP-2	AF220/AF210 AF120/AF110

MB90390 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V390HBCR-ES	PGA-299C	-
Probe cable	MB2132-469	For LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F394HA	LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	TEF110-394F16AP	AF220/AF210 AF120/AF110

16-bit Proprietary F²MC-16LX Family Support Tools

MB90M405 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90MV405CR-ES	PGA-256C	-
Probe cable	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB *	Main board Sunhayato	Option
	BBF2001-100QF2-NB *	Daughter board Sunhayato For QFP-100	

*: To purchase the appropriate product for this model, please contact Sunhayato Corp.

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90MF408	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	(Not supported)	AF220/AF210 AF120/AF110

16-bit Proprietary F²MC-16LX Family Support Tools

MB90420G series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V420GCR-ES	PGA-256C	-
Probe cable	MB2132-496	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A /1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F423GAPFV MB90F423GCPFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-580F03AP-2	MF00-709A	MF05-709B	(Not supported)	AF220/AF210 AF120/AF110
MB90F423GAPF MB90F423GCPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90425G series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V420GCR-ES	PGA-256C	-
Probe cable	MB2132-496	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/AF9723B	MODEL1890A /1930/1931/1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F428GAPFV MB90F428GCPFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-580F03AP-2	MF00-709B	MF05-709B	(Not supported)	AF220/AF210 AF120/AF110
MB90F428GAPF MB90F428GCPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90435 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V540GCR-ES	PGA-256C	-
Probe cable	MB2132-496	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A /1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F438LPFV MB90F438LSPFV MB90F439PFV MB90F439SPFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-580F03AP-2	MF00-709A	MF05-709B	(Not supported)	AF220/AF210 AF120/AF110
MB90F438LPF MB90F438LSPF MB90F439PF MB90F439SPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90440G series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V440GCR-ES	PGA-256C	-
Probe cable	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/AF9723B	MODEL1890A/1930/1931/1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F443GPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	AF220/AF210 AF120/AF110

MB90455 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V495GCR-ES	PGA-256C	-
Probe cable	MB2132-466	For LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F455 MB90F455S MB90F456 MB90F456S MB90F457 MB90F457S	LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	TEF110-387F15AP-2	AF220/AF210 AF120/AF110

16-bit Proprietary F²MC-16LX Family Support Tools

MB90460/465 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V460CR-ES	PGA-256C	-
Probe cable	MB2132-434	For SH-DIP-64 DIP-64P-M01	Selectable
	MB2132-434 + 64SD-64QF-8L	For QFP-64 (1.0 mm, 14 × 20 mm) FPT-64P-M06	
	MB2132-461	For LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A/ 1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F462P-SH MB90F462AP-SH MB90F463AP-SH	SH-DIP-64 DIP-64P-M01	TEF110-562F05AP-2	MF13-787B	(Under planning)	(Not supported)	AF220/AF210 AF120/AF110
MB90F462PF MB90F462APF MB90F463APF	QFP-64 (1.0 mm, 14 × 20 mm) FPT-64P-M06	TEF110-562F06AP-2	MF13-785B	(Under planning)	(Not supported)	
MB90F462PMC MB90F462APMC MB90F463APMC	LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M23	TEF110-562F07AP-2	MF13-786B	(Under planning)	(Not supported)	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90480B/485B series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V480BCR-ES	PGA-299C, for MB90480B series	Selectable
	MB90V485BCR-ES	PGA-299C, for MB90485B series	
Probe cable	MB2132-496	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB *	Main board Sunhayato	Option
	BBF2001-100QF2-NB *	Daughter board Sunhayato For QFP-100	

*: To purchase the appropriate product for this model, please contact Sunhayato Corp.

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/AF9723B	MODEL1890A/1930/1931/1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F481BPFV MB90F482BPFV MB90F488BPFV MB90F489BPFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-580F03AP-2	MF00-709A	MF05-709B	(Not supported)	AF220/AF210 AF120/AF110
MB90F481BPF MB90F482BPF MB90F488BPF MB90F489BPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90495G series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V495GCR-ES	PGA-256C	-
Probe cable	MB2132-461	For LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	Selectable
	MB2132-434 + 64SD-64QF-8L	For QFP-64 (1.0 mm, 14 × 20 mm) FPT-64P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A/ 1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F497GPF MB90F498GPF	QFP-64 (1.0 mm, 14 × 20 mm) FPT-64P-M06	TEF110-562F06AP-2	MF13-785B	MF05-785B	(Not supported)	AF220/AF210 AF120/AF110
MB90F497GPFM MB90F498GPFM	LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	TEF110-562F07AP-2	MF13-786B	MF05-786B	(Not supported)	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90520B series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V520ACR-ES	PGA-256C	-
Probe cable	MB2132-498	For LQFP-120 (0.4 mm, 14 × 14 mm) FPT-120P-M24	Selectable
	MB2132-468	For QFP-120 (0.5 mm, 20 × 20 mm) FPT-120P-M13	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/AF9723B	MODEL1890A/1930/1931/1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F523BPFF	LQFP-120 (0.4 mm, 14 × 14 mm) FPT-120P-M24	TEF110-523F08AP-2	MF00-22B	MF05-22B	(Not supported)	AF220/AF210 AF120/AF110
MB90F523BPFFV	QFP-120 (0.5 mm, 20 × 20 mm) FPT-120P-M13	TEF110-574F02AP-2	MF00-23B	MF05-23B	S5024	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90540G series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V540GCR-ES	PGA-256C	-
Probe cable	MB2132-496	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A /1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F543GPFV MB90F543GSPFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-580F03AP-2	MF00-709A	MF05-709B	(Not supported)	AF220/AF210 AF120/AF110
MB90F543GPF MB90F543GSPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90545G series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V540GCR-ES	PGA-256C	-
Probe cable	MB2132-496	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A /1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F546GPFV MB90F546GSPFV MB90F548GPFV MB90F548GSPFV MB90F548GLPFV MB90F548GLSPFV MB90F549GPFV MB90F549GSPFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-580F03AP-2	MF00-709A	MF05-709B	(Not supported)	AF220/AF210 AF120/AF110
MB90F546GPF MB90F546GSPF MB90F548GPF MB90F548GSPF MB90F548GLPF MB90F548GLSPF MB90F549GPF MB90F549GSPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90550A/550B series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V550ACR-ES	PGA-256C	-
Probe cable	MB2132-496	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A /1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F553APFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-580F03AP-2	MF00-709A	MF05-709B	(Not supported)	AF220/AF210 AF120/AF110
MB90F553APF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90560 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V560CR-ES	PGA-256C	-
Probe cable	MB2132-434	For SH-DIP-64 DIP-64P-M01	Selectable
	MB2132-434 + 64SD-64QF-8L	For QFP-64 (1.0 mm, 14 × 20 mm) FPT-64P-M06	
	MB2132-461	For LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A /1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F562BP	SH-DIP-64 DIP-64P-M01	TEF110-562F05AP-2	MF13-787B	MF05-787B	(Not supported)	AF220/AF210 AF120/AF110
MB90F562BPF	QFP-64 (1.0 mm, 14 × 20 mm) FPT-64P-M06	TEF110-562F06AP-2	MF13-785B	(Under planning)	(Not supported)	
MB90F562BPFM	LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	TEF110-562F07AP-2	MF13-786B	MF05-786B	(Not supported)	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90565 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V560CR-ES	PGA-256C	-
Probe cable	MB2132-461	For LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	Selectable
	MB2132-434 + 64SD-64QF-8L	For QFP-64 (1.0 mm, 14 × 20 mm) FPT-64P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/AF9723B	MODEL1890A/1930/1931/1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F568PF	QFP-64 (1.0 mm, 14 × 20 mm) FPT-64P-M06	TEF110-562F06AP-2	MF13-785B	MF05-785B	(Not supported)	AF220/AF210 AF120/AF110
MB90F568PFM	QFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M09	TEF110-562F07AP-2	MF13-786B	MF05-786B	(Not supported)	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90570A/570C series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V570ACR-ES	PGA-256C	-
Probe cable	MB2132-497	For LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	Selectable
	MB2132-498	For LQFP-120 (0.4 mm, 14 × 14 mm) FPT-120P-M24	
	MB2132-468	For QFP-120 (0.5 mm, 20 × 20 mm) FPT-120P-M13	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/AF9723B	MODEL1890A/1930/1931/1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F574APMT	LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	TEF110-574F02AP-2	MF00-729B	MF05-729B	S5024	AF220/AF210 AF120/AF110
MB90F574APFF	LQFP-120 (0.4 mm, 14 × 14 mm) FPT-120P-M24	TEF110-523F08AP-2	MF00-22B	(Under planning)	(Not supported)	
MB90F574APFV	QFP-120 (0.5 mm, 20 × 20 mm) FPT-120P-M13	TEF110-574F04AP-2	MF00-23B	MF05-23B	(Not supported)	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90580C/580CA series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V580BCR-ES	PGA-256C	-
Probe cable	MB2132-496	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A /1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F583CPFV MB90F583CAPFV MB90F584CPFV MB90F584CAPFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-580F03AP-2	MF00-709A	MF05-709B	(Not supported)	AF220/AF210 AF120/AF110
MB90F583CPF MB90F583CAPF MB90F584CPF MB90F584CAPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90590G series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V590GCR-ES	PGA-256C	-
Probe cable	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A /1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F591GPF MB90F594GPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	AF220/AF210 AF120/AF110

16-bit Proprietary F²MC-16LX Family Support Tools

MB90595G series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V595GCR-ES	PGA-256C	-
Probe cable	MB2132-464	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100QF2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer				Serial on board programmer
		Flash Support Group, Inc.	MINATO ELECTRONICS INC.		Data I/O Corporation	Yokogawa Digital Computer Corporation
		AF9708/AF9709B/ AF9723B	MODEL1890A/ 1930/1931/ 1893	MODEL1940	OPTIMA Dual-Package OCTAL FlashPAK	
MB90F598GPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-553F01AP-2	MF00-989B	MF05-989A	S5023	AF220/AF210 AF120/AF110

16-bit Proprietary F²MC-16LX Family Support Tools

MB90800 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V800-101CR-ES	Single clock, PGA-299C	Selectable
	MB90V800-201CR-ES	Dual clock, PGA-299C	
Probe cable	MB2147-582	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100CL2-NB	Daughter board Sunhayato For QFP-100	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F804-101PF-G MB90F804-201PF-G	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-328F12AP-2	AF220/AF210 AF120/AF110

16-bit Proprietary F²MC-16LX Family Support Tools

MB90820B series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V820BCR-ES	PGA-299C	-
Probe cable	MB2147-560	For QFP-80 (0.8 mm, 14 × 20 mm) FPT-80P-M06	Selectable
	MB2147-561	For LQFP-80 (0.5 mm, 12 × 12 mm) FPT-80P-M05	
	MB2147-562	For LQFP-80 (0.65 mm, 14 × 14 mm) FPT-80P-M11	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	(Not supported)	Main board	Option
	(Not supported)	Daughter board	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F822BPF MB90F823BPF	QFP-80 (0.8 mm, 14 × 20 mm) FPT-80P-M06	TEF110-822F27AP	AF220/AF210 AF120/AF110
MB90F822BPFV MB90F823BPFV	LQFP-80 (0.5 mm, 12 × 12 mm) FPT-80P-M05	TEF110-822F28AP	
MB90F822BPFM MB90F823BPFM	LQFP-80 (0.65 mm, 14 × 14 mm) FPT-80P-M11	TEF110-822F32AP	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90860E series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V340E-101CR-ES	Single clock PGA-299C	Selectable
	MB90V340E-102CR-ES	Dual clock, PGA-299C	
Probe cable	MB2147-581	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2147-582	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100CL2-NB	Daughter board Sunhayato For QFP-100 (0.65 mm, 14 × 20 mm)	
	BBF2004-100SCL-NB	Daughter board Sunhayato For QFP-100 (0.5 mm, 14 × 14 mm)	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F867EPFV MB90F867ESPFV	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-328F13AP-2	AF220/AF210 AF120/AF110
MB90F867EPF MB90F867ESPF	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	TEF110-328F12AP-2	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90880 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V880A-101CR-ES	Single clock, PGA-299C	Selectable
	MB90V880A-102CR-ES	Dual clock, PGA-299C	
Probe cable	MB2147-581	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2147-582	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100CL2-NB	Daughter board Sunhayato For QFP-100 (0.65 mm, 14 × 20 mm)	
	BBF2004-100SCL-NB	Daughter board Sunhayato For QFP-100 (0.5 mm, 14 × 14 mm)	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer	
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation	Flash Support Group, Inc.
MB90F882(S)PMC MB90F883A(S)PMC MB90F884A(S)PMC	LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M20	TEF110-328F13AP-2	AF220/AF210 AF120/AF110	-
MB90F882(S)PF MB90F883A(S)PF MB90F884A(S)PF	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	TEF110-328F12AP-2		

16-bit Proprietary F²MC-16LX Family Support Tools

MB90895 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-10	For PGA256	-
Evaluation Device	MB90V495GCR-ES	PGA-256C	-
Probe cable	MB2132-466	For LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F897 MB90F897S	LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	TEF110-387F15AP	AF220/AF210 AF120/AF110

MB90920 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V920-101CR-ES	Single clock, PGA-299C	Selectable
	MB90V920-102CR-ES	Dual clock, PGA-299C	
Probe cable/Header board	MB2132-469	For LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F922NB MB90F922NBS MB90F923NA MB90F923NAS MB90F924NA MB90F924NAS	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	TEF110-394F16AP	AF220/AF210 AF120/AF110

16-bit Proprietary F²MC-16LX Family Support Tools

MB90945 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V390HBCR-ES	PGA-299C	-
Probe cable/Header board	MB2147-583	For QFP-100 (0.65mm, 14 × 20 mm) FPT-100P-M06	Selectable
	MB2147-584	For LQFP-100 (0.5mm, 14 × 14 mm) FPT-100P-M20	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F946A MB90F947A MB90F949A	For QFP-100 (0.65mm, 14 × 20 mm) FPT-100P-M06	TEF110-328F12AP-2	AF220/AF210 AF120/AF110
	For LQFP-100 (0.5mm, 14 × 14 mm) FPT-100P-M20	TEF110-328F13AP-2	

16-bit Proprietary F²MC-16LX Family Support Tools

MB90950 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V340F-101CR-ES	Single clock, PGA-299C	Selectable
	MB90V340F-102CR-ES	Dual clock, PGA-299C	
	MB90V340F-103CR-ES	Single clock, PGA-299C	
	MB90V340F-104CR-ES	Dual clock, PGA-299C	
Probe cable	MB2147-581	For LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	Selectable
	MB2147-582	For QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M06	
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Evaluation board	BBF2004-MB	Main board Sunhayato	Option
	BBF2001-100CL2-NB	Daughter board Sunhayato For QFP-100 (0.65 mm, 14 × 20 mm)	
	BBF2004-100SCL-NB	Daughter board Sunhayato For QFP-100 (0.5mm, 14 × 14 mm)	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer	
		Flash Support Group, Inc. AF9708/AF9709B/ AF9723B	Yokogawa Digital Computer Corporation	Flash Support Group, Inc.
MB90F952JBPFV MB90F952JBSPFV MB90F952MBPFV MB90F952MBSPFV	LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M20	TEF110-328F13AP-2	AF220/AF210 AF120/AF110	-
MB90F952JBPF MB90F952JBSPF MB90F952MBPF MB90F952MBSPF	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	TEF110-328F12AP-2		

16-bit Proprietary F²MC-16LX Family Support Tools

MB90960 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V340E-101CR-ES	Single clock, PGA-299C	Selectable
	MB90V340E-102CR-ES	Dual clock, PGA-299C	
Probe cable/Header board	MB2147-521	For LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB90F962PMT MB90F962SPMT MB90F967PMT MB90F967SPMT	LQFP-48 (0.5mm, 7 × 7mm) FPT-48P-M26	TEF110-387F15AP-2	-

MB90980 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V485BCR-ES	PGA-299C	-
Probe cable	MB2147-541	For LQFP-64 (0.5 mm, 10 × 10 mm) FPT-64P-M03	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B
MB90F983	LQFP-64 (0.5 mm, 10 × 10 mm) FPT-64P-M03	TEF110-90F983

16-bit Proprietary F²MC-16LX Family Support Tools

MB90990 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2147-01	High speed version In Circuit Emulator	-
Adapter board	MB2147-20	High speed version For PGA299	-
Evaluation Device	MB90V340F-101CR-ES	Single clock, PGA-299C	Selectable
	MB90V340F-102CR-ES	Dual clock, PGA-299C	
	MB90V340F-103CR-ES	Single clock, PGA-299C	
	MB90V340F-104CR-ES	Dual clock, PGA-299C	
Probe cable	MB2147-521	For LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer	
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation	Flash Support Group, Inc.
MB90F997JAPMC MB90F997JASPMC MB90F997MAPMC MB90F997MASPMC	LQFP-48 (0.5 mm, 7 × 7 mm) FPT-48P-M26	TEF110-387F15AP-2	AF220/AF210 AF120/AF110	-

16-bit Proprietary F²MC-16LX Family Support Tools

RAM Monitor Board for F²MC-16LX Family (MB2147-80)

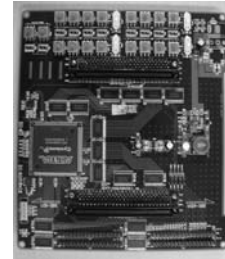
The MB2147-80 is a development support tool for evaluation purposes to output RAM data to an external device as digital data.
(Development support option.)

When used in combination with the F²MC-16L/LX emulator (MB2147-01) and adapter board (MB2147-10 or MB2147-20), the MB2147-80 can digitally output data from specified addresses.

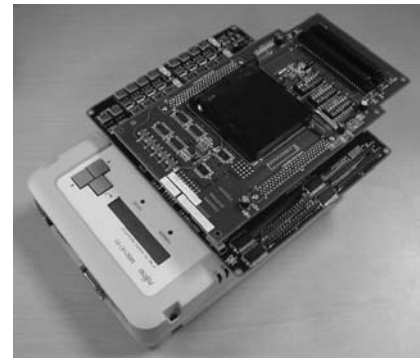
Digitally output data is measured or recorded with a measuring instrument such as an oscilloscope or plotter.

- Measurement target: 4 addresses (Lower 16 bits are set.)
Of four channels, two are fixed for bank 00 and the other two can be specified with a measurement bank (same one).
- Access attribute selectable: R, W, R/W
- Dimensions : W170 mm × D150 mm × H22 mm
- Weight : 146 g

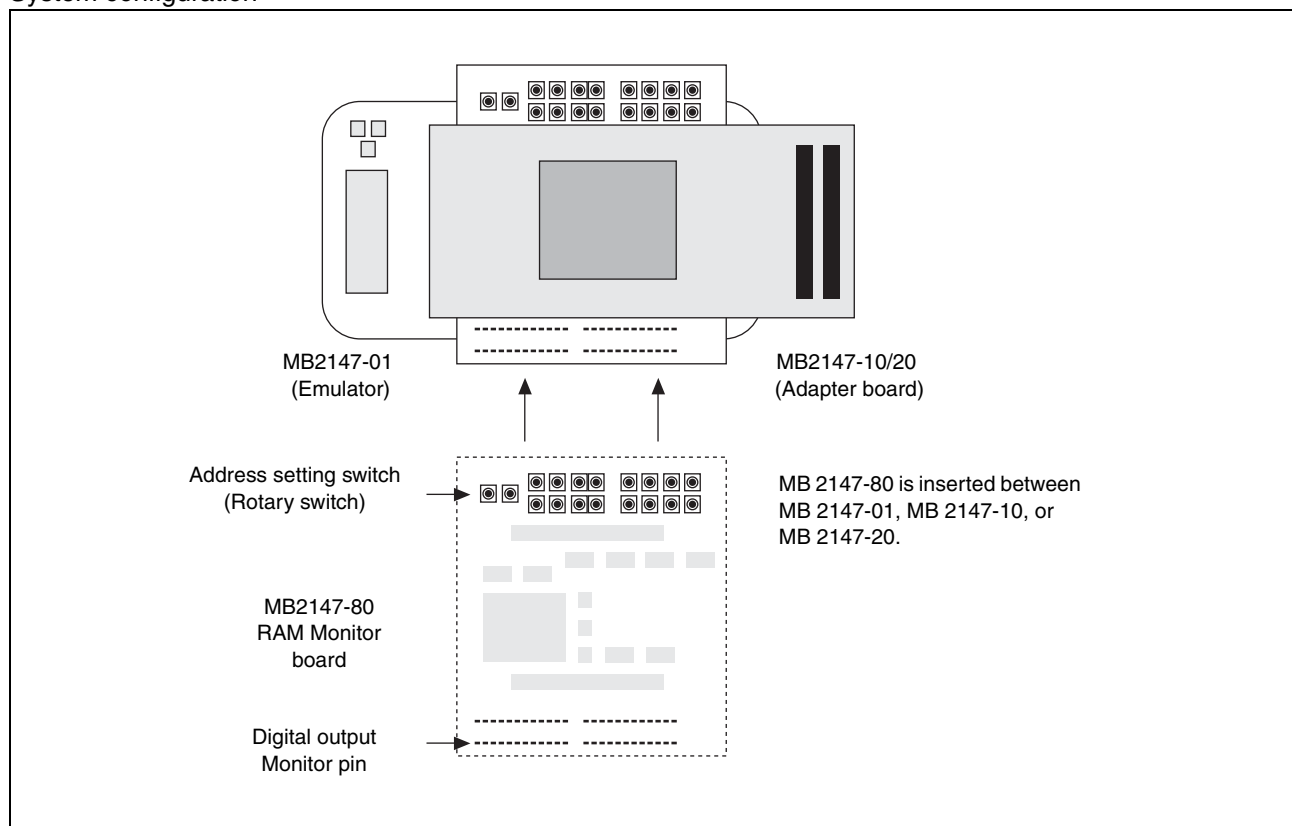
MB 2147-80



When MB 2147-80 is combined with MB 2147-01 and MB 2147-10



System configuration



16-bit Proprietary F²MC-16LX Family Support Tools

■ MB2000: CAN Flash EVALUATION BOARD

The Flash/CAN100 board was developed, in order to allow a fast software design start for customers wishing to use Fujitsu Flash and / or CAN MCUs in the 100-pin QFP package. Since Fujitsu Microelectronics in-circuit emulators require a target system that provides Vcc and GND, as well as an oscillation circuit, that enables customers to start development or evaluation work straight away without having to wait for their own target hardware.

Features

- 100-pin socket adaptor for device or emulator connection
- On-board regulator allows for a 7-14V unstabilised external DC power supply
- 5V and 3.7V internal power supply available for emulator
- Two high-speed CAN drivers
- RS232 interface
- All MCU pins brought out twice to external connectors
- Optional sub-clock
- RST, HST push-button
- 8 test LEDs
- External reset via RS232

The Flash/CAN100 is supplied with the MB90F598 single-CAN and 128 KByte flash microcontroller. It is capable of supporting all of the following device types:

- MB90540 = MB90V540, MB90F543, MB90543
- MB90545 = MB90V540, MB90F549, MB90F548, MB90548
- MB90550A = MB90V550A, MB90F553A, MB90553A
- MB90580 = MB90V580, MB90F583B, MB90583B
- MB90590 = MB90V590, MB90F594A, MB90594, MB90F591, MB90591
- MB90595 = MB90V595, MB90F598, MB90598

The order code for the kit is FLASH-CAN2-100P-M06 and it is delivered with:

- The Flash/CAN100 board itself
- Two 50-pin socket connectors
- Power supply connector
- MB90F598 - 128kB Flash microcontrollers
- 11 Jumpers
- 1 socket adapter cover
- English documentation

16-bit Proprietary F²MC-16LX Family Support Tools

F²MC-16LX Family Adaptors

- Programming adaptors for one-time PROM microcontrollers and EPROM microcontrollers

OTPROM/Flash microcontrollers	Package (lead pitch, body size) (mm)	Package code	Adaptor socket
MB90P553APF	QFP-100 (0.65 mm, □14 × 20 mm)	FPT-100P-M06	ROM-100QF-32DP-16L *1

*1: Use a general-purpose EPROM programmer that is able to program a MBM27C1000.

The above adaptor sockets can be purchased from Sunhayato Corp.

Contact for details: Tokyo Japan: Sunhayato Corp. TEL +81-3-3984-7791, FAX +81-3-3971-0535

Notes:

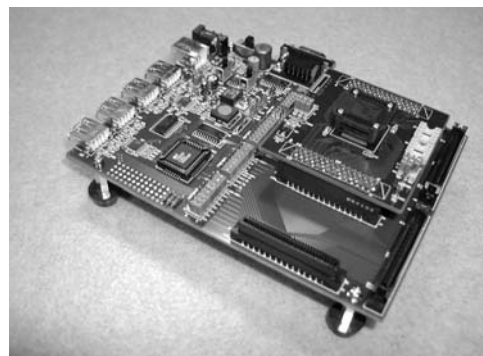
A signal-socket ROM programmer is recommended. Also, contact Fujitsu Microelectronics for programming mounted devices.

Take care to avoid bending the leads when programming QFP packages.

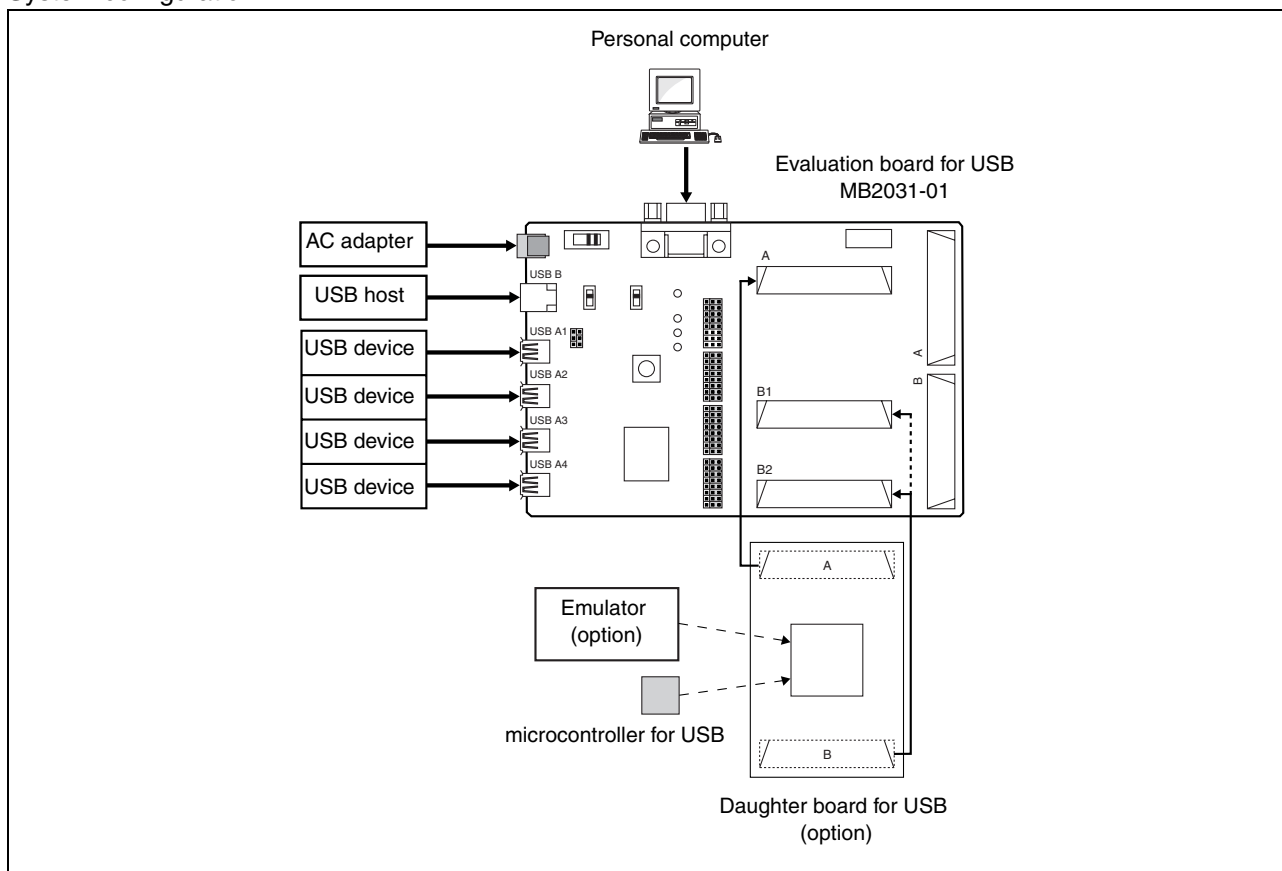
The recommended screening practice before mounting is high temperature aging (+150°C, 48H).

Evaluation Board for USB

It is an evaluation board corresponding to microcontroller for USB. It contributes to the rise of that the simple evaluation of operation before including in a visitor's system is possible, and development efficiency. It is constituted by evaluation board for USB, and a main board and a daughter board. A main board is common to each microcontroller products. By changing a daughter board, debugging by In Circuit Emulator combined with the emulator debugger for microcontroller can be performed.

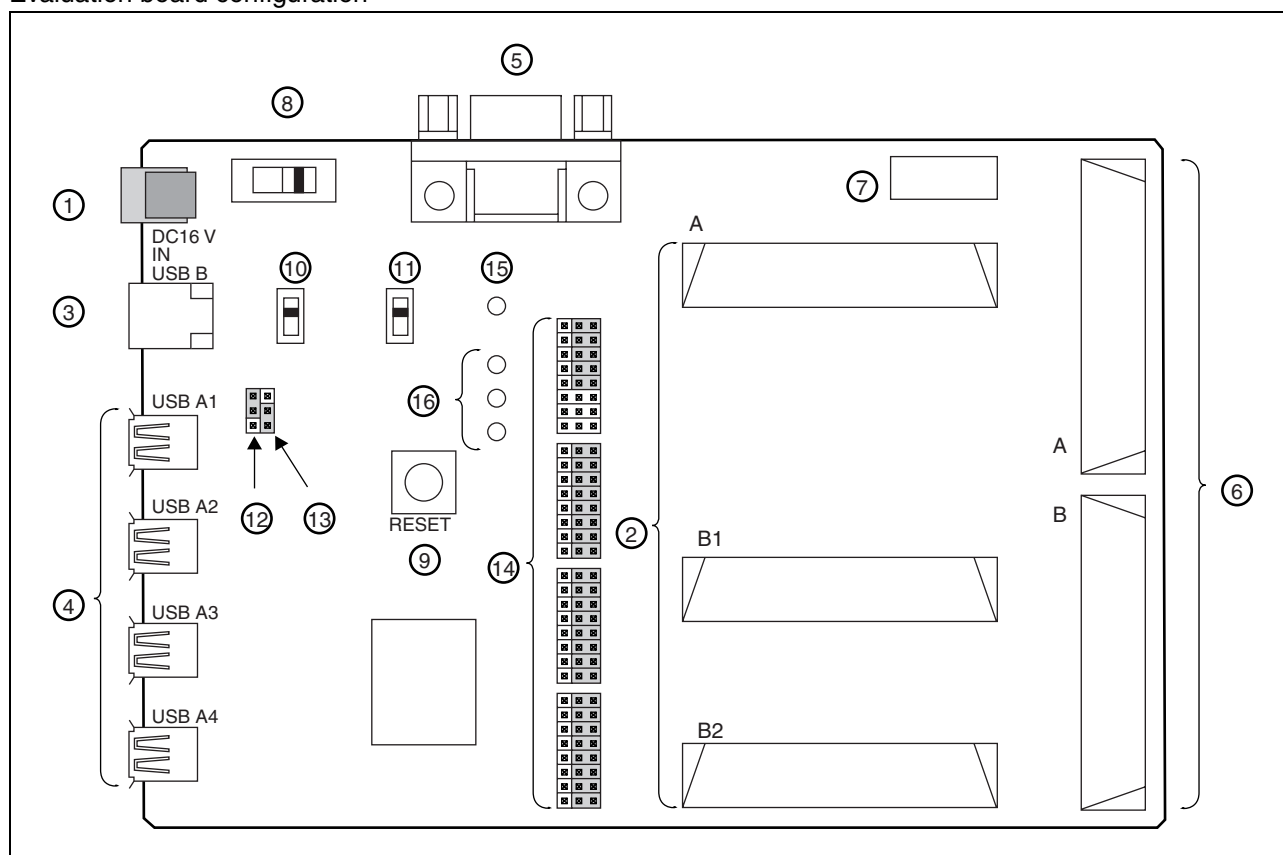


System configuration



16-bit Proprietary F²MC-16LX/FX Family Support Tools

Evaluation board configuration



- ① Power connector
- ② Daughter I/F connector

Part number	Target microcontroller	Package
MB2031-10	MB89P585B/BW	LQFP-64 (0.5 mm, □10 mm × 10 mm)
MB2031-11	MB89P589B	LQFP-64 (0.65 mm, □12 mm × 12 mm)
MB2031-20	MB90F334A	LQFP-120 (0.4 mm, □14 mm × 14 mm)

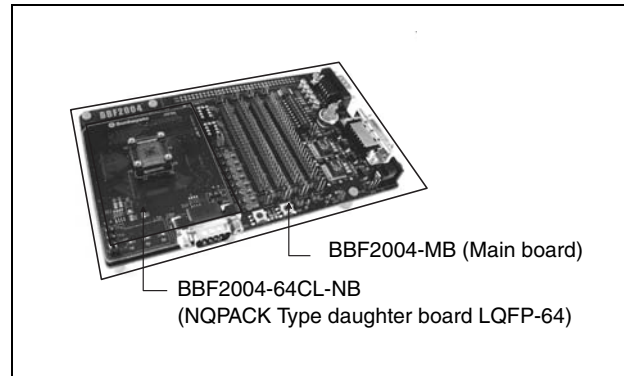
- ③ USB-B connector
- ④ USB-A connector
- ⑤ RS-232C connector
- ⑥ General I/F connector
- ⑦ IC socket for clock mounting
- ⑧ Power switch
- ⑨ Reset switch
- ⑩ USB transmission speed setting switch
- ⑪ USB transmission speed control switch
- ⑫ Short plug for a Power Mode setup (selection of a self-power supply or bus power supply)
- ⑬ Short plug for a MCU Power setup (selection of 3.3 V or 5 V)
- ⑭ Short plug for a functional setup
- ⑮ MCU power LED
- ⑯ USB-LED

16-bit Proprietary F²MC-16LX/FX Family Support Tools

F²MC-16LX Family Evaluation Board (BBF2004) : Sunhayato

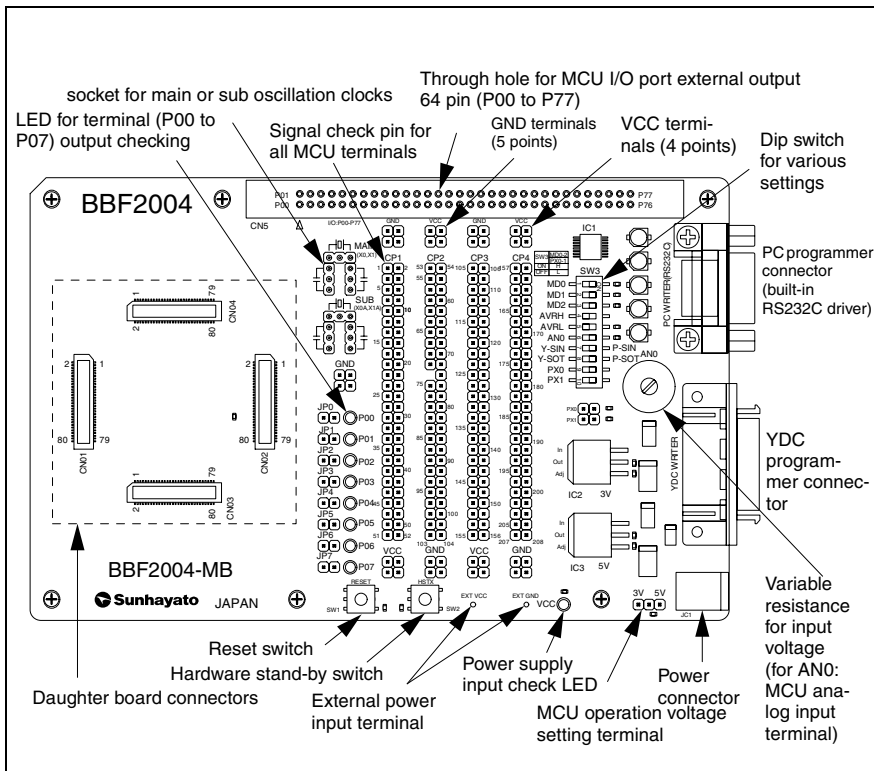
This is an evaluation board made by Sunhayato corp. in correspondence with Fujitsu Microelectronics F²MC-16LX/FX families. It can be used to verify the operating status of F²MC-16LX/FX families before they are actually embedded into a customer's system. As a consequence, development efficiency is accelerated.

This board consists of a main board and a daughter board. By changing the daughter board, it can be used for debugging with the (In Circuit Emulator) tool combined with the emulator debugger, evaluating a microcomputer with built-in flash memory and a serial programming. The board is adaptable to various series by changing the daughter board, while the main board is common to each part.

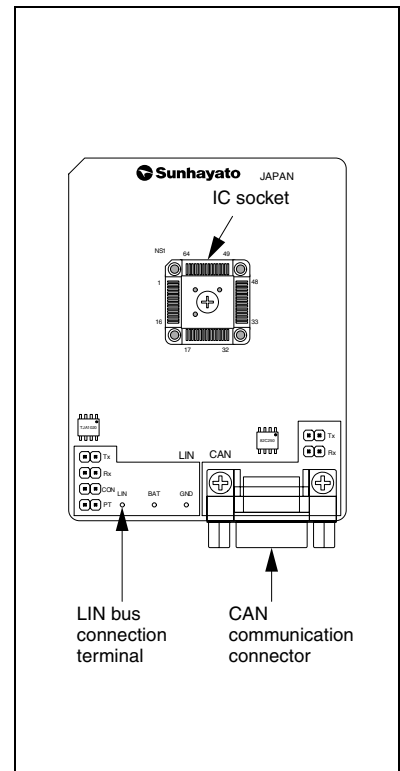


• Evaluation board configuration

Main board (BBF2004-MB)



Daughter board
(BBF2004-64CL-NB)



16-bit Proprietary F²MC-16LX Family Support Tools

• Product configuration

Main board

Part number	Description
BBF2004-MB	- Locating signal check pin to all terminals - Capability of changing input voltage to analog input terminal AN0 (by variable resistor) - Function of LED lightning for output port (P00 to P17) - Evaluate the capability of communication between PC and microcomputer with UART (mounted DSUB 9pin is possible.) - Can be use the serial programmer made by Fujitsu Microelectronics - Can be use the serial programmer made by Yokogawa Digital Computer corp.

Daughter board (The part number ending with "-NS" means a set of a main board and a daughter board.)

Part number	Description	Target microcontroller	Usage
BBF2004-64CL-NB *	NQPACK type (0.65 mm pitch, □12 mm × 12 mm)	MB90350E series	Evaluation board connectable with (In Circuit Emulator) tool. Board for writing and evaluating a microcomputer with a built-in flash memory.
BBF2004-64CL-NS *		MB96350 series	
BBF2004-64SCL-NB	NQPACK type (0.5 mm pitch, □10 mm × 10 mm)	MB90350E series	
BBF2004-64SCL-NS		MB96350 series	
BBF2001-100QF2-NB	NQPACK type (0.65 mm pitch, □14mm × 20 mm)	MB90540G series	
BBF2001-100QF2-NS		MB90545G series MB90550A series MB90550B series MB90580C series MB90580CA series MB90590G series MB90595G series MB90M405 series MB90420G series MB90425G series MB90435 series MB90480B series MB90485B series	
BBF2001-100CL2-NB *	NQPACK type (0.65 mm pitch, □14mm × 20 mm)	MB96340E series	
BBF2001-100CL2-NS *		MB90800 series MB90860E series MB90880 series MB96340 series	
BBF2004-100SCL-NB	NQPACK type (0.5 mm pitch, □14mm × 14 mm)	MB90340E series	
BBF2004-100SCL-NS		MB90860E series MB90880 series MB96340 series	

*: Includes CAN transceiver and LIN transceiver

Contact for details: Tokyo Japan: Sunhayato Corp. TEL +81-3-3984-7791, FAX +81-3-3971-0535

16-bit Proprietary F²MC-16LX Family Support Tools

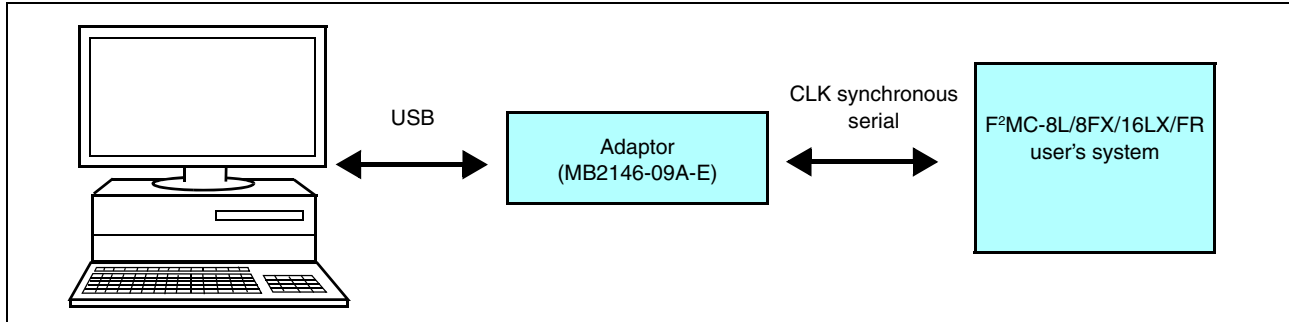
Serial on Board Programmer

The serial on board programming in Flash memory of the F²MC-16LX family is supported as the following programmer.

FLASH USB Programmer : Fujitsu Microelectronics

This is a FLASH USB Programmer which feature is the small size and low price, and it allows to program by using the microcontroller with Flash memory, personal computer and adapter (MB2146-09A-E) at the Flash ROM of microcontroller.

(1) System configuration



(2) Product configuration

Product name	Part number	Description
Adaptor (programmer)	MB2146-09A-E	F ² MC-8FX ICE and using combinedly (with USB cable)
FLASH USB Programmer	-	Software (download from Web(registration))

(3) Target microcontroller

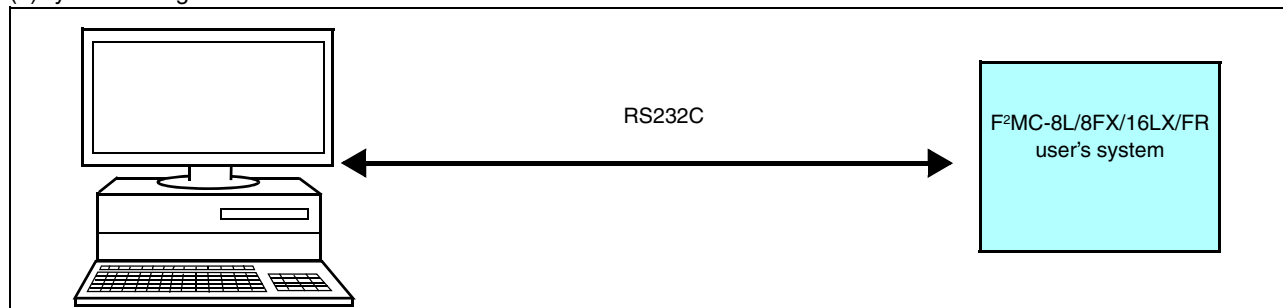
Version	Target microcontroller
FLASH USB Programmer for 8L/8FX/16LX/FR	MB90F352/C/S/CS, MB90F334, MB90F347 MB90F349, MB90F394, MB90F867 MB90MF408, MB90F423G, MB90F462 MB90F482, MB90F488, MB90F489B MB90F497G, MB90F498G, MB90F543G MB90F548G, MB90F598G, MB90F804 MB90F822, MB90F823, MB90F867 MB90F983 MB90F387, MB90F438L, MB90F548GL MB90F583C, MB90F882, MB90F884 MB90F946A, MB90F947A, MB90F949A

16-bit Proprietary F²MC-16LX Family Support Tools

FLASH MCU Programmer : Fujitsu Microelectronics

This is a FLASH MCU Programmer which feature is the small size and low price, and it allows to program by connection the microcontroller with Flash memory and personal computer at the Flash ROM of microcontroller.

(1)System configuration



(2) Product configuration

Product name	Part number	Description
FLASH MCU Programmer	-	Software (download from Web(registration))

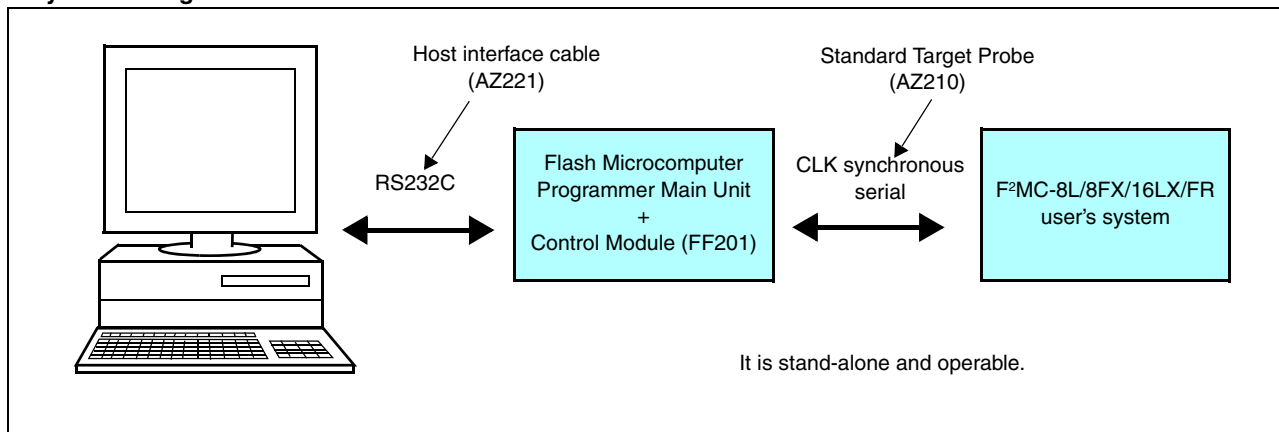
(3)Target microcontroller

Version	Target microcontroller
LASH MCU Programmer for F ² MC-16LX	MB90F334, MB90F337, MB90F342A/CA/AS/CAS, MB90F342E/CE/ES/CES, MB90F345 A/CA/AS/CAS, MB90F345E/CE/ES/CES, MB90F346A/CA/AS/CAS, MB90F346E/CE/ES/CES, MB90F347A/CA/AS/CAS, MB90F347E/CE/ES/CES, MB90F349 A/CA/AS/CAS, MB90F349E/CE/ES/CES, MB90F351/S, MB90F351A/AS/TA/TAS, MB90F351E/ES/TE/TES, MB90F351B/BS, MB90F352/S, MB90F352A/TAS/TA/AS, MB90F352B/BS, MB90F362E/ES/TE/TES, MB90F372, MB90F378, MB90F387/S, MB90F394/H, MB90F395H, MB90MF408, MB90F423GA/GC, MB90F428GA/GC, MB90F438L/LS, MB90F439/S, MB90F443G, MB90F455/S, MB90F456/S, MB90F457/S, MB90F462, MB90F481, MB90F482, MB90F488, MB90F489, MB90F497/G, MB90F498G, MB90F523B, MB90F543/G/GS, MB90F546G/GS, MB90F548G/GS, MB90F549/G/GS, MB90F553A, MB90F562/B, MB90F568, MB90F574/A, MB90F583B/C/CA, MB90F584C/CA, MB90F591A/G, MB90F594A/G, MB90F598/G, MB90F654A, MB90F804, MB90F822, MB90F823, MB90F867A/AS, MB90F883, MB90F884, MB90F897E/ES, MB90F897/S, MB90F983, MB90F922, MB90F946A, MB90F947A, MB90F949A, MB90F882

16-bit Proprietary F²MC-16LX Family Support Tools

AF220/AF210/AF120/AF110 (Flash microcontroller programmer) Yokogawa Digital Computer Corporation

• System configuration



• Product configuration

Product name	Part number	Description
Flash Microcontroller Programmer Main Unit	AF220/AC4P	with Ethernet(10Base-T) Interface /100V to 220V Power supply adaptor
	AF210/AC4P	Basic Model /100V to 220V Power supply adaptor
	AF120/AC4P	Single Operation Model with Ethernet(10Base-T) Interface /100V to 220V Power supply adaptor
	AF110/AC4P	Single Operation Model /100V to 220V Power supply adaptor
Host Interface Cable	AZ221	Writer exclusive use. RS232C cable for PC/AT
Standard Target Probe	AZ210	Standard Target Probe (a): 1 m
Control Modules	FF201	Control modules for F ² MC-16LX OTP or Flash microcontroller made by Fujitsu Microelectronics (High-speed version).
Remote Controller	AZ290	Remote Controller
Memory card	/P2	2MB PC Card
	/P4	4MB PC Card

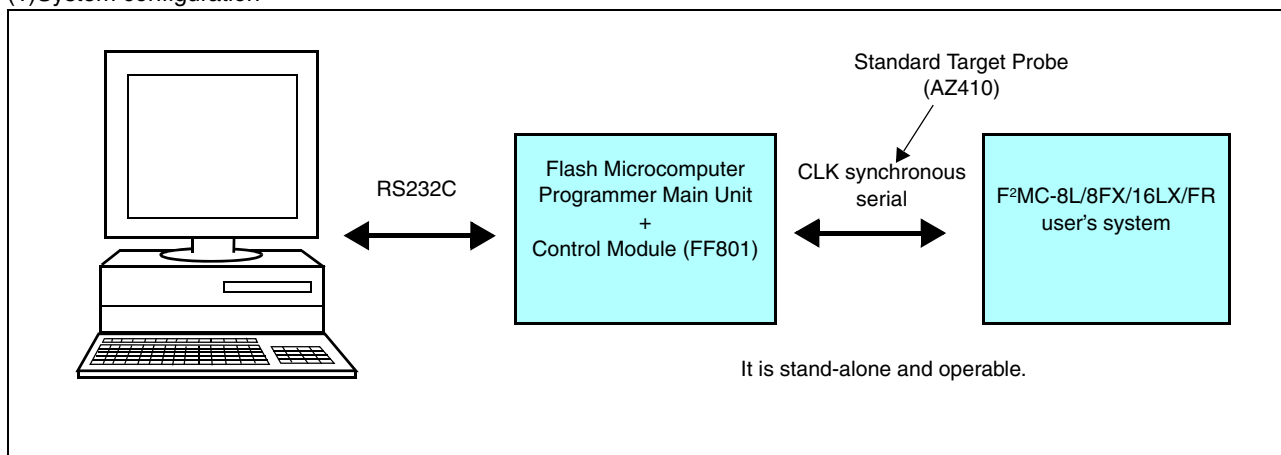
Contact for details: Yokogawa Digital Computer Corporation

The AF2XX/AF1XX series will terminate the sales in the end of March, 2007 (The maintenance and repair service will be available for the next 5 years after the end of sale). We have the alternative version (AF400/300, AF600/500 series) which includes the enhanced functions of the AF2XX/AF1XX series. For more information, please contact Yokogawa Digital Computer Corporation.
We will continuously provide you the technical support for the subsequent version of Fujitsu microcontrollers.

16-bit Proprietary F²MC-16LX Family Support Tools

AF420/AF620/AF320/AF520 (serial programmer) : Yokogawa Digital Computer

(1) System configuration



(2) Product configuration

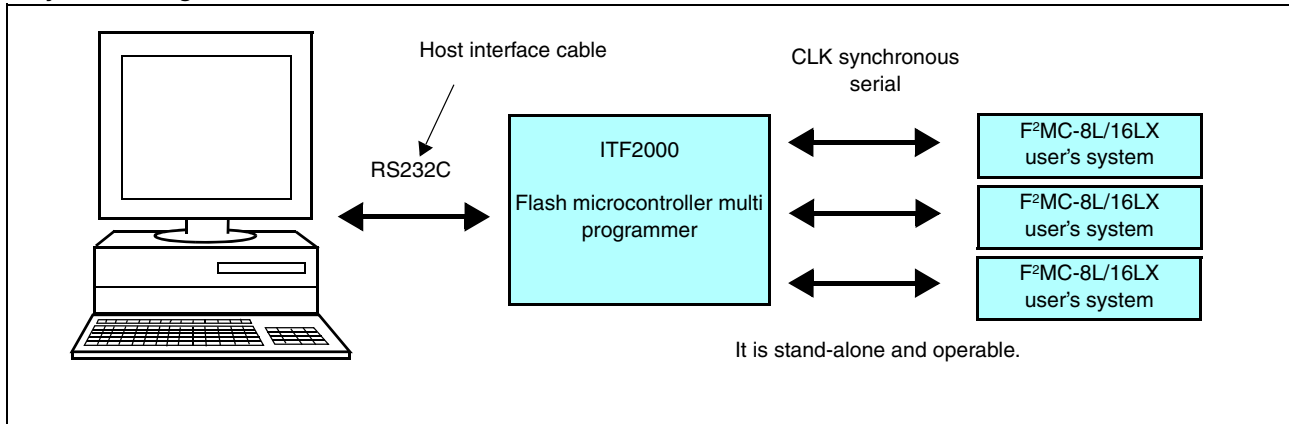
Product name	Part number	Description
Flash Microcontroller Programmer Main Unit	AF420/AC4P	FULL KEY model 100BASE-TX host interface
	AF620/AC4P	FULL KEY model CAN interface 100BASE-TX host interface
	AF320/AC4P	Single KEY model 100BASE-TX host interface
	AF520/AC4P	Single KEY model CAN interface 100BASE-TX host interface
Standard Target Probe	AZ410	Standard Target Probe (a): 1 m
Compact Modules	FF801	Control modules for Fujitsu microcontroller
Remote Controller	AZ490	Remote Controller
Memory card	-	PC Card

Contact for details: Yokogawa Digital Computer Corporation

16-bit Proprietary F²MC-16LX Family Support Tools

ITF2000 (Serial Gang programmer): Interface

• System configuration



• Product configuration

Product name	Function
ITF2000	Main unit of Flash microcontroller multi programmer (with remote software)
ISP2000	Adaptor for on board programming (with main cable)
CF001(for F ² MC-16LX family)	Control software
WF001/F001(for MB90P553A)	Microcontroller module

• Programming adaptor

Part number	Package	Programming adaptor
MB90F553A	QFP-100	TOP2000/QFP100TP1/P1 (single) TOP2000/QFP100TP1/P10 (10 sets)
	LQFP-100	TOP2000/LQFP100TP1/P1 (single) TOP2000/LQFP100TP1/P10 (10 sets)

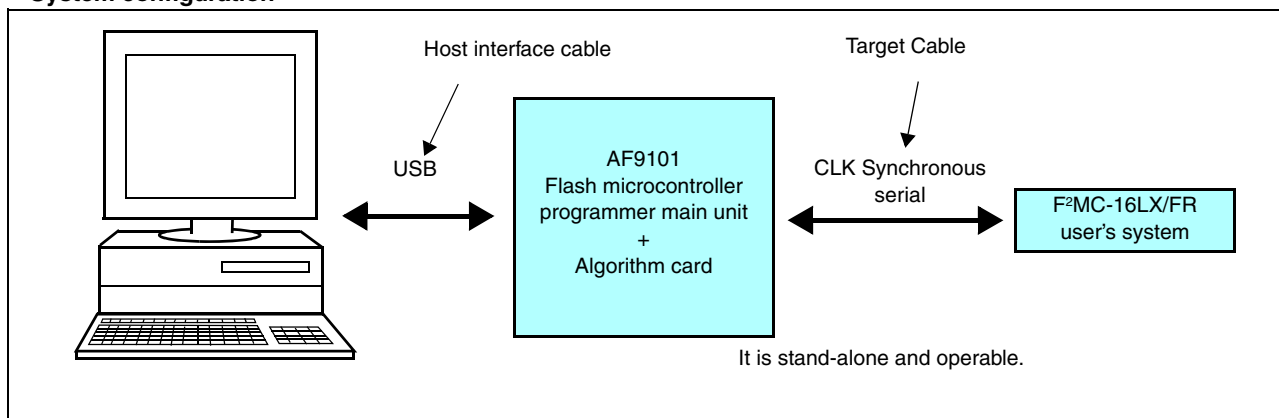
16-bit Proprietary F²MC-16LX Family Support Tools

AF9101 (Serial programmer): Flash Support Group, Inc.

This is a general-purpose programmer which feature is the small size and low price, and it allows to program on board by using the clock synchronous serial at the Flash ROM of F²MC-16LX family.



• System configuration



• Product configuration

Product name	Description
AF9101 serial programmer	100V to 220V power supply adaptor
TECFM-256-20	Algorithm card for AF9101
USB cable	—
Target cabl(one of terminals are processed)	—
PC control software	—

• Target microcontroller

Product name	Part number	Target microcontroller
Flash microcontroller programmer main unit	AF9101	MB90F347
		MB90F362

Contact: Flash Support Group, Inc.
TEL(053)428-8383 FAX(053)428-8377

16-bit Proprietary F²MC-16LX Family Support Tools

■ Parallel Programmer for Flash Microcontroller

The parallel programmer in Flash memory of the F²MC-16L/LX family is supported as the following programmer.

Flash Support Group, Inc.

- **Flash Programmer**

AF9708, AF9709/B: 3 V-products, 5 V-products.



AF9708

AF9709

- **Gang programmer**

Main unit: AF9723

Option unit: AF9833, AF9834, AF9845



The main unit, the option unit, and the program adaptor are combined.

Refer to the device list shown in following URL for the main unit, option unit and the program adaptor corresponding to each microcomputer.

URL <http://www.j-fsg.co.jp/e/top.html>

MINATO ELECTRONICS INC.

- **Universal Programmer**

MODEL 1890A + OU910 (Ver. 4.32b or more)



Notes:

This programmer ended in September, 2000. It is a schedule of correspondence with MODEL1881 (The current state uncorresponds) for the future. Please confirm to MINATO ELECTRONICS INC. when you buy.

MODEL1890A is scheduled to be done in the future to support.

URL http://www.minato.co.jp/index_e.asp

- **Gang Programmer**

MODEL 1893 (Ver. 1.10L or more) , MODEL 1931 (Ver 1.10L or more)

MODEL 1930 + SU3000LX (Ver. 4.10L or more)

MODEL 1895 (Ver. 1.11d or more)



MODEL 1893

- **Gang programmer**

MODEL1940 (Ver. 1.32C or more)



MODEL 1940

16-bit Proprietary F²MC-16LX Family Support Tools

Data I/O Corporation

(Agency) TOYO Corporation

- **Universal Programmer**

OPTIMA, Dual-Package



OPTIMA



Dual-Package

- **Gang Programmer**

OCTAL, FlashPAK



OCTAL

- **Flash MEMORY/Microcomputer Programmer**

FlashPAK

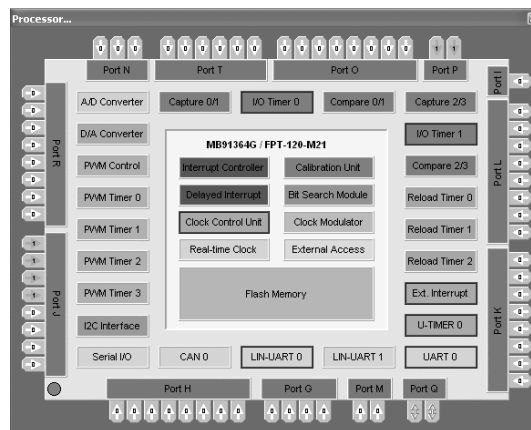
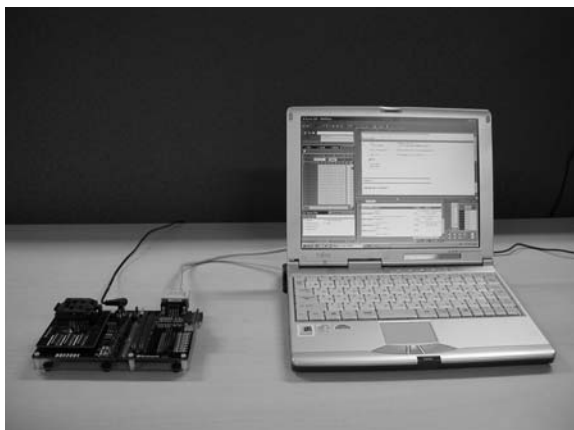


16-bit Proprietary F²MC-16LX Family Support Tools

■ Fujitsu Microcontroller Development Starter Kit

The Fujitsu microcontroller development starter kit allows you to experience a Fujitsu microcontroller development environment using the ACCEMIC MDE monitor debugger.

- Starter kit configuration
- Monitor debugger software (ACCEMIC MDE screen)



F²MC-16LX Family
Support tools

• Fujitsu microcontroller development starter kit enclosure article

Sunhayato evaluation board	It signal-check-pin-arranges for all terminals. Light Emitting Diode lighting control in the port of one part is possible. FLASH memory integrated microcontroller built-in is possible. DSUB 9 pin Connector, RS232C driver IC built-in It corresponds to FLASH memory onboard writing.
ACCEMIC MDE monitor debugger (trial version, program size is to 4KB)	The monitor debugger can construct a development environment only by being connected to the UART communications lines (two lines) in a FLASH memory integrated microcontroller.
Fujitsu Microelectronics SOFTUNE Integrated Development Environment (trial version, 45-day limited)	The development environment for the Fujitsu Microelectronics F ² MC-16LX series of microcontrollers is an integrated suite of programs such as a C compiler, assembler, linker, and debugger.
Others	FLASH memory integrated microcontroller, sample program

• Fujitsu microcontroller development starter kit product lineup

Starter kit product name	Correspondence microcontroller	The feature of a microcontroller
BBF2004-MB90F352-10	MB90F352	CAN:1ch, UART:2ch, A/D:15ch, PKG:64pin, 5V

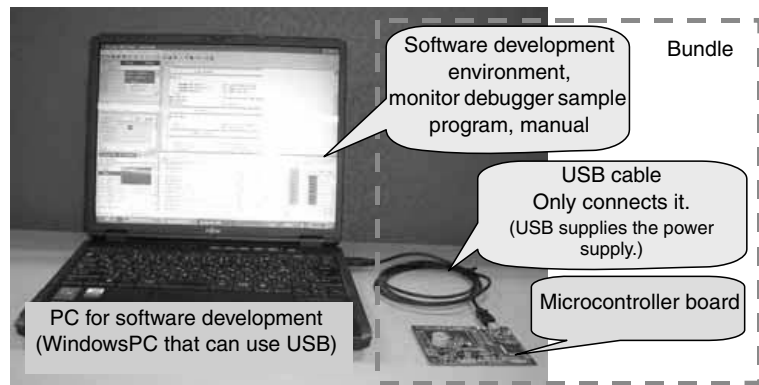
Contact
Sunhayato Corp. TEL +81-3-3984-7791, FAX +81-3-3971-0535

16-bit Proprietary F²MC-16LX Family Support Tools

■ Sunhayato Microcontroller Starter Kit

Jouet bleu is Microcontroller Starter Kit for the engineer who learns the microcontroller in the future and the embedded system. It is effective as the educational tool of the built-in software development for the student and the new employee.

jouet bleu configuration



It is possible to learn from the base of the microcontroller to the application by using Fujitsu Microelectronics 16bit microcontroller.

- Mechanism of LED lighting
- LED is controlled by the switch operation.
- Method for sounding a buzzer
- The interruption is planned and how to use.
- How to use of the timer.
- How to use of the temperature sensor.

There are a sample program and a manual for study (The manual prepares Japanese, English, and a Chinese version).



Necessary basic knowledge for building in software the development engineer is obtained only with jouet bleu.

Specification

Microcontroller	MB90F378
USB controller	MB90F334 (Equipped with interface Ltd. firmware)
I/O device	Buzzer, volume of slide, LED × 5, SW × 2, temperature sensor
Operation power supply	Supply by USB bus
I/F with PC	USB (mini B connector)
Size of board	72 × 95 mm
CD-ROM ^{*1}	SOFTUNE integration development environment (trial version) ^{*2} , ACCEMIC monitor debugger (trial version) ^{*3} , Sample program, User's manual
Other accessory	USB cable

^{*1}: Developing software should download data from Web.

^{*2}: The program size is limited to 32 KB.

^{*3}: The debugged program size is limited to 12 KB.

Sales & Contact

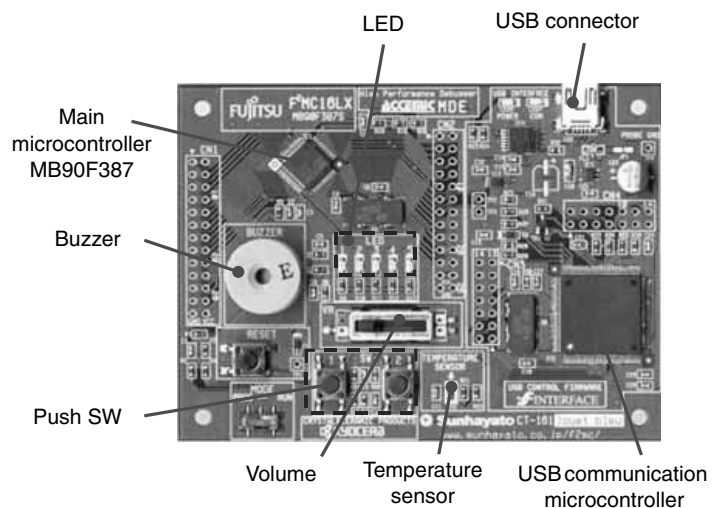
Sunhayato Corp.

TEL: 03-3984-7791

FAX: 03-3971-0535

URL: <http://www.sunhayato.co.jp/f2mc/>

Board configuration



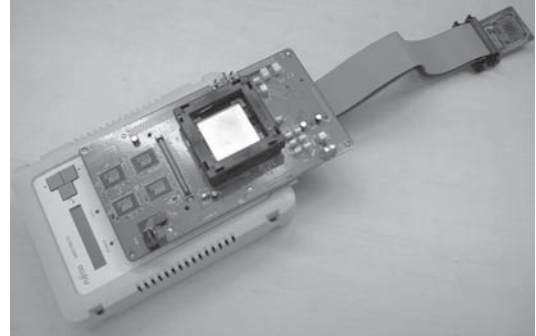
16-bit Proprietary F²MC-16FX Family Support Tools

Evaluation Tools for Support Hardware F²MC-16FX families (MB2198 emulator)

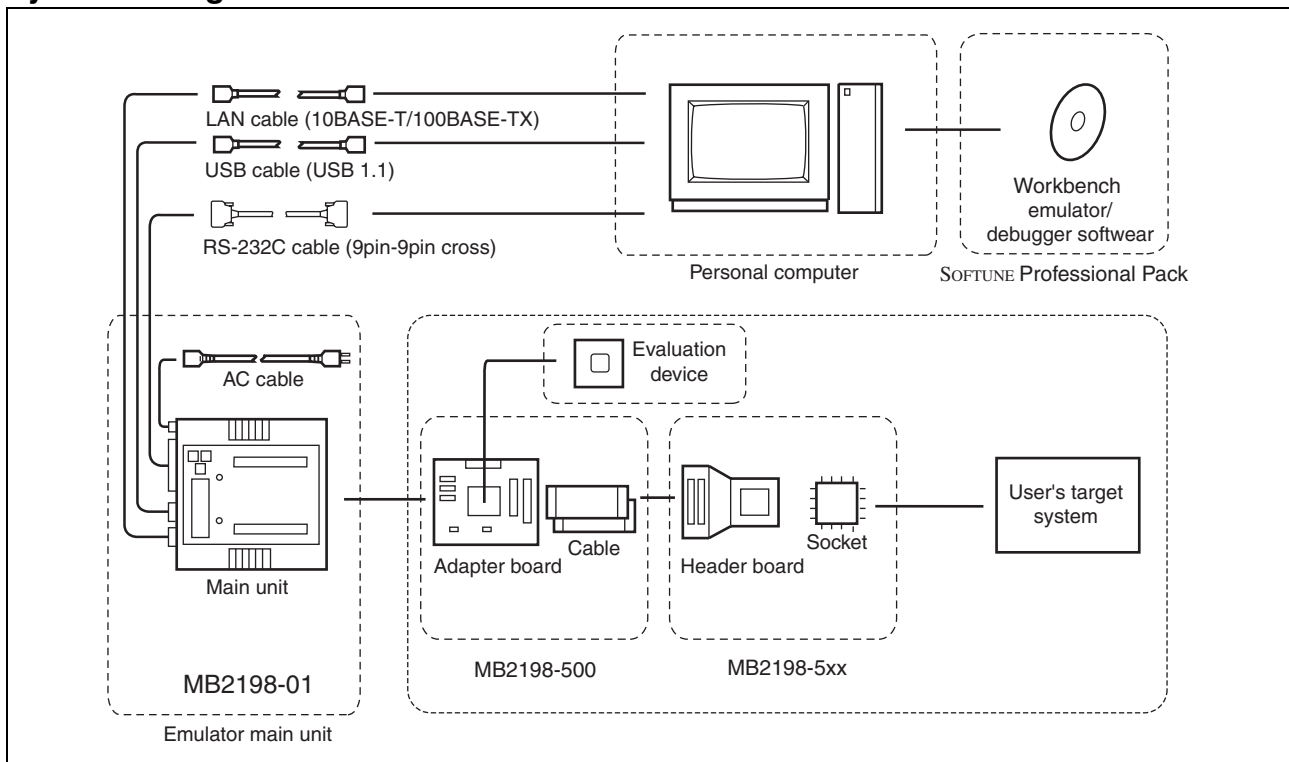
Features

- DSU support: DSU4
- Linear power supply voltage support from +2.7V to +5.5V
- Supports debugging of source level (assembly and C languages, a mixed indication)
- Simplified graphic interface operation execution using pull-down menu and buttons
- Real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Hardware break × 5, software break × 4096, code event × 2, data event × 2
- Operation cycle measurement function
- Host I/F (standard accessories) : RS-232C (max 115 Kbps) , LAN (10BASE-T, 100BASE-TX) , USB 1.1

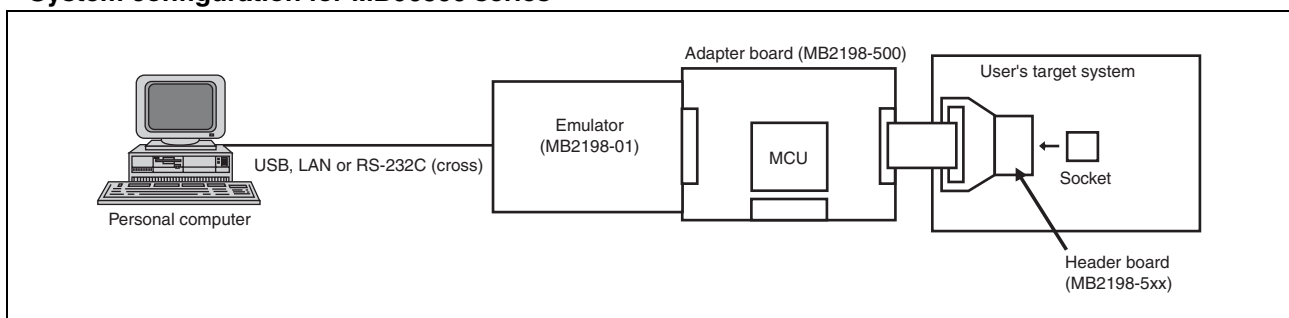
System Overview



System configuration



• System configuration for MB96300 series



16-bit Proprietary F²MC-16FX Family Support Tools

F²MC-16FX Emulator

• F²MC-16FX emulator main unit

Name	Part number	Remarks	Overview
F ² MC-16FX Emulator main unit	MB2198-01	- The systems development support tool which used MCU for evaluating F²MC-16FX and builds in DSU interface. - Power supply voltage: AC100V or AC200 V - Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg	

• Adaptor board

Name	Part number	Remarks	Overview
F ² MC-16FX Adaptor board	MB2198-500	- For F²MC-16FX (Evaluation device package : BGA-416) - Dimensions: 109 mm (width) × 204 mm (depth) × 33 mm (height) - Weight: 0.2 kg - Includes: Flat cable (standard, long) × each 2 manual	

• Header board

Name	Part number	Remarks	Overview
QFP-100 0.65mm pitch □ 14 × 20 mm	MB2198-501	- For MB96340 series - Package code: FPT-100P-M22 - Includes: NQPACK100RB179-A, HQPACK100RB179 * - NQPACK100RB179-A enables probe cable connection and mounted IC evaluation. manual	
LQFP-100 0.5mm pitch □ 14 × 14 mm	MB2198-502	- For MB96340 series - Package code: FPT-100P-M20 - Includes: NQPACK100SD-ND, HQPACK100SD, YQPACK100SD * - NQPACK100SD-ND enables probe cable connection and mounted IC evaluation. manual	
LQFP-64 0.5mm pitch □ 10 × 10 mm	MB2198-503	- For MB96350 series - Package code: FPT-64P-M24 - Includes: NQPACK064SD-ND, HQPACK064SD * - NQPACK064SD-ND enables probe cable connection and mounted IC evaluation. manual	
LQFP-64 0.65mm pitch □ 12 × 12 mm	MB2198-504	- For MB96350 series - Package code: FPT-64P-M23 - Includes: NQPACK064SB, YQPACK064SB, HQPACK064SB14 * - NQPACK064SB enables probe cable connection and mounted IC evaluation. manual	
LQFP-80 0.5mm pitch □ 12 × 12 mm	MB2198-505	- For MB96320 series - Package code: FPT-80P-M21 - Includes: NQPACK080SD-ND, HQPACK080SD * - NQPACK080SD-ND enables probe cable connection and mounted IC evaluation. manual	
LQFP-120 0.65mm pitch □ 16 × 16 mm	MB2198-16FX-120P-M21	- For MB96380 series - Package code: FPT-120P-M21 - Includes: NQPACK120SD, HQPACK120SD, YQPACK120SD * - NQPACK120SD enables probe cable connection and mounted IC evaluation. manual	

*:The header board requires NQPACK.

Note: Care is required in printed circuit board pattern design because the position of the board connector part (the flat section at the pin tips) of the NQPACK differs from the mass production product package.

Contact for details: Tokyo Eletech Co, Ltd. TEL(81)3-5295-1661

16-bit Proprietary F²MC-16FX Family Support Tools

Evaluation Tools

MB96320 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2198-01	ICE	-
Adaptor board	MB2198-500	With header cable	-
Header board	MB2198-505	LQFP-80 (0.5 mm, 12 × 12 mm) FPT-80P-M21	-
Evaluation device	MB96V300BRB-ES	BGA416	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Expansion trace board	MB2198-590-E	Large capacity / 2 GB Expansion trace board	Option

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB96F326	LQFP-80(0.5 mm, 12 × 12 mm) FPT-80P-M21	(Not supported)	(Not supported)

[Fujitsu Microelectronics PC serial programmer for Flash MCU]

Name	Flash microcontroller	Remarks
FUJITSU FLASH MCU Programmer	Under development	Fujitsu Microelectronics PC serial programmer

MB96340 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2198-01	ICE	-
Adaptor board	MB2198-500	With header cable	-
Header board	MB2198-501	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M22	Selectable
	MB2198-502	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	
Evaluation device	MB96V300BRB-ES	BGA416	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Expansion trace board	MB2198-590-E	Large capacity / 2 GB Expansion trace board	Option
Evaluation board	BBF2004-MB	Sunhayato Main board	
	BBF2001-100CL2-NB	Sunhayato Daughter board for QFP-100 (0.65 mm, 14 × 20 mm)	
	BBF2004-100SCL-NB	Sunhayato Daughter board for QFP-100 (0.5 mm, 14 × 14 mm)	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

16-bit Proprietary F²MC-16FX Family Support Tools

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB96F346/347/348	QFP-100 (0.65 mm, 14 × 20 mm) FPT-100P-M22	TEF110-96F348_QFP	(Not supported)
	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	TEF110-96F348_LQFP	(Not supported)

[Fujitsu Microelectronics PC serial programmer for Flash MCU]

Name	Flash microcontroller	Remarks
FUJITSU FLASH MCU Programmer	MB96F346R/Y MB96F347R/Y MB96F348H/T/R/Y	Fujitsu Microelectronics PC serial programmer

MB96350 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2198-01	ICE	-
Adaptor board	MB2198-500	With header cable	-
Header board	MB2198-503	LQFP-64 (0.5 mm, 10 × 10 mm) FPT-64P-M24	Selectable
	MB2198-504	LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M23	
Evaluation device	MB96V300BRB-ES	BGA416	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Expansion trace board	MB2198-590-E	Large capacity / 2 GB Expansion trace board	Option
Evaluation board	BBF2004-MB	Sunhayato Main board	
	BBF2004-64CL-NB	Sunhayato Daughter board for LQFP-64 (0.65 mm, 12 × 12 mm)	
	BBF2004-64SCL-NB	Sunhayato Daughter board for LQFP-64 (0.5 mm, 10 × 10 mm)	

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB96F346/347/348	LQFP-64 (0.5 mm, 10 × 10 mm) FPT-64P-M24	(Not supported)	(Not supported)
	LQFP-64 (0.65 mm, 12 × 12 mm) FPT-64P-M23	(Not supported)	(Not supported)

[Fujitsu Microelectronics PC serial programmer for Flash MCU]

Name	Flash microcontroller	Remarks
FUJITSU FLASH MCU Programmer	Under development	Fujitsu Microelectronics PC serial programmer

16-bit Proprietary F²MC-16FX Family Support Tools

MB96380 series

[Hardware]

Name	Part number	Description	Remarks
Main unit	MB2198-01	ICE	-
Adaptor board	MB2198-500	With header cable	-
Header board	MB2198-16FX-120P-M21	LQFP-120(0.65 mm, 16 × 16 mm) FPT-120P-M21	-
Evaluation device	MB96V300BRB-ES	BGA416	-
PC cable	LAN cable	10BASE-T/100BASE-TX	Selectable
	USB cable	USB1.1	
	RS-232C cable	9pin-9pin cross cable	
Expansion trace board	MB2198-590-E	Large capacity / 2 GB Expansion trace board	Option

[Software]

Software	Part number	Operating System
SOFTUNE V3 Professional Pack	SP3607Z008-P01	WindowsXP/2000/Vista

[Flash microcontroller for programming]

Flash microcontroller	Package	Parallel programmer	Serial on board programmer
		Flash Support Group, Inc. AF9708/AF9709B/AF9723B	Yokogawa Digital Computer Corporation
MB96F326	LQFP-120(0.65 mm, 16 × 16 mm) FPT-120P-M21	TEF110-96F387	(Not supported)

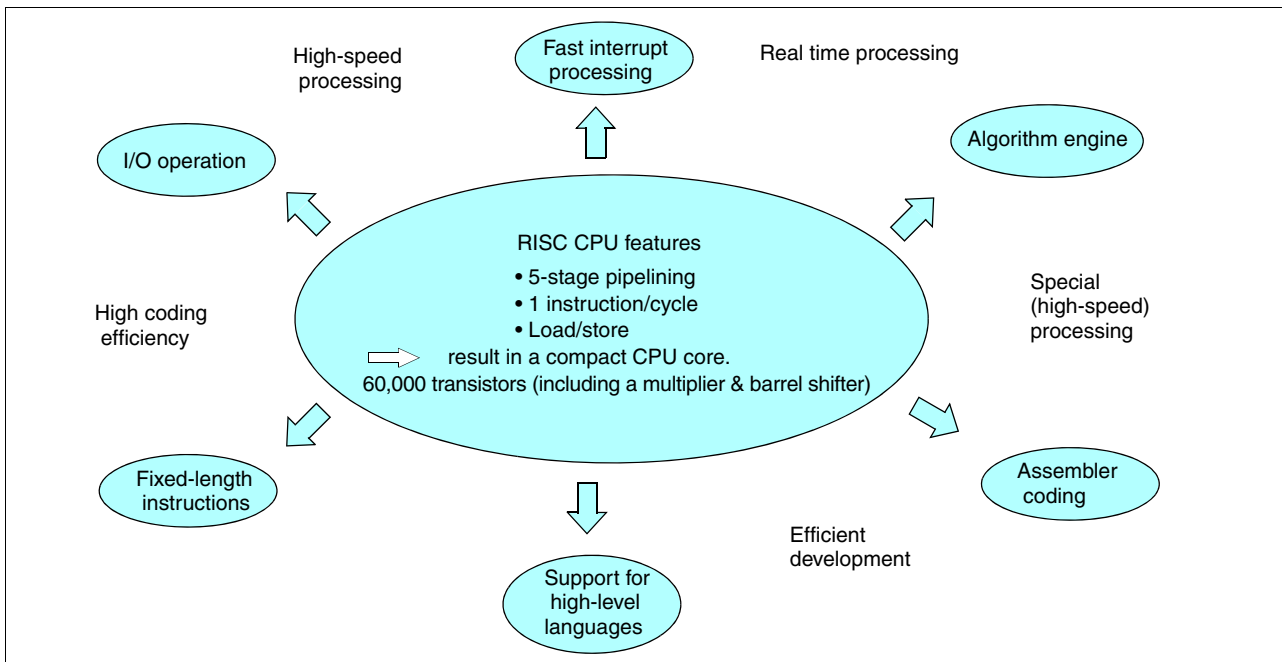
[Fujitsu Microelectronics PC serial programmer for Flash MCU]

Name	Flash microcontroller	Remarks
FUJITSU FLASH MCU Programmer	MB96F386R/Y MB96F387R/Y	Fujitsu Microelectronics PC serial programmer

32-bit FR Family

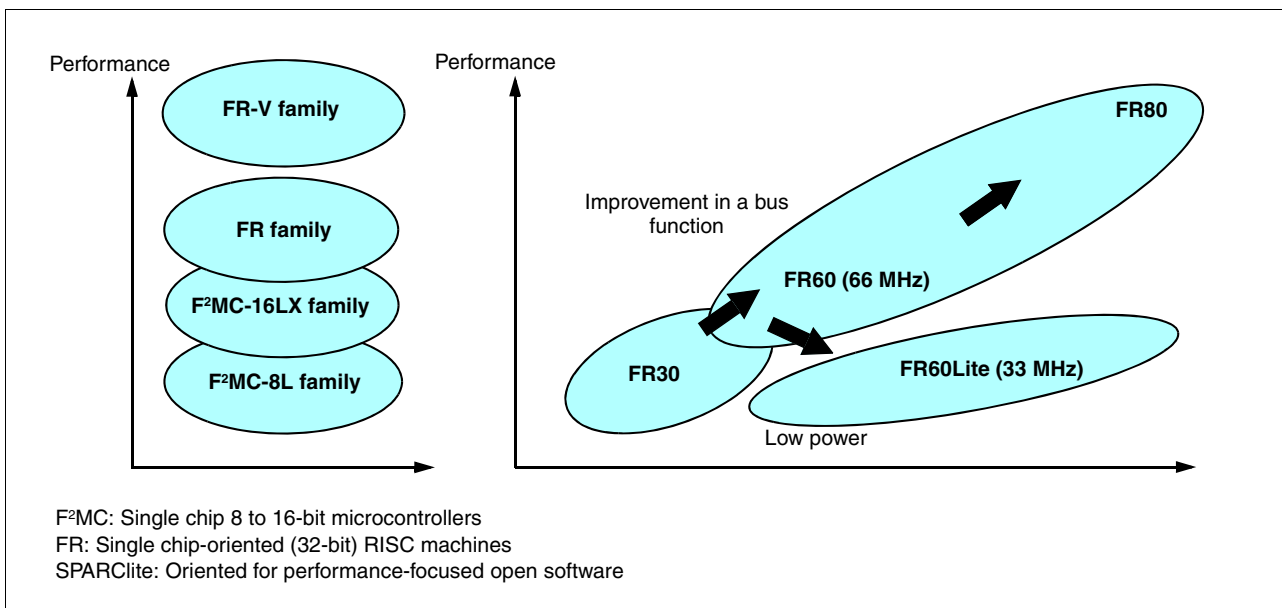
FR Family Features

- CPU core capable of running at a peak rate of 64 VAX MIPS (CPU core performance) at 50 MHz while featuring its compactness equivalent to 16-bit microcontrollers
- 5-stage pipelining and harvard-bus architecture, allowing efficient execution
- Implementation of, basically, 16-bit fixed length commands, providing high object code efficiency
- The command group enhanced for controllers and an algorithm engine, resulting in faster execution of instructions
- A variety of resources including the sum-of-product units
- Many kinds of internal peripheral devices
- **FR architecture features**

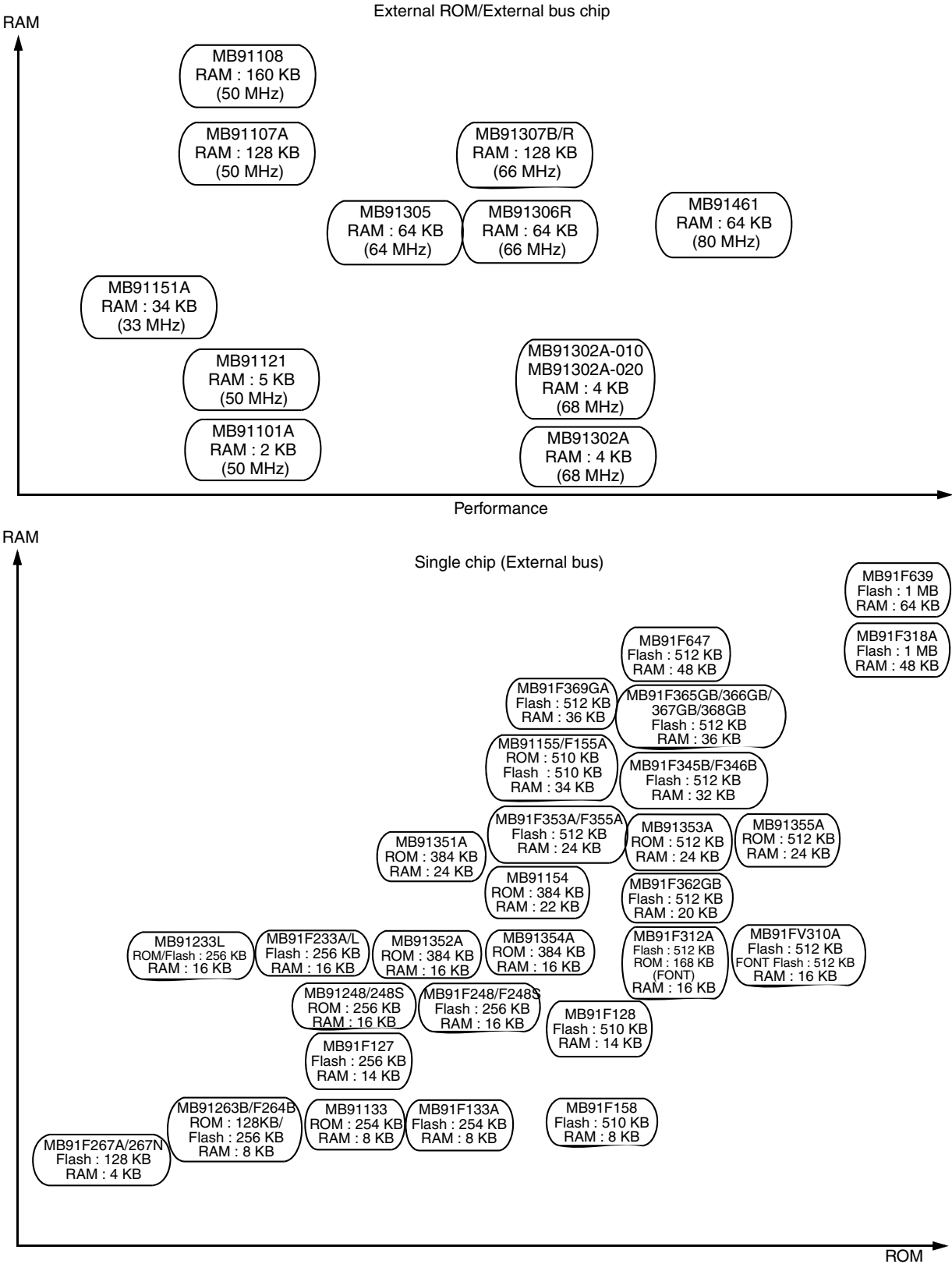


Fujitsu Microelectronics embedded RISC controller

The FR family is designed for optimum use in control systems while the SPARClite is suitable for data processing systems.

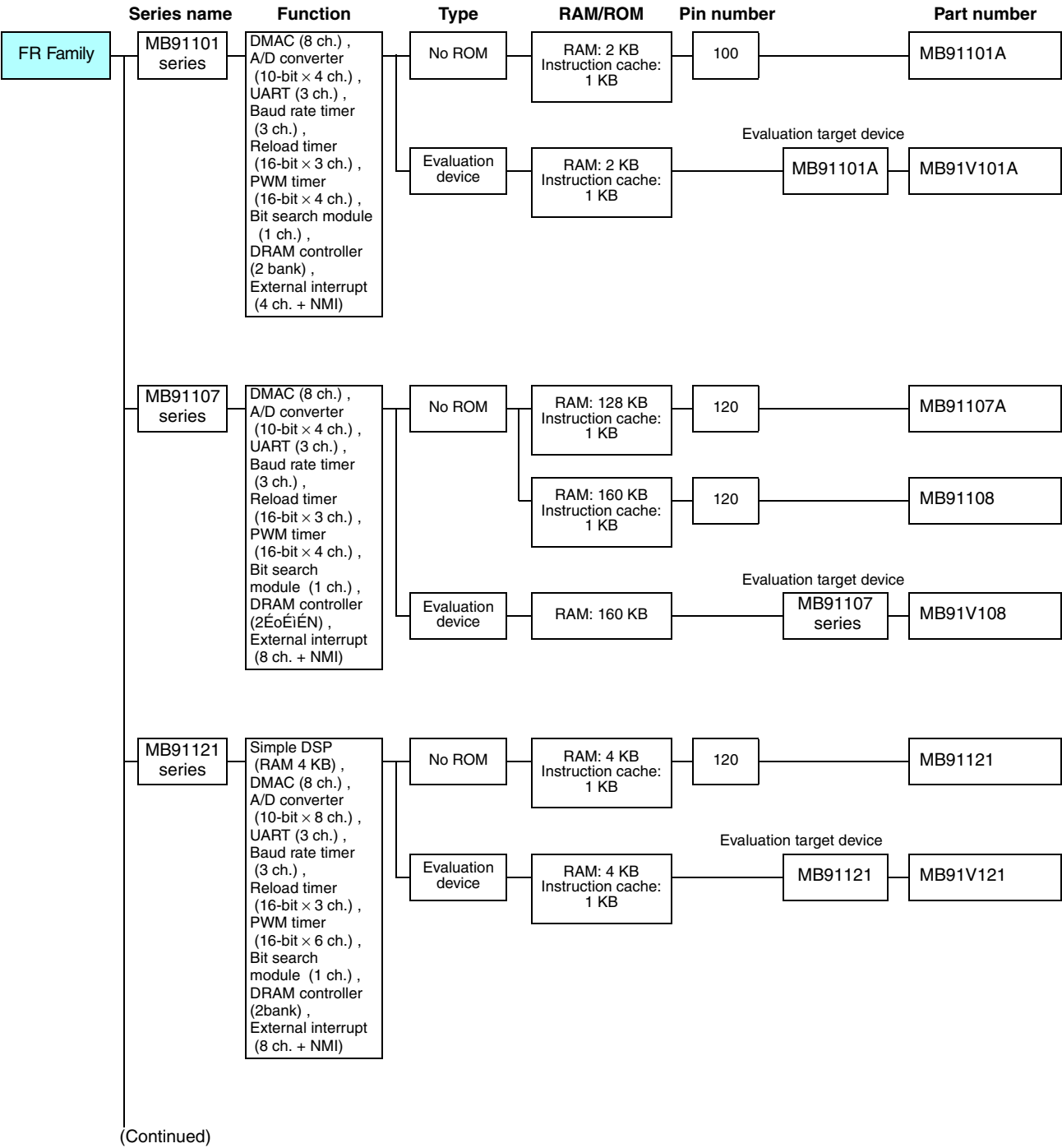


FR Family Product Range



32-bit FR Family

FR Family



■ MB91101 series

- For external bus, electronic musical instrument, game machine, etc.

MB91101A
RAM: 2 KB
Instruction cache: 1 KB

- Maximum clock frequency : 50 MHz
- Operating temperature range : -40 °C to +70 °C
- Operating power supply voltage : +5 V $\pm$ 10% / +3 V $\pm$ 10%

Part number	Operating power supply voltage (V)	Package		Functions	
		QFP (0.65 mm)	LQFP (0.5 mm)		
MB91101A	+5 $\pm$ 10 % or +3.3 (+3) $\pm$ 10 %	100P	100P	Maximum operating frequency : 50 MHz RAM : 2 KB Cache : Instruction cache 1 KB DRAM controller : 2 bank DMA controller : 8 ch. (External 3 ch.) UART/Baud rate timer : 3 ch./3 ch.	A/D converter : 10-bit $\times$ 4 ch. PWM timer : 4 ch. Reload timer : 16-bit $\times$ 3 ch. Bit search module : 1 ch. External interrupt input : 4 ch. + NMI I/O port : 54 port (multiplex with other signals)

Package: P-plastic

■ MB91107 series

- For DVD player, printer, CD-ROM, etc.

MB91107A
RAM: 128 KB
Instruction cache: 1 KB

MB91108
RAM: 160 KB
Instruction cache: 1 KB

- Maximum clock frequency : 50 MHz
- Operating temperature range : 0 °C to +70 °C
- Operating power supply voltage : +3.3 V $\pm$ 0.3 V

Part number	Operating power supply voltage (V)	Package		Functions	
		LQFP (0.5 mm)			
MB91107A	+3.3 $\pm$ 0.3	120P	Maximum operating frequency : 50 MHz RAM : 128KB(MB91107A) 160KB(MB91108) Cache : Instruction cache 1 KB DRAM controller : 2 bank DMA controller : 8 ch. (External 3 ch.) UART/Baud rate timer : 3 ch./3 ch.	A/D converter : 10-bit $\times$ 4 ch. PWM timer : 4 ch. Reload timer : 16-bit $\times$ 3 ch. Bit search module : 1 ch. External interrupt input : 8 ch. + NMI I/O port : 54 port (multiplex with other signals)	
MB91108		120P			

Package: P-plastic

■ MB91121 series

- For motor control, printer, DVD player, etc.

MB91121
RAM: 4 KB
Simple DSP

- Maximum clock frequency : 50 MHz
- Operating temperature range : 0 °C to +70 °C
- Operating power supply voltage : +3.3 V $\pm$ 0.3 V

Part number	Operating power supply voltage (V)	Package		Functions	
		LQFP (0.5 mm)			
MB91121	+3.3 $\pm$ 0.3	120P	Maximum operating frequency : 50 MHz RAM : 4 KB Cache : Instruction cache 1 KB Simple DSP : 16-bit fixed point operations DMA controller : 8 ch.	UART/Baud rate timer : 3 ch./3 ch. A/D converter : 10-bit $\times$ 8 ch. PWM timer : 16-bit $\times$ 4 ch. Reload timer : 16-bit $\times$ 3 ch.	

Package: P-plastic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91129 series	DMAC (5 ch.) , A/D converter (10-bit × 8 ch.) , UART (3 ch.) , Baud rate timer (3 ch.) , Reload timer (16-bit × 3 ch.) , PPGtimer (16-bit × 4 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 4 ch.) , free-run timer (16-bit × 1 ch.) , Bit search module (1 ch.) , External interrupt (6 ch. + NMI)	Flash	RAM: 14 KB Flash: 256 KB	100	MB91F127
			RAM: 14 KB Flash: 510 KB	120	MB91F128
		Evaluation device	RAM: 18 KB Flash: 510 KB	Evaluation target device MB91129 series	MB91FV129
MB91130 series	DMAC (8 ch.) , UP/DOWN counter (8-bit × 2 ch.) , A/D converter (10-bit × 8 ch.) , UART (5 ch.) , Reload timer (16-bit × 5 ch.) , D/A converter (8-bit × 3 ch.) , PPGtimer (16-bit × 6 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 8 ch.) , free-run counter (16-bit × 1 ch.)	MASK	RAM: 8 KB ROM: 254 KB	144	MB91133
		Flash	RAM: 8 KB Flash: 254 KB	144	MB91F133A
		Evaluation device	RAM: 8 KB Flash: 254 KB	Evaluation target device MB91130 series	MB91FV130

(Continued)

■ MB91129 series

- For mechatronics control, AV, home electric appliances control, etc.

MB91F127
Flash: 256 KB
RAM: 14 KB

MB91F128
Flash: 510 KB
RAM: 14 KB

- Maximum clock frequency : 25 MHz
- Operating temperature range : -30 °C to +70 °C
- Operating power supply voltage : +3.3 V ± 0.3 V

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm)		
MB91F127	+3.3 ± 0.3	100P	Maximum operating frequency : 25 MHz Flash memory : 256 KB(MB91F127) 510 KB(MB91F128)	Output compare : 16-bit × 4 ch. free-run timer : 16-bit × 1 ch. A/D converter : 8/10-bit × 8 ch. Reload timer : 16-bit × 3 ch. UART : 3 ch. External interrupt input : 6 ch.
MB91F128		100P	RAM : 14 KB PPGtimer : 4 ch. DMA controller : 5 ch. Input capture : 16-bit × 4 ch.	

Package: P-plastic

■ MB91130 series

- For mechatronics control, AV, home electric appliances control, etc.

MB91133
ROM: 254 KB
RAM: 8 KB

MB91F133A
Flash: 254 KB
RAM: 8 KB

- Maximum clock frequency : 33 MHz
- Operating temperature range : -40 °C to +70 °C
- Operating power supply voltage : +5 V ± 10% / +3.0 V to +3.6 V
+5 V ± 10% / +3.15 V to +3.6 V (MB91F133A)

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm)	BGA	
MB91133	+5 ± 10% +3.0 to +3.6	144P	144P	Operating frequency : 33 MHz ROM : 254 KB(MB91133) Flash memory : 254 KB(MB91F133A) RAM : 8 KB DMA controller : 8 ch. UP/DOWN counter : 8-bit × 2 ch. A/D converter : 10-bit × 8 ch. (With level comparator : 1 ch.)
MB91F133A	+5 ± 10% +3.15 to +3.6	144P	—	UART : 5 ch. Reload timer : 16-bit × 5 ch. D/A converter : 8-bit × 3 ch. PPGtimer : 16-bit × 6 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 8 ch. free-run counter : 16-bit × 1 ch.

Package: P-plastic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91150/ 151A/F158 series	DMAC (8 ch.) , UP/DOWN counter (8-bit × 2 ch.) , A/D converter (10-bit × 8 ch.) , UART (4 ch.) , Reload timer (16-bit × 2 ch., 4 ch.) , D/A converter (8-bit × 3 ch.) , PPGtimer (16-bit × 4 ch., 6 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 4 ch., 8 ch.) , free-run counter (16-bit × 1 ch.) , RTC (1 ch., no) , I ² C (1 ch., no)	No ROM	RAM: 34 KB Instruction cache : 1KB	144	MB91151A
		MASK	RAM: 22 KB ROM: 384 KB	144	MB91154
			RAM: 34 KB ROM: 510 KB	144	MB91155
		Flash	RAM: 34 KB Flash: 510 KB	144	MB91F155A
			RAM: 8 KB Flash: 510 KB	120	MB91F158
		Evaluation device	RAM: 34 KB Instruction cache : 1KB	Evaluation target device	
				MB91151A	MB91V151A
			RAM: 34 KB Flash: 510 KB	MB91154/155/ F155A/F158	MB91FV150

(Continued)

■ MB91150/151A/F158 series

- For mechatronics control, AV, home electric appliances control, etc.

- Maximum clock frequency : 33 MHz
- Operating temperature range : 0 °C to +70 °C
- Operating power supply voltage : +3.15 V to +3.6 V
+3.2 V to +3.5 V (MB91F158)



Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP (0.5 mm)		
MB91151A	+3.15 to +3.6	144P	Maximum operating frequency : 33 MHz ROM : 384 KB(MB91154) 510 KB(MB91155) Flash memory : 510 KB(MB91F155A) RAM : 34 KB (MB91151A/155/F155A) 22 KB (MB91154) Cache: Instruction cache: 1 KB (MB91151A) DMA controller : 8 ch. UP/DOWN counter : 8-bit × 2 ch. A/D converter : 10-bit × 8 ch.	UART : 4 ch. Reload timer : 16-bit × 4 ch. D/A converter : 8-bit × 3 ch. PPGtimer : 16-bit × 6 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 8 ch. free-run timer : 16-bit × 1 ch. I ² C : 1 ch. (MB91154/155/F155A) RTC : 1 ch. (MB91154/155/F155A)
MB91154		144P		
MB91155		144P		
MB91F155A		144P		
MB91F158	+3.2 to +3.5	120P	Operating frequency : 33 MHz Flash memory : 510 KB RAM : 8 KB UP/DOWN counter : 8-bit × 2 ch. A/D converter : 10-bit × 8 ch. UART : 2 ch.	Reload timer : 16-bit × 2 ch. D/A converter : 8-bit × 3 ch. PPGtimer : 16-bit × 4 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 4 ch. free-run timer : 16-bit × 1 ch.

Package: P-plastic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91301 series	DMAC (5 ch.) , UART (3 ch.) , Reload timer (16-bit × 3 ch.) , PPGtimer (16-bit × 4 ch.) , RTC (1 ch.) , SDRAM I/F, Instruction cache (4 KB) , A/D converter (10-bit × 4 ch.) , Input capture (16-bit × 4 ch.) , free-run timer (16-bit × 1 ch.) , I ² C (2 ch.)	MASK	RAM: 4 KB ROM: 4 KB Instruction cache: 4 KB	144	MB91302A
			RAM: 4 KB ROM: RTOS Instruction cache: 4 KB	144	MB91302A-010
			RAM: 4 KB ROM: Program loader Instruction cache: 4 KB	144	MB91302A-020
		Evaluation device	RAM: 16 KB Instruction cache: 4 KB	Evaluation target device MB91302A MB91V301A	
MB91305 series	DMAC (5 ch.) , A/D converter (10-bit × 10 ch.) , UART (5 ch.) , I ² C (4 ch.) External interrupt input (16 ch + NMI) , Reload timer (16-bit × 3 ch.) , PPGtimer (16-bit × 4 ch.) , PWC (16-bit × 1 ch.) , free-run timer (16-bit × 1 ch.) , SDRAM I/F, Input capture (16-bit × 4 ch.) , USB Function (USB2.0) , SDRAM I/F	No ROM Evaluation device	RAM: 64 KB Instruction cache: 4 KB	176	MB91305
MB91307 series	DMAC (5 ch.) , A/D converter (10-bit × 4 ch.) , UART (3 ch.) , I ² C (1 ch.) , Reload timer (16-bit × 3 ch.) , Watch. Doc Timer (1 ch.)	No ROM	RAM: 64 KB Instruction cache: 1 KB	120	MB91306R
			RAM: 128 KB Instruction cache: 1 KB	120	MB91307B MB91307R
		Evaluation device	RAM: 128 KB Instruction cache: 1 KB	Evaluation target device MB91307 series MB91V307R	

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MB91301 series

- For printer, FAX, image processing, etc.

MB91302A ROM: 4 KB RAM: 4 KB	MB91302A-010 ROM: RTOS RAM: 4 KB	MB91302A-020 ROM: Program loader RAM: 4 KB

- Maximum clock frequency : 68 MHz
- Operating temperature range : 0 °C to +70 °C
- Operating power supply voltage: +3.0 V to +3.6 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP (0.4 mm)		
MB91302A	+3.3 ± 0.3	144P	Maximum operating frequency : 68 MHz RAM : 4 KB ROM : 4 KB (MB91302A) RTOS (MB91302A-010) Program loader (MB91302A-020) Instruction cache : 4 KB UART : 3 ch. External interrupt input : 9 ch.	I ² C : 2 ch. Input capture : 16-bit × 4 ch. SDRAM I/F DMA controller : 5 ch. PPGtimer : 16-bit × 4 ch. A/D converter : 10-bit × 4 ch. Reload timer : 16-bit × 3 ch. Bit search module
MB91302A-010		144P		
MB91302A-020		144P		

Package: P-plastic

*1: Since the μ ITRON3.0 kernel and main system calls are built-in ROM, a high real-time system is realizable.

*2: Since ROM only for program loader is built-in, the rewriting program in an external flash memory can be transmitted to RAM, and can be performed.

MB91305 series

- For TV control, home electric appliances control, etc.

MB91305 RAM: 64 KB Instruction cache : 4 KB

- Maximum clock frequency : 64 MHz
- Operating temperature range : 0 °C to +70 °C
- Operating power supply voltage: +3.0 V to +3.6 V, +1.65 V to +1.95 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP (0.5 mm)		
MB91305	+3.3 ± 0.3 +1.8 ± 0.15	176P	Maximum operating frequency : 64 MHz Cache : Instruction cache : 4 KB RAM : 64 KB DMAC : 5 ch. A/D converter : 10-bit × 10 ch. UART : 5 ch. I ² C : 4 ch. External interrupt input : 16 ch. + NMI	Reload timer : 16-bit × 3 ch. PPG timer : 16-bit × 4 ch. PWC timer : 16-bit × 1 ch. free-run timer : 16-bit × 1 ch. Input capture : 16-bit × 4 ch. USB-Function : USB2.0 Watch DOG Timer SDRAM I/F

Package: P-plastic

MB91307 series

- For FAX, printer, DVD player, etc.

MB91306R RAM: 64 KB Instruction cache : 1 KB Twin 3.3/1.8 V	MB91307B RAM: 128 KB Instruction cache : 1 KB Single 3.3 V	MB91307R RAM: 128 KB Instruction cache : 1 KB Twin 3.3/1.8 V

- Maximum clock frequency : 66 MHz
- Operating temperature range : 0 °C to +70 °C
- Operating power supply voltage:
 - MB91307B +3.0 V to +3.6 V
 - MB91306R/307R +3.0 V to +3.6 V, +1.65 V to +1.95 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP (0.5 mm)		
MB91306R	+3.3 ± 0.3 +1.8 ± 0.15	120P	Maximum operating frequency : 66 MHz RAM : 64 KB (MB91306R) 128 KB (MB91307B/307R) Cache : Instruction cache 1 KB UART : 3 ch. External interrupt input : 9 ch.	I ² C : 1 ch. U-Timer : 3 ch. Reload timer : 16-bit × 3 ch. A/D converter : 10-bit × 4 ch. Watch DOG Timer DMAC : 5 ch. (External 3 ch.)
MB91307B	+3.3 ± 0.3	120P		
MB91307R	+3.3 ± 0.3 +1.8 ± 0.15	120P		

Package: P-plastic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91310 series	DMAC (5 ch.) , A/D converter (10-bit × 10 ch.) , UART (5 ch.) , U-Timer (5 ch.) , I ² C (4 ch.) Reload timer (16-bit × 3 ch.) , PPG timer (16-bit × 4 ch.) , PWC (16-bit × 1 ch.) , Multifunction timer (4 ch.) , USB host (USB 1.0) , USB function (USB 1.1) , OSDC, Bit search module (4 ch.) External interrupt input (5 ch.)	Flash	RAM: 16 KB Flash: 512 KB FONT ROM: 168 KB	144	MB91F312A
MB91313A series	DMAC (5 ch.) , A/D converter (10-bit × 10 ch.) , Multi function serial interface (11 ch.) , Reload timer (16-bit × 6 ch.) , PWC (16-bit × 1 ch.) , PPG timer (16-bit × 4 ch.) , Multifunction timer (4 ch.) , HDMI-CEC/Remote control reception (2 ch.) , Bit search module (1 ch.) External interrupt input (24 ch. + NMI)	Flash/ Evaluation device	RAM: 32 KB Flash: 544 KB	120	MB91F313A

(Continued)

■ MB91310 series

- For TV, PDP control, home electric appliances control, etc.

MB91F312A
Flash: 512 KB
FONT ROM: 168 KB
RAM: 16 KB

- Maximum clock frequency : 40 MHz
- Operating temperature range : -10 °C to +70 °C
- Operating power supply voltage : +3.0 V to +3.6 V
+2.35 V to +2.65 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP (0.5 mm)		
MB91F312A	+3.3 ± 0.3 +2.5 ± 0.15	144P	Maximum operating frequency : 40 MHz Flash memory : 512 KB FONT ROM : 168 KB (MB91F312A) FONT Flash memory : 512 KB (MB91FV310A) RAM : 16 KB A/D converter : 10-bit × 10 ch. External interrupt input : 5 ch. UART : 5 ch PPG : 16-bit × 4 ch.	Multifunction timer : 4 ch. (Interval timer, event count, capture) Reload timer : 16-bit × 3 ch. PWC timer : 16-bit × 1 ch. I ² C : 4 ch. USB host : USB1.0 USB function : USB1.1 OSDC Watch DOG Timer Bit search module : 4 ch.

Package: P-plastic

■ MB91313A series

- For TV control, home electric appliances control, etc.

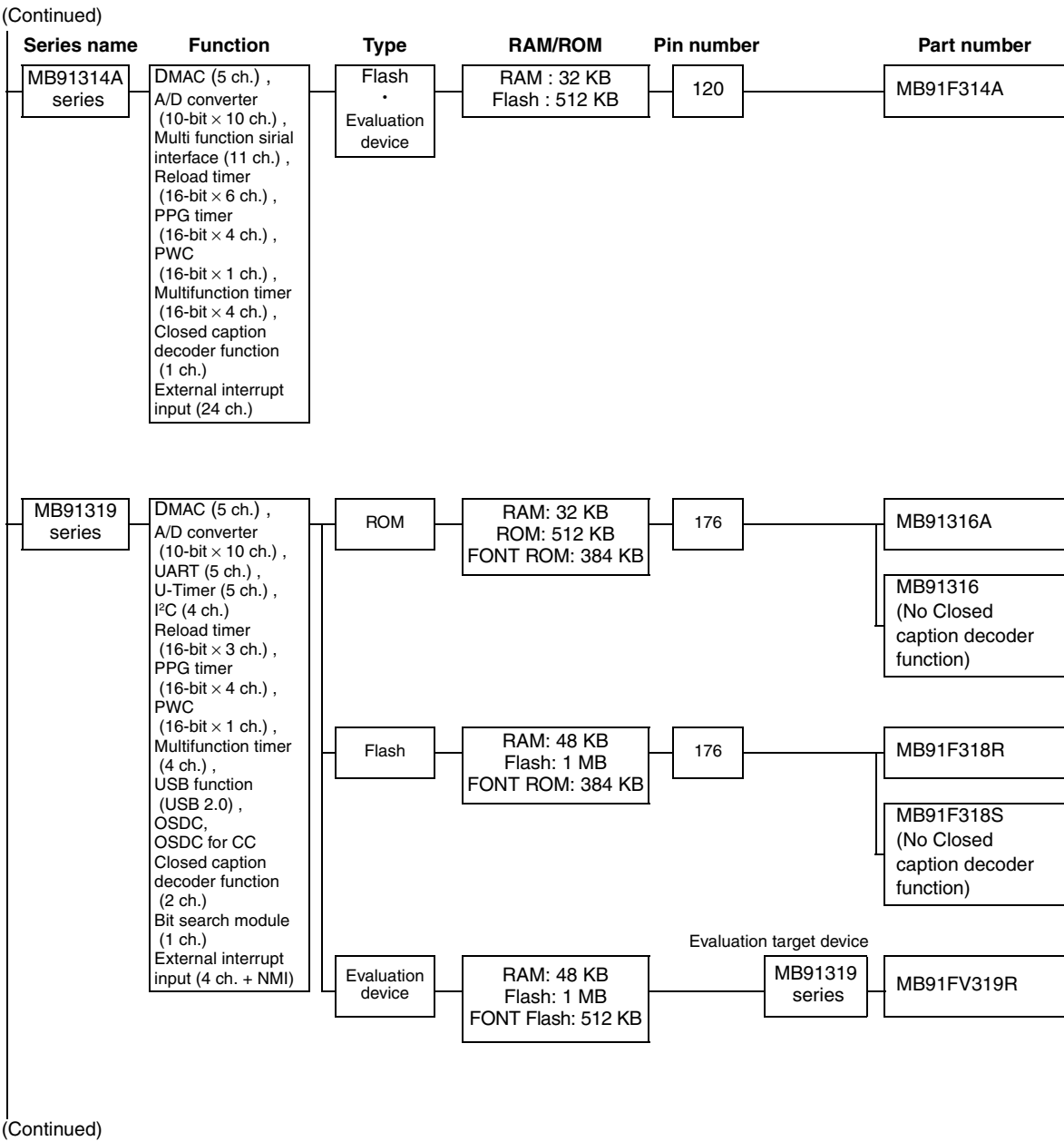
MB91F313A
Flash : 544 KB
RAM : 32 KB

- Maximum clock frequency : 33 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage : +3.0 V to +3.6 V
+1.65 V to +1.95 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP (0.5 mm)		
MB91F313A	+3.0 to +3.6 +1.65 to +1.95	120P	Maximum operating frequency : 33 MHz Flash memory : 544 KB RAM : 32 KB DMA Controller : 5 ch. A/D converter : 10-bit × 10 ch. Multifunction serial interface (UART/SIO/I ² C) : 11 ch. Reload timer : 16-bit × 6 ch. PWC timer : 16-bit × 1 ch. PPG : 16-bit × 4 ch. Multifunction timer : 4 ch. (Interval timer, event count, capture) HDMI-CEC/Remote control reception : 2 ch Bit search module External interrupt input : 24 ch. Watch DOG Timer Watch timer	

Package: P-plastic

32-bit FR Family



■ MB91314A series

- For TV control, home electric appliances control, etc.

MB91F314A
Flash: 512 KB
RAM: 32 KB

- Maximum clock frequency : 33 MHz
- Operating temperature range : -10 °C to +70 °C
- Operating power supply voltage : +3.0 V to +3.6 V
+1.65 V to +1.95 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP (0.5 mm)	
MB91F314A	+3.0 to +3.6 +1.65 to +1.95	120P	Maximum operating frequency : 33 MHz Flash memory : 512 KB RAM : 32 KB DMA Controller : 5 ch. A/D converter : 10-bit × 10 ch. Multifunction serial interface (UART/SIO/I ² C) : 11 ch. Reload timer : 16-bit × 6 ch. PPG : 16-bit × 4 ch. PWC timer : 16-bit × 1 ch. Multifunction timer : 4 ch. (Interval timer, event count, capture) Closed caption decoder function : 1 ch External interrupt input : 24 ch. Bit search module Watch DOG Timer

Package: P-plastic

■ MB91319 series

- For TV, PDP control, home electric appliances control, etc.

MB91316A, MB91316
ROM: 512 KB
FONT ROM: 384 KB
RAM: 32 KB

MB91F318R, MB91F318S
Flash: 1 MB
FONT ROM: 384 KB
RAM: 48 KB

- Maximum clock frequency : 40 MHz
- Operating temperature range : -10 °C to +70 °C
- Operating power supply voltage : +3.3 ± 0.3 V/+1.8 ± 0.15 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP (0.5 mm)	
MB91316A	+3.0 to +3.6 +1.65 to +1.95	176P	Maximum operating frequency : 40 MHz Flash memory : 1 MB (MB91F318R/F318S) ROM : 512 KB (MB91316A/316) FONT ROM : 384 KB RAM : 32 KB (MB91316A/316) 48 KB (MB91F318R/F318S) A/D converter : 10-bit × 10 ch. External interrupt input : 5 ch. UART : 5 ch. Multifunction timer : 4 ch. (Interval timer, event count, capture) PWC timer : 16-bit × 1 ch. Reload timer : 16-bit × 3 ch. I ² C : 4 ch. USB function : USB2.0 OSDC OSDC for CC Closed caption decoder function : 2 ch. (MB91316A/F318R) Watch DOG Timer Bit search module : 1 ch. DMAC: 5 ch. PPG : 16-bit × 4 ch.
MB91316		176P	
MB91F318R	+3.0 to +3.6 +2.3 to +2.7	176P	
MB91F318S		176P	

Package: P-plastic

32-bit FR Family

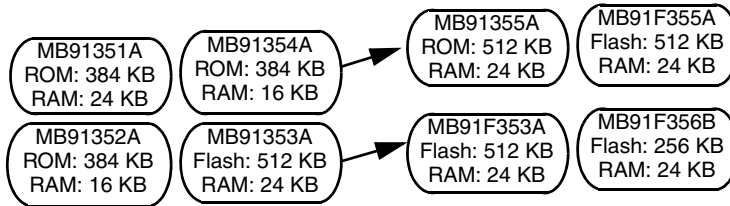
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Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91350A series	DMAC (5 ch.) , UP/DOWN counter (8-bit × 1 ch.) , A/D converter (10-bit × 8 ch.) , SIO (2 ch.) , UART (4 ch.) , Reload timer (16-bit × 4 ch.) , D/A converter (8-bit × 2 ch.) , PPGtimer (16-bit × 3 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 2 ch.) , free-run timer (16-bit × 1 ch.) , I ² C (1 ch.)	MASK	RAM: 24 KB ROM: 384 KB	120	MB91351A
			RAM: 16 KB ROM: 384 KB	120	MB91352A
			RAM: 24 KB Flash: 512 KB	120	MB91353A
		Flash	RAM: 24 KB Flash: 512 KB	120	MB91F353A
		Evaluation device	RAM: 16 KB DATA RAM: 16 KB	Evaluation target device MB91350A series MB91V350A	
	DMAC (5 ch.) , UP/DOWN counter (8-bit × 2 ch.) , A/D converter (10-bit × 12 ch.) , SIO (3 ch.) , UART (5 ch.) , Reload timer (16-bit × 4 ch.) , D/A converter (8-bit × 3 ch.) , PPGtimer (16-bit × 6 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 8 ch.) , free-run timer (16-bit × 1 ch.) , I ² C (1 ch.)	MASK	RAM: 16 KB ROM: 384 KB	176	MB91354A
			RAM: 24 KB ROM: 512 KB	176	MB91355A
		Flash	RAM: 24 KB Flash: 256 KB	176	MB91F356B
			RAM: 24 KB Flash: 512 KB	176	MB91F355A
		Evaluation device	RAM: 32 KB DATA RAM: 16 KB	Evaluation target device MB91350A series MB91V350A	

(Continued)

■ MB91350A series

- For mechatronics control, AV, home electric appliances control, etc.



- Maximum clock frequency : 50 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage : +3.0 V to +3.6 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP (0.5 mm)		
MB91351A	+3.3 ± 0.3	120P	Maximum operating frequency : 50 MHz RAM : 8 KB ROM : 384 KB (MB91351A/352A)	D/A converter : 8-bit × 2 ch. DMAC : 5 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 2 ch. Watch. DOG Timer
MB91352A		120P	Flash memory : 512 KB (MB91F353A) DATA RAM : 8 KB (MB91352A)	Reload timer : 16-bit × 4 ch. free-run timer : 16-bit × 1 ch. UP/DOWN counter : 8-bit × 1 ch. SIO : 1 ch. PPG : 16-bit × 3 ch.
MB91353A		120P	16 KB (MB91351A/F353A) UART : 4 ch. External interrupt input : 9 ch.	
MB91F353A		120P	I ² C : 1 ch. A/D converter : 10-bit × 8 ch.	
MB91354A		176P	Maximum operating frequency : 50 MHz RAM : 8 KB ROM : 384 KB (MB91354A)	D/A converter : 8-bit × 3 ch. DMAC : 5 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 8 ch. Watch. DOG Timer
MB91355A		176P	512 KB (MB91355A) Flash memory : 256 KB (MB91F356B) 512 KB (MB91F355A)	Reload timer : 16-bit × 4 ch. free-run timer : 16-bit × 1 ch. UP/DOWN counter : 8-bit × 2 ch. SIO : 3 ch. PPG : 16-bit × 6 ch.
MB91F355A		176P	DATA RAM : 8 KB (MB91354A) 16 KB (MB91355A/F355A/F356B)	
MB91F356B		176P	UART : 5 ch. External interrupt input : 17 ch. I ² C : 1 ch. A/D converter : 10-bit × 12 ch.	

Package: P-plastic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91210 series	CAN controller (3 ch.) , LIN-UART (7 ch.) , A/D converter (10-bit × 32 ch.) , Reload timer (16-bit × 3 ch.) , PPG timer (16-bit × 8 ch.) , Input capture (16-bit × 8 ch.) , Output compare (16-bit × 8 ch.) , Free-run timer (16-bit × 4 ch.) , DMAC (5 ch.) , External interrupt input (16 ch.) , Real time clock	MASK	RAM : 24 KB ROM : 544 KB	144	MB91213A
		Flash	RAM : 16 KB Flash : 288 KB	100	MB91F211B
			RAM : 24 KB Flash : 544 KB	144	MB91F213A
		Evaluation device	RAM : 36 KB	Evaluation target device MB91210 series MB91V210	
MB91220 series	CAN controller (2 ch.) , LIN-UART (4 ch.) , I ² C (2 ch.) , A/D converter (10-bit × 24 ch.) , D/A converter (8-bit × 2 ch.) , Reload timer (16-bit × 3 ch.) , PPG timer (16-bit × 16 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 2 ch.) , Free-run timer (16-bit × 2 ch.) , PWC timer (16-bit × 1 ch.) , DMAC (5 ch.) , External interrupt input (8 ch.) , Stepping motor controller (4 ch.) , Sound generator (3 ch.) , Real time clock	Flash	RAM : 16 KB ROM : 512 KB	144	MB91F223
					MB91F223S
		Flash	RAM : 24 KB ROM : 768 KB	144	MB91F224
					MB91F224S
		Evaluation device	RAM : 64 KB	Evaluation target device MB91220 series MB91V220B	

(Continued)

MB91210 series

- For automotive products, etc.

MB91213A
ROM : 544 KB
RAM : 24 KB

MB91F211B
Flash : 288 KB
RAM : 16 KB

MB91F213A
Flash : 544 KB
RAM : 24 KB

- Maximum clock frequency : 40 MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage : +3.5 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP		
MB91213A	+3.5 to +5.5	144P	Maximum operating frequency : 40 MHz Flash memory : 544 KB (MB91F213A), 288 KB (MB91F211B) ROM : 544 KB (MB91213A) RAM : 24 KB (MB91F213A/MB91213A) 16 KB (MB91F211B) DMA controller : 5 ch. A/D converter : 10-bit × 32 ch. (MB91F213A/MB91213A) 10-bit × 16 ch. (MB91F211B) CAN interface (32 message buffer) : 3 ch. (MB91F213A/MB91213A) 1 ch. (MB91F211B) LIN-UART : 7 ch. (MB91F213A/MB91213A), LIN 4 ch. + no LIN : 1 ch. (MB91F211B)	Reload timer : 16-bit × 3 ch. PPG timer : 16-bit : 8 ch. (MB91F213A/MB91213A) 16-bit : 4 ch. (MB91F211B) External interrupt input : 16 ch. Input capture : 16-bit × 8 ch. (MB91F213A/MB91213A) 16-bit × 4 ch. (MB91F211B) Output compare : 16-bit × 8 ch. (MB91F213A/MB91213A) 16-bit × 4 ch. (MB91F211B) Free-run timer : 16-bit × 4 ch. (MB91F213A/MB91213A) 16-bit × 2 ch. (MB91F211B) External interrupt input (16 ch.) Real time clock
MB91F213A				
MB91F211B		100P		

Package: P-plastic

MB91220 series

- For automotive products, etc.

MB91F223/S
Flash : 512 KB
RAM : 16 KB

MB91F224/S
Flash : 768 KB
RAM : 24 KB

- Maximum internal clock frequency : 32 MHz
- Operating temperature range : -40 °C to +105 °C,
-40 °C to +85 °C (during external
bus operation)
- Operating power supply voltage : +3.5 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP		
MB91F223 *2	+3.5 to +5.5	144P	Maximum operating frequency: 32 MHz Flash memory: 512 KB (F223/S), 768 KB (F224/S) RAM: 16 KB (F223/S), 24 KB (F224/S) DMAC: 5 ch.	
MB91F223S *1		144P	Successive approximation A/D converter: 10-bit × 24 ch. CAN interface (32 message buffer): 2 ch. LIN-UART: 4 ch. I ² C: 2 ch.	
MB91F224 *2		144P	Reload timer: 16-bit × 3 ch. PPG timer: 16-bit × 16 ch. External interrupt: 8 ch. Input capture: 16-bit × 4 ch. Output compare: 16-bit × 2 ch. Free-run timer: 16-bit × 2 ch. PWC timer: 16-bit × 1 ch. DMAC: 5 ch.	
MB91F224S *1		144P	External interrupts: 8 ch. Stepper motor controller: 4 ch. sound generator: 3 ch. Real time clock	

Package: P-plastic, C-ceramic

*1: single clock *2: dual clock

32-bit FR Family

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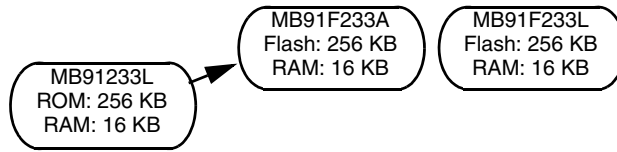
Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91230 series	UP/DOWN counter (8-bit × 2 ch.) , A/D converter (10-bit × 8 ch.) , UART (4 ch.) , Reload timer (16-bit × 4 ch.) , D/A converter (8-bit × 2 ch.) , PPGtimer (16-bit × 6 ch.) , Input capture (16-bit × 2 ch.) , Output compare (16-bit × 4 ch.) , free-run timer (16-bit × 1 ch.) , RTC (1 ch.) , LCD controller (4 com × 32 seg)	MASK	RAM: 16 KB ROM: 256 KB	120	MB91233L
		Flash	RAM: 16 KB Flash: 256 KB	120	MB91F233A MB91F233L
		Evaluation device	RAM: 24 KB	Evaluation target device MB91230 series MB91V230	
MB91245 series	CAN controller (2 ch.) , UART for LIN (3 ch.) , UART (1 ch.) , LCD controller (4 com × 32 seg) Stepping motor controller (6 ch.) , A/D converter (10-bit × 32 ch.) , Reload timer (16-bit × 3 ch.) , PPG timer (16-bit × 4 ch.) , Input capture (16-bit × 4 ch.) , PWC timer (16-bit × 1 ch.) , Output compare (16-bit × 2 ch.) , free-run timer (16-bit × 2 ch.) , RTC Sound generator (3 ch.) , DMAC (5 ch.) , External interrupt input (8 ch.)	MASK	RAM: 16 KB ROM: 256 KB	120	MB91248 * MB91248S *
		Flash	RAM: 16 KB Flash: 256 KB	120	MB91F248 MB91F248S
		Evaluation device	RAM: 32 KB	Evaluation target device MB91245 series MB91V245A	

*: Underdevelopment

(Continued)

MB91230 series

- For camera, IC recorder, home electric appliances control, etc.



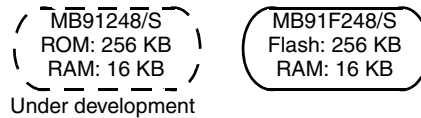
- Maximum clock frequency : 33.6 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage
 MB91F233A/V230: +4.0 V to +5.25 V (External)
 +3.0 V to +3.6 V (Internal)
 MB91233L/F233L: +3.0 V to +3.6 V
 A/D, D/A input: +3.0 V to +3.6 V

Part number	Operating power supply voltage (V)	Package		Functions	
		LQFP (0.4 mm)	FLGA		
MB91233L	+3.0 to +3.6	120P	120P Under development	Maximum operating frequency : 33 MHz RAM : 16 KB ROM : 256 KB (MB91233L) Flash memory : 256 KB (MB91F233A/F233L)	Up/down counter : 16-bit × 2 ch. Reload timer : 16-bit × 4 ch. free-run timer : 8-bit × 2 ch. Watch timer : 15 bit × 1 ch. PWCtimer : 8-bit × 2 ch. Input capture : 16-bit × 2 ch. Output compare : 16-bit × 4 ch. LCDC : SEG00-31/COM0-3 Watch DOG Timer Bit search module
MB91F233A	+4.0 to +5.25 (External) +3.0 to +3.6 (Internal)	120P	—	A/D converter : 10-bit × 8 ch. D/A converter : 8-bit × 2 ch. External interrupt input : 16 ch. UART : 4 ch. PPG : 16-bit × 6 ch.	
MB91F233L	+3.0 to +3.6	120P	120P Under development		

Package: P-plastic

MB91245 series

- For automotive products, display control, etc.



- Maximum clock frequency : 32 MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage : +3.5 V to +5.5 V

Part number	Operating power supply voltage (V)	Package		Functions	
		LQFP			
©MB91248 *2	+3.5 to +5.5	144P	Maximum operating frequency : 32 MHz RAM : 16 KB ROM : 256 KB (MB91248/248S) Flash memory : 256 KB (MB91F248/F248S)	Reload timer : 16-bit × 3 ch. PPG timer : 16-bit × 4 ch. (8-bit × 8 ch.) Input capture : 16-bit × 4 ch. Output compare : 16-bit × 2 ch. free-run timer : 16-bit × 2 ch. PWC counter : 16-bit × 1 ch. Timebase timer (WDT) : 16-bit × 1 ch. Real time clock Sound generator : 1 ch. External interrupt input : 8 ch. Low-power consumption modes : sleep, stop, watch mode	
©MB91248S *1		144P	DMAC : 5 ch. CAN interface (32 message buffer) : 2 ch. UART for LIN : 3 ch. UART : 1 ch. LCDC : 4COM × 32SEG		
MB91F248 *2		144P	Stepping motor controller : 6 ch. A/D converter : 10-bit × 32 ch.		
MB91F248S *1		144P			

Package: P-plastic

©: Under development

*1 : single clock

*2 : dual clock

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91260 series	DMAC (5 ch.) , UP/DOWN counter (8-bit × 2 ch.) , A/D converter (10-bit × 12 ch.) , UART (3 ch.) , Reload timer (16-bit × 3 ch.) , PPGtimer (16-bit × 8 ch.) , PWCtimer (16-bit × 2 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 6 ch.) , free-run timer (16-bit × 1 ch.) , Wave generator, MAC macro	MASK	RAM: 8 KB ROM: 128 KB	100	MB91263B
			RAM: 8 KB Flash: 256 KB	100	MB91264B
		Flash	RAM: 8 KB Flash: 256 KB	100	MB91F264B
		Evaluation device	RAM: 8 KB	Evaluation target device MB91260 series MB91V260B	
MB91265A series	DMAC (5 ch.) , A/D converter (10-bit × 11 ch.) , UART (2 ch.) , Reload timer (16-bit × 3 ch.) , PPG-timer (16-bit × 4 ch.) , PWC timer (16-bit × 1 ch.) , External interrupt input (8 ch. + NMI) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 6 ch.) , free-run timer (16-bit × 3 ch.) , Wave generator, MAC macro	MASK	RAM: 4 KB ROM: 128 KB	64	MB91267A
					MB91267NA
		Flash	RAM: 4 KB Flash: 128 KB	64	MB91F267A
					MB91F267NA
		Evaluation device	RAM: 8 KB ROM: 256 KB	Evaluation target device MB91265 series MB91V265A	

(Continued)

FR Family

- Maximum clock frequency : 33 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +4.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm)	QFP	
MB91263B	+4.0 to +5.5	100P	100P	Maximum operating frequency : 33 MHz Flash memory : 256 KB (MB91F264B) ROM: 128 KB (MB91263B) 256 KB (MB91264B) RAM : 8 KB DMA controller : 5 ch. A/D converter : 10bit × 12 ch. UART : 3 ch. Reload timer : 16-bit × 3 ch. PPGtimer : 16-bit × 8 ch. PWCtimer : 16-bit × 2 ch. External interrupt input : 10 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 6 ch. free-run timer : 16-bit × 1 ch. Wave generator (for motor drive) MAC (Multiplication and Addition Calculator) macro
MB91264B		100P	100P	
MB91F264B		100P	100P	

Package: P-plastic

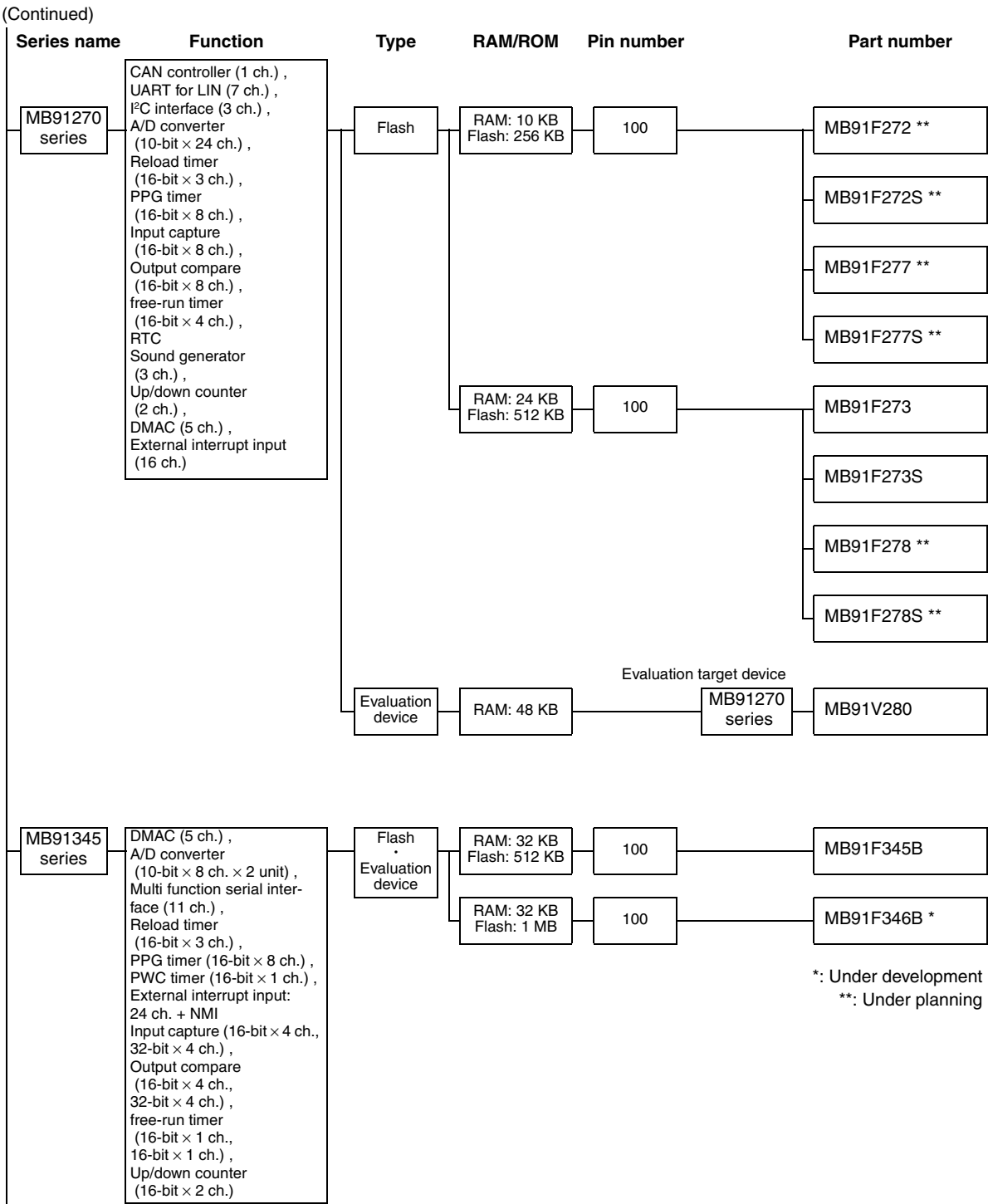
■ MB91265A series

- Maximum clock frequency : 33 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +4.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP (0.65 mm)		
MB91267A	+4.0 to +5.5	64P	Maximum operating frequency : 33 MHz Flash memory : 128 KB (MB91F267A/F267NA)	PWC timer : 16-bit × 1 ch. External interrupt input : 8 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 6 ch. free-run timer : 16-bit × 3 ch. Timebase timer (WDT) : 16-bit × 1 ch. Wave generator (for motor drive) MAC (Multiplication and Addition Calculator) macro Low-power consumption modes: sleep, stop, watch mode
MB91267NA			ROM : 128 KB (MB91267A/267NA) RAM : 4 KB (MB91F267A/F267NA) DMA controller : 5 ch. A/D converter : 10-bit × 11 ch. CAN interface (32 message buffer) : 1 ch. (MB91F267NA) UART : 2 ch. Reload timer : 16-bit × 3 ch. PPG timer : 16-bit × 4 ch.	
MB91F267A				
MB91F267NA				

Package: P-plastic

32-bit FR Family



(Continued)

MB91270 series

- For automotive products, etc.

MB91F272/S
Flash: 256 KB
RAM: 10 KB
Under planning

MB91F277/S
Flash: 512 KB
RAM: 24 KB
Under planning

MB91F273/S
Flash: 512 KB
RAM: 24 KB

MB91F278/S
Flash: 512 KB
RAM: 24 KB
Under planning

- Maximum clock frequency : 32 MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage : +3.5 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions	
		LQFP		
○MB91F272 *2	+3.5 to +5.5	100P	Maximum operating frequency : 32 MHz RAM :	Output compare : 16-bit × 8 ch. free-run timer : 16-bit × 4 ch. PPG timer : 16-bit × 8 ch. (8-bit × 16 ch.) Up/down counter : 2 ch. Timebase timer (WDT) : 16-bit × 1 ch. Real time clock Clock monitor External interrupt input : 16 ch. Low-power consumption modes: sleep, stop, real time clock mode clock supervisor (MB91F277/F277S/F278/F278S)
○MB91F272S *1		100P	10 KB (MB91F272/F272S/F277/F277S)	
MB91F273 *2		100P	24 KB (MB91F273/F273S/F278/F278S)	
MB91F273S *1		100P	Flash memory :	
○MB91F277 *2		100P	256 KB (MB91F272/F272S/F277/F277S)	
○MB91F277S *1		100P	512 KB (MB91F273/F273S/F278/F278S)	
○MB91F278 *2		100P	DMAC : 5 ch.	
○MB91F278S *1		100P	CAN interface (32 message buffer) : 1 ch. UART for LIN : 7 ch. I ² C interface : 3 ch. A/D converter : 10-bit × 24 ch. Reload timer : 16-bit × 3 ch. Input capture : 16-bit × 8 ch.	

Package: P-plastic

*1 : single clock, *2 : dual clock

○: Under planning

MB91345 series

- For audio-visual equipment, home electric equipment, mechatronics control, etc.

MB91F345B
Flash: 512 KB
RAM: 32 KB

MB91F346B
Flash: 1 MB
RAM: 32 KB

- Maximum clock frequency : 50 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +3.0 V to +3.6 V

Part number	Operating power supply voltage (V)	Package		Functions
		TQFP (0.4 mm)	LQFP (0.5 mm)	
MB91F345B	+3.0 to +3.6	100P	100P	Maximum operating frequency : 50 MHz Flash memory : 512 KB (MB91F345B) 1 MB (MB91F346B) RAM : 32 KB DMA controller : 5 ch. 10bit A/D converter : 8 ch. × 2 unit Multi function serial interface (UART/SIO/I ² C) : 11 ch. 2 channels are with built-in FIFO.
MB91F346B		100P	100P	Reload timer : 16-bit × 3 ch. PPG timer : 16-bit × 8 ch. (8-bit × 16 ch.) PWC timer : 16-bit × 1 ch. External interrupt : 24 ch. Input capture : 16-bit × 4 ch., 32-bit × 4 ch. Output compare : 16-bit × 4 ch., 32-bit × 4 ch. free-run timer : 16-bit × 2 ch., 32-bit × 1 ch. Up/down counter : 16-bit × 2 ch. (8-bit × 4 ch.)

Package: P-plastic

The pin of each peripheral function is using combinedly. Please confirm the combination of the peripheral function that can be used by the pin assignment.

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Stepping motor controller macro/sub clock	Part number	
MB91360 series	DMAC (5 ch.) , RTC (1 ch.) , I ² C (1 ch.) , SIO (2 ch.) , Watch. Dog Timer (1 ch.) , CAN (3 ch., 2 ch.) , A/D converter (10-bit × 16 ch., 10 ch., 8 ch.) , UART (3 ch., 2 ch., 1 ch.) , Reload timer (16-bit × 6 ch., 3 ch.) , D/A converter (8-bit × 2 ch., no) , PPGtimer (16-bit × 8 ch., 4 ch.) , Input capture (16-bit × 4 ch., no) , Output compare (16-bit × 4 ch., 2 ch., nothing) , free-run timer (16-bit × 2 ch., no) , Sound generator (1 ch., no)	MASK	RAM: 36 KB Flash: 512 KB	120	Yes/Yes	MB91366GA	
		Flash	RAM: 16 KB Flash: 256 KB	120	No/Yes	MB91F364G	
			RAM: 20 KB Flash: 512 KB	208	Yes/No	MB91F362GB	
			RAM: 36 KB Flash: 512 KB	120	Yes/No	MB91F365GB	
					Yes/Yes	MB91F366GB	
					No/No	MB91F367GB	
					No/Yes	MB91F368GB	
				160	No/No	MB91F369GA	
			RAM: 36 KB Flash: 768 KB	120	Yes/Yes	MB91F376G	
		Evaluation device	RAM: 36 KB Flash: 512 KB	Evaluation target device		MB91360 series	MB91FV360GA

(Continued)

MB91360 series

- For meter, mechatronics control, etc.

MB91F364G
Flash: 256 KB
RAM: 16 KB

MB91F365GB
Flash: 512 KB
RAM: 36 KB

MB91F366GB
Flash: 512 KB
RAM: 36 KB

MB91366GA
ROM: 512 KB
RAM: 36 KB

MB91F376G
Flash: 768 KB
RAM: 36 KB

MB91F369GA
Flash: 512 KB
RAM: 36 KB

MB91F362GB
Flash: 512 KB
RAM: 20 KB

MB91F367GB
Flash: 512 KB
RAM: 36 KB

MB91F368GB
Flash: 512 KB
RAM: 36 KB

- Maximum clock frequency : 64 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +4.25 V to +5.25 V

Part number	Operating power supply voltage (V)	Package		Functions
		QFP (0.65 mm)	QFP (0.5 mm)	
MB91F362GB	+4.25 to +5.25	—	208P	Maximum operating frequency : 64 MHz Flash memory : 512 KB RAM : 4 KB Instruction RAM : 4 KB DATA RAM : 12 KB DMA controller : 5 ch. (External 1 ch.) Stepping motor controller : 4 ch. A/D converter : 10bit × 16 ch. D/A converter : 10-bit × 2 ch. SIO : 2 ch. UART : 3 ch. I ² C : 1 ch. External interrupt : 8 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 4 ch. free-run timer : 16-bit × 2 ch. Reload timer : 16-bit × 6 ch. Watch DOG Timer CAN : 3 ch. U-Timer : 3 ch. Real time clock : 1 ch. PPG : 8 ch. Sound generator: 1 ch.
MB91F364G	+4.25 to +5.25	—	120P	Maximum operating frequency : 64 MHz Flash memory : 256 KB RAM : 4 KB DATA RAM : 12 KB A/D converter : 10bit × 12 ch. D/A converter : 10-bit × 2 ch. SIO : 1 ch. UART : 1 ch. I ² C : 1 ch. External interrupt : 8 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 4 ch. free-run timer : 16-bit × 2 ch. Reload timer : 16-bit × 3 ch. Watch DOG Timer CAN : 3 ch. U-Timer : 1 ch. Real time clock : 1 ch. PPG : 4 ch.
MB91F365GB	+4.25 to +5.25	—	120P	SIO : 2 ch. UART : 2 ch. I ² C : 1 ch. External interrupt : 8 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 2 ch. free-run timer : 16-bit × 2 ch. Reload timer : 16-bit × 6 ch. Watch DOG Timer CAN : 2 ch. Real time clock : 1 ch. PPG : 16-bit × 8 ch. Sound generator: 1 ch.
MB91366GA		—	120P	
MB91F366GB		—	120P	
MB91F376G		—	120P	
MB91F367GB	+4.25 to +5.25	—	120P	Maximum operating frequency : 64 MHz Flash memory : 512 KB RAM : 16 KB Instruction RAM : 4 KB DATA RAM : 16 KB DMA controller : 5 ch. A/D converter : 10bit × 8 ch. SIO : 2 ch. UART : 1 ch. I ² C : 1 ch. External interrupt : 8 ch. Input capture : 16-bit × 4 ch. Output compare : 16-bit × 2 ch. free-run timer : 16-bit × 2 ch. Reload timer : 16-bit × 3 ch. Watch DOG Timer CAN : 2 ch. Real time clock : 1 ch. PPG : 16-bit × 4 ch.
MB91F368GB		—	120P	Maximum operating frequency : 64 MHz Flash memory : 512 KB RAM : 16 KB Instruction RAM : 4 KB DATA RAM : 16 KB DMA controller : 5 ch. (External 1 ch.) CAN : 2 ch. A/D converter : 10bit × 10 ch. SIO : 2 ch.
MB91F369GA	+4.25 to +5.25	160P	—	Maximum operating frequency : 64 MHz Flash memory : 512 KB RAM : 16 KB Instruction RAM : 4 KB DATA RAM : 16 KB DMA controller : 5 ch. (External 1 ch.) CAN : 2 ch. A/D converter : 10bit × 10 ch. SIO : 2 ch.

Package: P-plastic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91460 series	DMAC (5 ch.) , CAN controller (2 ch.) , UART for LIN (7 ch.) , I ² C interface (3 ch.) , A/D converter (10-bit × 13 ch.) , Reload timer (16-bit × 5 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 4 ch.) , free-run timer (16-bit × 4 ch.) , PPG timer (16-bit × 8 ch.) , Timebase timer (WDT:26 bit × 1 ch.) , Real time clock External interrupt input (16 ch.) , DSU4	ROM less	RAM: 64 KB I-cache: 4 KB	176	MB91461
		Evaluation device	RAM: 128 KB	Evaluation target device MB91460 series MB91V460	
	DMAC (5 ch.) , CAN controller (2 ch.) , UART for LIN (7 ch.) , I ² C interface (3 ch.) , A/D converter (10-bit × 16 ch.) , Reload timer (16-bit × 5 ch.) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 4 ch.) , free-run timer (16-bit × 4 ch.) , PPG timer (16-bit × 8 ch.) , Timebase timer (WDT:26 bit × 1 ch.) , Real time clock External interrupt input (16 ch.) , SDRAM I/F	Flash	RAM: 64 KB ROM: 1088 KB cache: 4 KB	176	MB91F467R
		Evaluation device	RAM: 128 KB	Evaluation target device MB91460 series MB91V460	

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■ MB91460 series

- Car audio and car navigation, etc.

MB91461
RAM: 64 KB
I-cache: 4 KB

MB91F467R
Flash: 1088 KB
RAM: 64 KB
Cache: 4 KB

- Maximum clock frequency : 80 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +3.0 V to +3.6 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91461	+3.0 to +3.6	176P	Maximum operating frequency: 80 MHz Flash memory: 1088 KB (MB91F467R) RAM: 64 KB Instruction cache: 4 KB (MB91461) Cache: 8 KB (MB91F467R) DMAC: 5 ch. CAN interface (32 message buffer) : 2 ch. (MB91461) CAN interface (32 and 64 message buffer) : 2 ch. (MB91F467R) UART for LIN: 7 ch. I ² C bus interface: 3 ch. A/D converter: 10bit × 13 ch. (MB91461) 10bit × 16 ch. (MB91F467R) Rerod timer: 16-bit × 5 ch. Input capturer: 16-bit × 4 ch. Output compare: 16-bit × 4 ch. free-run timer: 16-bit × 4 ch. PPG timer: 16-bit × 8 ch. Timebase timer (WDT) : 26 bit × 1 ch. Realtime clock External interrupt input: 16 ch. Low-power consumption: sleep, stop, shut-down mode 5 V can be set to a part of I/O (When 5 V is supplied to the I/O power supply) . SDRAM I/F (MB91F467R) DSU4 (debug support unit, MB91461 only)
MB91F467R			

Package: P-plastic

32-bit FR Family

(Continued)	(Continued)					
Series name	Function	Type	RAM/ROM	Pin number	Part number	
MB91460 series	DMAC (5 ch.) , CAN controller (1 ch.) , UART for LIN (5 ch.) , I ² C interface (1 ch.) , A/D converter (10-bit × 21 ch.) , Reload timer (16-bit × 8 ch.) , Input capture (16-bit × 8 ch.) , Output compare (16-bit × 6 ch.) , free-run timer (16-bit × 8 ch.) , PPG timer (16-bit × 10 ch.) , Timebase timer (WDT:26 bit × 1 ch.) , Real time clock External interrupt input (10 ch.)	Flash	RAM: 16 KB Flash: 416 KB	100	MB91F464AB	
		Evaluation device	RAM: 128 KB	Evaluation target device MB91460 series MB91V460		
	DMAC (5 ch.) , CAN controller (1 ch.) , UART for LIN (5 ch.) , I ² C interface (1 ch.) , A/D converter (10-bit × 26 ch.) , Reload timer (16-bit × 8 ch.) , Input capture (16-bit × 8 ch.) , Output compare (16-bit × 8 ch.) , free-run timer (16-bit × 8 ch.) , PPG timer (16-bit × 12 ch.) , Timebase timer (WDT:26 bit × 1 ch.) , Real time clock External interrupt input (10 ch.)	Flash	RAM: 16 KB ROM: 544 KB	120	MB91F465KB	
		Evaluation device	RAM: 128 KB	Evaluation target device MB91460 series MB91V460		
(Continued)	(Continued)					

32-bit FR Family

- For automotive products, etc.

MB91F464AB
Flash: 416 MB
RAM: 16 KB

MB91F465KB
Flash: 544 MB
RAM: 16 KB
Cache: 4 KB

- Maximum clock frequency : 80 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F464AB	+3.0 to +5.5	100P	Maximum operating frequency: 80 MHz Flash memory: 416 KB (MB91F464AB) 544 KB (MB91F465KB) RAM: 16 KB Cache: 4 KB (MB91F465KB) DMAC: 5 ch. CAN interface (32 message buffer) : 1 ch. UART for LIN: 5 ch. I ² C bus interface: 1 ch. A/D converter: 10bit × 21 ch. (MB91F464AB) 10bit × 26 ch. (MB91F465KB)
MB91F465KB		120P	Rerod timer: 16-bit × 8 ch. Output compare: 16-bit × 6 ch. (MB91F464AB) 16-bit × 8 ch. (MB91F465KB) Input capturer: 16-bit × 8 ch. free-run timer: 16-bit × 4 ch. PPG timer: 16-bit × 10 ch. (MB91F464AB) 16-bit × 12 ch. (MB91F465KB) Timebase timer (WDT) : 26 bit × 1 ch. Realtime clock External interrupt input: 10 ch. Low-power consumption: sleep, stop

Package: P-plastic

32-bit FR Family

(Continued)	(Continued)					
Series name	Function	Type	RAM/ROM	Pin number	Part number	
MB91460 series	DMAC (5 ch.) , Real time clock, Free-run timer (16-bit × 8 ch.) , Input capture (16-bit × 8 ch.) , Output compare (16-bit × 8 ch.) , Reload timer (16-bit × 8 ch.) , PPG timer (16-bit × 16 ch.) , Up/down counter (16-bit × 2 ch.) , CAN interface (6 ch. × 32msg buffer) , LIN-UART (7 ch.) , I ² C interface (2 ch.) , External interrupt input (16 ch.) , A/D converter (10-bit × 32 ch.) , Low voltage detection	Flash	RAM : 40 KB Flash : 1088 KB Cache : 8 KB	144	MB91F467BA	
		Evaluation device	RAM : 128 KB	Evaluation target device MB91460 series MB91V460		
	DMAC (5 ch.) , Realtime clock, Free-run timer (16-bit × 8 ch.) , Input capture (16-bit × 8 ch.) , Output compare (16-bit × 8 ch.) , Reload timer (16-bit × 8 ch.) , PPG timer (16-bit × 16 ch.) , Up/down counter (16-bit × 2 ch.) , CAN interface (3 ch × 32msg buffer) , LIN-UART (7 ch.) , I ² C interface (2 ch.) , External interrupt input (16 ch.) , A/D converter (10-bit × 32 ch.) , Low voltage detection	Flash	RAM : 40 KB Flash : 544 KB Cache : 8 KB	144	MB91F465BB	
		Evaluation device	RAM : 128 KB	Evaluation target device MB91460 series MB91V460		
(Continued)	(Continued)					

32-bit FR Family

- For automotive product, car audio, etc.

MB91F465BB
Flash : 544 KB
RAM : 40 KB
Cache : 8 KB

MB91F467BA
Flash : 1088 KB
RAM : 40 KB
Cache : 8 KB

- Maximum clock frequency : 80 MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F465BB	+3.0 to +5.5	144P	Maximum operating frequency : 80 MHz Flash memory : 544 KB (MB91F465BB) 1088 KB (MB91F467BA) RAM : 40 KB Cache : 8 KB DMAC : 5 ch. Realtime clock Free-run timer : 16-bit × 8 ch. Input capture : 16-bit × 8 ch. Output compare : 16-bit × 8 ch. Reload timer : 16-bit × 8 ch. PPG timer : 16-bit × 16 ch. Up/down counter : 16-bit × 2 ch. CAN interface (32 message buffer) : 3 ch. (MB91F465BB) 6 ch. (MB91F467BA) LIN-UART : 7 ch. I ² C interface: 2 ch. External interrupt input : 16 ch. A/D converter : 10bit × 32 ch. Low voltage detection
MB91F467BA			

Package: P-plastic

FR Family

32-bit FR Family

(Continued)	(Continued)					
Series name	Function	Type	RAM/ROM	Pin number	Part number	
MB91460 series	DMAC (5 ch.) , Realtime clock, Free-run timer (16-bit × 8 ch.) , Input capture (16-bit × 8 ch.) , Output compare (16-bit × 4 ch.) , Reload timer (16-bit × 8 ch.) , PPG timer (16-bit × 12 ch.) , Sound generator, Up/down counter (16-bit × 2 ch.) , CAN interface (3 ch × 32msg buffer) , LIN-UART (5 ch.) , I ² C interface (3 ch.) , External interrupt input (14 ch.) , A/D converter (10-bit × 24 ch.) , Low voltage detection, SMC (6 ch.)	Flash	RAM : 48 KB Flash : 544 KB Cache : 8 KB	208	MB91F465DA	
			RAM : 64 KB Flash : 1088 KB Cache : 8 KB	208	MB91F467DB	
		Evaluation device	RAM : 128 KB	Evaluation target device MB91460 series	MB91V460	
	FlexRay (2 ch.) , DMAC (5 ch.) , CAN controller (2 ch.) , LIN-UART (3 ch.) , I ² C interface (1 ch.) , A/D converter (10-bit × 17 ch.) , Reload timer (16-bit × 8 ch.) , Input capture (16-bit × 8 ch.) , Output compare (16-bit × 6 ch.) , Free-run timer (16-bit × 8 ch.) , PPG timer (16-bit × 12 ch.) , Timebase timer (WDT: 26 bit × 1 ch.) , Realtime clock, External interrupt input (11 ch.)	Flash	RAM :32 KB Flash : 544 KB	100	MB91F465XA	
		Evaluation device	RAM : 128 KB	Evaluation target device MB91460 series	MB91V460	
(Continued)	(Continued)					

32-bit FR Family

- For dashboard, etc

MB91F465DA
Flash : 544 KB
RAM : 48 KB
Cache : 8 KB

MB91F467DB
Flash : 1088 KB
RAM : 64 KB
Cache : 8 KB

- Maximum internal clock frequency: 96MHz/100MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to 5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F465DA	+3.0 to +5.5	208P	Maximum operating frequency: 100MHz (MB91F465DA), 96MHz(MB91F467DB) RAM: 48 KB (MB91F465DA)/64 KB (MB91F467DB) Cache: 8 KB Flash memory: 544 KB (MB91F465DA)/1088 KB (MB91F467DB) DMAC: 5 ch. CAN interface (32 message buffer): 3 ch. LIN-UART: 5 ch. I ² C bus interface: 3 ch. Successive approximation A/D converter:10-bit × 24 ch. Reload timer: 16-bit × 8 ch.
MB91F467DB		208P	Input capture (ICU): 16-bit × 8 ch. Output compare (OCU): 16-bit × 4 ch. Free-run timer: 16-bit × 8 ch. PPG timer: 16-bit × 12 ch. Up/down counter: 2 ch. Real time clock Sound generator: 1 ch. SMC: 6 ch. External interrupt: 14 ch. Alarm comparator External bus I/F Low voltage detection EDSU (debug support unit)

Packages: P-plastic, C-ceramic

- FlexRay

MB91F465XA
Flash : 544 KB
RAM : 32 KB
Cache : 8 KB

- Maximum clock frequency : 100 MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F465XA	+3.0 to +5.5	100P	Maximum operating frequency : 100 MHz Flash memory : 544 KB RAM : 32 KB Cache : 8 KB DMAC : 5 ch. FlexRay : 2 ch. CAN interface (32 message buffer) : 2 ch. LIN-UART : 3 ch. I ² C interface: 1 ch. A/D converter : 10-bit × 17 ch. Reload timer : 16-bit × 8 ch. Input capture : 16-bit × 8 ch. Output compare : 16-bit × 6 ch. Free-run timer : 16-bit × 8 ch. PPG timer : 16-bit × 12 ch. Timebase timer (WDT) : 26 bit × 1 ch. Realtime clock External interrupt input : 11 ch. Low-power consumption modes: sleep, stop

Package: P-plastic

32-bit FR Family

(Continued)	(Continued)				
Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91460 series	DMAC (5 ch.), CAN controller (2 ch.), LIN-UART (4 ch.), A/D converter (10-bit × 8 ch.), Reload timer (16-bit × 5 ch.), ICU (16-bit × 4 ch.), OCU (16-bit × 4 ch.), Free-run timer (16-bit × 4 ch.), PPG timer (16-bit × 8 ch.), Realtime clock, External interrupt input (10 ch.)	Flash	RAM: 10 KB Flash: 288 KB	64	MB91F463NA
		Evaluation device	128 KB	Evaluation target device MB91460 series MB91V460	
	DMAC (5 ch.), CAN controller (3 ch.), LIN-UART (5 ch.), I ² C interface (3 ch.), A/D converter (10-bit × 30 ch.), Reload timer (16-bit × 8 ch.), ICU (16-bit × 8 ch.), OCU (16-bit × 4 ch.), Free-run timer (16-bit × 8 ch.), PPG timer (16-bit × 12 ch.), Realtime clock, External interrupt input (15 ch.), Sound generator. (1 ch.), Up/down counter (3 ch.), SMC (6 ch.), Low voltage detection, Alarm comparator	Flash	RAM: 32 KB Flash: 544 KB Cache: 8 KB	144	MB91F465CA
			RAM: 64 KB Flash: 1088 KB Cache: 8 KB	144	MB91F467CA
		Evaluation device	128 KB	Evaluation target device MB91460 series MB91V460	
(Continued)	(Continued)				

32-bit FR Family

- For automotive products, etc.

MB91F463NA
Flash : 288 KB
RAM : 10 KB

- Maximum clock frequency : 100 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +3.0 V to +3.6 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F463NA	+3.0 to +3.6	64P	Maximum operating frequency: 100 MHz RAM: 10 KB Flash memory: 288 KB DMAC: 5 ch. CAN interface (32 message buffer): 2 ch. UART for LIN: 4 ch. Successive approximation A/D converter: 10-bit × 8 ch. Reload timer: 16-bit × 5 ch. Input capturer (ICU): 16-bit × 4 ch. Output compare (OCU): 16-bit × 4 ch. free-run timer: 16-bit × 4 ch. PPG timer: 16-bit × 8 ch. Realtime clock External interrupt input: 10 ch. EDSU (debug support unit)

Package: P-plastic

- For dashboard and automotive products, etc

MB91F465CA
Flash : 544 KB
RAM : 32 KB
Cache : 8 KB

MB91F467CA
Flash : 1088 KB
RAM : 64 KB
Cache : 8 KB

- Maximum internal clock frequency: 96 MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F465CA	+3.0 to +5.5	144P	Maximum operating frequency: 96MHz RAM: 32 KB (MB91F465CA)/64 KB (MB91F467CA) Cache: 8 KB Flash memory: 544 KB (MB91F465CA)/1088 KB (MB91F467CA) DMAC: 5 ch. CAN interface (32 message buffer): 3 ch. LIN-UART: 4 ch. I ² C bus interface: 3 ch. Successive approximation A/D converter: 10-bit × 30 ch. Reload timer: 16-bit × 8 ch.
MB91F467CA		144P	Input capture (ICU): 16-bit × 8 ch. Output compare (OCU): 16-bit × 4 ch. Free-run timer: 16-bit × 8 ch. PPG timer: 16-bit × 12 ch. Up/down counter: 3 ch. Real time clock Sound generator: 1 ch. SMC: 6 ch. External interrupt: 15 ch. EDSU (debug support unit)

Packages: P-plastic, C-ceramic

32-bit FR Family

(Continued)	(Continued)					
Series name	Function	Type	RAM/ROM	Pin number	Part number	
MB91460 series	DMAC (5 ch.), CAN controller (6 ch.), LIN-UART (8 ch.), I ² C interface (4 ch.), A/D converter (10-bit × 32 ch.), Reload timer (16-bit × 8 ch.), ICU (16-bit × 8 ch.), OCU (16-bit × 8ch.), Free-run timer (16-bit × 8 ch.), PPG timer (16-bit × 16 ch.), Up/down counter (6 ch.), Realtime clock, External interrupt input (16 ch.) Alarm comparator (2 ch.) External bus I/F	Flash	RAM: 96 KB Flash: 2112 KB Cache: 20 KB	320	MB91F469GB	
		Evaluation device	128 KB	Evaluation target device MB91460 series MB91V460		
	DMAC (5 ch.), CAN controller (2 ch.), LIN-UART (9 ch.), I ² C interface (8 ch.), A/D converter (10-bit × 12 ch.), Reload timer (16-bit × 5 ch.), ICU (16-bit × 4 ch.), OCU (16-bit × 4 ch.), Free-run timer (16-bit × 4 ch.), PPG timer (16-bit × 8 ch.), Realtime clock, External interrupt input (16 ch.) MediaLB (1 ch.) I ² S (10 ch.) External bus I/F	Flash	RAM: 64 KB Flash: 1088 KB Cache: 8 KB	216	MB91F467MA *	
		Evaluation device	128 KB	Evaluation target device MB91460 series MB91V460		
					*: Under development	
(Continued)	(Continued)					

32-bit FR Family

- For automotive products, etc

MB91F469GB
Flash : 2112 KB
RAM : 96 KB
Cache : 20 KB

- Maximum clock frequency : 100 MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		BGA	
MB91F469GB	+3.0 to +5.5	320P	Maximum operating frequency: 100 MHz RAM: 96 KB Cache : 20 KB Flash memory: 2112 KB DMAC: 5 ch. CAN interface (128 message buffer): 6 ch. UART for LIN: 8 ch. I ² C interface: 4 ch. Successive approximation A/D converter: 10-bit × 32 ch. Reload timer: 16-bit × 8 ch. Input capturer (ICU): 16-bit × 8ch. Output compare (OCU): 16-bit × 8 ch. free-run timer: 16-bit × 8 ch. PPG timer: 16-bit × 16 ch. Sound generator : 1 ch. Up/down counter : 4 ch. (8-bit) +2 ch. (16-bit) Realtime clock External interrupt input: 16 ch. External bus I/F EDSU (debug support unit)

Package: P-plastic

- Car audio and car navigation, etc.

MB91F467MA
Flash : 1088 KB
RAM : 64 KB
Cache : 8 KB
Under development

- Maximum clock frequency : 80 MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
◎MB91F467MA	+3.0 to +5.5	216P	Maximum operating frequency: 80 MHz RAM: 64 KB Flash memory: 1084 KB Cache : 8 KB DMAC: 5 ch. CAN interface (32 message buffer + 64 message buffer): 2ch. UART for LIN: 9 ch. I ² C bus interface: 8 ch. MediaLB: 1 ch. I ² S: 10 ch. Successive approximation A/D converter: 10-bit × 12 ch. Reload timer: 16-bit × 5 ch. Input capturer (ICU): 16-bit × 4 ch. Output compare (OCU): 16-bit × 4 ch. free-run timer: 16-bit × 4 ch. PPG timer: 16-bit × 8 ch. Realtime clock External interrupt input: 16 ch. External bus I/F Low voltage detection DSU4 (debug support unit)

Package: P-plastic

◎: Under development

32-bit FR Family

(Continued)	(Continued)					
Series name	Function	Type	RAM/ROM	Pin number	Part number	
MB91460 series	DMAC (5 ch.), CAN controller (2 ch.), LIN-UART (6 ch.), I ² C interface (3 ch.), A/D converter (10-bit × 16 ch.), Reload timer (16-bit × 8 ch.), ICU (16bit × 8 ch.), OCU (16-bit × 4 ch.), Free-run timer (16-bit × 8 ch.), PPG timer (16-bit × 16 ch.), Up/Down counter (4 ch.), Real time clock, External interrupts (16 ch.), APIX, Low voltage detection, Alarm comparator, External bus I/F	Flash	RAM: 64 KB Flash: 1088 KB Cache: 8 KB	176	MB91F467SA	
		Evaluation device	128 KB	Evaluation target device MB91460 series MB91V460		
	DMAC (5 ch.), CAN controller (3 ch.), LIN-UART (12 ch.), I ² C interface (4 ch.), A/D converter (10-bit × 32 ch.), Reload timer (16-bit × 16 ch.), ICU (16-bit × 8 ch.), OCU (16-bit × 8 ch.), Free-run timer (16-bit × 8 ch.), PPG timer (16-bit × 32 ch.), Real time clock, External interrupts (16 ch.), Sound generator (1 ch.), Up/Down counter (4 ch.), Low voltage detection, External bus I/F	Flash	RAM: 40 KB Flash: 544 KB Cache: 8 KB	176	MB91F465PA	
		Evaluation device	128 KB	Evaluation target device MB91460 series MB91V460		
(Continued)	(Continued)					

32-bit FR Family

- For dashboard, etc

MB91F467SA
Flash : 1088 KB
RAM : 64 KB
Cache : 8 KB

- Maximum internal clock frequency: 100MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F467SA	+3.0 to +5.5	176P	Maximum operating frequency: 100MHz RAM: 64 KB Flash memory: 1088 KB Cache: 8 KB DMAC: 5 ch. CAN: 2 ch. (32 message buffer + 64 message buffer) LIN-UART: 6 ch. I ² C bus interface: 3 ch. APIX: 1 ch. Successive approximation A/D converter: 10-bit × 16 ch. Reload timer: 16-bit × 8 ch. Input capture (ICU): 16-bit × 8 ch. Output compare (OCU): 16-bit × 4 ch. Free-run timer: 16-bit × 8 ch. PPG timer: 16-bit × 16 ch. Real time clock External interrupt: 16 ch. Alarm comparator External bus I/F Low voltage detection EDSU (debug support unit)

Packages: P-plastic, C-ceramic

- For car bodies control, etc

MB91F465PA
Flash : 544 KB
RAM : 48 KB
Cache : 8 KB

- Maximum internal clock frequency: 100MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F465PA	+3.0 to +5.5	176P	Maximum operating frequency: 100MHz RAM: 40 KB Cache: 8 KB Flash memory: 544 KB DMAC: 5 ch. CAN interface (32 message buffer): 2 ch. LIN-UART: 7 ch. I ² C bus interface: 4 ch. Successive approximation A/D converter: 10-bit × 32 ch. Reload timer: 16-bit × 16 ch. Input capture (ICU): 16-bit × 8 ch. Output compare (OCU): 16-bit × 8 ch. Free-run timer: 16-bit × 8 ch. PPG timer: 16-bit × 32 ch. Up/Down counter: 4 ch. Real time clock Sound generator: 1 ch. External interrupt: 16 ch. External bus I/F Low voltage detection EDSU (debug support unit)

Packages: P-plastic, C-ceramic

32-bit FR Family

(Continued)	(Continued)					
Series name	Function	Type	RAM/ROM	Pin number	Part number	
MB91460 series	DMAC (5 ch.), CAN controller (2 ch.), LIN-UART (7 ch.), I ² C interface (2 ch.), A/D converter (10-bit × 16 ch.), Reload timer (16-bit × 8 ch.), ICU (16-bit × 8 ch.), OCU (16-bit × 4 ch.), Free-run timer (16-bit × 8 ch.), PPG timer (16-bit × 10 ch.), Real time clock, External interrupts (12 ch.), Sound generator (1 ch.), Up/Down counter (2 ch.), Low voltage detection, External bus I/F	Flash	RAM: 64 KB Flash: 1088 KB Cache: 8 KB	144	MB91F467TA	
		Evaluation device	128 KB	Evaluation target device		MB91460 series MB91V460
(Continued)						

32-bit FR Family

- For car audio, etc.

MB91F467TA
Flash : 1088 KB
RAM : 64 KB
Cache : 8 KB

- Maximum internal clock frequency: 100MHz
- Operating temperature range : -40 °C to +105 °C
- Operating power supply voltage: +3.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP	
MB91F467TA	+3.0 to +5.5	144P	Maximum operating frequency: 100MHz RAM: 64 KB Cache: 8 KB Flash memory: 1088 KB DMAC: 5 ch. CAN interface (32 message buffer): 2 ch. LIN-UART: 7 ch. I ² C bus interface: 2 ch. Successive approximation A/D converter: 10-bit × 16 ch. Reload timer: 16-bit × 8 ch. Input capture (ICU): 16-bit × 8 ch. Output compare (OCU): 16-bit × 4 ch. Free-run timer: 16-bit × 8 ch. PPG timer: 16-bit × 10 ch. Up/Down counter: 2 ch. Real time clock Sound generator: 1 ch. External interrupt: 12 ch. External bus I/F Low voltage detection EDSU (debug support unit)

Packages: P-plastic, C-ceramic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91470 series	DMAC (5 ch.) , 8/10-bit A/D converter (12 ch. × 1 unit) , 12-bit A/D converter (4 ch. × 2 unit) , Multi function serial interface : 6 ch. , Reload timer (16-bit × 2 ch.) , PPG timer (16-bit × 4 ch.) , Base timer (16-bit × 4 ch.) , External interrupt input (10 ch. + NMI) , Input capture (16-bit × 4 ch.) , Output compare (16-bit × 6 ch.) , free-run timer (16-bit × 3 ch.) , Wave generator, MAC circuit	Flash	RAM: 16 KB Flash: 256 KB	144	MB91F475
			RAM: 24 KB Flash: 384 KB	144	MB91F478
			RAM: 32 KB Flash: 512 KB	144	MB91F479
		Evaluation device	RAM: 40 KB Flash: 512 KB	Evaluation target device MB91470 series MB91FV470	
MB91480 series	DMAC (5 ch.) , 8/10-bit A/D converter (10 ch. × 1 unit, 4 ch. × 2 unit) , Multi function serial interface : 3 ch. , Reload timer (16-bit × 2 ch.) , PPG timer (16-bit × 8 ch.) , Base timer (16-bit × 4 ch.) , External interrupt input (10 ch. + NMI) , Input capture (16-bit × 8 ch.) , Output compare (16-bit × 12 ch.) , free-run timer (16-bit × 6 ch.) , Wave generator, MAC circuit	Flash	RAM: 16 KB Flash: 256 KB	100	MB91F482
			RAM: 32 KB Flash: 512 KB	100	MB91F487
		Mask	RAM: 16 KB ROM: 256 KB	100	MB91482
		Evaluation device	RAM: 40 KB Flash: 512 KB	Evaluation target device MB91480 series MB91FV470	

(Continued)

■ MB91470 series

- Car audio and car navigation, etc.

MB91F475
Flash: 256 MB
RAM: 16 KB

MB91F478
Flash: 384 MB
RAM: 24 KB

MB91F479
Flash: 512 KB
RAM: 32 KB

- Maximum clock frequency : 80 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +4.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.4 mm)	FBGA (0.8 mm)	
MB91F475	+4.0 to +5.5	144P	144P	Maximum operating frequency: 80 MHz Flash memory: 512 KB RAM: 32 KB DMAC: 5 ch. 8/10-bit A/D converter: 12 ch. × 1 unit 12-bit A/D converter: 4 ch. × 2 unit Multi function serial interface (UART/SIO/I ² C): 6 ch. Rerod timer: 16-bit × 2 ch. PPG timer: 16-bit × 4 ch. Base timer (rerod timer/PWM/PWC/PPG, for 32-bit mode) : 16-bit × 4 ch. External interrupt input: 10 ch. Input capturer: 16-bit × 4 ch. Output compare: 16-bit × 6 ch. free-run timer: 16-bit × 4 ch. Wave generator (for motor drive) MAC (Multiplication and Addition Calculator) circuit
MB91F478		144P	144P	
MB91F479		144P	144P	

Package: P-plastic

■ MB91480 series

- Car audio and car navigation, etc.

MB91482
ROM: 256 MB
RAM: 16 KB

MB91F482
Flash: 256 MB
RAM: 16 KB

MB91F487
Flash: 512 KB
RAM: 32 KB

- Maximum clock frequency : 80 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +4.0 V to +5.5 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP (0.5 mm)	
MB91482	+4.0 to +5.5	100P	Maximum operating frequency: 80 MHz Flash memory: 512 KB RAM: 32 KB DMAC: 5 ch. 8/10-bit A/D converter: 10 ch. × 1 unit, 4 ch. × 2 unit Multi function serial interface (UART/SIO/I ² C): 3 ch. Rerod timer: 16-bit × 2 ch. PPG timer: 16-bit × 8 ch. Base timer (rerod timer/PWM/PWC/PPG, for 32-bit mode) : 16-bit × 4 ch. External interrupt input: 10 ch. Input capturer: 16-bit × 8 ch. Output compare: 16-bit × 12 ch. free-run timer: 16-bit × 6 ch. Wave generator (for motor drive) MAC (Multiplication and Addition Calculator) circuit
MB91F482		100P	
MB91F487		100P	

Package: P-plastic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91605A series	DMAC (4 ch.) , A/D converter (10-bit × 12 ch.) , Multi function serial interface : 12 ch., Reload timer (16-bit × 3 ch.) , Base timer (16-bit × 12 ch.) , HDMI-CEC/Remote control reception (1 ch.) , External interrupt input (24 ch. + NMI) ,	ROM less • Evaluation device	RAM: 128 KB Instruction cash: 8 KB Data cash: 8 KB	176	MB91605A
MB91610 series	DMAC (8 ch.) , 10-bit A/D converter (1 unit) : 8 ch., Multi function serial interface (8 ch.) , Reload timer (16-bit × 3 ch.) , Base timer (16-bit × 8 ch.) , External interrupt input (16 ch.) , Input capture (32-bit × 4 ch.) , Output compare (32-bit × 4 ch.) , Free-run timer (32-bit × 1 ch.) , USB Mini-Host/USB Function (1 ch.) , HDMI-CEC/Remote control reception (1 ch.) , OSDC, Wild register(16 ch.) , Watch counter	MASK	RAM: 32 KB ROM: 512 KB FONT ROM: 7168 characters	120	MB91613 *
		Flash • Evaluation device	RAM: 32 KB Flash: 512 KB FONT Flash: 16384 characters	120	MB91F610

*: Underdevelopment

(Continued)

■ MB91605A series

- For TV/PDP control, home electric equipment, etc.

MB91605A
RAM: 128 KB
Instruction cashe : 8 KB
Data cashe : 8 KB

- Maximum clock frequency : 80 MHz
- Operating temperature range : -10 °C to +70 °C
- Operating power supply voltage: +3.0 V to +3.6 V
+1.65 V to +1.95 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP (0.5 mm)	
MB91605A	+3.0 to +3.6 +1.65 to +1.95	176P	Maximum operating frequency: 80 MHz RAM : 128 KB Instruction cashe : 8 KB Data cashe : 8 KB DMA controller : 8 ch. A/D converter: 10-bit × 12 ch. Multi function serial interface (UART/SIO/I ² C): 12 ch. Reroad timer: 16-bit × 3 ch. Base timer (reroad timer/PWM/PWC/PPG, for 32-bit mode): 16-bit × 12 ch. HDMI-CEC/Remote control reception : 1 ch. External interrupt input : 24 ch. SDRAM I/F

Package: P-plastic

■ MB91610 series

- For TV/PDP control, home electric equipment, etc.

MB91613
ROM: 512 KB
FONT ROM : 7168 characters
RAM : 32 KB
Under development

MB91F610
Flash: 512 KB
FONT Flash : 16384 characters
Data cashe : 32 KB

- Maximum clock frequency : 33 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +3.0 V to +3.6 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP (0.5 mm)	
©MB91613	+3.0 to +3.6	120P	Maximum operating frequency: 33 MHz Flash memory: 512 KB (MB91F610) ROM: 512 KB (MB91613) FONT ROM: 7168 characters (MB91613) FONT Flash: 16384 characters (MB91F610) RAM : 32 KB DMA controller : 8 ch. A/D converter: 10-bit × 8 ch. Multi function serial interface (UART/SIO/I ² C): 8 ch.
MB91F610		120P	Reroad timer: 16-bit × 3 ch. Base timer (reroad timer/PWM/PWC/PPG): 10-bit × 8 ch. External interrupt input : 16 ch. Input capturer: 32-bit × 4 ch. Output compare: 32-bit × 4 ch. Free-run timer: 32-bit × 1 ch. USB Mini-Host / USB Function(Full-speed) : 1 ch Watch counter HDMI-CEC/Remote control reception : 1 ch. OSDC Wild register : 16 ch. Watch counter

Package: P-plastic

©: Under development

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91635 series	DMAC (8 ch.) , 10-bit A/D converter (2 unit) : 31 ch., 8-bit D/A converter (3 ch.) , Multi function serial interface : 12 ch., Reload timer (16-bit × 3 ch.) , U/D counter (16-bit × 4 ch.) , Base timer (16-bit × 16 ch.) , External interrupt input (32 ch.) , Input capture (32-bit × 8 ch.) , Output compare (32-bit × 8 ch.) , Free-run timer (32-bit × 2 ch.) , Watch counter, External bus interface	Flash	RAM: 48 KB Flash: 512 KB	144	MB91F637
			RAM: 64 KB Flash: 1 MB	144	MB91F639
		Evaluation device	RAM: 128 KB	Evaluation target device MB91635 series MB91V650	

(Continued)

■ MB91635 series

- For home electric equipment, camera, AV products, etc.

MB91F637
Flash: 512 MB
RAM: 48 KB

MB91F639
Flash: 1 MB
RAM: 64 KB

- Maximum clock frequency : 60 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +2.7 V to +3.6 V

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm)	FBGA (0.8 mm)	
MB91F637	+2.7 to +3.6	144P	144P	Maximum operating frequency: 60 MHz Flash memory: 512 KB (MB91F637) 1 MB (MB91F639) RAM: 48 KB (MB91F637) 64 KB (MB91F639) DMAC: 8 ch. 10-bit A/D converter (2 unit): 31 ch. 8-bit D/A converter: 3 ch. Multi function serial interface (UART/SIO/I ² C): 12 ch. Reroad timer: 16-bit × 3 ch. U/D counter: 16-bit × 4 ch. Base timer (reroad timer/PWM/PWC/PPG, for 32-bit mode): 16-bit × 16 ch. External interrupt input: 32 ch. Input capturer: 32-bit × 8 ch. Output compare: 32-bit × 8 ch. Free-run timer: 32-bit × 2 ch. Watch counter External bus interface
MB91F639		144P	144P	

Package: P-plastic

32-bit FR Family

(Continued)

Series name	Function	Type	RAM/ROM	Pin number	Part number
MB91640 series	DMAC (8 ch.) 10-bit A/D converter (2 unit): 32 ch., 8-bit D/A converter (3 ch.) , Multi function serial interface : 12 ch., Reload timer (16-bit × 3 ch.) , U/D counter (16-bit × 4 ch.) , Base timer (16-bit × 16 ch.) , External interrupt input (32 ch. + NMI) , Input capture (32-bit × 8 ch.) , Output compare (32-bit × 8 ch.) , free-run timer (32-bit × 2 ch.) , Watch timer, External bus mode	Flash	RAM: 64 KB Flash: 1 MB	176	MB91F644
		Evaluation device	RAM: 128 KB	Evaluation target device MB91640 series MB91V650	
MB91645 series	DMAC (8 ch.) , 10-bit A/D converter (2 unit): 32 ch., 8-bit D/A converter (3 ch.) , Multi function serial interface : 12 ch., Reload timer (16-bit × 3 ch.) , U/D counter (16-bit × 4 ch.) , Base timer (16-bit × 16 ch.) , External interrupt input (32 ch.) , Input capture (32-bit × 8 ch.) , Output compare (32-bit × 8 ch.) , free-run timer (32-bit × 2 ch.) , Watch counter, External bus interface	Flash	RAM: 48 KB Flash: 512 KB	176	MB91F647
		Evaluation device	RAM: 128 KB	Evaluation target device MB91645 series MB91V650	

(Continued)

■ MB91640 series

- For home electric equipment, camera, AV products, etc.

MB91F644
Flash: 1 MB
RAM: 64 KB

- Maximum clock frequency : 60 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage : +2.7 V to +3.6 V

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm)		
MB91F644	+2.7 to +3.6	176P		Maximum operating frequency: 60 MHz Flash memory: 1 MB RAM: 64 KB DMAC: 8 ch. 10-bit A/D converter (2 unit): 32 ch. 8-bit D/A converter: 3 ch. Multi function serial interface (UART/SIO/I ² C): 12 ch. Reload timer: 16-bit × 3 ch. U/D counter: 16-bit × 4 ch. Base timer (reload timer/PWM/PWC/PPG, for 32-bit mode): 16-bit × 16 ch. External interrupt input: 32 ch. Input capturer: 32-bit × 8 ch. Output compare: 32-bit × 8 ch. Free-run timer: 32-bit × 2 ch. Watch timer External bus mode

Package: P-plastic

■ MB91645 series

- For home electric equipment, camera, AV products, etc.

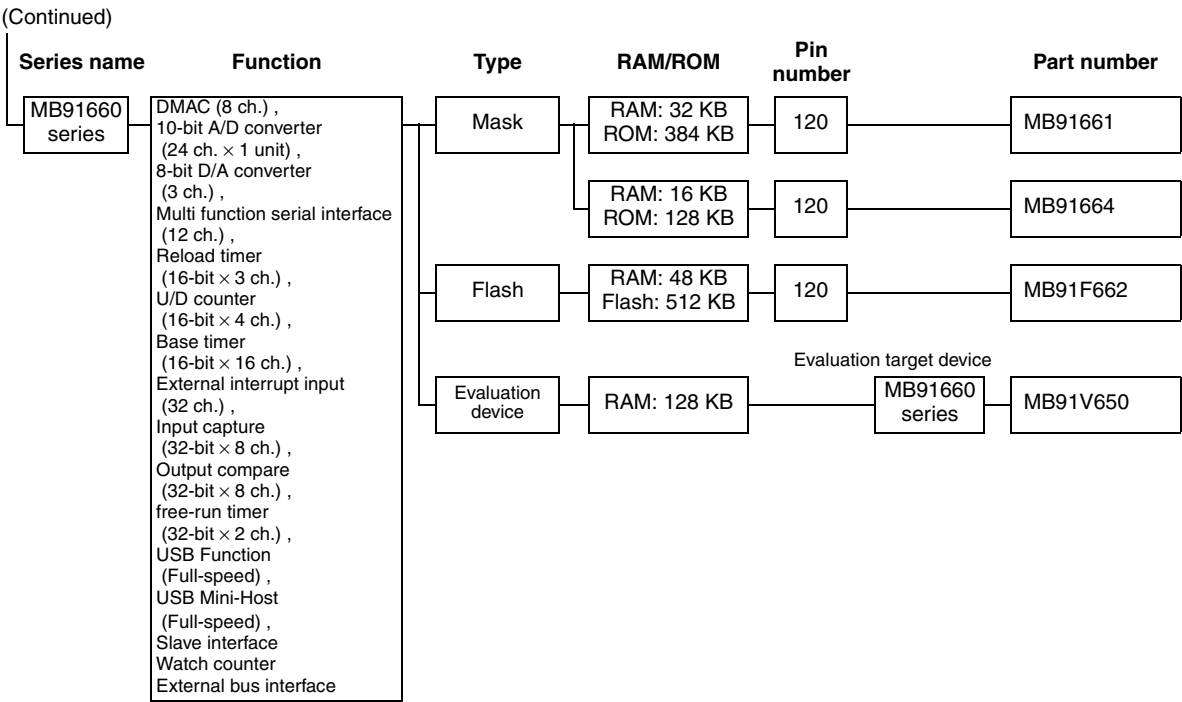
MB91F647
Flash: 512 MB
RAM: 48 KB

- Maximum clock frequency : 60 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: I/O: +2.7 to +3.6
Internal logic: +1.65 to +1.95

Part number	Operating power supply voltage (V)	Package		Functions
		LQFP (0.5 mm)	FBGA (0.8 mm)	
MB91F647	I/O: +2.7 to +3.6 Internal logic: +1.65 to +1.95	176P	176P	Maximum operating frequency: 60 MHz Flash memory: 512 KB RAM: 48 KB DMAC: 8 ch. 10-bit A/D converter (2 unit): 32 ch. 8-bit D/A converter: 3 ch. Multi function serial interface (UART/SIO/I ² C): 12 ch. Reroad timer: 16-bit × 3 ch. U/D counter: 16-bit × 4 ch. Base timer (reroad timer/PWM/PWC/PPG, for 32-bit mode): 16-bit × 16 ch. External interrupt input: 32 ch. Input capturer: 32-bit × 8 ch. Output compare: 32-bit × 8 ch. Free-run timer: 32-bit × 2 ch. Watch counter External bus interface

Package: P-plastic

32-bit FR Family



■ MB91660 series

- For TV controll, home electric equipment, etc.

MB91661
ROM: 384 KB
RAM: 32 KB

MB91664
ROM: 128 KB
RAM: 16 KB

MB91F662
Flash: 512 KB
RAM: 48 KB

- Maximum clock frequency : 33 MHz
- Operating temperature range : -40 °C to +85 °C
- Operating power supply voltage: +3.0 V to +3.6 V

Part number	Operating power supply voltage (V)	Package	Functions
		LQFP (0.5 mm)	
MB91661	+3.0 to +3.6	120P	Maximum operating frequency: 33 MHz ROM : 128 KB (MB91664) 384 KB (MB91661) Flash memory: 512 KB (MB91F662) RAM: 16 KB (MB91664) 32 KB (MB91661) 48 KB (MB91F662) DMA controller : 8 ch. 10-bit A/D converter: 24 ch. × 1 unit 8-bit D/A converter: 3 ch. Multi function serial interface (UART/SIO/I ² C): 12 ch. Rerod timer: 16-bit × 3 ch. U/D counter: 16-bit × 4 ch. Base timer (rerod timer/PWM/PWC/PPG, for 32-bit mode): 16-bit × 16 ch. External interrupt input: 32 ch. Input capturer: 32-bit × 8 ch. Output compare: 32-bit × 8 ch. Free-run timer: 32-bit × 2 ch. USB Function (Full-speed) USB Mini-Host (Full-speed) Slave interface Watch counter External bus interface
MB91664		120P	
MB91F662		120P	

Package: P-plastic

■ FR Family Support Tools

Features of Support Environments

(1) Comprehensive Development Environments (SOFTUNE Workbench) around C language

- Achieving effective development environments
- Enhancing the concerted use of independent development tools, allowing all tools to behave as if they were a single tool
- Support in collaboration with source generation management tools
- Made available both Japanese and English version simultaneously

(2) Supporting the tools for quality, performance, analysis of source programs

- SOFTUNE C/C++ Checker
Investigating the description form of a source to display the information to enhance portability/maintainability
- SOFTUNE C/C++ Analyzer
Analyzing the source description; displaying the overall hierarchical organization; effective for maintainability/portability

(3) Providing Embedded Real-time OS

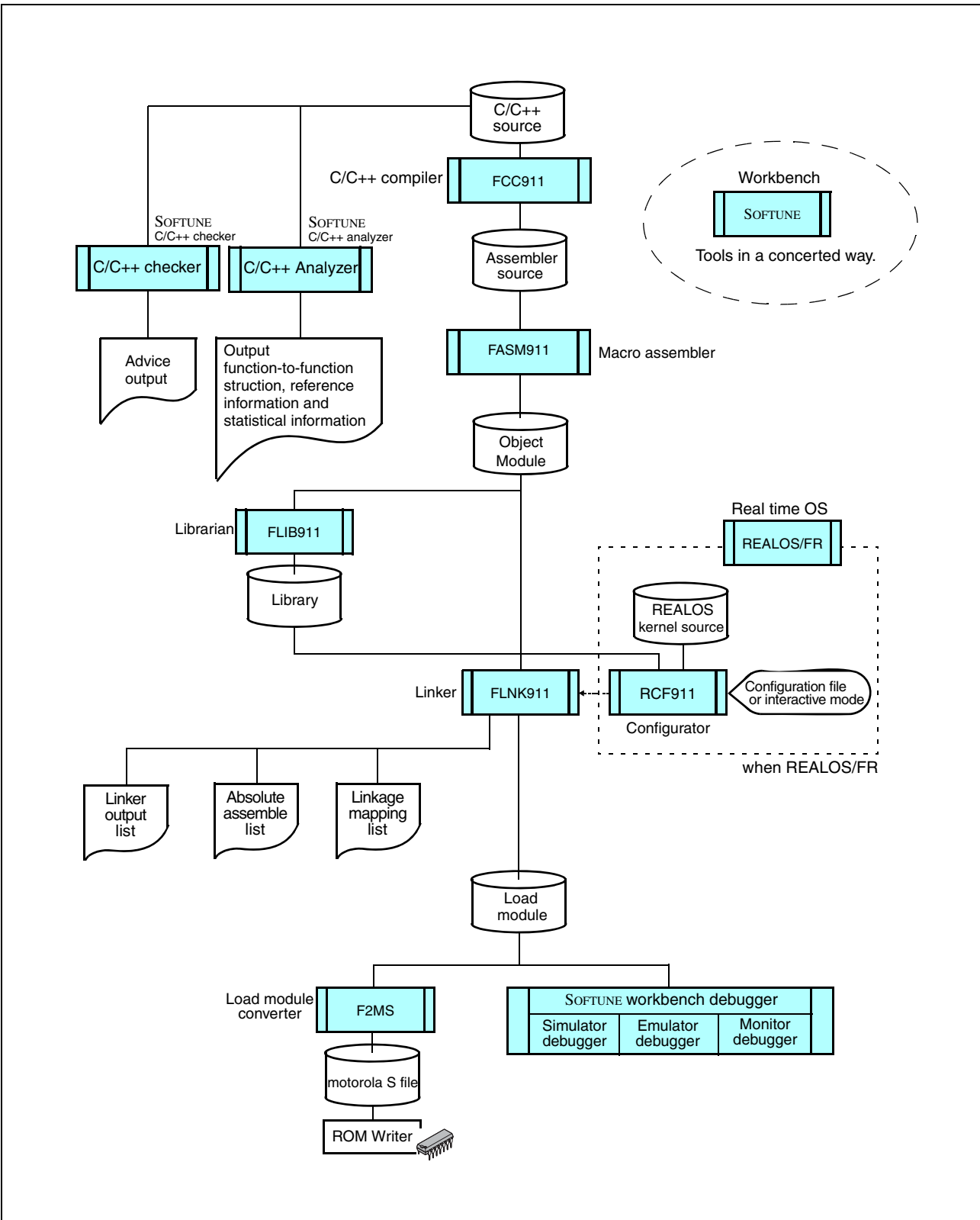
- In conformance with μ ITRON Specifications known as the Japanese industry standard
 μ ITRON3.0 Specifications SOFTUNE REALOS/FR
 μ ITRON4.0 Specifications SOFTUNE REALOS/FR Spec.4
- In conformance with μ T-Kernel Specifications known as the Embedded Real-time OS for the next generation
 μ T-Kernel Specifications SOFTUNE μ T-REALOS/FR
- The flexible system configuration matched to customer's application
SOFTUNE REALOS Configurator
- The development of customers of debugging and the tuning work, etc. is strongly backed up
SOFTUNE REALOS Analyzer

(4) The application development for the vehicle equipment control OS OSEK is supported

- Analyzing the transition of task states to graphically display the results
SOFTUNE OSEK Analyzer

32-bit FR Family Support Tools

Development Procedure (When Fujitsu Microelectronics product is used.)



32-bit FR Family Support Tools

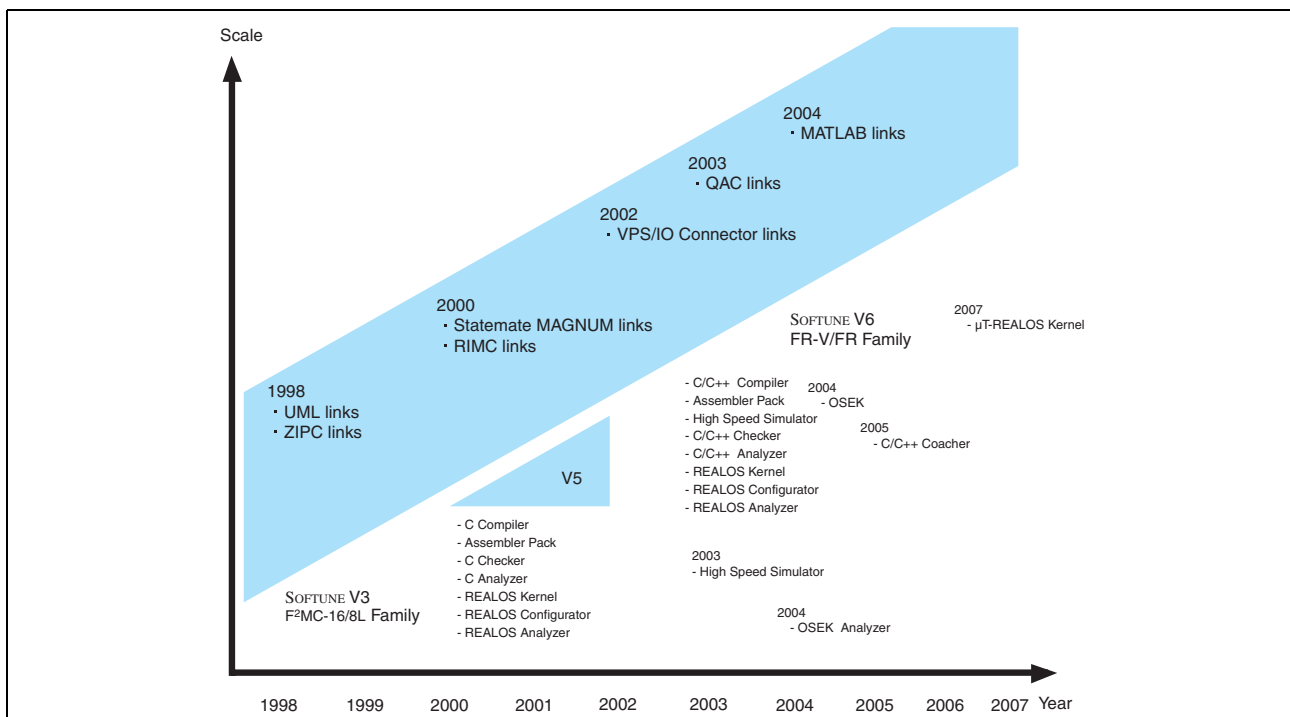
SOFTUNE V6 Support Software Product List (For FR Family)

Software	Operating Environment	Product number (Maintenance number)	Remarks
SOFTUNE V6 Professional Pack <Components> - Workbench - C/C++ compiler - Assembler Pack - C/C++ analyzer - C/C++ checker	- Personal computers FMV and similar IBM compatibles - Operating OS WindowsXP Windows2000 WindowsVista - In Circuit Emulator MB2197 series MB2198 series	SP365030118QAC (SP365030118MAC)	1 license
		SP365030118QBC (SP365030118MBC)	3 licenses
		SP365030118QCC (SP365030118MCC)	5 licenses
		SP365030118QDC (SP365030118MDC)	10 licenses
SOFTUNE V6 REALOS/FR Embedded License <Components> - Kernel - REALOS Configurator - REALOS Analyzer	- Personal computers FMV and similar IBM compatibles - Operating OS WindowsXP Windows2000 - In Circuit Emulator MB2197 series MB2198 series	SP365000218RCC (SP365000218MAC)	μITRON 3.0 Specifications License free Kernel (source code provided)
SOFTUNE V6 REALOS/FR Evaluation License <Components> - Kernel - REALOS Configurator - REALOS Analyzer		SP365000218EVC (—)	μITRON 3.0 Specifications For evaluation Kernel (no source code)
SOFTUNE V6 REALOS/FR Spec.4 Embedded License <Components> - Kernel Source Code - REALOS Configurator - REALOS Analyzer		SP365001518RCC (SP365001518MAC)	μITRON 4.0 Specifications License free Kernel (source code provided)
SOFTUNE V6 REALOS/FR Spec.4 Evaluation License <Components> - Kernel - REALOS Configurator - REALOS Analyzer		SP365001518EVC (—)	μITRON 4.0 Specifications For evaluation Kernel (no source code)
SOFTUNE V6 μT-REALOS/FR Embedded License <Components> - Kernel - μT-REALOS Configurator - REALOS Analyzer		SP3650P1218RCC (SP3650P1218MAC)	μT-Kernel Specifications License free Kernel (no source code)
SOFTUNE V6 μT-REALOS/FR Evaluation License <Components> - Kernel - μT-REALOS Configurator - REALOS Analyzer		SP3650P1218EVC (—)	μT-Kernel Specifications For evaluation Kernel (no source code)
SOFTUNE V6 OSEK Analyzer	- Personal computers FMV and similar IBM compatibles - Operating OS WindowsXP Windows2000	SP365031918QAC (—)	Analysis tool for OSEK made by Vector Japan Co., Ltd. or Elektrobit Corpora- tion

- The part number is an ordered number of the newest version.
- Please contact us if purchasing the previous version as a different part is used.
- An electronic manual (PDF format) is provided with each product (Japanese and English). Printed manuals are sold separately.
- Operating OS corresponds to Japanese and English.

SOFTUNE

1. The SOFTUNE Integrated Development Environment



2. SOFTUNE Structure and Features

Integrated manager and debugger modules

Errors can be corrected on the fly, as they are discovered, and the resulting code can be debugged on the spot.

A variety of tools to support C/C++-language coding

“C/C++ Checker” confirms code operation and “C/C++ Analyzer” analyzes the code’s structure.

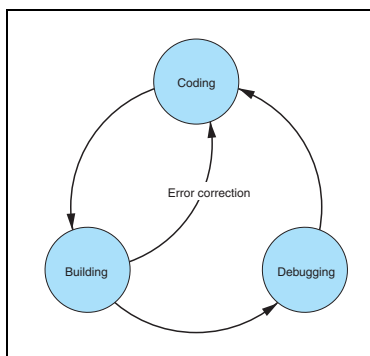
Includes such tools as Configurator and Analyzer to facilitate the use of REALOS, which conforms to the μITRON specifications and μT-Kernel specifications.

(1) Removing the Annoying Settings which are Part of Program Development

Developing programs for different systems requires the programmer to edit source code, perform actual builds and confirm program operation (debug). Finally, the programmer returns to the editing process to incorporate necessary changes, as indicated by the debugging results.

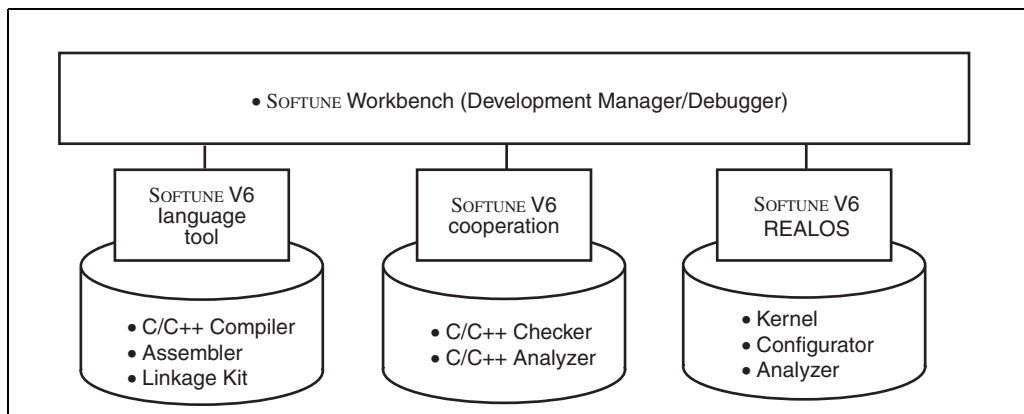
SOFTUNE is an integrated developing environment which is designed to perform such repetitive processes smoothly and efficiently. It is the next generation of SOFTUNE, which has evolved to meet various needs of our customers.

(2) Program Flow



32-bit FR Family Support Tools

(3) Structure of SOFTUNE

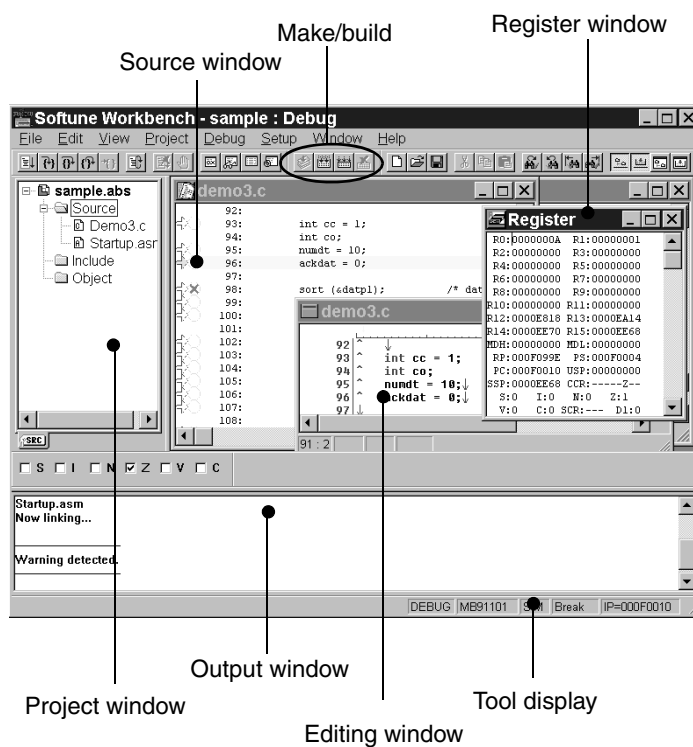


(4) Environment with SOFTUNE

The Efficient and Easy-to-Use Integrated Developing Environment

Program development requires repeated editing, make/build, and debugging operations. Performing these functions smoothly and effectively contributes to improved efficiency.

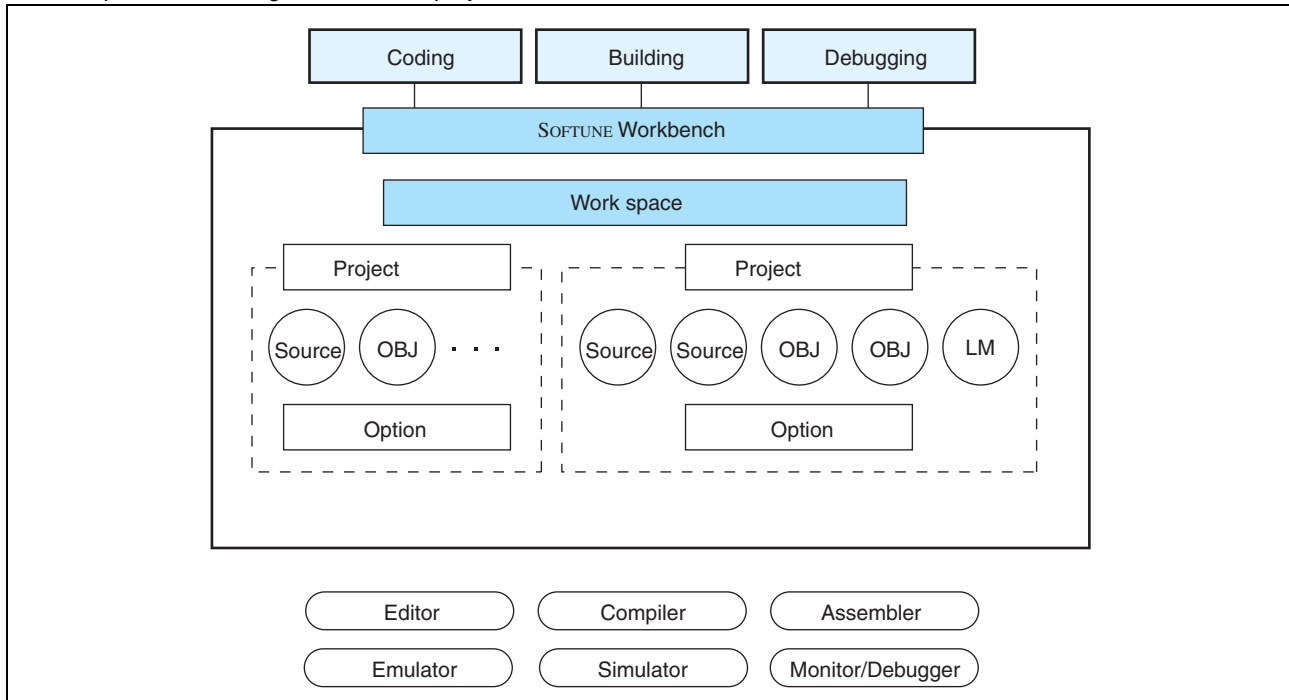
The SOFTUNE integrated developing system is designed to meet program developers' numerous demands, while ensuring ease of use.



3. Manager Functions

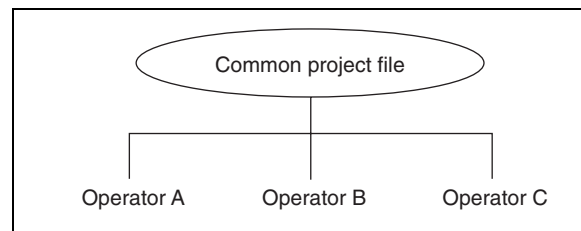
Software programming proceeds according to the “project file,” which contains all the information needed for program-development.

Workspace can manage two or more projects.



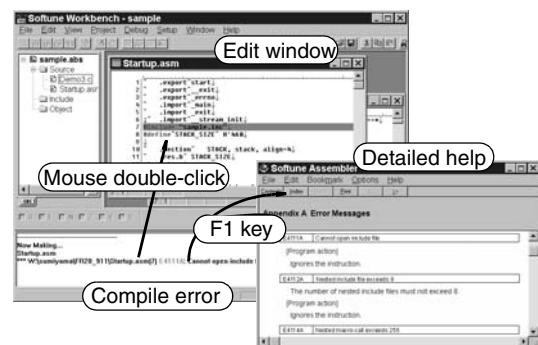
(1) Effective Project Usage

Whether working alone on several projects simultaneously or developing a project as a group, project files can be used to create a simple developing environment.



(2) Extremely Easy to Use

- Built-in Editor
The built-in editor comes complete with many useful functions, such as visual keyword emphasis and auto-indent.
- Error Jump and On-line Help
Errors that occur during builds are displayed in the output window at the bottom of the screen.
To make a “Tag-jump” Double-click Mouse. Once on the error press “F1 key” for a more detailed error display.
- Cooperation with Commercially Available Editors
To meet developers’ requests to use editors to which they are accustomed, SOFTUNE can be configured to use the following commercially available editors:
Codewright32, TextPAD32 and others.



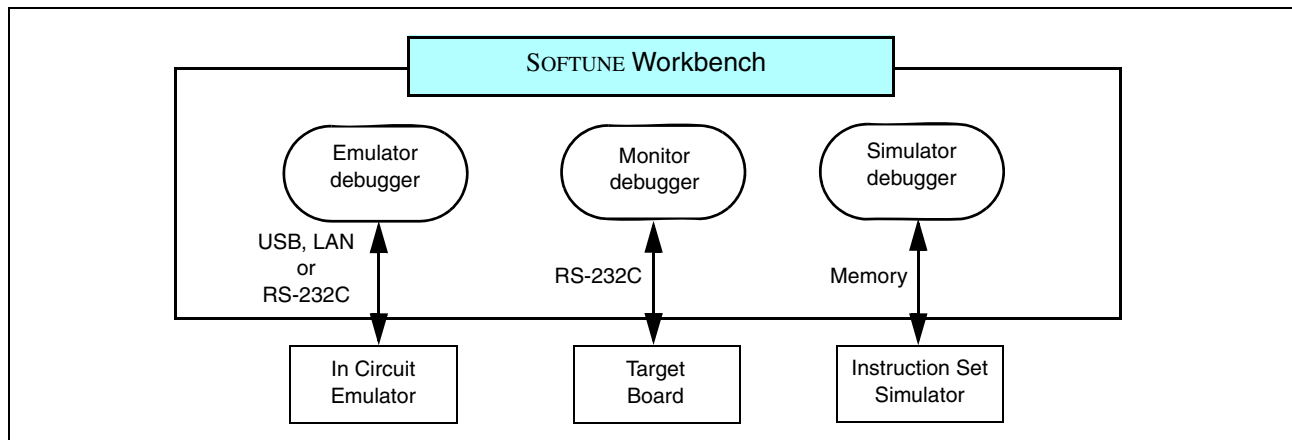
(3) Customizable Environment

When sharing files, cooperation with source generation management tools is assured, and file type conversion tools are called up, so that each person can operate in his or her own customized developing environment.

32-bit FR Family Support Tools

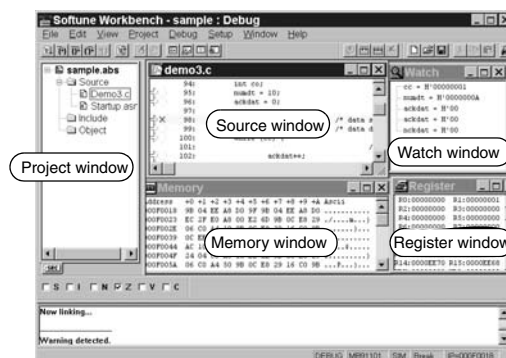
4. Debugger Function

SOFTUNE Workbench supports three debuggers that are needed at various stages of development. The appropriate debugger environment can be selected to match the situation.



(1) Easy-to see Screen Information

The user can freely change the screen layout by selecting the necessary windows. In addition, the displayed information can be selected to provide only the information that is necessary.



(2) Simple Environment Setting

- **Debugging Environment: Setup Wizard**
The setup wizard supports the selection of communication lines with emulator and boards, as well as window settings.
- **MCU Operating Environment**
The so-called "CPU information file," which contains the information required to support all MCUs, is provided as standard. Necessary information such as I/O port locations, ROM/RAM capacity and initial addresses can be set automatically.
- **Saving and Restoring the Debugging Environment**
Previous debugging environment specification, such as window locations, breakpoint settings, and memory mapping information, are saved, so that these settings are restored the next time the program is initiated.

5.Cooperation

In cooperation with SOFTUNE Workbench, the following SOFTUNE components help improve the quality of C-language programming, which greatly increases reviewing and documentation efficiency.

1) SOFTUNE C/C++ Checker

Designed to meet the following requests from beginners through to advanced users:

- Eliminate all coding mistakes.
- Review programs quickly and efficiently.
- Enable even C-language beginners to create quality code.
- Maximize coding skills.
- Use software assets on Fujitsu Microelectronics CPUs.

The SOFTUNE C Checker checks code for maintainability, methods of expanding specifications and transportability; indicates areas where quality and performance could be improved; and reports these results to the user. The user can then review the C-language code. Outline

Recent software (ROM) for embedded microcontrollers has been developed in the C language. However, it is difficult to understand messages which are output from a compiler unless the language specifications are well known. This development support tool checks C-source programs to display and print advice for better quality and performance. It also has the facility for selecting necessary advice carefully.

(1) Features

- Outputs advice suitable for objectives: Portability, coding error performance, porting to Fujitsu Microelectronics CUP's
- Allows customization to a programmers level.
- Works with C compilers for Fujitsu microcontrollers.
- Provides easy operation and simple display over a GUI.

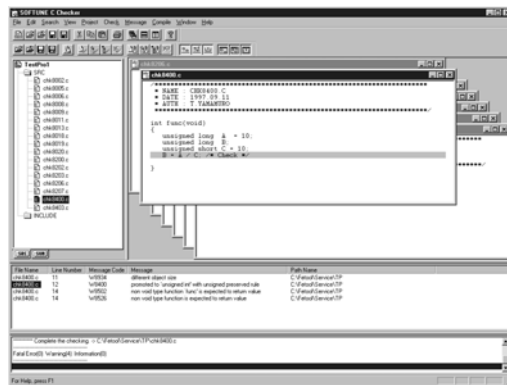
(2) Advising Function

The following pieces of advice are given. "Reason of Check", "Example of Program", "Suggestion of Correction", and "One-point Advice" are displayed and explained for each check item.

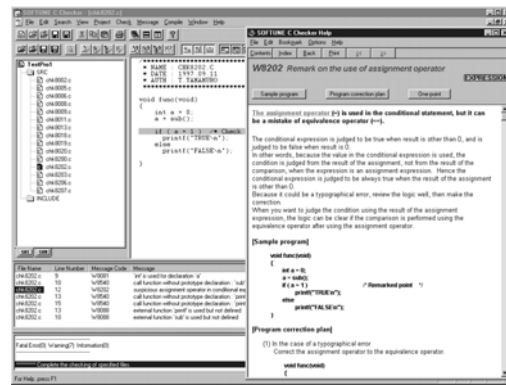
- Portability
This tool makes a close check on the items "processing-defined operation" and "undefined operation" which can be problems in portability in the ANSI standard.
It also gives an explanation of the operation of C compilers (fcc911 and cc907) for Fujitsu microcontrollers. For example, the tool gives the user proper advice on many problems (such as a data type acceptable to a structure, code, and its arrangement) at the time of printing.
- Coding error
This tool indicates the items which are not wrong in the language specifications but may cause an error and the items which are logically inconsistent.
For example, the equivalent expression "if (a==0)" in the if statement is likely to be typed as the assignment expression "if (a=0)" by mistake. Most compilers cannot detect such an error.
- Performance
This tool indicates the items which generally provide better performance and the items which are essential and effective for the FR family and F²MC-16 family.
Stress is especially, put on the detection of object size reduction which can be a problem in software for embedded microcontrollers.
For example, if a function return value is a structure of the double type, an area is reserved for the return value and an object to be transferred to the area is output.
- This tool advises the user to transfer the function return value by a pointer and largely reduce the objects size.
- Porting to Fujitsu Microelectronics CUP's
This tool advises the user what to consider in porting existing software from other makers' CPU to Fujitsu Microelectronics CPU in the FR family and F²MC-16 family.
For example, in porting software resources created for the F²MC-16 family to the FR family, this tool advises the user to delete the expansion specifications (`__far`, `__near`, and `__direct` etc.) inherent to the F²MC-16 family.

32-bit FR Family Support Tools

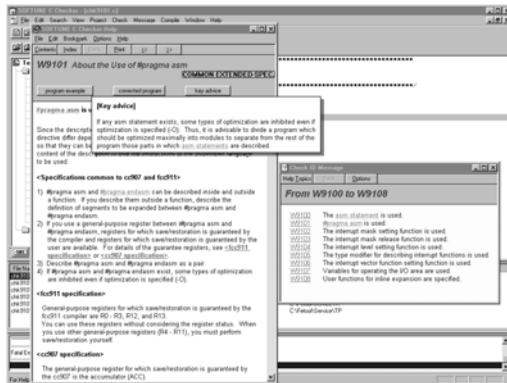
- Indicated messages output



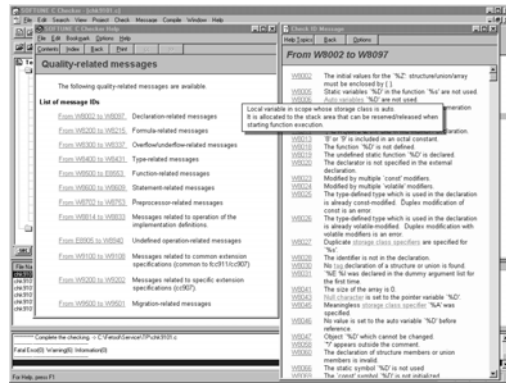
- Coding error indicated and advice displayed



- Advice for porting to Fujitsu C compilers displayed



- Messages indicated on quality listed



2) SOFTUNE C/C++ Analyzer

Designed to meet the following user situations:

- One wishes to examine a program's structure or processing, but the programmer is absent or documentation is unavailable.
- During program development, one wishes to create a structural program that takes into account structure and processing.
- One wishes to examine the range of effects that altering a program will create.
- One wishes to create a program's internal documentation.
- One wishes to explore the possibilities of a more efficient program.

The structure and usage of data in a C-language source programs are displayed visually, and the internal data structure, functional tree, stack usage and other information can be acquired and stored in a file.

(1) Outline

Recent software (ROM) for embedded microcontrollers is increasingly extending its development scale. This situation is created from development by many programmers, diversion of existing resources, and use of package programs.

This development support tool statically analyzes the C-source program to visually display and print the function-to-function structure, reference data, and statistical data. This tool creates data necessary for design and maintenance, as well as having a feature peculiar to C compilers for Fujitsu Microcontrollers (a feature of calculating the maximum amount of stacks used), considering its embedded feature.

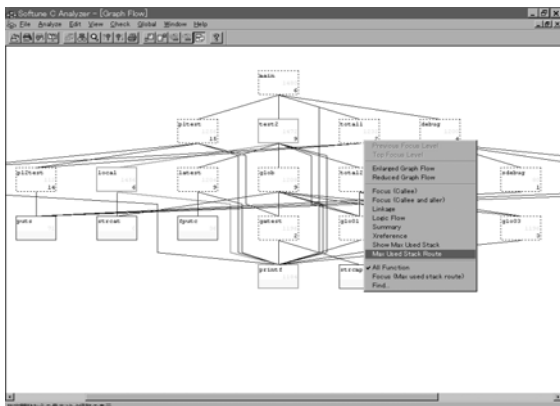
(2) Features

- Displays and prints the function-to-function structure, reference data, and statistical data.
- Supports the embedded capability of C compilers for Fujitsu microcontrollers.
- Provides easy operation and simple display over a GUI.

(3) Explanation of Features

The following data is enabled for development, maintenance, and higher porting efficiency.

- Graphic flow
This feature block-structures function calls for visual display. It also allows the display of the entire function and calls from any function and the retrieval of functions.
- Logic flow
This feature visually displays the internal structure of the C-source program.
For example, it shapes the control structure of `for` and `switch` statements and structure declarations. A jump feature for retrieval by functions, variable, tag, and macro names is also provided.
- Displaying statistical data
This feature displays the complexity and line count of a programs every function, the source of destination function name, and the count of appearance of (`if`, `for` and `asm` statements etc.).
- Displaying argument data
This feature displays data about the function-called file name and line number, the return value of the declared function, and the type of argument. It also checks the adjustability of dummy argument with actual argument.
- Displaying cross-reference data
This feature displays data about the functions and variables that a function is using, tag and macro declarations, and the appearing line number.
- Displaying global data
This feature displays the function using global variables. It also detects unused global variables.
- Program checking
This feature checks and displays the adjustability of dummy argument with actual argument.
- Calculating the maximum amount of stacks used
This feature calculates and displays the amount of stacks used in the entire function, as well as in any function. This calculation is made on the basis of the output of C compilers (fcc911 and cc907) for Fujitsu microcontrollers (FR family and F²MC-16 family).
- Displaying graphic flow



- Displaying logic flow, statistical and cross-reference data

C:\Software\C Analyzer - Reference window

File Analysis Edit View Check Global Window Help

```

00130 void glob1()
00131 {
00132     int i;
00133     i++;
00134     atfcat(a,g1);
00135     atfcat(a,g2);
00136 }
00137 printf("Go W, a=3");
00138
00139 printf("xxxxx Go xxxxxxx",a=3);
00140 atfcat(a,g3);
00141
00142 glob1();
00143 glob2();
00144 glob3();
00145
00146 }
00147
00148 void subdeb1(int*inuts,"subdebW");
00149
00150 void subdeb2(int*inuts,"subdebW");
00151
00152 void subdeb3(int*inuts,"subdebW");
00153
00154 }
00155
00156 void atfcat(a,g)
00157 {
00158     char s[10];
00159     sprintf(s,"%d",g);
00160     if(strlen(s)>0)
00161         printf("xxxxx Go xxxxxxx",a);
00162 }

```

```

Program name.....glob
Source File.....C:\Programmer\atfcat\atfcat.c
Compiler.....
Compiler options.....-g -O2 -fcommon -fPIE -fPIE -fPIE -fPIE
Compiler.....-g -O2 -fcommon -fPIE -fPIE -fPIE -fPIE
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Compiler.....-g -O2 -fcommon -fPIE -fPIE -fPIE -fPIE
Compiler.....-g -O2 -fcommon -fPIE -fPIE -fPIE -fPIE
Compiler.....-g -O2 -fcommon -fPIE -fPIE -fPIE -fPIE
Compiler.....-g -O2 -fcommon -fPIE -fPIE -fPIE -fPIE
Compiler.....-g -O2 -f
```

32-bit FR Family Support Tools

3) SOFTUNE C/C++ Compiler

- Complies with the ANSI C, ISO/ANSI C++, and EC++ specifications
Complies with ISO/IEC 9899-1990 and ISO/IEC 14882-1998
- Advanced general-purpose optimization function
Performs a detailed analysis of the program to optimize the code at the global, local, and instruction levels.
- Optimize for code size function
When the -Ksize option is specified, the compiler optimizes the program to reduce the code size.
- Optimize for execution speed function
When the -Kspeed option is specified, the compiler optimizes the program to improve the execution speed.
- Supports extended functions for embedded applications
The compiler supports a range of extended functions for embedded applications, including an assembly language function, interrupt coding function, and I/O access function.
- Supports automatic generation of C++ templates
Together with the linker, the compiler generates template instances with minimum object size without involving any complicated procedures.

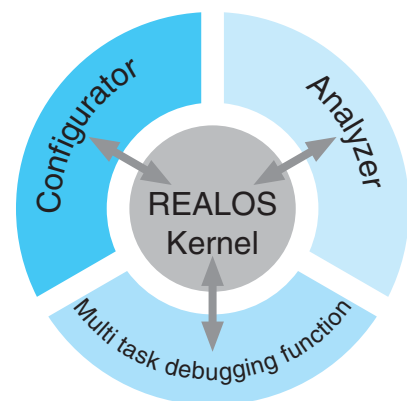
6. μ ITRON3.0 Compliant Real Time OS for FR Family (SOFTUNE REALOS/FR)

(1) Overview

SOFTUNE REALOS/FR is the real time OS for the FR Family of Fujitsu Microelectronics proprietary 32-bit MCUs, conforming to the μ ITRON3.0 specifications known as the Japanese industry standard.

• Features

μ ITRON 3.0 specifications
System design customized for 32-bit MCUs for control purposes
High-speed dispatch and interrupt processing
In-line expansion of service call functions
Providing a sample I/O driver
Easy-to-use GUI-based configurator
Graphical analysis tool REALOS Analyzer



• REALOS/FR Specifications

Name	Description
Target CPU	FR
Maximum number of task	32, 767
Maximum number of priority levels	32
Scheduling method	Priority-base, event-driven type
Number of system calls	58
Complying specifications	μ ITRON 3.0 specifications
Kernel coding	Assembly language
Application coding	C and Assembly Languages
Kernel size	About 2.7 KB (resident) to About 8.4 KB (maximum configuration)

(2) Configuration

• Kernel

The kernel provides the basic functions of the real time OS. It is an event-driven, multitasking real time OS.

The functions to be used by application programs can be selected as system calls.

• System calls

Function	Instruction	Description
Task management functions	sta_tsk ext_tsk ter_tsk dis_dsp ena_dsp chg_pri rot_rdq rel_wai get_tid ref_tsk	Start task Exit local task Terminate remote task Disable dispatch Enable dispatch Change task priority Rotate task ready queue Release remote task from wait state Get local task ID Reference task status
Task-supplied synchronization functions	sus_tsk rsm_tsk frsm_tsk slp_tsk tslp_tsk wup_tsk can_wup	Force remote task into wait state Resume task in forced wait state Force task in forced wait state to resume execution Put local task into sleep state Put local task into sleep state (to sleep until time-out) Wake up remote task Cancel task walk-up request
Synchronization/transmission functions	sig_sem wai_sem preq_sem ref_sem	Return semaphore resource Poll semaphore resource Poll semaphore resource (polling) Reference semaphore status
	set_flg clr_flg wai_flg pol_flg twai_flg ref_flg	Set event flag Clear event flag Wait for event flag Wait for event flag (polling) Wait for event flag (with time-out) Reference event flag status
	snd_msg rcv_msg prcv_msg trcv_msg ref_mbx	Send data to mailbox Receive data from mailbox Poll and receive message from mailbox (polling) Receive data from mailbox (with time-out) Reference mailbox status
Variable length memory pool	get_blk pget_blk rel_blk ref_mpl	Get variable length memory block Get variable length memory block (polling) Return variable length memory block Reference variable length memory block
Fixed length memory pool	get_blf pget_blf tget_blf rel_blf ref_mpl	Get fixed length memory block Get fixed length memory block (polling) Get fixed length memory block (with time-out) Return fixed length memory block Reference fixed length memory block status
Interrupt management function	ret_int loc_cpu uni_cpu chg_ilm ref_ilm	Return from interrupt handler Disable interrupt and dispatch Enable interrupt and dispatch Change interrupt level Reference interrupt level status
Time c functions	set_tim get_tim dly_tsk def_cyc act_cyc ref_cyc def_alm ref_alm ret_tmr	Set system clock Reference system clock Delay task Define cyclic handler Activate/control cyclic handler Reference cyclic handler status Define alarm handler Reference alarm handler status Return from timer handler
System management function	get_ver ref_sys	Get version number Reference system status

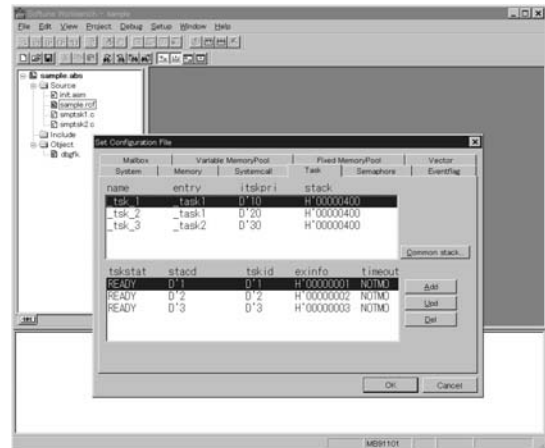
32-bit FR Family Support Tools

• Sample programs

Sample programs are provided as practical coding examples for user training purposes.

• REALOS Configurator

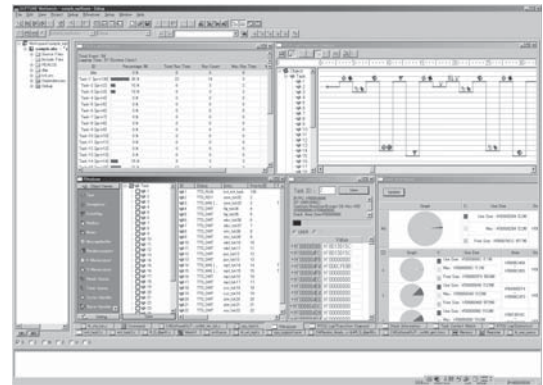
The configurator helps when setting conditions for creating the REALOS kernel. Necessary settings are made according to the display on the configurator screen, simplifying kernel configuration.



• REALOS Analyzer

The performance of the system by which REALOS is built in and the state transition of the task are analyzed and displayed by Graphic.

- Displaying object conditions
- OS break (execution break, access break, dispatcher break, service call/system call break)
- Issuing a service call/system call
- Task transition flow
- Stack status
- Task context watch



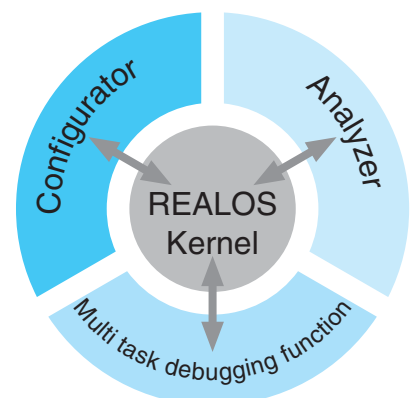
7. μ TRON4.0 specifications compliant Real Time OS for FR Family (SOFTUNE REALOS/FR Spec.4)

(1) Overview

SOFTUNE REALOS/FR Spec.4 is the real time OS for the FR Family of Fujitsu Microelectronics proprietary 32-bit MCUs, conforming to the μ TRON4.0 specifications.

• Features

μ TRON4.0 specifications
 System design customized for 32-bit MCUs for control purposes
 High-speed dispatch and interrupt processing
 Support for dynamic creation and deletion of a object
 Support for Mutex, Message buffer and so on
 In-line expansion of service call functions
 Providing sample I/O drivers
 Easy-to-use GUI-based REALOS configurator
 Graphical analysis tool REALOS Analyzer



• REALOS/FR Spec.4 Specifications

Name	Description
Target CPU	FR
Maximum number of task	32,767
Maximum number of priority levels	1,024
Scheduling method	Priority-base, event-driven type
Number of service calls	128
Complying specifications	μ TRON4.0 specifications
Kernel coding	C and Assembly Languages
Application coding	C and Assembly Languages
Kernel size	About 11 KB (resident) to About 44 KB (maximum configuration)

(2) Configuration

• Kernel

The kernel provides the basic functions of the real time OS.

It is an event-driven, multitasking real time OS.

The functions to be used by application programs can be selected as service calls.

• Service calls

Function	Instruction	Description
Task Management Functions	cre_tsk	Create Task
	acre_tsk	Create Task (ID Number Automatic Assignment)
	del_tsk	Delete Task
	act_tsk	Activate Task
	can_act	Cancel Task Activation Requests
	sta_tsk	Activate Task (with a Start Code)
	ext_tsk	Terminate Invoking Task
	exd_tsk	Terminate and Delete Invoking Task
	ter_tsk	Terminate Task
	chg_pri	Change Task Priority
	get_pri	Reference Task Priority
	ref_tsk	Reference Task State
	ref_tst	Reference Task State (Simplified Version)
Task Dependent Synchronization Functions	slp_tsk	Put Task to Sleep
	tslp_tsk	Put Task to Sleep (with Time-out)
	wup_tsk	Walk-up Task
	can_wup	Cancel Task Walk-up Requests
	rel_wai	Release Task from Waiting
	sus_tsk	Suspend Task
	rsm_tsk	Resume Suspended Task
	frsm_tsk	Forcibly Resume Suspended Task
Task Exception Handling Functions	dly_tsk	Delay Task
	def_tex	Define Task Exception Handling Routine
	ras_tex	Raise Task Exception Handling
	dis_tex	Disable Task Exceptions
	ena_tex	Enable Task Exceptions
	sns_tex	Reference Task Exception Handling State
Synchronization and Communication Functions	ref_tex	Reference Task Exception Handling State
	cre_sem	Create Semaphore
	acre_sem	Create Semaphore (ID Number Automatic Assignment)
	del_sem	Delete Semaphore
	sig_sem	Release Semaphore Resource
	wai_sem	Acquire Semaphore Resource
	pol_sem	Acquire Semaphore Resource (Polling)
	twai_sem	Acquire Semaphore Resource (with Time-out)
	ref_sem	Reference Semaphore State
	cre_flg	Create Event flag
	acre_flg	Create Event flag (ID Number Automatic Assignment)
	del_flg	Delete Event flag
	set_flg	Set Event flag
	clr_flg	Clear Event flag
	wai_flg	Wait for Event flag
	pol_flg	Wait for Event flag (Polling)
	twai_flg	Wait for Event flag (with Time-out)
	ref_flg	Reference Event flag Status
	cre_dtg	Create Data Queue
	acre_dtg	Create Data Queue (ID Number Automatic Assignment)
	del_dtg	Delete Data Queue
	snd_dtg	Send to Data Queue
	psnd_dtg	Send to Data Queue (Polling)
	tsnd_dtg	Send to Data Queue (with Time-out)
	fsnd_dtg	Forced Send to Data Queue
	rcv_dtg	Receive from Data Queue
	prcv_dtg	Receive from Data Queue (Polling)
	trcv_dtg	Receive from Data Queue (with Time-out)
	ref_dtg	Reference Data Queue State
	cre_mbx	Create Mailbox
	acre_mbx	Create Mailbox (ID Number Automatic Assignment)
	del_mbx	Delete Mailbox
	snd_mbx	Send to Mailbox
	rcv_mbx	Receive from Mailbox
	prcv_mbx	Receive from Mailbox (Polling)
	trcv_mbx	Receive from Mailbox (with Time-out)
	ref_mbx	Reference Mailbox State

Function	Instruction	Description
Extended Synchronization and Communication Functions	cre_mtx	Create Mutex
	acre_mtx	Create Mutex (ID Number Automatic Assignment)
	del_mtx	Delete Mutex
	loc_mtx	Lock Mutex
	ploc_mtx	Lock Mutex (Polling)
	tlloc_mtx	Lock Mutex (with Time-out)
	unl_mtx	Unlock Mutex
	ref_mtx	Reference Mutex State
	cre_mbf	Create Message Buffer
	acre_mbf	Create Message Buffer (ID Number Automatic Assignment)
	del_mbf	Delete Message Buffer
	snd_mbf	Send to Message buffer
	psnd_mbf	Send to Message buffer (Polling)
Fixed-Sized Memory Pools	tsnd_mbf	Send to Message buffer (with Time-out)
	rcv_mbf	Receive from Message Buffer
	prcv_mbf	Receive from Message Buffer (Polling)
	trcv_mbf	Receive from Message Buffer (with Time-out)
	ref_mbf	Reference Message Buffer State
	cre_mpf	Create Fixed-Sized Memory Pool
Variable-Sized Memory Pools	acre_mpf	Create Fixed-Sized Memory Pool (ID Number Automatic Assignment)
	del_mpf	Delete Fixed-Sized Memory Pool
	get_mpf	Acquire Fixed-Sized Memory Block
	pget_mpf	Acquire Fixed-Sized Memory Block (Polling)
	tget_mpf	Acquire Fixed-Sized Memory Block (with Time-out)
	rel_mpf	Release Fixed-Sized Memory Block
Time Management Functions	ref_mpf	Reference Fixed-Sized Memory Pool State
	cre_mpl	Create Variable-Sized Memory Pool
	acre_mpl	Create Variable-Sized Memory Pool (ID Number Automatic Assignment)
	del_mpl	Delete Variable-Sized Memory Pool
	get_mpl	Acquire Variable-Sized Memory Block
	pget_mpl	Acquire Variable-Sized Memory Block (Polling)
	tget_mpl	Acquire Variable-Sized Memory Block (with Time-out)
	rel_mpl	Release Variable-Sized Memory Block
	ref_mpl	Reference Variable-Sized Memory Pool State
	set_tim	Set System Time
	get_tim	Reference System Time
	isig_tim	Supply Time Tick
	cre_cyc	Create Cyclic Handler
System State Management Functions	acre_cyc	Create Cyclic Handler (ID Number Automatic Assignment)
	del_cyc	Delete Cyclic Handler
	sta_cyc	Start Cyclic Handler Operation
	stp_cyc	Stop Cyclic Handler Operation
	ref_cyc	Reference Cyclic Handler State
	cre_alm	Create Alarm Handler
	acre_alm	Create Alarm Handler (ID Number Automatic Assignment)
	del_alm	Delete Alarm Handler
	sta_alm	Start Alarm Handler Operation
	stp_alm	Stop Alarm Handler Operation
	ref_alm	Reference Alarm Handler State
	rot_rdg	Rotate Task Precedence
	get_tid	Reference Task ID in the RUNNING State
Interrupt Management Functions	loc_cpu	Lock the CPU
	unl_cpu	Unlock the CPU
	dis_dsp	Disable Dispatching
	ena_dsp	Enable Dispatching
	sns_ctx	Reference Contexts
	sns_loc	Reference CPU State
	sns_dsp	Reference Dispatching State
	sns_dpn	Reference Dispatch Pending State
	ref_sys	Reference System State
	chg_ilm	Change Interrupt Mask
	get_ilm	Reference Interrupt Mask
System Configuration Management Functions	ref_cfg	Reference Configuration Information
	ref_ver	Reference Version Information

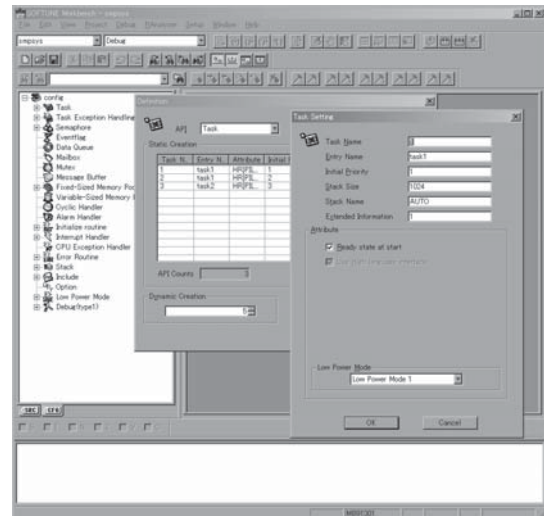
32-bit FR Family Support Tools

- **Sample programs**

Sample programs are provided as practical coding examples for user training purposes.

- **REALOS Configurator**

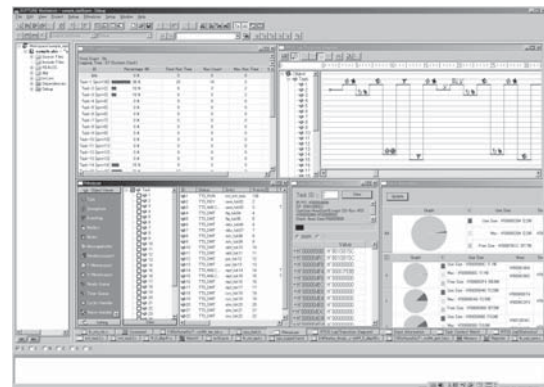
The configurator helps when setting conditions for creating the REALOS kernel. Necessary settings are made according to the display on the configurator screen, simplifying kernel configuration.



- **REALOS Analyzer**

The performance of the system by which REALOS is built in and the state transition of the task are analyzed and displayed by Graphic.

- Displaying object conditions
- OS break (execution break, access break, dispatcher break, service call/system call break)
- Issuing a service call/system call
- Task transition flow
- Stack status
- Task context watch



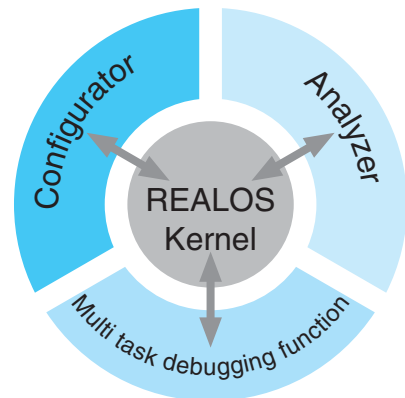
8. μ T-Kernel Specifications Compliant Real-Time OS for FR Family (SOFTUNE μ T-REALOS/FR)

(1) Overview

SOFTUNE μ T-REALOS/FR is the real time OS for the FR Family of Fujitsu Microelectronics proprietary 32-bit MCUs, it is the next generation realtime Operating System conforming to the μ T-Kernel specifications.

• Features

- μ T-Kernel specifications
- System design customized for 32-bit MCUs for control purposes
- High-speed dispatch and interrupt processing
- High-speed system call processing by function call
- Shift support by μ ITRON interchangeable API
- Customizing of kernel by optimization function
- Power saving by power control function in each task
- Providing sample I/O drivers
- Easy-to-use GUI-based REALOS configurator
- Graphical analysis tool REALOS Analyzer



• μ T-REALOS/FR Specifications

Name	Description
Target CPU	FR
Maximum number of task	32,767
Maximum number of priority levels	1,024
Scheduling method	Priority-base, event-driven type
Number of service calls	108
Complying specifications	μ T-Kernel specifications
Kernel coding	C and Assembly Languages
Application coding	C and Assembly Languages

32-bit FR Family Support Tools

(2) Configuration

• Kernel

The kernel provides the functions of the real time OS.
It is an event-driven, multitasking real time OS.
The functions to be used by application programs can be selected.

• Service calls

Function	Instruction	Description
Task Management	tk_cre_tsk	Generate Task
	tk_del_tsk	Delete Task
	tk_sta_tsk	Starte Task
	tk_ext_tsk	End Task
	tk_exd_tsk	Ende and delete Task
	tk_ter_tsk	Cancel Another task
	tk_chg_pri	Change priority of the task
	tk_ref_tsk	Refer to the state of the task
	tk_set_reg	Acquir task register
	tk_get_reg	Set task register
Task attachment synchronization	tk_slp_tsk	The task is shifted to the getting up waiting state
	tk_wup_tsk	Get up another task
	tk_can_wup	Nullified the getting up demand for the task
	tk_rel_wai	Released the waiting state of another task
	tk_sus_tsk	Another task is shifted to the compulsion waiting state
	tk_rsm_tsk	Restarted the task of the compulsion waiting state
Synchronization and Communication	tk_frsm_tsk	Restarts the task of the compulsion waiting state
	tk_dly_tsk	The task is shifted to the waiting state of the passage of time
	tk_cre_sem	The semaphore is generated
	tk_del_sem	The semaphore is deleted
	tk_wai_sem	The semaphore resource is acquired
	tk_sig_sem	The semaphore resource is returned
	tk_ref_sem	Refer to the state of the semaphore
	tk_cre_flg	The event flag is generated
	tk_del_flg	The event flag is deleted
	tk_set_flg	The event flag is set
	tk_clr_flg	The event flag is cleared
	tk_wai_flg	The event flag is waited for
	tk_ref_flg	Refer to the state of the event flag
	tk_cre_mbx	The mailbox is made
	tk_del_mbx	The mailbox is deleted
	tk_snd_mbx	Sent to mailbox
	tk_rcv_mbx	Received from mailbox
	tk_ref_mbx	Refer to the state of the mailbox
Enhancing Synchronization and Communication	tk_cre_mtx	Mutex is generated
	tk_del_mtx	Mutex is deleted
	tk_loc_mtx	Mutex is locked
	tk_unl_mtx	Mutex is unlocked
	tk_ref_mtx	Refer to the state of mutex
	tk_cre_mbf	The message buffer is generated
	tk_del_mbf	The message buffer is deleted
	tk_snd_mbf	Sent to message buffer
	tk_rcv_mbf	Received from message buffer
	tk_ref_mbf	Refer to the state of the message buffer
	tk_cre_por	The rendezvous port is generated
	tk_del_por	The rendezvous port is deleted
	tk_cal_por	The rendezvous to the rendezvous port is called
	tk_acp_por	The rendezvous to the rendezvous port is accepted
	tk_fwd_por	The rendezvous to the rendezvous port is forwarded
	tk_rpl_rdv	It answers the rendezvous to the rendezvous port
	tk_ref_por	Refer to the state of the rendezvous port.

Function	Instruction	Description
Memory pool management	tk_cre_mpf	The fixed length memory pool is generated
	tk_del_mpf	The fixed length memory pool is deleted
	tk_get_mpf	The fixed length memory block is acquired
	tk_rel_mpf	The fixed length memory block is returned
	tk_ref_mpf	Refer to the state of the fixed length memory pool
	tk_cre_mpl	The variable-length memory pool is generated
	tk_del_mpl	The variable-length memory pool is deleted
	tk_get_mpl	The variable-length memory block is acquired
	tk_rel_mpl	The variable-length memory block is returned
	tk_ref_mpl	Refer to the state of the variable-length memory pool
Management at time	tk_set_tim	The system time is set
	tk_get_tim	Refer to the time of the system now
	tk_get_otm	Refer to the system operating time
	tk_cre_cyc	The cycle handler is generated
	tk_del_cyc	The cycle handler is deleted
	tk_sta_cyc	The operation of the cycle handler begins
	tk_stp_cyc	The operation of the cycle handler is stopped
	tk_ref_cyc	Refer to the state of the cycle handler
	tk_cre_alm	The alarm handler is generated
	tk_del_alm	The alarm handler is deleted
Interruption management	tk_sta_alm	The operation of the alarm handler begins
	tk_stp_alm	The operation of the alarm handler is stopped
	tk_ref_alm	Refer to the state of the alarm handler
	isig_tim	Taimuticc is supplied
	tk_def_int	The interruption handler is defined
System state management	tk_ret_int	It returns from the interruption handler
	DI	All external interruptions are prohibited
	EI	All external interruptions are permitted
	isDI	The external interruption prohibition is examined
	tk_rot_rdq	The priority level of the task is rotated
Sub-system management	tk_get_tid	Refer to task ID of the running state task
	tk_dis_dsp	Dispatch is prohibited
	tk_ena_dsp	Dispatch is permitted
	tk_ref_sys	Refer to the state of the system
	tk_ref_ver	Refer to the version
Device management	tk_def_ssy	The subsystem is defined
	tk_ref_ssy	Refer to subsystem definition information
	tk_opn_dev	Opening of device
	tk_cls_dev	Close of device
	tk_rea_dev	Reading beginning of device
	tk_srea_dev	Synchronous reading beginning of device
	tk_wri_dev	Writing beginning of device
	tk_swri_dev	Synchronous writing beginning of device
	tk_wai_dev	Demand completion Ma of device
	tk_sus_dev	Suspension of device
	tk_get_dev	Acquisition of device name
	tk_ref_dev	Acquisition of device information
	tk_oref_dev	Acquisition of device information
	tk_lst_dev	Acquisition of device list that has been registered
	tk_evt_dev	The driver demand event is transmitted the device
Device management(device registration)	tk_def_dev	The device is registered
	tk_ref_idv	Device initial information is acquired

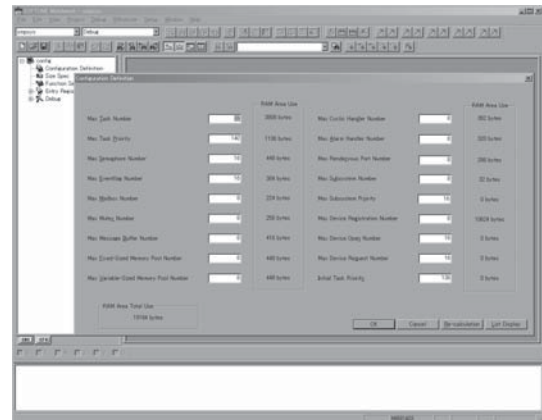
FR Family
Support tools

- **Sample programs**

Sample programs are provided as practical coding examples for user training purposes.

- **μT-REALOS Configurator**

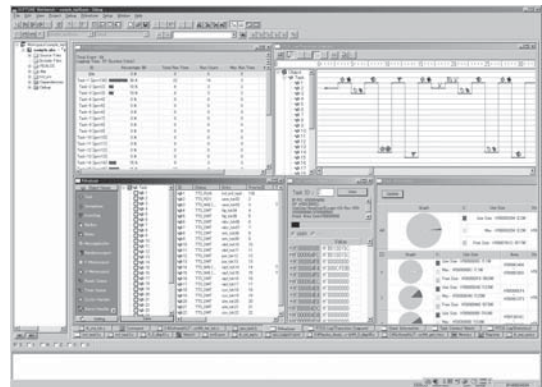
The configurator helps when setting conditions for creating the REALOS kernel. Necessary settings are made according to the display on the configurator screen, simplifying kernel configuration.



- **REALOS Analyzer**

The performance of the system by which REALOS is built in and the state transition of the task are analyzed and displayed by Graphic.

- Displaying object conditions
- OS break (execution break, access break, dispatcher break, service call/system call break)
- Issuing a service call/system call
- Task transition flow
- Stack status
- Task context watch



32-bit FR Family Support Tools

Evaluation Tools for Support Hardware FR families (MB2197 emulator)

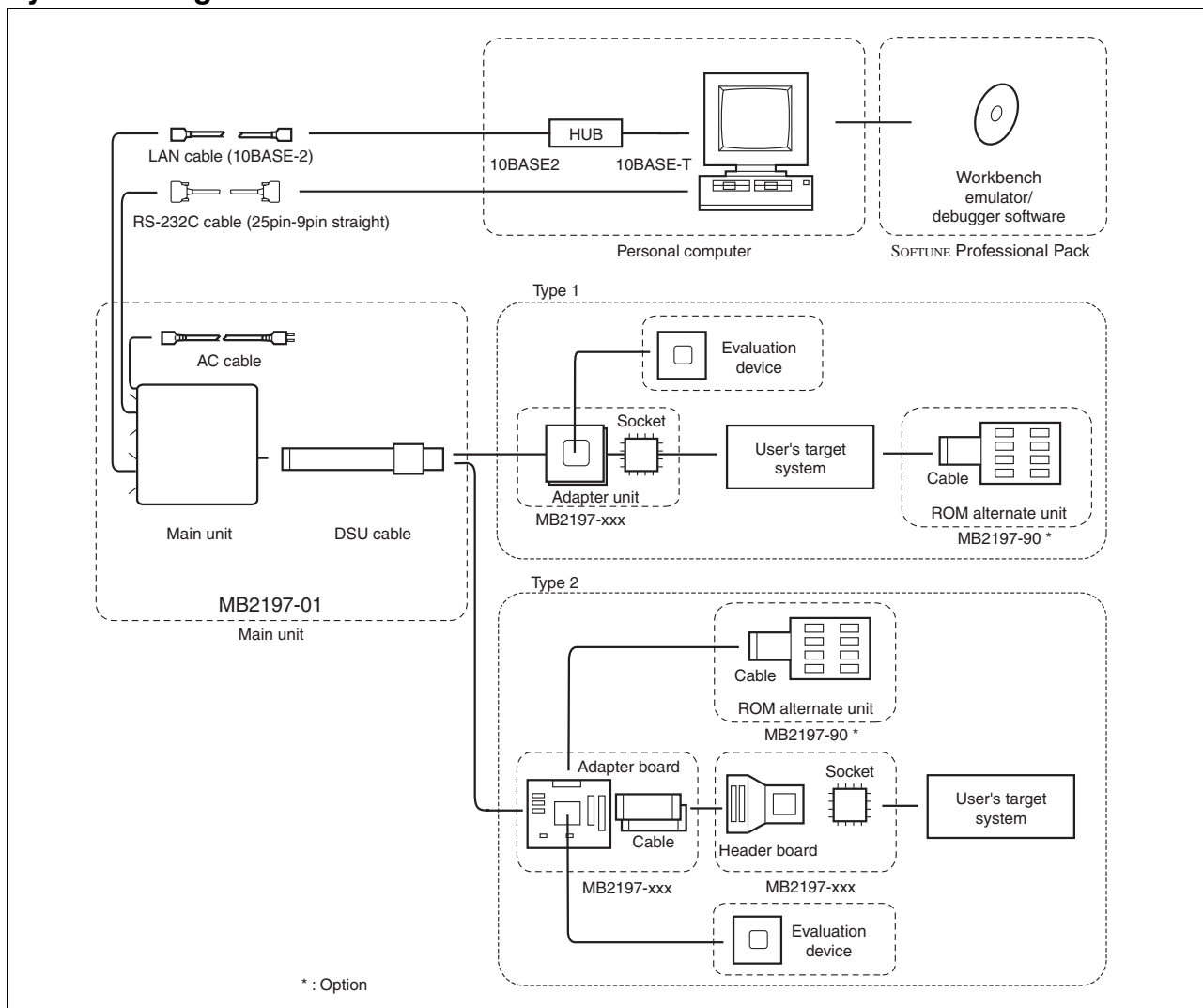
Features

- DSU support: DSU2, DSU3
- Linear power supply voltage support from +2.7V to +5.5V
- Supports debugging of source level (assembly and C languages, a mixed indication)
- Simplified graphic interface operation execution using pull-down menu and buttons
- Real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Hardware break $\times 5$, software break $\times 8192$, code event $\times 2$, data event $\times 2$
- Operation cycle measurement function
- Host I/F (standard accessories) : RS-232C (max 19.2 Kbps) , LAN (10BASE-2)

System Overview



System configuration



Evaluation Tools for Support Hardware FR families (MB2198 emulator)

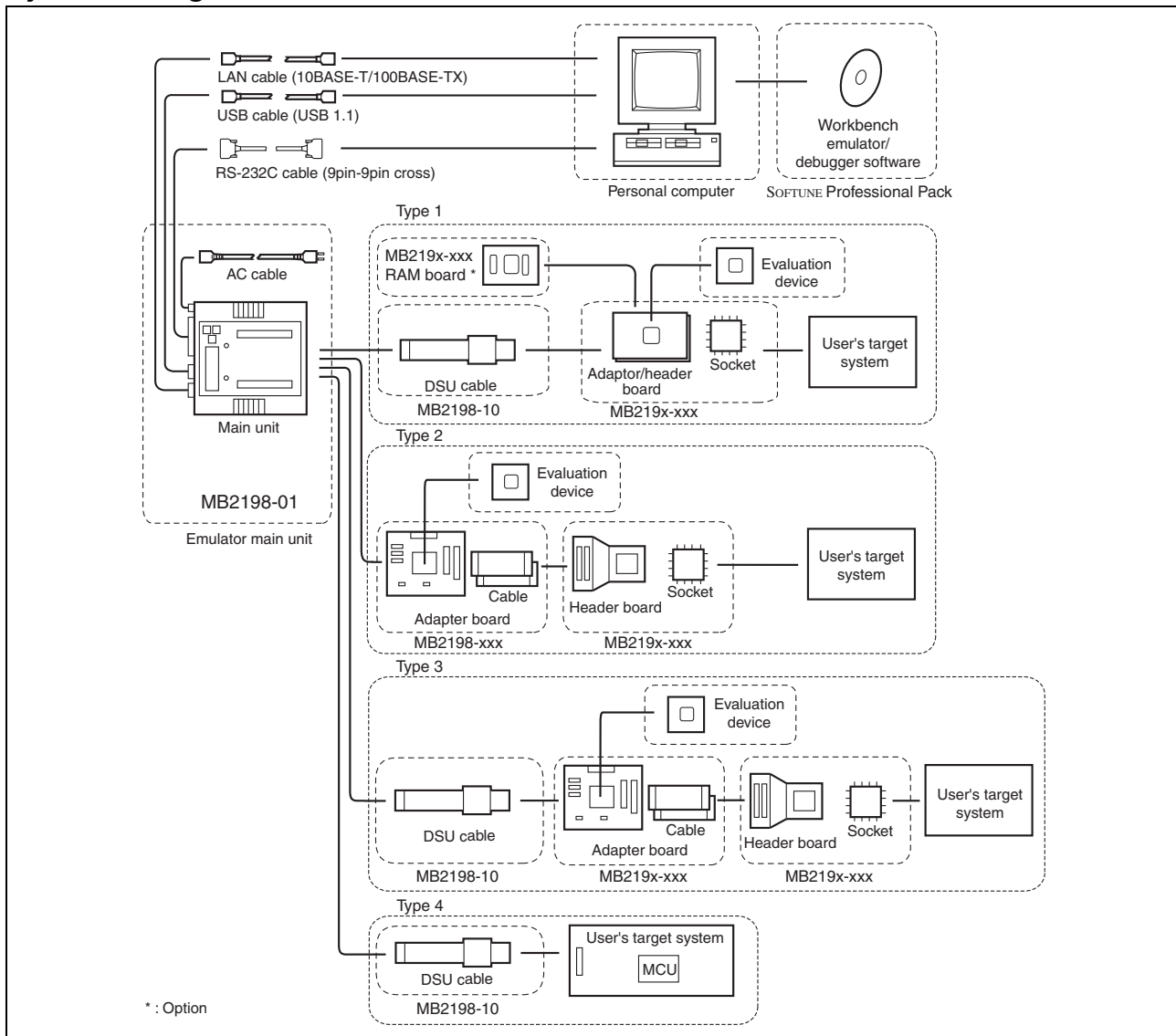
Features

- DSU support: DSU3, DSU4
- Linear power supply voltage support from +2.7V to +5.5V
- Supports debugging of source level (assembly and C languages, a mixed indication)
- Simplified graphic interface operation execution using pull-down menu and buttons
- Real time trace function
- Displays source codes, variables, register, memory and trace on multi windows
- Hardware break $\times 5$, software break $\times 4096$, code event $\times 2$, data event $\times 2$
- Operation cycle measurement function
- Host I/F (standard accessories) : RS-232C (max 115 Kbps) , LAN (10BASE-T, 100BASE-TX) , USB 1.1

System Overview

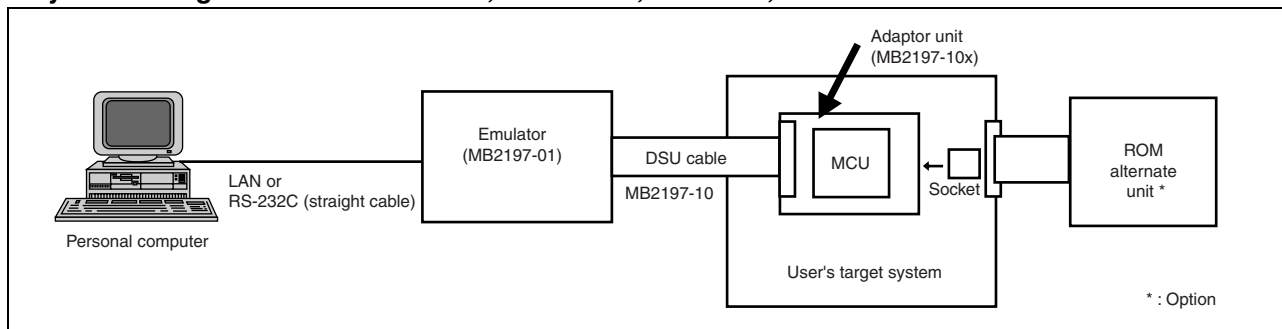


System configuration

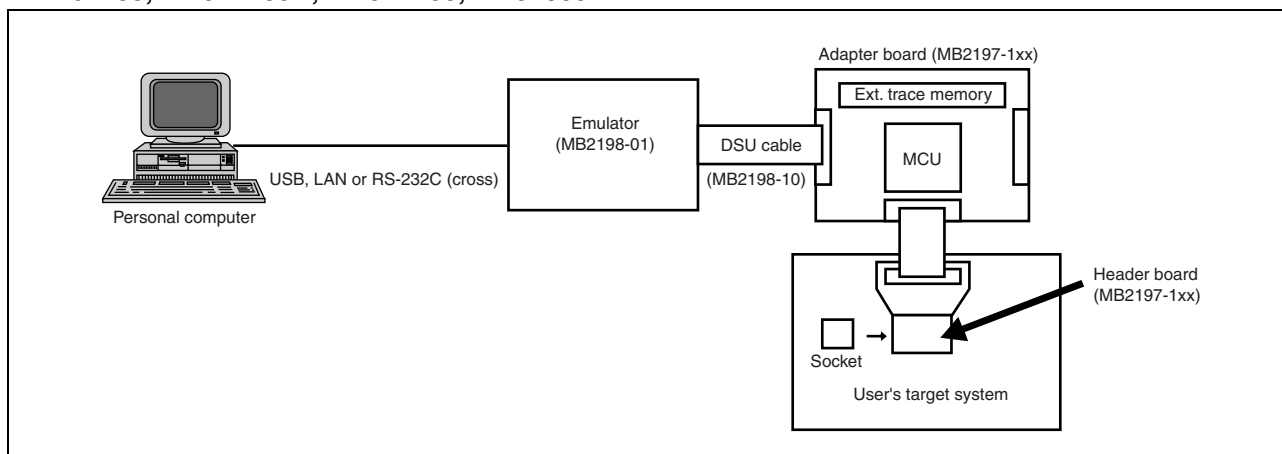


32-bit FR Family Support Tools

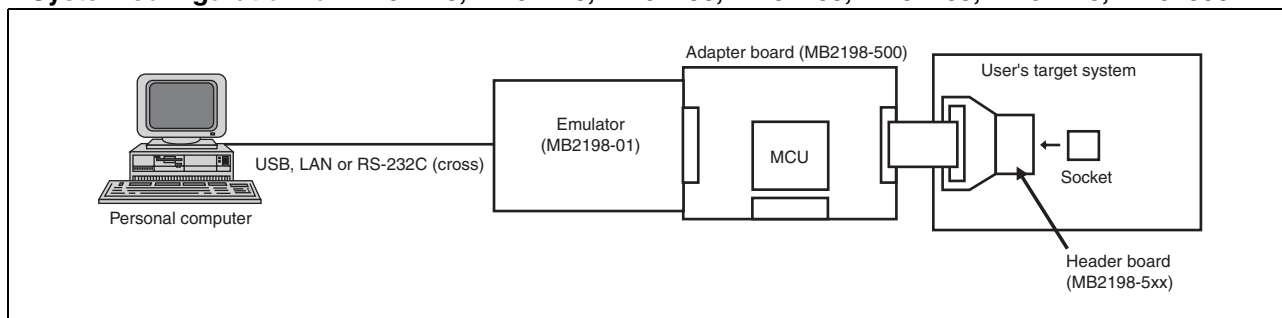
• System configuration for MB91101A, MB91107A, MB91108, MB91121



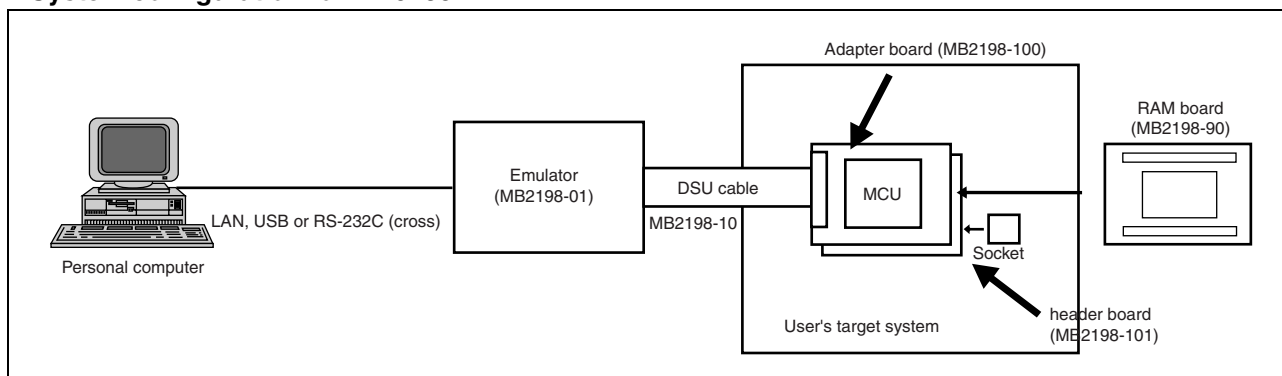
• System configuration for MB91F127, MB91F128, MB91133, MB91F133A, MB91151A, MB91154, MB91155, MB91F155A, MB91F158, MB91360



• System configuration for MB91210, MB91220, MB91230, MB91260, MB91265, MB91270, MB91350A

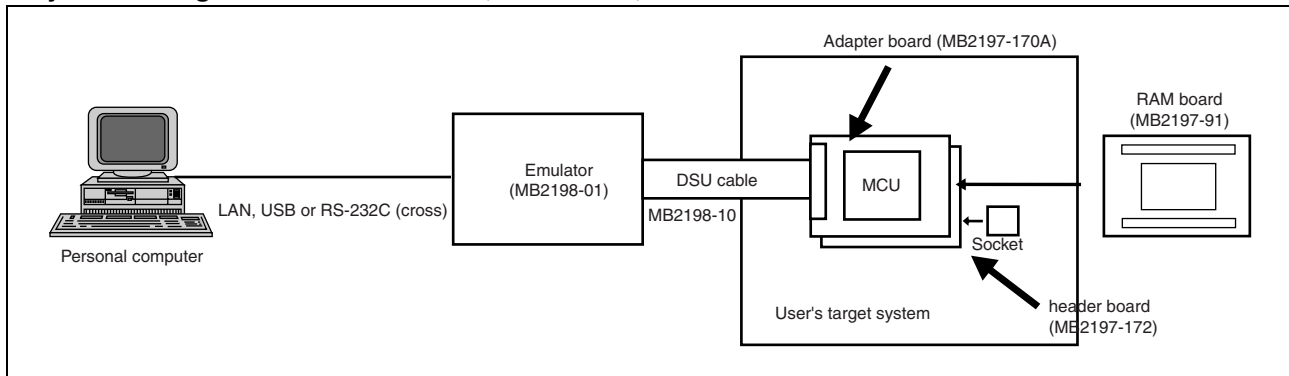


• System configuration for MB91302A

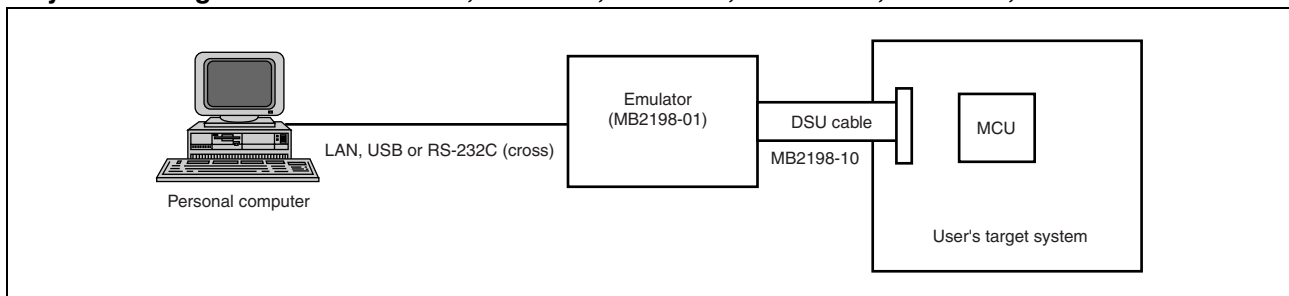


32-bit FR Family Support Tools

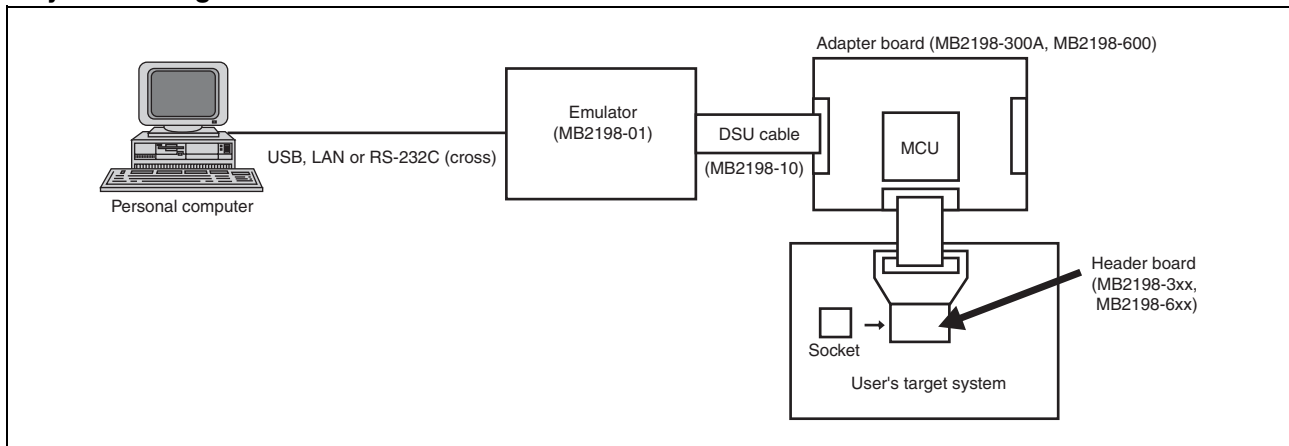
• System configuration for MB91306R, MB91307B, MB91307R



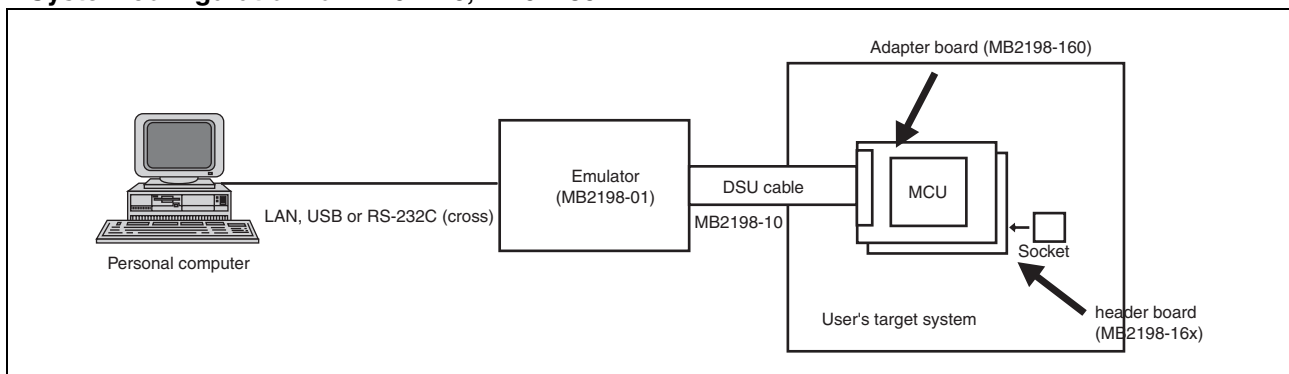
• System configuration for MB91305, MB91310, MB91313, MB91314A, MB91319, MB91345



• System configuration for MB91460



• System configuration for MB91470, MB91480



32-bit FR Family Support Tools

System

• For FR (DSU2/3) Emulator

Name	Part number	Remarks	Overview
Emulator main unit for FR (DSU2/3)	MB2197-01	- The systems development support tool which used MCU for evaluating FR and builds in DSU interface. - Power supply voltage: AC100V or AC200 V - Dimensions: 210 mm (width) × 297 mm (depth) × 87 mm (height) - Weight: 2.7 kg - With MB2197-10 (DSU2/3 cable)	
DSU2/3 cable	MB2197-10	Used to connect the emulator main unit to the adaptor unit or the adapter board.	
ROM alternate unit *	MB2197-90 (with 100-V AC adapter)	- Option for FR family - Memory board: Capable of substituting the memory on the target board - Memory size: 4 Mbytes - Data bus size: Selectable from among 8, 16, and 32-bit configurations - Write protect function	

*: The ROM alternate unit is directly connected to the CPU bus. To use the unit, therefore, the target board must be designed so that the unit can be connected on the board.

• For FR (DSU3/4) Emulator

Name	Part number	Remarks	Overview
Emulator main unit for FR (DSU3/4)	MB2198-01	- The systems development support tool which used MCU for evaluating FR and builds in DSU interface. - Power supply voltage: AC100V or AC200 V - Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg	
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board.	
Small cable for DSU3	MB2198-201	Used to connect the MB2198-10 with user system for DSU3. - Dimensions: 73 mm (width) × 31 mm (depth) × 7 mm (height) - Includes : Connector × 1 (SICA2P20HD, made by Tokyo Eletech Ltd.)	
Small cable for DSU4	MB2198-202	Used to connect the MB2198-10 with user system for DSU4. - Dimensions: 67 mm (width) × 30 mm (depth) × 7 mm (height) - Includes : Connector × 1 (SICA2P20HD, made by Tokyo Eletech Ltd.)	

For MB91101A

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91V101ACR-ES	• PGA135, DSU2
Emulator main unit for FR (DSU2/3)	MB2197-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 210 mm (width) × 297 mm (depth) × 87 mm (height) • Weight: 2.7 kg • With MB2197-10 (DSU2/3 cable)

• Adapter

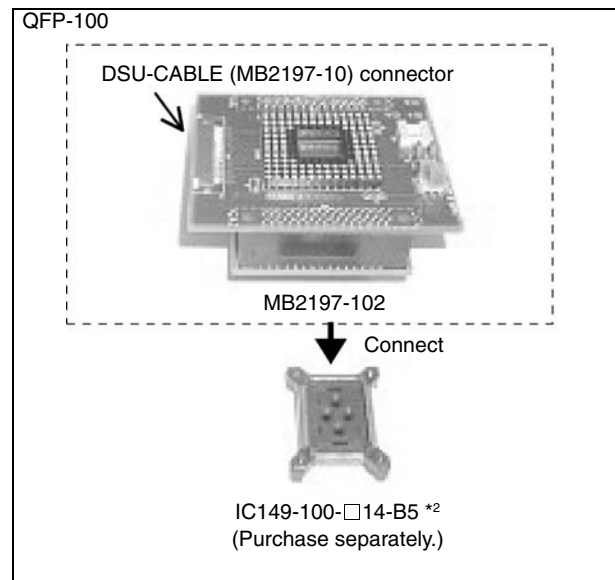
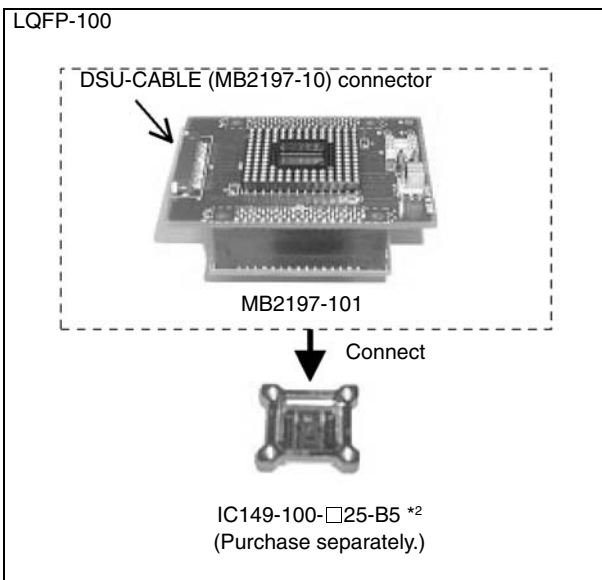
Name	Part number	Note
Adapter unit (LQFP-100)	MB2197-101	• Adapter unit to connect the user system using an LQFP100. • IC149-100-□25-B5 for MB91101A *1. The MB91V101A is required separately.
Adapter unit (QFP-100)	MB2197-102	• Adapter unit to connect the user system using a QFP100. • IC149-100-□14-B5 for MB91101A *1. The MB91V101A is required separately.

• Option tool

Name	Part number	Note
ROM alternate unit *3	MB2197-90 (with 100-V AC adapter)	• Memory board: Capable of substituting the memory on the target board • Memory size: 4 Mbytes • Data bus size: Selectable from among 8, 16, and 32-bit configurations • Write protect function

• Option

Name	Part number	Note
DSU2/3 cable	MB2197-10	Used to connect the emulator main unit to the adaptor unit or the adapter board.



32-bit FR Family Support Tools

Evaluation board

Name	Part number	Note
Evaluation board (Main board)	MB91906EB	- Main board + daughter board - For 5 V, 3 V products
Daughter board for MB91101A	MB91901EB	- For In Circuit Emulator (made by Fujitsu Microelectronics) - Combined use main board (MB91906EB) - Built-in MB91V101A
	MB91902EB	- For In Circuit Emulator for MB91101A (Yokogawa Digital Computer Corporation) - Combined use main board (MB91906EB)

• Simple target board

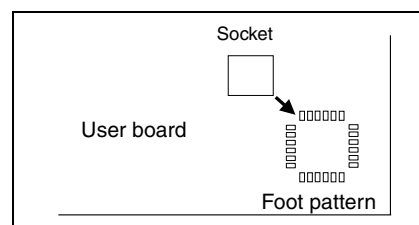
Name	Part number	Note
In Circuit Emulator Simple target board for MB91101A (FR30SRAM board)	MB91903EB	- Main board + Simple target board - Built-in MB91V101A - Connection to In Circuit Emulator (made by Fujitsu Microelectronics) - RAM 2 KB

*1: The adapter requires an IC socket manufactured by YAMAICHI ELECTRON-ICS Co., Ltd. (Separately priced)

<Contact> Yamaichi Electric Mfg. TEL: 81-3-3778-6121

*2: The IC socket is mounted on the foot pattern on the user board.

*3 : A ROM alternate unit is used connecting with a CPU bus. In the case of use, it is necessary to design so that ROM alternate unit can be connected on target board.



32-bit FR Family Support Tools

For MB91107A/108

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

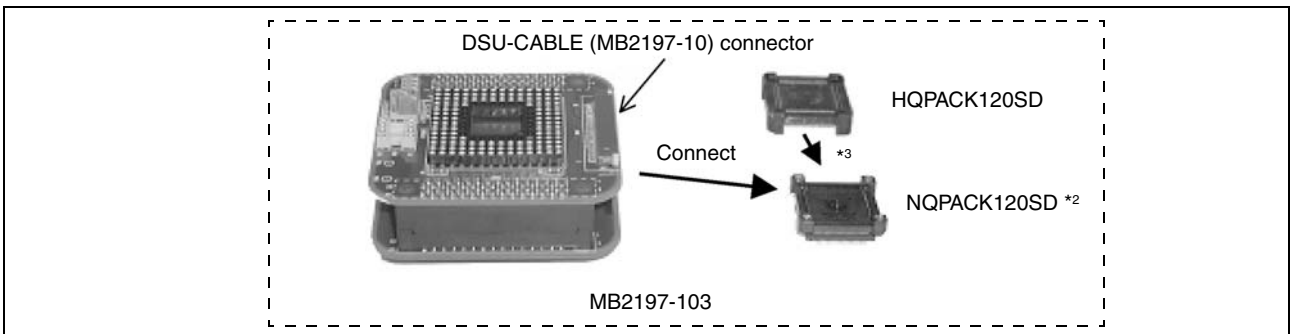
Name	Part number	Note
Evaluation device	MB91V108CR-ES	• PGA135, DSU2
Emulator main unit for FR (DSU2/3)	MB2197-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 210 mm (width) × 297 mm (depth) × 87 mm (height) • Weight: 2.7 kg • With MB2197-10 (DSU2/3 cable)
Adapter (LQFP-120)	MB2197-103	• Adapter unit to connect the user system using an LQFP120. • NQPACK120SD and HQPACK120SD are bundled *1 • MB91V108 is required separately

• Option tool

Name	Part number	Note
ROM alternate unit *4	MB2197-90 (with 100-V AC adapter)	• Memory board: Capable of substituting the memory on the target board • Memory size: 4 Mbytes • Data bus size: Selectable from among 8, 16, and 32-bit configurations • Write protect function

• Option

Name	Part number	Note
DSU2/3 cable	MB2197-10	Used to connect the emulator main unit to the adaptor unit or the adapter board.



Evaluation board

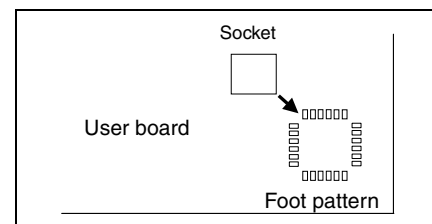
Name	Part number	Note
Evaluation board (Main board)	MB91906EB	• Main board + daughter board • For 5 V, 3 V products
Daughter board for MB91107A/108/121	MB91907EB	• Connection to In Circuit Emulator (made by Fujitsu Microelectronics) • Combined use main board(MB91906EB)

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board..

*3 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4: A ROM alternate unit is used connecting with a CPU bus. In the case of use, it is necessary to design so that ROM alternate unit can be connected on target board



32-bit FR Family Support Tools

For MB91121

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

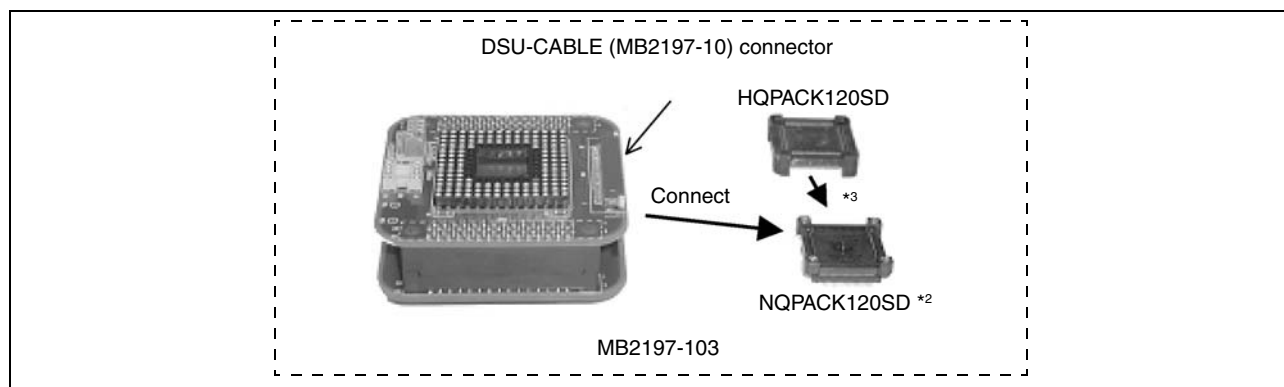
Name	Part number	Note
Evaluation device	MB91V121CR-ES	PGA135, DSU2
Emulator main unit for FR (DSU2/3)	MB2197-01	- The systems development support tool which used MCU for evaluating FR and builds in DSU interface. - Power supply voltage: AC100V or AC200 V - Dimensions: 210 mm (width) × 297 mm (depth) × 87 mm (height) - Weight: 2.7 kg - With MB2197-10 (DSU2/3 cable)
Adapter (LQFP-120)	MB2197-103	- Adapter unit to connect the user system using an LQFP120. - NQPACK120SD and HQPACK120SD are bundled *1 - MB91V108 is required separately

• Option tool

Name	Part number	Note
ROM alternate unit *4	MB2197-90 (with 100-V AC adapter)	- Memory board: Capable of substituting the memory on the target board - Memory size: 4 Mbytes - Data bus size: Selectable from among 8, 16, and 32-bit configurations - Write protect function

• Option

Name	Part number	Note
DSU2/3 cable	MB2197-10	Used to connect the emulator main unit to the adaptor unit or the adapter board.



Evaluation board

Name	Part number	Note
Evaluation board (Main board)	MB91906EB	- Main board + daughter board - For 5 V, 3 V products
Daughter board for MB91107A/108/121	MB91907EB	- Connection to In Circuit Emulator (made by Fujitsu Microelectronics) - Combined use main board (MB91906EB)

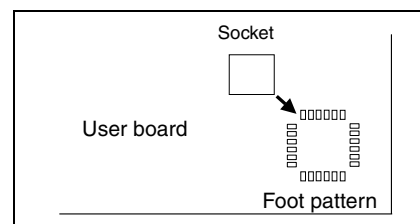
*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.

<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4 : A ROM alternate unit is used connecting with a CPU bus. In the case of use, it is necessary to design so that ROM alternate unit can be connected on target board.



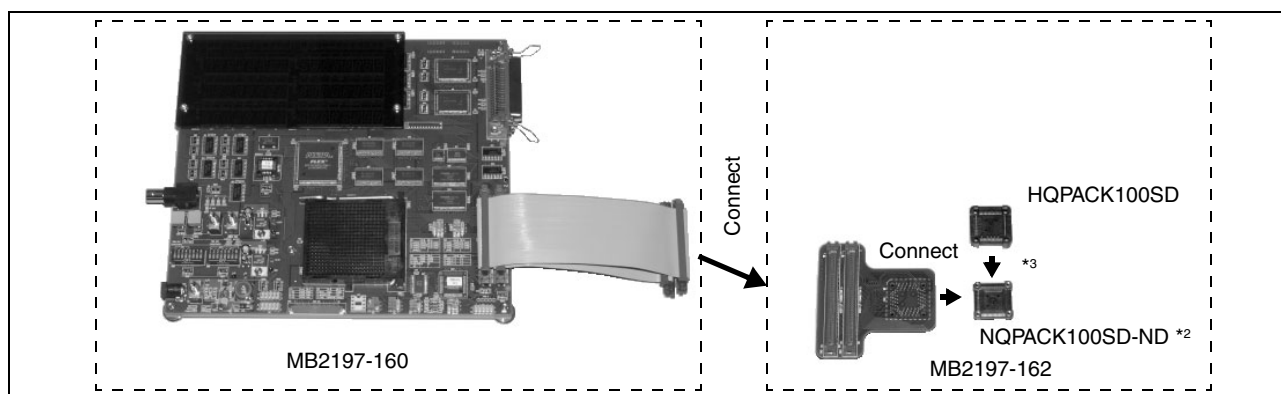
32-bit FR Family Support Tools

For MB91F127/128

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91FV129CR-ES	• PGA299, DSU3
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board
PGA299P adapter board type 3 for MB91FV129	MB2197-160	• User alternate memory: 4 MB • Header cable is bundled • MB91FV129 is required separately
LQFP-100Pheader board	MB2197-162	• Used to connect the adapter board to the user board • NQPACK100SD-ND and HQPACK100SD *1 are bundled



Evaluation board

Name	Part number	Note
Evaluation board (Main board)	MB91906EB	• Main board + daughter board • For 5 V, 3 V products
Daughter board for MB91106A/109	MB91910EB	Used to connect the adapter to the In Circuit Emulator (made by Fujitsu Microelectronics)

Programmer for Flash microcontroller

- Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F127PFV MB91F128PFV	LQFP-100 (0.5 mm, □14 × 14 mm)	FPT-100P-M05	TE110-123F14AP	—

- Serial programmer

Product name	Serial programmer	
	Yokogawa Digital Computer Corporation *6	
MB91F127PFV MB91F128PFV	NETIMPRESS	

32-bit FR Family Support Tools

*1 : The header requires the NQPACK manufactured by Tokyo Eletech Co.

<Contact>TEL: 81-3-5295-1661

*2 : The IC socket is mounted on the foot pattern on the user board.

*3 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4 : Flash Support Group, Inc.

<Contact> TEL : 053-428-8383

<http://www.j-fsg.co.jp/e/top.html>

*5 : MINATO ELECTRONICS INC.

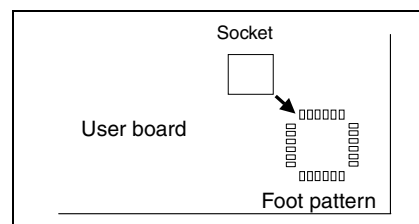
<Contact> TEL : 045-591-5611, FAX : 045-592-2854

http://www.minato.co.jp/index_e.asp

*6 : Yokogawa Digital Computer Corporation

<Contact> TEL: 042-333-6224 FAX : 042-352-6107

<http://www.yokogawa-digital.com/emb/en/index.html>

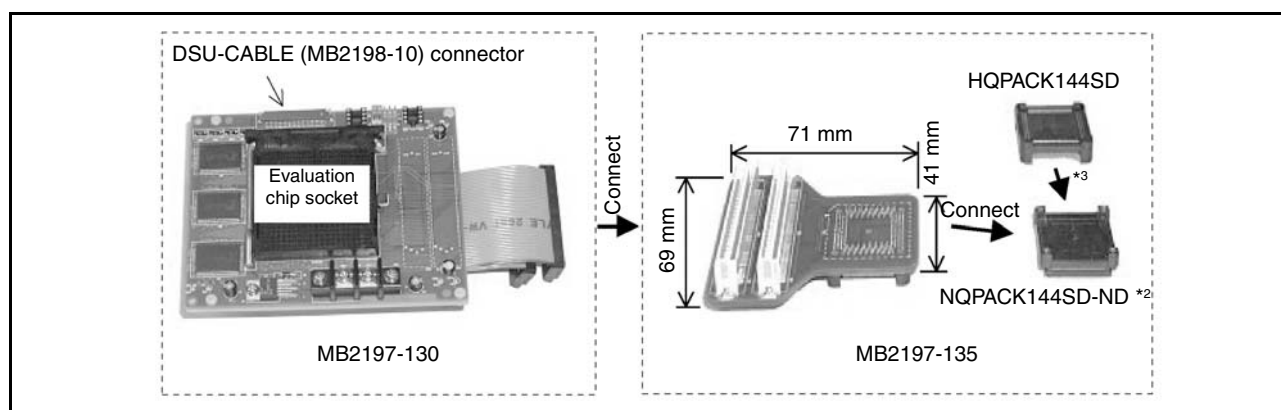


For MB91133, MB91F133A

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91FV130CR-ES	• PGA299, DSU3
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board.
PGA299P evaluation board type 2 for FR-DSU3	MB2197-130	• Connection to MB2197-10. Combined use MB2197-135. • Header cable is bundled • MB91FV130 is required separately
LQFP-144 Header type 2	MB2197-135	• Used to connect the evaluation board to the user board • NQPACK144SD-ND and HQPACK144SD are bundled *1



• Option tool

Name	Part number	Note
ROM alternate unit *4	MB2197-90 (with 100-V AC adapter)	• Memory board: Capable of substituting the memory on the target board • Memory size: 4 Mbytes • Data bus size: Selectable from among 8, 16, and 32-bit configurations • Write protect function

32-bit FR Family Support Tools

Evaluation board

Name	Part number	Note
Evaluation board (Main board)	MB91906EB	- Main board + daughter board - For 5 V, 3 V products
Evaluation board for MB91130 series	MB91908EB	It can be used only.

Programmer for Flash microcontroller

• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *5	MINATO ELECTRONICS INC.*6
MB91F133APMT2	LQFP-144 (0.5 mm, □20 × 20 mm)	FPT-144P-M08	—	MF00-871 (for MODEL1893/1931) MF05-871 (for MODEL1940)
MB91F133APBT	BGA-144 (0.8 mm, □12 × 12 mm)	BGA-144P-M01	—	MF00-870 (for MODEL1893/1931) MF05-870 (for MODEL1940)

• Serial programmer

Product name	Serial programmer	
	Yokogawa Digital Computer Corporation*7	
MB91F133APMT2 MB91F133APBT	NETIMPRESS	

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.

<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4 : A ROM alternate unit is used connecting with a CPU bus. In the case of use, it is necessary to design so that ROM alternate unit can be connected on target board.

*5 : Flash Support Group, Inc.

<Contact> TEL : 053-428-8383

<http://www.j-fsg.co.jp/e/top.html>

*6 : MINATO ELECTRONICS INC.

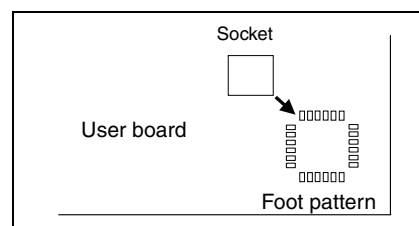
<Contact> TEL : 045-591-5611, FAX : 045-592-2854

http://www.minato.co.jp/index_e.asp

*7 : Yokogawa Digital Computer Corporation

<Contact> TEL: 042-333-6224 FAX : 042-352-6107

<http://www.yokogawa-digital.com/emb/en/index.html>



32-bit FR Family Support Tools

For MB91151A/154/155/F155A/F158

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

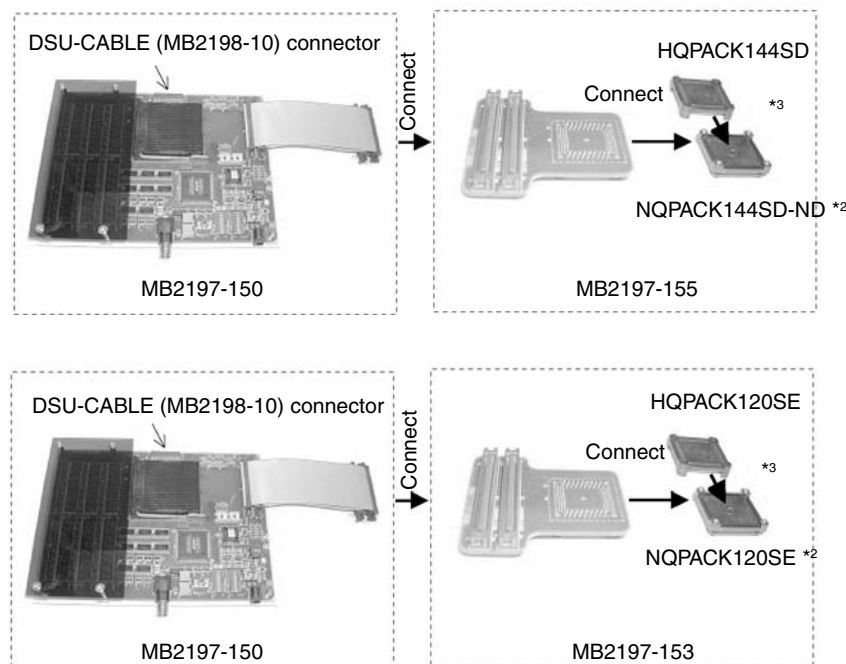
Name	Part number	Note
Evaluation device	MB91V151ACR-ES MB91FV150CR-ES	• PGA299, DSU3
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board.
Adapter unit	MB2197-150	• Connection to MB2198-10 • Capable of real-time display of internal RAM (6 points) • Built-in function for measuring two-point execution time • Combined use MB2197-155

• Header

Name	Part number	Note
Header for MB91151A, MB91154, MB91155, MB91F155A (LQFP-144)	MB2197-155	• Used to connect the adapter board to the user board. • NQPACK144SD-ND and HQPACK144SD are bundled *1
Header for MB91F158 (LQFP-120)	MB2197-153	• Used to connect the adapter board to the user board. • NQPACK120SE and HQPACK120SE are bundled *1

• Evaluation device

Name	Part number	Note
Evaluation device for MB91151A	MB91V151ACR-ES	For MB91151A
Evaluation device for MB91154, MB91155, MB91F155A, MB91F158	MB91FV150CR-ES	For MB91154, MB91155, MB91F155A and MB91F158



32-bit FR Family Support Tools

• Option

Name	Part number	Note
ROM alternate unit ^{*4}	MB2197-90 (with 100-V AC adapter)	- Memory board: Capable of substituting the memory on the target board - Memory size: 4 Mbytes - Data bus size: Selectable from among 8, 16, and 32-bit configurations - Write protect function

Evaluation board

Name	Part number	Note
Evaluation board	MB91906EB	- Main board + daughter board - FlashROM, DRAM, etc. Built-in - AC100 V, ACAdapter is bundled.
Evaluation board for MB91150 series	MB91911EB	It can be used only.

Programmer for Flash microcontroller

• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. ^{*5}	MINATO ELECTRONICS INC. ^{*6}
MB91F155APFV-G	LQFP-144 (0.5 mm, □20 × 20 mm)	FPT-144P-M08	TE110-155F10AP	MF05-1003 (for MODEL1940) MF13-1003A (for MODEL1893/1931)
MB91F158PFF-G	LQFP-120 (0.4 mm, □14 × 14 mm)	FPT-120P-M05	-	MF05-1271 (for MODEL1940) MF13-1271 (for MODEL1893/1931)

• Serial programmer

Product name	Serial programmer
	Yokogawa Digital Computer Corporation ^{*7}
MB91F155APFV	NETIMPRESS

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4 : A ROM alternate unit is used connecting with a CPU bus. In the case of use, it is necessary to design so that ROM alternate unit can be connected on target board.

*5 : Flash Support Group, Inc.

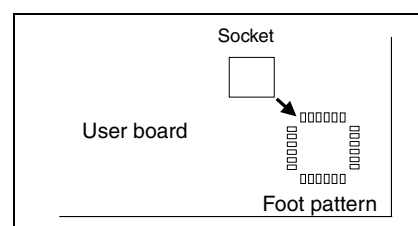
<Contact> TEL : 053-428-8383
<http://www.j-fsg.co.jp/e/top.html>

*6 : MINATO ELECTRONICS INC.

<Contact> TEL : 045-591-5611, FAX : 045-592-2854
http://www.minato.co.jp/index_e.asp

*7 : Yokogawa Digital Computer Corporation

<Contact> TEL: 042-333-6224 FAX : 042-352-6107
<http://www.yokogawa-digital.com/emb/en/index.html>



32-bit FR Family Support Tools

For MB91210 series

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91V210PB-ESE1	• PGA420, DSU4
Emulator main unit for FR (DSU4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 0.7 kg
Adapter board (PGA-420)	MB2198-140	• Header I/F cable is bundled
Header (LQFP-144)	MB2198-141	• Used to connect the adapter board to the user board
Header (LQFP-100)	MB2198-142	• Used to connect the adapter board to the user board

Programmer for Flash microcontroller

- Parallel programme

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F211B	LQFP-100 (0.5mm, 14 × 14mm)	FPT-100P-M20	Under development	-
MB91F213A	LQFP-144 (0.5mm, 20 × 20mm)	FPT-144P-M08	TEF110-91F213	-

For MB91220 series

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91V220CR-ES	• PGA401, DSU4
Emulator main unit for FR (DSU4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 0.7 kg
Adapter board (PGA-401)	MB2198-130	• Header I/F cable is bundled
Header (LQFP-144)	MB2198-132	• Used to connect the adapter board to the user board

Programmer for Flash microcontroller

- Parallel programme

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F223 MB91F223S MB91F224 MB91F224S	LQFP-144 (0.5mm, 20 × 20mm)	FPT-144P-M08	TEF110-248F42AP	-

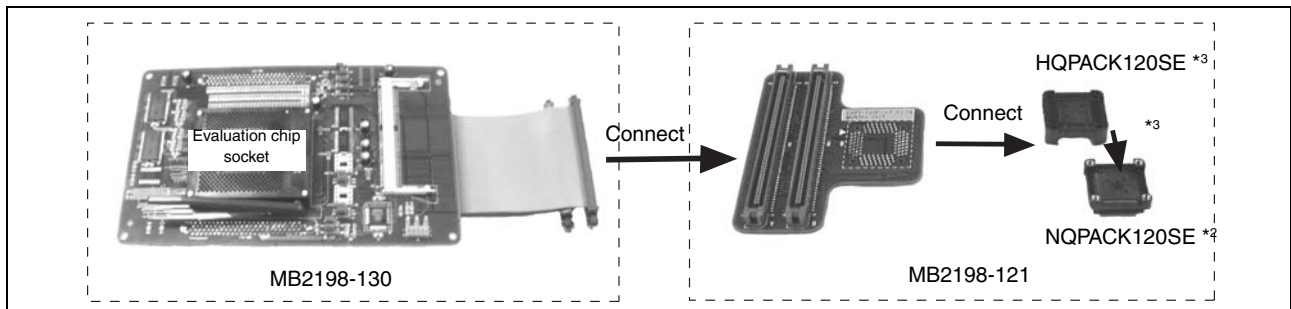
32-bit FR Family Support Tools

For MB91230 series

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91V230CR-ES	• PGA401, DSU4
Emulator main unit for FR (DSU4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 0.7 kg
Adapter board (PGA-401)	MB2198-130	• Header I/F cable is bundled
Header (LQFP-120)	MB2198-121	• Used to connect the adapter board to the user board • HQPACK120SE and NQPACK120SE are bundled *1



Programmer for Flash microcontroller

• Parallel programme

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F233A MB91F233L	LQFP-120 (0.4 mm, □14 × 14 mm)	FPT-120P-M05	TEF110-233F20AP	MF13-1330 (for MODEL1893/1931)
MB91F233L	FLGA-128 (0.65 mm, □9 × 9 mm)	LGA-128P-M01	TEF110-233F24AP	-

• Serial programmer

Product name	Serial programmer	
	Yokogawa Digital Computer Corporation *6	
MB91F233A MB91F233L	NETIMPRESS	

Evaluation board

Name	Part number	Note
Evaluation board for MB91F233	MB91920EB	It can be used only.

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.

<Contact> TEL : 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3: The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4: Flash Support Group, Inc.

<Contact> TEL : 053-428-8383

<http://www.j-fsg.co.jp/e/top.html>

*5: MINATO ELECTRONICS INC.

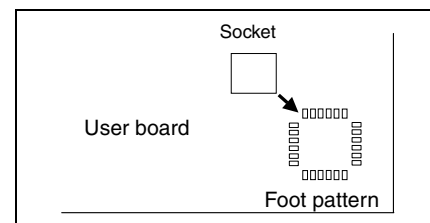
<Contact> TEL : 045-591-5611, FAX : 045-592-2854

http://www.minato.co.jp/index_e.asp

*6: Yokogawa Digital Computer Corporation

<Contact> TEL: 042-333-6224 FAX : 042-352-6107

<http://www.yokogawa-digital.com/emb/en/index.html>



32-bit FR Family Support Tools

For MB91245 series

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91V245ACR-ES	• PGA401, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 0.7 kg
Adapter board	MB2198-130	• Header I/F cable is bundled
header board	MB2198-123	• Adapter unit to connect the user system • NQPACK144SD-ND and HQPACK144SD are bundled *1

Programmer for Flash microcontroller

- Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit
			Flash Support Group, Inc. *2
MB91F248	LQFP-144 (0.5 mm, □20 × 20 mm)	FPT-144P-M08	TEF110-248F42AP
MB91F248S			

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.

<Contact>TEL: 81-3-5295-1661

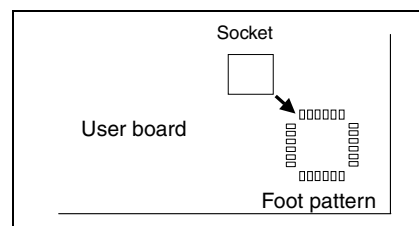
The IC socket is mounted on the foot pattern on the user board.

The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*2 : Flash Support Group, Inc.

<Contact> TEL : 053-428-8383

<http://www.j-fsg.co.jp/e/top.html>



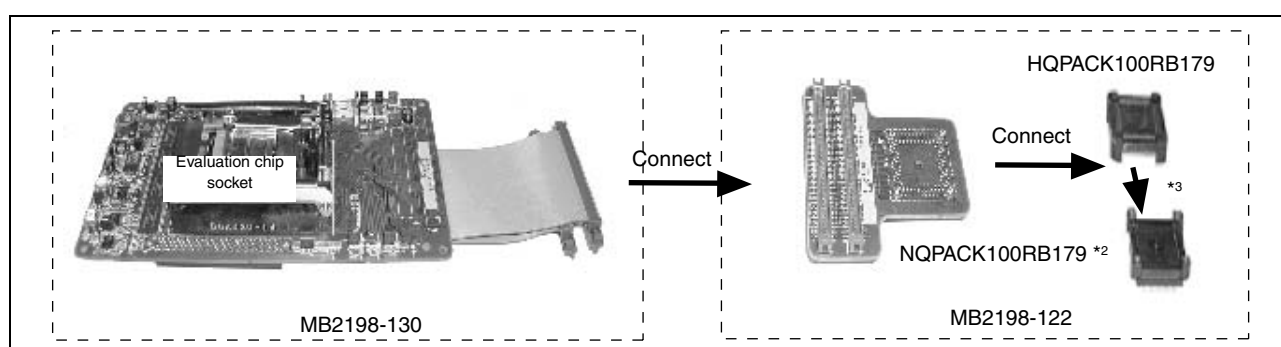
32-bit FR Family Support Tools

For MB91260B series

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91V260BCR-ES	• PGA401, DSU4
Emulator main unit for FR (DSU4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) Weight: 0.7 kg
Adapter board	MB2198-130	• Header I/F cable is bundled
header board (QFP-100)	MB2198-122	• Adapter unit to connect the user system • NQPACK100RB179-A and HQPACK100RB179 are bundled *1
header board (LQFP-100)	MB2198-126	• Adapter unit to connect the user system • NQPACK100SD-ND and HQPACK100SD are bundled *1



FR Family
Support tools

Programmer for Flash microcontroller

• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F264BPF-GE1	QFP-100 (0.65 mm, □14 × 20 mm)	FPT-100P-M06	TEF110-264F21AP	MF13-1427 (for MODEL1893/1931)
MB91F264BPFV-GE1	LQFP-100 (0.5 mm, □14 × 14 mm)	FPT-100P-M20	Under development	MF13-1605 (for MODEL1893/1931)

• Serial programmer

Product name	Serial programmer	
	Yokogawa Digital Computer Corporation *6	Flash Support Group, Inc.
MB91F264B	NETIMPRESS	AF9101

Evaluation board

Name	Part number	Note
Evaluation board for MB91F264B	MB91921EB	It can be used only.

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.

<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3: The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4: Flash Support Group, Inc.

<Contact> TEL : 053-428-8383

<http://www.j-fsg.co.jp/e/top.html>

*5: MINATO ELECTRONICS INC.

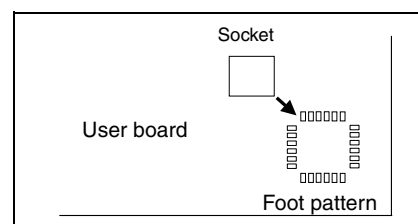
<Contact> TEL : 045-591-5611, FAX : 045-592-2854

http://www.minato.co.jp/index_e.asp

*6: Yokogawa Digital Computer Corporation

<Contact> TEL: 042-333-6224 FAX : 042-352-6107

<http://www.yokogawa-digital.com/emb/en/index.html>



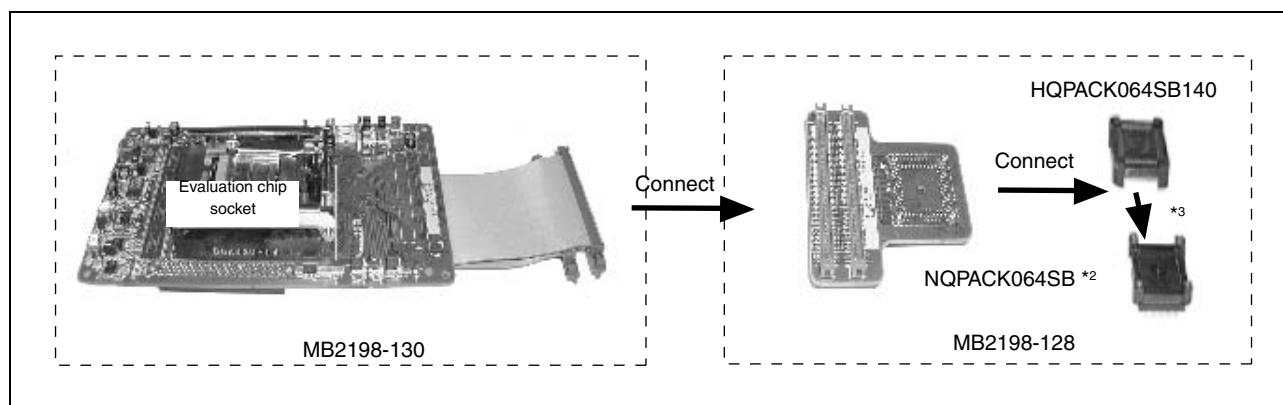
32-bit FR Family Support Tools

For MB91265A series

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91V265ACR-ES	PGA401, DSU4
Emulator main unit for FR (DSU4)	MB2198-01	- The systems development support tool which used MCU for evaluating FR and builds in DSU interface. - Power supply voltage: AC100 V or AC200 V - Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 0.7 kg
Adapter board	MB2198-130	Header I/F cable is bundled
header board (LQFP-64)	MB2198-128	- Adapter unit to connect the user system - NQPACK064SB and HQPACK064SB140 are bundled *1



Programmer for Flash microcontroller

- Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F267A MB91F267NA	LQFP-64 (0.65 mm, □12 × 12 mm)	FPT-64P-M23	Under development	MF13-1605 (for MODEL1893/1931)

- Serial programmer

Product name	Serial programmer
MB91F267A MB91F267NA	Under planning

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.

<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3: The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4: Flash Support Group, Inc.

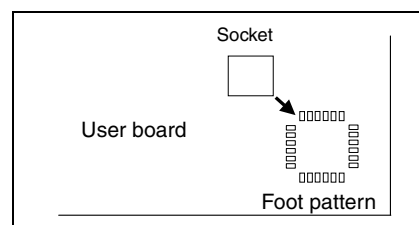
<Contact> TEL : 053-428-8383

<http://www.j-fsg.co.jp/e/top.html>

*5: MINATO ELECTRONICS INC.

<Contact> TEL : 045-591-5611, FAX : 045-592-2854

http://www.minato.co.jp/index_e.asp



32-bit FR Family Support Tools

For MB91270 series

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91V280CR-ES	• PGA401, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 0.7 kg
Adapter board	MB2198-130	• Header I/F cable is bundled
header board	MB2198-129	• Adapter unit to connect the user system • NQPACK100SD-ND and HQPACK100SD are bundled *1

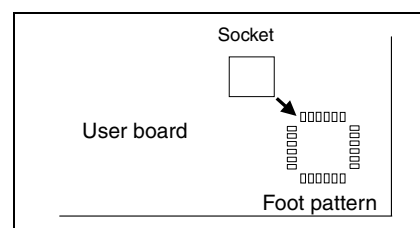
Programmer for Flash microcontroller

- Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit
			Flash Support Group, Inc. *2
MB91F273 MB91F273S MB91F278 MB91F278S	LQFP-100 (0.5 mm, □14 × 14 mm)	FPT-100P-M20	TEF110-272F39AP

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.
The IC socket is mounted on the foot pattern on the user board.
The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*2 : Flash Support Group, Inc.
<Contact> TEL : 053-428-8383
<http://www.j-fsg.co.jp/e/top.html>



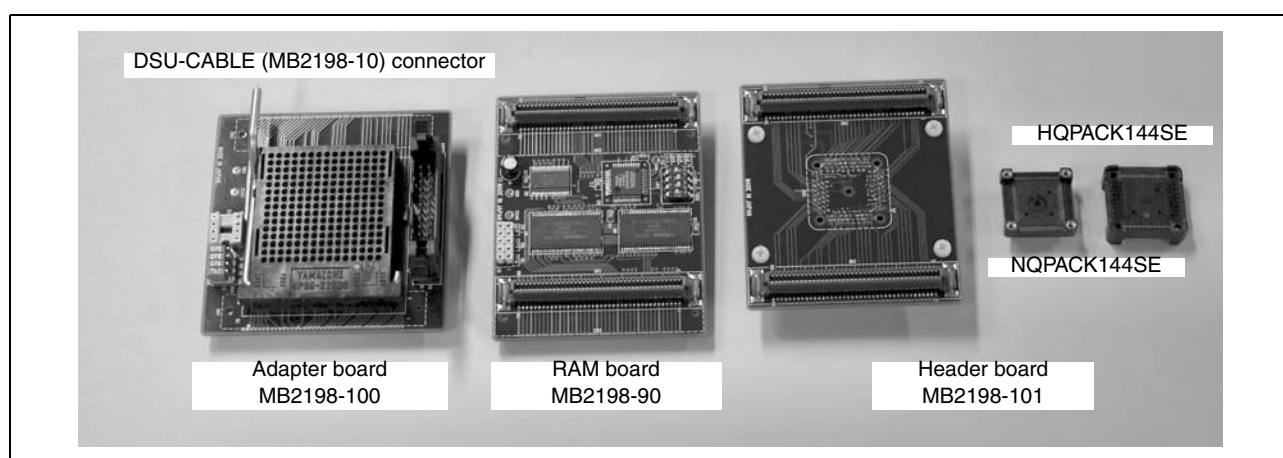
32-bit FR Family Support Tools

For MB91302A

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91V301ACR-ES	• PGA179, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board.
Adapter board for MB91V301A	MB2198-100	• MB91V301A is required separately
Header board for LQFP-144	MB2198-101	• Header board connect to the user system using an LQFP-144 • NQPACK144SE and HQPACK144SE are bundled *1



• Option tool

Name	Part number	Note
RAM board	MB2198-90	• Used to external ROM alternate memory • 32-bit bus: 4 MB, 16-bit bus: 2 MB
ROM alternate unit *4	MB2197-90 (with 100-V AC adapter)	• Memory board: Capable of substituting the memory on the target board • Memory size: 4 Mbytes • Data bus size: Selectable from among 8, 16, and 32-bit configurations • Write protect function

Evaluation board

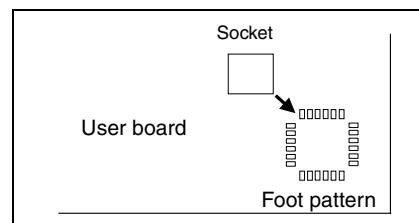
Name	Part number	Note
Evaluation board	MB91906EB	• Main board + daughter board • FlashROM, DRAM, etc. Built-in • AC100 V, ACAdapter is bundled.
Evaluation board for MB91302A	MB91914EB	It can be used only.

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4 : A ROM alternate unit is used connecting with a CPU bus. In the case of use, it is necessary to design so that ROM alternate unit can be connected on target board.



For MB91305

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91305PMC-G-BNDE1	• LQFP-176, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the target board.

Evaluation board

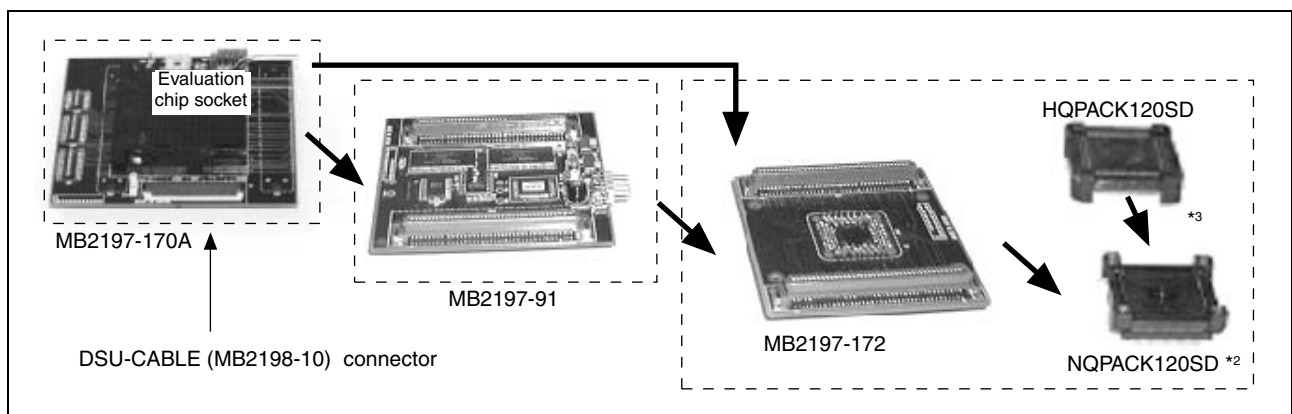
Name	Part number	Note
Evaluation board for MB91305	MB91925EB	It can be used only.

For MB91306R, MB91307B, MB91307R

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91V307RCR-ES	• PGA135, DSU3
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board.
DSU-FR emulator PGA-135PAdapter	MB2197-170A	—
DSU-FR emulator LQFP-120PHeader type 2	MB2197-172	• Header board connect to the user system using an LQFP-120 • NQPACK120SD and HQPACK120SD are bundled *1



32-bit FR Family Support Tools

• Option tool

Name	Part number	Note
RAM board	MB2197-91	- Used to external ROM alternate memory 32-bit bus: 4 MB, 16-bit bus: 2 MB
ROM alternate unit ^{*4}	MB2197-90 (with 100-V AC adapter)	- Memory board: Capable of substituting the memory on the target board - Memory size: 4 Mbytes - Data bus size: Selectable from among 8, 16, and 32-bit configurations - Write protect function

Evaluation board

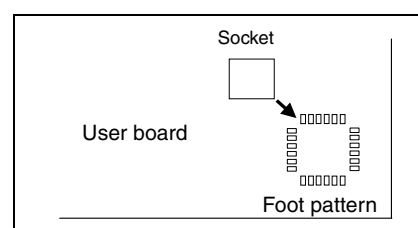
Name	Part number	Note
Evaluation board	MB91906EB	- Main board + daughter board - FlashROM, DRAM, etc. Built-in - AC100 V, ACAdapter is bundled.
Evaluation board for MB91306/307	MB91915EB	It can be used only.

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4 : A ROM alternate unit is used connecting with a CPU bus. In the case of use, it is necessary to design so that ROM alternate unit can be connected on target board.



For MB91310

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91FV310APFV-ESE1	LQFP-144, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	- The systems development support tool which used MCU for evaluating FR and builds in DSU interface. - Power supply voltage: AC100V or AC200 V - Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg - MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the target board.

Evaluation board

Name	Part number	Note
Evaluation board for MB91310	MB91918EB	It can be used only.

Programmer for Flash microcontroller

• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. ^{*4}	MINATO ELECTRONICS INC. ^{*5}
MB91F312A MB91FV310A	LQFP-144 (0.5 mm, □ 20 × 20 mm)	FPT-144P-M08	—	MF00-1526 (for MODEL1893/1931)

32-bit FR Family Support Tools

- Serial programmer

Product name	Serial programmer
	Yokogawa Digital Computer Corporation *6
MB91F312A MB91FV310A	NETIMPRESS

For MB91313A

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91F313APMC-GE1	LQFP-176, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	- The systems development support tool which used MCU for evaluating FR and builds in DSU interface. - Power supply voltage: AC100V or AC200 V - Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg - MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the target board.

Programmer for Flash microcontroller

- Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F313A	LQFP-120 (0.5 mm, □ 16 × 16 mm)	FPT-120P-M21	TRF110-91F313	—

For MB91314A

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91F314PMC-GE1	LQFP-120, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	- The systems development support tool which used MCU for evaluating FR and builds in DSU interface. - Power supply voltage: AC100V or AC200 V - Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg - MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the target board.

Programmer for Flash microcontroller

- Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F314A	LQFP-120 (0.5 mm, □ 16 × 16 mm)	FPT-120P-M21	TRF110-91F313	—

32-bit FR Family Support Tools

For MB91319

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91FV319APMT-ESE1	• LQFP-176, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the target board.

Programmer for Flash microcontroller

- Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. ^{*4}	MINATO ELECTRONICS INC. ^{*5}
MB91FV319A	LQFP-176 (0.5 mm, □ 24 × 24 mm)	FPT-176P-M07	—	MF05-1695 (for MODEL1940)

- Serial programmer

Product name	Serial programmer
	Yokogawa Digital Computer Corporation ^{*6}
MB91FV319A	NETIMPRESS

For MB91345

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91F345BPFT-GE1 MB91F346BPFT-GE1	• LQFP-100, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) - Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the target board.

- Serial programmer

Product name	Serial programmer
	Yokogawa Digital Computer Corporation ^{*6}
MB91F345B MB91F346B	NETIMPRESS

For MB91350A series

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91V350APB-ES	• BGA420, DSU4
Emulator main unit for FR (DSU4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 0.7 kg
Adapter board for MB91350A	MB2198-110	• Header I/F cable is bundled • Built-in emulation memory

• Header

Name	Part number	Note
Header for MB91352A/MB91353A/MB91F353A (LQFP-120)	MB2198-112	• Used to connect the adapter board to the user board. • NQPACK120SD and HQPACK120SD are bundled *1
Header for MB91354A/MB91355A/MB91F355A (LQFP-176)	MB2198-111	• Used to connect the adapter board to the user board • HQPACK176SD and NQPACK176SD are bundled *1

Programmer for Flash microcontroller

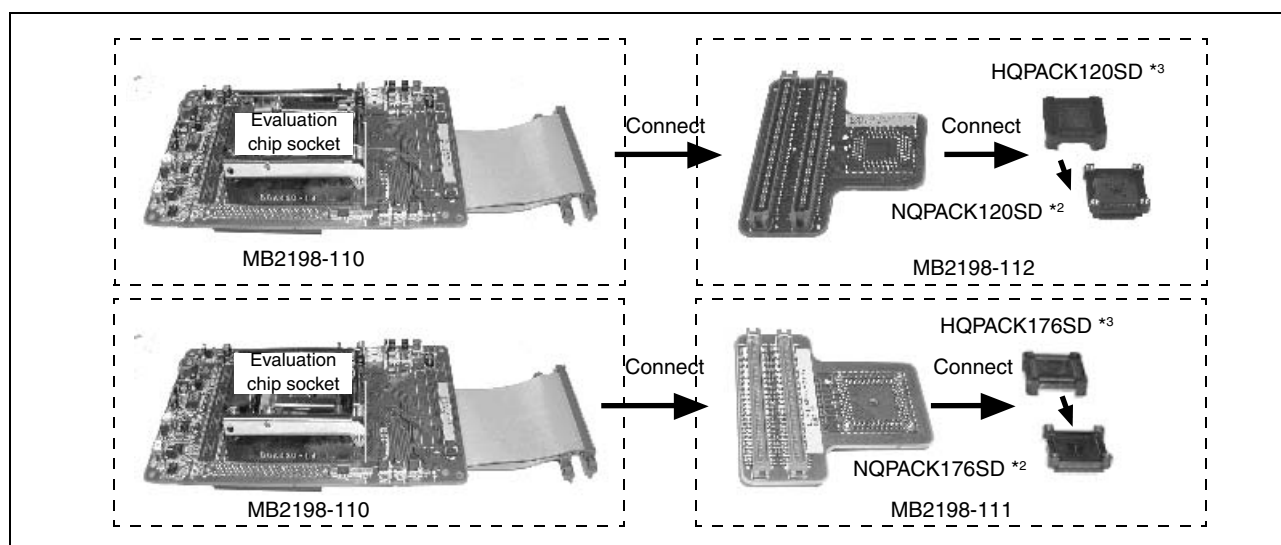
• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F353A	LQFP-120 (0.5mm, □16 × 16 mm)	FPT-120P-M21	TEF110-353F18AP	Under development
MB91F355A	LQFP-176 (0.5 mm, □24 × 24 mm)	FPT-176P-M02	TEF110-355F19AP	MF13-1361 (for MODEL1893/1931)

• Serial programmer

FR Family	Serial programmer
	Yokogawa Digital Computer Corporation *6
MB91F353A MB91F355A	NETIMPRESS

32-bit FR Family Support Tools



Evaluation board

• Main board

Name	Part number	Note
Evaluation board (Main board)	MB91906EB	- Main board + daughter board - For 5 V, 3 V products

• Daughter board

Name	Part number	Note
Daughter board for MB91F353A	MB91922EB	Combined use main board (MB91906EB)
Daughter board for MB91F355A	MB91916EB	Combined use main board (MB91906EB)

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.
<Contact>TEL: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3: The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4: Flash Support Group, Inc.

<Contact> TEL : 053-428-8383

<http://www.j-fsg.co.jp/e/top.html>

*5: MINATO ELECTRONICS INC.

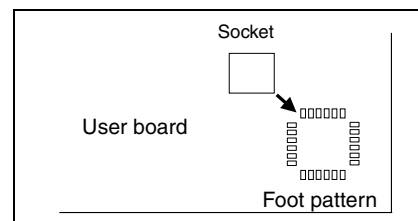
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*6: Yokogawa Digital Computer Corporation

<Contact> TEL: 042-333-6224 FAX : 042-352-6107

<http://www.yokogawa-digital.com/emb/en/index.html>



For MB91360 series

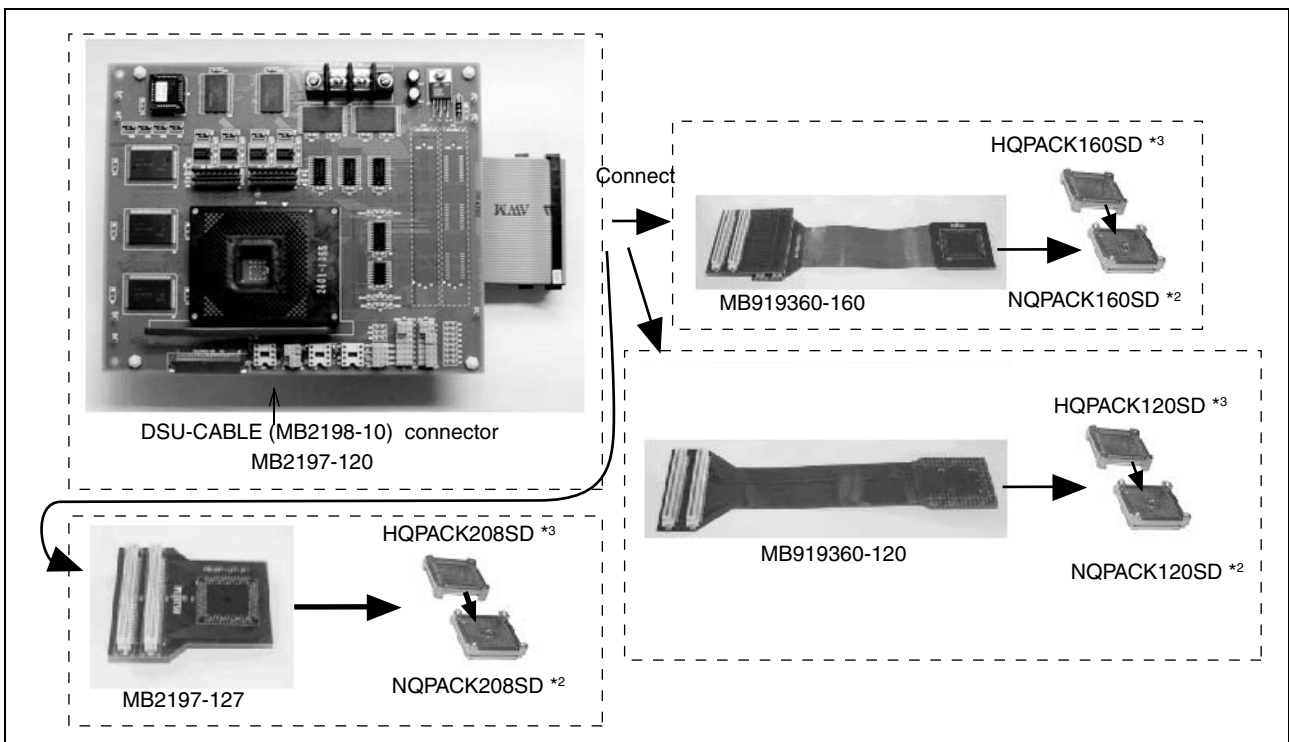
In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91FV360GACR-ES	• PGA401, DSU3
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board
PGA401P Adapter board for MB91360	MB2197-120	• Built-in external trace for evaluation device and user overlay memory

• Header board

Name	Part number	Note
Header board for MB91F36xGB (LQFP120)	MB919360-120	• FPT-120P-M21 header board. • Connection to user board. • NQPACK120SD and HQPACK120SD are required separately *1 • FME P/N : FR360-PROBE-120
Header board for MB91F369GA (QFP160)	MB919360-160	• FPT-160P-M15 header board. Connection to user board • NQPACK160SD and HQPACK160SD are required separately
Header board for MB91F362GA (QFP208)	MB2197-127	• FPT-208P-M04 header board. Connection to user board. • NQPACK208SD and HQPACK208SD are bundled *1



32-bit FR Family Support Tools

• Option tool

Name	Part number	Note
ROM alternate unit *4	MB2197-90 (with 100-V AC adapter)	- Memory board: Capable of substituting the memory on the target board - Memory size: 4 Mbytes - Data bus size: Selectable from among 8, 16, and 32-bit configurations - Write protect function

Evaluation board

Name	Part number	Note
Evaluation board	MB91906EB	- Main board + daughter board - FlashROM, DRAM, etc. Built-in - AC100 V, ACAdapter is bundled.
Evaluation board for MB91362GA	MB91913EB	It can be used only.

Programmer for Flash microcontroller

• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *5	MINATO ELECTRONICS INC. *6
MB91F362GBPFVS	QFP-208 (0.5mm, □28 × 28 mm)	FPT-208P-M04	—	MF00-892 (for MODEL1893/1931) MF05-892 (for MODEL1940)
MB91F364GPMT MB91F365GBPMT MB91F366GBPMT MB91F367GBPMT MB91F368GBPMT MB91F376GPMT	LQFP-120 (0.5 mm, □16 × 16 mm)	FPT-120P-M21	—	MF00-964 (for MODEL1893/1931)
MB91F369GAPQS1	QFP-160 (0.65 mm, □28 × 28 mm)	FPT-160P-M15	—	MF00-1272 (for MODEL1893/1931) MF05-1272 (for MODEL1940)

• Serial programmer

Product name	Serial programmer
	Yokogawa Digital Computer Corporation *7
MB91F362GBPFVS MB91F369GAPQS1	NETIMPRESS

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co. <Contacted: 81-3-5295-1661

*2: The IC socket is mounted on the foot pattern on the user board.

*3 : The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*4 : A ROM alternate unit is used connecting with a CPU bus. In the case of use, it is necessary to design so that ROM alternate unit can be connected on target board.

*5 : Flash Support Group, Inc.

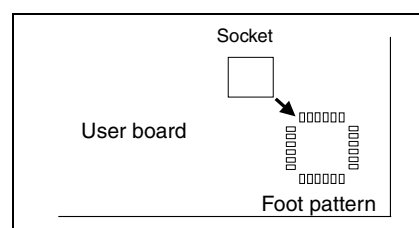
<Contact> TEL : 053-428-8383

<http://www.j-fsg.co.jp/e/top.html>

*6 : MINATO ELECTRONICS INC.

<Contact> TEL : 045-591-5611, FAX : 045-592-2854

http://www.minato.co.jp/index_e.asp



32-bit FR Family Support Tools

For MB91460 series

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91V460RB-ES	• BGA660, DSU4
Evaluation device for MB91461	MB91461PMC-GSE1	• LQFP-176P, DSU4
Evaluation device for MB91F467M	MB91F467MA	• LQFP-216P, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board

• Adapter board/Header board

Target device	Name	Part number	Note
MB91461 (LQFP-176)	Adapter board	-	-
	Header board	-	-
MB91F463N (LQFP-64)	Adapter board	MB2198-300A	• MB91V460RB-ES is required separately
	Header board (non level shifter)	MB2198-304A-E	• NQPACK064SB and HQPACK064SB140 are bundled *1
MB91F464A (LQFP-100)	Adapter board	MB2198-600A5	• MB91V460RB-ES is mounted • FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	• MB91V460RB-ES is mounted • FME P/N:EMA-MB91V460A-003 • Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-606-E	• NQPACK100SD-ND and HQPACK100SD are required separately *1 • FME P/N:EMA-MB91F464A-NLS-100M20
MB91F465K (LQFP-120)	Adapter board	MB2198-600A5	• MB91V460RB-ES is mounted • FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	• MB91V460RB-ES is mounted • FME P/N:EMA-MB91V460A-003 • Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-609-E	• NQPACK120SD and HQPACK120SD are required separately *1 • FME P/N:EMA-MB91F465K-NLS-120M21
MB91F465X (LQFP-100)	Adapter board	MB2198-600A5	• MB91V460RB-ES is mounted • FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	• MB91V460RB-ES is mounted • FME P/N:EMA-MB91V460A-003 • Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-602-E	• NQPACK100SD and HQPACK100SD are required separately *1 • FME P/N:EMA-MB91F465X-NLS-100M20
	FlexRay expansion board	MB2198-603-E	• FME P/N:EMA-MB91V460A-100
MB91F467B MB91F465B (LQFP-144)	Adapter board	MB2198-600A5	• MB91V460RB-ES is mounted • FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	• MB91V460RB-ES is mounted • FME P/N:EMA-MB91V460A-003 • Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-604B-E	• NQPACK144SD-ND and HQPACK144SD are required separately *1 • FME P/N:EMA-MB91F467B-NLS-144M08B
	Header board (level shifter)	MB2198-634B-E	• Multi power supply I/O, with level shifter • NQPACK144SD-ND and HQPACK144SD are required separately *1 • FME P/N:EMA-MB91F467B-LS-144M08
	Header board (for single chip)	MB2198-664-E	• NQPACK144SD-ND and HQPACK144SD are required separately *1 • FME P/N:EMA-MB91F467B-SC-144M08

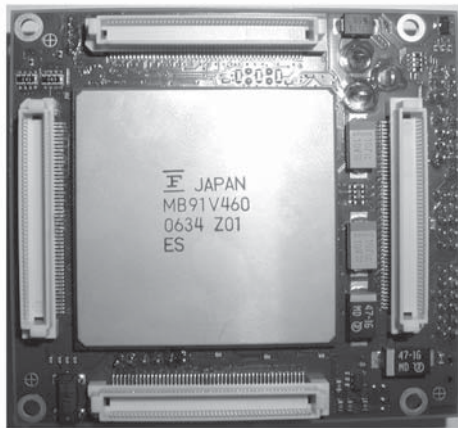
32-bit FR Family Support Tools

Target device	Name	Part number	Note
MB91F465C MB91F467C (LQFP-144)	Adapter board	MB2198-600A5	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-003 - Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-607-E	- NQPACK144SD-ND and HQPACK144SD are required separaterly *¹ - FME P/N:EMA-MB91F467B-NLS-144M08
MB91F465D MB91F467D (QFP-208)	Adapter board	MB2198-600A5	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-003 - Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-605-E	- NQPACK208SD and HQPACK208SD are required separaterly *¹ - FME P/N:EMA-MB91F467D-NLS-208M04
	Header board (level shifter)	MB2198-635-E	- Multi power supply I/O, with level shifter - NQPACK208SD and HQPACK208SD are required separaterly *¹ - FME P/N:EMA-MB91F467D-LS-208M04
MB91F465P	Adapter board	MB2198-600A5	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-003 - Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-616-E	FME P/N:EMA-MB91F465P-NLS-176M07
MB91F467M (LQFP-216)	Adapter board	-	-
	Header board	-	-
MB91F467R (LQFP-176)	Adapter board	MB2198-300A	MB91V460RB-ES is required separaterly
	Header board (level shifter)	MB2198-305	NQPACK176SD and HQPACK176SD are bundled *¹
MB91F467R (LQFP-176)	Adapter board	MB2198-600A5	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-003 - Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-601-E	- NQPACK176SD and HQPACK176SD are required separaterly*¹ - FME P/N:EMA-MB91F467R-NLS-176M07
MB91F467S	Adapter board	MB2198-600A5	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-003 - Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (level shifter)	MB2198-649-E	FME P/N:EMA-MB91F467S-LS-176M07
MB91F467T	Adapter board	MB2198-600A5	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-003 - Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (level shifter)	MB2198-650-E	FME P/N:EMA-MB91F467T-LS-144M08
	Header board (non level shifter)	MB2198-620-E	FME P/N:EMA-MB91F467T-NLS-144M08
MB91F469G (BGA320P)	Adapter board	MB2198-600A5	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-002B-80
	Adapter board (GHS conforming)	MB2198-600A4	- MB91V460RB-ES is mounted - FME P/N:EMA-MB91V460A-003 - Corresponds to the Super Trace Probe made by Green Hills Software, Inc.
	Header board (non level shifter)	MB2198-608-E	- CSPACK256Y2027FJ02 is required separaterly - FME P/N:EMA-MB91F469G-NLS-320M06
	Header board (level shifter)	MB2198-638-E	- CSPACK256Y2027FJ02 is required separaterly - FME P/N:EMA-MB91F469G-LS-320M06

32-bit FR Family Support Tools

• Evaluation board

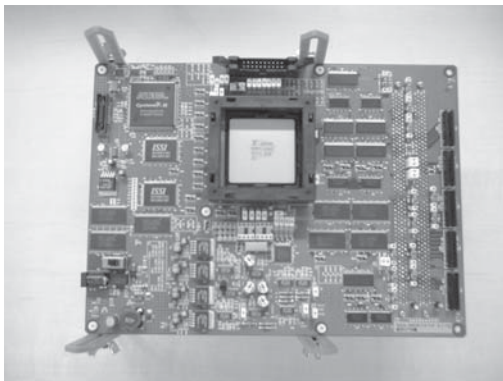
Name	Part number	Note
MB91F464A evaluation board	MB2198-606SK-E	Only the evaluation board can be used.
MB91F465K evaluation board	MB2198-609SK-E	Only the evaluation board can be used.
MB91F465X evaluation board	MB2198-602SK-E	Only the evaluation board can be used.
MB91F467B evaluation board	MB2198-604SK-E	Only the evaluation board can be used.
MB91F467C evaluation board	MB2198-607SK-E	Only the evaluation board can be used.
MB91F467D evaluation board	MB2198-605SK-E	Only the evaluation board can be used.
MB91F467R evaluation board	MB2198-601SK-E	Only the evaluation board can be used.
MB91F467T evaluation board	MB2198-620SK-E	Only the evaluation board can be used.
MB91F469G evaluation board	MB2198-608SK-E	Only the evaluation board can be used.



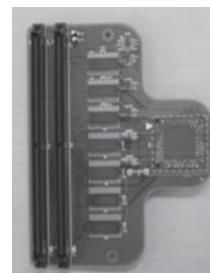
MB2198-600



MB2198-60x, MB2198-63x

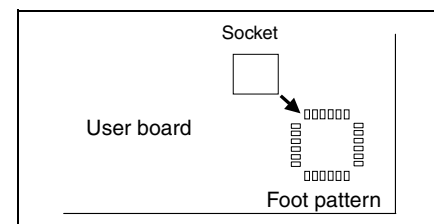


MB2198-300A



MB2198-30x

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.
 <Contact>TEL: 81-3-5295-1661
 The IC socket is mounted on the foot pattern on the user board.
 The NQPACK and HQPACK can be used to hold and cover a chip, respectively.



32-bit FR Family Support Tools

For MB91470/480 series

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91FV470BGL-ESE1	• BGA660, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the adapter board.
Adapter board	MB2198-160	• Connection to MB2198-10 • Header I/F cable is bundled
Pseudo power-on debug adapter	MB2198-169	Connection between adapter board and header board.

• Header board

Name	Part number	Note
Header board for MB91470 (LQFP-144)	MB2198-161	• NQPACK144SE and HQPACK144SE are bundled *1
Header board for MB91480 (LQFP-100)	MB2198-162	• NQPACK100SD-ND and HQPACK100SD are bundled *1

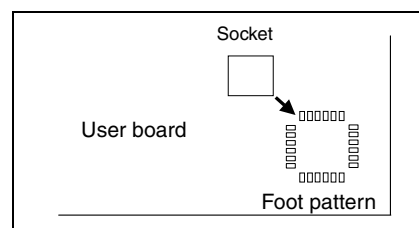
Programmer for Flash microcontroller

• Serial programmer

Product name	Serial programmer
	Yokogawa Digital Computer Corporation *2
MB91F475 MB91F478 MB91F479 MB91F482 MB91F487	NETIMPRESS

*1: The header requires the NQPACK manufactured by Tokyo Eletech Co.
 <Contact>TEL: 81-3-5295-1661
 The IC socket is mounted on the foot pattern on the user board.
 The NQPACK and HQPACK can be used to hold and cover a chip, respectively.

*2 : Yokogawa Digital Computer Corporation
 <Contact> TEL: 042-333-6224 FAX : 042-352-6107
<http://www.yokogawa-digital.com/emb/en/index.html>



For MB91605A series

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91605APMC-GE1	• BGA-544, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg
DSU3/4 cable	MB2198-10	• Used to connect the MB2198-01 to the adapter board.
MB91605 adapter	MB2198-81-E	• Adapter board, memory board, header board are bundled • NQPACK176SD and HQPACK176SD are bundled *1

For MB91610

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91F610	• LQFP-120, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg • MB2198-10 (DSU3/4 cable) is required separately
DSU3/4 cable	MB2198-10	Used to connect the MB2198-01 to the target board.

Programmer for Flash microcontroller

- Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit	
			Flash Support Group, Inc. *4	MINATO ELECTRONICS INC. *5
MB91F610	LQFP-120 (0.5 mm, □ 16 × 16 mm)	FPT-120P-M21	TRF029-91F610	—

Evaluation board

Name	Part number	Note
Evaluation board for MB91F610	MB91934EB	—

For MB91635 series

In Circuit Emulator (made by Fujitsu Microelectronics)

- Standard tool

Name	Part number	Note
Evaluation device	MB91V650PB-ESE1	• BGA-544, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg
Adapter board	MB2198-700-E	• Configuration board (MB2198-790-01-E) is bundled

- Header board

Name	Part number	Note
Header board for MB91635 (LQFP-144)	MB2198-702-E	• NQPACK144SD-ND and HQPACK144SD are bundled *1

32-bit FR Family Support Tools

Evaluation board

Name	Part number	Note
Main board	BBF2004-MB	Made by Sunhayato
Daughter board	BBF2004-FR144SQF-NB	Made by Sunhayato For LQFP-144

Programmer for Flash microcontroller

• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit
			Flash Support Group, Inc. *4
MB91F637	LQFP-144 (0.5 mm, □20 × 20 mm)	FPT-144P-M08	TRF029-91F637-LQFP
MB91F639	PFBGA-144 (0.8 mm, □12 × 12 mm)	BGA-144P-M06	TRF029-91F637-FBGA

• Serial programmer

Product name	Serial programmer
	Yokogawa Digital Computer Corporation *6
MB91F639	NETIMPRESS

For MB91640/645 series

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91V650PB-ESE1	• BGA-544, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg
Adapter board	MB2198-700-E	• Configuration board (MB2198-790-01-E) is bundled

• Header board

Name	Part number	Note
Header board for MB91640 (LQFP-176)	MB2198-703-E	• NQPACK176SD and HQPACK176SD are bundled *1 • For single power
Header board for MB91645 (LQFP-176)	(Under planning)	• For dual power

Evaluation board

Name	Part number	Note
Main board	BBF2004-MB	Made by Sunhayato
Daughter board	BBF2004-FR176SQF-NB	Made by Sunhayato For LQFP-176

Programmer for Flash microcontroller

• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit
			Flash Support Group, Inc. *4
MB91F647	LQFP-176 (0.5 mm, □24 × 24 mm)	FPT-176P-M07	TRF029-91F647-LQFP
	PFBGA-176 (0.8 mm, □12 × 12 mm)	BGA-176P-M04	TRF029-91F647-FBGA

For MB91660 series

In Circuit Emulator (made by Fujitsu Microelectronics)

• Standard tool

Name	Part number	Note
Evaluation device	MB91V650PB-ESE1	• BGA-544, DSU4
Emulator main unit for FR (DSU3/4)	MB2198-01	• The systems development support tool which used MCU for evaluating FR and builds in DSU interface. • Power supply voltage: AC100 V or AC200 V • Dimensions: 150 mm (width) × 210 mm (depth) × 46 mm (height) • Weight: 2.7 kg
Adapter board	MB2198-700-E	• Configuration board (MB2198-790-01-E) is bundled

• Header board

Name	Part number	Note
Header board for MB91645 (LQFP-120)	MB2198-701-E	• NQPACK120SD and HQPACK120SD are bundled *1

Evaluation board

Name	Part number	Note
Main board	BBF2004-MB	Made by Sunhayato
Daughter board	BBF2004-FR120SUS-NB	Made by Sunhayato For LQFP-120

Programmer for Flash microcontroller

• Parallel programmer

Product name	Package (lead pitch, body size)	Package code	Adapter unit
			Flash Support Group, Inc. *4
MB91F662	LQFP-120 (0.5 mm, □16 × 16 mm)	FPT-120P-M21	TRF029-91F662

• Serial programmer

Product name	Serial programmer
	Yokogawa Digital Computer Corporation *6
MB91F662	NETIMPRESS

32-bit FR Family Support Tools

■ Parallel programmer for Flash microcontroller

The parallel programmer in Flash memory of the FR family is supported as the following programmer.

Flash Support Group, Inc.

- **Flash Programmer**

AF9708, AF9709/B: 3 V-products, 5 V-products.



AF9708

AF9709

- **Gang programmer**

AF9723: 3 V-products, 5 V-products



MINATO ELECTRONICS INC.

- **Universal Programmer**

MODEL 1890A + OU910 (Ver. 4.32b or more)



Notes:

This programmer ended in September, 2000. It is a schedule of correspondence with MODEL1881 (The current state uncorresponds) for the future. Please confirm to MINATO ELECTRONICS INC. when you buy. MODEL1890A is scheduled to be done in the future to support.

- **Gang Programmer**

MODEL 1893 (Ver. 1.10L or more) , MODEL 1931 (Ver 1.10L or more)
MODEL 1930 + SU3000LX (Ver. 4.10L or more)



MODEL 1893

- **Gang programmer**

MODEL1940 (Ver. 1.32C or more)

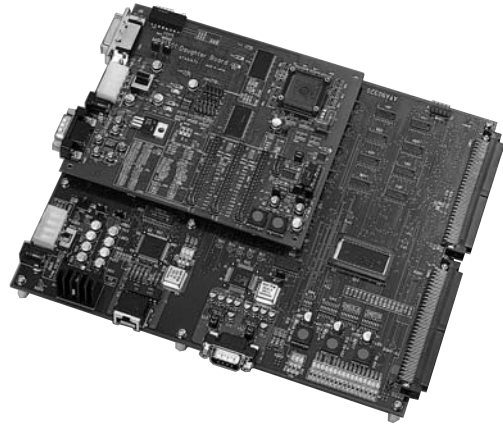


MODEL 1940

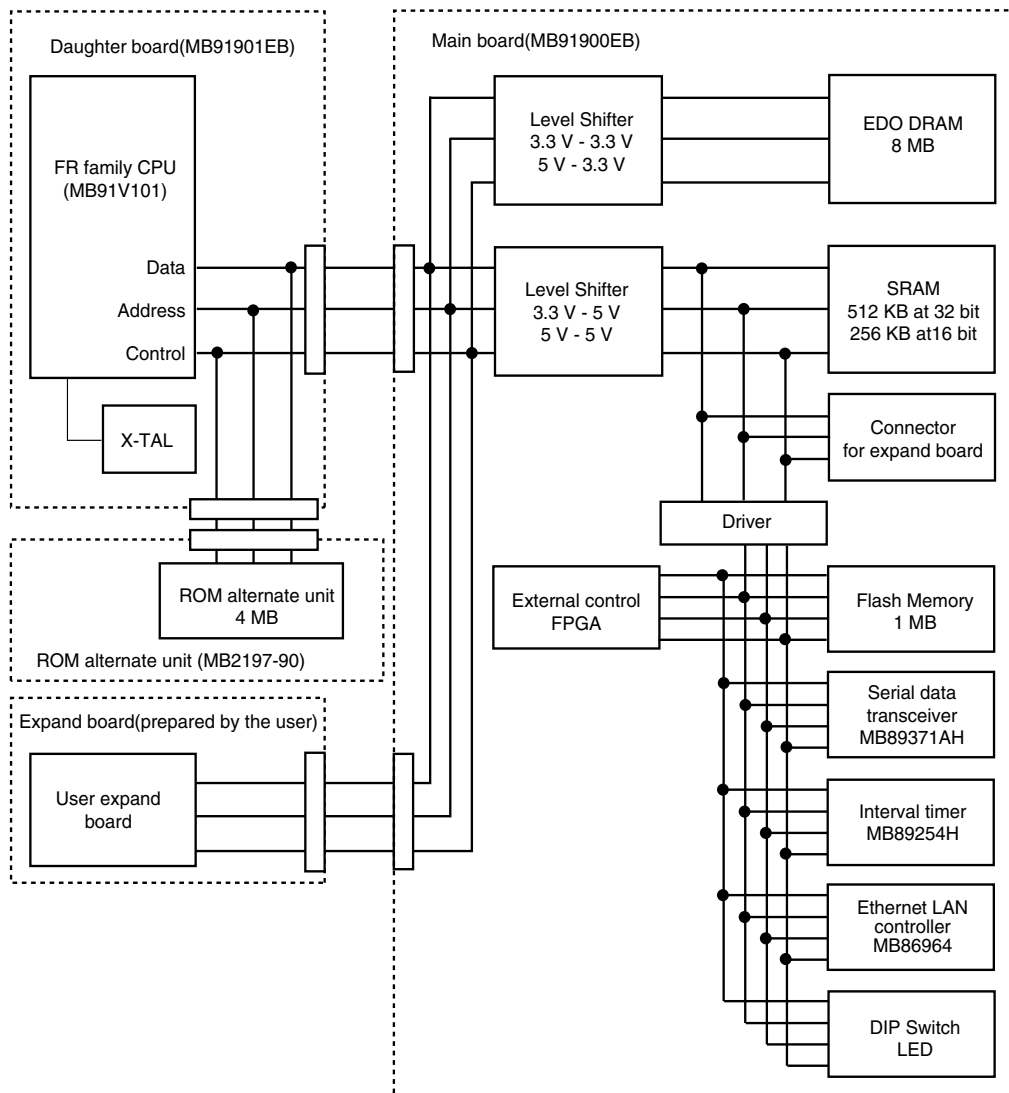
FR families Evaluation Board

- The FR30 series evaluation board can be used as a target board for running the emulator.
The board consists of a main board and a daughter board.
The main board can be used commonly for the FR30 series of microcontrollers.
- Since the evaluation board has SDRAM, DRAM, and Flash memory mounted, it can be used to test CPU performance or to configure a hardware circuit using the extension board connector on the main board.
- The ROM alternate unit (MB2197-90) can be connected to the evaluation board.
- The evaluation board can be used in combination with the MB2197-01 (emulator), for example, in the following configuration:
MB2197-01 + MB2197-10 + MB91906EB (main board)
+ MB91901EB (daughter board)

System overview



Evaluation board block diagram



32-bit FR Family Support Tools

Main Board

Name	Part number	Remarks
Evaluation board for FR families (NEW MAIN BOARD)	MB91906EB	- With 100-V AC adapter. - It is available according to the combination of daughter board as the target board of FR family for 3V or 5V power supply voltage (MB91130 is excluded). - The capacity of Flash memory or DRAM is increased. - The succeeding model of MB91900EB (the evaluation board for FR family) .

Daughter Board

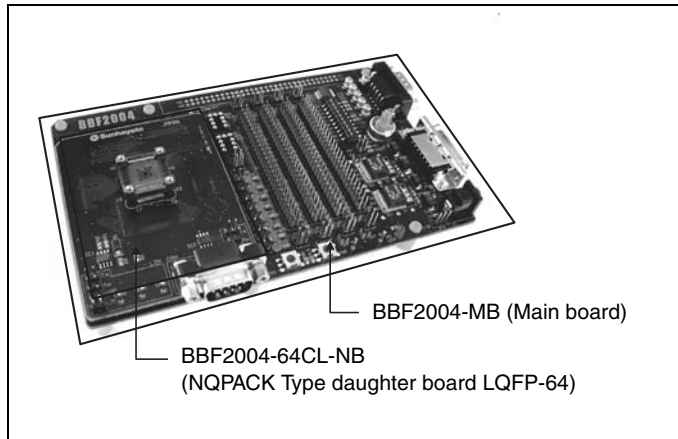
Name	Part number	Remarks
Daughter board for MB91101A	MB91901EB	- It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available. - MB91V101A pre mounted. - Connectable with In Circuit Emulator made by Fujitsu Microelectronics.
	MB91902EB	Connectable with In Circuit Emulator for MB91101A made by Yokogawa Digital Computer Corporation.
Daughter board for MB91107/108/121	MB91907EB	Connectable with In Circuit Emulator made by Fujitsu Microelectronics. It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91F130	MB91908EB	Connectable with In Circuit Emulator made by Fujitsu Microelectronics by using the evaluation board.
Daughter board for MB91150 series	MB91911EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Evaluation board for MB91F230	MB91920EB	Use only on an evaluation board is possible.
Evaluation board for MB91260	MB91921EB	Use only on an evaluation board is possible.
Daughter board for MB91302A	MB91914EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91305	MB91925EB	Use only on an evaluation board is possible.
Daughter board for MB91306/307	MB91915EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Evaluation board for MB91310	MB91918EB	Use only on an evaluation board is possible.
Daughter board for MB91F353	MB91922EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91F355	MB91916EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91362GA	MB91913EB	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.
Daughter board for MB91369GA	Under development	It is two piece composition of NEW MAIN BOARD (MB91906EB) + daughter board and available.

Simple Target Board

Name	Part number	Remarks
Simple target board for In Circuit Emulator connection for MB91101A (FR30 SRAM board)	MB91903EB	- It is two piece composition of NEW MAIN BOARD (MB91906EB) + simple target board and available. - MB91V101A pre mounted. - Connectable with In Circuit Emulator for MB91101A made by Fujitsu Microelectronics.

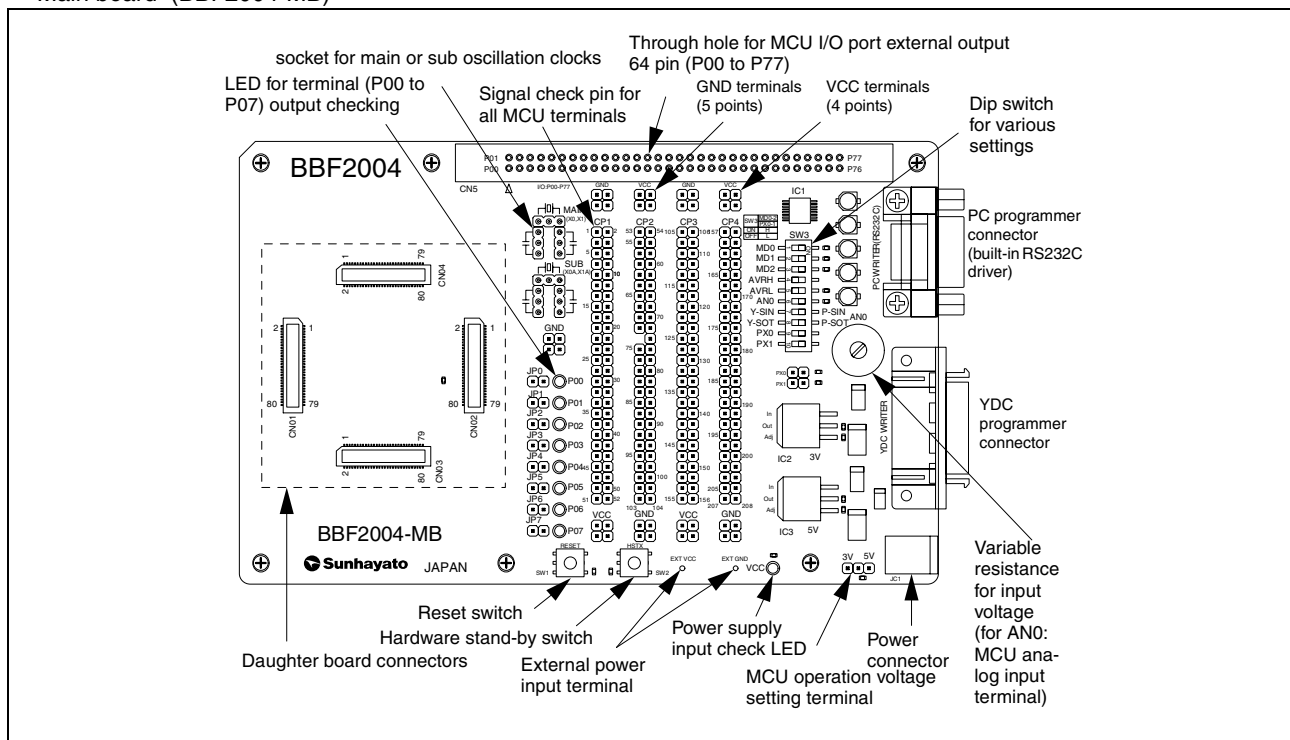
F²MC-FR Family Evaluation Board (BBF2004) : Sunhayato

This is an evaluation board made by Sunhayato corp. in correspondence with Fujitsu Microelectronics F²MC-16LX families. It can be used to verify the operating status of F²MC-16LX families before they are actually embedded into a customer's system. As a consequence, development efficiency is accelerated. This board consists of a main board and a daughter board. By changing the daughter board, it can be used for debugging with the (In Circuit Emulator) tool combined with the emulator debugger, evaluating a microcomputer with built-in Flash memory and a serial programming. The board is adaptable to various series by changing the daughter board, while the main board is common to each part.

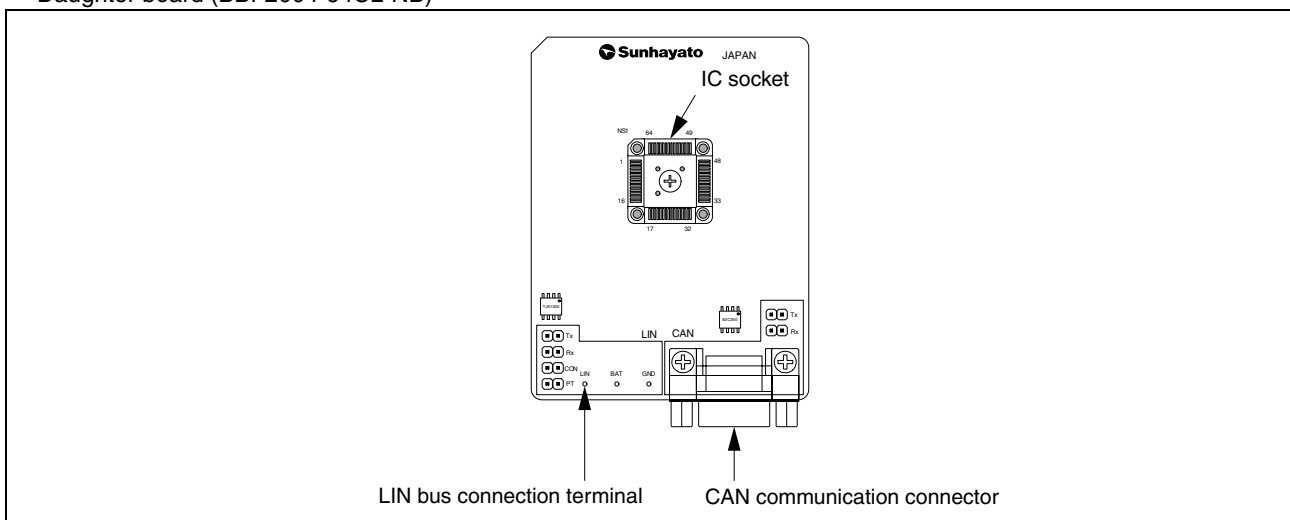


• Evaluation board configuration

Main board (BBF2004-MB)



Daughter board (BBF2004-64CL-NB)



32-bit FR Family Support Tools

• configuration

Main board

Part number	Description
BBF2004-MB	- Locating signal check pin to all terminals - Capability of changing input voltage to analog input terminal AN0 (by variable resistor) - Function of LED lightning for output port (P00 to P17) - Evaluate the capability of communication between PC and microcomputer with UART (mounted DSUB 9pin is possible.) - Can be use the serial programmer made by Fujitsu Microelectronics - Can be use the serial programmer made by Yokogawa Digital Computer corp.

Daughter board (The part number ending with "-NS" means a set of a main board and a daughter board.)

Part number	Description	Target microcontroller	Usage
BBF2004-FR64CAN-NB *	NQPACK type	MB91265 series	Evaluation board connectable with (In Circuit Emulator) tool. Board for writing and evaluating a microcomputer with a built-in Flash memory.
BBF2004-FR64CAN-NS *	(0.65 mm pitch, □12 mm × 12 mm)		
BBF2004-FR100SCL-NB *	NQPACK type	MB91270 series	
BBF2004-FR100SCL-NS *	(0.50 mm pitch, □14 mm × 14 mm)		
BBF2004-FR144SQF-NB	NQPACK type	MB91635 series	
BBF2004-FR144SQF-NS	(0.50 mm pitch, □20 mm × 20 mm)		
BBF2004-FR176SQF-NB	NQPACK type	MB91645 series	
BBF2004-FR176SQF-NS	(0.50 mm pitch, □24 mm × 24 mm)		
BBF2004-FR120SUS-NB	NQPACK type	MB91660 series	
BBF2004-FR120SUS-NS	(0.50 mm pitch, □16 mm × 16 mm)		

*: Includes CAN transceiver and LIN transceiver

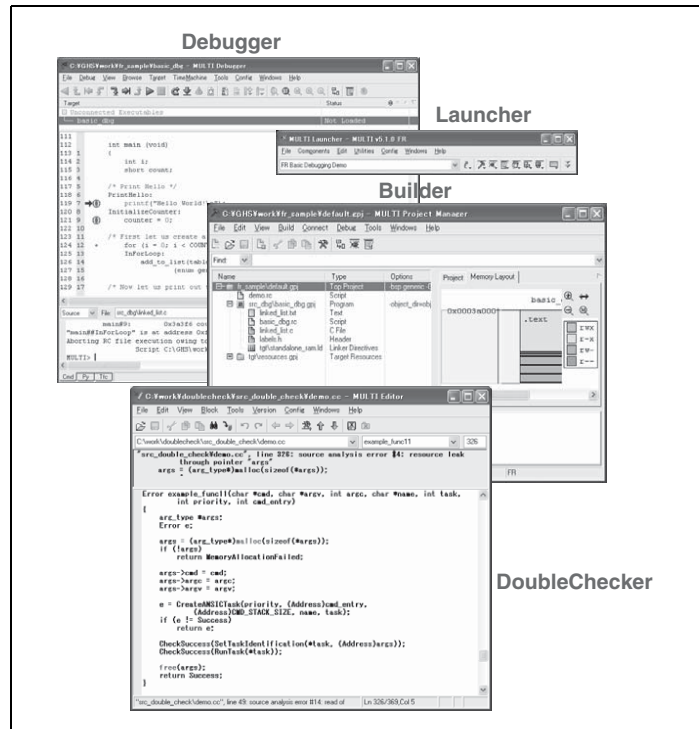
Contact for details: Sunhayato Corp. TEL +81-3-3984-7791, FAX +81-3-3971-0535

Green Hills Software's MULTI® 5 Integrated Development Environment

Green Hills Software's MULTI 5 Integrated Development Environment (IDE) includes the industry's most powerful and proven tools for developing embedded software. The MULTI 5 release of the most successful embedded IDE in history enables enterprises to achieve total reliability, absolute security and maximum performance with the lowest manufacturing and development costs, while getting to market in record time. In addition to streamlining the software development process, MULTI 5 makes it easier and faster than ever to find even the most difficult bugs.

Features a variety of new productivity-enhancing capabilities:

- DoubleCheck™ Source Code Analyzer - a new static source code analysis tool that examines the entire application to find reliability and security flaws such as buffer overflows, resource leaks, and overly complex functions
- a new distributed build system that dramatically reduces build times
- a new project manager to help create and maintain with ease even the most complex applications
- improved code generation for the smallest and fastest code possible
- improved visibility and graphical management of CPU and board level hardware features



and other various advanced feature that supports embedded system developer.

Green Hills Software's MULTI® TimeMachine™ Suite

The MULTI TimeMachine debugging suite combines a familiar debugger interface with innovative functions of MULTI-IDE that enable developers to step and run forward and backward through their code. It's based on SuperTrace Probe which can capture up to 1 GB of trace data.

Fix bugs faster

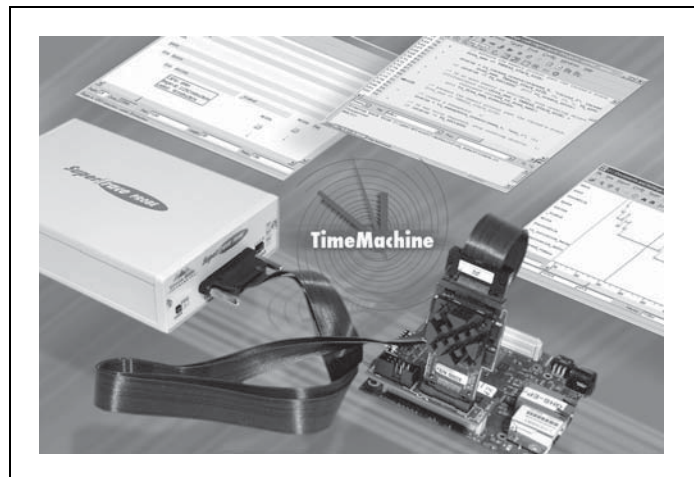
With TimeMachine, developers can more readily explore processor execution and, as a result, find and fix bugs faster.

Optimize with ease

Along with the PathAnalyzer and FunctionFlow, the TimeMachine suite integrates the patented MULTI Profiler to offer the capabilities to help you more easily identify performance problems in embedded code.

Supported Processors

FR 20/30/60/70/80 family



Sales contacts : Advanced Data Controls Corp. Sales Division
TEL : +81-3-3576-5351

E-mail: sales@adac.co.jp <http://www.adac.co.jp>

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Series	Part number	Aprication	Package [pin]	Operating voltage: V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	External interrupts [ch.]	External bus	8bit A/D converter		10bit A/D converter		8bit D/A converter [ch]	Timer	
				Min	Max								[unit]	[ch]	[unit]	[ch]		Reload timer [ch]	Output compare [ch]
MB89051	MB89051	USB	64	3.0	5.5	12	-	MASK	32	2	7	-	-	-	-	-	-	-	-
MB89051	MB89F051	USB	64	3.0	5.5	12	-	Flash	32	2	7	-	-	-	-	-	-	-	-
MB89120/A	MB89121	Standard	48	2.2	6.0	4.2	Yes	MASK	4	0.125	3	-	-	-	-	-	-	2	-
MB89120/A	MB89123A	Standard	48	2.2	6.0	4.2	Yes	MASK	8	0.25	11	-	-	-	-	-	-	2	-
MB89120/A	MB89125A	Standard	48	2.2	6.0	4.2	Yes	MASK	16	0.125	11	-	-	-	-	-	-	2	-
MB89130/A	MB89131	Standard	48	2.2	6.0	4.2	Yes	MASK	4	0.125	3	-	1	4	-	-	-	2	-
MB89130/A	MB89133A	Standard	48	2.2	6.0	4.2	Yes	MASK	8	0.25	11	-	1	4	-	-	-	2	-
MB89130/A	MB89135A	Standard	48	2.2	6.0	4.2	Yes	MASK	16	0.25	11	-	1	4	-	-	-	2	-
MB89130/A	MB89P131	Standard	48	2.7	6.0	4.2	Yes	OTP	4	0.125	3	-	1	4	-	-	-	2	-
MB89130/A	MB89P133A	Standard	48	2.7	6.0	4.2	Yes	OTP	8	0.25	11	-	1	4	-	-	-	2	-
MB89130/A	MB89P135A	Standard	48	2.7	6.0	4.2	Yes	OTP	16	0.5	11	-	1	4	-	-	-	2	-
MB89140	MB89143A	VFDC	64	4.0	6.0	8	Yes	MASK	8	0.25	2	-	1	8	-	-	-	1	-
MB89140	MB89144A	VFDC	64	4.0	6.0	8	Yes	MASK	12	0.25	2	-	1	8	-	-	-	1	-
MB89140	MB89145	VFDC	64	2.7	6.0	8	Yes	MASK	16	0.5	2	-	-	-	1	12	-	1	-
MB89140	MB89146	VFDC	64	2.7	6.0	8	Yes	MASK	24	0.75	2	-	-	-	1	12	-	1	-
MB89140	MB89P147	VFDC	64	2.7	6.0	8	Yes	OTP	32	1	2	-	-	-	1	12	-	1	-
MB89190/A/AH	MB89191	Standard	28	2.2	6.0	4.2	-	MASK	4	0.125	11	-	-	-	-	-	-	2	-
MB89190/A/AH	MB89191A	Standard	28	2.2	6.0	4.2	-	MASK	4	0.125	11	-	1	8	-	-	-	2	-
MB89190/A/AH	MB89191AH	Standard	28	2.2	6.0	4.2	-	MASK	4	0.125	11	-	1	8	-	-	-	2	-
MB89190/A/AH	MB89193	Standard	28	2.2	6.0	4.2	-	MASK	8	0.25	11	-	-	-	-	-	-	2	-
MB89190/A/AH	MB89193A	Standard	28	2.2	6.0	4.2	-	MASK	8	0.25	11	-	1	8	-	-	-	2	-
MB89190/A/AH	MB89193AH	Standard	28	2.2	6.0	4.2	-	MASK	8	0.25	11	-	1	8	-	-	-	2	-
MB89190/A/AH	MB89195	Standard	28	2.2	6.0	4.2	-	MASK	16	0.25	11	-	-	-	-	-	-	2	-
MB89190/A/AH	MB89195A	Standard	28	2.2	6.0	4.2	-	MASK	16	0.25	11	-	1	8	-	-	-	2	-
MB89190/A/AH	MB89P195	Standard	28	2.7	6.0	4.2	-	OTP	16	0.25	11	-	-	-	-	-	-	2	-
MB89190/A/AH	MB89P195A	Standard	28	2.7	6.0	4.2	-	OTP	16	0.25	11	-	1	8	-	-	-	2	-
MB89202/R	MB89202	Standard	32	2.2	5.5	12.5	-	MASK	16	0.5	11	-	-	-	1	8	-	-	-
MB89202/R	MB89202Y	Standard	34	2.2	5.5	12.5	-	MASK	16	0.5	11	-	-	-	1	8	-	-	-
MB89202/R	MB89F202	Standard	32	3.5	5.5	12.5	-	Flash	16	0.5	11	-	-	-	1	8	-	-	-
MB89202/R	MB89F202RA *	Standard	32	3.5	5.5	12.5	-	Flash	16	0.5	11	-	-	-	1	8	-	-	-
MB89202/R	MB89F202RAY *	Standard	32 or 34	3.5	5.5	12.5	-	Flash	16	0.5	11	-	-	-	1	8	-	-	-
MB89202/R	MB89F202Y	Standard	34	3.5	5.5	12.5	-	Flash	16	0.5	11	-	-	-	1	8	-	-	-
MB89470	MB89475	Standard	48	2.2	5.5	12.5	Yes	MASK	16	0.5	9	-	-	-	1	8	-	4	-
MB89470	MB89P475	Standard	48	3.5	5.5	12.5	Yes	OTP	16	0.5	9	-	-	-	1	8	-	4	-
MB89480	MB89485	LCD controller	64	2.2	5.5	12.5	Yes	MASK	16	0.5	12	-	-	-	1	4	-	4	-
MB89480	MB89485L	LCD controller	64	2.2	3.6	12.5	Yes	MASK	16	0.5	12	-	-	-	1	4	-	4	-
MB89480	MB89P485	LCD controller	64	3.5	5.5	12.5	Yes	OTP	16	0.5	12	-	-	-	1	4	-	4	-
MB89480	MB89P485L	LCD controller	64	2.7	3.6	12.5	Yes	OTP	16	0.5	12	-	-	-	1	4	-	4	-
MB89490	MB89498	LCD controller	100	2.2	3.6	12.5	Yes	MASK	48	2	16	-	-	-	1	8	-	4	-
MB89490	MB89F499	LCD controller	100	2.7	3.6	12.5	Yes	Flash	60	2	16	-	-	-	1	8	-	4	-
MB89530A	MB89535A	Standard	64	2.2	5.5	12.5	Yes	MASK	16	0.5	12	-	-	-	1	8	-	1	-
MB89530A	MB89537A	Standard	64	2.2	5.5	12.5	Yes	MASK	32	1	12	-	-	-	1	8	-	1	-
MB89530A	MB89537AC	Standard	64	2.2	5.5	12.5	Yes	MASK	32	1	12	-	-	-	1	8	-	1	-
MB89530A	MB89538A	Standard	64	2.2	5.5	12.5	Yes	MASK	48	2	12	-	-	-	1	8	-	1	-
MB89530A	MB89538AC	Standard	64	2.2	5.5	12.5	Yes	MASK	48	2	12	-	-	-	1	8	-	1	-
MB89530A	MB89P538	Standard	64	2.7	5.5	12.5	Yes	OTP	48	2	12	-	-	-	1	8	-	1	-
MB89530A	MB89F538	Standard	64	3.5	5.5	12.5	Yes	Flash	48	2	11	-	-	-	1	8	-	1	-
MB89530A	MB89F538L	Standard	64	2.4	3.6	12.5	Yes	Flash	48	2	11	-	-	-	1	8	-	1	-
MB89550A	MB89557A	LCD controller	100	2.2	5.5	12.5	Yes	MASK	32	1	16	-	-	-	1	8	2	5	-
MB89550A	MB89558A	LCD controller	100	2.2	5.5	12.5	Yes	MASK	48	2	16	-	-	-	1	8	2	5	-
MB89550A	MB89P558A	LCD controller	100	2.7	5.5	12.5	Yes	OTP	48	2	16	-	-	-	1	8	2	5	-
MB89560A	MB89567A	LCD controller	80	2.2	5.5	12.5	Yes	MASK	32	1	12	-	-	-	1	8	-	2	-
MB89560A	MB89567AC	LCD controller	80	2.2	5.5	12.5	Yes	MASK	32	1	12	-	-	-	1	8	-	2	-
MB89560A	MB89P568	LCD controller	80	2.7	5.5	12.5	Yes	OTP	48	1	12	-	-	-	1	8	-	2	-
MB89580B/BW	MB89583B	USB	64	3.0	5.5	12.5	-	MASK	8	0.5	8	-	-	-	-	-	-	-	-
MB89580B/BW	MB89583BW	USB	64	3.0	5.5	12.5	-	MASK	8	0.5	8	-	-	-	-	-	-	-	-
MB89580B/BW	MB89585B	USB	64	3.0	5.5	12.5	-	MASK	16	1	8	-	-	-	-	-	-	-	-
MB89580B/BW	MB89585BW	USB	64	3.0	5.5	12.5	-	MASK	16	1	8	-	-	-	-	-	-	-	-
MB89580B/BW	MB89589B	USB	64	3.0	5.5	12.5	-	MASK	16	18	8	-	-	-	-	-	-	-	-
MB89580B/BW	MB89P585B	USB	64	3.0	5.5	12.5	-	OTP	16	1	8	-	-	-	-	-	-	-	-
MB89580B/BW	MB89P585BW	USB	64	3.0	5.5	12.5	-	OTP	16	1	8	-	-	-	-	-	-	-	-

*: Under development

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Timer					Serial					LCD controller [seg. x com.]	Inverter	VFD	Functions	Evaluation device	Part number
Input capture [ch.]	PPG timer [ch.]	PWM timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	I ² C [ch.]	UART/SIO [ch.]	SIO [ch.]	UART [ch.]	USB-Function [ch.]						
-	-	2	-	-	1	1	2	-	1	-	-	-	USB-function:End point4	MB89F051	MB89051
-	-	2	-	-	1	1	2	-	1	-	-	-	USB-function:End point4	MB89F051	MB89F051
-	-	-	-	-	-	-	1	-	-	-	-	-	-	MB89PV130A	MB89121
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV130A	MB89123A
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV130A	MB89125A
-	-	-	-	-	-	-	1	-	-	-	-	-	-	MB89PV130A	MB89131
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV130A	MB89133A
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV130A	MB89135A
-	-	-	-	-	-	-	1	-	-	-	-	-	-	MB89PV130A	MB89P131
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV130A	MB89P133A
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV130A	MB89P135A
-	-	-	-	-	-	-	1	-	-	-	-	Yes	VFDC	MB89PV140	MB89143A
-	-	-	-	-	-	-	1	-	-	-	-	Yes	VFDC	MB89PV140	MB89144A
-	1	2	-	-	-	-	1	-	-	-	-	Yes	VFDC	MB89PV140	MB89145
-	1	2	-	-	-	-	1	-	-	-	-	Yes	VFDC	MB89PV140	MB89146
-	1	2	-	-	-	-	1	-	-	-	-	Yes	VFDC	MB89PV140	MB89P147
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190	MB89191
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190A	MB89191A
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190A	MB89191AH
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190	MB89193
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190A	MB89193A
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190A	MB89193AH
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190	MB89195
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190A	MB89195A
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190	MB89P195
-	-	-	-	-	-	-	1	-	-	-	-	-	Remote-controller carrier generator	MB89PV190A	MB89P195A
2	1	1	-	-	-	1	-	-	-	-	-	-	Buzzer output	MB89V201	MB89202
2	1	1	-	-	-	1	-	-	-	-	-	-	Buzzer output	MB89V201	MB89202Y
2	1	1	-	-	-	1	-	-	-	-	-	-	Buzzer output	MB89V201	MB89F202
2	1	1	-	-	-	1	-	-	-	-	-	-	Buzzer output	MB89V201	MB89F202RA *
2	1	1	-	-	-	1	-	-	-	-	-	-	Buzzer output	MB89V201	MB89F202RAY *
2	1	1	-	-	-	1	-	-	-	-	-	-	Buzzer output	MB89V201	MB89F202Y
-	-	1	2	-	-	2	-	-	-	-	-	-	-	MB89PV470	MB89475
-	-	1	2	-	-	2	-	-	-	-	-	-	-	MB89PV470	MB89P475
-	1	1	1	-	-	1	-	-	-	31 x 4	-	-	-	MB89PV480	MB89485
-	1	1	1	-	-	1	-	-	-	31 x 4	-	-	-	MB89PV480	MB89485L
-	1	1	1	-	-	1	-	-	-	31 x 4	-	-	-	MB89PV480	MB89P485
-	1	1	1	-	-	1	-	-	-	31 x 4	-	-	-	MB89PV480	MB89P485L
-	-	2	-	-	1	1	1	-	-	32 x 4	-	-	-	MB89PV490	MB89498
-	-	2	-	-	1	1	1	-	-	32 x 4	-	-	-	MB89PV490	MB89F499
-	3	2	1	-	-	1	1	1	-	-	-	-	-	MB89PV530	MB89535A
-	3	2	1	-	-	1	1	1	-	-	-	-	-	MB89PV530	MB89537A
-	3	2	1	-	1	1	1	1	-	-	-	-	-	MB89PV530	MB89537AC
-	3	2	1	-	-	1	1	1	-	-	-	-	-	MB89PV530	MB89538A
-	3	2	1	-	1	1	1	1	-	-	-	-	-	MB89PV530	MB89538AC
-	3	2	1	-	1	1	1	1	-	-	-	-	-	MB89PV530	MB89P538
-	3	2	1	-	1	1	1	1	-	-	-	-	-	MB89PV530	MB89F538
-	3	2	1	-	1	1	1	1	-	-	-	-	-	MB89PV530	MB89F538L
-	1	2	1	-	-	2	-	-	-	32 x 4	-	-	-	MB89PV550A	MB89557A
-	1	2	1	-	-	2	-	-	-	32 x 4	-	-	-	MB89PV550A	MB89558A
-	1	2	1	-	-	2	-	-	-	32 x 4	-	-	-	MB89PV550A	MB89P558A
-	2	2	1	-	-	2	-	-	-	24 x 4	-	-	-	MB89PV560	MB89567A
-	2	2	1	-	1	2	-	-	-	24 x 4	-	-	-	MB89PV560	MB89567AC
-	2	2	1	-	1	2	-	-	-	24 x 4	-	-	-	MB89PV560	MB89P568
-	-	2	-	-	-	1	-	-	1	-	-	-	-	MB89P585B	MB89583B
-	-	2	-	-	-	1	-	-	1	-	-	-	-	MB89P585BW	MB89583BW
-	-	2	-	-	-	1	-	-	1	-	-	-	-	MB89P585B	MB89585B
-	-	2	-	-	-	1	-	-	1	-	-	-	-	MB89P585BW	MB89585BW
-	-	2	-	-	-	1	-	-	1	-	-	-	-	MB89P589B	MB89589B
-	-	2	-	-	-	1	-	-	1	-	-	-	-	MB89P585B	MB89P585B
-	-	2	-	-	-	1	-	-	1	-	-	-	-	MB89P585BW	MB89P585BW

(Continued)

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Series	Part number	Aprication	Package [pin]	Operating voltage: V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub- clock	Memory type	ROM [KB]	RAM [KB]	External interrupts [ch.]	External bus	8bit A/D converter		10bit A/D converter		8bit D/A converter [ch]	Timer	
				Min	Max								[unit]	[ch]	[unit]	[ch]		Reload timer [ch]	Output compare [ch]
MB89580B/BW	MB89P589B	USB	64	3.0	5.5	12.5	-	OTP	16	18	8	-	-	-	-	-	-	-	-
MB89630R	MB89635R	Standard	64	2.2	6.0	10	Yes	MASK	16	0.5	4	Yes	-	-	1	8	-	1	-
MB89630R	MB89636R	Standard	64	2.2	6.0	10	Yes	MASK	24	0.75	4	Yes	-	-	1	8	-	1	-
MB89630R	MB89P637	Standard	64	2.7	6.0	10	Yes	OTP	32	1	4	Yes	-	-	1	8	-	1	-
MB89630R	MB89637R	Standard	64	2.2	6.0	10	Yes	MASK	32	1	4	Yes	-	-	1	8	-	1	-
MB89670AR	MB89673AR	Standard	80	2.2	6.0	10	-	MASK	8	0.375	8	Yes	-	-	1	8	-	3	-
MB89670AR	MB89675AR	Standard	80	2.2	6.0	10	-	MASK	16	0.5	8	Yes	-	-	1	8	-	3	-
MB89670AR	MB89P677A	Standard	80	2.2	6.0	10	-	OTP	32	1	8	Yes	-	-	1	8	-	3	-
MB89670AR	MB89677AR	Standard	80	2.7	6.0	10	-	MASK	32	1	8	Yes	-	-	1	8	-	3	-
MB89800	MB89803	LCD controller	100	2.2	6.0	10	-	MASK	8	0.25	2	-	-	-	-	-	-	-	-
MB89800	MB89805	LCD controller	100	2.2	6.0	10	-	MASK	16	0.5	2	-	-	-	-	-	-	-	-
MB89800	MB89P808	LCD controller	100	2.7	6.0	10	-	OTP	48	2	2	-	-	-	-	-	-	-	-
MB89820	MB89821	LCD controller	80	2.2	6.0	5	-	MASK	4	0.125	2	-	-	-	-	-	-	-	-
MB89820	MB89823R	LCD controller	80	2.2	6.0	5	-	MASK	8	0.25	2	-	-	-	-	-	-	-	-
MB89820	MB89825	LCD controller	80	2.2	6.0	5	-	MASK	16	0.25	2	-	-	-	-	-	-	-	-
MB89820	MB89P825	LCD controller	80	2.7	6.0	5	-	OTP	16	0.25	2	-	-	-	-	-	-	-	-
MB89860	MB89865	Inverter control	80	2.7	6.0	10	-	MASK	16	0.5	4	Yes	-	-	1	8	-	-	-
MB89860	MB89867	Inverter control	80	2.7	6.0	10	-	MASK	32	1	4	Yes	-	-	1	8	-	-	-
MB89860	MB89P867	Inverter control	80	2.7	5.5	10	-	OTP	32	1	4	Yes	-	-	1	8	-	-	-
MB89860	MB89W867	Inverter control	80	2.7	5.5	10	-	OTP	32	1	4	Yes	-	-	1	8	-	-	-
MB89920	MB89923	LCD controller	80	2.2	6.0	8	-	MASK	8	0.25	4	-	-	-	1	8	-	-	2
MB89920	MB89925	LCD controller	80	2.2	6.0	8	-	MASK	16	0.5	4	-	-	-	1	8	-	-	2
MB89920	MB89P928	LCD controller	80	2.7	6.0	8	-	OTP	48	1	4	-	-	-	1	8	-	-	2
MB89930B	MB89935B	Standard	30	2.2	5.5	10	-	MASK	16	0.5	11	-	-	-	1	8	-	-	-
MB89930B	MB89P935B	Standard	30	3.0	5.5	10	-	OTP	16	0.5	11	-	-	-	1	8	-	-	-
MB89940	MB89943	LCD controller	48	3.5	5.5	8	-	MASK	8	0.5	3	-	1	2	-	-	-	1	-
MB89940	MB89945	LCD controller	48	3.5	5.5	8	-	MASK	16	0.5	3	-	1	2	-	-	-	1	-
MB89940	MB89P945	LCD controller	48	3.5	5.5	8	-	OTP	16	0.5	3	-	1	2	-	-	-	1	-
MB89980	MB89983	Standard	64	2.2	6.0	4.2	Yes	MASK	8	0.25	12	-	1	4	-	-	-	1	-
MB89980	MB89P985	Standard	64	2.2	6.0	4.2	Yes	OTP	16	0.5	12	-	1	4	-	-	-	1	-

Microcontrollers (8-bit Proprietary F²MC-8L Family)

Timer					Serial					LCD controller [seg. x com.]	Inverter	VFD	Functions	Evaluation device	Part number
Input capture [ch.]	PPG timer [ch.]	PWM timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	I ² C [ch.]	UART/SIO [ch.]	SIO [ch.]	UART [ch.]	USB-Function [ch.]						
-	-	2	-	-	-	1	-	-	1	-	-	-	-	MB89P589B	MB89P589B
-	-	2	1	-	-	1	1	-	-	-	-	-	-	MB89PV630	MB89635R
-	-	2	1	-	-	1	1	-	-	-	-	-	-	MB89PV630	MB89636R
-	-	2	1	-	-	1	1	-	-	-	-	-	-	MB89PV630	MB89P637
-	-	2	1	-	-	1	1	-	-	-	-	-	-	MB89PV630	MB89637R
-	-	6	-	2	-	1	1	-	-	-	-	-	-	MB89PV670A	MB89673AR
-	-	6	-	2	-	1	1	-	-	-	-	-	-	MB89PV670A	MB89675AR
-	-	6	-	2	-	1	1	-	-	-	-	-	-	MB89PV670A	MB89P677A
-	-	6	-	2	-	1	1	-	-	-	-	-	-	MB89PV670A	MB89677AR
-	-	1	1	-	-	1	-	-	-	70 x 4	-	-	-	MB89PV800	MB89803
-	-	1	1	-	-	1	-	-	-	70 x 4	-	-	-	MB89PV800	MB89805
-	-	1	1	-	-	1	-	-	-	70 x 4	-	-	-	MB89PV800	MB89P808
-	-	1	1	-	-	1	-	-	-	50 x 4	-	-	-	MB89PV820	MB89821
-	-	1	1	-	-	1	-	-	-	50 x 4	-	-	-	MB89PV820	MB89823R
-	-	1	1	-	-	1	-	-	-	50 x 4	-	-	-	MB89PV820	MB89825
-	-	1	1	-	-	1	-	-	-	50 x 4	-	-	-	MB89PV820	MB89P825
-	-	2	-	-	-	1	1	-	-	-	Yes	-	-	MB89P867	MB89865
-	-	2	-	-	-	1	1	-	-	-	Yes	-	-	MB89P867	MB89867
-	-	2	-	-	-	1	1	-	-	-	Yes	-	-	MB89P867	MB89P867
-	-	2	-	-	-	1	1	-	-	-	Yes	-	-	MB89P867	MB89W867
2	-	2	-	-	-	-	1	1	-	24 x 4	-	-	Low Volt. Detection Reset	MB89PV920	MB89923
2	-	2	-	-	-	-	1	1	-	24 x 4	-	-	Low Volt. Detection Reset	MB89PV920	MB89925
2	-	2	-	-	-	-	1	1	-	24 x 4	-	-	Low Volt. Detection Reset	MB89PV920	MB89P928
-	1	1	-	-	-	1	-	-	-	-	-	-	8/16bit Chapchar timer/counter (Output compare/Input chapchar)	MB89PV930A	MB89935B
-	1	1	-	-	-	1	-	-	-	-	-	-	8/16bit Chapchar timer/counter (Output compare/Input chapchar)	MB89PV930A	MB89P935B
-	-	4	-	-	-	-	-	-	-	17 x 4	-	-	Stepping motor controller x 2ch, Low Volt. Detection Reset, Ext.Volt. Monitor Int.	MB89PV940	MB89943
-	-	4	-	-	-	-	-	-	-	17 x 4	-	-	Stepping motor controller x 2ch, Low Volt. Detection Reset, Ext.Volt. Monitor Int.	MB89PV940	MB89945
-	-	4	-	-	-	-	-	-	-	17 x 4	-	-	Stepping motor controller x 2ch, Low Volt. Detection Reset, Ext.Volt. Monitor Int.	MB89PV940	MB89P945
-	-	2	-	-	-	-	-	-	-	-	-	-	Remote-controller carrier generator, Buzzer output	MB89PV980	MB89983
-	-	2	-	-	-	-	-	-	-	-	-	-	Remote-controller carrier generator, Buzzer output	MB89PV980	MB89P985

Microcontrollers (8-bit Proprietary F²MC-8FX Family)

Microcontrollers (8-bit Proprietary F²MC-8FX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [Byte]	RAM [Byte]	External interrupts [ch.]	10bit A/D converter		Timer		
				Min	Max							[unit]	[ch]	Reload timer [ch]	PPG timer [ch.]	Comp ound timer [ch]
MB95100AM	MB95108AM	Standard	64	2.4	5.5	16	Yes	MASK	60	2K	12	1	12	1	6	4
MB95100AM	MB95F104AMS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95100AM	MB95F106AMS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95100AM	MB95F108AMS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95100AM	MB95F104ANS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95100AM	MB95F106ANS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95100AM	MB95F108ANS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95100AM	MB95F104AMW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95100AM	MB95F106AMW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95100AM	MB95F108AMW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95100AM	MB95F104ANW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95100AM	MB95F106ANW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95100AM	MB95F108ANW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95100AM	MB95F104AJS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95100AM	MB95F106AJS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95100AM	MB95F108AJS	Standard	64	2.4	5.5	16	-	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95100AM	MB95F104AJW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95100AM	MB95F106AJW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95100AM	MB95F108AJW	Standard	64	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95100B	MB95107B	Standard	64	1.8	3.6	16	Yes	MASK	60	2K	12	1	12	1	6	4
MB95100B	MB95F108BS	Standard	64	1.8	3.3	16	-	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95100B	MB95F108BW	Standard	64	1.8	3.3	16	Yes	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95110B	MB95116B	Standard	48 or 52	1.8	3.6	16	Yes	MASK	32	1K	8	1	8	-	5	4
MB95110B	MB95F118BS	Standard	48 or 52	1.8	3.3	16	-	Dual Op. Flash	60	2K	8	1	8	-	5	4
MB95110B	MB95F118BW	Standard	48 or 52	1.8	3.3	16	Yes	Dual Op. Flash	60	2K	8	1	8	-	5	4
MB95110M	MB95117M	Standard	52	2.4	5.5	16	Yes	MASK	48	2K	8	1	8	-	5	4
MB95110M	MB95F114MS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	16	512	8	1	8	-	5	4
MB95110M	MB95F116MS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F116MAS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F118MS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	60	2K	8	1	8	-	5	4
MB95110M	MB95F114NS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	16	512	8	1	8	-	5	4
MB95110M	MB95F116NS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F116NAS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F118NS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	60	2K	8	1	8	-	5	4
MB95110M	MB95F114MW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	16	512	8	1	8	-	5	4
MB95110M	MB95F116MW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F116MAW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F118MW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	8	1	8	-	5	4
MB95110M	MB95F114NW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	16	512	8	1	8	-	5	4
MB95110M	MB95F116NW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F116NAW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F118NW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	8	1	8	-	5	4
MB95110M	MB95F114JS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	16	512	8	1	8	-	5	4
MB95110M	MB95F116JS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F118JS	Standard	52	2.4	5.5	16	-	Dual Op. Flash	60	2K	8	1	8	-	5	4
MB95110M	MB95F114JW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	16	512	8	1	8	-	5	4
MB95110M	MB95F116JW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	8	1	8	-	5	4
MB95110M	MB95F118JW	Standard	52	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	8	1	8	-	5	4
MB95120	MB95F128D	LCD controller	100	1.8	3.3	16	Yes	Dual Op. Flash	60	2K	12	1	12	1	6	4

F₂MC-8FX Family
product list

(Continued)

Microcontrollers (8-bit Proprietary F²MC-8FX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub- clock	Memory type	ROM [Byte]	RAM [Byte]	External interrupts [ch.]	10bit A/D converter		Timer		
				Min	Max							[unit]	[ch]	Reload timer [ch]	PPG timer [ch]	Comp ound timer [ch]
MB95120MB	MB95128MB	LCD controller	100	2.4	5.5	16	Yes	MASK	60	2K	12	1	12	1	6	4
MB95120MB	MB95F124MB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95120MB	MB95F126MB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95120MB	MB95F128MB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95120MB	MB95F124NB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95120MB	MB95F126NB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95120MB	MB95F128NB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95120MB	MB95F124JB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	16	512	12	1	12	1	6	4
MB95120MB	MB95F126JB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	32	1K	12	1	12	1	6	4
MB95120MB	MB95F128JB	LCD controller	100	2.4	5.5	16	Yes	Dual Op. Flash	60	2K	12	1	12	1	6	4
MB95130MB	MB95136MB	Standard	28	2.4	5.5	16	Yes	MASK	32	1K	8	1	8	-	3	2
MB95130MB	MB95F133MBS	Standard	28	2.4	5.5	16	-	Flash	8	256	8	1	8	-	3	2
MB95130MB	MB95F134MBS	Standard	28	2.4	5.5	16	-	Flash	16	512	8	1	8	-	3	2
MB95130MB	MB95F136MBS	Standard	28	2.4	5.5	16	-	Flash	32	1K	8	1	8	-	3	2
MB95130MB	MB95F133NBS	Standard	28	2.4	5.5	16	-	Flash	8	256	8	1	8	-	3	2
MB95130MB	MB95F134NBS	Standard	28	2.4	5.5	16	-	Flash	16	512	8	1	8	-	3	2
MB95130MB	MB95F136NBS	Standard	28	2.4	5.5	16	-	Flash	32	1K	8	1	8	-	3	2
MB95130MB	MB95F133MBW	Standard	28	2.4	5.5	16	Yes	Flash	8	256	8	1	8	-	3	2
MB95130MB	MB95F134MBW	Standard	28	2.4	5.5	16	Yes	Flash	16	512	8	1	8	-	3	2
MB95130MB	MB95F136MBW	Standard	28	2.4	5.5	16	Yes	Flash	32	1K	8	1	8	-	3	2
MB95130MB	MB95F133NBW	Standard	28	2.4	5.5	16	Yes	Flash	8	256	8	1	8	-	3	2
MB95130MB	MB95F134NBW	Standard	28	2.4	5.5	16	Yes	Flash	16	512	8	1	8	-	3	2
MB95130MB	MB95F136NBW	Standard	28	2.4	5.5	16	Yes	Flash	32	1K	8	1	8	-	3	2
MB95130MB	MB95F133JBS	Standard	28	2.4	5.5	16	-	Flash	8	256	8	1	8	-	3	2
MB95130MB	MB95F134JBS	Standard	28	2.4	5.5	16	-	Flash	16	512	8	1	8	-	3	2
MB95130MB	MB95F136JBS	Standard	28	2.4	5.5	16	-	Flash	32	1K	8	1	8	-	3	2
MB95130MB	MB95F133JBW	Standard	28	2.4	5.5	16	Yes	Flash	8	256	8	1	8	-	3	2
MB95130MB	MB95F134JBW	Standard	28	2.4	5.5	16	Yes	Flash	16	512	8	1	8	-	3	2
MB95130MB	MB95F136JBW	Standard	28	2.4	5.5	16	Yes	Flash	32	1K	8	1	8	-	3	2
MB95140	MB95F146S	Standard	32	2.4	3.3	16	-	Flash	32	1K	8	1	8	-	5	4
MB95140	MB95F146W	Standard	32	2.4	3.3	16	Yes	Flash	32	1K	8	1	8	-	5	4
MB95150M	MB95156M	LCD controller	48 or 52	2.4	5.5	16	Yes	MASK	32	1K	8	1	8	-	5	4
MB95150M	MB95F156M	LCD controller	48 or 52	2.4	5.5	16	Yes	Flash	32	1K	8	1	8	-	5	4
MB95150M	MB95F156N	LCD controller	48 or 52	2.4	5.5	16	Yes	Flash	32	1K	8	1	8	-	5	4
MB95150M	MB95F156J	LCD controller	48 or 52	2.4	5.5	16	Yes	Flash	32	1K	8	1	8	-	5	4
MB95160	MB95F166D	LCD controller	64	2.0	3.3	16	Yes	Flash	32	1K	8	1	8	-	5	4
MB95160MA	MB95F168MA	LCD controller	64	2.4	5.5	16	Yes	Flash	60	2K	8	1	8	-	5	4
MB95160MA	MB95F168NA	LCD controller	64	2.4	5.5	16	Yes	Flash	60	2K	8	1	8	-	5	4
MB95160MA	MB95F168JA	LCD controller	64	2.4	5.5	16	Yes	Flash	60	2K	8	1	8	-	5	4
MB95200H	MB95F202H	Standard	20 or 24	2.4	5.5	16	Yes	Flash	4	240	6	1	6	-	-	4
MB95200H	MB95F202K	Standard	20 or 24	2.4	5.5	16	Yes	Flash	4	240	6	1	6	-	-	4
MB95200H	MB95F203H	Standard	20 or 24	2.4	5.5	16	Yes	Flash	8	496	6	1	6	-	-	4
MB95200H	MB95F203K	Standard	20 or 24	2.4	5.5	16	Yes	Flash	8	496	6	1	6	-	-	4
MB95200H	MB95F204H	Standard	20 or 24	2.4	5.5	16	Yes	Flash	16	496	6	1	6	-	-	4
MB95200H	MB95F204K	Standard	20 or 24	2.4	5.5	16	Yes	Flash	16	496	6	1	6	-	-	4
MB95210H	MB95F212H	Standard	8	2.4	5.5	16	Yes	Flash	4	240	2	1	2	-	-	2
MB95210H	MB95F212K	Standard	8	2.4	5.5	16	Yes	Flash	4	240	2	1	2	-	-	2

F₂MC-8FX Family
product list(Continued)

Microcontrollers (8-bit Proprietary F²MC-8FX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub- clock	Memory type	ROM [Byte]	RAM [Byte]	External interrupts [ch.]	10bit A/D converter		Timer		
				Min	Max							[unit]	[ch]	Reload timer [ch]	PPG timer [ch.]	Comp ound timer [ch]
MB95210H	MB95F213H	Standard	8	2.4	5.5	16	Yes	Flash	8	496	2	1	2	-	-	2
MB95210H	MB95F213K	Standard	8	2.4	5.5	16	Yes	Flash	8	496	2	1	2	-	-	2
MB95210H	MB95F214H	Standard	8	2.4	5.5	16	Yes	Flash	16	496	2	1	2	-	-	2
MB95210H	MB95F214K	Standard	8	2.4	5.5	16	Yes	Flash	16	496	2	1	2	-	-	2
MB95220H	MB95F222H *	Standard	16	2.4	5.5	16	Yes	Flash	4	240	2	1	5	-	-	2
MB95220H	MB95F222K *	Standard	16	2.4	5.5	16	Yes	Flash	4	240	2	1	5	-	-	2
MB95220H	MB95F223H *	Standard	16	2.4	5.5	16	Yes	Flash	8	496	2	1	5	-	-	2
MB95220H	MB95F223K *	Standard	16	2.4	5.5	16	Yes	Flash	8	496	2	1	5	-	-	2

*: Under development

Microcontrollers (8-bit Proprietary F²MC-8FX Family)

Serial			LCD controller [seg. x com.]	Functions	Evaluation device	Part number
I ² C [ch]	UART/ SIO [ch]	LIN/ UART/ SIO [ch]				
-	-	-	-	One Sector Flash, Compound timer (Timer/PPG/PWM/PWC/Input chapchar selectable), Clock supervisor	MB95F213H	MB95F213H
-	-	-	-	One Sector Flash, Compound timer (Timer/PPG/PWM/PWC/Input chapchar selectable), Low-voltage detection, Clock supervisor	MB95F213K	MB95F213K
-	-	-	-	One Sector Flash, Compound timer (Timer/PPG/PWM/PWC/Input chapchar selectable), Clock supervisor	MB95F214H	MB95F214H
-	-	-	-	One Sector Flash, Compound timer (Timer/PPG/PWM/PWC/Input chapchar selectable), Low-voltage detection, Clock supervisor	MB95F214K	MB95F214K
-	-	1	-	One Sector Flash, Compound timer (Timer/PPG/PWM/PWC/Input chapchar selectable), Clock supervisor	MB95F222H	MB95F222H *
-	-	1	-	One Sector Flash, Compound timer (Timer/PPG/PWM/PWC/Input chapchar selectable), Low-voltage detection, Clock supervisor	MB95F222K	MB95F222K *
-	-	1	-	One Sector Flash, Compound timer (Timer/PPG/PWM/PWC/Input chapchar selectable), Clock supervisor	MB95F223H	MB95F223H *
-	-	1	-	One Sector Flash, Compound timer (Timer/PPG/PWM/PWC/Input chapchar selectable), Low-voltage detection, Clock supervisor	MB95F223K	MB95F223K *

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter		8bit D/A converter [ch]	Timer			
				Min	Max									[unit]	[ch]		Reload timer [ch]	Free-run timer [ch]	Output compare [ch]	Input capture [ch.]
MB90330A	MB90333A	USB	120	3.0	3.6	24	Yes	MASK	256	16	16	8	Yes	1	16	-	3	1	4	4
MB90330A	MB90F334A	USB	120	3.0	3.6	24	Yes	Flash	384	24	16	8	Yes	1	16	-	3	1	4	4
MB90330A	MB90F335A	USB	120	3.0	3.6	24	Yes	Flash	512	30	16	8	Yes	1	16	-	3	1	4	4
MB90335	MB90337	USB	64	3.0	3.6	24	-	MASK	64	4	16	8	-	-	-	-	1	-	-	-
MB90335	MB90F337	USB	64	3.0	3.6	24	-	Dual Op. Flash	64	4	16	8	-	-	-	-	1	-	-	-
MB90340E	MB90341CE	CAN	100	3.5	5.5	24	Yes	MASK	128	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90341CES	CAN	100	3.5	5.5	24	-	MASK	128	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90341E	CAN	100	3.5	5.5	24	Yes	MASK	128	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90341ES	CAN	100	3.5	5.5	24	-	MASK	128	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90342CE	CAN	100	3.5	5.5	24	Yes	MASK	256	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90342CES	CAN	100	3.5	5.5	24	-	MASK	256	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90342E	CAN	100	3.5	5.5	24	Yes	MASK	256	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90342ES	CAN	100	3.5	5.5	24	-	MASK	256	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90346CE	CAN	100	3.5	5.5	24	Yes	MASK	64	2	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90346CES	CAN	100	3.5	5.5	24	-	MASK	64	2	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90346E	CAN	100	3.5	5.5	24	Yes	MASK	64	2	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90346ES	CAN	100	3.5	5.5	24	-	MASK	64	2	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90347CE	CAN	100	3.5	5.5	24	Yes	MASK	128	6	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90347CES	CAN	100	3.5	5.5	24	-	MASK	128	6	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90347E	CAN	100	3.5	5.5	24	Yes	MASK	128	6	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90347ES	CAN	100	3.5	5.5	24	-	MASK	128	6	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90348CE	CAN	100	3.5	5.5	24	Yes	MASK	128	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90348CES	CAN	100	3.5	5.5	24	-	MASK	128	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90348E	CAN	100	3.5	5.5	24	Yes	MASK	128	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90348ES	CAN	100	3.5	5.5	24	-	MASK	128	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90349CE	CAN	100	3.5	5.5	24	Yes	MASK	256	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90349CES	CAN	100	3.5	5.5	24	-	MASK	256	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90349E	CAN	100	3.5	5.5	24	Yes	MASK	256	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90349ES	CAN	100	3.5	5.5	24	-	MASK	256	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F342CE	CAN	100	3.5	5.5	24	Yes	Flash	256	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F342CES	CAN	100	3.5	5.5	24	-	Flash	256	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F342E	CAN	100	3.5	5.5	24	Yes	Flash	256	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F342ES	CAN	100	3.5	5.5	24	-	Flash	256	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F343CE	CAN	100	3.5	5.5	24	Yes	Flash	384	20	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F343CES	CAN	100	3.5	5.5	24	-	Flash	384	20	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F343E	CAN	100	3.5	5.5	24	Yes	Flash	384	20	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F343ES	CAN	100	3.5	5.5	24	-	Flash	384	20	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F345CE	CAN	100	3.5	5.5	24	Yes	Flash	512	20	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F345CES	CAN	100	3.5	5.5	24	-	Flash	512	20	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F345E	CAN	100	3.5	5.5	24	Yes	Flash	512	20	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F345ES	CAN	100	3.5	5.5	24	-	Flash	512	20	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F346CE	CAN	100	3.5	5.5	24	Yes	Flash	64	2	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F346CES	CAN	100	3.5	5.5	24	-	Flash	64	2	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F346E	CAN	100	3.5	5.5	24	Yes	Flash	64	2	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F346ES	CAN	100	3.5	5.5	24	-	Flash	64	2	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F347CE	CAN	100	3.5	5.5	24	Yes	Flash	128	6	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F347CES	CAN	100	3.5	5.5	24	-	Flash	128	6	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F347E	CAN	100	3.5	5.5	24	Yes	Flash	128	6	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F347ES	CAN	100	3.5	5.5	24	-	Flash	128	6	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F349CE	CAN	100	3.5	5.5	24	Yes	Flash	256	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F349CES	CAN	100	3.5	5.5	24	-	Flash	256	16	16	16	Yes	1	24	-	4	2	8	8
MB90340E	MB90F349E	CAN	100	3.5	5.5	24	Yes	Flash	256	16	16	16	Yes	1	16	-	4	2	8	8
MB90340E	MB90F349ES	CAN	100	3.5	5.5	24	-	Flash	256	16	16	16	Yes	1	16	-	4	2	8	8
MB90350E	MB90351E	CAN	64	3.5	5.5	24	Yes	MASK	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90351ES	CAN	64	3.5	5.5	24	-	MASK	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90351TE	CAN	64	3.5	5.5	24	Yes	MASK	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90351TES	CAN	64	3.5	5.5	24	-	MASK	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90352E	CAN	64	3.5	5.5	24	Yes	MASK	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90352ES	CAN	64	3.5	5.5	24	-	MASK	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90352TE	CAN	64	3.5	5.5	24	Yes	MASK	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90352TES	CAN	64	3.5	5.5	24	-	MASK	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90356E	CAN	64	3.5	5.5	24	Yes	MASK	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90356ES	CAN	64	3.5	5.5	24	-	MASK	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90356TE	CAN	64	3.5	5.5	24	Yes	MASK	64	4	16	8	Yes	1	15	-	4	2	4	6

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Timer					Serial							IE bus [ch]	LCD controller [seg. x com.]	Inverter	VFD	Functions	Evaluation device	Part number
PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer [ch.]	Mult Function timer [ch.]	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host/USB-Function [ch]							
6	1	-	-	-	3	4	1	-	-	-	1	-	-	-	-	-	MB90V330A	MB90333A
6	1	-	-	-	3	4	1	-	-	-	1	-	-	-	-	-	MB90V330A	MB90F334A
6	1	-	-	-	3	4	1	-	-	-	1	-	-	-	-	-	MB90V330A	MB90F335A
4	1	-	-	-	1	1	1	-	-	-	1	-	-	-	-	-	MB90V330A	MB90337
4	1	-	-	-	1	1	1	-	-	-	1	-	-	-	-	Dual operation Flash	MB90V330A	MB90F337
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90341CE
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90341CES
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90341E
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90341ES
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90342CE
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90342CES
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90342E
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90342ES
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90346CE
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90346CES
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90346E
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90346ES
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90347CE
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90347CES
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90347E
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90347ES
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90348CE
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90348CES
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90348E
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90348ES
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90349CE
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90349CES
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90349E
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90349ES
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90F342CE
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90F342CES
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90F342E
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90F342ES
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90F343CE
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90F343CES
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90F343E
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90F343ES
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90F345CE
16	-	-	-	-	2	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90F345CES
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-102	MB90F345E
16	-	-	-	-	-	-	-	4	-	2	-	-	-	-	-	LIN	MB90V340E-101	MB90F345ES
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F346CE
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F346CES
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F346E
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F346ES
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F347CE
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F347CES
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F347E
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F347ES
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F349CE
16	-	-	-	-	2	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F349CES
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F349E
16	-	-	-	-	-	-	-	4	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F349ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90351E
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90351ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-102	MB90351TE
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-101	MB90351TES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90352E
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90352ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-102	MB90352TE
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-101	MB90352TES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-104	MB90356E
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-103	MB90356ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-104	MB90356TE

(Continued)

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter		8bit D/A converter [ch]	Timer			
				Min	Max									[unit]	[ch]		Reload timer [ch]	Free run timer [ch]	Output compare [ch]	Input capture [ch.]
MB90350E	MB90356TES	CAN	64	3.5	5.5	24	-	MASK	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90357E	CAN	64	3.5	5.5	24	Yes	MASK	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90357ES	CAN	64	3.5	5.5	24	-	MASK	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90357TE	CAN	64	3.5	5.5	24	Yes	MASK	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90357TES	CAN	64	3.5	5.5	24	-	MASK	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F351E	CAN	64	3.5	5.5	24	Yes	Flash	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F351ES	CAN	64	3.5	5.5	24	-	Flash	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F351TE	CAN	64	3.5	5.5	24	Yes	Flash	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F351TES	CAN	64	3.5	5.5	24	-	Flash	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F352E	CAN	64	3.5	5.5	24	Yes	Dual Op. Flash	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F352ES	CAN	64	3.5	5.5	24	-	Dual Op. Flash	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F352TE	CAN	64	3.5	5.5	24	Yes	Dual Op. Flash	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F352TES	CAN	64	3.5	5.5	24	-	Dual Op. Flash	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F356E	CAN	64	3.5	5.5	24	Yes	Flash	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F356ES	CAN	64	3.5	5.5	24	-	Flash	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F356TE	CAN	64	3.5	5.5	24	Yes	Flash	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F356TES	CAN	64	3.5	5.5	24	-	Flash	64	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F357E	CAN	64	3.5	5.5	24	Yes	Dual Op. Flash	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F357ES	CAN	64	3.5	5.5	24	-	Dual Op. Flash	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F357TE	CAN	64	3.5	5.5	24	Yes	Dual Op. Flash	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90350E	MB90F357TES	CAN	64	3.5	5.5	24	-	Dual Op. Flash	128	4	16	8	Yes	1	15	-	4	2	4	6
MB90360E	MB90362E	CAN	48	3.5	5.5	24	Yes	MASK	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90362ES	CAN	48	3.5	5.5	24	-	MASK	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90362TE	CAN	48	3.5	5.5	24	Yes	MASK	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90362TES	CAN	48	3.5	5.5	24	-	MASK	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90367E	CAN	48	3.5	5.5	24	Yes	MASK	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90367ES	CAN	48	3.5	5.5	24	-	MASK	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90367TE	CAN	48	3.5	5.5	24	Yes	MASK	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90367TES	CAN	48	3.5	5.5	24	-	MASK	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90F362E	CAN	48	3.5	5.5	24	Yes	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90F362ES	CAN	48	3.5	5.5	24	-	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90F362TE	CAN	48	3.5	5.5	24	Yes	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90F362TES	CAN	48	3.5	5.5	24	-	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90F367E	CAN	48	3.5	5.5	24	Yes	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90F367ES	CAN	48	3.5	5.5	24	-	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90F367TE	CAN	48	3.5	5.5	24	Yes	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90360E	MB90F367TES	CAN	48	3.5	5.5	24	-	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90370	MB90372	LCD controller	144	3.0	3.6	16	Yes	MASK	64	6	-	6	-	1	12	2	4	-	-	-
MB90370	MB90F372	LCD controller	144	3.0	3.6	16	Yes	Flash	64	6	-	6	-	1	12	2	4	-	-	-
MB90378	MB90F378	LCD controller	144	3.0	3.6	16	Yes	Flash	128	6	-	24	-	1	12	2	4	-	-	-
MB90385	MB90387	CAN	48	3.5	5.5	16	Yes	MASK	64	2	-	4	-	1	8	-	2	1	-	4
MB90385	MB90387S	CAN	48	3.5	5.5	16	-	MASK	64	2	-	4	-	1	8	-	2	1	-	4
MB90385	MB90F387	CAN	48	3.5	5.5	16	Yes	Flash	64	2	-	4	-	1	8	-	2	1	-	4
MB90385	MB90F387S	CAN	48	3.5	5.5	16	-	Flash	64	2	-	4	-	1	8	-	2	1	-	4
MB90390	MB90394HA	CAN	120	4.5	5.5	24	-	MASK	384	10	-	8	-	1	15	-	4	2	8	6
MB90390	MB90F394HA	CAN	120	4.5	5.5	24	-	Flash	384	10	-	8	-	1	15	-	4	2	8	6
MB90420G	MB90423GA	CAN	100	4.5	5.5	16	-	MASK	128	6	-	8	-	1	8	-	2	1	-	4
MB90420G	MB90423GC	CAN	100	4.5	5.5	16	Yes	MASK	128	6	-	8	-	1	8	-	2	1	-	4

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Timer					Serial							IE bus [ch]	LCD controller [seg. x com.]	Inverter	VFD	Functions	Evaluation device	Part number
PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer [ch.]	Mult Function timer [ch.]	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host/USB-Function [ch]							
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-103	MB90356TES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-104	MB90357E
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-103	MB90357ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-104	MB90357TE
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-103	MB90357TES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F351E
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F351ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-102	MB90F351TE
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-101	MB90F351TES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F352E
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F352ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-102	MB90F352TE
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-101	MB90F352TES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-104	MB90F356E
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-103	MB90F356ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-104	MB90F356TE
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-103	MB90F356TES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-104	MB90F357E
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-103	MB90F357ES
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-104	MB90F357TE
10	-	-	-	-	1	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-103	MB90F357TES
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90362E
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90362ES
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-102	MB90362TE
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-101	MB90362TES
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-104	MB90367E
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-103	MB90367ES
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-104	MB90367TE
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-103	MB90367TES
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-102	MB90F362E
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN	MB90V340E-101	MB90F362ES
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-102	MB90F362TE
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset	MB90V340E-101	MB90F362TES
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-104	MB90F367E
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340A-103	MB90F367ES
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-104	MB90F367TE
2	-	-	-	-	-	-	-	2	-	1	-	-	-	-	-	LIN, Low-voltage detection reset, Clock Supervisor	MB90V340A-103	MB90F367TES
3	-	-	-	-	2	3	-	-	-	-	-	-	9 x 4	-	-	Bit decoder, PS/2 interface, LPC interface	MB90V370	MB90372
3	-	-	-	-	2	3	-	-	-	-	-	-	9 x 4	-	-	Bit decoder, PS/2 interface, LPC interface	MB90V370	MB90F372
3	-	-	-	-	2	3	-	-	-	-	-	-	9 x 4	-	-	Bit decoder, PS/2 interface, LPC interface	MB90V378	MB90F378
4	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	MB90V495G	MB90387
4	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	MB90V495G	MB90387S
4	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	MB90V495G	MB90F387
4	-	-	-	-	-	1	-	-	-	1	-	-	-	-	-	-	MB90V495G	MB90F387S
12	-	-	-	-	1	2	1	1	-	2	-	-	-	-	-	SMC x 6ch, Sound Generator	MB90V390HB	MB90394HA
12	-	-	-	-	-	2	1	1	-	2	-	-	-	-	-	SMC x 6ch, Sound Generator	MB90V390HB	MB90F394HA
3	-	-	-	-	-	2	-	-	-	2	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90423GA
3	-	-	-	-	-	2	-	-	-	2	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90423GC

(Continued)

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter		8bit D/A converter [ch]	Timer			
				Min	Max									[unit]	[ch]		Reload timer [ch]	Free-run timer [ch]	Output compare [ch]	Input capture [ch.]
MB90420G	MB90F423GA	CAN	100	4.5	5.5	16	-	Flash	128	6	-	8	-	1	8	-	2	1	-	4
MB90420G	MB90F423GC	CAN	100	4.5	5.5	16	Yes	Flash	128	6	-	8	-	1	8	-	2	1	-	4
MB90425G	MB90427GA	CAN	100	4.5	5.5	16	-	MASK	64	4	-	8	-	1	8	-	2	1	-	4
MB90425G	MB90427GC	CAN	100	4.5	5.5	16	Yes	MASK	64	4	-	8	-	1	8	-	2	1	-	4
MB90425G	MB90428GA	CAN	100	4.5	5.5	16	-	MASK	128	6	-	8	-	1	8	-	2	1	-	4
MB90425G	MB90428GC	CAN	100	4.5	5.5	16	Yes	MASK	128	6	-	8	-	1	8	-	2	1	-	4
MB90425G	MB90F428GA	CAN	100	4.5	5.5	16	-	Flash	128	6	-	8	-	1	8	-	2	1	-	4
MB90425G	MB90F428GC	CAN	100	4.5	5.5	16	Yes	Flash	128	6	-	8	-	1	8	-	2	1	-	4
MB90435	MB90437L	Standard	100	3.5	5.5	16	Yes	MASK	64	2	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90437LS	Standard	100	3.5	5.5	16	-	MASK	64	2	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90438L	Standard	100	3.5	5.5	16	Yes	MASK	128	4	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90438LS	Standard	100	3.5	5.5	16	-	MASK	128	4	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90439	Standard	100	4.5	5.5	16	Yes	MASK	256	6	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90439S	Standard	100	4.5	5.5	16	-	MASK	256	6	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90F438L	Standard	100	3.5	5.5	16	Yes	Flash	128	4	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90F438LS	Standard	100	3.5	5.5	16	-	Flash	128	4	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90F439	Standard	100	4.5	5.5	16	Yes	Flash	256	6	-	8	Yes	1	8	-	2	1	4	6
MB90435	MB90F439S	Standard	100	4.5	5.5	16	-	Flash	256	6	-	8	Yes	1	8	-	2	1	4	6
MB90440G	MB90443G	** CAN	100	4.5	5.5	16	Yes	MASK	128	6	-	8	Yes	1	8	-	2	1	4	8
MB90440G	MB90F443G	CAN	100	4.5	5.5	16	Yes	Flash	128	6	-	8	Yes	1	8	-	2	1	4	8
MB90455	MB90455	Standard	48	3.5	5.5	16	Yes	MASK	24	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90455S	Standard	48	3.5	5.5	16	-	MASK	24	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90456	Standard	48	3.5	5.5	16	Yes	MASK	32	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90456S	Standard	48	3.5	5.5	16	-	MASK	32	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90457	Standard	48	3.5	5.5	16	Yes	MASK	64	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90457S	Standard	48	3.5	5.5	16	-	MASK	64	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90F455	Standard	48	3.5	5.5	16	Yes	Flash	24	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90F455S	Standard	48	3.5	5.5	16	-	Flash	24	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90F456	Standard	48	3.5	5.5	16	Yes	Flash	32	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90F456S	Standard	48	3.5	5.5	16	-	Flash	32	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90F457	Standard	48	3.5	5.5	16	Yes	Flash	64	2	-	4	-	1	8	-	2	1	-	4
MB90455	MB90F457S	Standard	48	3.5	5.5	16	-	Flash	64	2	-	4	-	1	8	-	2	1	-	4
MB90460	MB90462	Inverter control	64	3.0	5.5	16	-	MASK	64	2	-	8	-	1	8	-	2	-	-	-
MB90460	MB90F462	Inverter control	64	4.5	5.5	16	-	Flash	64	2	-	8	-	1	8	-	2	-	-	-
MB90460	MB90F462A	Inverter control	64	4.5	5.5	16	-	Flash	64	2	-	8	-	1	8	-	2	-	-	-
MB90460	MB90F463A	Inverter control	64	4.5	5.5	16	-	Flash	128	2	-	8	-	1	8	-	2	-	-	-
MB90465	MB90467	Inverter control	64	3.0	5.5	16	-	MASK	64	2	-	8	-	1	8	-	2	-	-	-
MB90480B	MB90F481B	Standard	100	2.7	3.6 or 5.5	25	Yes	Flash	192	4	16	8	Yes	1	8	-	1	1	6	2
MB90480B	MB90F482B	Standard	100	2.7	3.6 or 5.5	25	Yes	Flash	256	6	16	8	Yes	1	8	-	1	1	6	2
MB90485B	MB90483C	Standard	100	2.7	3.6	25	Yes	MASK	256	16	16	8	Yes	1	8	-	1	1	6	2
MB90485B	MB90487B	Standard	100	2.7	3.6	25	Yes	MASK	192	10	16	8	Yes	1	8	-	1	1	6	2
MB90485B	MB90488B	Standard	100	2.7	3.6	25	Yes	MASK	256	10	16	8	Yes	1	8	-	1	1	6	2
MB90485B	MB90F488B	Standard	100	2.7	3.6	25	Yes	Flash	256	10	16	8	Yes	1	8	-	1	1	6	2
MB90485B	MB90F489B	Standard	100	2.7	3.6	25	Yes	Flash	384	24	16	8	Yes	1	8	-	1	1	6	2
MB90495G	MB90497G	CAN	64	4.5	5.5	16	Yes	MASK	64	2	-	8	Yes	1	8	-	2	1	-	4
MB90495G	MB90F497G	CAN	64	4.5	5.5	16	Yes	Flash	64	2	-	8	Yes	1	8	-	2	1	-	4
MB90495G	MB90F498G	CAN	64	4.5	5.5	16	Yes	Flash	128	2	-	8	Yes	1	8	-	2	1	-	4
MB90520B	MB90522B	LCD controller	128	2.7	5.5	16	Yes	MASK	64	4	-	8	-	1	8	2	2	2	8	2
MB90520B	MB90523B	LCD controller	128	2.7	5.5	16	Yes	MASK	64	4	-	8	-	1	8	2	2	2	8	2

** : Under planning

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Timer					Serial							IE bus [ch]	LCD controller [seg. x com.]	Inverter	VFD	Functions	Evaluation device	Part number
PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer [ch.]	Mult Function timer [ch.]	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host/USB-Function [ch]							
3	-	-	-	-	-	2	-	-	-	2	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90F423GA
3	-	-	-	-	-	2	-	-	-	2	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90F423GC
3	-	-	-	-	-	2	-	-	-	1	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90427GA
3	-	-	-	-	-	2	-	-	-	1	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90427GC
3	-	-	-	-	-	2	-	-	-	1	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90428GA
3	-	-	-	-	-	2	-	-	-	1	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90428GC
3	-	-	-	-	-	2	-	-	-	1	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90F428GA
3	-	-	-	-	-	2	-	-	-	1	-	-	24 x 4	-	-	SMC x 4ch, Sound Generator	MB90V420G	MB90F428GC
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90437L
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90437LS
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90438L
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90438LS
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90439
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90439S
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90F438L
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90F438LS
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90F439
4	-	-	-	-	-	2	1	-	-	-	-	-	-	-	-	-	MB90V540G	MB90F439S
4	-	-	-	-	-	2	1	-	-	3	-	-	-	-	-	-	MB90V440G	MB90443G **
4	-	-	-	-	-	2	1	-	-	3	-	-	-	-	-	-	MB90V440G	MB90F443G
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90455
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90455S
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90456
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90456S
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90457
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90457S
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90F455
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90F455S
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90F456
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90F456S
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90F457
4	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	MB90V495G	MB90F457S
3	2	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi-function Timer (Freerun timer+OCU+ICU+PPG+W aveform generator)	MB90V460	MB90462
3	2	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi-function Timer (Freerun timer+OCU+ICU+PPG+W aveform generator)	MB90V460	MB90F462
3	2	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi-function Timer (Freerun timer+OCU+ICU+PPG+W aveform generator)	MB90V460	MB90F462A
3	2	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi-function Timer (Freerun timer+OCU+ICU+PPG+W aveform generator)	MB90V460	MB90F463A
3	2	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi-function Timer (Freerun timer+OCU+ICU+PPG+W aveform generator)	MB90V460	MB90467
6	-	2	-	-	-	1	2	-	-	-	-	-	-	-	-	-	MB90V480	MB90F481B
6	-	2	-	-	-	1	2	-	-	-	-	-	-	-	-	-	MB90V480	MB90F482B
6	3	2	-	-	1	1	2	-	-	-	-	-	-	-	-	-	MB90V485B	MB90483C
6	3	2	-	-	1	1	2	-	-	-	-	-	-	-	-	-	MB90V485B	MB90487B
6	3	2	-	-	1	1	2	-	-	-	-	-	-	-	-	-	MB90V485B	MB90488B
6	3	2	-	-	1	1	2	-	-	-	-	-	-	-	-	-	MB90V485B	MB90F488B
6	3	2	-	-	1	1	2	-	-	-	-	-	-	-	-	-	MB90V485B	MB90F489B
1	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	MB90V495G	MB90497G
1	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	MB90V495G	MB90F497G
1	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	-	MB90V495G	MB90F498G
2	-	2	-	-	-	1	2	-	-	-	-	-	32 x 4	-	-	-	MB90V520A	MB90522B
2	-	2	-	-	-	1	2	-	-	-	-	-	32 x 4	-	-	-	MB90V520A	MB90523B

(Continued)

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter		8bit D/A converter [ch]	Timer			
				Min	Max									[unit]	[ch]		Reload timer [ch]	Free run timer [ch]	Output compare [ch]	Input capture [ch.]
MB90520B	MB90F523B	LCD controller	128	3.3	5.5	16	Yes	Flash	128	4	-	8	-	1	8	2	2	2	8	2
MB90540G	MB90543G	CAN	100	3.5	5.5	16	Yes	MASK	128	6	-	8	Yes	1	8	-	2	1	4	8
MB90540G	MB90543GS	CAN	100	3.5	5.5	16	-	MASK	128	6	-	8	Yes	1	8	-	2	1	4	8
MB90540G	MB90F543G	CAN	100	4.5	5.5	16	Yes	Flash	128	6	-	8	Yes	1	8	-	2	1	4	8
MB90540G	MB90F543GS	CAN	100	4.5	5.5	16	-	Flash	128	6	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90547G	CAN	100	3.5	5.5	16	Yes	MASK	64	2	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90547GS	CAN	100	3.5	5.5	16	-	MASK	64	2	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90548G	CAN	100	3.5	5.5	16	Yes	MASK	128	4	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90548GS	CAN	100	3.5	5.5	16	-	MASK	128	4	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90549G	CAN	100	4.5	5.5	16	Yes	MASK	256	6	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90549GS	CAN	100	4.5	5.5	16	-	MASK	256	6	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90F546G	CAN	100	4.5	5.5	16	Yes	Flash	256	8	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90F546GS	CAN	100	4.5	5.5	16	-	Flash	256	8	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90F548G	CAN	100	4.5	5.5	16	Yes	Flash	128	4	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90F548GL	CAN	100	3.5	5.5	16	Yes	Flash	128	4	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90F548GLS	CAN	100	3.5	5.5	16	-	Flash	128	4	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90F548GS	CAN	100	4.5	5.5	16	-	Flash	128	4	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90F549G	CAN	100	4.5	5.5	16	Yes	Flash	256	6	-	8	Yes	1	8	-	2	1	4	8
MB90545G	MB90F549GS	CAN	100	4.5	5.5	16	-	Flash	256	6	-	8	Yes	1	8	-	2	1	4	8
MB90550A	MB90552A	Standard	100	3.5	5.5	16	-	MASK	64	2	-	8	Yes	1	8	-	2	1	4	4
MB90550A	MB90553A	Standard	100	3.5	5.5	16	-	MASK	128	4	-	8	Yes	1	8	-	2	1	4	4
MB90550A	MB90F553A	Standard	100	4.5	5.5	16	-	Flash	128	4	-	8	Yes	1	8	-	2	1	4	4
MB90550A	MB90P553A	Standard	100	4.5	5.5	16	-	OTP	128	4	-	8	Yes	1	8	-	2	1	4	4
MB90550A	MB90T552A	Standard	100	3.5	5.5	16	-	No ROM/ External ROM	-	2	-	8	Yes	1	8	-	2	1	4	4
MB90550A	MB90T553A	Standard	100	3.5	5.5	16	-	No ROM/ External ROM	-	4	-	8	Yes	1	8	-	2	1	4	4
MB90550B	MB90552B	Standard	100	3.5	5.5	16	-	MASK	64	2	-	8	Yes	1	8	-	2	1	4	4
MB90550B	MB90553B	Standard	100	3.5	5.5	16	-	MASK	128	4	-	8	Yes	1	8	-	2	1	4	4
MB90560	MB90561A	Inverter control	64	3.0	5.5	16	-	MASK	32	1	-	8	-	1	8	-	2	1	6	4
MB90560	MB90562A	Inverter control	64	3.0	5.5	16	-	MASK	64	2	-	8	-	1	8	-	2	1	6	4
MB90560	MB90F562B	Inverter control	64	4.5	5.5	16	-	Flash	64	2	-	8	-	1	8	-	2	1	6	4
MB90565	MB90567	Inverter control	64	2.7	3.6	16	-	MASK	96	4	-	8	-	1	8	-	2	1	6	4
MB90565	MB90568	Inverter control	64	2.7	3.6	16	-	MASK	128	4	-	8	-	1	8	-	2	1	6	4
MB90565	MB90F568	Inverter control	64	2.7	3.6	16	-	Flash	128	4	-	8	-	1	8	-	2	1	6	4
MB90570A	MB90573	Standard	120	3.0	5.5	16	Yes	MASK	128	6	-	8	Yes	1	8	2	-	1	4	2
MB90570A	MB90F574A	Standard	120	4.5	5.5	16	Yes	Flash	256	10	-	8	Yes	1	8	2	-	1	4	2
MB90570C	MB90574C	Standard	120	3.0	5.5	16	Yes	MASK	256	10	-	8	Yes	1	8	2	-	1	4	2
MB90580	MB90583C	IE bus	100	3.0	5.5	16	Yes	MASK	128	6	-	8	Yes	1	8	2	3	1	2	4
MB90580	MB90583CA	IE bus	100	3.0	5.5	16	-	MASK	128	6	-	8	Yes	1	8	2	3	1	2	4
MB90580	MB90587C	IE bus	100	3.0	5.5	16	Yes	MASK	64	4	-	8	Yes	1	8	2	3	1	2	4
MB90580	MB90587CA	IE bus	100	3.0	5.5	16	-	MASK	64	4	-	8	Yes	1	8	2	3	1	2	4
MB90580	MB90F583C	IE bus	100	4.5	5.5	16	Yes	Flash	128	6	-	8	Yes	1	8	2	3	1	2	4
MB90580	MB90F583CA	IE bus	100	4.5	5.5	16	-	Flash	128	6	-	8	Yes	1	8	2	3	1	2	4
MB90580	MB90F584C	IE bus	100	4.5	5.5	16	Yes	Flash	256	6	-	8	Yes	1	8	2	3	1	2	4
MB90580	MB90F584CA	IE bus	100	4.5	5.5	16	-	Flash	256	6	-	8	Yes	1	8	2	3	1	2	4
MB90590G	MB90591G	CAN	100	4.75	5.25	16	-	MASK	384	8	-	8	-	1	8	-	2	1	6	6
MB90590G	MB90594G	CAN	100	4.5	5.5	16	-	MASK	256	6	-	8	-	1	8	-	2	1	6	6
MB90590G	MB90F591G	CAN	100	4.75	5.25	16	-	Flash	384	8	-	8	-	1	8	-	2	1	6	6
MB90590G	MB90F594G	CAN	100	4.5	5.5	16	-	Flash	256	6	-	8	-	1	8	-	2	1	6	6
MB90595G	MB90598G	CAN	100	4.5	5.5	16	-	MASK	128	4	-	8	-	1	8	-	2	1	4	4
MB90595G	MB90F598G	CAN	100	4.5	5.5	16	-	Flash	128	4	-	8	-	1	8	-	2	1	4	4

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Timer					Serial							IE bus [ch]	LCD controller [seg. x com.]	Inverter	VFD	Functions	Evaluation device	Part number
PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer [ch.]	Mult Function timer [ch.]	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host/USB-Function [ch]							
2	-	2	-	-	-	1	2	-	-	-	-	-	32 x 4	-	-	-	MB90V520A	MB90F523B
4	-	-	-	-	-	2	1	-	-	2	-	-	-	-	-	-	MB90V540G	MB90543G
4	-	-	-	-	-	3	2	-	-	2	-	-	-	-	-	-	MB90V540G	MB90543GS
4	-	-	-	-	-	4	3	-	-	2	-	-	-	-	-	-	MB90V540G	MB90F543G
4	-	-	-	-	-	5	4	-	-	2	-	-	-	-	-	-	MB90V540G	MB90F543GS
4	-	-	-	-	-	6	5	-	-	1	-	-	-	-	-	-	MB90V540G	MB90547G
4	-	-	-	-	-	7	6	-	-	1	-	-	-	-	-	-	MB90V540G	MB90547GS
4	-	-	-	-	-	8	7	-	-	1	-	-	-	-	-	-	MB90V540G	MB90548G
4	-	-	-	-	-	9	8	-	-	1	-	-	-	-	-	-	MB90V540G	MB90548GS
4	-	-	-	-	-	10	9	-	-	1	-	-	-	-	-	-	MB90V540G	MB90549G
4	-	-	-	-	-	11	10	-	-	1	-	-	-	-	-	-	MB90V540G	MB90549GS
4	-	-	-	-	-	12	11	-	-	1	-	-	-	-	-	-	MB90V540G	MB90F546G
4	-	-	-	-	-	13	12	-	-	1	-	-	-	-	-	-	MB90V540G	MB90F546GS
4	-	-	-	-	-	14	13	-	-	1	-	-	-	-	-	-	MB90V540G	MB90F548G
4	-	-	-	-	-	15	14	-	-	1	-	-	-	-	-	-	MB90V540G	MB90F548GL
4	-	-	-	-	-	16	15	-	-	1	-	-	-	-	-	-	MB90V540G	MB90F548GLS
4	-	-	-	-	-	17	16	-	-	1	-	-	-	-	-	-	MB90V540G	MB90F548GS
4	-	-	-	-	-	18	17	-	-	1	-	-	-	-	-	-	MB90V540G	MB90F549G
4	-	-	-	-	-	19	18	-	-	1	-	-	-	-	-	-	MB90V540G	MB90F549GS
6	-	-	-	-	2	1	2	-	-	-	-	-	-	-	-	-	MB90V550A	MB90552A
6	-	-	-	-	2	1	2	-	-	-	-	-	-	-	-	-	MB90V550A	MB90553A
6	-	-	-	-	2	1	2	-	-	-	-	-	-	-	-	-	MB90V550A	MB90552B
6	-	-	-	-	2	1	2	-	-	-	-	-	-	-	-	-	MB90V550A	MB90553B
6	-	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V560	MB90561A
6	-	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V560	MB90562A
6	-	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V560	MB90F562B
6	-	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V560	MB90567
6	-	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V560	MB90568
6	-	-	-	1	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V560	MB90F568
2	-	2	-	-	1	2	3	-	-	-	-	-	-	-	-	-	MB90V570A	MB90573
2	-	2	-	-	1	2	3	-	-	-	-	-	-	-	-	-	MB90V570A	MB90F574A
2	-	2	-	-	1	2	3	-	-	-	-	-	-	-	-	-	MB90V570A	MB90574C
2	1	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	MB90V580B	MB90583C
2	1	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	MB90V580B	MB90583CA
2	1	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	MB90V580B	MB90587C
2	1	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	MB90V580B	MB90587CA
2	1	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	MB90V580B	MB90F583C
2	1	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	MB90V580B	MB90F583CA
2	1	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	MB90V580B	MB90F584C
2	1	-	-	-	-	5	-	-	-	-	-	1	-	-	-	-	MB90V580B	MB90F584CA
6	-	-	-	-	-	3	1	-	-	2	-	-	-	-	-	Stepper Motor Controller: 4ch, Sound generator	MB90V590G	MB90591G
6	-	-	-	-	-	3	1	-	-	2	-	-	-	-	-	Stepper Motor Controller: 4ch, Sound generator	MB90V590G	MB90594G
6	-	-	-	-	-	3	1	-	-	2	-	-	-	-	-	Stepper Motor Controller: 4ch, Sound generator	MB90V590G	MB90F591G
6	-	-	-	-	-	3	1	-	-	2	-	-	-	-	-	Stepper Motor Controller: 4ch, Sound generator	MB90V590G	MB90F594G
6	-	-	-	-	-	2	1	-	-	1	-	-	-	-	-	Stepper Motor Controller: 4ch	MB90V595G	MB90598G
6	-	-	-	-	-	2	1	-	-	1	-	-	-	-	-	Stepper Motor Controller: 4ch	MB90V595G	MB90F598G

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Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{cc} [V]		Internal clock frequency [Max., MHz]	Sub- clock	Memory type	ROM [KB]	RAM [KB]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter		8bit D/A converter [ch]	Timer				
				Min	Max									[unit]	[ch]		Reload timer [ch]	Freeru n timer [ch]	Output compar e [ch]	Input capture [ch.]	
MB90800	MB90803	LCD controller	100	2.7	3.6	25	Yes	MASK	128	4	-	4	-	1	12	-	3	1	2	2	
MB90800	MB90F803	LCD controller	100	2.7	3.6	25	Yes	Dual Op. Flash	128	4	-	4	-	1	12	-	3	1	2	2	
MB90800	MB90F804	LCD controller	100	2.7	3.6	25	Yes	Flash	256	16	-	4	-	1	12	-	3	1	2	2	
MB90800	MB90F809	LCD controller	100	2.7	3.6	25	Yes	Flash	192	10	-	4	-	1	12	-	3	1	2	2	
MB90820B	MB90822B	Inverter control	80	3.5	5.5	24	-	MASK	64	4	-	8	-	1	16	2	2	-	-	-	
MB90820B	MB90823B	Inverter control	80	3.5	5.5	24	-	MASK	128	4	-	8	-	1	16	2	2	-	-	-	
MB90820B	MB90F822B	Inverter control	80	3.5	5.5	24	-	Flash	64	4	-	8	-	1	16	2	2	-	-	-	
MB90820B	MB90F823B	Inverter control	80	3.5	5.5	24	-	Flash	128	4	-	8	-	1	16	2	2	-	-	-	
MB90820B	MB90F828B	Inverter control	80	3.5	5.5	24	-	Flash	128	8	-	8	-	1	16	2	2	-	-	-	
MB90860E	MB90867E	Standard	100	3.5	5.5	24	Yes	MASK	128	6	16	16	Yes	1	24	-	4	2	8	8	
MB90860E	MB90867ES	Standard	100	3.5	5.5	24	-	MASK	128	6	16	16	Yes	1	24	-	4	2	8	8	
MB90860E	MB90F867E	Standard	100	3.5	5.5	24	Yes	Flash	128	6	16	16	Yes	1	24	-	4	2	8	8	
MB90860E	MB90F867ES	Standard	100	3.5	5.5	24	-	Flash	128	6	16	16	Yes	1	24	-	4	2	8	8	
MB90880	MB90882	*	Standard	100	2.7	3.6	33	Yes	MASK	256	16	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90882S	*	Standard	100	2.7	3.6	33	-	MASK	256	16	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90883	**	Standard	100	2.7	3.6	33	Yes	MASK	384	24	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90883S	**	Standard	100	2.7	3.6	33	-	MASK	384	24	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90884	**	Standard	100	2.7	3.6	33	Yes	MASK	512	30	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90884S	**	Standard	100	2.7	3.6	33	-	MASK	512	30	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F882A		Standard	100	2.7	3.6	33	Yes	Flash	256	16	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F882AS		Standard	100	2.7	3.6	33	-	Flash	256	16	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F883B		Standard	100	2.7	3.6	25	Yes	Flash	384	24	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F883BH		Standard	100	2.7	3.6	33	Yes	Flash	384	24	16	24	Yes	1	20	-	-	1	6	2

*: Under development, **: Under planning

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Timer					Serial							IE bus [ch]	LCD controller [seg. x com.]	Inverter	VFD	Functions	Evaluation device	Part number
PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer [ch.]	Multi Function timer [ch.]	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host/USB-Function [ch]							
2	-	-	-	-	1	2	2	-	-	-	-	-	48 x 4	-	-	-	MB90V800	MB90803
2	-	-	-	-	1	2	2	-	-	-	-	-	48 x 4	-	-	-	MB90V800	MB90F803
2	-	-	-	-	1	2	2	-	-	-	-	-	48 x 4	-	-	-	MB90V800	MB90F804
2	-	-	-	-	1	2	2	-	-	-	-	-	48 x 4	-	-	-	MB90V800	MB90F809
3	2	-	-	-	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V820B	MB90822B
3	2	-	-	-	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V820B	MB90823B
3	2	-	-	-	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V820B	MB90F822B
3	2	-	-	-	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator)	MB90V820B	MB90F823B
3	2	-	-	-	-	2	-	-	-	-	-	-	-	Yes	-	Multi Functional Timer (16bit-freerun timer/OCU/ICU/PPG, Waveform generator), Clock Supervisor	MB90V820B	MB90F828B
16	-	-	-	-	2	-	-	4	-	-	-	-	-	-	-	-	MB90V340E-102	MB90867E
16	-	-	-	-	2	-	-	4	-	-	-	-	-	-	-	-	MB90V340E-101	MB90867ES
16	-	-	-	-	2	-	-	4	-	-	-	-	-	-	-	-	MB90V340E-102	MB90F867E
16	-	-	-	-	2	-	-	4	-	-	-	-	-	-	-	-	MB90V340E-101	MB90F867ES
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880-102	MB90882 *
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880-101	MB90882S *
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880-102	MB90883 **
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880-101	MB90883S **
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880-102	MB90884 **
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880-101	MB90884S **
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880-102	MB90F882A
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880-101	MB90F882AS
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880A-102	MB90F883B
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880A-102	MB90F883BH

(Continued)

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter		8bit D/A converter [ch]	Timer			
				Min	Max									[unit]	[ch]		Reload timer [ch]	Free-run timer [ch]	Output compare [ch]	Input capture [ch.]
MB90880	MB90F883BHS	Standard	100	2.7	3.6	33	-	Flash	384	24	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F883BS	Standard	100	2.7	3.6	25	-	Flash	384	24	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F884B	Standard	100	2.7	3.6	25	Yes	Flash	512	30	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F884BH	Standard	100	2.7	3.6	33	Yes	Flash	512	30	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F884BHS	Standard	100	2.7	3.6	33	-	Flash	512	30	16	24	Yes	1	20	-	-	1	6	2
MB90880	MB90F884BS	Standard	100	2.7	3.6	25	-	Flash	512	30	16	24	Yes	1	20	-	-	1	6	2
MB90895	MB90F897	CAN	48	3.5	5.5	16	Yes	Dual Op. Flash	64	2	-	4	-	1	8	-	2	1	-	4
MB90895	MB90F897S	CAN	48	3.5	5.5	16	-	Dual Op. Flash	64	2	-	4	-	1	8	-	2	1	-	4
MB90920	MB90922NAS	CAN	120	4.0	5.5	32	-	MASK	256	10	-	8	-	1	8	-	4	1	-	8
MB90920	MB90F922NB	CAN	120	4.0	5.5	32	Yes	Flash	256	10	-	8	-	1	8	-	4	1	-	8
MB90920	MB90F922NBS	CAN	120	4.0	5.5	32	-	Flash	256	10	-	8	-	1	8	-	4	1	-	8
MB90920	MB90F923NA	CAN	120	4.0	5.5	32	-	Flash	384	16	-	8	-	1	8	-	4	1	-	8
MB90920	MB90F923NAS	CAN	120	4.0	5.5	32	-	Flash	384	16	-	8	-	1	8	-	4	1	-	8
MB90920	MB90F924NA	CAN	120	4.0	5.5	32	-	Flash	512	24	-	8	-	1	8	-	4	1	-	8
MB90920	MB90F924NAS	CAN	120	4.0	5.5	32	-	Flash	512	24	-	8	-	1	8	-	4	1	-	8
MB90945	MB90947A	CAN	100	3.5	5.5	24	-	MASK	128	6	16	8	-	1	15	-	1	2	4	6
MB90945	MB90F946A	CAN	100	3.5	5.5	24	-	Flash	384	16	16	8	-	1	15	-	1	2	4	6
MB90945	MB90F947A	CAN	100	3.5	5.5	24	-	Flash	128	6	16	8	-	1	15	-	1	2	4	6
MB90945	MB90F949A	CAN	100	3.5	5.5	24	-	Flash	256	12	16	8	-	1	15	-	1	2	4	6
MB90950	MB90F952JB	CAN	100	3.0	5.5	32	Yes	Flash	256	16	16	16	Yes	1	24	2	4	2	8	8
MB90950	MB90F952JBS	CAN	100	3.0	5.5	32	-	Flash	256	16	16	16	Yes	1	24	2	4	2	8	8
MB90950	MB90F952MB	CAN	100	3.0	5.5	32	Yes	Flash	256	16	16	16	Yes	1	24	2	4	2	8	8
MB90950	MB90F952MBS	CAN	100	3.0	5.5	32	-	Flash	256	16	16	16	Yes	1	24	2	4	2	8	8
MB90960	MB90F962	Standard	48	3.5	5.5	24	Yes	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90960	MB90F962S	Standard	48	3.5	5.5	24	-	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90960	MB90F967	Standard	48	3.5	5.5	24	Yes	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90960	MB90F967S	Standard	48	3.5	5.5	24	-	Flash	64	3	-	8	-	1	16	-	2	1	-	4
MB90980	MB90982	Standard	64	2.7	3.6	25	Yes	MASK	128	10	16	8	-	1	8	-	1	1	4	2
MB90980	MB90F983	Standard	64	2.7	3.6	25	Yes	Flash	192	12	16	8	-	1	8	-	1	1	4	2
MB90M405	MB90M407	VFDC	100	3.0	3.6	16	-	MASK	96	4	-	4	-	1	16	-	3	1	1	2
MB90M405	MB90M408	VFDC	100	3.0	3.6	16	-	MASK	128	4	-	4	-	1	16	-	3	1	1	2
MB90M405	MB90MF408	VFDC	100	3.0	3.6	16	-	Flash	128	4	-	4	-	1	16	-	3	1	1	2
MB90990	MB90F997JA	CAN	48	3.0	5.5	32	Yes	Flash	128+32	8	-	8	-	1	16	1	2	1	-	4
MB90990	MB90F997JAS	CAN	48	3.0	5.5	32	-	Flash	128+32	8	-	8	-	1	16	1	2	1	-	4
MB90990	MB90F997MA	CAN	48	3.0	5.5	32	Yes	Flash	128+32	8	-	8	-	1	16	1	2	1	-	4
MB90990	MB90F997MAS	CAN	48	3.0	5.5	32	-	Flash	128+32	8	-	8	-	1	16	1	2	1	-	4

Microcontrollers (16-bit Proprietary F²MC-16LX Family)

Timer					Serial							IE bus [ch]	LCD controller [seg. x com.]	Inverter	VFD	Functions	Evaluation device	Part number
PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer [ch]	Mult Function timer [ch]	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host/USB-Function [ch]							
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880A-101	MB90F883BHS
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880A-101	MB90F883BS
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880A-102	MB90F884B
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880A-102	MB90F884BH
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880A-101	MB90F884BHS
8	-	2	4	-	-	-	-	-	7	-	-	-	-	-	-	4ch Base-timer (16bit-reload timer/PWC/PPG/PWM selectable), Serial: Multi Function Serial Interface: UART/SIO/I2C	MB90V880A-101	MB90F884BS
4	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	Dual operation Flash	MB90V495G	MB90F897
4	-	-	-	-	-	2	-	-	-	1	-	-	-	-	-	Dual operation Flash	MB90V495G	MB90F897S
6	-	-	-	-	-	-	-	4	-	4	-	-	32 x 4	-	-	Stepper Motor Controller x 4ch, Sound generator x 2ch	MB90V920-101	MB90922NAS
6	-	-	-	-	-	-	-	4	-	4	-	-	32 x 4	-	-	Stepper Motor Controller x 4ch, Sound generator x 2ch	MB90V920-102	MB90F922NB
6	-	-	-	-	-	-	-	4	-	4	-	-	32 x 4	-	-	Stepper Motor Controller x 4ch, Sound generator x 2ch	MB90V920-101	MB90F922NBS
6	-	-	-	-	-	-	-	4	-	4	-	-	32 x 4	-	-	Stepper Motor Controller x 4ch, Sound generator x 2ch	MB90V920-102	MB90F923NA
6	-	-	-	-	-	-	-	4	-	4	-	-	32 x 4	-	-	Stepper Motor Controller x 4ch, Sound generator x 2ch	MB90V920-101	MB90F923NAS
6	-	-	-	-	-	-	-	4	-	4	-	-	32 x 4	-	-	Stepper Motor Controller x 4ch, Sound generator x 2ch	MB90V920-102	MB90F924NA
6	-	-	-	-	-	-	-	4	-	4	-	-	32 x 4	-	-	Stepper Motor Controller x 4ch, Sound generator x 2ch	MB90V920-101	MB90F924NAS
6	-	-	-	-	1	1	1	1	-	1	-	-	-	-	-	LIN	MB90V390HB	MB90947A
6	-	-	-	-	1	1	1	2	-	1	-	-	-	-	-	LIN	MB90V390HB	MB90F946A
6	-	-	-	-	1	1	1	1	-	1	-	-	-	-	-	LIN	MB90V390HB	MB90F947A
6	-	-	-	-	1	1	1	1	-	1	-	-	-	-	-	LIN	MB90V390HB	MB90F949A
16	-	-	-	-	2	-	-	7	-	2	-	-	-	-	-	LIN, Clock Supervisor	MB90V340F-104	MB90F952JB
16	-	-	-	-	2	-	-	7	-	2	-	-	-	-	-	LIN, Clock Supervisor	MB90V340F-103	MB90F952JBS
16	-	-	-	-	2	-	-	7	-	2	-	-	-	-	-	LIN	MB90V340F-102	MB90F952MB
16	-	-	-	-	2	-	-	7	-	2	-	-	-	-	-	LIN	MB90V340F-101	MB90F952MBS
2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	LIN	MB90V340E-102	MB90F962
2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	LIN	MB90V340E-101	MB90F962S
2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	LIN, Clock Supervisor	MB90V340E-104	MB90F967
2	-	-	-	-	-	-	-	2	-	-	-	-	-	-	-	LIN, Clock Supervisor	MB90V340E-103	MB90F967S
4	2	2	-	-	1	1	2	-	-	-	-	-	-	-	-	-	MB90V485B	MB90982
4	2	2	-	-	1	1	2	-	-	-	-	-	-	-	-	-	MB90V485B	MB90F983
-	-	-	-	-	1	2	2	-	-	-	-	-	-	-	Yes	VFDC	MB90MV405	MB90M407
-	-	-	-	-	1	2	2	-	-	-	-	-	-	-	Yes	VFDC	MB90MV405	MB90M408
-	-	-	-	-	1	2	2	-	-	-	-	-	-	-	Yes	VFDC	MB90MV405	MB90MF408
3	-	-	-	-	-	1	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340F-104	MB90F997JA
3	-	-	-	-	-	1	-	2	-	1	-	-	-	-	-	LIN, Clock Supervisor	MB90V340F-103	MB90F997JAS
3	-	-	-	-	-	1	-	2	-	1	-	-	-	-	-	LIN	MB90V340F-102	MB90F997MA
3	-	-	-	-	-	1	-	2	-	1	-	-	-	-	-	LIN	MB90V340F-101	MB90F997MAS

Microcontrollers (16-bit Proprietary F²MC-16FX Family)

Microcontrollers (16-bit Proprietary F²MC-16FX Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter	
				Min	Max									[unit]	[ch]
MB96320	MB96F326RSA	CAN	80	3.0	5.5	56	-	Flash	288	12	4	15	Yes	1	18
MB96320	MB96F326RWA	CAN	80	3.0	5.5	56	Yes	Flash	288	12	4	15	Yes	1	18
MB96320	MB96F326YSA	CAN	80	3.0	5.5	56	-	Flash	288	12	4	15	Yes	1	18
MB96320	MB96F326YWA	CAN	80	3.0	5.5	56	Yes	Flash	288	12	4	15	Yes	1	18
MB96340	MB96F348HSC	CAN	100	3.0	5.5	56	-	Flash	544+32	24	6	16	Yes	1	24
MB96340	MB96F348HWC	CAN	100	3.0	5.5	56	Yes	Flash	544+32	24	6	16	Yes	1	24
MB96340	MB96F348RSB	CAN	100	3.0	5.5	56	-	Flash	544	24	6	16	Yes	1	24
MB96340	MB96F348RWB	CAN	100	3.0	5.5	56	Yes	Flash	544	24	6	16	Yes	1	24
MB96340	MB96F348TSC	CAN	100	3.0	5.5	56	-	Flash	544+32	24	6	16	Yes	1	24
MB96340	MB96F348TWC	CAN	100	3.0	5.5	56	Yes	Flash	544+32	24	6	16	Yes	1	24
MB96340	MB96F348YSB	CAN	100	3.0	5.5	56	-	Flash	544	24	6	16	Yes	1	24
MB96340	MB96F348YWB	CAN	100	3.0	5.5	56	Yes	Flash	544	24	6	16	Yes	1	24
MB96350	MB96F356RSB	CAN	64	3.0	5.5	56	-	Flash	288	12	4	13	Yes	1	15
MB96350	MB96F356RWB	CAN	64	3.0	5.5	56	Yes	Flash	288	12	4	13	Yes	1	15
MB96350	MB96F356YSB	CAN	64	3.0	5.5	56	-	Flash	288	12	4	13	Yes	1	15
MB96350	MB96F356YWB	CAN	64	3.0	5.5	56	Yes	Flash	288	12	4	13	Yes	1	15
MB96380	MB96F387RSB	CAN	120	3.0	5.5	56	-	Flash	416	16	7	8	Yes	1	16
MB96380	MB96F387RWB	CAN	120	3.0	5.5	56	Yes	Flash	416	16	7	8	Yes	1	16
MB96380	MB96F387YSB	CAN	120	3.0	5.5	56	-	Flash	416	16	7	8	Yes	1	16
MB96380	MB96F387YWB	CAN	120	3.0	5.5	56	Yes	Flash	416	16	7	8	Yes	1	16

Microcontrollers (16-bit Proprietary F²MC-16FX Family)

Timer					Serial			LCD controller [seg. x com.]	Functions	Evaluation device	Part number
Reload timer [ch]	Freerun timer [ch]	Output compare [ch]	Input capture [ch.]	PPG timer [ch.]	I ² C [ch]	LIN/ UART/ SIO [ch]	CAN [ch]				
4	4	6	12	20	1	4	2	-	-	MB96V300B	MB96F326RSA
4	4	6	12	20	1	4	2	-	-	MB96V300B	MB96F326RWA
4	4	6	12	20	1	4	2	-	-	MB96V300B	MB96F326YSA
4	4	6	12	20	1	4	2	-	-	MB96V300B	MB96F326YWA
4	2	8	8	16	2	7	2	-	-	MB96V300B	MB96F348HSC
4	2	8	8	16	2	7	2	-	-	MB96V300B	MB96F348HWC
4	2	8	8	16	2	7	2	-	-	MB96V300B	MB96F348RSB
4	2	8	8	16	2	7	2	-	-	MB96V300B	MB96F348RWB
4	2	8	8	16	2	7	2	-	-	MB96V300B	MB96F348TSC
4	2	8	8	16	2	7	2	-	-	MB96V300B	MB96F348TWC
4	2	8	8	16	2	7	2	-	-	MB96V300B	MB96F348YSB
4	2	8	8	16	2	7	2	-	-	MB96V300B	MB96F348YWB
4	2	4	6	20	1	4	2	-	-	MB96V300B	MB96F356RSB
4	2	4	6	20	1	4	2	-	-	MB96V300B	MB96F356RWB
4	2	4	6	20	1	4	2	-	-	MB96V300B	MB96F356YSB
4	2	4	6	20	1	4	2	-	-	MB96V300B	MB96F356YWB
4	2	4	8	8	1	5	2	65 x 4	SMC x 5ch, Sound generator x 2ch	MB96V300B	MB96F387RSB
4	2	4	8	8	1	5	2	65 x 4	SMC x 5ch, Sound generator x 2ch	MB96V300B	MB96F387RWB
4	2	4	8	8	1	5	2	65 x 4	SMC x 5ch, Sound generator x 2ch	MB96V300B	MB96F387YSB
4	2	4	8	8	1	5	2	65 x 4	SMC x 5ch, Sound generator x 2ch	MB96V300B	MB96F387YWB

Microcontrollers (32-bit Proprietary FR Family)

Microcontrollers (32-bit FR Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	Instraction-Cash [ch]	Data-Cash [ch]	DMAC [ch]	Ext. interr ups [ch.]	Ext. bus	10bit A/D converter		12bit A/D converter		8bit D/Aconverter [ch]	10bit D/Aconverter [ch]
				Min	Max											[unit]	[ch]	[unit]	[ch]		
MB91101	MB91101A	Standard	100	2.7	5.5	50	-	No ROM/ External ROM	-	2	1	-	8	5	Yes	1	4	-	-	-	-
MB91107	MB91107A	Standard	120	3.0	3.6	50	-	No ROM/ External ROM	-	128	1	-	8	9	Yes	1	4	-	-	-	-
MB91107	MB91108	Standard	120	3.0	3.6	50	-	No ROM/ External ROM	-	160	1	-	8	9	Yes	1	4	-	-	-	-
MB91121	MB91121	Standard	120	3.0	3.6	50	-	No ROM/ External ROM	-	4	1	-	8	9	Yes	1	8	-	-	-	-
MB91129	MB91F127	Standard	100	3.0	3.6	25	-	Flash	256	14	-	-	8	6	Yes	1	8	-	-	-	-
MB91129	MB91F128	Standard	100	3.0	3.6	25	-	Flash	510	14	-	-	8	6	Yes	1	8	-	-	-	-
MB91130	MB91133	Standard	144	3.0	5.5	33	Yes	MASK	254	8	-	-	8	24	Yes	1	8	-	-	3	-
MB91130	MB91F133A	Standard	144	3.15	5.5	33	Yes	Flash	254	8	-	-	8	24	Yes	1	8	-	-	3	-
MB91151A	MB91151A	Standard	144	3.15	3.6	36	-	No ROM/ External ROM	-	34	2	32	8	16	Yes	1	8	-	-	3	-
MB91150	MB91154	Standard	144	3.15	3.6	33	Yes	MASK	384	22	-	-	8	16	Yes	1	8	-	-	3	-
MB91150	MB91155	Standard	144	3.15	3.6	33	Yes	MASK	510	34	-	-	8	16	Yes	1	8	-	-	3	-
MB91150	MB91F155A	Standard	144	3.15	3.6	33	Yes	Flash	510	34	-	-	8	16	Yes	1	8	-	-	3	-
MB91F158	MB91F158	Standard	120	3.20	3.6	33	-	Flash	510	8	-	-	-	16	Yes	1	8	-	-	3	-
MB91210	MB91213A	CAN	144	3.5	5.5	40	Yes	MASK	544	24	-	-	5	16	-	1	32	-	-	-	-
MB91210	MB91F211B	CAN	100	3.5	5.5	40	Yes	Flash	288	16	-	-	5	16	-	1	16	-	-	-	-
MB91210	MB91F213A	CAN	144	3.5	5.5	40	Yes	Flash	544	24	-	-	5	16	-	1	32	-	-	-	-
MB91220	MB91F223	CAN	144	3.5	5.5	32	Yes	Flash	512	16	-	-	5	8	Yes	1	24	-	-	2	-
MB91220	MB91F223S	CAN	144	3.5	5.5	32	-	Flash	512	16	-	-	5	8	Yes	1	24	-	-	2	-
MB91220	MB91F224	CAN	144	3.5	5.5	32	Yes	Flash	768	24	-	-	5	8	Yes	1	24	-	-	2	-
MB91220	MB91F224S	CAN	144	3.5	5.5	32	-	Flash	768	24	-	-	5	8	Yes	1	24	-	-	2	-
MB91230	MB91233L	LCD controller	120	3.0	3.6	33.6	Yes	MASK	256	16	-	-	-	16	-	2	8	-	-	2	-
MB91230	MB91F233A	LCD controller	120	3.0	5.25	33.6	Yes	Flash	256	16	-	-	-	16	-	2	8	-	-	2	-
MB91230	MB91F233L	LCD controller	120	3.0	3.6	33.6	Yes	Flash	256	16	-	-	-	16	-	2	8	-	-	2	-
MB91245	MB91248	CAN	144	3.5	5.5	32	Yes	MASK	256	16	-	-	5	8	-	1	32	-	-	-	-
MB91245	MB91248S	CAN	144	3.5	5.5	32	-	MASK	256	16	-	-	5	8	-	1	32	-	-	-	-
MB91245	MB91F248	CAN	144	3.5	5.5	32	Yes	Flash	256	16	-	-	5	8	-	1	32	-	-	-	-
MB91245	MB91F248S	CAN	144	3.5	5.5	32	-	Flash	256	16	-	-	5	8	-	1	32	-	-	-	-
MB91260B	MB91263B	Inverter control	100	4.0	5.5	33	-	MASK	128	8	-	-	5	10	-	3	8+2+2	-	-	-	-
MB91260B	MB91264B	Inverter control	100	4.0	5.5	33	-	MASK	256	8	-	-	5	10	-	3	8+2+2	-	-	-	-
MB91260B	MB91F264B	Inverter control	100	4.0	5.5	33	-	Flash	256	8	-	-	5	10	-	3	8+2+2	-	-	-	-
MB91265A	MB91267A	CAN	64	4.0	5.5	33	-	MASK	128	4	-	-	5	8	-	2	4+7	-	-	-	-
MB91265A	MB91267NA	CAN	64	4.0	5.5	33	-	MASK	128	4	-	-	5	8	-	2	4+7	-	-	-	-
MB91265A	MB91F267A	CAN	64	4.0	5.5	33	-	Dual Op. Flash	128	4	-	-	5	8	-	2	4+7	-	-	-	-
MB91265A	MB91F267NA	CAN	64	4.0	5.5	33	-	Dual Op. Flash	128	4	-	-	5	8	-	2	4+7	-	-	-	-
MB91270	MB91F272	** CAN	100	3.5	5.5	32	Yes	Flash	256	10	-	-	5	16	Yes	1	24	-	-	-	-
MB91270	MB91F272S	** CAN	100	3.5	5.5	32	-	Flash	256	10	-	-	5	16	Yes	1	24	-	-	-	-
MB91270	MB91F273	CAN	100	3.5	5.5	32	Yes	Flash	512	24	-	-	5	16	Yes	1	24	-	-	-	-
MB91270	MB91F273S	CAN	100	3.5	5.5	32	-	Flash	512	24	-	-	5	16	Yes	1	24	-	-	-	-
MB91270	MB91F277	** CAN	100	3.5	5.5	32	Yes	Flash	256	10	-	-	5	16	Yes	1	24	-	-	-	-

** : Under planning

Microcontrollers (32-bit Proprietary FR Family)

FR Family
product list

Timer										Serial										LCD controll er[seg. x com.]	Inver ter	Functions	Evaluation device	Part number		
PWM timer [ch]	Reload timer	Freerun timer	Output compare [ch]	Input capture [ch.]	PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer	Mult	FC [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	UART [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host [ch]	USB-Function [ch]	USB-Host/USB-Function [ch]							
3	-	-	-	-	4	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	DRAM I/F	MB91V101A	MB91101A	
3	-	-	-	-	4	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	DRAM I/F	MB91V108	MB91107A	
3	-	-	-	-	4	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	DRAM I/F	MB91V108	MB91108	
3	-	-	-	-	4	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	DRAM I/F, DSP	MB91V121CR	MB91121	
3	1	4	4	4	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV129	MB91F127	
3	1	4	4	4	-	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV129	MB91F128	
5	-	-	-	6	-	-	2	-	1	-	5	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV130	MB91133	
5	-	-	-	6	-	-	2	-	1	-	5	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV130	MB91F133A	
4	-	-	-	6	-	-	2	-	1	-	4	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV151A	MB91151A	
4	-	-	-	6	-	-	2	-	1	1	4	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV150	MB91154	
4	-	-	-	6	-	-	2	-	1	1	4	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV150	MB91155	
4	-	-	-	6	-	-	2	-	1	1	4	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV150	MB91F155A	
2	-	-	-	4	-	-	2	-	1	-	2	-	-	-	-	-	-	-	-	-	-	-	-	MB91FV150	MB91F158	
3	4	8	8	16	-	-	-	-	-	-	-	-	7	-	-	3	-	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V210	MB91213A
3	2	4	4	8	-	-	-	-	-	-	1	-	4	-	-	1	-	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V210	MB91F211B
3	4	8	8	16	-	-	-	-	-	-	-	-	7	-	-	3	-	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V210	MB91F213A
3	2	2	4	32	-	1	-	-	-	2	-	-	4	-	-	2	-	-	-	32 x 4	-	-	-	CAN: 32Msg-buffer, SMC x 4ch, Sound generator x 3ch, LIN	MB91V220	MB91F223
3	2	2	4	32	-	1	-	-	-	2	-	-	4	-	-	2	-	-	-	32 x 4	-	-	-	CAN: 32Msg-buffer, SMC x 4ch, Sound generator x 3ch, LIN	MB91V220	MB91F223S
3	2	2	4	32	-	1	-	-	-	2	-	-	4	-	-	2	-	-	-	32 x 4	-	-	-	CAN: 32Msg-buffer, SMC x 4ch, Sound generator x 3ch, LIN	MB91V220	MB91F224
3	2	2	4	32	-	1	-	-	-	2	-	-	4	-	-	2	-	-	-	32 x 4	-	-	-	CAN: 32Msg-buffer, SMC x 4ch, Sound generator x 3ch, LIN	MB91V220	MB91F224S
4	2	4	2	6	-	2	2	-	-	-	4	-	-	-	-	-	-	-	-	32 x 4	-	-	-	-	MB91V230	MB91233L
4	2	4	2	6	-	2	2	-	-	-	4	-	-	-	-	-	-	-	-	32 x 6	-	-	-	-	MB91V230	MB91F233A
4	2	4	2	6	-	2	2	-	-	-	4	-	-	-	-	-	-	-	-	32 x 5	-	-	-	-	MB91V230	MB91F233L
3	2	2	4	8	-	1	-	-	-	-	1	-	3	-	-	2	-	-	-	32 x 4	-	-	-	CAN: 32Msg-buffer, SMC x 6ch, LIN	MB91V245A	MB91248
3	2	2	4	8	-	1	-	-	-	-	1	-	3	-	-	2	-	-	-	32 x 4	-	-	-	CAN: 32Msg-buffer, SMC x 6ch, LIN	MB91V245A	MB91248S
3	2	2	4	8	-	1	-	-	-	-	1	-	3	-	-	2	-	-	-	32 x 4	-	-	-	CAN: 32Msg-buffer, SMC x 6ch, LIN	MB91V245A	MB91F248
3	2	2	4	8	-	1	-	-	-	-	1	-	3	-	-	2	-	-	-	32 x 4	-	-	-	CAN: 32Msg-buffer, SMC x 6ch, LIN	MB91V245A	MB91F248S
3	-	-	-	16	-	2	-	-	1	-	3	-	-	-	-	-	-	-	-	-	Yes	-	-	Multi-function Timer (Freerun timer x 1/ Input chapchar x 4/ Output compare x 6/PPG x 8/ Waveform generator x 1/AD generation compare x 3), Multiply and Accumulation	MB91V260B	MB91263B
3	-	-	-	16	-	2	-	-	1	-	3	-	-	-	-	-	-	-	-	-	Yes	-	-	Multi-function Timer (Freerun timer x 1/ Input chapchar x 4/ Output compare x 6/PPG x 8/ Waveform generator x 1/AD generation compare x 3), Multiply and Accumulation	MB91V260B	MB91264B
3	-	-	-	16	-	2	-	-	1	-	3	-	-	-	-	-	-	-	-	-	Yes	-	-	Multi-function Timer (Freerun timer x 1/ Input chapchar x 4/ Output compare x 6/PPG x 8/ Waveform generator x 1/AD generation compare x 3), Multiply and Accumulation	MB91V260B	MB91F264B
3	3	6	4	8	-	1	-	-	-	-	2	-	-	-	-	1	-	-	-	-	Yes	-	-	CAN: 32Msg-buffer	MB91V265A	MB91267A
3	3	6	4	8	-	1	-	-	-	-	2	-	-	-	-	1	-	-	-	-	Yes	-	-	CAN: 32Msg-buffer	MB91V265A	MB91267NA
3	3	6	4	8	-	1	-	-	-	-	2	-	-	-	-	1	-	-	-	-	Yes	-	-	CAN: 32Msg-buffer	MB91V265A	MB91F267A
3	3	6	4	8	-	1	-	-	-	-	2	-	-	-	-	1	-	-	-	-	Yes	-	-	CAN: 32Msg-buffer	MB91V265A	MB91F267NA
3	4	8	8	16	-	-	2	-	-	3	-	-	7	-	-	1	-	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V280	MB91F272
3	4	8	8	16	-	-	2	-	-	3	-	-	7	-	-	1	-	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V280	MB91F272S
3	4	8	8	16	-	-	2	-	-	3	-	-	7	-	-	1	-	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V280	MB91F273
3	4	8	8	16	-	-	2	-	-	3	-	-	7	-	-	1	-	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V280	MB91F273S
3	4	8	8	16	-	-	2	-	-	3	-	-	7	-	-	1	-	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Clock supervisor	MB91V280	MB91F277

(Continued)

Microcontrollers (32-bit Proprietary FR Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	Instraction-Cash [ch]	Data-Cash [ch]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter		12bit A/D converter		8bit D/Aconverter [ch]	10bit D/Aconverter [ch]
				Min	Max											[unit]	[ch]	[unit]	[ch]		
MB91270	MB91F277S **	CAN	100	3.5	5.5	32	-	Flash	256	10	-	-	5	16	Yes	1	24	-	-	-	-
MB91270	MB91F278 **	CAN	100	3.5	5.5	32	Yes	Flash	512	24	-	-	5	16	Yes	1	24	-	-	-	-
MB91270	MB91F278S **	CAN	100	3.5	5.5	32	-	Flash	512	24	-	-	5	16	Yes	1	24	-	-	-	-
MB91301	MB91302A	Standard	144	3.0	3.6	68	-	MASK	4	4	4	-	5	9	Yes	1	4	-	-	-	-
MB91301	MB91302A-010	Standard	144	3.0	3.6	68	-	No ROM/ External ROM	-	4	4	-	5	9	Yes	1	4	-	-	-	-
MB91301	MB91302A-020	Standard	144	3.0	3.6	68	-	No ROM/ External ROM	-	4	4	-	5	9	Yes	1	4	-	-	-	-
MB91305	MB91305	USB	176	3.0	3.6	64	-	No ROM/ External ROM	-	64	4	-	5	16	Yes	1	10	-	-	-	-
MB91307	MB91306R	Standard	120	3.0	3.6	66	-	No ROM/ External ROM	-	64	1	-	5	9	Yes	1	4	-	-	-	-
MB91307	MB91307B	Standard	120	3.0	3.6	66	-	No ROM/ External ROM	-	128	1	-	5	9	Yes	1	4	-	-	-	-
MB91307	MB91307R	Standard	120	3.0	3.6	66	-	No ROM/ External ROM	-	128	1	-	5	9	Yes	1	4	-	-	-	-
MB91310	MB91F312A	USB	144	3.0	3.6	40	Yes	Flash	512	16	-	-	5	5	-	1	10	-	-	-	-
MB91313A	MB91F313A	Standard	120	3.0	3.6	33	Yes	Flash	544	32	-	-	5	24	Yes	1	10	-	-	-	-
MB91314A	MB91F314A	Standard	120	3.0	3.6	33	Yes	Flash	512	32	-	-	5	24	Yes	1	10	-	-	-	-
MB91319	MB91316A	USB	176	3.0	3.6	40	Yes	MASK	512	32	-	-	5	5	-	1	10	-	-	-	-
MB91319	MB91316	USB	176	3.0	3.6	40	Yes	MASK	512	32	-	-	5	5	-	1	10	-	-	-	-
MB91319	MB91F318R	USB	176	3.0	3.6	40	Yes	Flash	1024	48	-	-	5	5	-	1	10	-	-	-	-
MB91319	MB91F318S	USB	176	3.0	3.6	40	Yes	Flash	1024	48	-	-	5	5	-	1	10	-	-	-	-
MB91345	MB91F345B	Standard	100	3.0	3.6	50	-	Flash	512	32	-	-	5	24	Yes	2	8	-	-	-	-
MB91345	MB91F346B	Standard	100	3.0	3.6	50	-	Flash	1024	32	-	-	5	24	Yes	2	8	-	-	-	-
MB91350A	MB91351A	Standard	120	3.0	3.6	50	Yes	MASK	384	24	-	-	5	9	Yes	1	8	-	-	2	-
MB91350A	MB91352A	Standard	120	3.0	3.6	50	Yes	MASK	384	16	-	-	5	9	Yes	1	8	-	-	2	-
MB91350A	MB91353A	Standard	120	3.0	3.6	50	Yes	MASK	512	24	-	-	5	9	Yes	1	8	-	-	2	-
MB91350A	MB91354A	Standard	176	3.0	3.6	50	Yes	MASK	384	16	-	-	5	17	Yes	1	12	-	-	3	-
MB91350A	MB91355A	Standard	176	3.0	3.6	50	Yes	MASK	512	24	-	-	5	17	Yes	1	12	-	-	3	-
MB91350A	MB91F353A	Standard	120	3.0	3.6	50	Yes	Flash	512	24	-	-	5	9	Yes	1	8	-	-	2	-
MB91350A	MB91F355A	Standard	176	3.0	3.6	50	Yes	Flash	512	24	-	-	5	17	Yes	1	12	-	-	3	-
MB91350A	MB91F356B	Standard	176	3.0	3.6	50	Yes	Flash	256	24	-	-	5	17	Yes	1	12	-	-	3	-
MB91360	MB91366GA	CAN	120	4.25	5.25	64	Yes	MASK	512	36	-	-	5	8	-	1	8	-	-	-	-
MB91360	MB91F362GB	CAN	208	4.25	5.25	64	-	Flash	512	20	-	-	5	8	Yes	1	16	-	-	-	2
MB91360	MB91F364G	CAN	120	4.25	5.25	64	Yes	Flash	256	16	-	-	5	8	-	1	12	-	-	-	2
MB91360	MB91F365GB	CAN	120	4.25	5.25	64	-	Flash	512	36	-	-	5	8	-	1	8	-	-	-	2
MB91360	MB91F366GB	CAN	120	4.25	5.25	64	Yes	Flash	512	36	-	-	5	8	-	1	8	-	-	-	-
MB91360	MB91F367GB	CAN	120	4.25	5.25	64	-	Flash	512	36	-	-	5	8	-	1	8	-	-	-	-
MB91360	MB91F368GB	CAN	120	4.25	5.25	64	Yes	Flash	512	36	-	-	5	8	-	1	8	-	-	-	-
MB91360	MB91F369GA	CAN	160	4.25	5.25	64	-	Flash	512	36	-	-	5	8	Yes	1	10	-	-	-	-

*: Under planning

Microcontrollers (32-bit Proprietary FR Family)

FR Family
product list

Timer										Serial										LCD control er[seg. x com.]	Inver ter	Functions	Evaluation device	Part number			
PWM timer [ch]	Reload timer	Freerun timer	Output compare [ch]	Input capture [ch.]	PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer	Mult	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	UART [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host [ch]	USB-Function [ch]	USB-Host/USB-Function [ch]								
3	4	8	8	16	-	-	2	-	-	3	-	-	7	-	-	1	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Clock supervisor	MB91V280	MB91F277S	**	
3	4	8	8	16	-	-	2	-	-	3	-	-	7	-	-	1	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Clock supervisor	MB91V280	MB91F278	**	
3	4	8	8	16	-	-	2	-	-	3	-	-	7	-	-	1	-	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Clock supervisor	MB91V280	MB91F278S	**	
3	1	-	4	4	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	SDRAM I/F	MB91V301A	MB91302A		
3	1	-	4	4	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	RTOS	MB91V301A	MB91302A-010		
3	1	-	4	4	-	-	-	-	-	2	3	-	-	-	-	-	-	-	-	-	-	-	ProgramLoader	MB91V301A	MB91302A-020		
3	1	-	4	4	-	1	-	-	-	4	5	-	-	-	-	-	-	1	-	-	-	-	Dual power supply, SDRAM I/F	MB91305	MB91305		
3	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-	Dual power supply	MB91V307R	MB91306R		
3	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-	-	MB91V307R	MB91307B		
3	-	-	-	-	-	-	-	-	-	1	3	-	-	-	-	-	-	-	-	-	-	-	Dual power supply	MB91V307R	MB91307R		
3	-	-	-	4	-	1	-	-	4	4	5	-	-	-	-	-	1	1	-	-	-	-	Dual power supply, FONT ROM 168KB, OSDC, Multi-function Timer (Interval timer/lvent count/Chapchar selectable)	MB91FV310A	MB91F312A		
6	-	-	-	4	-	1	-	-	4	-	-	-	-	-	11	-	-	-	-	-	-	-	Dual power supply, HDMI-CEC/ Remote control reception x 2, Multi Function Serial (UART/ SIO/I2C selectable), Multi-function Timer (Interval timer/ lvent count/Chapchar selectable)	MB91F313A	MB91F313A		
6	-	-	-	4	-	1	-	-	4	-	-	-	-	-	11	-	-	-	-	-	-	-	Dual power supply, CCD x 1, OSDC, Multi-function Serial(UART/SIO/I2C selectable), Multi-function Timer (Interval timer/lvent count/ Chapchar selectable)	MB91F314A	MB91F314A		
3	-	-	-	4	-	1	-	-	4	4	5	-	-	-	-	-	-	1	-	-	-	-	Dual power supply, FONT ROM 384KB, OSDC, Multi-function Timer (Interval timer/lvent count/Chapchar selectable), CCD x 2	MB91FV319R	MB91316A		
3	-	-	-	4	-	1	-	-	4	4	5	-	-	-	-	-	-	1	-	-	-	-	Dual power supply, FONT ROM 384KB, OSDC, Multi-function Timer (Interval timer/lvent count/Chapchar selectable)	MB91FV319R	MB91316		
3	-	-	-	4	-	1	-	-	4	4	5	-	-	-	-	-	-	1	-	-	-	-	Dual power supply, FONT ROM 384KB, OSDC, Multi-function Timer (Interval timer/lvent count/Chapchar selectable), CCD x 2	MB91FV319R	MB91F318R		
3	-	-	-	4	-	1	-	-	4	4	5	-	-	-	-	-	-	1	-	-	-	-	Dual power supply, FONT ROM 384KB, OSDC, Multi-function Timer (Interval timer/lvent count/Chapchar selectable)	MB91FV319R	MB91F318S		
3	2	8	8	16	-	1	2	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	Multi-function Serial (UART/ SIO/I2C selectable), MIN/MAX/ ABS arithmetic function	MB91F345B	MB91F345B		
3	2	8	8	16	-	1	2	-	-	-	-	-	-	-	11	-	-	-	-	-	-	-	Multi-function Serial (UART/ SIO/I2C selectable), MIN/MAX/ ABS arithmetic function	MB91F346B	MB91F346B		
4	1	2	4	3	-	-	1	-	-	1	4	2	-	-	-	-	-	-	-	-	-	-	-	MB91V350A	MB91351A		
4	1	2	4	3	-	-	1	-	-	1	4	2	-	-	-	-	-	-	-	-	-	-	-	MB91V350A	MB91352A		
4	1	2	4	3	-	-	1	-	-	1	4	2	-	-	-	-	-	-	-	-	-	-	-	MB91V350A	MB91353A		
4	1	8	4	6	-	-	2	-	-	1	5	3	-	-	-	-	-	-	-	-	-	-	-	MB91V350A	MB91354A		
4	1	8	4	6	-	-	2	-	-	1	5	3	-	-	-	-	-	-	-	-	-	-	-	MB91V350A	MB91355A		
4	1	2	4	3	-	-	1	-	-	1	4	2	-	-	-	-	-	-	-	-	-	-	-	MB91V350A	MB91F353A		
4	1	8	4	6	-	-	2	-	-	1	5	3	-	-	-	-	-	-	-	-	-	-	-	MB91V350A	MB91F355A		
4	1	8	4	6	-	-	2	-	-	1	5	3	-	-	-	-	-	-	-	-	-	-	-	MB91V350A	MB91F356B		
6	2	2	4	16	-	-	-	-	-	1	-	2	-	2	-	2	-	-	-	-	-	-	-	Sound generator	MB91FV360GA	MB91366GA	
6	2	4	4	16	-	-	-	-	-	1	-	2	-	3	-	3	-	-	-	-	-	-	-	SMC, Sound generator	MB91FV360GA	MB91F362GB	
3	2	4	4	8	-	-	-	-	-	1	-	1	2	1	-	1	-	-	-	-	-	-	-	MB91FV360GA	MB91F364G		
6	2	2	4	16	-	-	-	-	-	1	-	2	-	2	-	2	-	-	-	-	-	-	-	Sound generator	MB91FV360GA	MB91F365GB	
6	2	2	4	16	-	-	-	-	-	1	-	2	-	2	-	2	-	-	-	-	-	-	-	Sound generator	MB91FV360GA	MB91F366GB	
3	2	2	4	8	-	-	-	-	-	1	-	1	-	2	-	2	-	-	-	-	-	-	-	MB91FV360GA	MB91F367GB		
3	2	2	4	8	-	-	-	-	-	1	-	1	-	2	-	2	-	-	-	-	-	-	-	MB91FV360GA	MB91F368GB		
6	-	-	-	8	-	-	-	-	-	1	-	2	-	1	-	2	-	-	-	-	-	-	-	Sound generator	MB91FV360GA	MB91F369GA	

(Continued)

Microcontrollers (32-bit Proprietary FR Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	Instraction-Cash [ch]	Data-Cash [ch]	DMAC [ch]	Ext. interrupts [ch.]	Ext. bus	10bit A/D converter		12bit A/D converter		8bit D/Aconverter [ch]	10bit D/Aconverter [ch]
				Min	Max											[unit]	[ch]	[unit]	[ch]		
MB91360	MB91F376G	CAN	120	4.25	5.25	64	Yes	Flash	768	36	-	-	5	8	-	1	8	-	-	-	-
MB91460	MB91461	CAN	176	3.0	3.6	80	-	No ROM/ External ROM	-	64	4	-	5	16	Yes	1	13	-	-	-	-
MB91460	MB91F463NA	CAN	64	3.0	3.6	100	Yes	Flash	288	10	-	-	5	10	-	1	8	-	-	-	-
MB91460	MB91F464AB	CAN	100	3.0	5.5	80	Yes	Flash	416	16	-	-	5	10	-	1	21	-	-	-	-
MB91460	MB91F465BB	CAN	144	3.0	5.5	80	Yes	Flash	544	40	8	-	5	16	Yes	1	16	-	-	-	-
MB91460	MB91F465KB	CAN	120	3.0	5.5	80	Yes	Flash	544	16	4	-	5	10	-	1	26	-	-	-	-
MB91460	MB91F465XA	CAN	100	3.0	5.5	100	Yes	Flash	544	32	-	-	5	11	-	1	17	-	-	-	-
MB91460	MB91F467BA	CAN	144	3.0	5.5	80	Yes	Flash	1088	40	8	-	5	16	Yes	1	16	-	-	-	-
MB91460	MB91F465CA	CAN	144	3.0	5.5	96	Yes	Flash	544	32	8	-	5	15	-	1	30	-	-	-	-
MB91460	MB91F467CA	CAN	144	3.0	5.5	96	Yes	Flash	1088	64	8	-	5	15	-	1	30	-	-	-	-
MB91460	MB91F465DA	CAN	208	3.0	5.5	100	Yes	Flash	544	48	8	-	5	14	Yes	1	24	-	-	-	-
MB91460	MB91F467DB	CAN	208	3.0	5.5	96	Yes	Flash	1088	64	8	-	5	14	Yes	1	24	-	-	-	-
MB91460	MB91F467MA	CAN	216	3.0	5.5	80	Yes	Flash	1084	64	8	-	5	16	Yes	1	12	-	-	-	-
MB91460	MB91F465PA	CAN	176	3.0	5.5	100	Yes	Flash	544	40	8	-	5	16	Yes	1	32	-	-	-	-
MB91460	MB91F467R	CAN	176	3.0	3.6	80	Yes	Flash	1088	64	8	-	5	16	Yes	1	16	-	-	-	-
MB91460	MB91F467SA	CAN	176	3.0	5.5	100	Yes	Flash	1088	64	8	-	5	16	Yes	1	16	-	-	-	-
MB91460	MB91F467TA	CAN	144	3.0	5.5	100	Yes	Flash	1088	64	8	-	5	12	Yes	1	16	-	-	-	-
MB91460	MB91F469GB	CAN	320	3.0	5.5	100	Yes	Flash	2112	96	8	-	5	16	Yes	1	32	-	-	-	-
MB91470	MB91F475	Inverter control	144	4.0	5.5	80	-	Flash	256	16	-	-	5	10	Yes	1	12	2	4+4	-	-
MB91470	MB91F478	Inverter control	144	4.0	5.5	80	-	Flash	384	24	-	-	5	10	Yes	1	12	2	4+4	-	-
MB91470	MB91F479	Inverter control	144	4.0	5.5	80	-	Flash	512	32	-	-	5	10	Yes	1	12	2	4+4	-	-
MB91480	MB91482	Inverter control	100	4.0	5.5	80	-	MASK	256	16	-	-	5	10	-	3	4+4+10	-	-	-	-
MB91480	MB91F482	Inverter control	100	4.0	5.5	80	-	Flash	256	16	-	-	5	10	-	3	4+4+10	-	-	-	-
MB91480	MB91F487	Inverter control	100	4.0	5.5	80	-	Flash	512	32	-	-	5	10	-	3	4+4+10	-	-	-	-
MB91605A	MB91605A	Standard	176	3.0	3.6	80	-	No ROM/ External ROM	-	128	8	8	4	24	Yes	1	12	-	-	-	-
MB91635	MB91F637	Standard	144	2.7	3.6	60	Yes	Flash	512	48	-	-	8	32	Yes	2	31	-	-	3	-
MB91635	MB91F639	Standard	144	2.7	3.6	60	Yes	Flash	1024	64	-	-	8	32	Yes	2	31	-	-	3	-

Microcontrollers (32-bit Proprietary FR Family)

FR Family
product list

Timer													Serial							LCD control er[seg. x com.]	Inver ter	Functions	Evaluation device	Part number
PWM timer [ch]	Reload timer	Free-run timer	Output compare [ch]	Input capture [ch.]	PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer	Mult	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	UART [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host [ch]	USB-Function [ch]	USB-Host/USB-Function [ch]					
6	2	2	4	16	-	-	-	-	-	1	-	2	-	2	-	2	-	-	-	-	-	Sound generator	MB91FV360GA	MB91F376G
5	4	4	4	16	-	-	-	-	-	3	-	-	7	-	-	2	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V460	MB91461
5	4	4	4	16	-	-	2	-	-	2	-	-	4	-	-	2	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V460	MB91F463NA
8	8	6	8	20	-	-	-	-	-	1	-	-	5	-	-	1	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V460	MB91F464AB
8	8	8	8	32	-	-	2	-	-	2	-	-	7	-	-	3	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V460	MB91F465BB
8	8	8	8	24	-	-	-	-	-	1	-	-	5	-	-	1	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V460	MB91F465KB
8	8	6	8	24	-	-	-	-	-	1	-	-	3	-	-	2	-	-	-	-	-	CAN: 32Msg-buffer, LIN, FlexRay	MB91V460	MB91F465XA
8	8	8	8	32	-	-	2	-	-	2	-	-	7	-	-	6	-	-	-	-	-	CAN: 32Msg-buffer, LIN	MB91V460	MB91F467BA
8	8	4	8	24	-	-	3	-	-	3	-	-	5	-	-	3	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Sound generator, SMC: 6ch	MB91V460	MB91F465CA
8	8	4	8	24	-	-	3	-	-	3	-	-	5	-	-	3	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Sound generator, SMC: 6ch	MB91V460	MB91F467CA
8	8	4	8	24	-	-	2	-	-	3	-	-	5	-	-	3	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Sound generator, SMC: 6ch	MB91V460	MB91F465DA
8	8	4	8	24	-	-	2	-	-	3	-	-	5	-	-	3	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Sound generator, SMC: 6ch	MB91V460	MB91F467DB
5	4	4	4	24	-	-	-	-	-	8	-	-	9	-	-	2	-	-	-	-	-	CAN: 32Msg-buffer+64Msg-buffer, LIN, MediaLB: 1ch, I2S: 10ch	MB91V460	MB91F467MA
16	8	8	8	32	-	-	4	-	-	4	-	-	12	-	-	3	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Sound generator	MB91V460	MB91F465PA
5	4	4	4	16	-	-	-	-	-	3	-	-	7	-	-	2	-	-	-	-	-	CAN: 32/64Msg-buffer, LIN	MB91V460	MB91F467R
8	8	4	8	16	-	-	4	-	-	3	-	-	6	-	-	2	-	-	-	-	-	APIX, CAN: 32Msg-buffer, LIN	MB91V460	MB91F467SA
8	8	4	8	10	-	-	2	-	-	2	-	-	7	-	-	2	-	-	-	-	-	CAN: 32Msg-buffer, LIN, Sound generator	MB91V460	MB91F467TA
8	8	8	8	32	-	-	4	-	-	4	-	-	8	-	-	6	-	-	-	-	-	CAN: 128Msg-buffer, LIN	MB91V460	MB91F469GB
2	-	-	-	8	-	-	1	4	1	-	-	-	-	-	6	-	-	-	-	-	Yes	Base Timer (Reload Timer/PPG/PWM/PWC selectable), Multi-function Serial (UART/SIO/I2C selectable), Waveform generator, Multiply and Accumulation	MB91V470	MB91F475
2	-	-	-	8	-	-	1	4	1	-	-	-	-	-	6	-	-	-	-	-	Yes	Base Timer (Reload Timer/PPG/PWM/PWC selectable), Multi-function Serial (UART/SIO/I2C selectable), Waveform generator, Multiply and Accumulation	MB91V470	MB91F478
2	-	-	-	8	-	-	1	4	1	-	-	-	-	-	6	-	-	-	-	-	Yes	Base Timer (Reload Timer/PPG/PWM/PWC selectable), Multi-function Serial (UART/SIO/I2C selectable), Waveform generator, Multiply and Accumulation	MB91V470	MB91F479
2	-	-	-	16	-	-	-	4	2	-	-	-	-	-	3	-	-	-	-	-	Yes	Base Timer (Reload Timer/PPG/PWM/PWC selectable), Multi-function Serial (UART/SIO/I2C selectable), Waveform generator x 2, Multiply and Accumulation	MB91V470	MB91482
2	-	-	-	16	-	-	-	4	2	-	-	-	-	-	3	-	-	-	-	-	Yes	Base Timer (Reload Timer/PPG/PWM/PWC selectable), Multi-function Serial (UART/SIO/I2C selectable), Waveform generator x 2, Multiply and Accumulation	MB91V470	MB91F482
2	-	-	-	16	-	-	-	4	2	-	-	-	-	-	3	-	-	-	-	-	Yes	Base Timer (Reload Timer/PPG/PWM/PWC selectable), Multi-function Serial (UART/SIO/I2C selectable), Waveform generator x 2, Multiply and Accumulation	MB91V470	MB91F487
3	-	-	-	-	-	-	-	12	-	-	-	-	-	-	12	-	-	-	-	-	-	Dual power supply, SDRAM I/F, HDMI-CEC/Remote control reception x 1, Multi-function Serial (UART/SIO/I2C selectable), Base Timer (Reload Timer/PPG/PWM/PWC selectable)	MB91605A	MB91605A
3	2	8	8	-	-	-	4	16	-	-	-	-	-	-	12	-	-	-	-	-	-	Multi-function Serial (UART/SIO/I2C selectable), Base Timer (Reload Timer/PPG/PWM/PWC selectable)	MB91V650	MB91F637
3	2	8	8	-	-	-	4	16	-	-	-	-	-	-	12	-	-	-	-	-	-	Multi-function Serial (UART/SIO/I2C selectable), Base Timer (Reload Timer/PPG/PWM/PWC selectable)	MB91V650	MB91F639

(Continued)

Microcontrollers (32-bit Proprietary FR Family)

Series	Part number	Aprication	Package [pin]	Operating voltage : V _{CC} [V]		Internal clock frequency [Max., MHz]	Sub-clock	Memory type	ROM [KB]	RAM [KB]	Instraction-Cash [ch]	Data-Cash [ch]	DMAC [ch]	Ext. interrups [ch.]	Ext. bus	10bit A/D converter		12bit A/D converter		8bit D/Aconverter [ch]	10bit D/Aconverter [ch]
				Min	Max											[unit]	[ch]	[unit]	[ch]		
MB91640	MB91F644	Standard	176	2.7	3.6	60	Yes	Flash	1024	64	-	-	8	32	Yes	2	32	-	-	3	-
MB91645	MB91F647	Standard	176	2.7	3.6	60	Yes	Flash	512	48	-	-	8	32	Yes	2	32	-	-	3	-
MB91610	MB91613	* USB	120	3.0	3.6	33	Yes	MASK	512	32	-	-	8	16	-	1	8	-	-	-	-
MB91610	MB91F610	USB	120	3.0	3.6	33	Yes	Flash	512	32	-	-	8	16	-	1	8	-	-	-	-
MB91660	MB91661	Standard	120	3.0	3.6	33	Yes	MASK	384	32	-	-	8	32	Yes	1	24	-	-	3	-
MB91660	MB91664	Standard	120	3.0	3.6	33	Yes	MASK	128	16	-	-	8	32	Yes	1	24	-	-	3	-
MB91660	MB91F662	Standard	120	3.0	3.6	33	Yes	Flash	512	48	-	-	8	32	Yes	1	24	-	-	3	-

*: Under development

Microcontrollers (32-bit Proprietary FR Family)

Timer										Serial										LCD control ler [seg. x com.]	Inver ter	Functions	Evaluation device	Part number				
PWM timer [ch]	Reload timer	Freerun timer	Output compare [ch]	Input capture [ch.]	PPG timer [ch.]	PWC timer [ch.]	Up/Down counter [ch.]	Base timer	Mult	I ² C [ch]	UART/SIO [ch]	SIO [ch]	LIN/UART/SIO [ch]	UART [ch]	Multi Function Serial [ch]	CAN [ch]	USB-Host [ch]	USB-Function [ch]	USB-Host/USB-Function [ch]									
3	2	8	8	-	-	-	4	16	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	Multi-function Serial (UART/SIO/I2C selectable), Base Timer (Reload Timer/PPG/PWM/PWC selectable)	MB91V650	MB91F644	
3	2	8	8	-	-	-	4	16	-	-	-	-	-	-	12	-	-	-	-	-	-	-	-	-	Dual power supply, Multi-function Serial (UART/SIO/I2C selectable), Base Timer (Reload Timer/PPG/PWM/PWC selectable)	MB91V650	MB91F647	
3	1	4	4	-	-	-	-	8	-	-	-	-	-	-	8	-	-	-	1	-	-	-	-	-	FONT ROM: 7168 characters, OSDC, HDMI-CEC/Remote control reception, Multi-function Serial (UART/SIO/I2C selectable), Base Timer (Reload Timer/PPG/PWM/PWC selectable), Wild register	MB91F610	MB91613	*
3	1	4	4	-	-	-	-	8	-	-	-	-	-	-	8	-	-	-	1	-	-	-	-	-	FONT Flash: 16384 characters, OSDC, HDMI-CEC/Remote control reception, Multi-function Serial (UART/SIO/I2C selectable), Base Timer (Reload Timer/PPG/PWM/PWC selectable), Wild register	MB91F610	MB91F610	
3	2	8	8	-	-	-	4	16	-	-	-	-	-	-	12	-	-	-	1	-	-	-	-	-	USB2.0, Slave I/F, Multi-function Serial (UART/SIO/I2C selectable), Base timer (Reload timer/PPG/PWM/PWC selectable)	MB91V650	MB91661	
3	2	8	8	-	-	-	4	16	-	-	-	-	-	-	12	-	-	-	1	-	-	-	-	-	USB2.0, Slave I/F, Multi-function Serial (UART/SIO/I2C selectable), Base timer (Reload timer/PPG/PWM/PWC selectable)	MB91V650	MB91664	
3	2	8	8	-	-	-	4	16	-	-	-	-	-	-	12	-	-	-	1	-	-	-	-	-	USB2.0, Slave I/F, Multi-function Serial (UART/SIO/I2C selectable), Base timer (Reload timer/PPG/PWM/PWC selectable)	MB91V650	MB91F662	

Support Hardware for F²MC-8L Family

Support Hardware for F²MC-8L Family

Development Tools				
Target Microcontroller			Fujitsu Microelectronics ICE	
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series
MB89051	MB89051 MB89F051	LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M09	Cable : MB2144-220 + Header : MB2144-227-01 *4	• Main unit : MB2141B • Pod : MB2144-508 • Emulator debugger software : SOFTUNE • RS-232C cable or LAN cable
MB89120	MB89121	QFP-48P (0.8 mm, 10 × 10 mm) FPT-48P-M13	MB2144-203	
MB89120A	MB89123A	QFP-48P (0.8 mm, 10 × 10 mm) FPT-48P-M13	MB2144-203	
	MB89125A	QFP-48P (0.8 mm, 10 × 10 mm) FPT-48P-M13		
MB89130	MB89131 MB89P131	QFP-48P (0.8 mm, 10 × 10 mm) FPT-48P-M13	MB2144-203	
MB89130A	MB89133A MB89P133A	QFP-48P (0.8 mm, 10 × 10 mm) FPT-48P-M13	MB2144-203	
		SDIP-48P DIP-48P-M01		
	MB89135A MB89P135A	QFP-48P (0.8 mm, 10 × 10 mm) FPT-48P-M13		
MB89140/A	MB89143A MB89144A	SH-DIP-64P DIP-64P-M01	MB2144-201	
	MB89145 MB89146 MB89P147	QFP-64P (1.0 mm, 14 × 20 mm) FPT-64P-M06	MB2144-202	
	MB89W147	SH-DIP-64C DIP-64C-A06	MB2144-201	
	MB89150	MB89151 MB89152 MB89153 MB89154 MB89155 MB89P155 -101 to 105	LQFP-80P (0.5 mm, 12 × 12 mm) FPT-80P-M05	
LQFP-80P (0.65 mm, 14 × 14 mm) FPT-80P-M11				
QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06				
MB89150A	MB89151A MB89152A MB89153A MB89154A MB89155A MB89P155 -201 to 205	LQFP-80P (0.5 mm, 12 × 12 mm) FPT-80P-M05	MB2144-202	
		LQFP-80P (0.65 mm, 14 × 14 mm) FPT-80P-M11		
		QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06		
MB89160	MB89161 MB89163 MB89165 MB89P165 -101 to 105	LQFP-80P (0.5 mm, 12 × 12 mm) FPT-80P-M05	MB2144-202	
		LQFP-80P (0.65 mm, 14 × 14 mm) FPT-80P-M11		
		QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06		
		QFP-80C (0.8 mm, 14 × 20 mm) FPT-80C-A02		
MB89160L	MB89163L MB89165L	LQFP-80P (0.5 mm, 12 × 12 mm) FPT-80P-M05	MB2144-202	
		LQFP-80P (0.65 mm, 14 × 14 mm) FPT-80P-M11		
		QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06		
MB89160A	MB89161A MB89163A MB89165A MB89P165 -201 to 203	LQFP-80P (0.5 mm, 12 × 12 mm) FPT-80P-M05	MB2144-202	
		LQFP-80P (0.65 mm, 14 × 14 mm) FPT-80P-M11		
		QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06		
MB89180	MB89181 MB89182 MB89183 MB89185 MB89P185 -101 to 108	LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M09	MB2144-202	
		QFP-64P (1.0 mm, 14 × 20 mm) FPT-64P-M06		
		SQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M03		
MB89190	MB89191 MB89193 MB89195 MB89P195-101	SOP-28P (1.27 mm, 17.75 × 8.6 mm) FPT-28P-M17	MB2144-203	
		SH-DIP-28P DIP-28P-M03		
		DIP-28P		
		DIP-28P-M05		

Support Hardware for F²MC-8L Family

Development Tools		Equipment for Program to OTP/EPROM			Target Microcontroller
Evaluation Device (Lead pitch, body size)	IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/ EPROM)	Product name
		Product name			
MB89F051 LQFP-64P (mounted on probe header)	Unnecessary	MB89F051 FPT-64P-M09	Recommended EPROM Programmer *9 Yokogawa Digital Computer *3 Serial programmer	FLASH-64QF2-32DP-8LF3	MB89051 MB89F051
MB89PV130A MQP-64C-P01 (0.8 mm, 15 × 15 mm) *5	Unnecessary	MB89P131 FPT-48P-M13	General-purpose EPROM Programmer *6 (capable of programming to MBM27C256A)	ROM-48QF2-28DP-8L	MB89121
	Unnecessary	MB89P133A FPT-48P-M13		ROM-48QF2-28DP-8L	MB89123A
	Unnecessary	MB89P135A FPT-48P-M13		ROM-48QF2-28DP-8L	MB89125A
	Unnecessary	MB89P131 FPT-48P-M13		ROM-48QF2-28DP-8L	MB89131 MB89P131
	Unnecessary	MB89P133A FPT-48P-M13		ROM-48QF2-28DP-8L	MB89133A MB89P133A
	48QF-48SD-8L	MB89P133A DIP-48P-M01		ROM-48SD-28DP-8L2	MB89135A MB89P135A
	Unnecessary	MB89P135A FPT-48P-M13		ROM-48QF2-28DP-8L	MB89143A MB89144A
MB89PV140 MDP-64C-P02	Unnecessary	MB89P147 DIP-64P-M01		ROM-64SD-28DP-8L4	MB89145 MB89146 MB89P147
MB89PV140 MQP-64C-P01 (1.0 mm, 16 × 22 mm) *5	Unnecessary	MB89P147 FPT-64P-M06		ROM-64QF-28DP-8L4	MB89W147
MB89PV140 MDP-64C-P02	Unnecessary	MB89W147 DIP-64C-A06		ROM-64SD-28DP-8L4	MB89151 MB89152
MB89PV150-101 to 105 MQP-80C-P01 (0.8 mm, 16 × 22 mm) *5	80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN	MB89P155-101 to 105 FPT-80P-M05		ROM-80SQF-28DP-8L	MB89153 MB89154 MB89155
	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P155-101 to 105 FPT-80P-M11		ROM-80QF2-28DP-8L2	MB89P155 -101 to 105
	Unnecessary	MB89P155-101 to 105 FPT-80P-M06		ROM-80QF-28DP-8L3	MB89151A MB89152A MB89153A MB89154A MB89155A
MB89PV150-101 to 105 MQP-80C-P01 (0.8 mm, 16 × 22 mm) *5	80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN	MB89P155-201 to 205 FPT-80P-M05		ROM-80QF-28DP-8L3	MB89155 -201 to 205
	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P155-201 to 205 FPT-80P-M11		ROM-80SQF-28DP-8L	MB89161 MB89163 MB89165
	Unnecessary	MB89P155-201 to 205 FPT-80P-M06		ROM-80QF2-28DP-8L2	MB89165 -101 to 105
MB89PV160-101 to 105 MQP-80C-P01 (0.8 mm, 16 × 22 mm) *5	80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN	MB89P165-101 to 105 FPT-80P-M05		ROM-80QF-28DP-8L3	MB89W165
	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P165-101 to 105 FPT-80P-M11		ROM-80SQF-28DP-8L	MB89163L MB89165L
	Unnecessary	MB89P165-101 to 105 FPT-80P-M06		ROM-80QF2-28DP-8L2	MB89161A MB89163A MB89165A MB89P165 -201 to 203
	Unnecessary	MB89W165 FPT-80C-A02		ROM-80QF-28DP-8L3	
MB89PV160-101 to 105 MQP-80C-P01 (0.8 mm, 16 × 22 mm) *5	80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN	MB89P165-101 to 105 FPT-80P-M05		ROM-80QF-28DP-8L3	
	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P165-101 to 105 FPT-80P-M11		ROM-80SQF-28DP-8L	
	Unnecessary	MB89P165-101 to 105 FPT-80P-M06		ROM-80QF2-28DP-8L2	
MB89PV160-101 to 105 MQP-80C-P01 (0.8 mm, 16 × 22 mm) *5	80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN	MB89P165-201 to 203 FPT-80P-M05		ROM-80QF-28DP-8L3	
	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P165-201 to 203 FPT-80P-M11		ROM-80SQF-28DP-8L	
	Unnecessary	MB89P165-201 to 203 FPT-80P-M06		ROM-80QF2-28DP-8L2	
MB89PV180-101 to 107 MQP-64C-P01 (1.0 mm, 16 × 22 mm) *5	Not supported	MB89P185-101 to 107 FPT-64P-M09	General-purpose EPROM Programmer *6 (capable of programming to MBM27C256A)	ROM-64QF2-28DP-8L2	MB89181 MB89182
	Unnecessary	MB89P185-101 to 107 FPT-64P-M06		ROM-64QF-28DP-8L3	MB89183 MB89185
	Not supported	Not OTP ROM type		Not OTP ROM type	MB89P185 -101 to 108
MB89PV190 MQP-48C-P01 (0.8 mm, 15 × 15 mm) *5	48QF-28SOP-8L	MB89P195-101 FPT-28P-M17	General-purpose EPROM Programmer *7	ROM-28SOP-28DP-8L	MB89191 MB89193 MB89195
	48QF-28SD-8L	Not OTP ROM type		Not OTP ROM type	MB89P195-101
	48QF-28DP-8L	MB89P195-101 DIP-28P-M05		ROM-28DP-28DP-8L	

(Continued)

Support Hardware for F²MC-8L Family

Development Tools				
Target Microcontroller			Fujitsu Microelectronics ICE	
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series
MB89190A	MB89191A	SOP-28P (1.27 mm, 17.75 × 8.6 mm)	MB2144-203	• Main unit : MB2141B • Pod : MB2144-508 • Emulator debugger software : SOFTUNE • RS-232C cable or LAN cable
	MB89191H	FPT-28P-M17		
	MB89193A	SH-DIP-28P		
	MB89193H	DIP-28P-M03		
	MB89195A	DIP-28P		
MB89P195A-201	DIP-28P-M05			
MB89202/R	MB89202	SH-DIP-32P (1.78 mm, 28 × 8.89 mm)	MB2144-201	
	MB89F202	DIP-32P-M06		
	MB89F202R			
	MB89202Y	SSOP-34P (0.65 mm, 11 × 6.1 mm)		
MB89F202Y	FPT-34P-M03			
MB89F202RY	QFP-32P (0.8 mm, 7 × 7 mm)			
MB89480	MB89485	LQFP-64P (0.65 mm, 12 × 12 mm)	MB2144-201	
	MB89485L	FPT-64P-M09		
	MB89P485	SH-DIP-64P		
MB89P485L	DIP-64P-M01			
MB89490	MB89497	QFP-100P (0.65 mm, 14 × 20 mm)	MB2144-202	
	MB89498	FPT-100P-M06		
	MB89F499	LQFP-100P (0.5 mm, 14 × 14 mm)		
		FPT-100P-M05		
MB89530A	MB89535A MB89537A MB89537AC MB89538A MB89538AC MB89P538 MB89F538	SH-DIP-64P	MB2144-201	
		DIP-64P-M01		
		LQFP-64P (0.5 mm, 10 × 10 mm)		
		LQFP-64P (0.65 mm, 12 × 12 mm)	MB2144-202	
		FPT-64P-M09		
	QFP-64P (1.0 mm, 14 × 20 mm)			
	FPT-64P-M06			
MB89550A	MB89557A MB89558A MB89P558A -201 to 203	TQFP-100P (0.4 mm, 12 × 12 mm)	MB2144-203	
		FPT-100P-M18		
		LQFP-100P (0.5 mm, 14 × 14 mm)		
	FPT-100P-M05			
MB89560	MB89567A MB89567AC MB89P568	LQFP-80P (0.5 mm, 12 × 12 mm)	MB2144-202	
		FPT-80P-M05		
		LQFP-80P (0.65 mm, 14 × 14 mm)		
		FPT-80P-M11		
	QFP-80P (0.8 mm, 14 × 20 mm)			
	FPT-80P-M06			

Support Hardware for F²MC-8L Family

Support Hardware for
F²MC-8L Family

Development Tools		Equipment for Program to OTP/EPROM			Target Microcontroller
Evaluation Device (Lead pitch, body size)	IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/ EPROM)	Product name
		Product name			
MB89PV190A MQP-48C-P01 (0.8 mm, 15 × 15 mm) *5	48QF-28SOP-8L	MB89P195A-201 FPT-28P-M17	General-purpose EPROM Programmer *7	ROM-28SOP-28DP-8L	MB89191A/H MB89193A/H MB89195A MB89P195A-201
	48QF-28SD-8L	Not OTP ROM type		Not OTP ROM type	
	48QF-28DP-8L	MB89P195A-201 DIP-28P-M05		ROM-28DP-28DP-8L	
MB2144-230	Unnecessary	MB89F202 MB89F202R	Flash Support Group Parallel Programmer	TEF110-89F202-PSH	MB89202 MB89F202 MB89F202R
	Tokyo Eletech FEA-20P2	MB89F202Y MB89F202RY		TEF110-89F202-PFV	MB89202Y MB89F202Y MB89F202RY
	Not supported	MB89F202RY		Not supported	MB89F202RY
MB89PV480 MDP-64C-P02	64SD-64QF2-8L	MB89P485 MB89P485L FPT-64P-M09	Recommended EPROM Programmer *9	ROM2-64QF2-32DP-8LA3	MB89485 MB89P485 MB89485L MB89P485L
	Unnecessary	MB89P485 MB89P485L DIP-64P-M01		ROM2-64SD-32DP-8LA3	
MB89PV490 MQP-100C-P01 (0.65 mm, 16 × 22 mm)	Unnecessary	MB89F499 FPT-100P-M06	Recommended EPROM Programmer *9	FLASH-100QF-32DP-8LF2	MB89497 MB89498 MB89F499
	100QF-100SQF-8L		Yokogawa Digital Computer *3 Serial programmer	FLASH-100SQF-32DP-8LF	
MB89PV530 MDIP-64C-P02	Unnecessary	MB89P538 DIP-64P-M01	General-purpose EPROM Programmer (capable of programming to MBM27C1001) *6	ROM-64SD-32DP-8LA2	MB89535A MB89537A MB89537AC MB89538A MB89538AC MB89P538 MB89F538
		MB89F538 DIP-64P-M01	Recommended EPROM Programmer *9	FLASH-64SD-32DP-8LF	
	64SD-64SQF-8L	Not OTP and ROM type	—	Not OTP and ROM type	
	64SD-64QF2-8L	MB89P538 FPT-64P-M09	General-purpose EPROM Programmer (capable of programming to MBM27C1001) *6	ROM-64QF2-32DP-8LA	
		MB89F538 FPT-64P-M09	Recommended EPROM Programmer *9	FLASH-64QF2-32DP-8LF2	
MB89PV530 MQP-64C-P01 (1.0 mm, 16 × 22 mm) *5	Unnecessary	MB89P538 FPT-64P-M06	General-purpose EPROM Programmer (capable of programming to MBM27C1001) *6	ROM-64QF-32DP-8LA2	
		MB89F538 FPT-64P-M06	Recommended EPROM Programmer *9	FLASH-64QF-32DP-8LF	
			Yokogawa Digital Computer *3 Serial programmer		
MB89PV550A MQP-100C-P02 (0.5 mm, 15 × 15 mm) *5	100SQF-100TQF-8L	MB89P558A FPT-100P-M18	General-purpose EPROM Programmer *6 (capable of programming to MBM27C1001)	ROM-100TQF-32DP-8LA	MB89557A MB89558A MB89P558A
			Yokogawa Digital Computer *3 Serial programmer		
	Unnecessary	MB89P558A FPT-100P-M20	General-purpose EPROM Programmer *6 (capable of programming to MBM27C1001)	ROM-100SQF-32DP-8LA2	
			Yokogawa Digital Computer *3		
			Serial programmer		
MB89PV560 MQP-80C-P01 (0.8 mm, 16 × 22 mm) *5	80QF-80QF2-8L-UP 80QF-80SQF-8L-DWN	MB89P568 FPT-80P-M05	General-purpose EPROM Programmer *6 (capable of programming to MBM27C1001)	ROM-80SQF-32DP-8LA	MB89567A MB89567AC MB89P568
	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P568 FPT-80P-M11		ROM-80QF2-32DP-8LA2	
	Unnecessary	MB89P568 FPT-80P-M06		ROM-80QF-32DP-8LA2	

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Support Hardware for F²MC-8L Family

Development Tools				
Target Microcontroller			Fujitsu Microelectronics ICE	
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series
MB89580B	MB89583B MB89585B MB89P585B	LQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M03	Cable : MB2144-220 + Header : MB2144-217-01 *4	• Main unit : MB2141B • Pod : MB2144-508 • Emulator debugger software : SOFTUNE • RS-232C cable or LAN cable
	MB89589B MB89P589B	LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M09	Cable : MB2144-220 + Header : MB2144-224-01 *4	
MB89580BW	MB89583BW MB89585BW MB89P585BW	LQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M03	Cable : MB2144-220 + Header : MB2144-225-01 *10	
MB89630R	MB89635R MB89T635R MB89636R MB89637R MB89T637R	SH-DIP-64P DIP-64P-M01	MB2144-201	
		LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M09		
		QFP-64P (1.0 mm, 14 × 20 mm) FPT-64P-M06	MB2144-202	
	MB89W637	SH-DIP-64C DIP-64C-A06	MB2144-201	
MB89650AR	MB89653AR MB89655AR MB89656AR MB89657AR MB89P657A	QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2144-203	
		LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M05		
MB89660R	MB89663R MB89665R MB89P665	SH-DIP-64P DIP-64P-M01	Cable : MB2144-220 + Header : MB2144-216-01	
		QFP-64P (1.0 mm, 14 × 20 mm) FPT-64P-M06	Cable : MB2144-220 + Header : MB2144-215-01 for QFP-64 *4	
MB89670AR	MB89673AR MB89675AR MB89677AR MB89P677A	QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06	MB2144-202	
		LQFP-80P (0.65mm, 14 × 14 mm) FPT-80P-M11		
MB89680	MB89689 MB89P689	QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2144-202	
	MB89W689	QFP-100C (0.65 mm, 14 × 20 mm) FPT-100C-A02		
MB89800	MB89803 MB89805 MB89P808	QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2144-202	
		LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M05		
MB89810A	MB89816A MB89P817A	QFP-64P (1.0 mm, 14 × 20 mm) FPT-64P-M06	Cable : MB2144-220 + Header : MB2144-214-01A	
MB89820	MB89821 MB89823R MB89825 MB89P825	LQFP-80P (0.65 mm, 14 × 14 mm) FPT-80P-M11	MB2144-202	
MB89850R	MB89855R MB89P857	QFP-64P (1.0 mm, 14 × 20 mm) FPT-64P-M06	Cable : MB2144-220 + Header : MB2144-212-01A	
	MB89W857	QFP-64C FPT-64C-A02		
	MB89855R MB89P857	SH-DIP-64P DIP-64P-M01		
	MB89W857	SH-DIP-64C DIP-64C-A06		
MB89863	MB89863	QFP-48P (0.8 mm, 10 × 10 mm) FPT-48P-M04	Cable : MB2144-220 + Header : MB2144-212-01A	
MB89860	MB89865 MB89867 MB89P867	QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06	Cable : MB2144-220 + Header : MB2144-211-01A fir QFP-80 *4	
	MB89W867	QFP-80C (0.8 mm, 14 × 20 mm) FPT-80C-A02		

Support Hardware for F²MC-8L Family

Development Tools		Equipment for Program to OTP/EPROM			Target Microcontroller
Evaluation Device (Lead pitch, body size)	IC Package Conversion Adapter ^{*3} (Converting foot patterns of evaluation device)	Microcontroller Subject to Program	EPROM Programmer	IC Package Conversion Adapter ^{*3} (for Program to OTP/ EPROM)	Product name
		Product name			
MB89P585B LQFP64 (mounted to Probe Header)	Unnecessary	MB89P585B FPT-64P-M03	Recommended EPROM Programmer ^{*8} Yokogawa Digital Computer ^{*3} Serial programmer	ROM2-64LQF-32DP-8LA	MB89583B MB89P585B MB89585B
MB89P589B LQFP64 (mounted to Probe Header)		MB89P589B FPT-64P-M09	Recommended EPROM Programmer ^{*8}	ROM2-64QF2-32DP-8LA2	MB89589B MB89P589B
MB89P585BW LQFP64 (mounted to Probe Header)	Unnecessary	MB89P585BW FPT-64P-M03	Recommended EPROM Programmer ^{*8} Yokogawa Digital Computer ^{*3} Serial programmer	ROM2-64LQF-32DP-8LA	MB89583BW MB89585BW MB89P585BW
MB89PV630 MDP-64C-P02	Unnecessary	MB89W637 DIP-64P-M01	General-purpose EPROM Programmer ^{*6} (capable of programming to MBM27C256A)	ROM-64SD-28DP-8L	MB89635R MB89T635R MB89636R MB89637R MB89T637R
	64SD-64QF2-8L	MB89W637 FPT-64P-M09		ROM-64QF2-28DP-8L	
MB89PV630 MQP-64C-P01 (1.0 mm, 16 × 22 mm) ^{*5}	Unnecessary	—		—	
MB89PV630 MDP-64C-P02	Unnecessary	MB89W637 DIP-64C-A06		ROM-64SD-28DP-8L	MB89W637
MB89PV650A MQP-100C-P02 (0.5 mm, 15 × 15 mm) ^{*5}	100SQF-100QF-8L	MB89P657A FPT-100P-M06		ROM-100QF-28DP-8L2	MB89653AR MB89655AR MB89656AR MB89657AR MB89P657A
	Unnecessary	MB89P657A FPT-100P-M20		ROM-100SQF-28DP-8L	
MB89P665 SH-DIP-64P (mounted to Probe Header)	Unnecessary	MB89P665 DIP-64P-M01	General-purpose EPROM Programmer (capable of programming to MBM27C256A)	ROM-64SD-28DP-8L	MB89663R MB89665R MB89P665
MB89P665 QFP-64P (mounted to Probe Header)		MB89P665 FPT-64P-M06		ROM-64QF-28DP-8L	
MB89PV670A MQP-80C-P01 (0.8 mm, 16 × 22 mm) ^{*5}	Unnecessary	MB89P677A FPT-80P-M06		ROM-80QF-28DP-8L2	MB89673AR MB89675AR MB89677AR MB89P677A
	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P677A FPT-80P-M11		ROM-80QF2-28DP-8L	
MB89PV680 MQP-100C-P01 (0.65 mm, 16 × 22 mm) ^{*5}	Unnecessary	MB89P689 MB89W689 FPT-100P-M06	General-purpose EPROM Programmer ^{*6} (capable of programming to MBM27C1001)	ROM-100QF-32DP-8LA	MB89689 MB89P689
		MB89P689 MB89W689 FPT-100C-A02		ROM-100QF-32DP-8LA	MB89W689
MB89PV800 MQP-100C-P01 (0.65 mm, 16 × 22 mm)	Unnecessary	MB89P808 FPT-100P-M06	General-purpose EPROM Programmer (capable of programming to MBM27C1001)	ROM-100QF-32DP-8LA2	MB89803 MB89805 MB89P808
	Not supported	MB89P808 FPT-100P-M20		ROM-100SQF-32DP-8LA3	
MB89P817 QFP-64P (1.00mm, 14 × 20mm) (mounted to Probe Header)	Unnecessary	MB89P817A FPT-64P-M06	General-purpose EPROM Programmer (capable of programming to MBM27C256A)	ROM-64QF-28DP-8L	MB89816A MB89P817A
MB89PV820 MQP-80C-P01 (0.8 mm, 16 × 22 mm) ^{*5}	80QF-80QF2-8L-UP 80QF-80QF2-8L-DWN	MB89P825 FPT-80P-M11		ROM-80QF2-28DP-8L3	MB89821 MB89823R MB89825 MB89P825
MB89P857 SH-DIP-64P (mounted to Probe Header)	64SD-64QF-8L	MB89P857 FPT-64P-M06		ROM-64QF-28DP-8L	MB89855R MB89P857
		MB89W857 FPT-64C-A02		ROM-64QF-28DP-8L5	MB89W857
	Unnecessary	MB89P857 DIP-64P-M01 MB89W857 FPT-64C-A06		ROM-64SD-28DP-8L	MB89855R MB89P857 MB89W857
MB89P857 SH-DIP-64P (mounted to Probe Header)	64SD-48QF-8L	MB89P857 MB89W857 DIP-64P-M01		ROM-64SD-28DP-8L	MB89863
MB89P867 QFP-80P (14 × 20 mm) (mounted to Probe Header)	Unnecessary	MB89P867 FPT-80P-M06	General-purpose EPROM Programmer (capable of programming to MBM27C256A)	ROM-80QF-28DP-8L2	MB89865 MB89867 MB89P867
		MB89W867 FPT-80C-A02			MB89W867

(Continued)

Support Hardware for F²MC-8L Family

Development Tools				
Target Microcontroller			Fujitsu Microelectronics ICE	
Series name	Product name	Package (Lead pitch, body size)	Probe	Equipment common to series
MB89890	MB89898 MB89899 MB89P899	QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2144-202	• Main unit : MB2141B • Pod : MB2144-508 • Emulator debugger software : SOFTUNE • RS-232C cable or LAN cable
MB89920	MB89923 MB89925 MB89P928	QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06	MB2144-202	
MB89930A MB89930B	MB89935B MB89P935B	SSOP-30P (0.65 mm, 5.6 × 9.7 mm) FPT-30P-M02	MB2144-203	
MB89940	MB89943 MB89945 MB89P945	QFP-48P (0.8mm, 12 × 12mm) FPT-48P-M16	MB2144-203	
MB89980	MB89983 MB89P985	LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09	MB2144-202	
		LQFP-64P (0.5mm, 10 × 10mm) FPT-64P-M03		

*1 : Under development

*2 : The IC package conversion adapter is provided by Sunhayato Corp. Contact details

Sales Info: Advanced Interconnectics: URL: <http://advintcorp.com>

*3 : Contact details: Yokogawa Digital Computer Corporation TEL(81-42)333-6222 FAX(81-42)352-6107

*4 : For QFP-48 : TQ-PACK048SA and TQ-SOCKET048SAG (each provided)

For QFP-64 : TQ-PACK060RZ and TQ-SOCKET064RZG (each provided)

For LQFP-64 : TQ-PACK064SD and TQ-SOCKET064SD (each provided)

For QFP-80 : TQ-PACK080SA and TQ-SOCKET080RAZ (each provided)

It should be noted that there is a slight difference in footprint size between the Q pack and other mass-produced packages. therefore, caution is required in designing the footprint of the print board.

Sales Info:

• USA:OESS Co. San Jose Office TEL(408)437-1582

• Europe Germany: OESS GmbH TEL(06106)2857890

Tokyo Eletech Co, Ltd. TEL(81)3-3820-7141

Support Hardware for F²MC-8L Family

Development Tools		Equipment for Program to OTP/EPROM			Target Microcontroller
Evaluation Device (Lead pitch, body size)	IC Package Conversion Adapter *3 (Converting foot patterns of evaluation device)	Microcontroller Subject to Program	EPROM Programmer	IC Package Conversion Adapter *3 (for Program to OTP/ EPROM)	Product name
		Product name			
MB89PV890 MQP-100C-P01 (0.65 mm, 16 × 22 mm) *5	Unnecessary	MB89P899 FPT-100P-M06	General-purpose EPROM Programmer (capable of programming to MBM27C1001)	ROM-100QF-32DP-8LA	MB89898 MB89899 MB89P899
MB89PV920 MQP-80C-P01 (0.8 mm, 16 × 22 mm) *5	Unnecessary	MB89P928 FPT-80P-M06		ROM-80QF-32DP-8LA	MB89923 MB89925 MB89P928
MB89PV930A MQP-48C-P01 (0.8 mm, 15 × 15 mm) *5	48QF-30SOP-8L	MB89P935B FPT-30P-M02	Yokogawa Digital Computer *3 Serial programmer	ROM3-FPT30M02-8L	MB89935B MB89P935B
MB89PV940 MQP-48C-P01 (0.8mm, 15 × 15mm) *5	Unnecessary	MB89P945 FPT-48P-M16	General-purpose EPROM Programmer *6 (capable of programming to MBM27C256A)	ROM-48QF-28DP-8L3	MB89943 MB89945 MB89P945
MB89PV980 MQP-64C-P01 (1.0mm, 16 × 22mm)	Not supported	MB89P985 FPT-64P-M09	General-purpose EPROM Programmer *6 (capable of programming to MBM27C256A)	ROM-64QF2-28DP-8L4	MB89983 MB89P985
	Not supported	MB89P985 FPT-64P-M03		ROM-64SQF-28DP-8L3	

*5 : It should be noted that there is a slight difference in footprint size of mass-produced packages. therefore, caution is required in designing the footprint of the print board.

*6 : Recommended EPROM programmer for OTP/EPROM microcontroller

- Contact details: Data I/O TEL(81-3)3779-2151
- Contact details: Minato Electronics Inc. TEL(81)45-591-5611
- Contact details: Advantest URL: <http://www.advantest.co.jp/index-e.html>

*7 : Recommended EPROM programmer for MB89P195/P195A

- MODEL 1890A(Ver. 2.1 or higher) + OU910(Ver. 4.07 or higher); Contact details: Minato Electronics Inc. TEL(81)45-591-5611
- AF9708, AF9709, AF9723; Contact details: Flash Support Group, Inc. TEL(81)53-428-8383

*8 : Recommended EPROM programmer

- MODEL 1890A(Ver. 2.8 or higher)+OU-910(Ver. 4.32t1 or higher) is required 3 V board (ML 01-781) ;Contact details: Minato Electronics Inc. TEL(81)45-591-5611
- AF9708, AF9709, AF9723; Contact details: Flash Support Group, Inc. TEL(81)53-428-8383

*9 : Recommended EPROM programmer

- MODEL 1890A+OU-910(Ver. 4.32t1 or higher); Contact details: Minato Electronics Inc. TEL(81)45-591-5611
- A conversion board (H910-1148) is required.
- AF9708, AF9709/B; Contact details: Flash Support Group, Inc. TEL(81)53-428-8383

*10: For QFP-64 (MB89P589B) : NQPACK064SB, HQPACK064SB140 (each provided)

Support Hardware for F²MC-8FX Family

Support Hardware for F²MC-8FX Family

Development Tools					
Target Microcontroller			Fujitsu Microelectronics ICE		
Series name	Product name	Package (Lead pitch, body size)	Header board	MCU board	Equipment common to series
MB95100B	MB95107B *1 MB95F108B *1	LQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M03	MB2146-220 Includes: NQPACK064SD *2 × 1 HQPAC064SD *2 × 1	MB2146-301A-E	• BGM adapter : MB2146-09A-E • Emulator debugger software : SOFTUNE • USB cable (bundled to MB2146-09A-E)
		LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M09	MB2146-221 Includes: NQPACK064SB *2 × 1 HQPAC064SB140 *2 × 1	MB2146-301A-E	
MB95100AM	MB95108AM *1 MB95F108AM *1	LQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M03	MB2146-220 Includes: NQPACK064SD *2 × 1 HQPAC064SD *2 × 1	MB2146-303A-E	
		LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M09	MB2146-221 Includes: NQPACK064SB *2 × 1 HQPAC064SB140 *2 × 1	MB2146-303A-E	
MB95110B	MB95116B *1 MB95F118B *1	LQFP-48P (0.5 mm, 7 × 7 mm) FPT-48P-M26	MB2146-210 Includes: NQPACK048SD *2 × 1 HQPAC048SD *2 × 1	MB2146-301A-E	
		BCC-48P (0.5 mm, 7 × 7 mm) LCC-48P-M09	—	MB2146-301A-E	
MB95110M	MB95117M *1 MB95F118M	LQFP-52P (0.65 mm, 10 × 10 mm) FPT-52P-M01	MB2146-260 Includes: NQPACK052SB *2 × 1 HQPAC052SB *2 × 1	MB2146-303A-E	
MB95120	MB95F128D	LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M20	MB2146-250 Includes: NQPACK100SD *2 × 1 HQPAC100SD *2 × 1	MB2146-301A-E	
		QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2146-251 Includes: NQPACK100RB179 *2 × 1 HQPAC100RB179 *2 × 1		
MB95120MB	MB95F128MB	LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M20	MB2146-250 Includes: NQPACK100SD *2 × 1 HQPAC100SD *2 × 1	MB2146-303A-E	
		QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2146-251 Includes: NQPACK100RB179 *2 × 1 HQPAC100RB179 *2 × 1	MB2146-303A-E	
MB95130M	MB95136M *1 MB95F136M *4	SOP-28P (1.27 mm, 8.6 × 17.75 mm) FPT-28P-M17	MB2146-270 Includes: SSA-28YR1-M17 × 1	MB2146-303A-E	
MB95140	MB95F146	LQFP-32P (0.8 mm, 7 × 7 mm) FPT-32P-M21	MB2146-200 Includes: NQPACK032SA *2 × 1 HQPAC032SA *2 × 1	MB2146-301A-E	
MB95150M	MB95F156M	LQFP-48P (0.5 mm, 7 × 7 mm) FPT-48P-M26	MB2146-213 Includes: NQPACK048SD *2 × 1 HQPAC048SD *2 × 1	MB2146-303A-E	
		LQFP-52P (0.65 mm, 10 × 10 mm) FPT-52P-M01	MB2146-261 Includes: NQPACK052SB *2 × 1 HQPAC052SB *2 × 1		
MB95160	MB95F166D	LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M23	MB2146-223 Includes: NQPACK064SB *2 × 1 HQPAC064SB *2 × 1	MB2146-301A-E	
		LQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M24	MB2146-222 Includes: NQPACK064SD *2 × 1 HQPAC064SD *2 × 1		
MB95160MA	MB95F168MA	LQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M24	MB2146-222 Includes: NQPACK064SD *2 × 1 HQPAC064SD *2 × 1	MB2146-303A-E	
		LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M23	MB2146-223 Includes: NQPACK064SB *2 × 1 HQPAC064SB *2 × 1		

*1: Under development

*2: The header board requires NQPACK.

Contact for details:

- USA: OESS Co. San Jose Office TEL(408)437-1582
- Europe Germany: OESS GmbH TEL(06106)2857890
- Tokyo Eletech Co, Ltd. TEL(81)3-3820-7141

*3: Compatible Flash Support Group ROM programmers: AF9708, AF9709/B: URL <http://www.j-fsg.co.jp/e/top.html>

*4: The signal conversion board is used instead of NQPACK.

Signal conversion board for MB95F136M: SSA-28YR1-M17

Contact for details:

- USA: OESS Co. San Jose Office TEL(408)437-1582
- Europe Germany: OESS GmbH TEL(06106)2857890
- Tokyo Eletech Co, Ltd. TEL(81)3-3820-7141

Support Hardware for F²MC-8FX Family

Development Tools	Equipment for Program to OTP/EPROM			Target Microcontroller
Evaluation Device (Lead pitch, body size)	Microcontroller subject Program	Parallel Programmer		Product name
	Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	
MB95FV100D-101 (The evaluation device has been mounted on the MCU board.)	MB95F108B FPT-64P-M03	Flash Support Group, Inc.	TEF110-108F35AP	MB95107B *1 MB95F108B *1
	MB95F108B FPT-64P-M09	Flash Support Group, Inc.	TEF110-108F36AP	
MB95FV100D-103 (The evaluation device has been mounted on the MCU board.)	MB95F108AM FPT-64P-M03	Flash Support Group, Inc.	TEF110-108F35AP	MB95108AM *1 MB95F108AM *1
	MB95F108AM FPT-64P-M09	Flash Support Group, Inc.	TEF110-108F36AP	
MB95FV100D-101 (The evaluation device has been mounted on the MCU board.)	MB95F118B FPT-48P-M26	Flash Support Group, Inc.	TEF110-118F37AP	MB95116B *1 MB95F118B *1
	MB95F118B LCC-48P-M09	Flash Support Group, Inc.	TEF110-118F41AP	
MB95FV100D-103 (The evaluation device has been mounted on the MCU board.)	MB95F118M FPT-52P-M01	Flash Support Group, Inc.	TEF110-95118PMC	MB95117M *1 MB95F118M
MB95FV100D-101 (The evaluation device has been mounted on the MCU board.)	MB95F128 FPT-100P-M20	Flash Support Group, Inc.	TEF110-95F128HSPFV	MB95F128D
	MB95F128 FPT-100P-M06	Flash Support Group, Inc.	TEF110-95F128HSFPF	
MB95FV100D-103 (The evaluation device has been mounted on the MCU board.)	MB95F128MB FPT-100P-M20	Flash Support Group, Inc.	TEF110-95F128HSPFV	MB95F128MB
	MB95F128MB FPT-100P-M06	Flash Support Group, Inc.	TEF110-95F128HSFPF	
MB95FV100D-103 (The evaluation device has been mounted on the MCU board.)	MB95F136M FPT-28P-M17	Flash Support Group, Inc.	TEF110-95F136HSFPF	MB95136M *1 MB95F136M *4
MB95FV100D-101 (The evaluation device has been mounted on the MCU board.)	MB95F146 FPT-32P-M21	Flash Support Group, Inc.	TEF110-95F146	MB95F146
MB95FV100D-103 (The evaluation device has been mounted on the MCU board.)	MB95F156M FPT-48P-M26	Flash Support Group, Inc.	TEF110-95F156HPFV	MB95F156M
	MB95F156M FPT-52P-M01	Flash Support Group, Inc.	TEF110-95F156HPMC	
MB95FV100D-101 (The evaluation device has been mounted on the MCU board.)	MB95F166D FPT-64P-M23	Flash Support Group, Inc.	TEF110-95F168HPMC1	MB95F166D
	MB95F166D FPT-64P-M24	Flash Support Group, Inc.	TEF110-95F168HPMC	
MB95FV100D-103 (The evaluation device has been mounted on the MCU board.)	MB95F168MA FPT-64P-M24	Flash Support Group, Inc.	TEF110-95F168HPMC1	MB95F168MA
	MB95F168MA FPT-64P-M23	Flash Support Group, Inc.	TEF110-95F168HPMC	

Support Hardware for F²MC-16LX Family

Support Hardware for F²MC-16LX Family

Development Tools					
Target Microcontroller			Fujitsu Microelectronics ICE		Evaluation Device
Series name	Product name	Package (Lead pitch, body size)	Probe	Main unit, other	
MB90330A	MB90333A MB90F334A	LQFP-120P (0.4 mm, 14 × 14 mm) FPT-120P-M05	MB2132-491 *5		MB90V330A (PGA-299C)
	MB90333A MB90F334A MB90F335A	LQFP-120P (0.5 mm, 16 × 16 mm) FPT-120P-M21	MB2132-492 *5		
MB90335	MB90337 *1 MB90F337 *1	LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M09	MB2132-493 *5		MB90V330A (PGA-299C)
MB90340E	MB90341E *1 MB90341ES *1 MB90341CE *1 MB90341CES *1 MB90342E MB90342ES MB90342CE MB90342CES MB90F342E MB90F342ES MB90F342CE MB90F342CES MB90F343E *1 MB90F343ES *1 MB90F343CE *1 MB90F343CES *1 MB90F345E MB90F345ES MB90F345CE MB90F345CES MB90346E MB90346ES MB90346CE MB90346CES MB90F346E MB90F346ES MB90F346CE MB90F346CES MB90347E MB90347ES MB90347CE MB90347CES MB90F347E MB90F347ES MB90F347CE MB90F347CES MB90348E *1 MB90348ES *1 MB90348CE *1 MB90348CES *1 MB90349E MB90349ES MB90349CE MB90349CES MB90F349E MB90F349ES MB90F349CE MB90F349CES	LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M05	MB2147-581 *5	• Main unit : MB2147-01 • Adaptor board : MB2147-20 • Evaluation device : separately available • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V340E-101 (1-clock system) or MB90V340E-102 (2-clock system) (PGA-299C)
		QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2147-582 *5		

Support Hardware for F²MC-16LX Family

Equipment for Program to Flash/OTP/EPROM				Target Microcontroller
Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90F334A FPT-120P-M05	Flash Support Group	TEF110-334F22AP *8	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90333A MB90F334A MB90F335A
MB90F334A MB90F335A FPT-120P-M21		TEF110-334F26AP *8		
MB90F337 FPT-64P-M09	Flash Support Group	TEF110-337F31AP *8	Flash Support Group • Main unit: AF9101 (Under planning excluding MB90F347) Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90337 *1 MB90F337 *1
MB90F342E MB90F342ES MB90F342CE MB90F342CES MB90F343E *1 MB90F343ES *1 MB90F343CE *1 MB90F343CES *1 MB90F345E MB90F345ES MB90F345CE MB90F345CES MB90F346E MB90F346ES MB90F346CE MB90F346CES MB90F347E MB90F347ES MB90F347CE MB90F347CES MB90F349E MB90F349ES MB90F349CE MB90F349CES FPT-100P-M20	Flash Support Group	TEF110-328F13AP-2 *8		MB90341E *1 MB90341ES *1 MB90341CE *1 MB90341CES *1 MB90342E MB90342ES MB90342CE MB90342CES MB90F342E MB90F342ES MB90F342CE MB90F342CES MB90F343E *1 MB90F343ES *1 MB90F343CE *1 MB90F343CES*1 MB90F345E MB90F345ES MB90F345CE MB90F345CES MB90F346E MB90F346ES MB90F346CE MB90F346CES MB90F347E MB90F347ES MB90F347CE MB90F347CES MB90F349E MB90F349ES MB90F349CE MB90F349CES MB90F349CES
MB90F342E MB90F342ES MB90F342CE MB90F342CES MB90F343E *1 MB90F343ES *1 MB90F343CE *1 MB90F343CES *1 MB90F345E MB90F345ES MB90F345CE MB90F345CES MB90F346E MB90F346ES MB90F346CE MB90F346CES MB90F347E MB90F347ES MB90F347CE MB90F347CES MB90F349E MB90F349ES MB90F349CE MB90F349CES FPT-100P-M06	Flash Support Group	TEF110-328F12AP-2 *8		MB90348E *1 MB90348ES *1 MB90348CE *1 MB90348CES *1 MB90349E MB90349ES MB90349CE MB90349CES MB90F349E MB90F349ES MB90F349CE MB90F349CES

(Continued)

Support Hardware for F²MC-16LX Family

Development Tools					
Target Microcontroller			Fujitsu Microelectronics ICE		Evaluation Device
Series name	Product name	Package (Lead pitch, body size)	Probe	Main unit, other	
MB90350E	MB90351E MB90351ES MB90351TE MB90351TES MB90352E MB90352ES MB90352TE MB90352TES MB90356E MB90356ES MB90356TE MB90356TES MB90357E MB90357ES MB90357TE MB90357TES MB90F351E MB90F351ES MB90F351TE MB90F351TES MB90F352E MB90F352ES MB90F352TE MB90F352TES MB90F356E MB90F356ES MB90F356TE MB90F356TES MB90F357E MB90F357ES MB90F357TE MB90F357TES	LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M23	MB2147-540 *2	- Main unit : MB2147-01 - Adaptor board : MB2147-20 - Evaluation device : (separately available) - Emulator debugger software : SOFTUNE - RS-232C cable or USB cable or LAN cable	MB90V340E-101/103 (1-clock system) MB90V340E-102/104 (2-clock system) (PGA-299C)
	MB90F351E MB90F351ES MB90F351TE MB90F351TES MB90F352E MB90F352ES MB90F352TE MB90F352TES MB90F356E MB90F356ES MB90F356TE MB90F356TES MB90F357E MB90F357ES MB90F357TE MB90F357TES	LQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M24	MB2147-542		
MB90360E	MB90362E MB90362ES MB90362TE MB90362TES MB90F362E MB90F362ES MB90F362TE MB90F362TES MB90367E MB90367ES MB90367TE MB90367TES MB90F367E MB90F367ES MB90F367TE MB90F367TES	LQFP-48P (0.5 mm, 7 × 7 mm) FPT-48P-M26	MB2147-521 *2		MB90V340E-101/103 (1-clock system) MB90V340E-102/104 (2-clock system) (PGA-299C)
MB90370	MB90372 MB90F372	LQFP-144P (0.4 mm, 16 × 16 mm) FPT-144P-M12	MB2132-471	- Main unit : MB2147-01 - Adaptor board : MB2147-10 - Evaluation device : separately available - Emulator debugger software : SOFTUNE - RS-232C cable or USB cable or LAN cable	MB90V370 (PGA-256C)
MB90375	MB90F377	LQFP-144P (0.4 mm, 16 × 16 mm) FPT-144P-M12			
MB90378	MB90F378	LQFP-144P (0.4 mm, 16 × 16 mm) FPT-144P-M12	MB2132-471	- Main unit : MB2147-01 - Adaptor board : MB2147-20 - Evaluation device : (separately available) - Emulator debugger software : SOFTUNE - RS-232C cable or USB cable or LAN cable	MB90V378 (PGA-299C)
MB90385	MB90387 MB90387S MB90F387 MB90F387S	LQFP-48P (0.5 mm, 7 × 7 mm) FPT-48P-M26	MB2132-466 *5	- Main unit : MB2147-01 - Adaptor board : MB2147-10 - Evaluation device : separately available - Emulator debugger software : SOFTUNE - RS-232C cable or USB cable or LAN cable	MB90V495G (PGA-256C)

Support Hardware for F²MC-16LX Family

Equipment for Program to Flash/OTP/EPROM				Target Microcontroller
Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90F351E MB90F351ES MB90F351TE MB90F351TES MB90F352E MB90F352ES MB90F352TE MB90F352TES MB90F356E MB90F356ES MB90F356TE MB90F356TES MB90F357E MB90F357ES MB90F357TE MB90F357TES FPT-64P-M23	Flash Support Group	TE110-352F30AP *8	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90351E MB90351ES MB90351TE MB90351TES MB90352E MB90352ES MB90352TE MB90352TES MB90356E MB90356ES MB90356TE MB90356TES MB90357E MB90357ES MB90357TE MB90357TES MB90F351E MB90F351ES MB90F351TE MB90F351TES MB90F352E MB90F352ES MB90F352TE MB90F352TES MB90F356E MB90F356ES MB90F356TE MB90F356TES MB90F357E MB90F357ES MB90F357TE MB90F357TES
MB90F351E MB90F351ES MB90F351TE MB90F351TES MB90F352E MB90F352ES MB90F352TE MB90F352TES MB90F356E MB90F356ES MB90F356TE MB90F356TES MB90F357E MB90F357ES MB90F357TE MB90F357TES FPT-64P-M24	Flash Support Group	TEF110-90F352A		MB90362E MB90362ES MB90362TE MB90362TES MB90F362E MB90F362ES MB90F362TE MB90F362TES MB90367E MB90367ES MB90367TE MB90367TES MB90F367E MB90F367ES MB90F367TE MB90F367TES
MB90F362E MB90F362ES MB90F362TE MB90F362TES MB90F367E MB90F367ES MB90F367TE MB90F367TES FPT-48P-M26	Flash Support Group	TEF110-387F15AP-2 *8	Flash Support Group • Main unit: AF9101 Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90362E MB90362ES MB90362TE MB90362TES MB90F362E MB90F362ES MB90F362TE MB90F362TES MB90367E MB90367ES MB90367TE MB90367TES MB90F367E MB90F367ES MB90F367TE MB90F367TES
MB90F372 FPT-144P-M12	Flash Support Group	TE110-372F17AP *8	Not supported	MB90372 MB90F372
MB90F377 FPT-144P-M12	Flash Support Group	TE110-372F17AP *8	Not supported	MB90F377
MB90F378 FPT-144P-M12	Flash Support Group	TE110-372F17AP *8	Not supported	MB90F378
MB90F387 MB90F387S FPT-48P-M26	Flash Support Group	TEF110-387F15AP-2 *8	Yokogawa Digital Computer • Main unit: AF2xx	MB90387 MB90387S MB90F387 MB90F387S

Support Hardware
for F²MC-16LX Family

(Continued)

Support Hardware for F²MC-16LX Family

Development Tools					
Target Microcontroller			Fujitsu Microelectronics ICE		Evaluation Device
Series name	Product name	Package (Lead pitch, body size)	Probe	Main unit, other	
MB90390	MB90394HA MB90F394HA	LQFP-120P (0.5mm, 16 × 16 mm) FPT-120P-M21	MB2132-469 *5	• Main unit : MB2147-01 • Adaptor board : MB2147-20 • Evaluation device : (separately available) • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V390HB (PGA-299C)
MB90M405	MB90M407 MB90M407A MB90M408 MB90M408A MB90MF408 MB90MF408A	QFP-100P (0.65mm, 14 × 20 mm) FPT-100P-M06	MB2132-464 *5		MB90MV405 (PGA-256C)
MB90420G MB90425G	MB90423GA MB90423GB MB90423GC MB90F423GA MB90F423GB MB90F423GC MB90427GA MB90427GB MB90427GC MB90428GA MB90428GB MB90428GC MB90F428GA MB90F428GB MB90F428GC	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5		MB90V420G (PGA-256C)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5		
MB90435	MB90437L MB90437LS MB90438L MB90438LS MB90439 MB90439S MB90F438L MB90F438LS MB90F439 MB90F439S	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5	• Main unit : MB2147-01 • Adaptor board : MB2147-10 • Evaluation device : separately available • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V540G (PGA-256C)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5		
MB90440G	MB90443G *1 MB90F443G	QFP-100P (0.65mm, 14 × 20 mm) FPT-100P-M06	MB2132-464 *5		MB90V440G (PGA-256C)
MB90455	MB90455 MB90455S MB90F455 MB90F455S MB90456 MB90456S MB90F456 MB90F456S MB90457 MB90457S MB90F457 MB90F457S	LQFP-48P (0.5mm, 7 × 7 mm) FPT-48P-M26	MB2132-466 *5		MB90V495G (PGA-256C)

Support Hardware for F²MC-16LX Family

Equipment for Program to Flash/OTP/EPROM				Target Microcontroller
Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90F394H FPT-120P-M21	Flash Support Group	TEF110-394F16AP * ⁸	- Yokogawa Digital Computer - Main unit: AF2xx - Control modules compatible with various microcontrollers - Other options	MB90394HA MB90F394HA
MB90MF408 MB90MF408A FPT-100P-M06	Not supported	Not supported	Yokogawa Digital Computer - Main unit: AF2xx - Control modules compatible with various microcontrollers - Other options	MB90M407 MB90M407A MB90M408 MB90M408A MB90MF408 MB90MF408A
MB90F423GA MB90F423GB MB90F423GC MB90F428GA MB90F428GB MB90F428GC FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹	Yokogawa Digital Computer - Main unit: AF2xx - Control modules compatible with various microcontrollers - Other options	MB90423GA MB90423GB MB90423GC MB90F423GA MB90F423GB MB90F423GC MB90427GA MB90427GB MB90427GC MB90428GA MB90428GB MB90428GC MB90F428GA MB90F428GB MB90F428GC
	Flash Support Group	TEF110-553F01AP-2 * ⁸		
	Data I/O	S5023		
MB90F423GA MB90F423GB MB90F423GC MB90F428GA MB90F428GB MB90F428GC FPT-100P-M20	Minato Electronics	MF00-709A * ⁶ MF05-709B * ⁹	Yokogawa Digital Computer - Main unit: AF2xx - Control modules compatible with various microcontrollers - Other options	MB90437L MB90437LS MB90438L MB90438LS MB90439 MB90439S MB90F438L MB90F438LS MB90F439 MB90F439S
	Flash Support Group	TEF110-580F03AP-2 * ⁸		
	Data I/O	Not supported		
MB90F438L MB90F438LS MB90F439 MB90F439S FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹	Yokogawa Digital Computer - Main unit: AF2xx - Control modules compatible with various microcontrollers - Other options	MB90443G * ¹ MB90F443G
	Flash Support Group	TEF110-553F01AP-2 * ⁸		
	Data I/O	S5023		
MB90F443G FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹	Yokogawa Digital Computer - Main unit: AF2xx - Control modules compatible with various microcontrollers - Other options	MB90455 MB90455S MB90F455 MB90F455S MB90456 MB90456S MB90F456 MB90F456S MB90457 MB90457S MB90F457 MB90F457S
	Flash Support Group	TEF110-553F01AP-2 * ⁸		
	Data I/O	S5023		
MB90F455 MB90F455S MB90F456 MB90F456S MB90F457 MB90F457S FPT-48P-M26	Flash Support Group	TEF110-387F15AP-2 * ⁸	Yokogawa Digital Computer - Main unit: AF2xx - Control modules compatible with various microcontrollers - Other options	

(Continued)

Support Hardware for F²MC-16LX Family

Development Tools					
Target Microcontroller			Fujitsu Microelectronics ICE		Evaluation Device
Series name	Product name	Package (Lead pitch, body size)	Probe	Main unit, other	
MB90460/465	MB90462 MB90467 MB90F462 MB90F462A MB90F463A	SH-DIP-64P DIP-64P-M01	MB2132-434	• Main unit : MB2147-01 • Adaptor board : MB2147-10 • Evaluation device : separately available • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V460 (PGA-256C)
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2132-434 + 64SD-64QF-8L *3		
		LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09	MB2132-461 *5		
MB90480B	MB90F481B MB90F482B	QFP-100P (0.65mm, 14 × 20 mm) FPT-100P-M06	MB2132-464 *5	• Main unit : MB2147-01 • Adaptor board : MB2147-20 • Evaluation device : separately available • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V480B (PGA-299C)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M20	MB2132-496 *5		
MB90485B	MB90483C MB90487B MB90488B MB90F488B MB90F489B	QFP-100P (0.65mm, 14 × 20 mm) FPT-100P-M06	MB2132-464 *5		MB90V485B (PGA-299C)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M20	MB2132-496 *5		
MB90495G	MB90497G MB90F497G MB90F498G	QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2132-434 + 64SD-64QF-8L *3	• Main unit : MB2147-01 • Adaptor board : MB2147-10 • Evaluation device : separately available • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V495G (PGA-256C)
		LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09	MB2132-461 *5		

Support Hardware for F²MC-16LX Family

Equipment for Program to Flash/OTP/EPROM				Target Microcontroller
Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90F462 MB90F462A MB90F463A DIP-64P-M01	Minato Electronics	MF13-787B * ⁶	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90462 MB90467 MB90F462 MB90F462A MB90F463A
	Flash Support Group	TEF110-562F05AP-2 * ⁸		
	Data I/O	Not supported		
MB90F462 MB90F462A MB90F463A FPT-64P-M06	Minato Electronics	MF13-785B * ⁶		
	Flash Support Group	TEF110-562F06AP-2 * ⁸		
	Data I/O	Not supported		
MB90F462 MB90F462A MB90F463A FPT-64P-M23	Minato Electronics	MF13-786B * ⁶		
	Flash Support Group	TEF110-562F07AP-2 * ⁸		
	Data I/O	Not supported		
MB90F481B MB90F482B FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹		MB90F481B MB90F482B
	Flash Support Group	TEF110-553F01AP-2 * ⁸		
	Data I/O	S5023 * ⁷		
MB90F481B MB90F482B FPT-100P-M20	Minato Electronics	MF00-709A * ⁶ MF05-709B * ⁹		
	Flash Support Group	TEF110-580F03AP-2 * ⁸		
	Data I/O	Not supported		
MB90F488B MB90F489B FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹	Flash Support Group • Main unit: AF9101 Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90483C MB90487B MB90488B MB90F488B MB90F489B
	Flash Support Group	TEF110-553F01AP-2 * ⁸		
	Data I/O	S5023 * ⁷		
MB90F488B MB90F489B FPT-100P-M20	Minato Electronics	MF00-709A * ⁶ MF05-709B * ⁹		
	Flash Support Group	TEF110-580F03AP-2 * ⁸		
	Data I/O	Not supported		
MB90F497G MB90F498G FPT-64P-M06	Minato Electronics	MF13-785B * ⁶ MF05-785B * ⁹	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90497G MB90F497G MB90F498G
	Flash Support Group	TEF110-562F06AP-2 * ⁸		
	Data I/O	Not supported		
MB90F497G MB90F498G FPT-64P-M09	Minato Electronics	MF13-786B * ⁶ MF05-786B * ⁹		
	Flash Support Group	TEF110-562F07AP-2 * ⁸		
	Data I/O	Not supported		

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Support Hardware
for F²MC-16LX Family

Support Hardware for F²MC-16LX Family

Development Tools					
Target Microcontroller			Fujitsu Microelectronics ICE		Evaluation Device
Series name	Product name	Package (Lead pitch, body size)	Probe	Main unit, other	
MB90520A MB90520B	MB90522A MB90522B MB90523A MB90523B MB90F523A MB90F523B	QFP-120P (0.5mm, 20 × 20mm) FPT-120P-M13	MB2132-468 *5	• Main unit : MB2147-01 • Adaptor board : MB2147-10 • Evaluation device : separately available • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V520A (PGA-256C)
		LQFP-120P (0.4mm, 14 × 14mm) FPT-120P-M05	MB2132-498 *5		
MB90540 MB90540G	MB9543G MB90543GS MB90F543 MB90F543G MB90F543GS	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5		MB90V540 MB90V540G (PGA-256C)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5		
MB90545 MB90545G	MB90F546G MB90F546GS MB90547G MB90547GS MB90548G MB90548GS MB90F548G MB90F548GL MB90F548GLS MB90F548GS MB90549G MB90549GS MB90F549 MB90F549G MB90F549GS	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5		MB90V540 MB90V540G (PGA-256C)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5		
MB90550A MB90550B	MB90552A MB90552B MB90T552A MB90553A MB90553B MB90T553A MB90P553A MB90F553A	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5		MB90V550A (PGA-256C)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5		
MB90560	MB90561 MB90561A MB90562 MB90562A MB90F562 MB90F562B	SH-DIP-64P DIP-64P-M01	MB2132-434		MB90V560 (PGA-256C)
		LQFP-64P (0.65mm, 12 × 12mm) FPT-64P-M09	MB2132-461 *5		
		QFP-64P (1.0mm, 14 × 20mm) FPT-64P-M06	MB2132-434 + 64SD-64QF-8L *3		

Support Hardware for F²MC-16LX Family

Equipment for Program to Flash/OTP/EPROM				Target Microcontroller		
Microcontroller subject Program	Parallel Programmer		Serial Programmer			
Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name		
MB90F523A MB90F523B FPT-120P-M13	Minato Electronics	MF00-23B * ⁶ MF05-23B * ⁹	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90522A MB90522B MB90523A MB90523B MB90F523A MB90F523B		
	Flash Support Group	TEF110-574F02AP-2 * ⁸				
	Data I/O	S5024				
MB90F523A MB90F523B FPT-120P-M24	Minato Electronics	MF00-22B * ⁶ MF05-22B * ⁹				
	Flash Support Group	TEF110-523F08AP-2 * ⁸				
	Data I/O	Not supported				
MB90F543 MB90F543G/GS FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹		Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90543G MB90543GS MB90F543 MB90F543G MB90F543GS	
	Flash Support Group	TEF110-553F01AP-2 * ⁸				
	Data I/O	S5023				
MB90F543 MB90F543G/GS FPT-100P-M20	Minato Electronics	MF00-709A * ⁶ MF05-709B * ⁹				
	Flash Support Group	TEF110-580F03AP-2 * ⁸				
	Data I/O	Not supported				
MB90F546G/GS MB90F548G/GS MB90F548GL/GLS MB90549/G/GS FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹			Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90F546G MB90F546GS MB90547G MB90547GS MB90548G MB90548GS MB90F548G MB90F548GL MB90F548GLS MB90F548GS MB90549G MB90549GS MB90F549 MB90F549G MB90F549GS
	Flash Support Group	TEF110-553F01AP-2 * ⁸				
	Data I/O	S5023				
MB90F546G/GS MB90F548G/GS MB90F548GL/GLS MB90F549/G/GS FPT-100P-M20	Minato Electronics	MF00-709A * ⁶ MF05-709B * ⁹				
	Flash Support Group	TEF110-580F03AP-2 * ⁸				
	Data I/O	Not supported				
MB90P553A FPT-100P-M06	General-purpose EPROM Programmer capable of programming to MBM27C1000	ROM-100QF-32DP-16L * ³	—			
MB90F553A FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options			MB90552A MB90552B MB90T552A MB90553A MB90553B MB90T553A MB90P553A MB90F553A
	Flash Support Group	TEF110-553F01AP-2 * ⁸				
	Data I/O	S5023				
MB90F553A FPT-100P-M20	Minato Electronics	MF00-709A * ⁶ MF05-709B * ⁹				
	Flash Support Group	TEF110-580F03AP-2 * ⁸				
	Data I/O	Not supported				
MB90F562 MB90F562B DIP-64P-M01	Minato Electronics	MF13-787B * ⁶ MF05-787B * ⁹		Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options		MB90561 MB90561A MB90562 MB90562A MB90F562 MB90F562B
	Flash Support Group	TEF110-562F05AP-2 * ⁸				
	Data I/O	Not supported				
MB90F562 MB90F562B FPT-64P-M09	Minato Electronics	MF13-786B * ⁶ MF05-786B * ⁹				
	Flash Support Group	TEF110-562F07AP-2 * ⁸				
	Data I/O	Not supported				
MB90F562 MB90F562B FPT-64P-M06	Minato Electronics	MF13-785B * ⁶				
	Flash Support Group	TEF110-562F06AP-2 * ⁸				
	Data I/O	Not supported				

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Support Hardware
for F²MC-16LX Family

Support Hardware for F²MC-16LX Family

Development Tools					
Target Microcontroller			Fujitsu Microelectronics ICE		Evaluation Device
Series name	Product name	Package (Lead pitch, body size)	Probe	Main unit, other	
MB90565	MB90567 MB90568 MB90F568	QFP-64P (1.0mm, 14 × 20mm) FTP-64P-M06	MB2132-434 + 64SD-64QF-8L	• Main unit : MB2147-01 • Adaptor board : MB2147-10 • Evaluation device : separately available • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V560 (PGA-256C)
		LQFP-64P (0.65mm, 12 × 12mm) FTP-64P-M09	MB2132-461 *5		
MB90570A/C	MB90574C MB90F574 MB90F574A	LQFP-120P (0.5mm, 16 × 16mm) FPT-120P-M21	MB2132-497 *5		MB90V570 MB90V570A (PGA-256C)
	MB90573 MB90574 MB90574C MB90F574 MB90F574A	QFP-120P (0.5mm, 20 × 20mm) FPT-120P-M13	MB2132-468 *5		
	MB90573 MB90574 MB90F574 MB90F574A	LQFP-120P (0.4mm, 14 × 14mm) FPT-120P-M05	MB2132-498 *5		
MB90580C	MB90583C MB90583CA MB90F583C MB90F583CA MB90F584C MB90F584CA MB90587C MB90587CA	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5		MB90V580B (PGA-256C)
		LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M05	MB2132-496 *5		
MB90590G	MB90591G MB90F591G MB90594G MB90F594G	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5		MB90V590G (PGA-256C)
MB90595G	MB90598G MB90F598G	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	MB2132-464 *5		MB90V595G (PGA-256C)
MB90800	MB90803 MB90F803 MB90804 *2 MB90F804 MB90F809	QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2147-582 *5	• Main unit : MB2147-01 • Adaptor board : MB2147-20 • Evaluation device : (separately available) • Emulator debugger software : SOFTUNE • RS-232C cable or USB cable or LAN cable	MB90V800-101 (Single clock) MB90V800-201 (Dual clock) (PGA-299C)
MB90820B	MB90822B MB90F822B MB90F823B	QFP-80P (0.8 mm, 14 × 20 mm) FPT-80P-M06	MB2147-560 *5		MB90V820B (PGA-299C)
		LQFP-80P (0.5 mm, 12 × 12 mm) FPT-80P-M05	MB2147-561 *5		
		LQFP-80P (0.65 mm, 14 × 14 mm) FPT-80P-M11	MB2147-562 *5		
MB90860E/ES	MB90867E MB90867ES MB90F867E MB90F867ES	LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M05	MB2147-581 *5		MB90V340E-101 (1-clock system) or MB90V340E-102 (2-clock system) (PGA-299C)
		QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2147-582 *5		

Support Hardware for F²MC-16LX Family

Equipment for Program to Flash/OTP/EPROM				Target Microcontroller		
Microcontroller subject Program	Parallel Programmer		Serial Programmer			
Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name		
MB90F568 FPT-64P-M06	Minato Electronics	MF13-785B * ⁶ MF05-785B * ⁹	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90567 MB90568 MB90F568		
	Flash Support Group	TEF110-562F06AP-2 * ⁸				
	Data I/O	Not supported				
MB90F568 FPT-64P-M09	Minato Electronics	MF13-786B * ⁶ MF05-786B * ⁹			MB90574C MB90F574 MB90F574A	
	Flash Support Group	TEF110-562F07AP-2 * ⁸				
	Data I/O	Not supported				
MB90F574A FPT-120P-M21	Minato Electronics	MF00-729B * ⁶ MF05-729B * ⁹		MB90573 MB90574 MB90574C MB90F574 MB90F74A		
	Flash Support Group	TEF110-574F04AP-2 * ⁸				
	Data I/O	Not supported				
MB90F574A FPT-120-M13	Minato Electronics	MF00-23B * ⁶ MF05-23B * ⁹			MB90573 MB90574 MB90F574 MB90F574A	
	Flash Support Group	TEF110-574F02AP-2 * ⁸				
	Data I/O	S5024 * ⁷				
MB90F574A FPT-120P-M24	Minato Electronics	MF00-22B * ⁶		MB90583C MB90583CA MB90F583C MB90F583CA MB90F584C MB90F584CA MB90587C MB90587CA		
	Flash Support Group	TEF110-523F08AP-2 * ⁸				
	Data I/O	Not supported				
MB90F583C MB90F583CA MB90F584C MB90F584CA FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹			MB90591G MB90F591G MB90594G MB90F594G	
	Flash Support Group	TEF110-553F01AP-2 * ⁸				
	Data I/O	S5023 * ⁷				
MB90F583C MB90F583CA MB90F584C MB90F584CA FPT-100P-M20	Minato Electronics	MF00-709A * ⁶ MF05-709B * ⁹		Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options		MB90803 MB90F803 MB90804 * ² MB90F804 MB90F809
	Flash Support Group	TEF110-580F03AP-2 * ⁸				
	Data I/O	Not supported				
MB90F591G MB90F594G FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹			MB90822B MB90F822B MB90F823B	
	Flash Support Group	TEF110-553F01AP-2 * ⁸				
	Data I/O	S5023 * ⁷				
MB90F598G FPT-100P-M06	Minato Electronics	MF00-989B * ⁶ MF05-989A * ⁹	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90867E MB90867ES MB90F867E MB90F867ES		
	Flash Support Group	TEF110-553F01AP-2 * ⁸				
	Data I/O	S5023 * ⁷				
MB90F803 MB90F804 MB90F809 FPT-100P-M06	Flash Support Group	TEF110-328F12AP-2 * ⁸				
MB90F822B MB90F823B FPT-80P-M06	Flash Support Group	TEF110-822F27AP	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90867E MB90867ES MB90F867E MB90F867ES		
MB90F822B MB90F823B FPT-80P-M05	Flash Support Group	TEF110-822F28AP				
MB90F822B MB90F823B FPT-80P-M11	Flash Support Group	TEF110-822F32AP				
MB90F867E MB90F867ES FPT-100P-M20	Flash Support Group	TEF110-328F13AP-2				
MB90F867E MB90F867ES FPT-100P-M06	Flash Support Group	TEF110-328F12AP-2 * ⁸				

(Continued)

Support Hardware for F²MC-16LX Family

Development Tools					
Target Microcontroller			Fujitsu Microelectronics ICE		Evaluation Device
Series name	Product name	Package (Lead pitch, body size)	Probe	Main unit, other	
MB90880	MB90882 MB90882S MB90883 MB90883S MB90884 MB90884S MB90F882 MB90F882S MB90F883A MB90F883AS MB90F884A MB90F884AS	LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M20	MB2147-581 *5	- Main unit : MB2147-01 - Adaptor board : MB2147-20 - Evaluation device : (separately available) - Emulator debugger software : SOFTUNE - RS-232C cable or USB cable or LAN cable	MB90V880A
		QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2147-582 *5		
MB90895	MB90F897 MB90F897S	LQFP-48P (0.5 mm, 7 × 7 mm) FPT-48P-M26	MB2132-466 *5	- Main unit : MB2147-01 - Adaptor board : MB2147-10 - Evaluation device : (separately available) - Emulator debugger software : SOFTUNE - RS-232C cable or USB cable or LAN cable	MB90V495G (PGA-256C)
MB90920	MB90F922NB MB90F922NBS MB90F923NA MB90F923NAS MB90F924NA MB90F924NAS	LQFP-120P (0.5 mm, 16 × 16 mm) FPT-120P-M21	MB2132-469	- Main unit : MB2147-01 - Adaptor board : MB2147-20 - Evaluation device : (separately available) - Emulator debugger software : SOFTUNE - RS-232C cable or USB cable or LAN cable	MB90V920 (PGA-299C)
MB90945	MB90947A MB90F946A MB90F947A MB90F949A	QFP-100P (0.65 mm, 14 × 20 mm) FPT-100P-M06	MB2147-583		MB90V390HB (PGA-299C)
		LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M05	MB2147-584		
MB90960	MB90F962 MB90F962S MB90F967 MB90F967S	LQFP-48P (0.5 mm, 7 × 7 mm) FPT-48P-M26	MB2147-5421		MB90V340E (PGA-299C)
MB90980	MB90F983	LQFP-64P (0.5 mm, 10 × 10 mm) FPT-64P-M03	MB2147-541 *5		MB90V485B (PGA-299C)

*1 : Under development

*2 : Being planned

*3 : The IC package conversion adapter provided by Sunhayato is required for connecting the probe cable (separately available).

100QF-100SQF-16F : For QFP-100 (0.65mm, 14 × 20mm) to SQFP-100 (0.5mm, 14 × 14mm)

64SD-64QF2-8L : For SHDIP-64 to QFP-64

Sales Info: Advanced Interconnectics <http://advintcorp.com>

*4 : The Yamaichi Electronics IC socket is always required for connecting each probe cable (separately available).

IC149-100-14-B5 (_ = "0" positioning post unavailable, _ = "1" positioning post available) for QFP-100 (lead pitch : 0.65mm, body size : 14 × 20mm)

Sales Info:

• USA: Yamaichi Electronics Inc. TEL(408)4520797

• Europe Denmark: Wlmatok A.S. TEL(65)351446

England: Radiatron Components Ltd. TEL(01)8911221
AB Connector Ltd. TEL(0604)712000

Finland: Dualtek Oy TEL(80)8019911

France: Manudax-France TEL(1)4342-2050

Germany: Macrotron AG TEL(089)4208148

Glyn GmbH TEL:(49)61278077

Connector Service GmbH TEL:(089)429277

Eurosab International s.r.l TEL(02)93169781

Italy: S.A. Generalde Imporcionas Electronicas TEL(1)416-92-61

Spain: Bexab Electronics TEL(08)7680560

Sweden: Slocovend AG TEL(01)8303161

Switzerland: Slocovend AG TEL(01)8303161

• Asia Singapore: Yamco Electronics Pte Ltd. TEL(336)6522

Korea: Asia Yamaichi Electronics, Inc. TEL(02)482-7263

Taiwan: Sing Way Co. TEL:(02)718-5971

Joung Lai Trading Co. Ltd. TEL:(02)754-1022

For IC sockets, it should be noted that there is a slight difference in footprint size between these and other mass-produced packages. Therefore, caution is required in designing the footprint of the print board.

Support Hardware for F²MC-16LX Family

Equipment for Program to Flash/OTP/EPROM				Target Microcontroller
Microcontroller subject Program	Parallel Programmer		Serial Programmer	
Product name	Programmer (manufacturer)	IC Package Conversion Adapter (for program)	Programmer (manufacture)	Product name
MB90F882 MB90F882S MB90F883A MB90F883AS MB90F884A MB90F884AS FPT-100P-M20	Flash Support Group	TEF110-328F13AP-2 *8	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90882 MB90882S MB90883 MB90883S MB90884 MB90884S MB90F882 MB90F882S MB90F883A MB90F883AS MB90F884A MB90F884AS
MB90F882 MB90F882S MB90F883A MB90F883AS MB90F884A MB90F884AS FPT-100P-M06	Flash Support Group	TEF110-328F12AP-2 *8		MB90F882 MB90F882S MB90F883A MB90F883AS MB90F884A MB90F884AS
MB90F897 MB90F897S FPT-48P-M26	Flash Support Group	TEF110-387F15AP		MB90F897 MB90F897S
MB90F922NB MB90F922NBS MB90F923NA MB90F923NAS MB90F924NA MB90F924NAS FPT-120P-M21	Flash Support Group	TEF110-394F16AP		MB90F922NB MB90F922NBS MB90F923NA MB90F923NAS MB90F924NA MB90F924NAS
MB90F946A MB90F947A MB90F949A FPT-100P-M06	Flash Support Group	TEF110-328F12AP-2		MB90947A MB90F946A MB90F947A MB90F949A
MB90F946A MB90F947A MB90F949A FPT-100P-M20	Flash Support Group	TEF110-328F13AP-2		
MB90F962 MB90F962S MB90F967 MB90F967S FPT-48P-M26	Flash Support Group	TEF110-387F15AP-2	-	MB90F962 MB90F962S MB90F967 MB90F967S
MB90F983 FPT-64P-M03	Flash Support Group	TEF110-90F983	Yokogawa Digital Computer • Main unit: AF2xx • Control modules compatible with various microcontrollers • Other options	MB90F983

*5: TQPACK and NQPACK required for the connecting target of probe cable:

NQPACK048SD and HQPACK048SD (attached) for LQFP-48 (lead pitch: 0.5 mm; body size: 7 × 7 mm)
NQPACK064SB and HQPACK064SB140 (attached) for LQFP-64 (lead pitch: 0.65 mm; body size: 12 × 12 mm)
NQPACK064SD-ND and HQPACK064SD (attached) for LQFP-64 (lead pitch: 0.5 mm; body size: 10 × 10 mm)
NQPACK080RA and HQPACK080RA (attached) for QFP-80 (lead pitch: 0.8 mm; body size: 14 × 20 mm)
NQPACK080SB and HQPACK080SB160 (attached) for LQFP-80 (lead pitch: 0.65 mm; body size: 14 × 14 mm)
NQPACK080SD and HQPACK080SD (attached) for LQFP-80 (lead pitch: 0.5 mm; body size: 12 × 12 mm)
NQPACK100RB179-A and HQPACK100RB179 (attached) for QFP-100 (lead pitch: 0.65 mm; body size: 14 × 20 mm)
NQPACK100SD-ND and HQPACK100SD (attached) for LQFP-100 (lead pitch: 0.5 mm; body size: 14 × 14 mm)
NQPACK120SD220 and HQPACK120SD226 (attached) for QFP-120 (lead pitch: 0.5 mm; body size: 20 × 20 mm)
TQPACK120/144SD and TQSOCKET120/144SDP (attached) for QFP-120 (lead pitch: 0.5 mm; body size: 20 × 20 mm)
NQPACK120SD and HQPACK120SD (attached) for QFP-120 (lead pitch: 0.5 mm; body size: 16 × 16 mm)
NQPACK120SE and HQPACK120SE (attached) for LQFP-120 (lead pitch: 0.4 mm; body size: 14 × 14 mm)

Caution: For the TQPACK and NQPACK, it should be noted that there is a slight difference in footprint size between these and other mass-produced packages.

Therefore, caution is required in designing the footprint of the print board.

Sales Info:

- USA: OESS Co. San Jose Office TEL(408)437-1582
- Europe Germany: OESS GmbH TEL(06106)2857890

*6: Compatible Minato Electronics ROM programmers: MODEL 1890A (Ver. 2.5 or later) + OU910 (Ver. 4.32r or later), MODEL 1893 (Ver. 1.10l or higher), MODEL 1931 (Ver. 1.10l or higher), MODEL 1930 + SU3000LX (Ver. 4.10l or higher);

Contact details: TEL (81-45) 591-5611; FAX (81-45) 592-2854

*7: Compatible Data I/O ROM programmers: OPTIMA, Dual-Package, OCTAL, QUAD: TEL(81-3) 3779-2151

*8: Compatible Flash Support Group ROM programmers: AF9708, AF9709/B: URL <http://www.j-fsg.co.jp/e/top.html>

*9: Adaptor for MODEL-1940

Support Hardware for FR Family

Support Hardware for FR Family

Target Microcontroller		Development Tools		
Product name	Package (Lead pitch, body size) Package code	Fujitsu Microelectronics ICE		
		Adapter, header	Main unit, other	- Evaluation Device - Package - DSU type
MB91101A	LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M20	- Adapter unit: MB2197-101 *2 Note: Yamaichi Electronics IC socket is required separately (Option: IC149-100-□25-B5).	- Main unit: MB2197-01 - DSU cable: MB2197-10 - Evaluation device : separately available - Option ROM alternate unit: MB2197-90 - RS232C cable or LAN cable - Debugger software: SOFTUNE	- MB91V101A - PGA135 - DSU2
	QFP-100 (0.65mm, 14 × 20mm) FPT-100P-M06	- Adapter unit: MB2197-102 *2 Note: Yamaichi Electronics IC socket is required separately (Option: IC149-100-□14-B5).		
MB91107A MB91108	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	- Adapter unit: MB2197-103 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK120SD, HQPACK120SD) .		- MB91V108 - PGA135 - DSU2
MB91121	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	- Adapter unit: MB2197-103 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK120SD, HQPACK120SD).		- MB91V121 - PGA135 - DSU2
MB91F127 MB91F128	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	- Adapter board: MB2197-160 - Header: MB2197-162 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK100SD-ND, HQPACK100SD) .		- MB91FV129 - PGA299 - DSU3
MB91133 MB91F133A	LQFP-144 (0.5 mm, 20 × 20 mm) FPT-144P-M08	- Adapter board: MB2197-130 - Header: MB2197-135 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK144SD-ND, HQPACK144SD) .	- Main unit: MB2198-01 - DSU cable: MB2198-10 - Evaluation device: separately avail- able - RS232C cable or USB cable or LAN cable - Debugger software: SOFTUNE	- MB91FV130 - PGA299 - DSU3
MB91151A	LQFP-144 (0.5mm, 14 × 20mm) FPT-144P-M08	- Adapter board: MB2197-150 - Header: MB2197-155 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK144SD-ND, HQPACK144SD) .		- MB91V151A - PGA299 - DSU3
MB91154 MB91155 MB91F155A	LQFP-144 (0.5mm, 20 × 20mm) FPT-144P-M08	- Adapter board: MB2197-150 - Header: MB2197-155 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK144SD-ND, HQPACK144SD) .		- MB91FV150 - PGA299 - DSU3
MB91F158	LQFP-120 (0.4mm, 14 × 14mm) FPT-120P-M24	- Adapter board: MB2197-150 - Header: MB2197-153 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK120SE, HQPACK120SE) .	- Main unit: MB2198-01 - DSU cable: MB2198-10 - Evaluation device: separately avail- able - RS232C cable or USB1.1 cable or LAN cable: Commercial product - Debugger software: SOFTUNE	- MB91FV150 - PGA299 - DSU3
MB91F211B	LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M20	- Adapter board: MB2198-140 - Header: MB2198-142 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK100SD-ND, HQPACK100SD) .	- Main unit: MB2198-01 - Evaluation device: separately avail- able - Debugger software: SOFTUNE	- MB91V210 - PGA420 - DSU4
MB91213A MB91F213A	LQFP-144P (0.5mm, 20 × 20mm) FPT-144P-M08	- Adapter board: MB2198-140 - Header: MB2198-141 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK144SD-ND, HQPACK144SD)	- RS232C cable: Commercial product (9pin-9pin cross) - USB1.1 cable: Commercial product - LAN cable: Commercial product	- MB91V210 - PGA420 - DSU4

Support Hardware for FR Family

Development Tools		Equipment for Program to Flash				Target Microcontroller
Evaluation board		Microcontroller Subject to Program	Parallel programmer		Serial programmer	
Fujitsu Microelectronics	Sunhayato Corp.	Product name (Package)	Maker name	Programming adapter	Maker name Product name	Product name
1) - Main board: MB91906EB - Daughter board: MB91901EB *: Simple substance use is possible. (Evaluation device is with mounting. Connection use of ICE is possible (DSU) .	Not supported	—	—	—	—	MB91101A
2) - Main board: MB91906EB - Daughter board: MB91902EB *: Simple substance use is possible. (Option: MB91101A , Connection use of SOPHIA SYSTEMS or YDC ICE is possible. (NQPAC socket Note: Fujitsu ICE is not connectable (Yamachi Electronics socket).	Not supported	—	—	—	—	
3) - Main board: MB91906EB - Simple target for ICE: MB91903EB *: Simple substance use is possible. (Evaluation device is with mounting. Connection use of ICE is possible (DSU) .	Not supported	—	—	—	—	
- Main board: MB91906EB - Daughter board: MB91907EB *: Connection use of ICE is possible (NQPAC socket is used).	Not supported	—	—	—	—	MB91107A MB91108
- Main board: MB91906EB - Daughter board: MB91907EB *: Simple substance use is possible (Option: MB911121 , Connection use of ICE is possible (NQPAC socket is used).	Not supported	—	—	—	—	MB91121
- Main board: MB91906EB - Daughter board: MB91910EB	Not supported	MB91F128 FPT-100P-M20	Flash Support Group *5	TE110-123F14AP	Yokogawa Digital Computer NETIMPRESS *6	MB91F127 MB91F128
- Main board: MB91906EB - Daughter board: MB91908EB *: Simple substance use is possible (Option: MB91F133A , Connection use of ICE is possible (NQPAC socket is used).	Not supported	MB91F133A FPT-144P-M08	Minato Electronics *4	MF00-871 (for MODEL1893/ 1931 MF05-871 (for MODEL1940)	Yokogawa Digital Computer NETIMPRESS *6	MB91133 MB91F133A
- Main board: MB91906EB - Daughter board: MB91911EB *: Simple substance use is possible (Option: MB91F155A , Connection use of ICE is possible (NQPAC socket is used).	Not supported	—	—	—	—	MB91151A
- Main board: MB91906EB - Daughter board: MB91911EB *: Simple substance use is possible. (Option: MB91F155A , Connection use of ICE is possible (NQPAC socket is used).	Not supported	MB91F155A FPT-144P-M08	Minato Electronics *4	MF13-1003A (for MODEL1893/ 1931 MF05-103 (for MODEL1940)	Yokogawa Digital Computer NETIMPRESS *6	MB91154 MB91155 MB91F155A
- Main board: MB91906EB - Daughter board: MB91911EB *: Simple substance use is possible. (Option: MB91F155A , Connection use of ICE is possible (NQPAC socket is used).	Not supported	MB91F158 FPT-120P-M24	Minato Electronics *4	MF13-1271 (for MODEL1893/ 1931) MF05-1271 (for MODEL1940)	—	MB91F158
Not supported	Not supported	MB91F211B FPT-100P-M20	Flash Support Group *5	Under development	—	MB91F211B
Not supported	Not supported	MB91F213A FPT-144P-M08	Flash Support Group *5	TEF110-91F213	—	MB91213A MB91F213A

(Continued)

Support Hardware for FR Family

Target Microcontroller		Development Tools		
Product name	Package (Lead pitch, body size) Package code	Fujitsu Microelectronics ICE		
		Adapter, header	Main unit, other	- Evaluation Device - Package - DSU type
MB91F223 MB91F223S MB91F224 MB91F224S	LQFP-144P (0.5mm, 20 × 20mm) FPT-144P-M08	- Adapter board: MB2198-130 - Header: MB2198-132 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK144SD-ND, HQPACK144SD)	- Main unit: MB2198-01 - Evaluation device: separately available - Debugger software: SOFTUNE - RS232C cable: Commercial product (9pin-9pin cross) - USB1.1 cable: Commercial product - LAN cable: Commercial product	- MB91V220 - PGA401 - DSU4
MB91233L MB91F233 MB91F233L	LQFP-120P (0.4mm, 14 × 14mm) FPT-120P-M24	- Adapter board: MB2198-130 - Header: MB2198-121 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK120SE, HQPACK120SE) .		- MB91V230 - PGA401 - DSU4
MB91248 *1 MB91248S *1 MB91F248 MB91F248S	LQFP-144P (0.5mm, 20 × 20mm) FPT-144P-M08	- Adapter board: MB2198-130 - Header: MB2198-123 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK144SD-ND, HQPACK144SD)		- MB91V245A - PGA401 - DSU4
MB91263B MB91264B MB91F264B	LQFP-100P (0.5mm, 14 × 14mm) FPT-100P-M20	- Adapter board: MB2198-130 - Header: MB2198-126 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK100SD-ND, HQPACK100SD) .		- MB91V260B - PGA401 - DSU4
	QFP-100P (0.65mm, 14 × 20mm) FPT-100P-M06	- Adapter board: MB2198-130 - Header: MB2198-122 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK100RB179-A, HQPACK100RB179) .		
MB91267A MB91267NA MB91F267A MB91F267NA	LQFP-64 (0.65mm, 12 × 12mm) FPT-64P-M09	- Adapter board: MB2198-130 - Header: MB2198-128 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK064SB, HQPACK064SB140) .		- MB91V265A - PGA401 - DSU4
MB91F273 MB91F273S MB91F278 MB91F278S	LQFP-100 (0.5mm, 14 × 14mm) FPT-100P-M20	- Adapter board: MB2198-130 - Header: MB2198-129 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK100SD-ND, HQPACK100SD) .		- MB91V280 - PGA401 - DSU4
MB91302A	LQFP-144 (0.4mm, 16 × 16mm) FPT-144P-M12	- Adapter board: MB2198-100 - Header: MB2198-101 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK144SE, HQPACK144SE) . - RAM board (Option) : MB2198-90		- MB91V301A - PGA179 - DSU4
MB91305	LQFP-176 (0.5 mm, 24 × 24 mm) FPT-176P-M07	-	- Main unit: MB2198-01 - DSU cable: MB2198-10 - Evaluation device: separately available - RS232C cable or USB cable or LAN cable - Debugger software: SOFTUNE	- MB91305 - LQFP-176 - DSU4
MB91306R MB91307B MB91307R	LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	- Adapter board: MB2197-170A - Header: MB2197-172 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK120SD, HQPACK120SD). - RAM board (Option) : MB2197-91		- MB91V307R - PGA135 - DSU3
MB91F312A	LQFP-144 (0.5 mm, 20 × 20 mm) FPT-144P-M08	-		- MB91FV310A - LQFP-144 - DSU4
MB91F313A	LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	-		- MB91F313A - LQFP-120 - DSU4

Support Hardware for FR Family

Development Tools		Equipment for Program to Flash				Target Microcontroller
Evaluation board		Microcontroller Subject to Program	Parallel programmer		Serial programmer	
Fujitsu Microelectronics	Sunhayato Corp.	Product name (Package)	Maker name	Programming adapter	Maker name Product name	Product name
Not supported	Not supported	MB91F223 MB91F223S MB91F224 MB91F224S FPT-144P-M08	Flash Support Group *5	TEF110-248F42AP	—	MB91F223 MB91F223S MB91F224 MB91F224S
- MB91920EB	Not supported	MB91F233 MB91F233L FPT-120P-M24	Minato Electronics *4	MF13-1330 (for MODEL1893/ 1931)	Yokogawa Digital Computer NETIMPRESS *6	MB91233L MB91F233 MB91F233L
			Flash Support Group *5	TEF110-233F20AP		
Not supported	Not supported	MB91F248 MB91F248S FPT-144P-M08	Flash Support Group *5	TEF110-248F42AP	Yokogawa Digital Computer NETIMPRESS *6	MB91248 *1 MB91248S *1 MB91F248 MB91F248S
- MB91921EB	- Main unit: BBF-2001-MB01 - Daughter unit: BBF-2001-FR100CAN2-NB - Main + Daughter unit: BBF-2001-FR100CAN2-NS	MB91F264B FPT-100P-M20	Minato Electronics *4	MF13-1605 (for MODEL1893/ 1931)	Flash Support Group *5 AF9101	MB91263B MB91264B MB91F264B
			Flash Support Group *5	TEF110-264F34AP	Yokogawa Digital Computer NETIMPRESS *6	
		MB91F264B FPT-100P-M06	Minato Electronics *4	MF13-1427 (for MODEL1893/ 1931)	Flash Support Group *5 AF9101	
			Flash Support Group *5	TEF110-264F21AP	Yokogawa Digital Computer NETIMPRESS *6	
Not supported	Not supported	MB91F267A MB91F267NA FPT-64P-M09	Flash Support Group *5	TEF110-267F43AP	Yokogawa Digital Computer NETIMPRESS *6	MB91267A MB91267NA MB91F267A MB91F267NA
Not supported	- Main unit: BBF-2004 - Daughter unit: BBF-2004-FR100SCL-NB - Main + Daughter unit: BBF-2004-FR100SCL-NS	MB91F272 FPT-100P-M20	Flash Support Group *5	TEF110-272F39AP	—	MB91F273 MB91F273S MB91F278 MB91F278S
- Main board: MB91906EB - Daughter board: MB91914EB	Not supported	—	—	—	—	MB91302A
- MB91925EB	-	—	—	—	—	MB91305
- Main board: MB91906EB - Daughter board: MB91915EB	Not supported	—	—	—	—	MB91306R MB91307B MB91307R
- MB91918EB	Not supported	MB91FV310A FPT-144P-M08	Minato Electronics *4	MF00-1526 (for MODEL1893/ 1931)	Not supported	MB91F312A
—	Not supported	MB91F313A FPT-120P-M21	Flash Support Group *5	TRF110-91F313	Yokogawa Digital Computer NETIMPRESS *6	MB91F313A

Support Hardware
for FR Family

(Continued)

Support Hardware for FR Family

Target Microcontroller		Development Tools		
Product name	Package (Lead pitch, body size) Package code	Fujitsu Microelectronics ICE		
		Adapter, header	Main unit, other	- Evaluation Device - Package - DSU type
MB91F314A	LQFP-120 (0.5 mm, 16 × 16 mm) FPT-120P-M21	-	- Main unit: MB2198-01 - DSU cable: MB2198-10 - Evaluation device: separately available - Debugger software: SOFTUNE - RS232C cable: Commercial product (9pin-9pin cross) - USB1.1 cable: Commercial product - LAN cable: Commercial product	- MB91F314A - LQFP-120 - DSU4
MB91316A MB91F318A MB91F318B	LQFP-176 (0.5 mm, 24 × 24 mm) FPT-176P-M07	-		- MB91FV319A - LQFP-176 - DSU4
MB91F318R MB91F318S	LQFP-176 (0.5 mm, 24 × 24 mm) FPT-176P-M07	-		- MB91FV319R - LQFP-176 - DSU4
MB91F345B MB91F346B *1	LQFP-100 (0.5 mm, 14 × 14 mm) FPT-100P-M20	-		- MB91F345B - MB91F346B - LQFP-100 - DSU4
MB91351A MB91352A MB91353A MB91F353A	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	- Adapter board: MB2198-110 - Header: MB2198-112 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK120SD, HQPACK120SD).	- Main unit: MB2198-01 - Evaluation device: separately available - Debugger software: SOFTUNE - RS232C cable: Commercial product (9pin-9pin cross) - USB1.1 cable: Commercial product - LAN cable: Commercial product	- MB91V350A - BGA420 - DSU4
MB91354A MB91355A MB91F355A MB91F356B	LQFP-176 (0.5mm, 24 × 24mm) FPT-176P-M07	- Adapter board: MB2198-110 - Header: MB2198-111 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled: NQPACK176SD, HQPACK176SD).		- MB91V350A - BGA420 - DSU4
MB91F362GB	QFP-208 (0.5 mm,28 × 28 mm) FPT-208P-M04	- Adapter board: MB2197-120 - Header: MB2197-127 *3 Note: Tokyo Eletech IC socket is required separately (1-set is bundled.: NQPACK208SD, HQPACK208SD) .	- Main unit: MB2198-01 - DSU cable: MB2198-10 - Evaluation device: separately available - Debugger software: SOFTUNE - RS232C cable: Commercial product (9pin-9pin cross) - USB1.1 cable: Commercial product - LAN cable: Commercial product	- MB91FV360GA - PGA401 - DSU3
MB91F364G	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	- Adapter board: MB2197-120 - Header: MB919360-120		- MB91FV360GA - PGA401 - DSU3
MB91F365GB	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21			
MB91366GA MB91F366GB	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21			
MB91F367GB	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21	- Adapter board: MB2197-120 - Header: MB919360-120		- MB91FV360GA - PGA401 - DSU3
MB91F368GB	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21			
MB91F376G	LQFP-120 (0.5mm, 16 × 16mm) FPT-120P-M21			
MB91F369GA	QFP-160 (0.65mm,28 × 28mm) FPT-160P-M15	- Adapter board: MB2197-120 - Header: MB919360-160	- MB91FV360GA - PGA401 - DSU3	
MB91461	LQFP-176P (0.5 mm, 24 × 24 mm) FPT-176P-M07	—		- MB91461 - LQFP176 - DSU4
MB91F463N	LQFP-64P (0.65 mm, 12 × 12 mm) FPT-64P-M23	- Adapter board: MB2198-300A - Header: MB2198-304A-E		- MB91V460 - BGA660 - DSU4
MB91F464A	LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M20	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-606-E (non level shifter)		- MB91V460 - BGA660 - DSU4

Support Hardware for FR Family

Development Tools		Equipment for Program to Flash				Target Microcontroller
Evaluation board		Microcontroller Subject to Program	Parallel programmer		Serial programmer	
Fujitsu Microelectronics	Sunhayato Corp.	Product name (Package)	Maker name	Programming adapter	Maker name Product name	Product name
—	Not supported	MB91F314A FPT-120P-M21	Flash Support Group *5	TRF110-91F313	—	MB91F314A
—	Not supported	MB91FV319A FPT-176P-M07	Minato Electronics *4	MF05-1695 (for MODEL1940)	Not supported	MB91316A MB91F318A MB91F318B
—	Not supported	MB91FV319R FPT-176P-M07	Flash Support Group *5	TEF110-91FV319R	Yokogawa Digital Computer NETIMPRESS *6	MB91F318R MB91F318S
Not supported	Not supported	—	—	—	Yokogawa Digital Computer NETIMPRESS *6	MB91F345B MB91F346B *1
- Main board: MB91906EB - Daughter board: MB91922EB	Not supported	MB91F353A FPT-120P-M21	Minato Electronics *4	Under development	Yokogawa Digital Computer NETIMPRESS *6	MB91351A MB91352A MB91353A MB91F353A
			Flash Support Group *5	TEF110-353F18AP		
- Main board: MB91906EB - Daughter board: MB91916EB	Not supported	MB91F355A FPT-176P-M07	Minato Electronics *4	MF13-1361 (for MODEL1893/ 1931)	Yokogawa Digital Computer NETIMPRESS *6	MB91354A MB91355A MB91F355A MB91F356B
			Flash Support Group *5	TEF110-355F19AP		
- Main board: MB91906EB - Daughter board: MB91913EB *: Simple substance use is possible (Option: MB91F362GA , Connection use of ICE is possible (NPACK socket is used).	Not supported	MB91F362GA FPT-208P-M04	Minato Electronics *4	MF00-892 (for MODEL1893/ 1931) MF05-892 (for MODEL1940)	Yokogawa Digital Computer NETIMPRESS *6	MB91F362GB
Not supported	Not supported	MB91F364G FPT-120P-M21	Minato Electronics *4	MF00-964 (for MODEL1893/ 1931)	Not supported	MB91F364G
Not supported	Not supported	MB91F365GB FPT-120P-M21	Minato Electronics *4	MF00-964 (for MODEL1893/ 1931)	Not supported	MB91F365GB
Not supported	Not supported	MB91F366GB FPT-120P-M21	Minato Electronics *4	MF00-964 (for MODEL1893/ 1931)	Not supported	MB91366GA MB91F366GB
Not supported	Not supported	MB91F367GB FPT-120P-M21	Minato Electronics *4	MF00-964 (for MODEL1893/ 1931)	Not supported	MB91F367GB
Not supported	Not supported	MB91F368GB FPT-120P-M21	Minato Electronics *4	MF00-964 (for MODEL1893/ 1931)	Not supported	MB91F368GB
Not supported	Not supported	MB91F376G FPT-120P-M21	Minato Electronics *4	MF00-964 (for MODEL1893/ 1931)	Not supported	MB91F376G
Under development	Not supported	MB91F369GA FPT-160P-M15	Minato Electronics *4	MF00-1272 (for MODEL1893/ 1931) MF05-1272 (for MODEL1940)	Yokogawa Digital Computer NETIMPRESS *6	MB91F369GA
Not supported	Not supported	—	—	—	—	MB91461
Not supported	Not supported	—	—	—	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F463N
Not supported	Not supported	—	—	—	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F464A

(Continued)

Support Hardware
for FR Family

Support Hardware for FR Family

Target Microcontroller		Development Tools		
Product name	Package (Lead pitch, body size) Package code	Fujitsu Microelectronics ICE		
		Adapter, header	Main unit, other	Evaluation Device - Package - DSU type
MB91F465K	LQFP-120P (0.5 mm, 16 × 16 mm) FPT-120P-M21	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-609-E (non level shifter)	- Main unit: MB2198-01 - DSU cable: MB2198-10 - Evaluation device: separately available - Debugger software: SOFTUNE - RS232C cable: Commercial product (9pin-9pin cross) - USB1.1 cable: Commercial product - LAN cable: Commercial product	- MB91V460 - BGA660 - DSU4
MB91F465P	LQFP-176P (0.5 mm, 24 × 24 mm) FPT-176P-M07	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-616-E (level shifter)		-
MB91F465X	LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M20	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-602-E (non level shifter) - FlexRay expansion board: MB2198-603-E		- MB91V460 - BGA660 - DSU4
MB91F467R	LQFP-176P (0.5 mm, 24 × 24 mm) FPT-176P-M07	- Adapter board: MB2198-300A - Header: MB2198-305-E (level shifter)		- MB91V460 - BGA660 - DSU4
	LQFP-176P (0.5 mm, 24 × 24 mm) FPT-176P-M07	- Adapter board: MB2198-600 - Header: MB2198-601-E (non level shifter)		- MB91V460 - BGA660 - DSU4
MB91F465B MB91F467B	LQFP-144P (0.5 mm, 20 × 20 mm) FPT-144P-M08	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-604B-E (non level shifter) - Header: MB2198-634B-E (level shifter) - Header: MB2198-664-E (single chip)		- MB91V460 - BGA660 - DSU4
MB91F467C	QFP-144P (0.5 mm, 20 × 20 mm) FPT-144P-M08	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-607-E (non level shifter)		- MB91V460 - BGA660 - DSU4
MB91F465D MB91F467D	LQFP-208P (0.5 mm, 28 × 28 mm) FPT-208P-M07	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-605-E (non level shifter) - Header: MB2198-635-E (level shifter)		- MB91V460 - BGA660 - DSU4
MB91F467M	LQFP-216P (0.4 mm, 24 × 24 mm) FPT-216P-M01	—		- MB91F467M - LQFP216 - DSU4
MB91F467S	LQFP-176P (0.5 mm, 24 × 24 mm) FPT-176P-M07	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-649-E		- MB91V460 - MBGA660 - DSU4
MB91F467T	QFP-144P (0.5 mm, 20 × 20 mm) FPT-144P-M08	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-620-E - Header: MB2198-650-E (level shifter)		- MB91V460 - MBGA660 - DSU4
MB91F469G	BGA-320P	- Adapter board: MB2198-600A5 - Adapter board: MB2198-600A4 (GHS) - Header: MB2198-608-E (non level shifter) - Header: MB2198-638-E (level shifter)		- MB91V460 - BGA660 - DSU4
MB91F475 MB91F478 MB91F479	LQFP-144P (0.4 mm, 16 × 16 mm) FPT-144P-M12	- Adapter board: MB2198-160 - Header: MB2198-161 - Pseudo power-on debug adapter: MB2198-169		- MB91FV470 - BGA224 - DSU4
	PFBGA-144P (0.8 mm, 12 × 12 mm) BGA-144P-M06	—		- MB91FV470 - BGA224 - DSU4
MB91F482 MB91F487	LQFP-100P (0.5 mm, 14 × 14 mm) FPT-100P-M20	- Adapter board: MB2198-160 - Header: MB2198-162 - Pseudo power-on debug adapter: MB2198-169		- MB91FV470 - BGA224 - DSU4

*1: Under development

*2: A Yamaichi Electronics IC socket is required for connection of an adapter.

Contact details: TEL: (81-3)3778-6104, FAX: (81-3)3778-6171, http://www.yamaichi.co.jp/index_e.shtml

*3: A Tokyo Eletech IC socket is required for connection of an adapter (side of user's board)

Contact details: TEL: (81-3)5295-1661, FAX: (81-3)5295-1775, http://www.tetc.co.jp/e_tet.htm

*4: MINATO ELECTRONICS INC.

Contact details: TEL: (81)45-591-5611, FAX: (81-45)592-2854, http://www.minato.co.jp/index_e.asp

*5: Flash Support Group, Inc.

Contact details: TEL: (81)53-459-1050, FAX: (81)53-455-6020, <http://www.j-fsg.co.jp/e/top.html>

*6: Yokogawa Digital Computer Corporation

Contact details: TEL: (81)42-333-6224, FAX: (81)42-352-6107, <http://www.yokogawa-digital.com/emb/en/index.html>

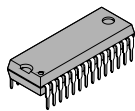
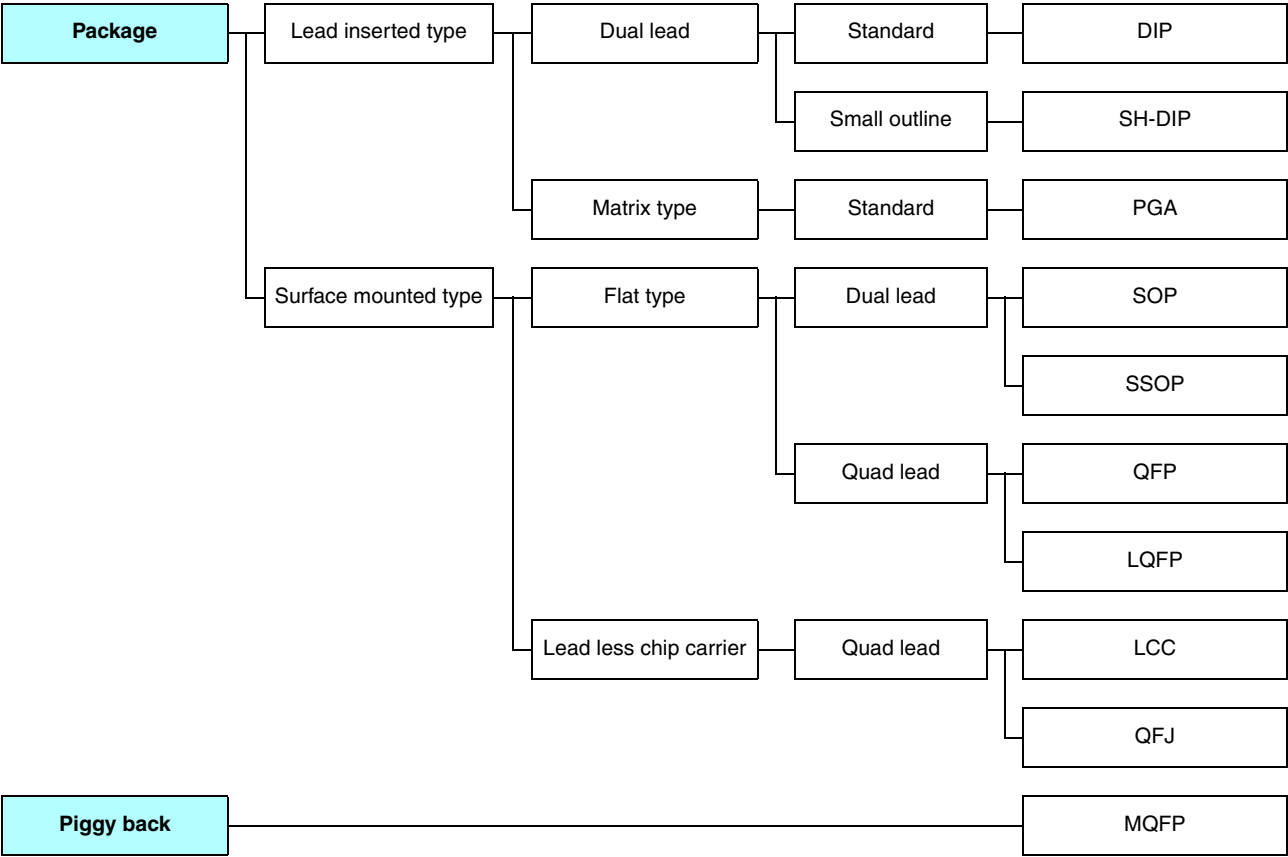
Support Hardware for FR Family

Development Tools		Equipment for Program to Flash				Target Microcontroller
Evaluation board		Microcontroller Subject to Program	Parallel programmer		Serial programmer	
Fujitsu Microelectronics	Sunhayato Corp.	Product name (Package)	Maker name	Programming adapter	Maker name Product name	Product name
Not supported	Not supported	—	—	—	—	MB91F465K
Not supported	Not supported	—	—	—	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F465P
Not supported	Not supported	—	—	—	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F465X
Not supported	Not supported	—	—	TEF110-91F467RA	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F467R
Not supported	Not supported	—	—	—	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F465B MB91F467B
Not supported	Not supported	—	—	—	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F467C
Not supported	Not supported	—	—	TRF029-91F467DA	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F465D MB91F467D
Not supported	Not supported	—	—	—	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F467M
Not supported	Not supported	—	—	—	—	MB91F467S
Not supported	Not supported	—	—	—	—	MB91F467T
Not supported	Not supported	—	—	—	—	MB91F469G
Not supported	Not supported	—	—	TRF029-91F479-LQFP	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F475 MB91F478 MB91F479
Not supported	Not supported	—	—	TRF029-91F479-FBGA	Yokogawa Digital Computer NETIMPRESS *1, *6	
Not supported	Not supported	—	—	TRF110-91F487	Yokogawa Digital Computer NETIMPRESS *1, *6	MB91F482 MB91F487

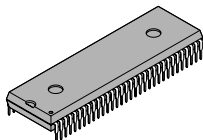
Support Hardware
for FR Family

Package Line-up

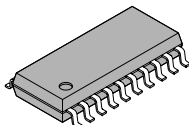
Package Line-up



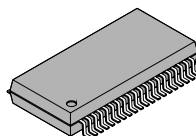
DIP-28P



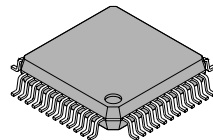
SH-DIP-64P



SOP-20P



SSOP-40P



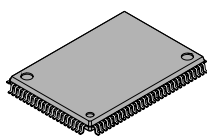
QFP-48P

Package Line-up

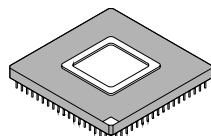
Name of package	Description	Lead pitch (mm)
DIP	Dual In-line Package	2.54
SH-DIP *	Shrink Dual In-line Package	1.778
PGA	Pin Grid Array Package	1.27/2.54
SOP	Small Outline Package (straight lead) Small Outline L-Leaded Package (gull wing lead)	1.27
SSOP	Shrink Small Outline L-Leaded Package	0.65/0.80/1.00
QFP	Quad Flat Package (straight lead), Quad Flat L-Leaded Package (gull wing lead)	0.40/0.50/ 0.65/0.80/1.00
LQFP *	Low-Profile Quad Flat L-Leaded Package	0.40/0.50/0.65/0.80
LCC	Leadless Chip Carrier	1.016
QFJ	Quad Flat J-Leaded Package	1.27
MQFP	Quad Flat Type Module	0.50/0.65/0.80/1.00

*: Package name by Fujitsu Microelectronics.

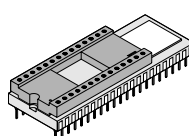
Note: Plastic surface mount packages have some limitations regarding mounting conditions. Please check before using



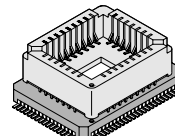
LQFP-100P



PGA-256C



MDIP-42C



MQFP-80C

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MB89131	8	DS07-12510-10E	MB89F538	12	DS07-12547-7E
MB89133A	8	DS07-12510-10E	MB89F538L	12	DS07-12547-7E
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MB89143A	26	DS07-12528-3E	MB89P133A	8	DS07-12510-10E
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MB89193A	6	DS07-12512-8E	MB89P538	12	DS07-12547-7E
MB89193AH	6	DS07-12512-8E	MB89P558A	22	DS07-12550-2E
MB89195	6	DS07-12512-8E	MB89P568	20	DS07-12555-2E
MB89195A	6	DS07-12512-8E	MB89P585B	28	DS07-12543-5E
MB89202	10	DS07-12562-2E	MB89P585BW	28	DS07-12543-5E
MB89202Y	10	DS07-12562-2E	MB89P589B	28	DS07-12543-5E
MB89475	12	DS07-12552-2E	MB89P637	14	DS07-12531-3E
MB89485	18	DS07-12559-2E	MB89P677A	14	DS07-12537-2E
MB89485L	18	DS07-12559-2E	MB89P808	22	DS07-12549-2E
MB89498	24	DS07-12560-2E	MB89P825	18	DS07-12513-7E
MB89535A	12	DS07-12547-7E	MB89P867	26	DS07-12504-6E
MB89537A	12	DS07-12547-7E	MB89P928	20	DS07-12526-2E
MB89537AC	12	DS07-12547-7E	MB89P935B	10	DS07-12541-7E
MB89538A	12	DS07-12547-7E	MB89P945	16	DS07-12536-6E
MB89538AC	12	DS07-12547-7E	MB89P985	16	-
MB89557A	22	DS07-12550-2E	MB89PV130A	8	-
MB89558A	22	DS07-12550-2E	MB89PV140	26	-
MB89567A	20	DS07-12555-2E	MB89PV190	6	-
MB89567AC	20	DS07-12555-2E	MB89PV190A	6	-
MB89583B	28	DS07-12543-5E	MB89PV470	12	DS07-12552-2E
MB89583BW	28	DS07-12543-5E	MB89PV480	18	DS07-12559-2E
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MB89635R	14	DS07-12531-3E	MB89PV560	20	DS07-12555-2E
MB89636R	14	DS07-12531-3E	MB89PV630	14	DS07-12531-3E
MB89637R	14	DS07-12531-3E	MB89PV670A	14	DS07-12537-2E
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MB89675AR	14	DS07-12537-2E	MB89PV820	18	DS07-12513-7E
MB89677AR	14	DS07-12537-2E	MB89PV920	20	DS07-12526-2E
MB89803	22	DS07-12549-2E	MB89PV930A	10	DS07-12541-7E
MB89805	22	DS07-12549-2E	MB89PV940	16	DS07-12536-6E
MB89821	18	DS07-12513-7E	MB89PV980	16	-
MB89823R	18	DS07-12513-7E	MB89V201	10	DS07-12562-2E
MB89825	18	DS07-12513-7E	MB89W867	26	DS07-12504-6E
MB89865	26	DS07-12504-6E	MB90333A	138	DS07-13734-6E
MB89867	26	DS07-12504-6E	MB90337	138	DS07-13735-3E
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