

# SK-FM3-176PMC-ETHERNET

#### Hardware V2.0 / Documentation V1.0



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This board and its deliverables must only be used for test applications in an evaluation laboratory environment.



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#### **Overview**

- MCU Features, Board Features & Contents
- Test it
- The Hardware / Pin Overview
- The Jumper Table / Jumper Default
- Board Power
- Software Examples & Tools
- Flash Programming
- JTAG / CMSIS-DAP
- IAR-Embedded Workbench
- KEIL µVision
- Workshops, Contacts & More



- Additional documents
  - Schematic (HW version 2.0) (1.1)
  - Data sheet MB9BD10T Series
    - Peripheral Manual (errata)
      - Timer part (errata)
      - Analog part (errata)
      - Communication part (errata)
      - Ethernet part
    - Flash programming manual (errata)



#### Features of the microcontroller

- SK-FM3-176PMC-ETHERNET is a versatile evaluation board based on the Spansion ARM® Cortex-M3<sup>TM</sup> device MB9BFD18T
- The MB9BD10T Series includes the following features:
  - 32-bit ARM Cortex-M3 Core with up to 144MHz operation
  - Up to 1 Mbyte high-speed flash memory with true 72MHz and Flash Accelerator System
  - Up to 128Kbyte on-chip SRAM memory
  - Wide supply voltage range from 2.7 to 5.5 V
  - 2 Ethernet MAC channels
  - 2 USB interface channels
  - 8 Multi-function Serial Interface channels (for UART, CSIO (SPI), I2C and LIN)
  - 8 DMA Controller channels
  - 3 12-bit A/D Converters, 1MSp, 32 channels max.
  - External bus interface
  - 16 Base Timer channels (PWM, PPG, reload or PWV timers selectable)
  - Up to 154 fast General Purpose I/O Ports
  - 3 Multi-function Timer units(can be used to achieve the motor control)
  - 3 Quadrature Position/Revolution Counter (QPRC) channels
  - Dual Timer (32/16bit Down Counter)
  - Resource Pin Relocation
  - Hardware Watchdog
  - CRC (Cyclic Redundancy Check) Accelerator
  - Five dynamically selectable clock sources (2 external oscillator, 2 internal CR oscillator, Main PLL)
  - Clock Supervisor (CSV)
  - Low Voltage Detector (LVD) and Low Power Mode

RC oscillator +/-2% Clock Supervisor Subclock (option)	ARM Cortex-M3 – CPU 144MHz (max) 2.7-5.5V Main CLK: 4MHz		ICU x 4ch FRTim x 3ch Waveform Generator
Low Voltage Detector 2ch	MAIN RC CLK: 4MHz SUB RC CLK: 100kHz	PPG 9ch	QDU 3ch
Memory Protection Unit		Base Timer 16ch	External IRQs 16ch + NMI
SWJ/TPIU/ETMDebug Ports		Dual Timer	DMA 8ch
MFS(UART/SPI/I <sup>2</sup> C) 8ch	Package: LQFP144 <sup>*1</sup> , LQFP176 <sup>*2</sup>	Watch Counter	CRC
USB FS Host+Function 2ch each	MB9BFD16S/T FLASH SRAM 512K SRAM 64K	Resource Pin Relocation	Hardware Watchdog
CAN (32 MSB) 2ch	MB9BFD17S/T (FLASH) (SRAM) 785K (SRAM)	12-bit ADC	
Ethernet MAC 10/100MBit 2ch	MB9BFD18S/T (FLASH) (SRAM) 1MB (128K)	12-bit ADC 24ch" 32ch"2	
External Bus Interface 8/16 Data, 19 <sup>11</sup> /25 <sup>12</sup> Addr, 8CS		12-bit ADC	

\*I ME98D10S: LQFP144
\*2 ME98D10T: LQFP176

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#### Features of the board

- Features of the SK-FM3-176PMC-ETHERNET board:
  - Microcontroller MB9BFD18T
  - 2x Ethernet connectors
  - 2x USB-Host (Type-A connector)
  - 1x USB-Device (Type-B connector)
  - 1x USB-to-serial converter (Type-B connector)
    - UART and on-board JTAG simultaneously (version 1.1: OpenOCD, version 2.0: CMSIS DAP)
  - 1x High-speed CAN-Transceiver
  - 1x UART-Transceiver (SUB-D9 connector)
  - JTAG and Trace Interface each on a 20 pin-header
  - 2x LED-Display (7-Segment)
  - 2x pushbutton (User buttons), rotary encoder, potentiometer
  - 1x Reset-button, Reset-LED
  - All 176 pins routed to pin-header
  - On-board 5V and 3V voltage regulators to supply MCU, Power-LED
  - 4x Power supply options: USB, USB-Device, JTAG or external 8V to 12V
  - Voltage filter for ADC
  - 3x Motor-Control-Interface for e.g. SK-POWER-3P-LV2-MC
  - Multicon-Interface to connect e.g. the Fujitsu SK-TSC-1127S-SB

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#### **Contents SK-FM3-176PMC-ETHERNET**

- The SK-FM3-176PMC-ETHERNET box contains
  - The SK-FM3-176PMC-ETHERNET evaluation board
  - USB cable
  - CD: Documentation, software examples and development utilities
  - 1-page flyer





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#### Test it

- The microcontroller on the SK-FM3-176PMC-ETHERNET is already preprogrammed with an example application (<drive:>\Examples\mb9bf61xt\_ethernet\_lwip\_v13.zip).
  - Connect the SK-FM3-176PMC-ETHERNET via USB (X11) with the PC
  - Verify that jumper J5 is in the USBPWR1 position
  - Switch SW1 is set to RUN
  - Press the Reset-button
  - The SK-FM3-176PMC-ETHERNET's display will show "00"
  - Using pushbuttons SW3 and SW2 increase or decrease value
- Install the USB Driver first <drive:>\drivers\driverinstaller.exe
  - Check the availibility for virtual COM port
  - e.g. Windows Device Manager
  - Open a serial terminal tool
  - e.g. Spansion Serial Port Viewer
     <drive:><u>\tools\serialportviewer\setup.exe</u>
  - Settings 115200 baud, 8N1
  - Board system status is printed to the console.
- Connect X15 (static IP address 192.168.1.20) or X16 (DHCP) to a local network
  - DHCP address can be found out via serial debug console (see above)
  - Point your webbrowser to board's IP address

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You finished successfully the first test

# **Congratulations!**

 Now you will get more details about the SK-FM3-176PMC-ETHERNET

- You will learn more about
  - The on-board features
  - How to program the Flash
  - How to start with IAR-Embedded-Workbench and KEIL  $\mu Vision$





### Hardware

#### The Hardware (Top Side) – Function Overview



#### Pin-List SK-FM3-176PMC-ETHERNET (1/8)

Pin	Function	Description
1	vcc	MCUVCC
2	PA0/RTO20_0/TIOA08_0/FRCK1_0	Reset Multicon Connector / INT0
3	PA1/RTO21_0/TIOA09_0/IC10_0	Hall Sensor1-3 /INT1
4	PA2/RTO22_0/TIOA10_0/IC11_0	Hall Sensor1-4
5	PA3/RTO23_0/TIOA11_0/IC12_0	Hall Sensor1-5
6	PA4/RTO24_0/TIOA12_0/IC13_0/RX0_2/INT03_0	TINT Multicon Connector
7	PA5/RTO25_0/TIOA13_0/TX0_2/INT10_2	GINT Multicon Connector
8	P05/TRACED0/TIOA05_2/SIN4_2/INT00_1	UART4 ( RXD)/ TRACED0
9	P06/TRACED1/TIOB05_2/SOT4_2/INT01_1	UART4 ( TXD)/ TRACED1
10	P07/TRACED2/ADTG_0/SCK4_2	TRACED2
11	P08/TRACED3/TIOA00 2/CTS4 2	CTS4/TRACED3
12	P09/TRACECLK/TIOB00_2/RTS4_2/DTTI2X_0	RTS/TRACECLK
13	P50/INT00_0/AIN0_2/SIN3_1/RT010_0/IC20_0/MOEX_0	MotorDrive1 PWM1H / SEG1-A
14	P51/INT01 0/BIN0 2/SOT3 1/RT011 0/IC21 0/MWEX 0	MotorDrive1 PWM1L /SEG1-B
15	P52/INT02_0/ZIN0_2/SCK3_1/RT012_0/IC22_0/MDQM0_0	MotorDrive1 PWM2H /SEG1-C
16	P53/SIN6_0/TIOA01_2/INT07_2/RTO13_0/IC23_0/MDQM1_0	MotorDrive1 PWM2L / SEG1-D
17	P54/SOT6 0/TIOB01 2/RTO14 0/MALE 0	MotorDrive1 PWM3H /SEG1-E
18	P55/SCK6 0/ADTG 1/RTO15 0/MRDY 0	MotorDrive1 PWM3L /SEG1-F
19	P56/SIN1 0/INT08 2/TIOA09 2/DTTI1X 0/MNALE 0	MotorDrive1 FAULT /SEG1-G
20	P57/SOT1 0/TIOB09 2/INT16 1/MNCLE 0	SEG1-DP
21	P58/SCK1_0/TIOA11_2/INT17_1/MNWEX_0	
22	P59/SIN7_0/RX1_1/TIOB11_2/INT09_2/MNREX_0	



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Pin	Function	Description
23	P5A/SOT7_0/TX1_1/TIOA13_1/INT18_1/MCSX0_0	
24	P5B/SCK7_0/TIOB13_1/INT19_1/MCSX1_0	
25	P5C/TIOA06_2/INT28_0/IC20_1	
26	P5D/TIOB06_2/INT29_0/DTTI2X_1	MotorDrive2 FAULT
27	VSS	GND
28	P30/AIN0_0/TIOB00_1/INT03_2	QPRC0-A
29	P31/BIN0_0/TIOB01_1/SCK6_1/INT04_2	QPRC0-B
30	P32/ZIN0_0/TIOB02_1/SOT6_1/INT05_2	QPRC0-Z
31	P33/INT04_0/TIOB03_1/SIN6_1/ADTG_6	
32	P34/FRCK0_0/TIOB04_1/TX0_1	CANL
33	P35/IC03_0/TIOB05_1/RX0_1/INT08_1	CANH
34	P36/IC02_0/SIN5_2/INT09_1/TIOA12_2/MCSX2_0	Hall Sensor0-5
35	P37/IC01_0/SOT5_2/INT10_1/TIOB12_2/MCSX3_0	Hall Sensor0-4
36	P38/IC00_0/SCK5_2/INT11_1/MCLKOUT_0	Hall Sensor0-3
37	P39/DTTI0X_0/ADTG_2	MotorDrive0 FAULT
38	P3A/RTO00_0/TIOA00_1	MotorDrive0 PWM1H
39	P3B/RT001 0/TIOA01 1	MotorDrive0 PWM1L
40	P3C/RTO02 0/TIOA02 1	MotorDrive0 PWM2H
41	P3D/RT003 0/TIOA03 1	MotorDrive0 PWM2L
42	P3E/RT004_0/TIOA04_1	MotorDrive0 PWM3H
43	P3F/RTQ05_0/TIQ405_1	MotorDrive0 PWM3L
44	VSS	GND
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Pin	Function	Description
45	vcc	MCUVCC
46	P40/TIOA00_0/RTO10_1/INT12_1	
47	P41/TIOA01_0/RT011_1/INT13_1	
48	P42/TIOA02_0/RTO12_1	
49	P43/TIOA03_0/RTO13_1/ADTG_7	
50	P44/TIOA04_0/RTO14_1	U14 LAN reset 'nRST'
51	P45/TIOA05 0/RTO15 1	U12 LAN reset 'nRST'
52	 C	C-pin
53	VSS	GND
54	VCC	MCUVCC
55	P46/X04	Subclock (optional)
56	P47/X1A	Subclock (optional)
57		Key button 'Reset'
58	P48/DTTI1X_1/INT14_1/SIN3_2	
59	P49/TIOB00_0/IC10_1/AIN0_1/SOT3_2	
60	P4A/TIOB01_0/IC11_1/BIN0_1/SCK3_2/MADATA00_0	
61	P4B/TIOB02_0/IC12_1/ZIN0_1/MADATA01_0	
62	P4C/TIOB03_0/IC13_1/SCK7_1/AIN1_2/MADATA02_0	
63	P4D/TIOB04_0/FRCK1_1/SOT7_1/BIN1_2/MADATA03_0	
64	P4E/TIOB05_0/INT06_2/SIN7_1/ZIN1_2/MADATA04_0	
65	P70/TX0_0/TIOA04_2/MADATA05_0	SEG2-A
66	P71/RX0 0/INT13 2/TIOB04 2/MADATA06 0	SEG2-B



#### Pin-List SK-FM3-176PMC-ETHERNET (4/8)

Pin	Function	Description
67	P72/SIN2_0/INT14_2/AIN2_0/MADATA07_0	SEG2-C / QPRC2-A
68	P73/SOT2_0/INT15_2/BIN2_0/MADATA08_0	SEG2-D/ QPRC2-B
69	P74/SCK2 0/ZIN2 0/MADATA09 0	SEG2-E/ QPRC2-Z
70	P75/SIN3 0/ADTG 8/INT07 1/MADATA10 0	SEG2-F
71	P76/SOT3 0/TIOA07 2/INT11 2/MADATA11 0	SEG2-G
72	P77/SCK3 0/TIOB07 2/INT12 2/MADATA12 0	SEG2-DP
73	P78/AIN1 0/TIOA15 0/MADATA13 0	SW Rotary-A /QPRC1-A
74	P79/BIN1 0/TIOB15 0/INT23 1/MADATA14 0	SW Rotary-B /QPRC1-B
75	P7A/ZIN1 0/INT24 1/MADATA15 0	QPRC1-Z
76	P7B/TIOB07_0/INT10_0	
77	P7C/TIOA07_0/INT11_0	
78	P7D/TIOA14_1/FRCK2_1/INT12_0	USB Host-Overcurrent
79	P7E/TIOB14_1/IC21_1/INT24_0	Hall Sensor2-3
80	P7F/TIOA15_1/IC22_1/INT25_0	Hall Sensor2-4
81	PF0/TIOB15_1/SIN1_2/INT13_0/IC23_1	Hall Sensor2-5 / SIN Multicon Connector
82	PF1/TIOA08_1/SOT1_2/INT14_0	SDA1 Multicon Connector
83	PF2/TIOB08 1/SCK1 2/INT15 0	SCL1 Multicon Connector
84	PE0/MD1	
85	MD0	Programming Switch S1
86	PE2/X0	4MHz Crystal
87	PE3/X1	4MHz Crystal
88	VSS	GND



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#### Pin-List SK-FM3-176PMC-ETHERNET (5/8)

Pin	Function	Description
89	VCC	MCUVCC
90	P10/AN00/MCSX7_0	Motor Drive0-U_DC_BUS
91	P11/AN01/SIN1_1/INT02_1/RX1_2/FRCK0_2/MCSX6_0	Motor Drive0-U_PH_A
92	P12/AN02/SOT1_1/TX1_2/IC00_2/MCSX5_0	Motor Drive0-U_PH_B
93	P13/AN03/SCK1_1/IC01_2/MCSX4_0	Motor Drive0-U_PH_C
94	P14/AN04/SIN0 1/INT03 1/IC02 2/MAD00 0	Motor Drive0-I_DC_BUS
95	P15/AN05/SOT0 1/IC03 2/MAD01 0	Motor Drive0-I_PH_A
96	P16/AN06/SCK0 1/INT20 1/MAD02 0	Motor Drive0-I_PH_B
97	P17/AN07/SIN2 2/INT04 1/MAD03 0	Motor Drive0-I_PH_C
98	P18/AN08/SOT2 2/INT21 1/MAD04 0	Motor Drive1-U_DC_BUS
99	P19/AN09/SCK2 2/INT22 1/MAD05 0	Motor Drive1-U_PH_A
100	P1A/AN10/SIN4 1/INT05 1/TIOA13 2/IC00 1/MAD06 0	Motor Drive1-U_PH_B
101	P1B/AN11/SOT4 1/INT25 1/TIOB13 2/IC01 1/MAD07 0	Motor Drive1-U_PH_C
102	P1C/AN12/SCK4 1/INT26 1/TIOA14 2/IC02 1/MAD08 0	Motor Drive1-I_DC_BUS
103	P1D/AN13/CTS4 1/INT27 1/TIOB14 2/IC03 1/MAD09 0	Motor Drive0-I_PH_A
104	P1E/AN14/RTS4 1/INT28 1/TIOA15 2/DTTI0X 1/MAD10 0	Motor Drive0-I_PH_B
105	P1F/AN15/ADTG 5/INT29 1/TIOB15 2/FRCK0 1/MAD11 0	Motor Drive0-I_PH_C
106	AVCC	AVCC
107	AVRH	AVRH
108	AVSS	GND
109	VSS	GND
110	PB0/AN16/TIOA09_1/SIN7_2/INT16_0	Motor Drive2-U_DC_BUS



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### Pin-List SK-FM3-176PMC-ETHERNET (6/8)

Pin	Function	Description
111	PB1/AN17/TIOB09_1/SOT7_2/INT17_0	Motor Drive2-U_PH_A
112	PB2/AN18/TIOA10_1/SCK7_2/INT18_0	Motor Drive2-U_PH_B
113	PB3/AN19/TIOB10_1/INT19_0	Motor Drive2-U_PH_C
114	PB4/AN20/TIOA11_1/SIN0_2/INT20_0	Motor Drive2-I_DC_BUS
115	PB5/AN21/TIOB11 1/SOT0 2/INT21 0/AIN2 2	Motor Drive2-I_PH_A
116	PB6/AN22/TIOA12 1/SCK0 2/INT22 0/BIN2 2	Motor Drive2-I_PH_B
117	PB7/AN23/TIOB12 1/INT23 0/ZIN2 2	Motor Drive2-I_PH_C
118	P29/AN24/MAD12_0	
119	P28/AN25/ADTG_4/INT09_0/RTO05_1/MAD13_0	
120	P27/AN26/INT02_2/RTO04_1/MAD14_0	
121	P26/AN27/SCK2_1/RTO03_1/MAD15_0	
122	P25/AN28/SOT2_1/TX1_0/RTO02_1/MAD16_0	
123	P24/AN29/SIN2_1/INT01_2/RX1_0/RTO01_1/MAD17_0	
124	P23/AN30/SCK0_0/TIOA07_1/RTO00_1	Variable resistor
125	P22/AN31/SOT0_0/TIOB07_1/ZIN1_1	UART0 ( TXD)
126	P21/SIN0_0/INT06_1/BIN1_1	UART0 ( RXD)
127	P20/INT05_0/CROUT_0/UHCONX1/AIN1_1/MAD18_0	
128	PF6/FRCK2_0/NMIX	
129	USBVCC1	USB- Power supply
130	P82/UMP1	USB Data -
131	P82/UDP1	USB Data +
132	VSS	GND



#### Pin-List SK-FM3-176PMC-ETHERNET (7/8)

Pin	Function	Description
133	vcc	MCUVCC
134	P00/TRSTX	JTAG TRSTX
135	P01/ <b>TCK</b>	JTAG TCK / TRACE TCK
136	P02/TDI	JTAG TDI/ TRACE TDI
137	P03/TMS	JTAG TMC/ TRACE TMC
138	P04/ <b>TDO</b>	JTAG TMC/ TRACE TMC
139	P90/TIOB08 0/RTO20 1/INT30 0/MAD19 0	Motor Drive2-PWM1H
140	P91/TIOB09 0/RTO21 1/INT31 0/MAD20 0	Motor Drive2-PWM1L
141	P92/TIOB10 0/RTO22 1/SIN5 1/MAD21 0	Motor Drive2-PWM2H
142	P93/TIOB11 0/RTO23 1/SOT5 1/MAD22 0	Motor Drive2-PWM2L
143	P94/TIOB12 0/RTO24 1/SCK5 1/INT26 0/MAD23 0	Motor Drive2-PWM3H
144	P95/TIOB13_0/RTO25_1/INT27_0/MAD24_0	
145	PC0/E_RXER0_RXDV1	Ethernet
146	PC1/E_RX03_RX11	Ethernet
147	PC2/E_RX02_RX10	Ethernet
148	PC3/ <b>E_RX01</b> /TIOA06_1	Ethernet
149	PC4/ <b>E_RX00</b> /TIOA08_2	Ethernet
150	PC5/ <b>E_RXDV0</b> /TIOA10_2	Ethernet
151	PC6/E_MDIO0/TIOA14_0	Ethernet
152	PC7/ <b>E_MDC0</b> /CROUT_1	Ethernet
153	PC8/E_RXCK0_REFCK	Ethernet clock
154	PC9/E_COL0	Host/Device USB switch



#### Hardware

#### Pin-List SK-FM3-176PMC-ETHERNET (8/8)

Pin	Function	Description
155	PCA/E_CRS0	USB Host enable
156	ETHVCC	Ethernet VCC
157	VSS	GND
158	PCB/E_COUT	
159	PCC/E_MDIO1	Reset Ethernet switch
160	PCD/E_TCK0_MDC1	Ethernet
161	PCE/E_TXER0_TXEN1/RTS4_0/TIOB06_1	Ethernet
162	PCF/E_TX03_TX11/CTS4_0/TIOB08_2	Ethernet
163	PD0/ <b>E_TX02_TX10</b> /SCK4_0/TIOB10_2/INT30_1	Ethernet
164	PD1/ <b>E_TX01</b> /SOT4_0/TIOB14_0/INT31_1	Ethernet
165	PD2/E_TX00/SIN4_0/TIOA03_2/INT00_2	Ethernet
166	PD3/E_TXEN0/TIOB03_2	Ethernet
167	P62/E_PPS0_PPS1/SCK5_0/ADTG_3	
168	P61/SOT5_0/TIOB02_2/UHCONX0	USB UHCONX
169	P60/SIN5_0/TIOA02_2/INT15_1	Programming Switch S1
170	PF3/TIOA06_0/SIN6_2/INT06_0/AIN2_1	
171	PF4/TIOB06_0/SOT6_2/INT07_0/BIN2_1	
172	PF5/SCK6_2/INT08_0/ZIN2_1	
173	USBVCC0	USBVCC
174	P80/UDM0	USB Switch
175	P81/UDP0	USB Switch
176	VSS	GND



#### The Hardware (v2.0 Top Side) – Jumper Settings

: default position





#### Jumper Settings SK-FM3-176PMC-ETHERNET

Number	Description	Special Type	Default
JP1	Main Clock Oscillator		open
JP2	Main Clock Oscillator		open
JP3	Main Clock Oscillator		open
JP4	Main Clock Oscillator		open
JP5	Sub Clock Oscillator		open
JP6	Sub Clock Oscillator		open
JP7	Sub Clock Oscillator		open
JP8	C-Pin	Solder Jumper	closed
JP9	C-Pin	Solder Jumper	closed
JP10	USB/UART programming		open
JP11	Sub Clock Oscillator	Solder Jumper	closed
JP12	Sub Clock Oscillator	Solder Jumper	closed
JP13	AVRH		closed
JP14	AGND		closed
JP15	Main Clock Oscillator	Solder Jumper	closed
JP16	Main Clock Oscillator	Solder Jumper	closed
JP17	5V/3V3		1-2
JP18	MCUVCC		closed

Number	Description	Special Type	Default
JP19	SEG1 - P50	Solder Jumper	closed
JP20	SEG1 - P51	Solder Jumper	closed
JP21	SEG1 - P52	Solder Jumper	closed
JP22	SEG1 - P53	Solder Jumper	closed
JP23	SEG1 - P54	Solder Jumper	closed
JP24	SEG1 - P55	Solder Jumper	closed
JP25	SEG1 - P56	Solder Jumper	closed
JP26	SEG1 - P57	Solder Jumper	closed
JP27	Multicon / I2C / SCL-Pullup		closed
JP28	Multicon / I2C / SDA-Pullup		closed
JP29	SEG2 - P70	Solder Jumper	closed
JP30	SEG2 - P71	Solder Jumper	closed
JP31	SEG2 - P72	Solder Jumper	closed
JP32	SEG2 - P73	Solder Jumper	closed
JP33	SEG2 - P74	Solder Jumper	closed
JP34	SEG2 - P75	Solder Jumper	closed
JP35	SEG2 - P76	Solder Jumper	closed
JP36	SEG2 - P77	Solder Jumper	closed



#### Jumper Settings SK-FM3-176PMC-ETHERNET

	Description			
Number	Version 1.1	Version 2.0	Special Type	Default
JP37	SPI / SIN-Pin		Solder Jumper	open
JP38	CAN MCUVCC /	VCC5V	Solder Jumper	2-3
JP39	USBVCC0			1-2
JP40	VBUS USBHO			2-3
JP41	USBVCC1			1-2
JP42	USB UHCONX			closed
JP43	Rotary Encoder		Solder Jumper	closed
JP44	Rotary Encoder		Solder Jumper	closed
JP45	Potentiometer		Solder Jumper	closed
JP46	VBUS USBH1			1-2
				closed/
JP47	FTDI JTAG	CMSIS DAP prog		v2.0:open
JP48	FTDI JTAG	Not available		closed
JP49	FTDI JTAG	Not available		closed
JP50	FTDI JTAG	Not available		closed
JP51	UART / SOT USB	<-> RS232		U-0
JP52	UART / SIN USB	<-> RS232		R-1
JP53	Flow control			open
JP54	CTS4			open

Number	Description	Special Type	Default	
JP47	FTDI JTAG		closed	
JP48	FTDI JTAG		closed	
JP49	FTDI JTAG		closed	
JP50	FTDI JTAG		closed	
JP51	UART / SOT USB <-> RS232		U-0	
JP52	UART / SIN USB <-> RS232		R-1	
JP53	Flow control		open	
JP54	CTS4		open	
JP55	MAX3232 VCC	Solder Jumper	closed	
JP56	UART MD0	Solder Jumper	open	
JP57	RTS		open	
JP58	UART-RST		open	
JP59	Flow control	Solder Jumper	1-2	
JP60	Flow control	Solder Jumper	2-2	
JP61	Ethernet PHY0	Solder Jumper	closed	
JP62	Ethernet PHY0	Solder Jumper	closed	
JP63	Ethernet PHY0	Solder Jumper	closed	
JP64	Ethernet PHY0	Solder Jumper	closed	



#### Jumper Settings SK-FM3-176PMC-ETHERNET

Number	Description	Special Type	Default
JP65	Ethernet PHY0 Reset		1-2
JP66	Ethernet PHY0	Solder Jumper	closed
JP67	Ethernet PHY0	Solder Jumper	closed
JP68	Ethernet PHY0	Solder Jumper	closed
JP69	Ethernet PHY0	Solder Jumper	closed
JP70	Ethernet Clock Enabled		closed
JP71	Ethernet Reference Clock	Solder Jumper	closed
JP72	Ethernet PHY1	Solder Jumper	closed
JP73	Ethernet PHY1	Solder Jumper	closed
JP74	Ethernet PHY1	Solder Jumper	closed
JP75	Ethernet PHY1	Solder Jumper	closed
JP76	Ethernet PHY1 Reset		1-2
JP77	Ethernet PHY1	Solder Jumper	closed
JP78	Ethernet PHY1	Solder Jumper	closed
JP79	Ethernet PHY1	Solder Jumper	closed
JP80	Ethernet PHY1	Solder Jumper	closed
JP81	Ethernet VCC		1-2
JP82	Motor Control 0	Solder Jumper	closed

Number	Description	Special Type	Default
JP83	Motor Control 1	Solder Jumper	open
JP84	Motor Control 2	Solder Jumper	open
JP85	Motor Control 0	Solder Jumper	closed
JP86	Motor Control 1	Solder Jumper	open
JP87	Motor Control 2	Solder Jumper	open
JP88	Motor Control 0	Solder Jumper	closed
JP89	Motor Control 1	Solder Jumper	open
JP90	Motor Control 2	Solder Jumper	open
JP91	Motor Control 0	Solder Jumper	closed
JP92	Motor Control 1	Solder Jumper	open
JP93	Motor Control 2	Solder Jumper	open
JP94	Motor Control 0	Solder Jumper	closed
JP95	Motor Control 1	Solder Jumper	open
JP96	Motor Control 2	Solder Jumper	open
JP97	Motor Control 0	Solder Jumper	closed
JP98	Motor Control 1	Solder Jumper	open
JP99	Motor Control 2	Solder Jumper	open
JP100	Motor Control 0	Solder Jumper	closed



#### JP51, JP52 : UART selection

- UART0 and UART4 of the microcontroller can be used together with a standard RS232 SUB-D9 connector and a serial/USB converter
- The jumpers JP51 and JP52 routes the channel to the connector
- The interface is selected by the jumpers' alignment
- UART0 = USB-connector (X11), UART4 = Sub-D9 (X12) (default)
  - Setting of Jumper JP51 and JP52: U-0 / R-4



(default)

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- UART0 = Sub-D9 (X12), UART4 = USB-connector (X11)
  - Setting of Jumper JP51 and JP52: U-4 / R-0





- The starter kit can be powered by
  - external power supply (8-12V) (default)
  - JLINK/JTAG connector X14 (CN3
  - USB device connector X7
  - by UART B USB connector X11
- The Microcontroller can be supplied with 3.3V or 5V
  - Jumper JP17 selects MCUVCC
  - Default: JP17: 1-2 (3.3V)









### Software

Software examples for IAR EWARM V6.60 or KEIL µVision5.1:

See <drive:>\Examples\ or www.spansion.com

- mb9bfd18t\_template-v16
  - ,Empty' project as base for user applications
- mb9bfxxx\_ethernet-driver-v13.zip
  - Fujitsu low-level Ethernet driver
- mb9bfxxx\_ethernet\_uip-v19.zip
  - Port of the free µIP (micro-IP) TCP/IP stack including webserver
- mb9bfxxx\_ethernet-lwip-v14.zip
  - Port of the free LwIP (Lightweight IP) TCP/IP stack including AJAX-enabled web application



#### Note: Please copy the examples to your local drive before compiling!

You can find a demonstration firmware and additional product information

of the commercially supported TCP/IP stack by SEVENSTAX on this CD.



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- The following software tools are available
  - USB Virtual-COM port
    - allows UART communciation via the PC's USB connection
    - On-board UART-to-USB converter (via X11, CMSIS-DAP)
    - For driver installation <drive:><u>\drivers\driverinstaller.exe</u>
  - FLASH USB DIRECT Programmer
    - Microcontroller Flash programming (via X7, USB-Device-Port)
    - Install from <drive:><u>\tools\USBDIRECT</u>
  - Terminal program ,Serial Port Viewer'
    - Install from <drive:><u>\tools\serialportviewer\setup.exe</u>



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# Flash Programming

- There are several options to program the microcontroller's flash:
  - FLASH USB DIRECT Programmer via X7 (USB device)
    - For installation <drive:><u>\tools\USBDIRECT\setup.exe</u>
    - USB driver is located in subdirectory of FLASH USB DIRECT Programmer
  - FLASH MCU Programmer via X11 (Serial via UART A or UART B)
    - For installation <drive:><u>\tools\PCWFM3-V01L07\setup.exe</u>
    - For driver installation of USB/Virtual-COM port v2.0: <drive:><u>\drivers\driverinstaller.exe</u>
    - v1.1: Spansion OpenOCD Starter -> button "Install driver"
  - JTAG Programming via X11 (v2.0: CMSIS-DAP, v1.1: OpenOCD)
    - Example is given for <u>IAR</u> and <u>KEIL</u>
    - See documentation of your development suite how to setup CMSIS-DAP
  - JTAG Programming via X14 (optional JTAG adapter)
    - The correct JTAG-adapter must be selected in the IDE toolchain



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### Flash Programming via X7 (USB direct)

- FLASH USB DIRECT Programming via X7 (USB device)
  - Jumper Setting
    - Select the MCU power supply (J5)
    - Close JP10 -
    - Set switch S1 to position PROG
  - Connect USB port X7 with the PC
  - If connected for first time Windows OS may ask for a driver
    - See subfolder ,driver' of USBdirect installation path or <drive:><u>\tools\USBDIRECT\driver</u>
  - Start the FLASH USB DIRECT Programmer
    - For first installation: <drive:><u>\tools\USBDIRECT\setup.exe</u>
    - Select the COM port
    - Press Reset
    - Start Full Operation
    - Set switch S1 to position RUN
    - Press Reset





### Flash Programming via X7 (USB device)

- Choose the right target MCU MB9BFD18S/T
- Browse for the programming file (\*.srec or \*.hex)
  - IAR: see subfolder <project>\example\IAR\output\release\exe
  - ARM/KEIL: see subfolder <project>\example\ARM\output\release
- Adjust the corresponding virtual COM-port

Select MCU: MB9BFD18S/T Select file (\*.srec; \*.hex) Select Virtual COM-port

- Use ,Full Operation'
  - Download kernel
  - Erase Flash memory / Blank check
  - Program & Verify project to Flash memory
- Set switch S1 to position RUN and press Reset button

SELECT Target MCU Hex File COM (1-255) Command to COM	MB9BF618S/T mb9bfd18t_ioport_cr 4	▼ ounter.sre Open	FLASH INFORMAT Start Addr Er 000000H 0F 100000H 10	FION nd Addr FFFFFH D0001H	Size 100000H 000002H	
	Full Operation(D+E+B+P)		<u>S</u> et Environment	1	<u>H</u> elp	
<u>D</u> ownload	Erase	<u>B</u> lank Check	Check SUM	UM <u>V</u> ersion Info		
Program & Verify	Read & Compare	<u>C</u> opy	USB DIRECT programmer			

- FLASH MCU Programming via X11 or X12 (UART A or UART B)
- Jumper setting
  - Check jumper setting: J14:2-3 (P60)
  - Connect the board via USB CMSIS-DAP (CN3) to the USB-Port of the PC
    - When connected for first time Windows OS may ask for ,spansionusbvcomm.inf'
      - <drive:>\drivers\cmsis-dap
  - Use the FLASH MCU Programmer for FM3/FM4
    - For installation <drive:><u>\tools\PCWFM3-V01L07\setup.exe</u>



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### Flash Programming via X11 or X12 (Serial)

- Choose the right target MCU MB9BFD18S/T
- Select JP51 and JP52 accordingly
- Select 4MHz Crystal Frequency
- Browse for the programming file (\*.srec or \*.hex)
  - IAR: see subfolder <project>\example\IAR\output\release\exe
  - ARM/KEIL: see subfolder <project>\example\ARM\output\release
- Adjust the corresponding virtual COM-port

Select MCU: MB9BFD18S/T		FUJITSU FLASH MCU P	rogrammer for FM3				_ 🗆 🗙	
			Flash Information					
Select 4MHz Crystal Frequency		<u>T</u> arget MCU	MB9BF618S/T		Start Addr	End Addr	Size	
Select file (*.srec / *.hex)		Crystal Frequency 4MHz		100000H	100001H	000002H		
Select Virtual COM-port		Hex File	mb9bfxxx_can_ua	rt_termina <u>O</u> pen				
Execute ,Full Operation		Command to COM7						
incl. stand-alone operations			<u>F</u> ull Operation(D+E+B+P)			Set Environment <u>H</u> elp		
- <u>D</u> ownload Kernel		<u>D</u> ownload	Erase	<u>B</u> lank Check	Check SU	M	¥01,L02	
- <u>E</u> rase		Program & Verify	Bead & Compare	Cnny	Conv			
- <u>B</u> lank Check				2-17			- •	

- Program&Verify
- Set switch S1 to position RUN and press Reset button



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# JTAG Debugger

- SK-FM3-176PMC-FA contains an on-board JTAG debugger that can be connected via X11 (UART B) USB connector.
- Board version v2.0 uses CMSIS-DAP
- Board version v1.1 uses OpenOCD



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- This starterkit includes an on-board JTAG adapter
  - Compatible to CMSIS-DAP <u>http://www.keil.com/support/man/docs/dapdebug/dapdebug\_introduction.htm</u>
  - Select debugger CMSIS-DAP in your tool chain
- Any other JTAG-adapter can be connected to X14, too.
  - The correct JTAG-adapter must be selected in the IDE toolchain
    - No jumper setting is required

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- Additional virtual COM port is provided by X11 (UART B)
  - For driver installation <drive:>\drivers\driverinstaller.exe
  - Please set jumper J19 and J20 accordingly



# Setup in IAR EWARM (1)

- Navigate to project options:
  - Via Files-List
    - Right-click at the project
    - Select "Options…"
  - Or via menu "Project"
    - Select "Options…"



Edit Configurations...

Create <u>N</u>ew Project... Add <u>E</u>xisting Project...

on Control Such

ALT+F7

Remo<u>v</u>e

Options...



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# JTAG adapter CMSIS-DAP – within IAR EWARM

#### Setup in IAR EWARM (2)

- Setup Project Debbuger Options
  - (1) Navigate to Debugger
  - (2) Select tab "Setup"
  - (3) Select Driver "CMSIS-DAP"

- (4) Select in "CMSIS-DAP"
- (5) Select tab "JTAG/SWD"
- (6) Select SWD







# JTAG adapter CMSIS-DAP – within Keil µVision

# Setup in Keil µVision (1)

- Navigate to project options:
  - Via Project
    - Right-click at the project
    - Select "Options…"
  - Or via menu "Project"
    - Select "Options…"



Select Device for Target 'MB9BFxx6\_Release'...

Options fo Jarget 'MB9BFxx6\_Release'..

Open Project...

**Close Project** 

Export

Manage

Remove Item



Project

🖻 📇 source,

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# JTAG adapter CMSIS-DAP – within Keil µVision

### Setup in Keil µVision (2)

- Setup Debug & Utilities
  - (1) Select tab "Debug"
  - (2) Select "CMSIS-DAP Debugger"

- (3) Select tab "Utilities"
- (4) Select "CMSIS-DAP Debugger"

	(1)
V Uptions for Target MB9BFxxb_Release	
Use Simulator     Settings     Unit Speed to Real-Time     Void Application at Startup     Run to main() Initialization File:	Clube: ULINK2/ME Cottex Debugger ▼     Signum Systems JTAGjet     JUNK /J Trace Cortex     Load, JT-Link (Depreched Version)     UniNK Pro Cortex Oebugger     Initiatatik NULink Pebugger     Cocox Debugger
Restore Debug Session Settings  Restore Debug Session Settings  Value Windows & Performance Analyzer  Memory Display	ST-Link (Deprecated Wrein) Restore ST-Link Debugger ✓ Brit Models Debugger ✓ Watch Widels Debugger ✓ Watch Windows ✓ Memory Display
CPU DLL: Parameter: SARMCM3.DLL	Driver DLL: Parameter: SARMCM3.DLL
Dialog DLL: Parameter: DCM.DLL pCM4	Dialog DLL: Parameter: TCM.DLL pCM4
OK Ca	ncel Defaults Help
👯 Options for Target 'MB9BFxx6_Release'	×
Options for Target 'MB9BFxx6_Release'     Device Target Output Listing User C/C++ Asm	Linker Debug Utilities
V Options for Target 'MB9BFxx6_Release' Device   Target   Output   Listing   User   C/C++   Asm   Configure Flash Menu Command	Linker Debug Utiliter
Options for Target "MB9BFxx6_Release"      Device   Target   Output   Listing   User   C/C++   Asm        Configure Flash Menu Command      G Use Target Driver for Flash Programming	Linker Debug Utilities
Options for Target 'MB9BFxx6_Release'      Device Target Output Listing User C/C++ Asm      Configure Flash Menu Command      Use Target Driver for Flash Programming      ULINK2/ME Cortex Debugger     Julik / Jarace Cortex     ST-Link (Deprecated Version)     ULINK Pobugger     Command.     Stab UDA Debugger     ST-Link Debugger     Stab UDA Debugger     Stab UDA Debugger     Stat Models Debugger     MSISDAP Debugger     MSISDAP Debugger     MSISDAP Debugger     Stat Models Debugger	Linker Debug Utilitier





- SK-FM3-176PMC-ETHERNET v1.1 offers on-board debugging via OpenOCD instead of CMSIS-DAP via X11
  - Connect the board on X11 to the USB-Port of your PC
  - Open OpenOCD
  - Select the sk-fm3-176pmc-ethernet in config file

Spansion OpenOCD Starter		
Config File:sk-fm3-176pmc-ethernet.c	fg 🗸 🗸	> Help About
Firmware File:	Open	Settings Install Driver
	opon	Licence
Commands Programming	Debugging	<b>GUI Frontend for</b>
Full Operation (E+P)       Erase       Program	Start Debug	OpenOCD http://openocd.sourceforge.net/ with Lib USB-win32 driver: http://libusb-win32.sourceforge.net/
Spansion Semiconductor Europe OpenOCD GUI Frontend OpenOCD binaries within this package ar drivers instead of proprietary library OpenOCD binary for Windows can be found http://www.freddiechopin.info/index.php	e from http://www.freddiechopin. FTD2XX. 1 here: //en/download/category/4-openocd	info and using LibUSB
		•

If necessary you can install or reinstall the drivers via the "Install driver" button



IAR Workbench configuration

- Open the project you want to debug.
- Go to Project->Options

- Select Debugger
- Select Setup
- As driver select GDB Server

🎢 IAR Embedde	ed Workbench IDE		
<u>F</u> ile <u>E</u> dit ⊻iew	Project Tools Window	w <u>H</u> elp	
🗅 🧀 🗐 🖨 Workspace	Add Files Add Group		
Debug	Edit Configurations		
Files	Remoye		
- ⊞ 🗀 comm	Create <u>N</u> ew Project Add <u>E</u> xisting Project.		
	Options	ALT+F7	
	Version Control Syste	em	•
	<u>M</u> ake	F7	
	Compile	STRG+E7	

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	OK Cancel



Opt

- IAR Workbench configuration
  - Select GDB Server
  - Type 127.0.0.1 on the field of TCP/IP address

Options for node "mb9	bfxxx_ioport_counter"	x
Category: General Options C/C++ Compiler	Factory Setting	IS
Assembler Output Converter Custom Build Build Actions Linker Debugger Simulator Appel	GDB Server Breakpoints ICP/IP address or bostname (.port) 127.0.0.1	
GDB Server IAR ROM-monitor J-Link/J-Trace TI Stellaris FTDI Macraigor PE micro RDI ST-LINK Third-Party Driver TI XDS100	Log communication  \$PR0J_DIR\$\cspycomm.log	
	OK Cancel	

- Start debug in IAR Workbench





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# IAR Embedded Workbench

- Installation
- Getting Started
- Open Project
- Build Project
- Debug Project



- Install EWARM from IAR-CD or download latest version from IAR Website
  - EWARM size-limited (32k) or time-limited (full) Evaluation Version
    - http://supp.iar.com/Download/SW/?item=EWARM-EVAL
- Start EWARM Workbench
- Choose File  $\rightarrow$  Open  $\rightarrow$  Workspace
  - e.g.: <drive:><u>\sw-examples\</u>





- IAR Workbench
  - Workspace on left side of Workbench window
    - If hidden then View→Workspace
  - Source files on right side of Workbench window as tabbed windows
  - Project open File  $\rightarrow$  Open  $\rightarrow$  Workspace  $\rightarrow$  \*.eww
  - For new projects start with ,mb9bfd1xt\_template'

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#       GettingStarted.eww         #       GettingStarted.eww         #       #         DESCRIPTION       ************************************				
#       GettingStarted.eww         #       GettingStarted.eww         #       #         DESCRIPTION         This example project shows how to use the IAR Embedded Workbench for ARM to develop code for IAR KSK-MB9BF506 board. It shows basic use of I/O, Dual timer and the interrupt controller.         COMPATIBILITY         The example project is compatible with IAR KSK-MB9BF506 board. By default, the project is configured to use the J-Link SWD interface.         CONFIGURATION         The GettingStarted application is downloaded to the iFlash or iRAM memory depending on selected configuration and executed.         GETTING STARTED         Interface         Inthe IAR Embedded Workbench			<del></del>	
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Image: Constraint of the second se			# #	
DESCRIPTION     Descriptin     Descriptin     Descriptin     Descriptin     Descriptin			**************************************	
This example project shows how to use the IAR Embedded Workbench for ARM to develop code for IAR KSK-MB9BF506 board. It shows basic use of I/O, Dual timer and the interrupt controller. COMPATIBILITY The example project is compatible with IAR KSK-MB9BF506 board. By default, the project is configured to use the J-Link SWD interface. CONFIGURATION The GettingStarted application is downloaded to the iFlash or iRAM memory depending on selected configuration and executed. GETTING STARTED The Getting Started application and executed. GETTING STARTED The Getting Started application for ARM.				
COMPATIBILITY C			This example project shows how to use the IAR Embedded Workbench for ARM to develop code for IAR KSK-MB9BF506 board. It shows basic use of I/O, Dual timer and the interrupt controller.	
The example project is compatible with IAR KSK-MB9BF506 board. By default, the project is configured to use the J-Link SWD interface. CONFIGURATION The GettingStarted application is downloaded to the iFlash or iRAM memory depending on selected configuration and executed. GETTING STARTED The GETTING STARTED The GettingStart the IAR Embedded Workbench for ARM.			COMPATIBILITY ==========	
CONFIGURATION  CONFIGURATION CONFIGURATION CONFIGURATION  CONFIGURATION CONFIGURATION CONFIGURATION CONFIGURATION CONFIGURATION CONFIGURATION CONFIGURATION			The example project is compatible with IAR KSK-MB9BF506 board. By default, the project is configured to use the J-Link SWD interface.	
The GettingStarted application is downloaded to the iFlash or iRAM memory depending on selected configuration and executed.  GETTING STARTED  I) Start the IAR Embedded Workbench for ARM.			CONFIGURATION	
			The GettingStarted application is downloaded to the iFlash or iRAM memory depending on selected configuration and executed.	
1) Start the IAR Embedded Workbench for ARM.			GETTING STARTED	
- Nine Charle d			1) Start the IAR Embedded Workbench for ARM.	
fo fo	ettingStarted			▼ ▼ ▶



#### IAR Menu Bar









- Making the Project
  - Use Make-Icon ( 😳 ), <F7> or Menu: Project→Make
  - Check for no errors in Output window below
  - Build errors are indicated by <sup>1</sup>/<sub>4</sub> or <sup>3</sup>/<sub>8</sub> In Output window and Source view

h] ysizet.h

essages.

Errors: 1 Warnings: 1

😣 Error[Pe070]: incomplete type is not allowed

😣 Error while running C/C++ Compiler

Total number of errors: 1 Total number of warnings: 1

GettingStarted



Messages



- Download to Target and Start Debugging
  - Use ▶ Icon, <Ctrl>-D, or Project→Download and Debug
  - A new menu bar will occur on sucessful connection to target



- Source Window
  - The Source windows do not change contents but get additional information
    - Current line (PC):
    - Halted on Breakpoint:
    - Halted on Data break (example):
- Disassembly Window
  - Shows 'pure' disassebly view
  - Shows mixed mode view



Disa	assembly				>
	Go to	Memory 💌			
	0x1fffc3bc: 0x60( 	D1 STR SW2))	r1, [r0]		<b>•</b>
	0x1fffc3be: 0x482 0x1fffc3c0: 0x680	24 LDR.N DO LDR	r0, ??DataTable1 r0, [r0]	0_33 [0x1fffc450] ; PDIR5	
₽	0x1fffc3c2: 0x078 0x1fffc3c4: 0xd4c	BO LSLS AC BMI.N	r0, r0, #30 ??main_2	; 0x1fffc380	
	<u>TimerlControl</u> 0x1fffc3c6: 0x482 0x1fffc3c8: 0x680 0x1fffc3c8: 0x680	<u>bit.TimerEn = 1;</u> 21 LDR.N 30 LDR 50 0×0080 ORPS N	r0, ??DataTable1 r0, [r0] r0, r0, #128	0_32 [0x1fffc44c] ; Timer1Cc	ontrol
┛					•



- Watch Window
  - Watch
    - Expressions/Variables have to be added by user and are updated by Halt/Breakpoint

Watch				×
Expression	Value	Location	Туре	
Tmr1Tick	0	0x20000804	int	
J				
Watch Locals   St	atics   Auto   Live Wa	atch   Quick Watch		×

- Quick Watch
  - The Quick watch allows the user to calculate and recalculate expressions even with variables

Quick Watch				×
G Tmr1Tick + 0xAA - 123				•
Expression	Value	Location	Туре	
Tmr1Tick + 0xAA - 123	0×00000030		int	
Watch   Locals   Statics   Auto	Live Watch Quick	k Watch		×

The drop down menu memorizes the last typed contents



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### **IAR Workbench – Simulator**

#### Simulator

- Mark Project File in Workspace
- Choose Project→Options
- Choose Simulator in Debugger Setup
- Start Simulator with usual 🛃 Icon

Workspace	drv_hd44780.c drv_hd44780_l.c   main.c
RAM Debug	Options for node "GettingStarted"
Files            GettingStarted - RAM Debug*             GettingStarted - RAM Debug*             GottingStarted - RAM Debug*             GottingConducts            GottingConducts            GottingConducts            GottingConducts            GottingConducts            GottingConducts            Board.h            DLib_Config_Normal.h            DLib_Product.h            DLib_Product.h            DLib_Threads.h            DLib_Threads.h            board.h            bordrow            boarcos.h            biomacros.h            biomb9bf500.h            biomb9b	Options for node "GettingStarted"         Category:         General Options         C/C++ Compile         Assembler         Output Convertine         Custom Build         Build Actions         Linker         Debugger         Simulator         Angel         GDB Server         IAR ROM-monitor         J-Link/J-Trace         IMI FTDI         Macraigor         RDI         ST-Link         Third-Party Driver
	OK Cancel





# KEIL µVision

- Installation
- Getting Started
- Open Project
- Build Project
- Debug Project



- Install µVision from KEIL-CD or download latest version from KEIL Website
  - Evaluation Version
    - https://www.keil.com/demo/eval/arm.htm
    - Registration required
- Install ULINK-ME
  - Special installation is not needed, because ULINK-ME acts as a USB Human Interface Device (HID) and thus needs no extra USB driver
- Install ULINK Pro (optional)
  - ULINK Pro needs an own dedicated USB driver located in: <Installation Path>\KEIL\ARM\ULINK
- Start µVision



#### **KEIL µVision – Getting Started**

- Choose Menu: Project→Open Project...
  - Browse to: <drive:>\sw-examples\mb9bf56xr\_gpio-v10\example\ARM\
  - Choose mb9bf56xr\_gpio.uvproj

Blinky - µVision4	_ 🗆 X
Elle Edit View Project Flash Debug Perjpherals Iools SVCS Window Help	
🗋 🍘 📓 🕼 🛍 🖉 🗠 🗇 🖗 🦉 🦉 淳 津 胆 振 🎯 📄 💌 📓 🖉 🖉 🖉 🖉 🖉	
🛛 🖉 🕮 🖓 🖳 🙀 MB9BF50x Flash 💿 🔊 🛃 🔁	
Project 4 X Abstract.txt X Binky.c	•
Project       9.X         Image: Startup       Image: Startup         Image: Startup       Startup, M898F50x.s         Image: Startup, M898F50x.c       Image: Startup, M898F50x.c         Image: Startup, M898F50x.c       Image: Startup, M898F50x.c         Image: Startup, M898F50x.c       Image: Startup, M898F50x.c         Image: Startup, M898F50x.ch       Image: Startup, M898F50x.ch         Image: Start	× ×
	-
Build Output Grind In Files	
ULINK Cortex Debugger L:1 C:71	CAI //



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# KEIL µVision – Main Window

# KEIL µVision

- Project window on left side of IDE window
  - Choose:
     View→Project Window
     if hidden
- Source files on right side of IDE window as tabbed windows
- Output window on bottom side of IDE window





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- Menu Bar 1
  - Can be moved in bar window area or set floating





#### Menu Bar 2

- Can be moved in bar window area or set floating









- Making the Project
  - Use Rebuild Icon
     ( ) or
     Project→Rebuild all target files
  - Check for no errors in Output window below

Build Output
Build target 'MB9BF50x Flash' assembling startup_MB9BF50x.s compiling system_MB9BF50x.c compiling Blinky.c compiling Retarget.c compiling Serial.c compiling Retarget.c linking Program Size: Code=2604 RO-data=320 RW-data=32 ZI-data=512 ".\Flash\Blinky.axf" - 0 Error(s), 0 Warning(s).
Build Output

- Build errors are shown in Output window.
  - Can be double-clicked by showing the source line with a blue arrow

Build Output	<ul> <li>▼ 104</li> <li>TYPO while (1) (</li> <li>105</li> </ul>	/* Loop forever
compiling Blinky.c Blinky.c(104): error: Blinky.c: TVPO whil	#20: identifier "TYPO" is undefine	ed (* Loop forever *
Blinky.c: / NPO while Blinky.c: ^	.e (1) (	/* Loop forever */



- Start Debugging
  - Download to target first, when MCU Flash does not contain the current application openend and built in the IDE
  - Start Debug Session
    - Use Start/Stop Debug Icon (
       Q
       ) or Menu: Debug→Start/Stop Debug Session
  - Ending Debug Session
    - Use same way as for starting debug session



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- Debugging Icon Bar
  - During a Debug Session there will be visible a new icon bar





- Source View
  - The Source windows do not change contents but get additional information



- Disassembly View
  - Mixed mode is selectable and deselectable





- Memory Window
  - Up to 4 Memory windows can be displayed in tabs
  - Memory is updated during runtime
  - Memory window tabs are shared with Watch windows

Memory 1																	џх
Address: 0x20000004											<u>_</u>						
0x2000000	4: 34	12	00	00	00	00	00	00	00	00	00	00	01	00	00	00	
0x2000001	4: 00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
0x2000002	4: 00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	
0x2000003	4: 00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	00	<b>_</b>
Watch 1	Mem	ory 1	ſ														

- Register View
  - Register view is a tab of the Project window
  - Changes are highlighted in dark blue text background
  - Register tree knots can be expanded

Registers	Ф X							
Register	Value							
Core								
R0	0x000003F5							
R1	0x20000220							
R2	0x00000000							
R3	0x000006A1							
R4	0x00000B6C							
<mark>R5</mark>	0x00000000							
R6	0x00000000							
B7	0x00000000							
R8	0x00000000							
R9	0x00000000							
R10	0x00000000							
B11	0x00000000							
R12	0x00000000							
R13 (SP)	0x20000220							
	0x00000639							
R15 (PC)	0x000003F6							
±····· xPSR	0x61000000							
🛨 Banked								
± System								
□ Internal								
Mode	Thread							
Privilege	Privileged							
Stack	MSP							
States	2974522							
Sec	0.03718153							
🔃 Project 🛛 🚟 Regist	ers							



- Variable Windows
  - Watch Windows

Watch 1	<b>д</b> Х
Name	Value
\Blinky\AD_dbg	0x01EA
<pre> <double-click add="" f2="" or="" to=""></double-click></pre>	
BLocals Watch 1 Memory 1	

- Up to 2 Watch windows are sharing their tabs with e.g. Memory and Local views
- Updated during runtime
- Any changes are highlighted in dark blue text backround color
- Displayed values can be changed by user during break

	Locals	д×
	Name	Value
I	AD_value	0x01EA
I	AD_print	0x01EA
I	L ticks	<out ot="" scope=""></out>
	BLocals Watch 1   I Memory 1	

- Local View
  - The local view shares the tab with e.g. Memory and Watch windows
  - Any changes are highlighted in dark blue text backround color
  - Displayed values can be changed by user during break



- Trace via ITM
  - Simple Trace views via Instrumentation Trace Macro is supported by  $\mu\text{LINK}\ \text{ME}$ 
    - Records
    - Exceptions

<ul> <li>Counters</li> </ul>	,
------------------------------	---

Trace R	tecords							X
Туре	Ovf Num	Address	Data	PC	Dly	Cycles	Time[s]	
ITM	0		41H			82975148	1.03718935	
ITM	0		44H			82975293	1.03719116	
ITM	0		20H		Х	82988592	1.03735740	
ITM	0		76H		Х	82988592	1.03735740	
ITM		1	61H		Х	82988592	1.03735740	
ITM	V Counter Events		6CH		×	82988592	1.03735740	
ITM	<ul> <li>Exceptions</li> </ul>		75H		×	82988592	1.03735740	
ITM	PC Samples		65H X 8298				1.03735740	
ITM	A ITM Events		20H		×	82988592	1.03735740	
ITM	V THALVERIES		3DH		×	82988592	1.03735740	
ITM	<ul> <li>Data Reads</li> </ul>		20H		×	82988592	1.03735740	
ITM	✓ Data Writes		30H		×	82988592	1.03735740	
ITM	U		78H		×	82988592	1.03735740	
ITM	0		30H			82993831	1.03742289	
ITM	0		31H		×	83001392	1.03751740	
ITM	0		45H		X	83001392	1.03751740	
ITM	0		42H		X	83001392	1.03751740	
ITM	0		ODH		X	83001392	1.03751740	
ITM	0		0AH		Х	83001392	1.03751740	
ITM	0		0DH		Х	83001392	1.03751740	-



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#### Trace via ETM

- Check settings in menu:
  - Flash→Configure Flash Tools... Tab:Debug

Options for Target 'MB9BF50x Flash'	×	
Device Target Output Listing User C/C++ Asm	Linker Debug Utilities	
C Use Simulator Settings	• Link Pro Cortex Debugger	
✓ Load Application at Startup ✓ Run to main() Initialization File:	Coad Application at Startup     Run to main()     Initialization File:     VETM Taxes eachly iti	
Restore Debug Session Settings Breakpoints Toolbox Watch Windows & Performance Analyzer Memory Display CPU DLL: Parameter: SARMCM3.DLL -MPU	Restore Debug Session Settings	ETM_Trace_enable.ini - Notepad Eile Edit Format View Help LwDwORD(0x40033000, 0x000003FF); WBYTE(0x40033603, 0x03); enables ETM pins
Dialog DLL: Parameter: DCM.DLL -pCM3	Dialog DLL: Parameter:	



- Instruction Trace
  - Real Time Trace recording
  - Output can be filtered by several ETM and ITM events
  - Trace buffer is held in PC memory and transferred to  $\mu$ Vision on break

Instruction Tr	race										џ×
Filter: A	I			•							<b>_</b>
#	Туре	Flag	Num	PC	Opcode	Instruct	ion	Source	Code		
1048564	ETM			0x0000043E	4284	CMP	r4,r0				
1048565	ETM			0x00000440	D001	BEQ	0x00000446	444.	K (AD	AD LOOP (	/* Male and Mark AD inter-
1046566	ETM			0x00000446 0x00000448	42AC D002	BEQ	0x00000450		IF(AD_Value != /	AD_print) t	7 Make sure that AD Inter
1048568	ETM			0x00000450	4814	LDR	r0,[pc,#80];;@0x000004A4	116:	if (clock_1s) {		
1048569	ETM			0x00000452	7800	LDRB	[00x0#,01],01				
		_									
🔄 🔝 Bli	nky.c ×		Abstract	.txt 🛄 st	dio.h						•
108	if (A	D_val	ue !=	AD_last)		1	* Make sure that AD	inter	rupt did	*/	
109	AD_	value	e = AD	_last;		1	* not interfere with	value	e reading	*/	
→111	if (A	D val	ue !=	AD print	) (	1	* Make sure that AD	inter	rupt did	*/	
112	AD_	print	; = AD	_value;		1	* Get unscaled value	for p	printout	*/	
113	AD_	dbg	= AD	_value;							


### Simulator

- The Core Simulator can be selected by the menu:
   Flash → Configure Flash Tools... and then choosing Use Simulator
- Look & feel is like using ULINK debugger
- Controlable also with \*.ini files

Options for Target 'MB9BF50x Flash'					
Device Target Output Listing User C/C++ Asm Linker Debug Utilities					
Use Simulator     Settings     Settings	C Use: ULINK Pro Cortex Debugger 💌 Settings				
Load Application at Startup     Run to main() Initialization File:  Edit	Load Application at Startup     Initialization File:     LETM_Trace_enable.ini     LETM_Trace_enable.ini				
Restore Debug Session Settings P Breakpoints V Atch Windows & Performance Analyzer Memory Display CPUDIT: Parameter:	Restore Debug Session Settings Breakpoints Toolbox Watch Windows Memory Display Driver DU : Parameter				
SARMCM3.DLL MPU	SARMCM3.DLL MPU				
Dialog DLL: Parameter: DCM.DLL PCM3	Dialog DLL: Parameter: TCM.DLL				
OK Cancel Defaults Help					



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## Finally

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### Workshops & Seminars



FM3/FM4 Seminar	Motor Control	USB Workshop	Ethernet Workshop	
	Please register here: http://news.spansion.com/seminars			
<ul> <li>Overview FM3/FM4 family</li> <li>Memory</li> <li>Peripheral resources</li> </ul>	<ul> <li>Introduction of Spansion MCU</li> <li>Line-Up of microcontrollers with motion control features</li> </ul>	• Introduction of Spansion MCU • Line-op of USB MCUs	<ul> <li>Introduction of Spansion MCU</li> <li>Line-op of Ethernt MCUs</li> </ul>	
Packages	Performance	<ul> <li>USB vs. RS232</li> <li>Historical Background</li> </ul>	<ul> <li>Fundamentals of Ethernet</li> </ul>	
<ul> <li>Processor architecture</li> <li>Bus structure</li> </ul>	<ul> <li>Introduction of motors types</li> <li>ACIM</li> </ul>	Electrical Layer	• Ethernet Microcontrollers	
<ul><li>Flash memory</li><li>Flash programming</li></ul>	• BLDC • PMSM	USB Protocol	Hardware Design considerations	
Peripheral resources	<ul> <li>Introduction of control types</li> </ul>	• Enumeration Process (Descriptors & USB Settings)	Software Design considerations	
<ul> <li>Clock distribution</li> <li>Timer</li> </ul>	<ul> <li>Sinusoidal commutation</li> <li>Field Orientated Control</li> </ul>	<ul><li>Transfer Types</li><li>Data Transfers</li></ul>	Communication layer models	
<ul><li>Interfaces</li><li>FM3 features</li></ul>	Space Vector Modulation	USB Class Concept	The Internet Protocol suite	
<ul> <li>Development tool chains</li> <li>IAR workbench / J-Link</li> </ul>	<ul> <li>Peripherals of FM3/FM4 MCUs</li> <li>Base Timer</li> <li>Multifunction Timer</li> </ul>	<ul> <li>Software Driver Concepts</li> <li>USB Host</li> </ul>	<ul> <li>Web technologies in embedded systems</li> </ul>	
• KEIL µVision / uLink • Starter Kits	<ul> <li>12-bit A/D Converter</li> <li>Quadrature Position and Revolution Counter</li> </ul>	• USB Examples     • Virtual COM Port     • USB Descriptor Manager	<ul> <li>Developing Ethernet applications</li> <li>Tools and methods</li> </ul>	
Practical exercises     Flash programming     Project setup/modification	Interrupt Controller     Hands-on exercise / SW-Example	Create Template Classes     Create Descriptors	<ul> <li>Practical hints and advice on FM3 Ethernet solutions</li> </ul>	
Debugging     External interrupts	• BLDC motor with hall sensor • PMSM motor with	PC software based on LibUSB	Hands-on training	
	field orientated control	Special Use Cases		



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• e.g. boot loader

Please check the following website, for any available updates

www.spansion.com

- Please contact your local support team for any technical question
  - America: <u>Spansion.Solutions@Spansion.com</u>
  - China: <u>mcu-ticket-cn@spansion.com</u>
  - Europe: <u>mcu-ticket-de@spansion.com</u>
  - Japan: <u>mcu-ticket-jp@spansion.com</u>
  - Other: <u>http://www.spansion.com/Support/SES/Pages/Ask-Spansion.aspx</u>



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# CE

Hiermit erklären wir, Spansion International Inc., Germany Branch, Pittlerstrasse 47, 63225 Langen, Germany, dass dieses Board aufgrund seiner Konzipierung und Bauart sowie in den von uns in Verkehr gebrachten Ausführung(en) den grundlegenden Anforderungen der EU-Richtlinie 2004/108/EC "Elektromagnetische Verträglichkeit" entspricht. Durch eine Veränderung des Boards (Hard- und/ oder Software) verliert diese Erklärung ihre Gültigkeit!

We, Spansion International Inc., Germany Branch, Pittlerstrasse 47, 63225 Langen, Germany hereby declare that the design, construction and description circulated by us of this board complies with the appropriate basic safety and health requirements according to the EU Guideline 2004/108/EC entitled 'Electro-Magnetic Compatibility'. Any changes to the equipment (hardware and/ or software) will render this declaration invalid!

### Note:

This evaluation board is a Class A product according to EN61326-1.

It is intended to be used only in a laboratory environment and might cause radio interference when used in residential areas. In this case, the user must take appropriate measures to control and limit electromagnetic interference. All data and power supply lines connected to this starter kit should be kept as short as possible, with a maximum allowable length of 3m. Shielded cables should be used for data lines. As a rule of thumb, the cable length used when connecting external circuitry to the MCU pin header connectors for example should be less than 20cm. Longer cables may affect EMC performance and cause radio interference.



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- Gültig für EU-Länder:
  - Gemäß der Europäischen WEEE-Richtlinie und deren Umsetzung in landesspezifische Gesetze nehmen wir dieses Gerät wieder zurück.
  - Zur Entsorgung schicken Sie das Gerät bitte an die folgende Adresse:
- Valid for European Union Countries:
  - According to the European WEEE-Directive and its implementation into national laws we take this device back.
  - For disposal please send the device to the following address:



**CCS Express GMBH** c/o Spansion International Inc. Frankfurter Str. 83-107 D-65479 Raunheim Germany

This board is compliant with China RoHS







#### www.spansion.com

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