

32

SH7137 CPU Board

# M3A-HS37

User's Manual

Renesas 32-Bit RISC Microcomputer  
SuperH RISC engineFamily/SH7137 Group

User's Manual

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M3A-HS37 SCHEMATICS

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Chapter 1  
Overview

## 1.1 Overview

The SH7137 CPU board (Part number: M3A-HS37) is designed for evaluating the feature and performance of the SH7137 group of Renesas Technology original MCU, as well as developing and evaluating the application software for the MCUs. SH7137 data bus, address bus and on-chip peripheral pins are all connected to the expansion connectors on the M3A-HS37 to allow for the timing analysis with peripherals that use measurement instruments and connections of MCU I/O pins according to its application. Renesas Technology E10A-USB on-chip emulator can be connected to the M3A-HS37.

## 1.2 System Configuration

Figure 1.2.1 shows a system configuration using the M3A-HS37.

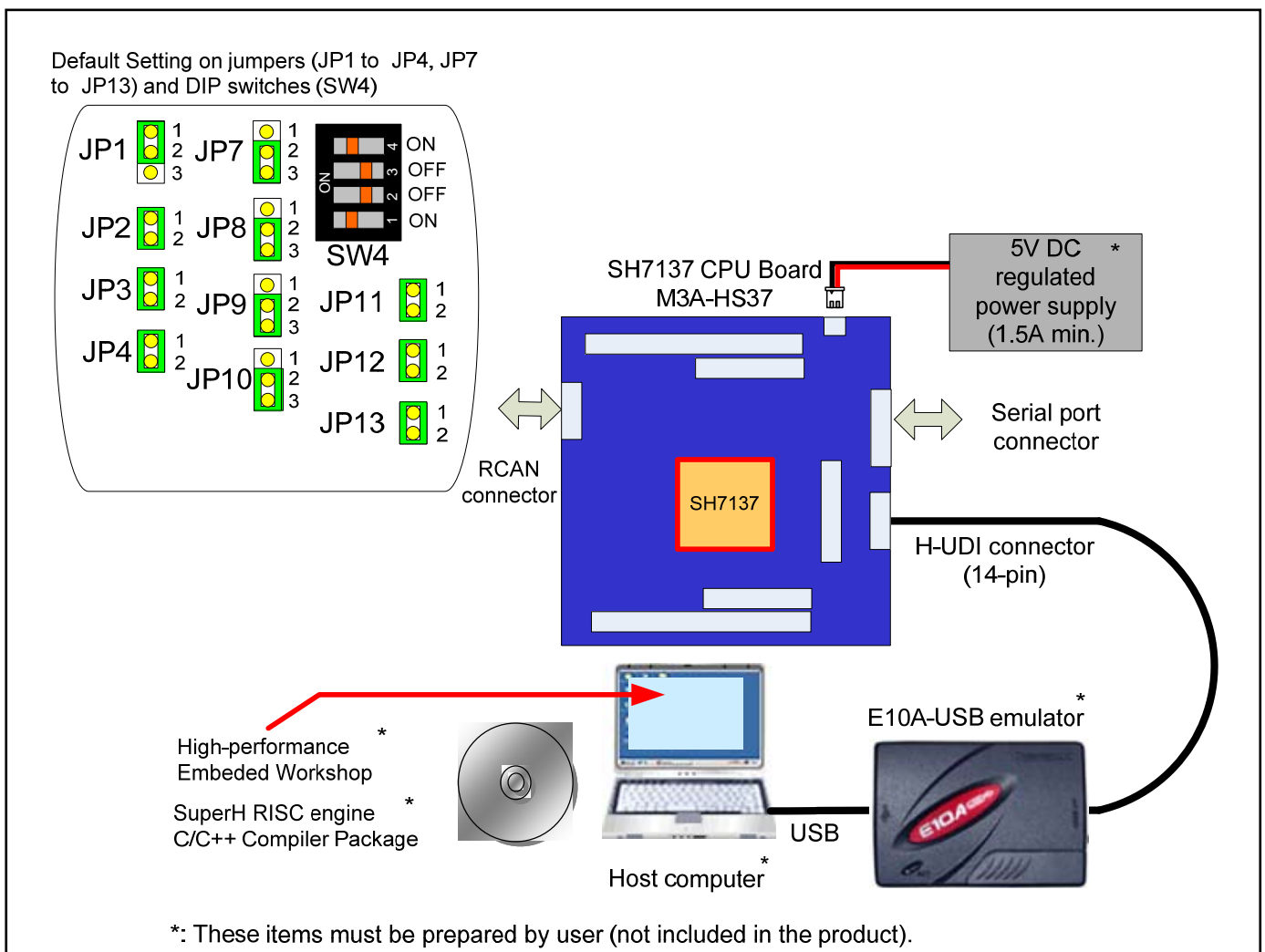


Figure 1.2.1 M3A-HS37 System Configuration

## 1.3 External Specifications

Table 1.3.1 list the M3A-HS37 external specifications.

Table 1.3.1 External Specifications

No.	Item	Description
1	CPU	SH7137 <ul style="list-style-type: none"> <li>● Input (XIN) clock: 10.0 MHz</li> <li>● CPU clock: 80 MHz (max.)</li> <li>● Bus clock: Maximum 40 MHz (max.)</li> <li>● On-chip memory               <ul style="list-style-type: none"> <li>• Flash memory: 256 KB</li> <li>• RAM: 16 KB</li> </ul> </li> </ul>
2	Memory	<ul style="list-style-type: none"> <li>● SRAM: 32 KB               <ul style="list-style-type: none"> <li>M5M5256DFP-70GI: 1 (8-bit bus width, optional)</li> </ul> </li> <li>● EEPROM: 16 KB (optional)</li> <li>● HN58X24128FPIE: 1 (I<sup>2</sup>C bus connection)</li> </ul>
3	Connectors	<ul style="list-style-type: none"> <li>● Expansion connectors (Bus, I/O, VCC, and GND)</li> <li>● Serial port connector (D-sub 9-pin)</li> <li>● H-UDI connector (14-pin)</li> <li>● RCAN connector (D-sub 9-pin)</li> </ul>
4	LEDs	<ul style="list-style-type: none"> <li>● POWER LED: 1</li> <li>● User LEDs: 6</li> </ul>
5	Switches	<ul style="list-style-type: none"> <li>● Reset switch: 1</li> <li>● NMI switch: 1</li> <li>● IRQ2 switch: 1</li> <li>● System setting DIP switches: 4/package</li> <li>● User DIP switches: 4/package</li> </ul>
6	Dimensions	<ul style="list-style-type: none"> <li>● Dimensions: 100 mm x 100 mm</li> <li>● Mounting form : 4 layers, double-sided</li> <li>● Board configuration : 1 board</li> </ul>

## 1.4 Appearance

Figure 1.4.1 shows the M3A-HS37 appearance.

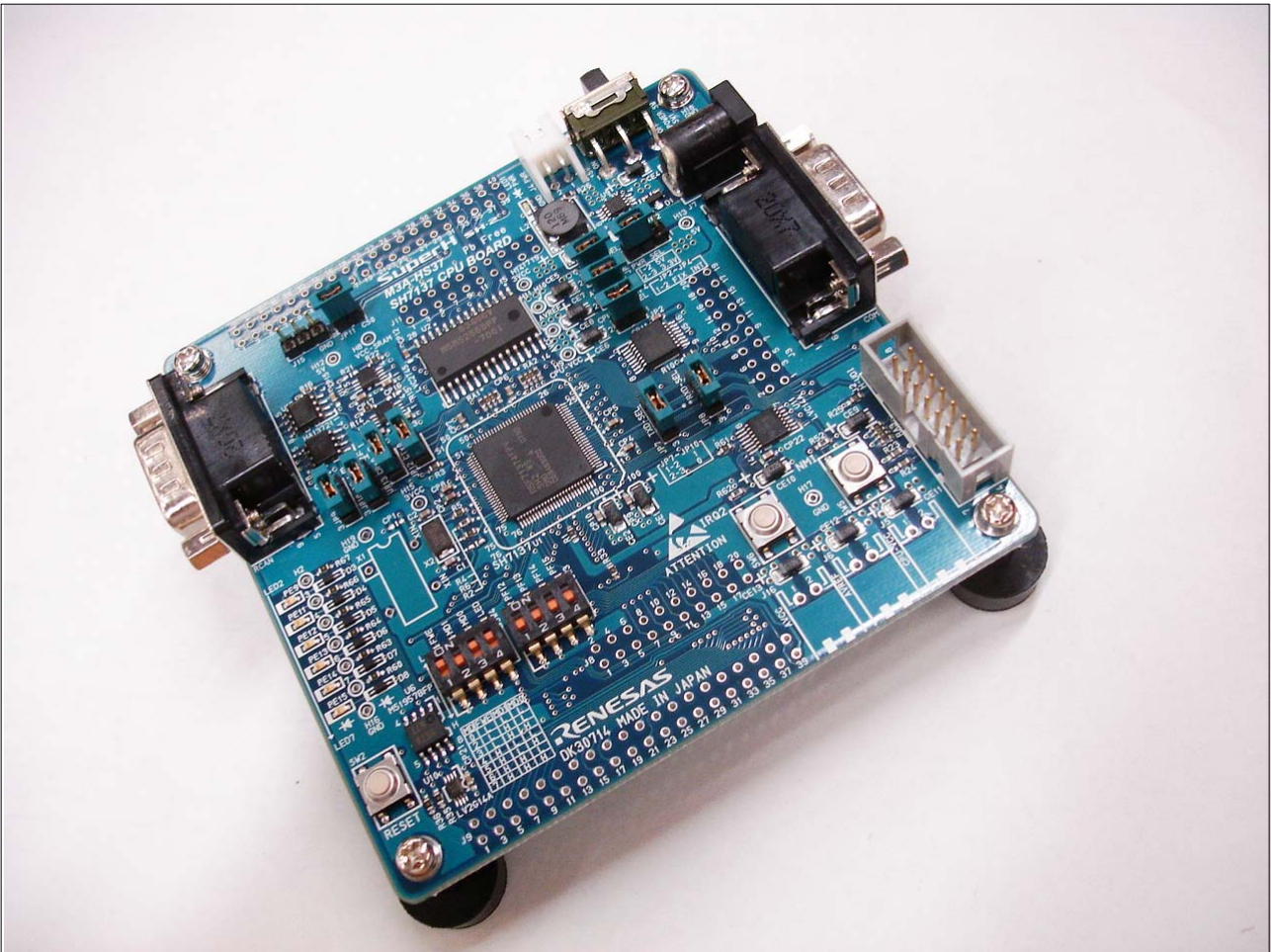


Figure 1.4.1 M3A-HS37 Appearance



1.5 M3A-HS37 Block Diagram

Figure 1.5.1 shows the M3A-HS37 system block diagram.

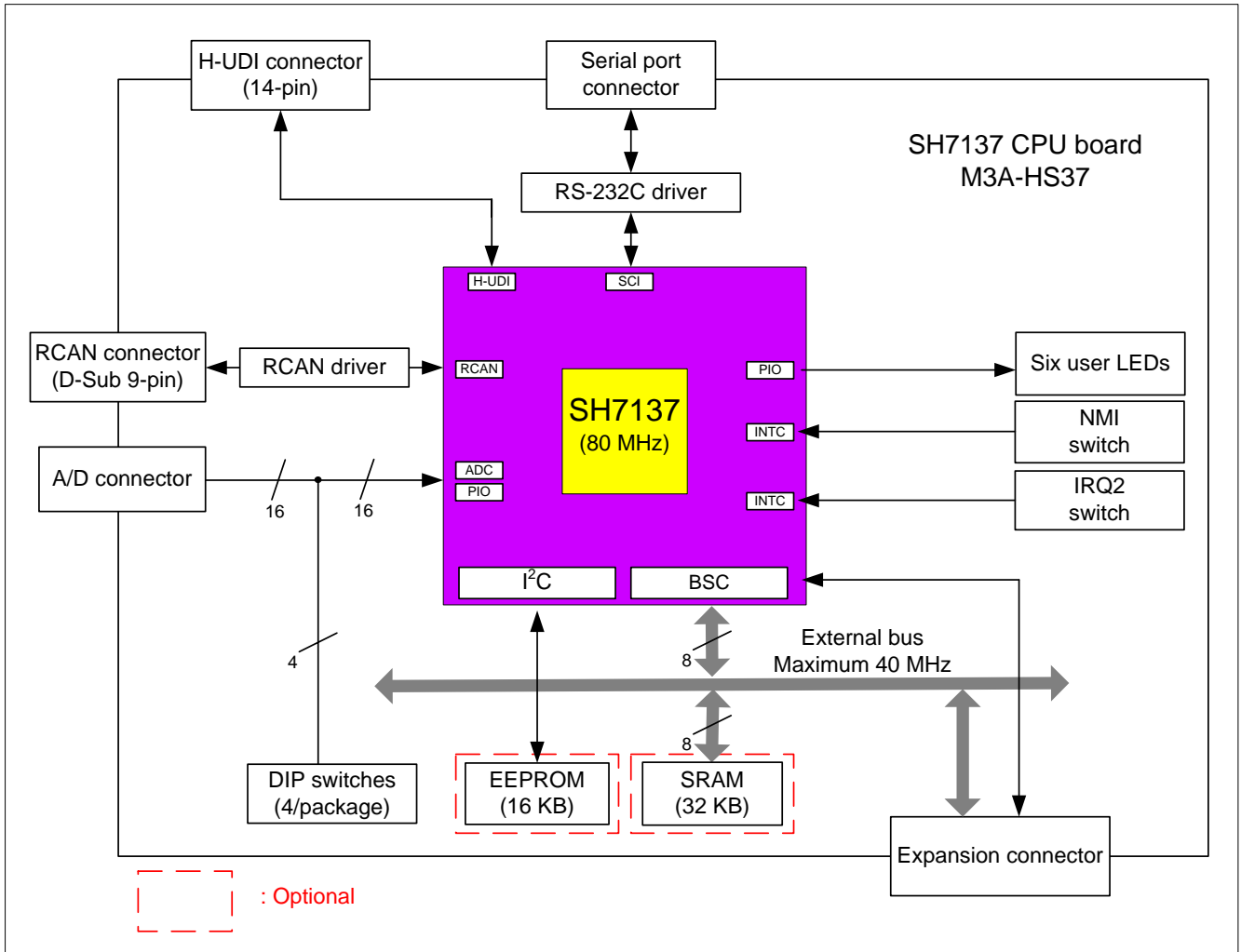


Figure 1.5.1 M3A-HS37 System Block Diagram

1.6 M3A-HS37 Major Components

Figure 1.6.1 shows the M3A-HS37 major components.

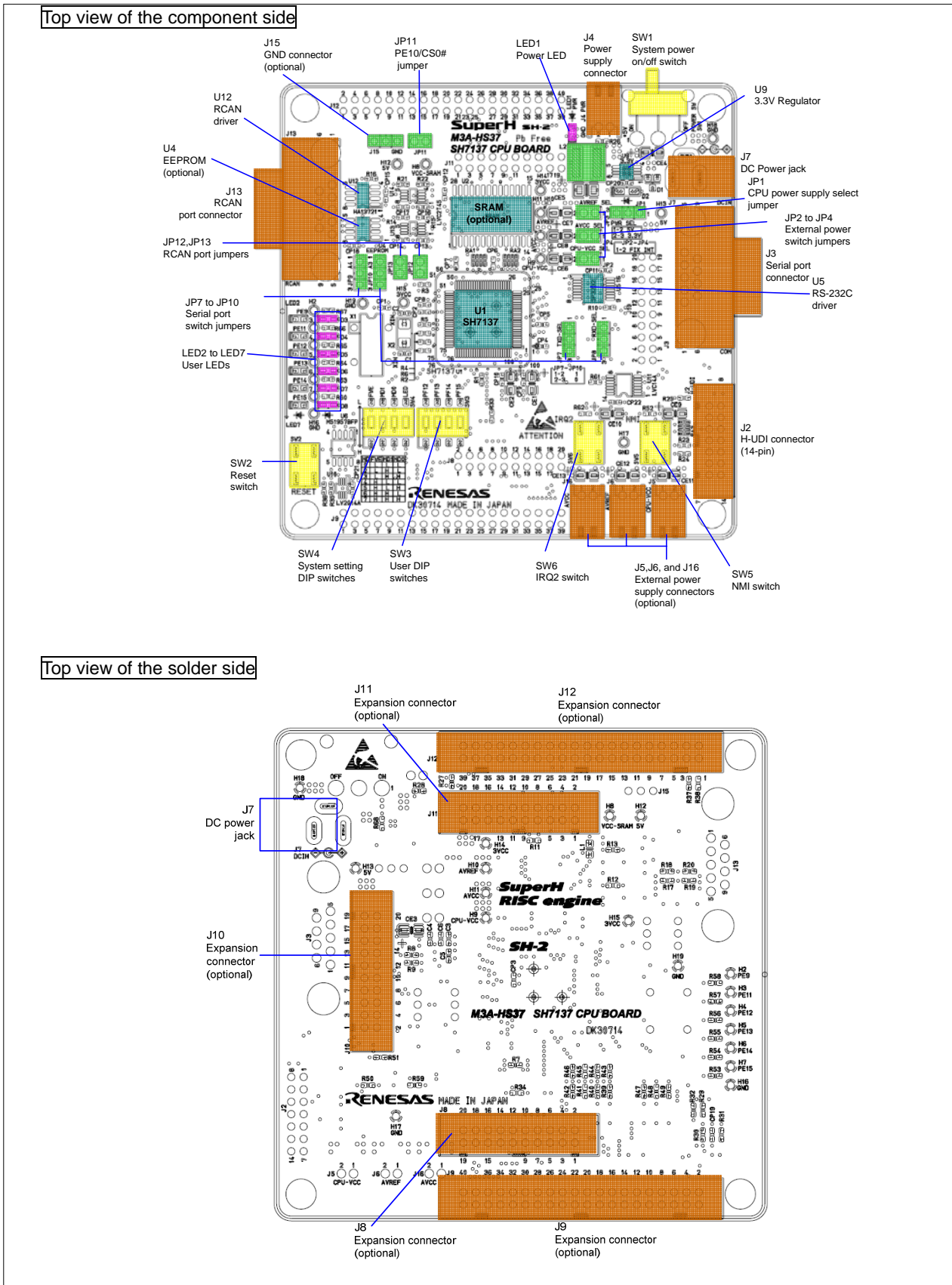


Figure 1.6.1 M3A-HS37 Major Components

Table 1.6.1 lists the major components on the M3A-HS37.

Table 1.6.1 Main Components Mounted on the M3A-HS37

No.	Name	Part Number	Manufacturer	Remarks
U1	CPU	SH7137	Renesas	
U1	CPU socket	NQPACK100SD(-ND)	TET	
U2	SRAM	M5M5256DFP-70GI	Renesas	Optional
U4	EEPROM	HN58X24128FPIE	Renesas	Optional
U5	RS-232C driver	SP3232ECA	Sipex	
U6	Reset IC	M51957BFP	Renesas	
U9	3.3 V regulator	LM2738YMY	NS	SW regulator
U10	Inverter	HD74LV2G14A	Renesas	
U11	Inverter	SN74LVC14APWR	TI	
U12	RCAN driver IC	HA13721FPK	Renesas	
U13, U14	Level shifters	SN74VC2T45DCT	TI	
X1	Oscillator	SG8002DC_10.0MHz	Epson	Optional
X1	Oscillator socket			Optional
X2	Oscillator	CX5032GB 10000	KYOCERA KINSEKI	
J2	H-UDI connector (14-pin)	7614-6002	Sumitomo 3M	
J3	Serial port connector	XM2C-0942-132L	OMRON	
J4	Power supply connector	S2B-XH-A	JST	
J7	DC power jack	HEC0470-01-630	HOSIDEN	
J8, J10, J11	Expansion connectors (20-pin)	XG8T-2031	OMRON	Optional
J9, J12	Expansion connectors (40-pin)	XG8T-2031: 2	OMRON	Optional
J13	CAN connector (9-pin)	XM2C-0942-132L	OMRON	
LED1	Power LED	Blue		
LED2 to LED7	User LEDs	Green		
SW1	Power switch	MS-12AAH1	nikkai	
SW2	Reset switch	B3SN-3012	OMRON	Push-button switch
SW3	User DIP switches	A6S-4104	OMRON	4/package
SW4	System setting DIP switches	A6S-4104	OMRON	4/package
SW5	NMI switch	B3SN-3012	OMRON	Push-button switch
SW6	IRQ2 switch	B3SN-3012	OMRON	Push-button switch

1.7 M3A-HS37 Memory Map

Figure 1.7.1 and Figure 1.7.2 show the memory map examples of SH7137 on the M3A-HS37.

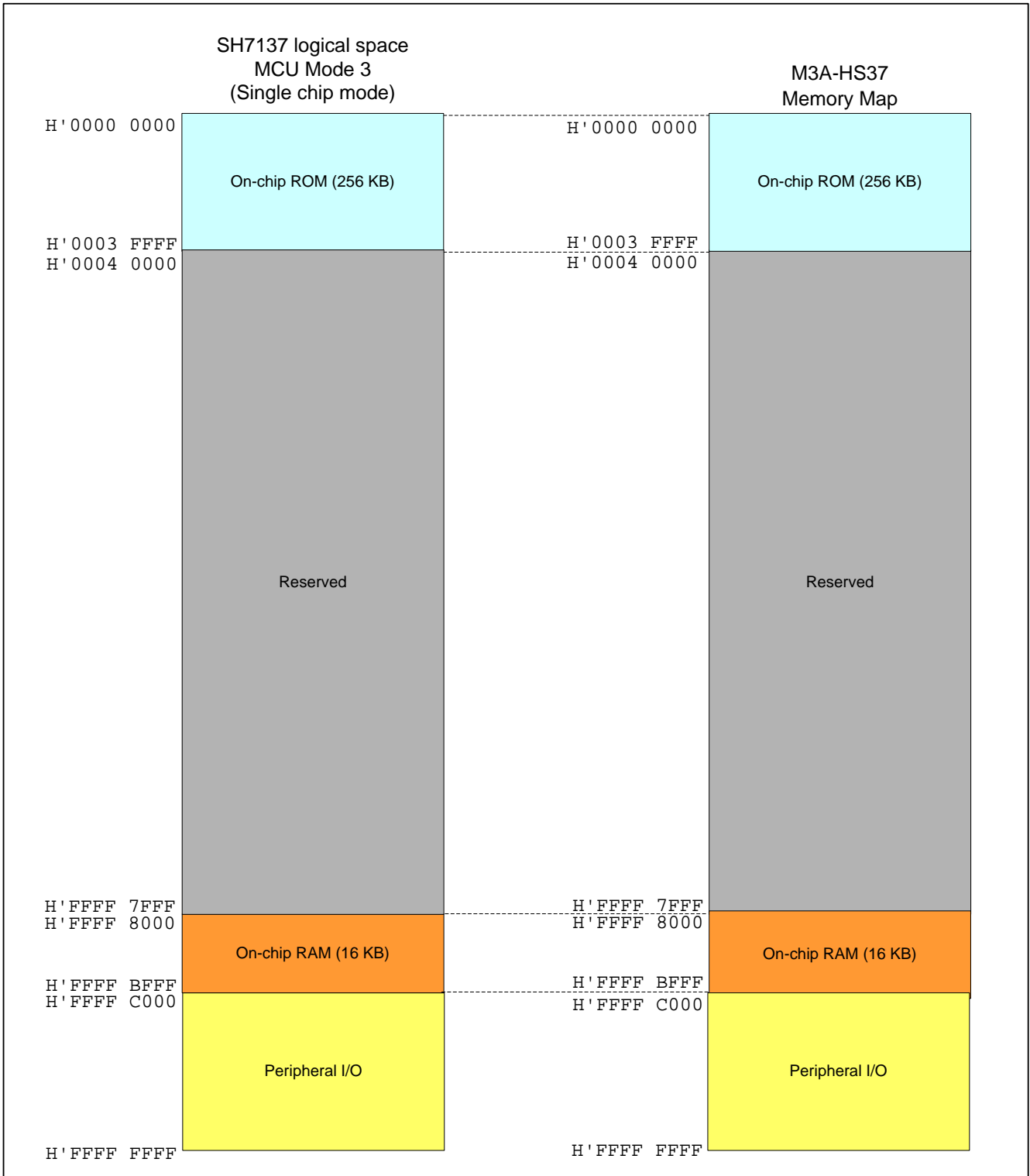


Figure 1.7.1 SH7137 Memory Map (MCU mode 3)

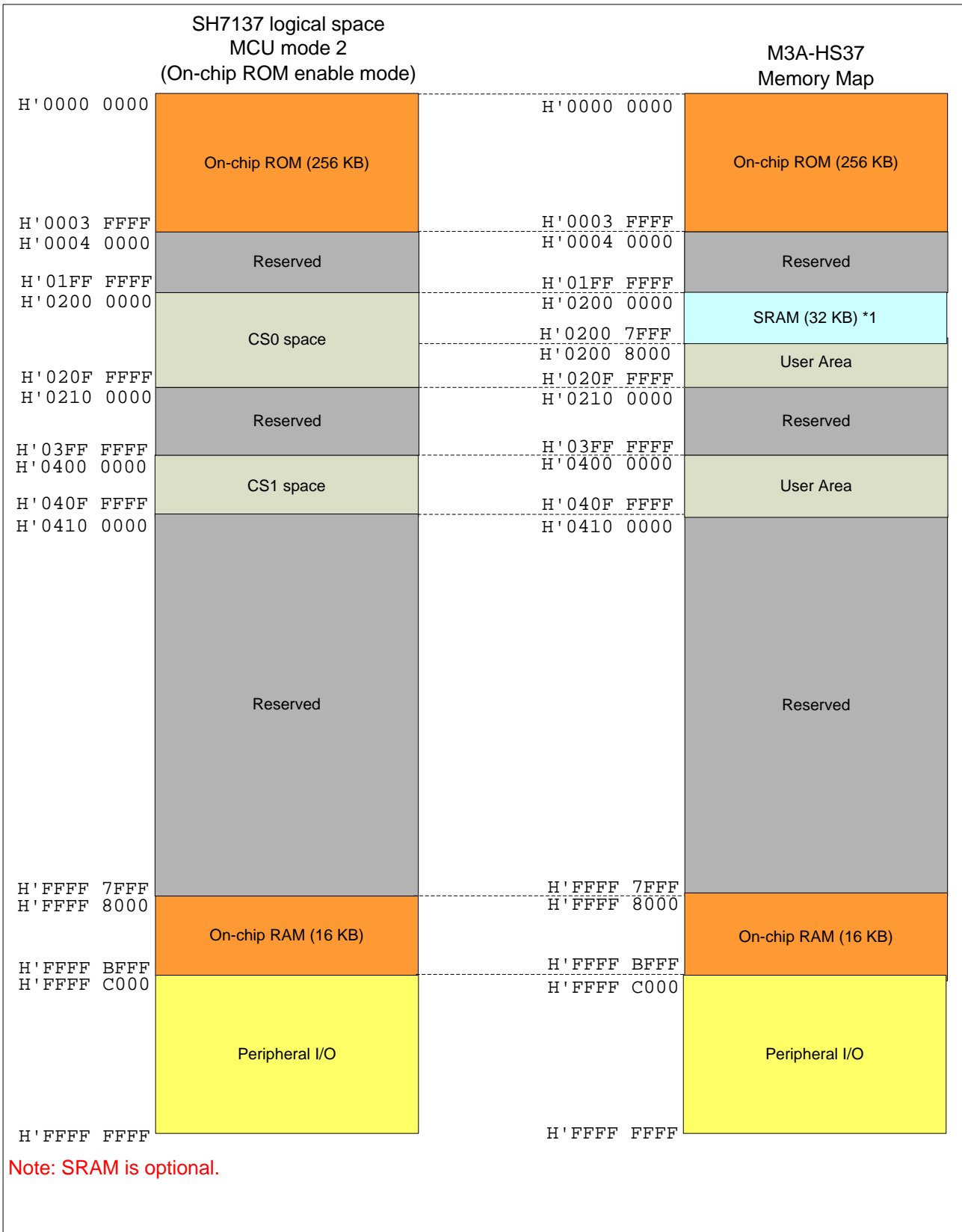


Figure 1.7.2 SH7137 Memory Map (MCU mode 2)

## 1.8 Absolute Maximum Ratings

Table 1.8.1 lists the absolute maximum ratings of the M3A-HS37.

Table 1.8.1 Absolute Maximum Ratings of M3A-HS37

Symbol	Parameter	Rated Value	Remarks
CPU-VCC	Power supply voltage	-0.3 to 7.0 V	Reference voltage: VSS. Both VCC = 5 V and 3.3 V allowed.
AVCC	ADC power supply voltage	-0.3 to 7.0 V	Reference voltage: AVSS, for A/D converter
Topr	Operating temperature	0 to 50°C	No dewdrops allowed.
Tstr	Storage temperature	-10 to 60°C	No corrosion gas allowed

**Note:** Temperature refers to the air temperature in the vicinity of the board.

## 1.9 Recommended Operating Conditions

Table 1.9.1 lists the recommended operating conditions of the M3A-HS37.

Table 1.9.1 Operating Conditions

Symbol	Parameter	Value	Remarks
CPU-VCC	3.3-5 V systems power supply voltage	3.0 to 5.5 V	Reference voltage: VSS Both VCC = 5 V and 3.3 V allowed
AVCC	ADC power supply voltage	4.5 to 5.5 V	Reference voltage: AVSS, for A/D converter
-	Maximum current consumption	1.5 A max.	
Topr	Operating temperature	0 to 50°C	No dewdrops allowed, no corrosion gas allowed.

## Chapter 2

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# Functional Specifications

## 2.1 Features

The M3A-HS37 CPU board has function modules listed in Table 2.1.1.

Table 2.1.1 lists the M3A-HS37 functional modules.

Table 2.1.1 M3A-HS37 Functional Modules

Section	Features	Description
2.2	CPU	SH7137 <ul style="list-style-type: none"> <li>● Input (XIN) clock: 10.0 MHz</li> <li>● CPU clock: 80 MHz (max.)</li> <li>● Bus clock: 40 MHz (max.)</li> <li>● Internal memory               <ul style="list-style-type: none"> <li>• Flash memory: 256 KB</li> <li>• RAM: 16 KB</li> </ul> </li> </ul>
2.3	Memory	<ul style="list-style-type: none"> <li>● SRAM: 32 KB M5M5256DFP-70GI: 1 (8-bit bus width, optional)</li> <li>● EEPROM: 16 KB (optional) HN58X24128FPIE: 1 (I<sup>2</sup>C bus connection)</li> </ul>
2.4	Serial Port Interface	Connects the SH7137 SCI1 or SCI0 pins to the serial port connector
2.5	I/O Ports	Connects to the SH7137 I/O ports
2.6	Power Supply Module	Controls the M3A-HS37 system power supply
2.7	RCAN Interface	Connects the SH7137 CAN pin to RCAN connector via an RCAN driver
2.8	Clock Modules	Controls the system clock
2.9	Reset Module	Resets the device on the M3A-HS37
2.10	Interrupt Switches	Connect to the NMI pin, IRQ2 pin and test port
2.11	E10A-USB Interface	SH7137 H-UDI interface (14-pin)
-	Operational Specifications	Connectors, switches and LEDs <ul style="list-style-type: none"> <li>● SH7137 expansion connectors</li> <li>● Switches and LEDs</li> <li>● H-UDI connector</li> </ul> Refer to Chapter 3 for details.



2.2 CPU

The M3A-HS37 is provided with the SH7137, the 32-bit RISC MCU operates with a maximum frequency of 80 MHz.

The SH7137 MCU is provided with a 256-KB flash memory, and a 16-KB RAM, which covers a wide range of applications from data processing to equipment control.

The M3A-HS37 can be operated with a maximum CPU frequency of 80 MHz (external bus 40 MHz at maximum) using a 10.0 MHz of the input clock.

Figure 2.2.1 shows the SH7137 block diagram on the M3A-HS37.

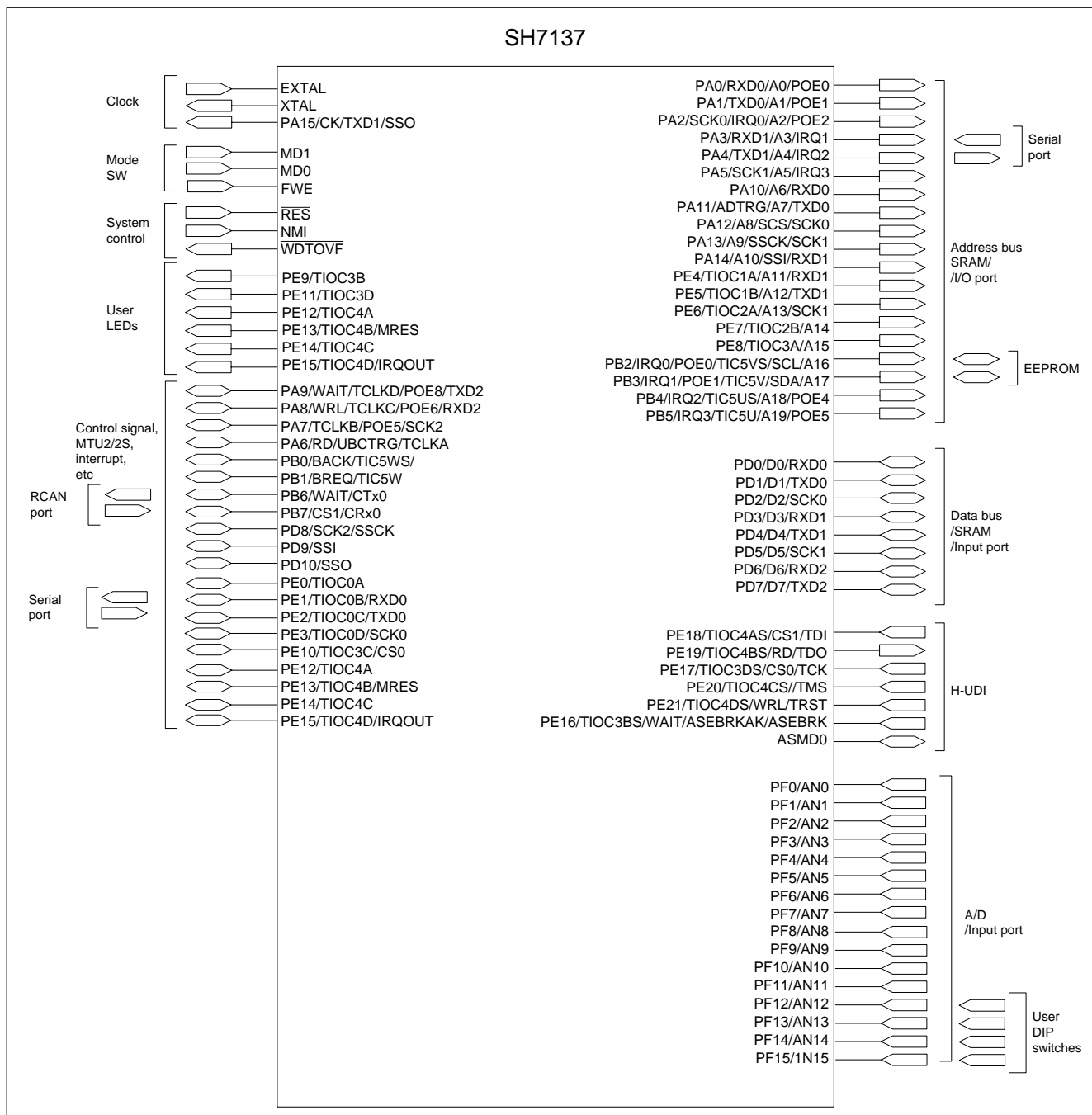


Figure 2.2.1 SH7137 Block Diagram

## 2.3 Memory

### 2.3.1 SH7137 Internal Memory

The SH7137 MCU is provided with a 256-KB flash memory and a 16-KB RAM.

### 2.3.2 SRAM

A 32-KB of SRAM can be mounted on the M3A-HS37 (optional). Both 5 V and 3.3 V can be supplied for the CPU and the SRAM on the M3A-HS37. The supply voltage supplied to the CPU is also supplied to SRAM. When M5M5256DFP-70GI is mounted as SRAM, the supply voltage is automatically the same as the CPU. The SRAM is controlled by the SH7137 on-chip bus state controller.

Table 2.3.1 lists the SRAM specifications. Figure 2.3.1 shows the block diagram of the connection between the SH7137 and SRAM. Table 2.3.2 lists the jumper connections.

Table 2.3.1 SRAM Specifications

Part Number	Bus size	Capacity	Package
M5M5256DFP-70GI	8-bit	32 KB (bus width: 8-bit)	28-pin SOP (450 mil)

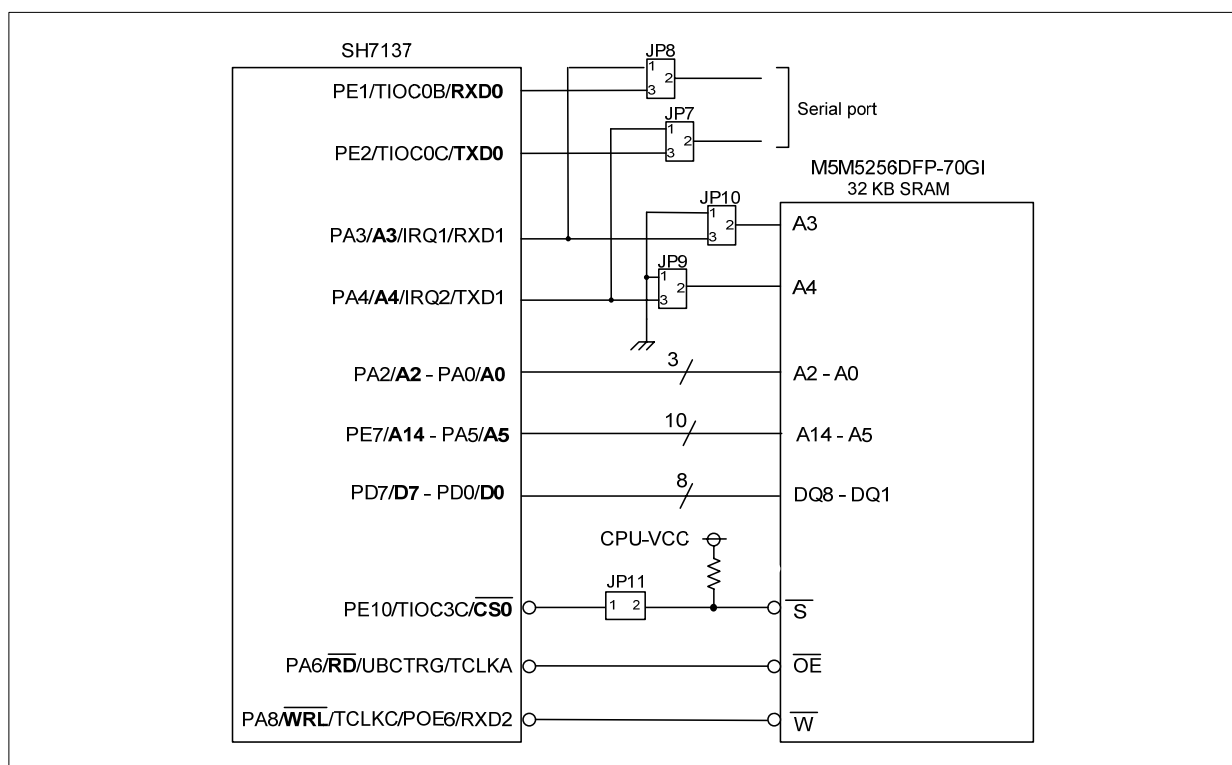


Figure 2.3.1 Connection Diagram Between SH7137 and SRAM

Table 2.3.2 Jumper Connections

SCI0	SCI1	SRAM	JP7	JP8	JP9	JP10
Y	N	Y	2-3	2-3	2-3	2-3
N	Y	N	1-2	1-2	1-2	1-2

Note: Y = yes, N = no

### 2.3.3 EEPROM

A 16-KB of the EEPROM can be mounted on the M3A-HS37. The EEPROM is controlled by the SH7137 on-chip I<sup>2</sup>C bus interface.

Table 2.3.3 lists the EEPROM specifications.

Figure 2.3.2 shows the connection circuit block diagram of SH7137 and EEPROM.

Table 2.3.3 EEPROM Specifications

Part Number	Interface	Capacity	Package
HN58X24128FPIE	2-wire system serial (I <sup>2</sup> C bus) *	16 KB	8-pin SOP

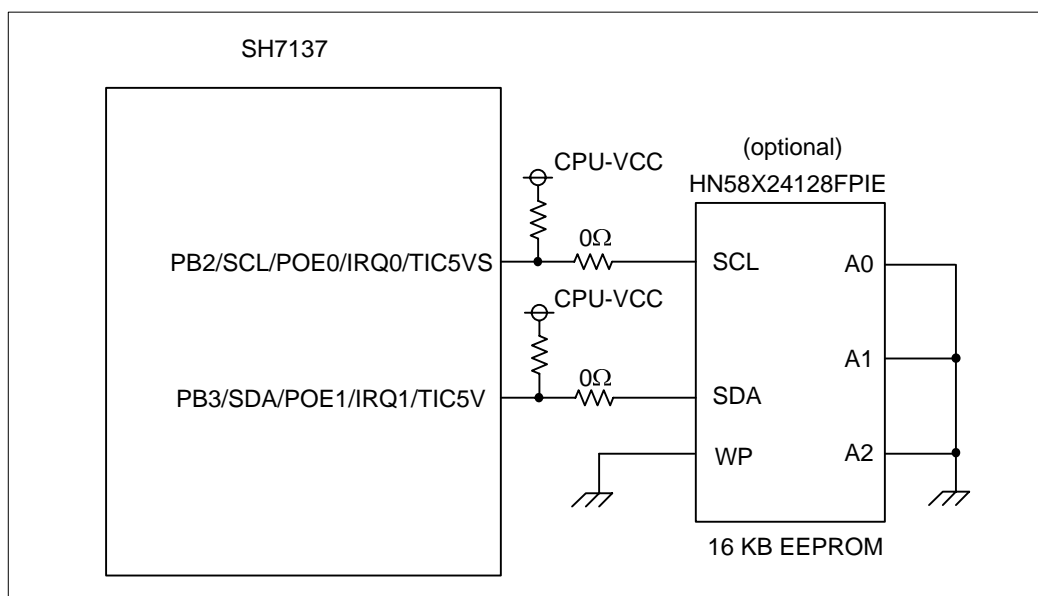


Figure 2.3.2 Connection Diagram Between SH7137 and EEPROM

Note: I<sup>2</sup>C bus is a trademark of Koninklijke Philips Electronics N. V.

2.4 Serial Port Interface

SH7137 SCI0 or SCI 1 pins can be connected to the serial port connector on the M3A-HS37 (default: PE1 pin and PE2 pin are connected to the serial port connector, J3). The serial port switch jumpers (JP7, JP8, JP9, and JP10) switch the SCI channels connected to a serial port connector.

Figure 2.4.1 shows the serial port block diagram on the M3A-HS37, and Table 2.4.1 lists the jumper connections.

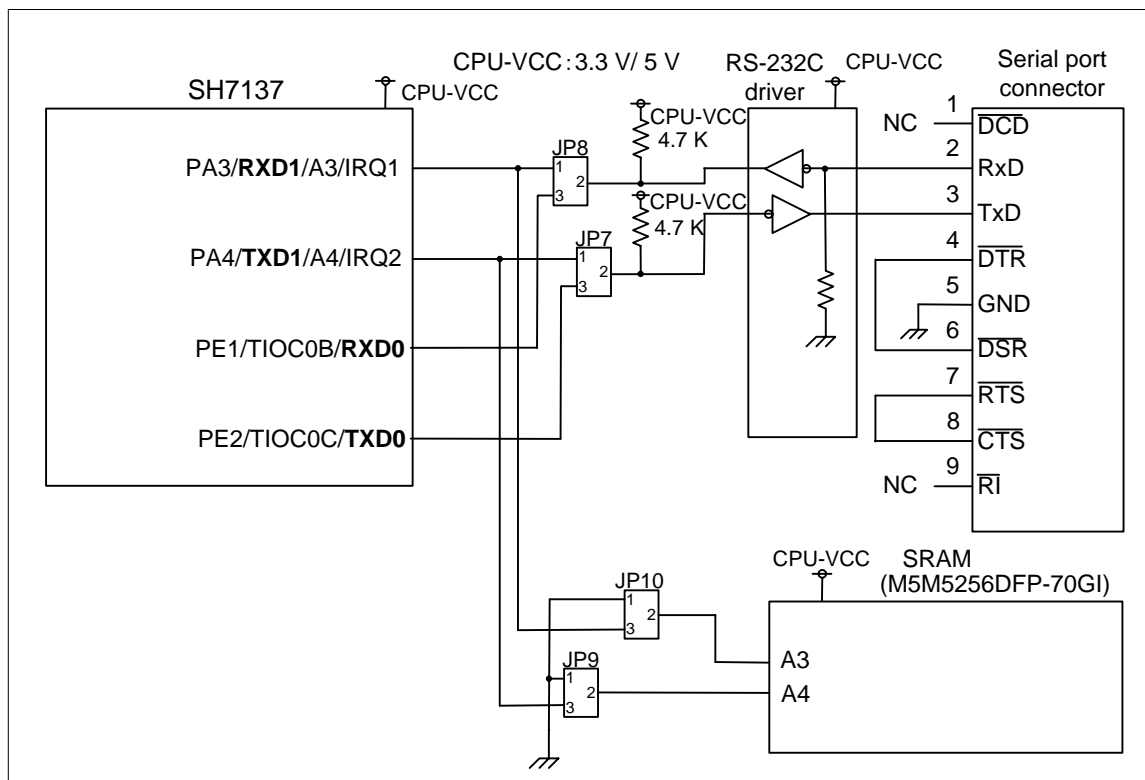


Figure 2.4.1 Serial Port Block Diagram

Table 2.4.1 Jumper Connections

SCI0	SCI1	SRAM	JP7	JP8	JP9	JP10
Y	N	Y	2-3	2-3	2-3	2-3
N	Y	N	1-2	1-2	1-2	1-2

Note: Y = yes, N = no

2.5 I/O Ports

All of the SH7137 I/O ports are connected to the expansion bus connectors on the M3A-HS37.

Some I/O ports are connected to the DIP switches and LEDs, which are allowed for user.

Figure 2.5.1 shows the DIP switches and LEDs connection diagram.

Table 2.5.1 lists the I/O port features.

Note: Unused ports are open to allow for expansion on the M3A-HS37.

(PA6 to PA9, PB0, PB1, PB5, PD8-PD10, PE0, PE3, and PE8)

Set these unused ports as output at first when using the M3A-HS37.

When some ports of the SH7137 MCU are unused on the user system, the pull-up or pull-down process is recommended.

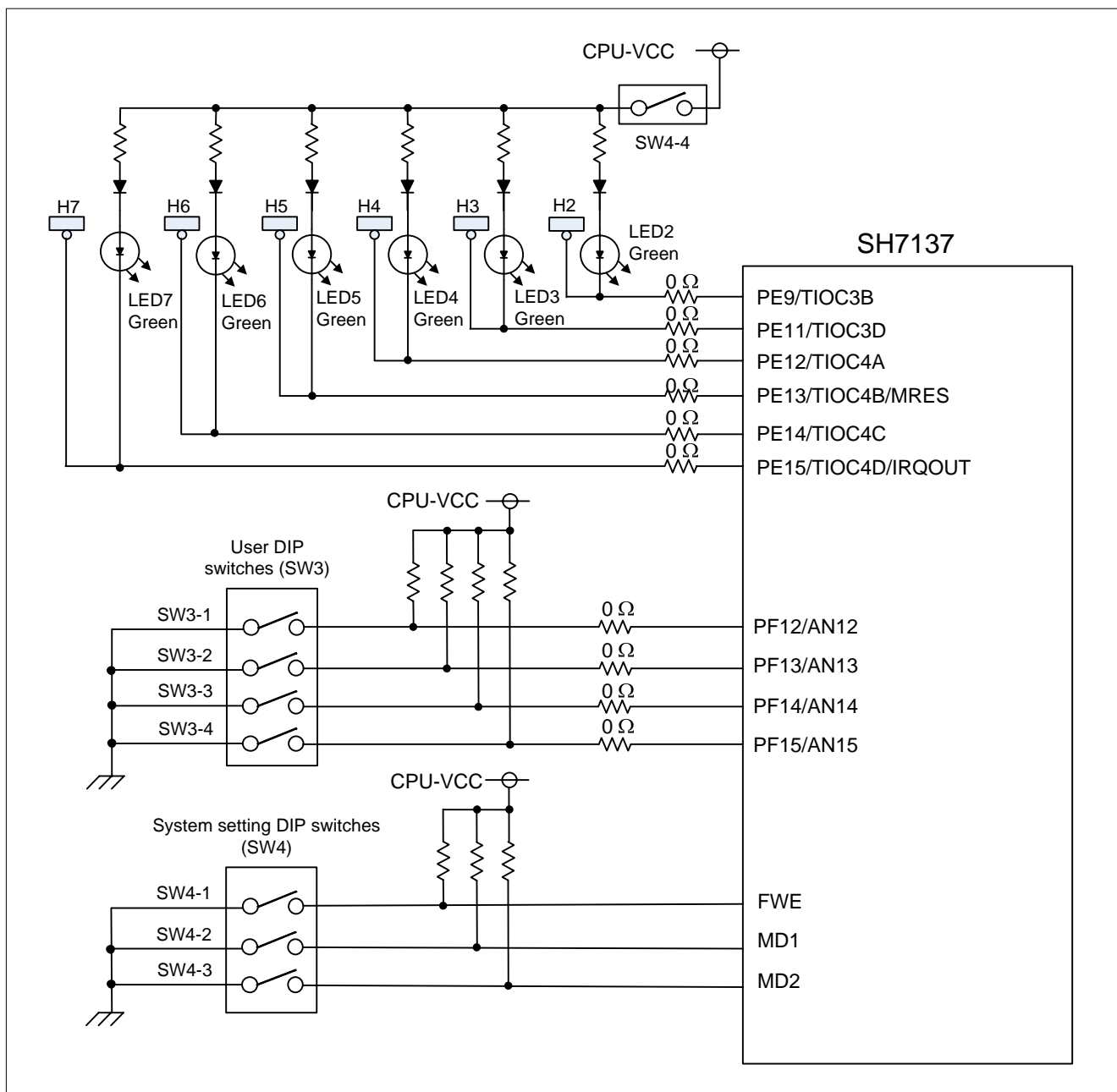


Figure 2.5.1 DIP Switches and LEDs Connection Diagram

Table 2.5.1 I/O Port Features

No.	SH7137 Pin Name	Expansion connectors					Remarks
		J8	J9	J10	J11	J12	
2	PE21/WRL/TIOC4DS/TRST			√*			
4	PE20/TIOC4CS/TMS			√*			
5	PE19/RD/TIOC4BS/TDO			√*			
6	PE18/CS1/TIOC4AS/TDI			√*			
7	PE17/CS0/TIOC3DS/TCK			√*			
8	PE16/WAIT/TIOC3BS/ASEBKAK/ASEBK		√				
9	PE15/TIOC4D/IRQOUT		√				LED
10	PE14/TIOC4C		√				LED
12	PE13/TIOC4B/MRES		√				LED
13	PE12/TIOC4A		√				LED
15	PE11/TIOC3D		√				LED
17	PE9/TIOC3B		√				LED
18	PE10/CS0/TIOC3C		√				
19	PE8/A15/TIOC3A		√				
20	PE7/A14/TIOC2B		√				
21	PE6/A13/TIOC2A/SCK1		√				
22	PE5/A12/TIOC1B/TXD1		√				
23	PE4/A11/TIOC1A/RXD1		√				
24	PE3/TIOC0D/SCK0		√				
25	PE2/TIOC0C/TXD0		√				Serial
26	PE1/TIOC0B/RXD0		√				Serial
27	PE0/TIOC0A		√				
28	PD10/SSO			√			
29	PD9/SSI			√			
30	PD8/SCK2/SSCK			√			
31	PD7/D7/TXD2/SCS			√		√	
32	PD6/D6/RXD2			√		√	
33	PD5/D5/SCK1					√	
34	PD4/D4/TXD1					√	
35	PD3/D3/RXD1					√	
37	PD2/D2/SCK0					√	
38	PD1/D1/TXD0					√	
40	PD0/D0/RXD0					√	
41	PB7/CS1/CRx0			√			RCAN
42	PB6/WAIT/CTx0			√			RCAN
43	PB5/A19/IRQ3/POE5/TIC5U		√				
44	PB4/A18/IRQ2/POE4/TIC5US		√				IRQ2 SW
45	PB3/A17/IRQ1/POE1/TIC5V/SDA		√				EEPROM
46	PB2/A16/IRQ0/POE0/TIC5VS/SCL		√				EEPROM
47	PB1/BREQ/TIC5W			√			
49	PB0/BACK/TIC5WS			√			
51	PA15/CK/TXD1/SSO		√				
52	PA14/A10/RXD1/SSI		√				
53	PA13/A9/SCK1/SSCK		√				
54	PA12/A8/SCK0/SCS		√				
55	PA11/A7/TXD0/ADTRG		√				
56	PA10/A6/RXD0		√				
58	PA9/WAIT/TCLKD/POE8/TXD2			√			
60	PA8/WRL/TCLKC/POE6/RXD2			√			
61	PA7/TCLKB/POE5/SCK2/						
62	PA6/RD/UBCTRG/TCLKA/POE4					√	
63	PA5/A5/IRQ3/SCK1		√				
65	PA4/A4/IRQ2/TXD1		√				Serial
66	PA3/A3/IRQ1/RXD1		√				Serial
67	PA2/A2/IRQ0/POE2/SCK0		√				
68	PA1/A1/POE1/TXD0		√				
69	PA0/A0/POE0/RXD0		√				

SH7137		Expansion connectors					Remarks
No.	Pin Name	J8	J9	J10	J11	J12	
80	PF15/AN15	√					Analog input pin User DIP switches SW
81	PF14/AN14	√					Analog input pin User DIP switches SW
82	PF13/AN13	√					Analog input pin User DIP switches SW
83	PF12/AN12	√					Analog input pin User DIP switches SW
84	PF11/AN11	√					Analog input pin
85	PF10/AN10	√					Analog input pin
86	PF9/AN9	√					Analog input pin
87	PF8/AN8	√					Analog input pin
89	PF7/AN7	√					Analog input pin
90	PF6/AN6	√					Analog input pin
91	PF5/AN5	√					Analog input pin
92	PF4/AN4	√					Analog input pin
94	PF3/AN3	√					Analog input pin
95	PF2/AN2	√					Analog input pin
96	PF1/AN1	√					Analog input pin
97	PF0/AN0	√					Analog input pin

Note: Connected only when the 0Ω resistance is mounted.

## 2.6 Power Supply Module

The M3A-HS37 is supplied +5 V power and the voltage regulator on the board generates +3.3 V. LM2738YMY is the output voltage adjustable regulator and the desired voltage value can be generated by changing the resistance value. +5 V power is supplied from the DC regulated power supply (via the power connector, J4) or AC adapter (via the DC power jack, J7).

The SH7137 system power supply (VCC) can be switched to +3.3 V or +5 V by 3V/5V select jumper (JP1) setting (default: 5V).

When switching the VCC, note that the following:

- The conversion voltages between 5 V and 3 V are supplied to the RCAN interface as appropriate.
- Both +5 V and +3 V are available on the CPU and SRAM (part number: 5M5256DFP-VP70GI).
- The supply voltage supplied to the CPU is also supplied to SRAM.
- Always +5 V is supplied to the SH7137 A/D converter.

The SH7137 system power supply (VCC), A/D power supply (AVCC), and AVREF power supply can be supplied from external power supply, respectively.

Figure 2.6.1 shows the M3A-HS37 power circuit block diagram.

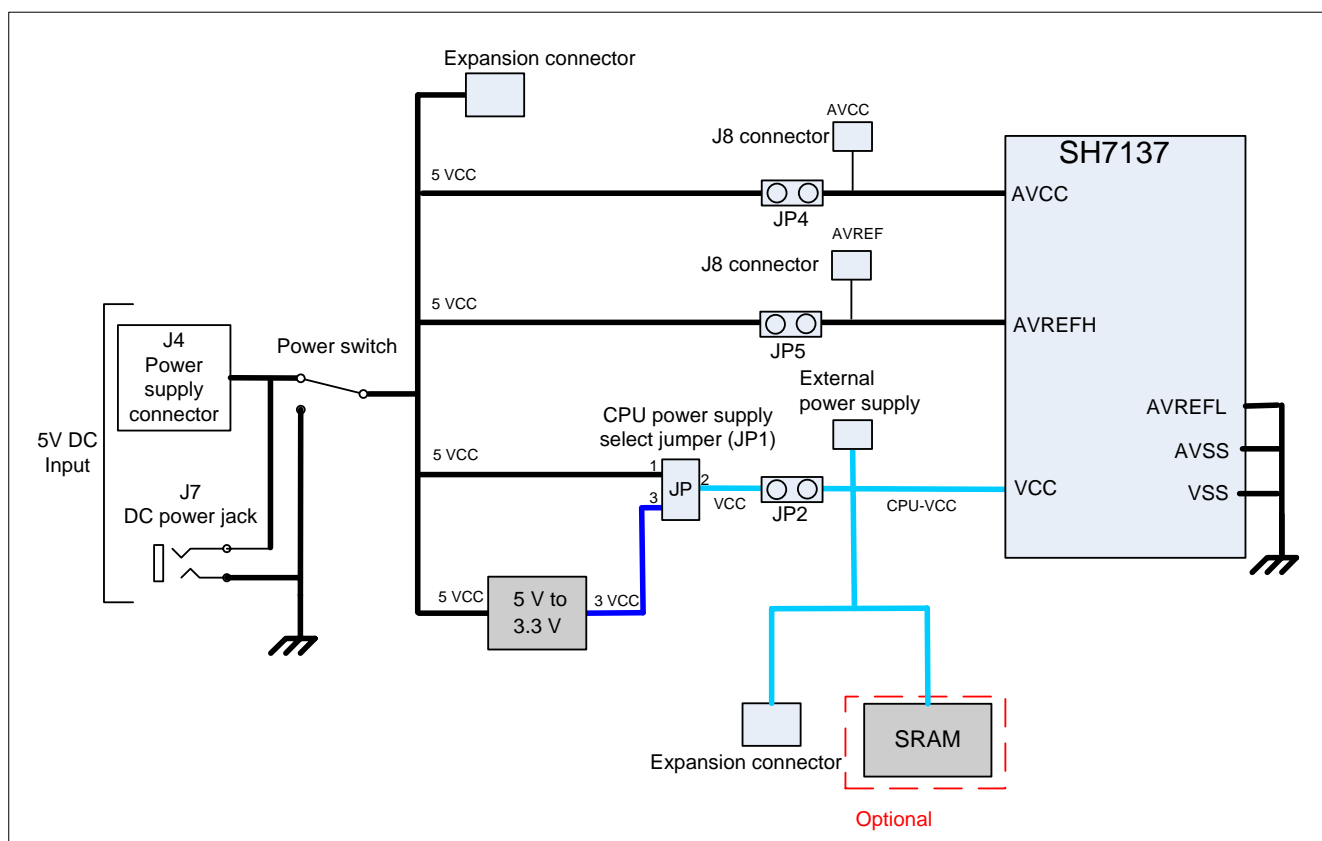


Figure 2.6.1 Power Supply Circuit Block Diagram



2.7 RCAN Interface

The M3A-HS37 is provided with an RCAN connector (D-Sub 9-pin).

Figure 2.7.1 shows the RCAN interface block diagram.

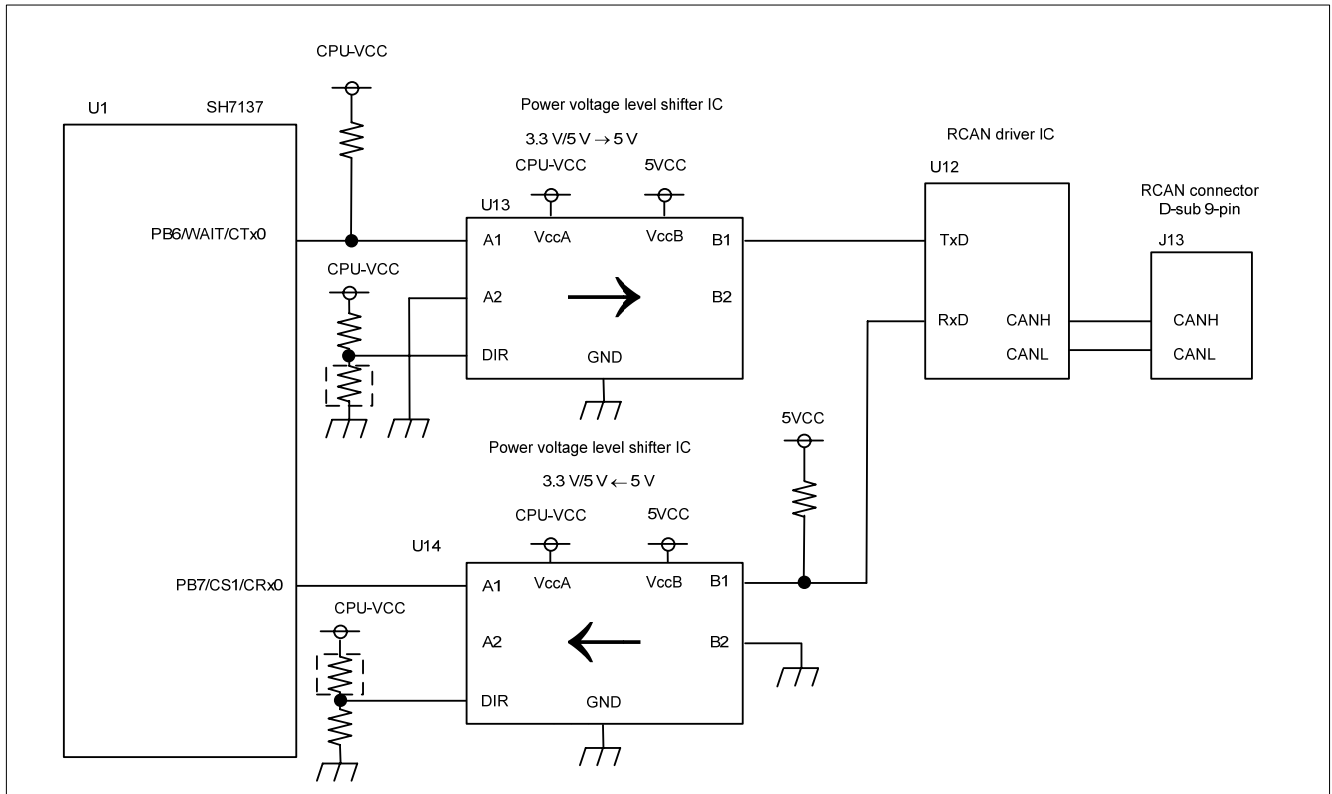


Figure 2.7.1 RCAN Interface Block Diagram

## 2.8 Clock Modules

The M3A-HS37 clock modules consists of two blocks.

- Crystal resonator is connected to EXTAL and XTAL
- Output from the oscillator is connected to the SH7137 EXTAL

The M3A-HS37 comes standard with a 10.0 MHz crystal resonator.

When mounting the oscillator, remove R7 and the crystal oscillation circuit.

Figure 2.8.1 shows the clock module block diagram.

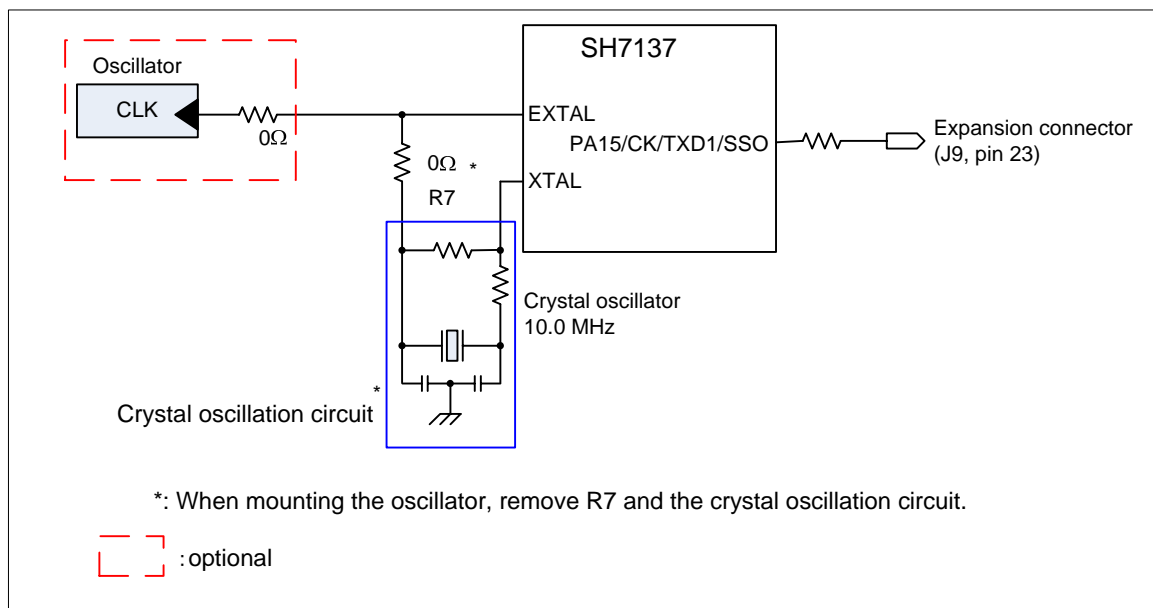


Figure 2.8.1 Clock Module Block Diagram

2.9 Reset Module

The reset circuit controls the SH7137 reset signals on the M3A-HS37.

Figure 2.9.1 shows the M3A-HS37 reset module block diagram.

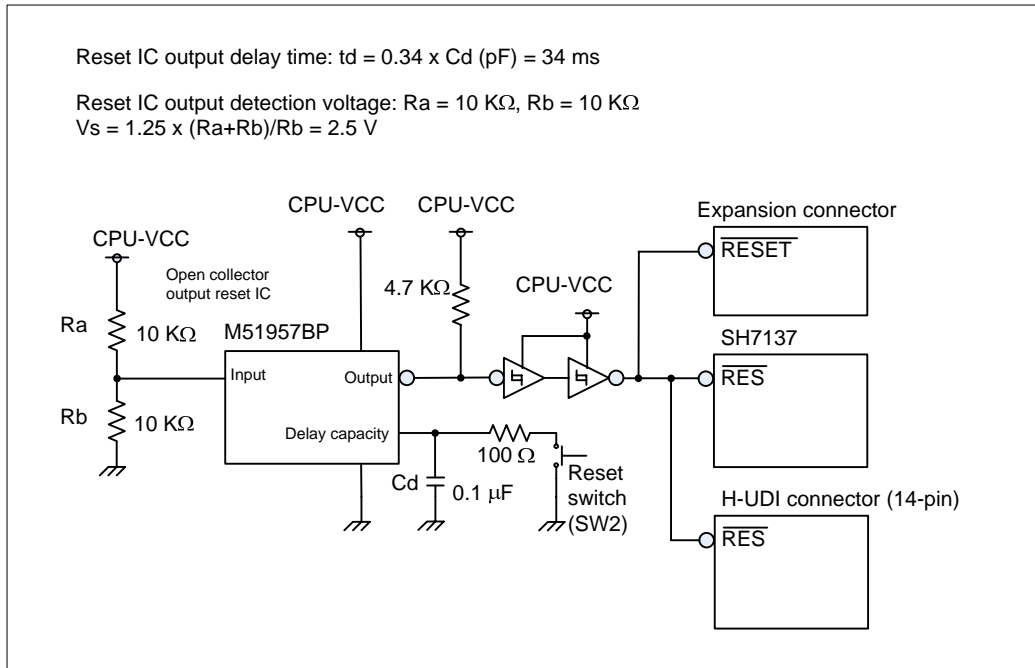


Figure 2.9.1 Reset Module Block Diagram

2.10 Interrupt Switches

The M3A-HS37 is provided with two push-button switches (NMI switch and IRQ2 switch) for the NMI pin and IRQ2 pin of the SH7137. Figure 2.10.1 shows the interrupt switch block diagram.

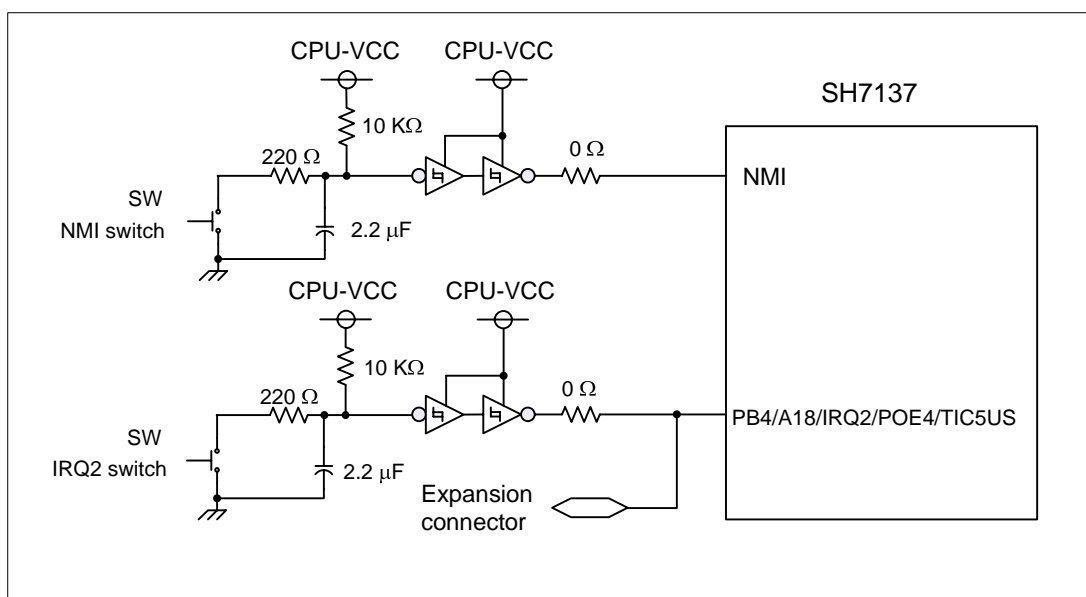


Figure 2.10.1 Interrupt Switch Block Diagram

2.11 E10A-USB Interface

The M3A-HS37 is provided with an H-UDI connector (J2) to connect the E10A-USB emulator.

Figure 2.11.1 shows the E10A-USB interface block diagram.

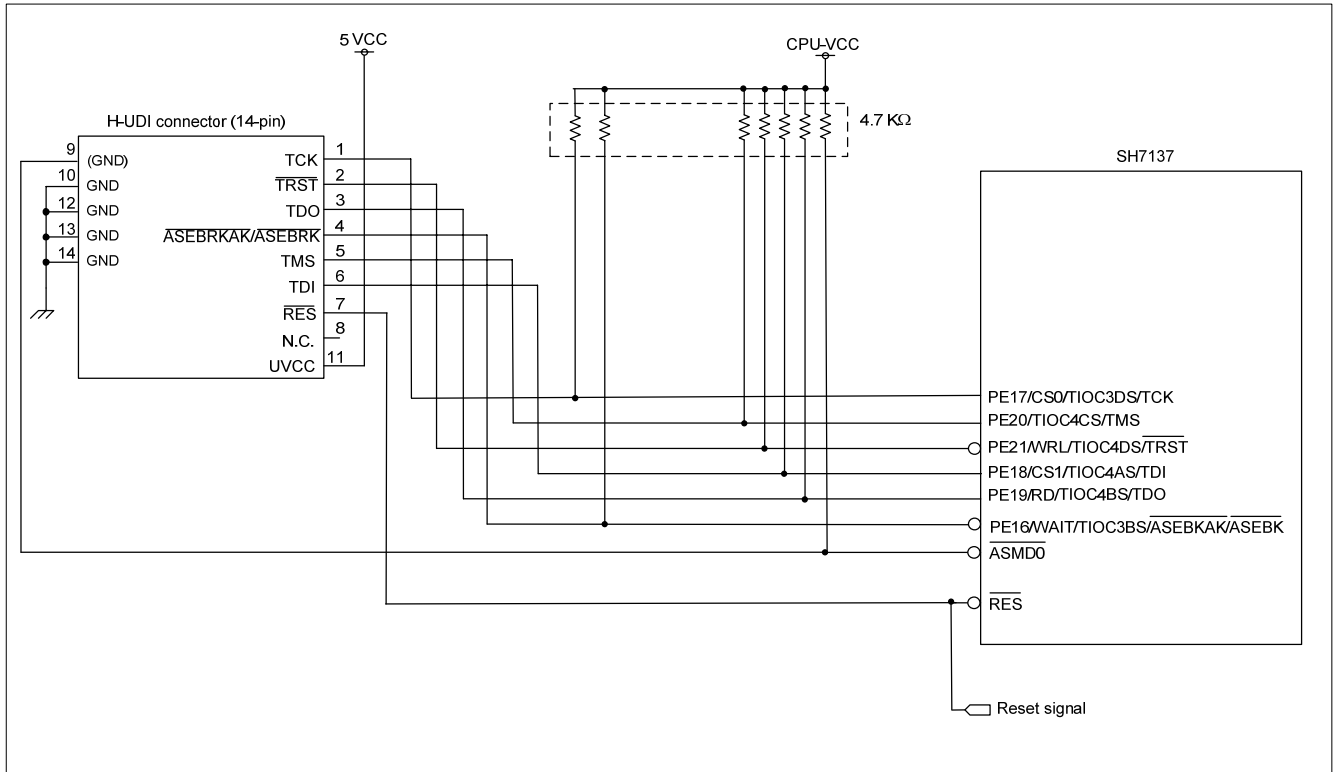


Figure 2.11.1 E10A-USB Interface Block Diagram

## Chapter 3

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# Operational Specifications

#### 3.1 M3A-HS37 Connectors

Figure 3.1.1 shows the M3A-HS37 connector assignments.

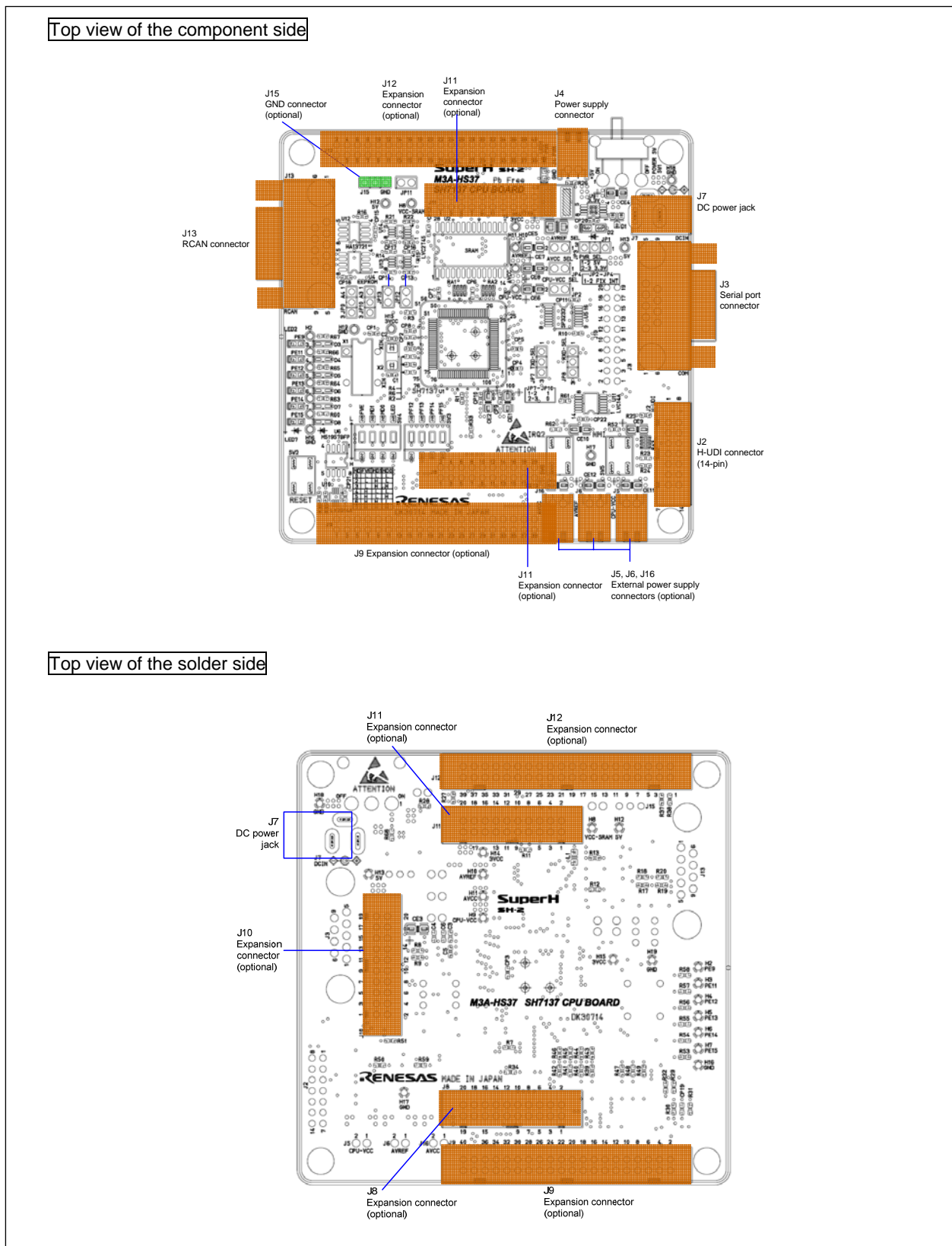


Figure 3.1.1 M3A-HS37 Connector Assignments

## 3.1.1 H-UDI Connector (J2)

Figure 3.1.2 shows the pin assignments for the H-UDI connector (J2).

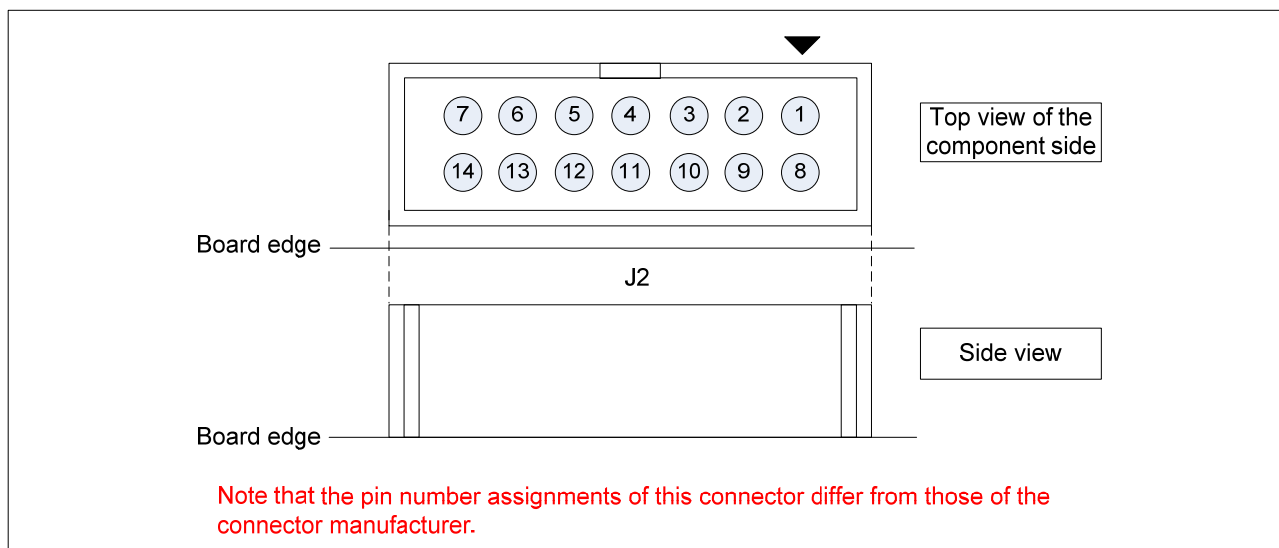


Figure 3.1.2 Pin Assignments for H-UDI Connector (J2)

Table 3.1.1 lists the pin assignments for the H-UDI connector (J2).

Table 3.1.1 Pin Assignments of H-UDI Connector (J2)

No.	Signal Name	No.	Signal Name
1	TCK	8	NC
2	$\overline{\text{TRST}}$	9	(GND)
3	TDO	10	GND
4	$\overline{\text{ASEBRKAK/ASEBRK}}$	11	UVCC
5	TMS	12	GND
6	TDI	13	GND
7	$\overline{\text{RES}}$	14	GND

### 3.1.2 Serial Port Connector (J3)

The M3A-HS37 is provided with a serial port connector (J3).

Figure 3.1.3 shows the pin assignments for the serial port connector.

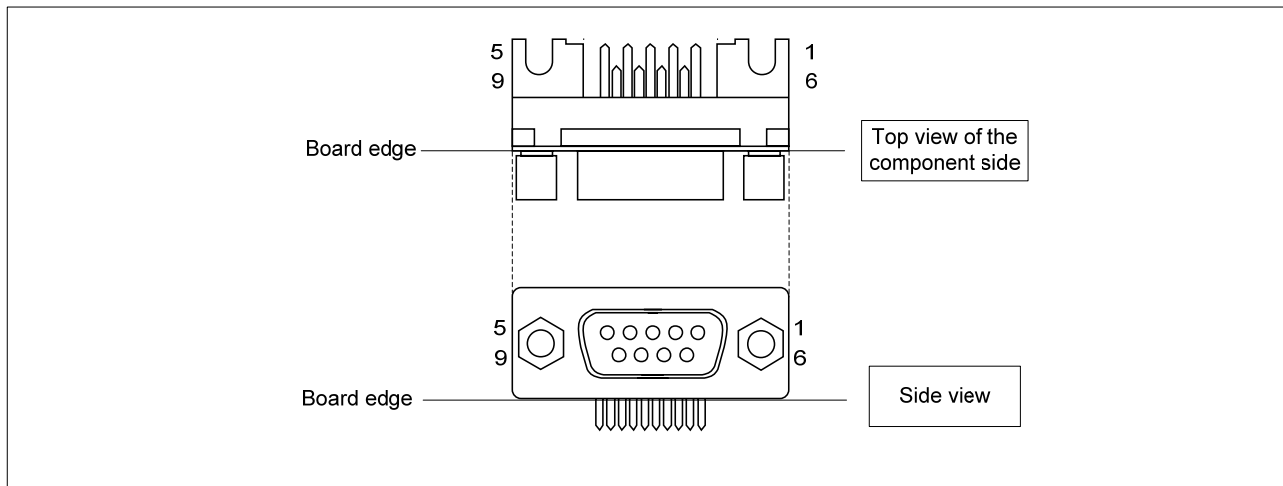


Figure 3.1.3 Pin Assignments for Serial Port Connector (J3)

Table 3.1.2 lists the pin assignments for the serial port connector.

Table 3.1.2 Pin Assignments for Serial Port Connector (J3)

No.	Signal Name	No.	Signal Name
1	NC	6	$\overline{\text{DSR}}$
2	RXD	7	RTS
3	TXD	8	CTS
4	$\overline{\text{DTR}}$	9	NC
5	GND		

Pins 4 to 6 (DTR-DSR), and pins 7 to 8(RTS-CTS) are loop-back connected, respectively.



### 3.1.3 Power Supply Connector (J4)

The M3A-HS37 is provided with a power supply connector.

Figure 3.1.4 shows the pin assignments for the power supply connector.

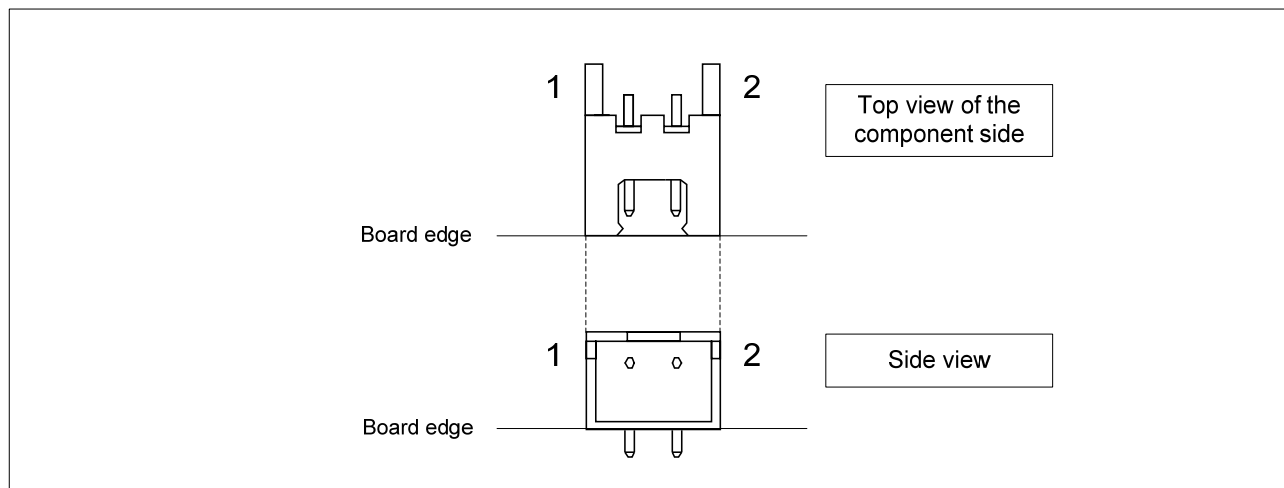


Figure 3.1.4 Pin Assignments for Power Supply Connector (J4)

Table 3.1.3 lists the pin assignments for the power supply connector.

Table 3.1.3 Pin Assignments for Power Supply Connector (J4)

No.	Signal Name	No.	Signal Name
1	+5 V	2	GND

### 3.1.4 External Power Supply Connectors for SH7137 (J5, J6, and J16)

The M3A-HS37 is provided with connector pins for external power supply. The pins are used to be supplied the power for CPU and USB. When using this connector to supply the power, remove the post heads of the external power switch jumpers (JP2, JP3, and JP4) to open.

Figure 3.1.5 shows the pin assignments for the power supply connector.

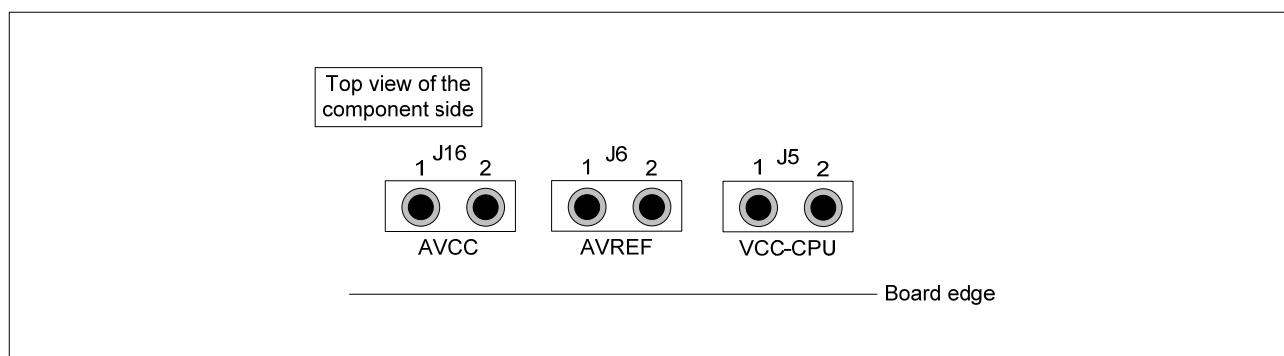


Figure 3.1.5 Pin Assignments of Power Supply Connector (J5, J6, and J16)

Table 3.1.4 lists the pin assignment for the power supply connector (J5).

Table 3.1.4 Pin Assignments for Power Supply Connector (J5)

No.	Signal Name	No.	Signal Name
1	VCC-CPU	2	GND

Table 3.1.5 lists the pin assignment for the power supply connector (J6).

Table 3.1.5 Pin Assignments for Power Supply Connector (J6)

No.	Signal Name	No.	Signal Name
1	AVREF	2	GND

Table 3.1.6 lists the pin assignment for the power supply connector (J16).

Table 3.1.6 Pin Assignments for Power Supply Connector (J16)

No.	Signal Name	No.	Signal Name
1	AVCC	2	GND

### 3.1.5 DC Power Jack (J7)

A DC power jack can be mounted on the M3A-HS37. Figure 3.1.6 shows the pin assignments for the DC power jack, and Table 3.1.7 lists the pin assignments for the DC power jack (J7).

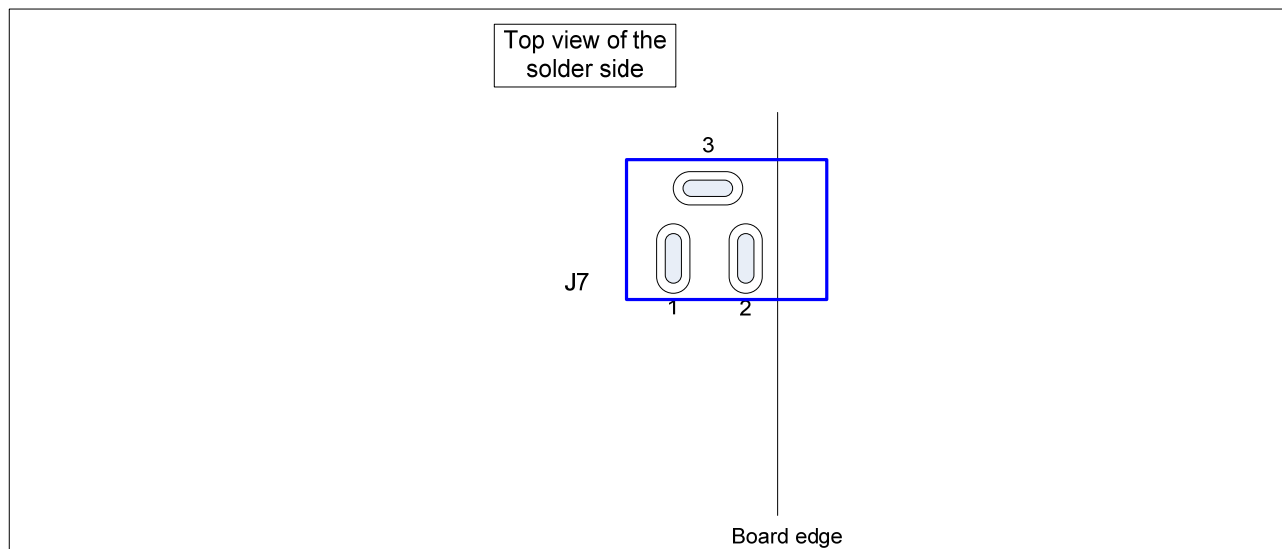


Figure 3.1.6 Pin Assignments for DC Power Jack (J7)

Table 3.1.7 Pin Assignments for DC Power Jack (J7)

No.	Signal Name
1	+5 V
2	GND
3	GND

#### 3.1.6 Expansion Connectors (J8 to J12)

The M3A-HS37 is provided with through-holes for expansion connectors. The SH7137 I/O pins are connected to the through-holes.

MIL-spec connectors can be connected to the through-holes (J8 to J12), allowing for connecting with expansion boards or monitoring the SH7137 bus signals. Figure 3.1.7 shows the pin assignments for expansion connectors.

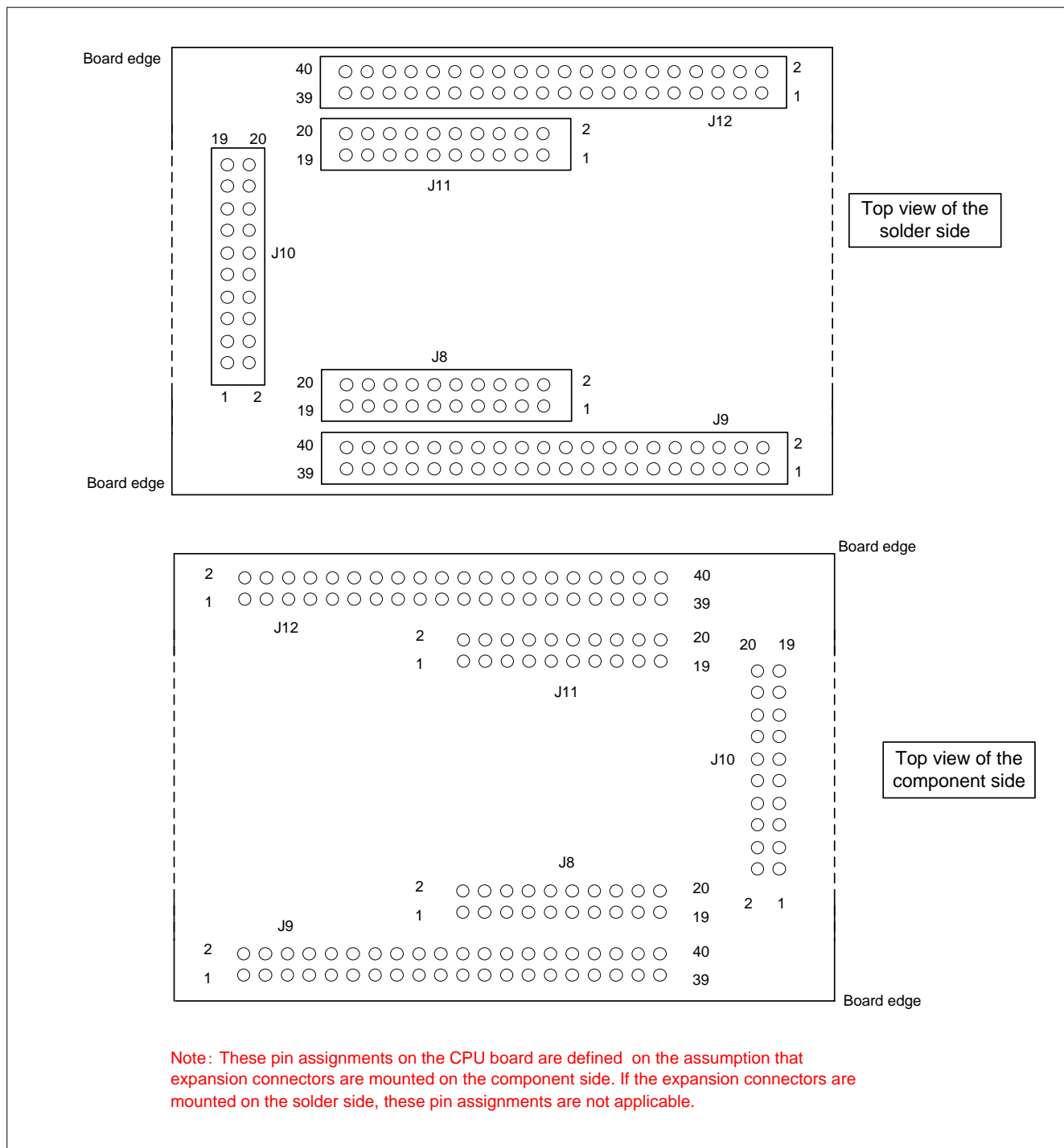


Figure 3.1.7 Pin Assignments for Expansion Connectors

Table 3.1.8 lists the pin assignments for the expansion connector (J8).

Table 3.1.8 Pin Assignments for Expansion Connector (J8)

No.	Signal Name	Also connected to	
1	AVCC	-	
2	Avrefh	-	
3	PF0/AN0	-	
4	PF1/AN1	-	
5	PF2/AN2	-	
6	PF3/AN3	-	
7	PF4/AN4	-	
8	PF5/AN5	-	
9	PF6/AN6	-	
10	PF7/AN7	-	
11	PF8/AN8	-	
12	PF9/AN9	-	
13	PF10/AN10	-	
14	PF11/AN11	-	
15	PF12/AN12	User DIP switch (SW3)	
16	PF13/AN13	User DIP switch (SW3)	
17	PF14/AN14	User DIP switch (SW3)	
18	PF15/AN15	User DIP switch (SW3)	
19	Avrefl	-	
20	GND(Avss)	-	

Table 3.1.9 lists the pin assignments for the expansion connector (J9).

Table 3.1.9 Pin Assignments for Expansion Connector (J9)

No.	Signal Name	Also connected to	
1	VCC	-	
2	VCC	-	
3	/WDTOVF	-	
4	PE12/TIOC4A	User LED	
5	PE11/TIOC3D	User LED	
6	PE10/CS0/TIOC3C	-	
7	PE9/TIOC3B	User LED	
8	PE3/TIOC0D/SCK0	-	
9	PE2/TIOC0C/TXD0	Serial port connector (J3) For P7 = 2-3, JP9 = 2-3	
10	PB5/A19/IRQ3/POE5/TIC5U	-	
11	PB4/A18/IRQ2/POE4/TIC5US	IRQ2 SW (SW6)	
12	PB3/A17/IRQ1/POE1/TIC5V/SDA	EEPROM (U4)	
13	PB2/A16/IRQ0/POE0/TIC5VS/SCL	EEPROM (U4)	
14	PE8/A15/TIOC3A	-	
15	PE7/A14/TIOC2B	SRAM (U2) <sup>*</sup>	
16	PE6/A13/TIOC2A/SCK1	SRAM (U2) <sup>*</sup>	
17	PE5/A12/TIOC1B/TXD1	SRAM (U2) <sup>*</sup>	
18	PE4/A11/TIOC1A/RXD1	SRAM (U2)	
19	PA14/A10/RXD1/SSI	SRAM (U2) <sup>*</sup>	
20	GND	-	
21	PE1/TIOC0B/RXD0	Serial port connector (J3) For JP8 = 2-3, JP10 = 2-3	
22	PE0/TIOC0A	-	
23	PA15/CK/TXD1/SSO	SRAM (U2) <sup>*</sup>	
24	PA13/A9/SCK1/SSCK	SRAM (U2) <sup>*</sup>	
25	PA12/A8/SCK0/SCS	SRAM (U2) <sup>*</sup>	
26	PA11/A7/TXD0/ADTRG	SRAM (U2) <sup>*</sup>	
27	PA10/A6/RXD0	SRAM (U2) <sup>*</sup>	
28	PA5/A5/IRQ3/SCK1	SRAM (U2) <sup>*</sup>	
29	PA4/A4/IRQ2/TXD1	SRAM (U2) <sup>*</sup> For JP7 = 2-3, JP9 = 2-3 Serial port connector (J3) For JP7 = 1-2, JP9 = 1-2	
30	PA3/A3/IRQ1/RXD1	SRAM (U2) <sup>*</sup> For JP8 = 2-3, JP10 = 2-3 Serial port connector (J3) For JP8 = 1-2, JP10 = 1-2	
31	PA2/A2/IRQ0/POE2/SCK0	SRAM (U2) <sup>*</sup>	
32	PA1/A1/POE1/TXD0	SRAM (U2) <sup>*</sup>	
33	PA0/A0/POE0/RXD0	SRAM (U2) <sup>*</sup>	
34	PE17/CS0/TIOC3DS/TCK	H-UDI connector (J2)	
35	PE16/WAIT/TIOC3BS/ASEBKAK/ASEBK	H-UDI connector (J2)	
36	PE15/TIOC4D/IRQOUT	User LED	
37	PE14/TIOC4C	User LED	
38	PE13/TIOC4B/MRES	User LED	
39	/RES	Reset module	
40	GND	-	

Table 3.1.10 lists the pin assignments for the expansion connector (J10).

Table 3.1.10 Pin Assignments for Expansion Connector (J10)

No.	Signal Name	Also connected to	
1	PE21/WRL/TIOC4DS/TRST	H-UDI connector (J2)	
2	PE20/TIOC4CS/TMS	H-UDI connector (J2)	
3	PE19/RD/TIOC4BS/TDO	H-UDI connector (J2)	
4	PE18/CS1/TIOC4AS/TDI	H-UDI connector (J2)	
5	PD10/SSO	-	
6	PD9/SSI	-	
7	PD8/SCK2/SSCK	-	
8	PB7/CS1/CRx0	JP13 – RCAN IN	
9	PB6/WAIT/CTx0	JP12 – RCAN OUT	
10	PB1/BREQ/TIC5W	-	
11	PB0/BACK/TIC5WS	-	
12	PA9/WAIT/TCLKD/POE8/TXD2	-	
13	PA8/WRL/TCLKC/POE6/RXD2	-	
14	PA7/TCLKB/POE5/SCK2/	-	
15	---	-	
16	---	-	
17	---	-	
18	---	-	
19	---	-	
20	GND	-	

Table 3.1.11 lists the pin assignments for the expansion connector (J11).

Table 3.1.11 Pin Assignments for Expansion Connector (J11)

No.	Signal Name	Also connected to
1	---	-
2	---	-
3	---	-
4	---	-
5	---	-
6	---	-
7	---	-
8	---	-
9	---	-
10	---	-
11	---	-
12	---	-
13	---	-
14	---	-
15	---	-
16	---	-
17	---	-
18	---	-
19	---	-
20	GND	-



Table 3.1.12 lists the pin assignments for the expansion connector (J12).

Table 3.1.12 Pin Assignments for Expansion Connector (J12)

No.	Signal Name	Also connected to
1	VCC	-
2	VCC	-
3	---	-
4	---	-
5	---	-
6	---	-
7	---	-
8	---	-
9	---	-
10	---	-
11	---	-
12	---	-
13	---	-
14	---	-
15	---	-
16	---	-
17	---	-
18	---	-
19	---	-
20	---	-
21	---	-
22	---	-
23	PA6/RD/UBCTRG/TCLKA/POE4	SRAM (U2)
24	---	-
25	---	-
26	---	-
27	---	-
28	---	-
29	---	-
30	---	-
31	---	-
32	PD7/D7/TXD2/SCS	SRAM (U2)*
33	PD6/D6/RXD2	SRAM (U2)
34	PD5/D5/SCK1	SRAM (U2)*
35	PD4/D4/TXD1	SRAM (U2)
36	PD3/D3/RXD1	SRAM (U2)*
37	PD2/D2/SCK0	SRAM (U2)*
38	PD1/D1/TXD0	SRAM (U2)*
39	PD1/D1/TXD0	SRAM (U2)
40	GND	-

### 3.1.7 RCAN Connector (J13)

The RCAN communication is available on the M3A-HS37.

Figure 3.1.8 shows the pin assignments for the RCAN connector (J13).

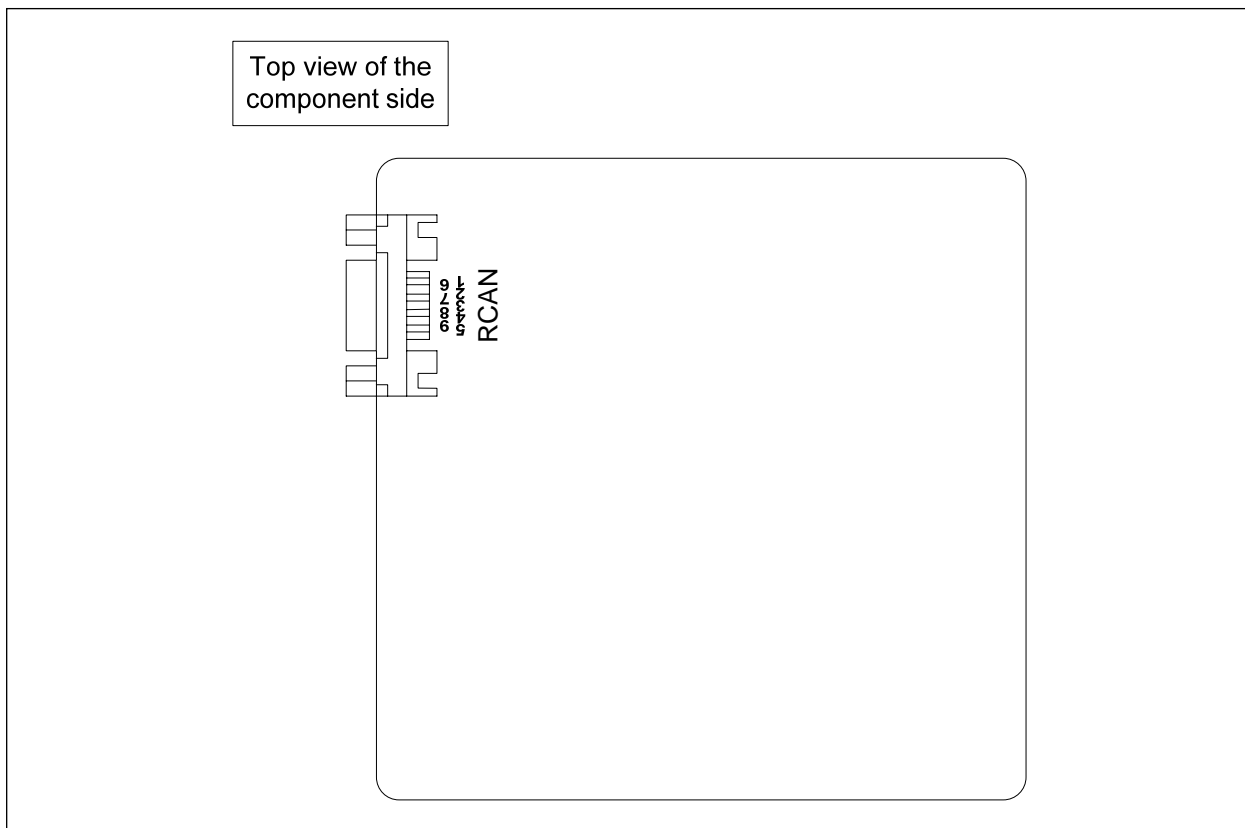


Figure 3.1.8 Pin Assignments for RCAN Connector (J13)

Table 3.1.13 lists the pin assignments for the RCAN connector (J13).

Table 3.1.13 Pin Assignments for RCAN Connector (J13)

No.	Signal Name	No.	Signal Name
1	NC	2	CANL (U12)
3	GND	4	NC
5	NC	6	NC
7	CANH (U12)	8	NC
9	NC		

### 3.1.8 GND Connector (J15)

The M3A-HS37 is provided with a GND connector.

The pin assignments are shown and listed in Figure 3.1.9 and Table 3.1.14.

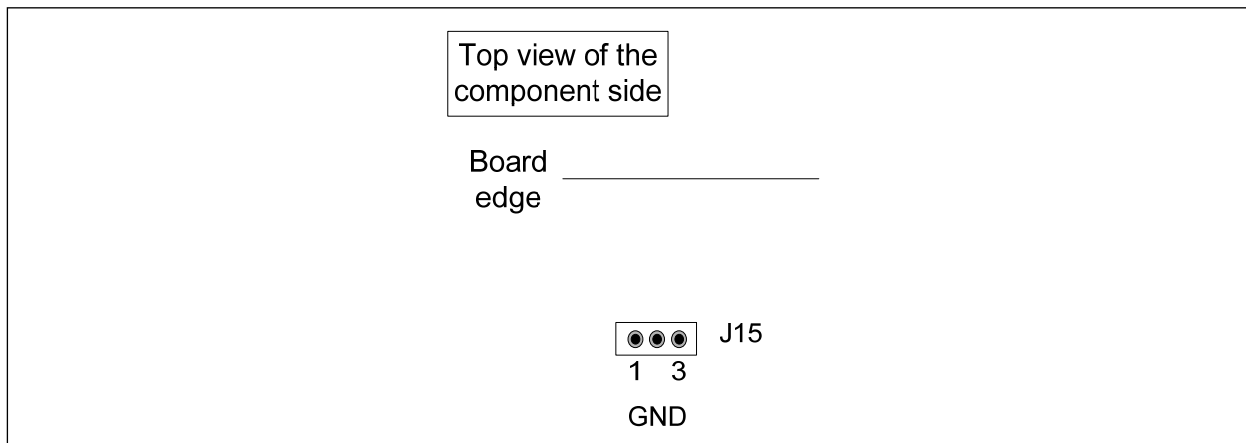


Figure 3.1.9 Pin Assignments for GND Connector (J15)

Table 3.1.14 Pin Assignments for GND Connector (J15)

No.	Signal Name
1	GND
2	GND
3	GND

3.2 Switches and LEDs

The M3A-HS37 is provided with switches and LEDs as its operational components.

Figure 3.2.1 shows the assignments of the M3A-HS37 operational components.

Top view of the component side

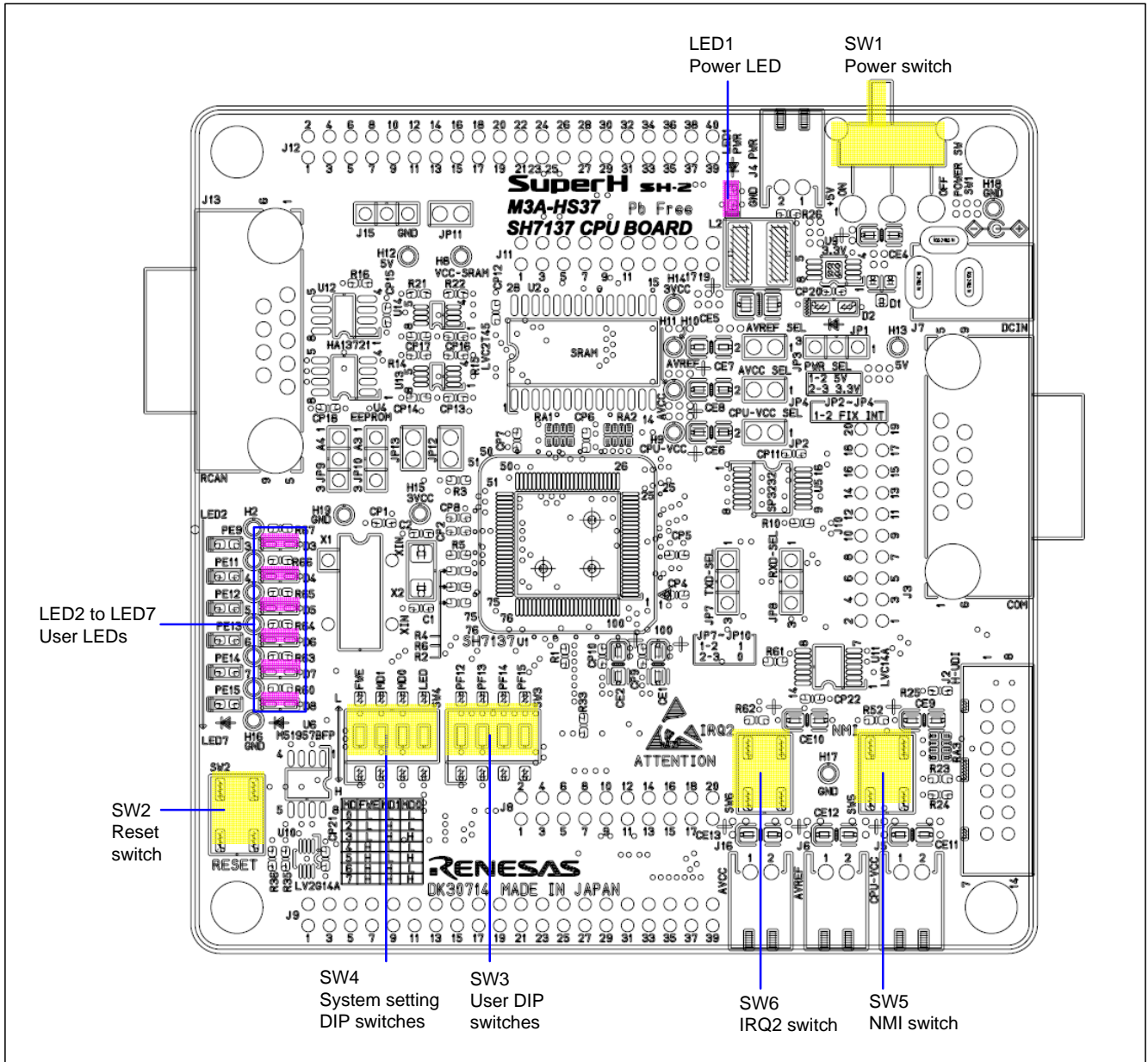


Figure 3.2.1 Assignments for the M3A-HS37 Operational Components

### 3.2.1 CPU Power Supply Select Jumper (JP1)

Set JP1 to switch 3.3 V or 5 V supplied to the SH7137 MCU.

The jumper switches the supply voltage for the SH7137 (U1), M5M5256DFP-VP70GI (SRAM, U2), and the power supply on the CPU side of the SN74LVC2T45DCT (U13, and U14, RCAN level shifter). The supply voltages for other components are not changed.

Figure 3.2.2 shows the CPU power supply select jumper assignments. Table 3.2.1 lists the CPU power supply select jumper setting.

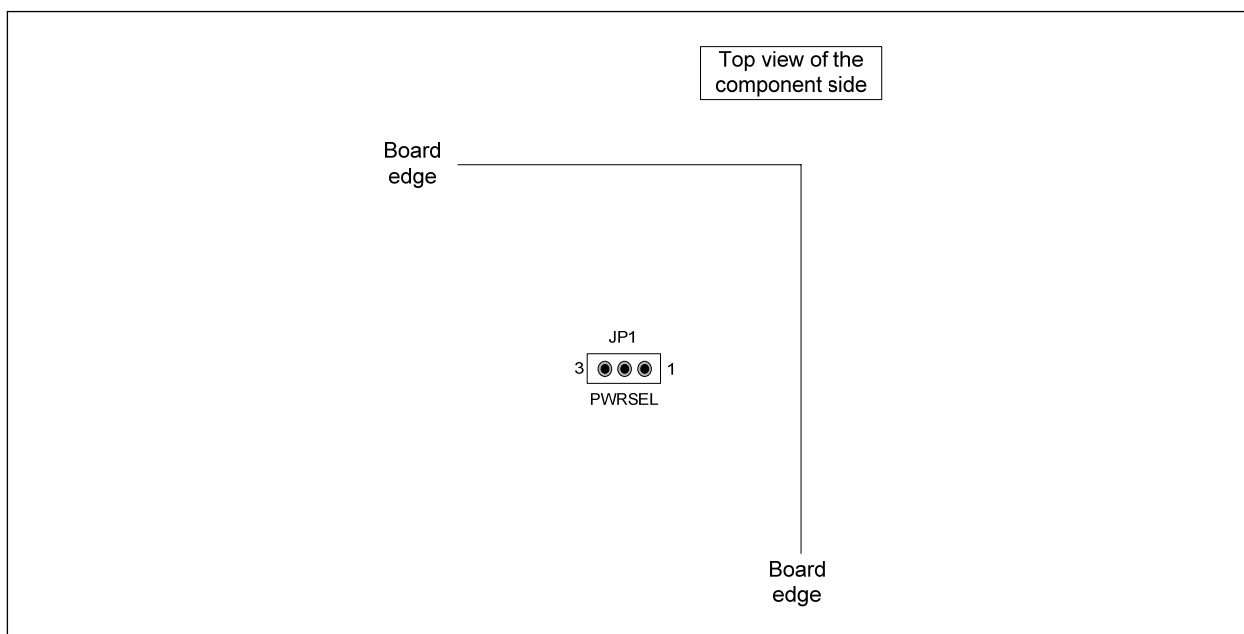


Figure 3.2.2 CPU Power Supply Select Jumper Assignments (JP1)

Table 3.2.1 CPU Power Supply Select Jumper Setting (JP1)

No.	Setting	Function
JP1 PWRSEL	1-2	+5 V is supplied to CPU and SRAM
	2-3	+3.3 V is supplied to CPU and SRAM
	Open	External power supply voltage (supplied from J5 or H9) <b>Do not leave the jumper open not supplying the power from an external source.</b>

■ indicates the default setting.

**Note:** Do not make any change with the jumper setting while the M3A-HS37 is operating. Ensure to turn the power OFF before changing the setting.

## 3.2.2 External Power Supply Select Jumpers (JP2, JP3, and JP4)

Set JP2 to JP4 to switch the power voltage source to the SH7137 system power (CPU-VCC), the analog power supply (AVCC), and the A/D reference power supply (AVREF).

Figure 3.2.3 shows the external power supply select jumper assignments. Table 3.2.2 lists the external power supply select jumper setting.

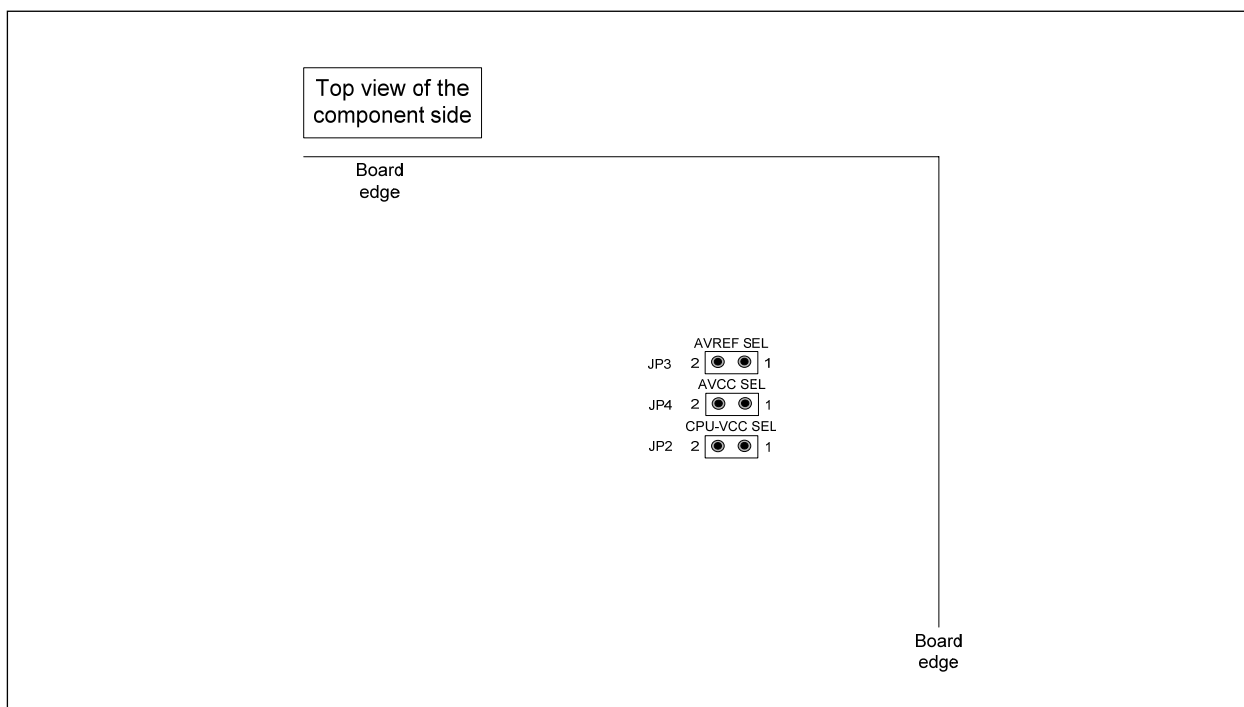


Figure 3.2.3 External Power Supply Select Jumper Assignments (JP2,JP3,JP4)

Table 3.2.2 External Power Supply Select Jumper Setting (JP2,JP3,JP4)

No.	Setting	Function
JP2 CPU-VCC SEL	1-2	SH7137 power supply voltage (CPU-VCC) is supplied from J4 or J7
	Open	External power supply voltage (supplied from J5 or H9) <b>Do not leave the jumper open not supplying the power from an external source.</b>
JP3 AVREFSEL	1-2	SH7137 AVREF is connected to 5 V fixed power supply voltage
	Open	External power supply voltage (supplied from J8 or H10)
JP4 AVCCSEL	1-2	SH7137 AVCC is connected to the 5 V fixed power supply voltage
	Open	External power supply voltage (supplied from J8 or H11)

■ indicates the default setting.

**Note:** Do not make any change with the jumper setting while the M3A-HS37 is operating. Ensure to turn the power OFF before changing the setting.

## 3.2.3 Serial Port/SRAM Select Jumpers (JP7 to JP11), RCAN-I/O Jumpers (JP12, and JP13)

Set JP7 to JP13 to change the SH7137 SCI channels connected to the serial port connector (J3).

SCI channel 0 is connected to the serial port connector (J3) as default.

Figure 3.2.4 shows the serial port select jumper assignments. Table 3.2.3 lists the serial port select jumper setting.

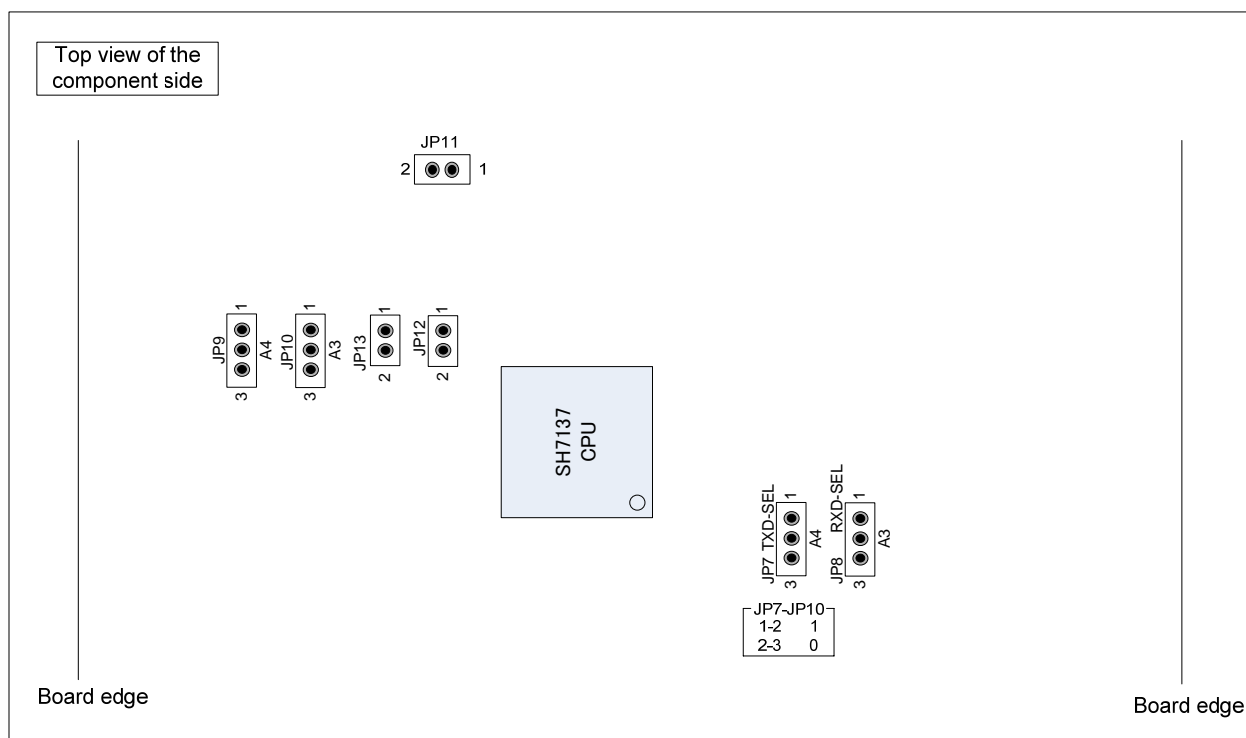


Figure 3.2.4 Serial Port Select Jumper Assignments (JP7 to JP13)

Table 3.2.3 Serial Port Select Jumper Setting (JP7 to JP13)

No.	Setting	Function
JP7 TXDSEL	1-2	The SH7137 PA4/TXD1 pin is connected to the serial port connector (J3)
	2-3	The SH7137 PE2/TXD0 is connected to the serial port connector (J3)
JP8 RXDSEL	1-2	The SH7137 PA3/RXD1 pin is connected to the serial port connector (J3)
	2-3	The SH7137 PE1/RXD0 pin is connected to the serial port connector (J3)
JP9 A4	1-2	GND is connected to the A4 of the SRAM (U2)
	2-3	The SH7137 PA4/TXD1 pin is connected to the A4 of the SRAM (U2)
JP10 A3	1-2	GND is connected to the A3 of the SRAM (U2)
	2-3	The SH7137 PA3/RXD1 pin is connected to the A3 of the SRAM (U2)
JP11 $\bar{S}$	1-2	The SH7137 CS0 pin is connected to the $\bar{S}$ pin of the SRAM (U2)
	Open	Releases $\bar{S}$ pin of the SRAM (U2)
JP12 CTx0	1-2	The SH7137 CTx0 pin is connected to the TxD pin of the RCAN
	Open	Releases the CTx0 pin of the SH7137 MCU
JP13 CRx0	1-2	The pin SH7137 CRx0 is connected to the RxD pin of the RCAN
	Open	Releases the CRx0 pin of the SH7137 MCU

■ indicates the default setting.

Note: Do not make any change with the jumper setting while the M3A-HS37 is operating. Ensure to turn the power OFF before changing the setting. JP7 to JP10 must be set in the same way.

### 3.2.4 Switches and LEDs

The M3A-HS37 is provided with six switches and seven LEDs.

Table 3.2.4 lists switches on the M3A-HS37.

Table 3.2.4 Switches on the M3A-HS37

No.	Function	Remarks
SW1	System power on/off switch	-
SW2	System reset input switch	Refer to Section 2.9 for details.
SW3	User DIP switches (4/package) SW3-1 OFF: PF12 = "H" ON: PF12 = "L" SW3-2 OFF: PF13 = "H" ON: PF13 = "L" SW3-3 OFF: PF14 = "H" ON: PF14 = "L" SW3-4 OFF: PF15 = "H" ON: PF15 = "L"	PF12,PF13,PF14, and PF15 are pulled up. Refer to Section 2.5 for details.
SW4	System setting DIP switches (4/package)	Refer to Table 3.2.5 for the functions
SW5	NMI input switch	Refer to Section 2.10 for details.
SW6	IRQ2 input switch	Refer to Section 2.10 for details.

Table 3.2.5 lists the functions of the switch (SW4). The SH7137 operating mode is set by the combinations of the pins FEW, MD0, and MD1. Table 3.2.6 lists the SH7137 operating mode setting.

Table 3.2.5 Functions of Switch (SW4)


No.	Setting	Function	
SW4-1 FWE	OFF	FWE="H" (On-chip flash memory is write- and erase-protected)	Operating mode setting (Refer to Table 3.2.6)
	ON	FWE="L" (On-chip flash memory is write- and erase-enabled)	
SW4-2 MD1	OFF	MD1 pin state is "H"	
	ON	MD1 pin state is "L"	
SW4-3 MD0	OFF	MD0 pin state is "H"	
	ON	MD0 pin state is "L"	
SW4-4 LED	OFF	LED Vcc OFF	
	ON	LED Vcc ON	

 indicates the default setting.

Note: Refer to Figure 2.5.1 for LED Vcc.

Table 3.2.6 SH7137 Operating Mode Setting

SW4-1 (FWE)	SW4-2 (MD1)	SW4-3 (MD0)	SH7137 Operating Mode	
			No.	Name
ON	ON	ON	Mode 0	MCU expansion mode 0 (On-chip ROM disabled, CS0 space: 8-bit bus)
ON	OFF	ON	Mode 2	MCU expansion mode 2 (On-chip ROM enabled, CS0 space: 8-bit bus)
ON	OFF	OFF	Mode 3	Single chip mode (On-chip ROM enabled)
OFF	ON	ON	Mode 4 *	Boot mode (On-chip ROM enabled)
OFF	ON	OFF	Mode 5 *	User boot mode (On-chip ROM enabled, CS0 space: 8-bit bus)
OFF	OFF	ON	Mode 6 *	User program mode (On-chip ROM enabled, CS0 space: 8-bit bus)
OFF	OFF	OFF	Mode 7 *	User program mode (On-chip ROM enabled)

 Indicates the default setting.

Note: These are the programming mode of the flash memory



Table 3.2.7 lists the functions of LEDs on the M3A-HS37.

When SW4-4 is set to OFF, the LEDs power is OFF.

Table 3.2.7 Functions of LEDs mounted on M3A-HS37

No.	Color	Function/remarks
LED1	Blue	Power LED (Lit when the power is supplied)
LED2	Green	User LED (Lit when PE9 outputs "L")
LED3	Green	User LED (Lit when PE11 outputs "L")
LED4	Green	User LED (Lit when PE12 outputs "L")
LED5	Green	User LED (Lit when PE13 outputs "L")
LED6	Green	User LED (Lit when PE14 outputs "L")
LED7	Green	User LED (Lit when PE15 outputs "L")

Note: When SW4-4 is set to OFF, LEDs are not lit.

3.2.5 Jumper Switch Setting when Using Development Tool

The SH7137 emulator-related signals ( $\overline{\text{FWE/ASEBRKAK/ASEBRK}}$ , TDI, TDO) are multiplexed with a flash writing control pin. When using the development tools such as E10A-USB emulator and Flash Development Toolkit (FDT), set the jumper switches as shown in Table 3.2.8.

Table 3.2.8 Jumper Setting for Each Connector

Tool	Connector	Setting	Remarks
		JP7 to JP10	
E10A-USB emulator	H-UDI connector (J2)	Don't care	Connect "2-3" when using SRAM.
FDT	Serial port connector (J3)	"1-2"	Connect TXD1, and RXD1 pins (required)

## 3.3 M3A-HS37 Dimensions

Figure 3.3.1 shows the M3A-HS37 dimensions.

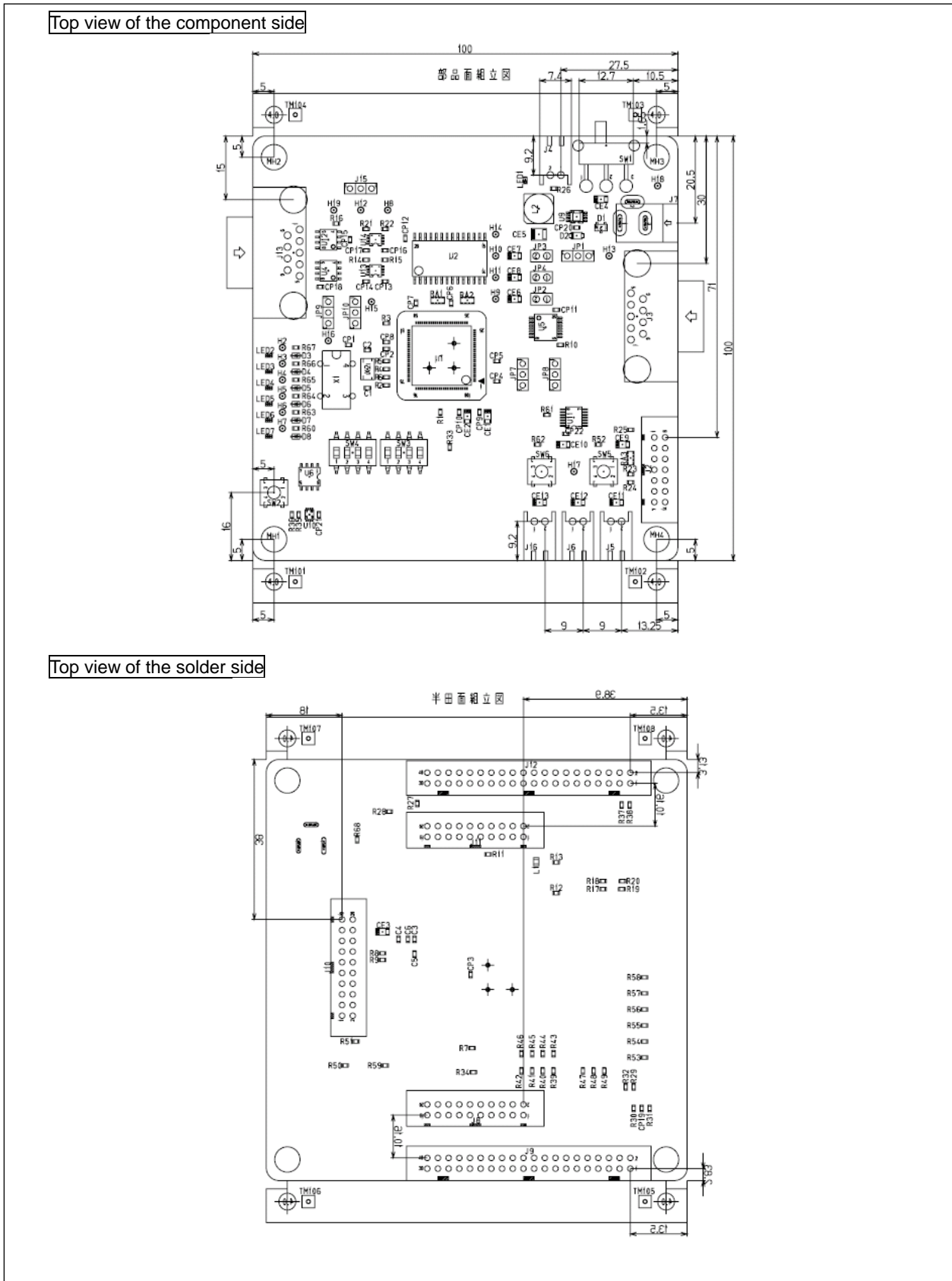


Figure 3.3.1 M3A-HS37 Dimensions

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Appendix

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M3A-HS37 SCHEMATICS

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# SH7137 CPU Board M3A-HS37 SCHEMATICS

## TITLE

INDEX  
 SH7137, SRAM, EEPROM, RCAN, Serial Interface  
 H-UDI, Reset, Power  
 Other Connectors, PUSH\_SW, LED

## PAGE

1  
 2  
 3  
 4

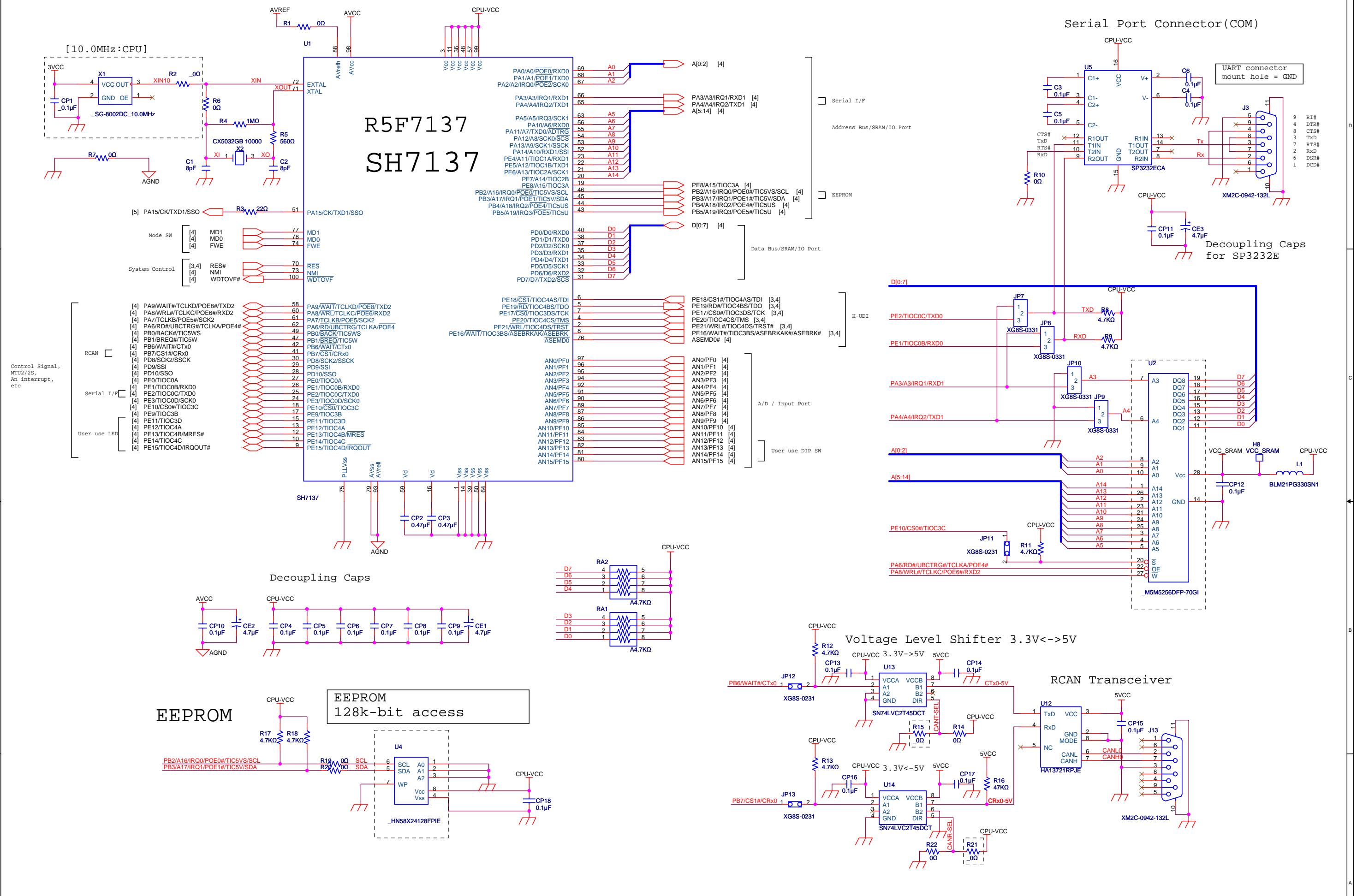
### Note:

3VCC = 3.3V  
 5VCC = 5V  
 CPU-VCC = 5V or 3.3V  
 AVCC = 5V (Analog)  
 AVREF = 5V (Analog VREF)  
 VCC\_SRAM = 5V or 3.3V (Follow CPU\_vcc)

R = Fixed Resistors  
 RA = Resister Array  
 C = Ceramic Caps  
 CE = Electrolytic Caps  
 CP = Decoupling Caps

 :not mounted

CHANGE	Ver. 1.00		RENESAS SOLUTIONS CORPORATION				M3A-HS37
	SCALE		DRAWN	CHECKED	DESIGNED	APPROVED	INDEX ( 1 / 4 )
	DATE	08-04-14					DK30714A

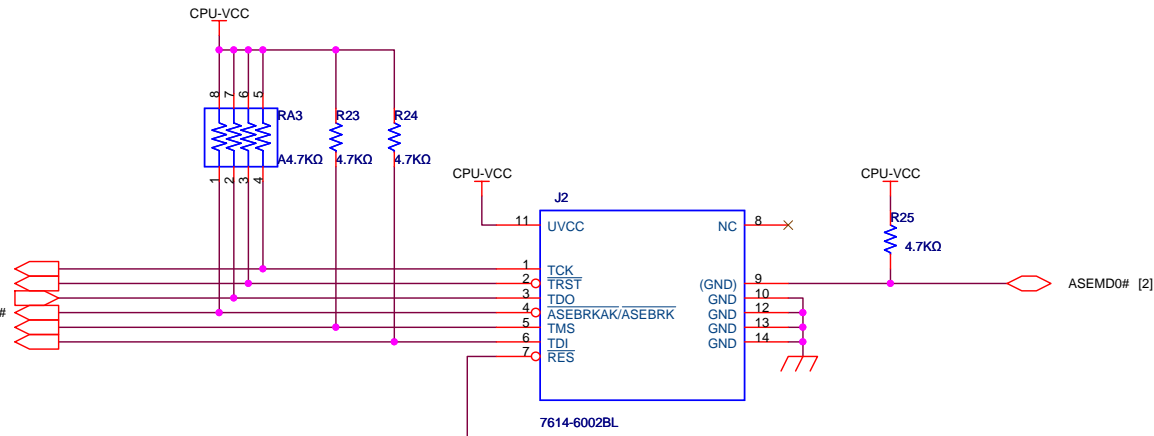


CHANGE	Ver. 1.00	RENASAS SOLUTIONS CORPORATION				M3A-HS37 SH7137, SRAM, EEPROM, RCAN, Serial I/F ( 2 / 4 )
		DRAWN	CHECKED	DESIGNED	APPROVED	
		SCALE				
	DATE	08-04-14				DK30714A

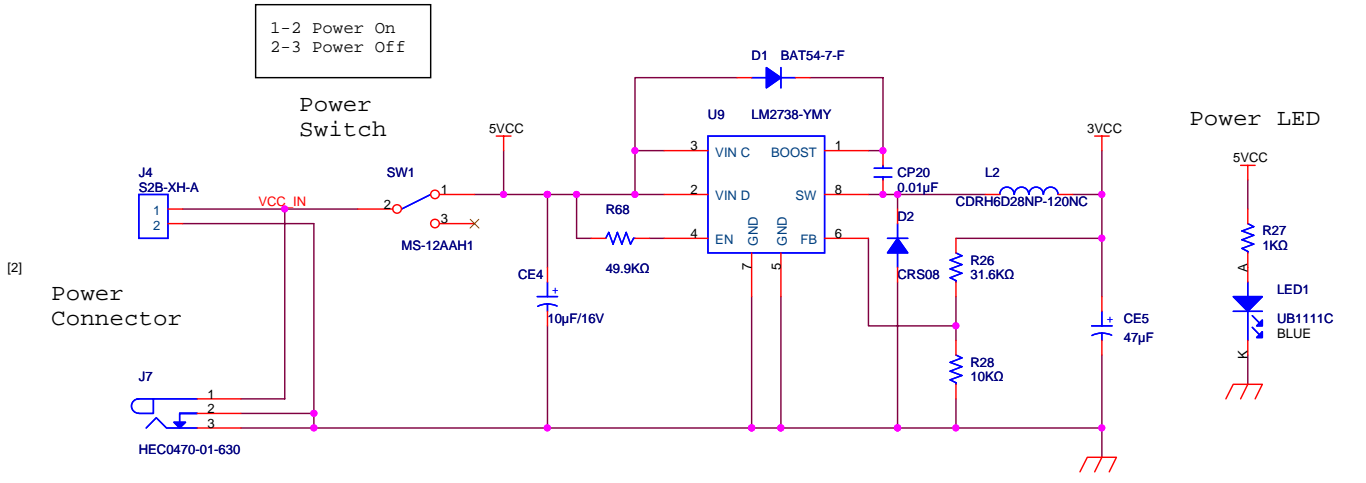


# H-UDI Interface

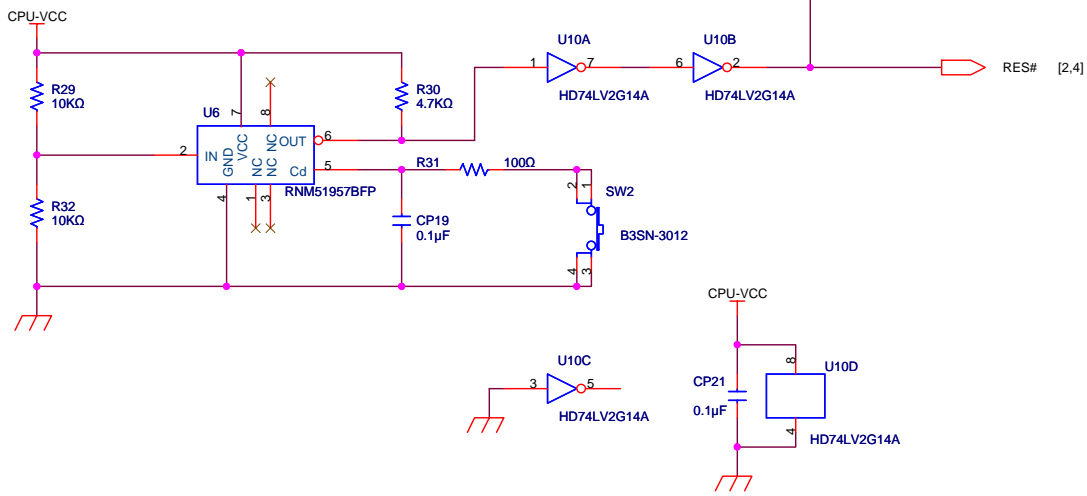
- [2,4] PE17/CS0#/TIOC3DS/TCK
- [2,4] PE21/WRL#/TIOC4DS/TRST#
- [2,4] PE19/RD#/TIOC4BS/TDO
- [2,4] PE16/WAIT#/TIOC3BS/ASEBRKAK#/ASEBRK#
- [2,4] PE20/TIOC4CS/TMS
- [2,4] PE18/CS1#/TIOC4AS/TDI



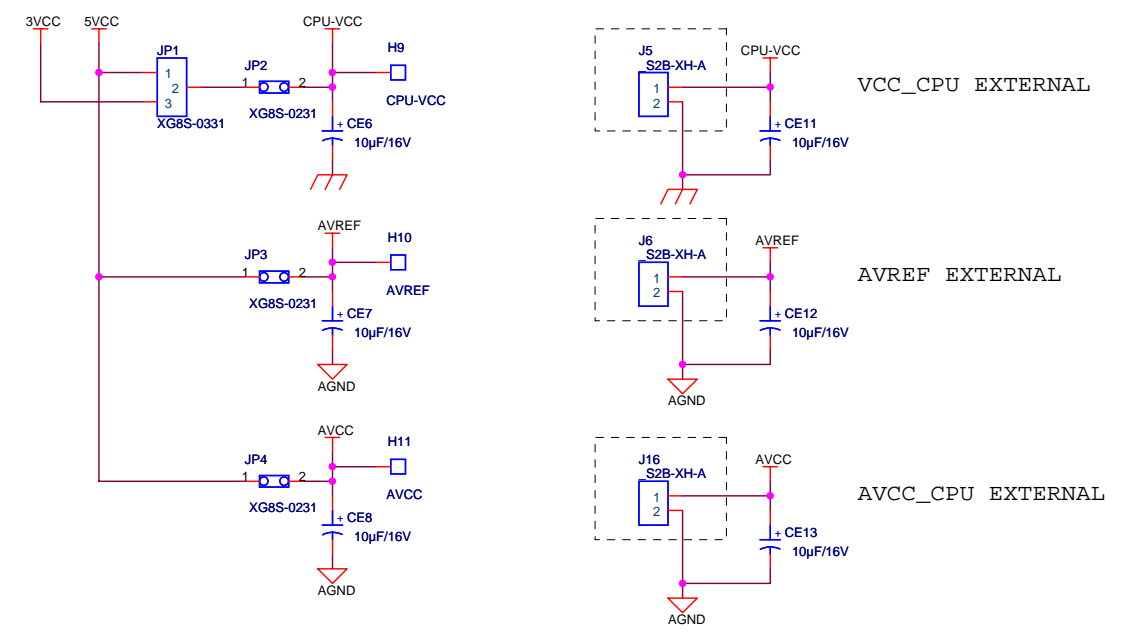
# 5V To 3.3V Linear Regulator



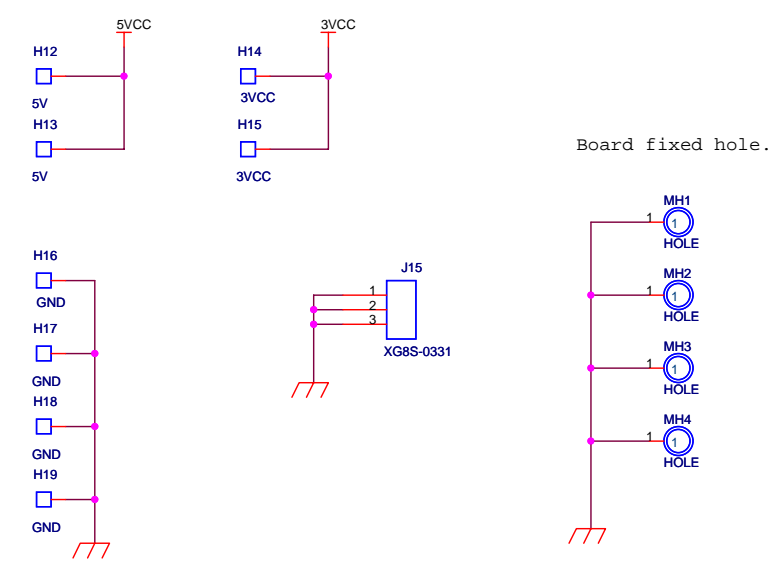
# Power On Reset



1-2 5V  
2-3 3.3V

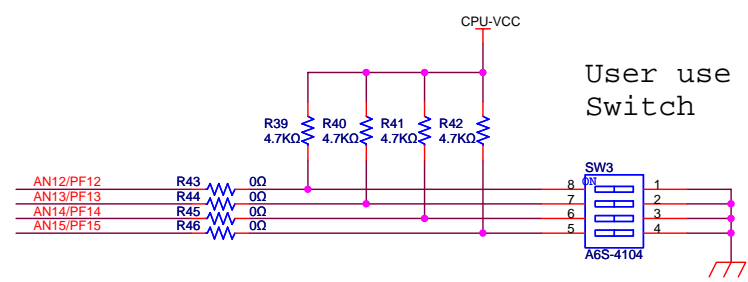
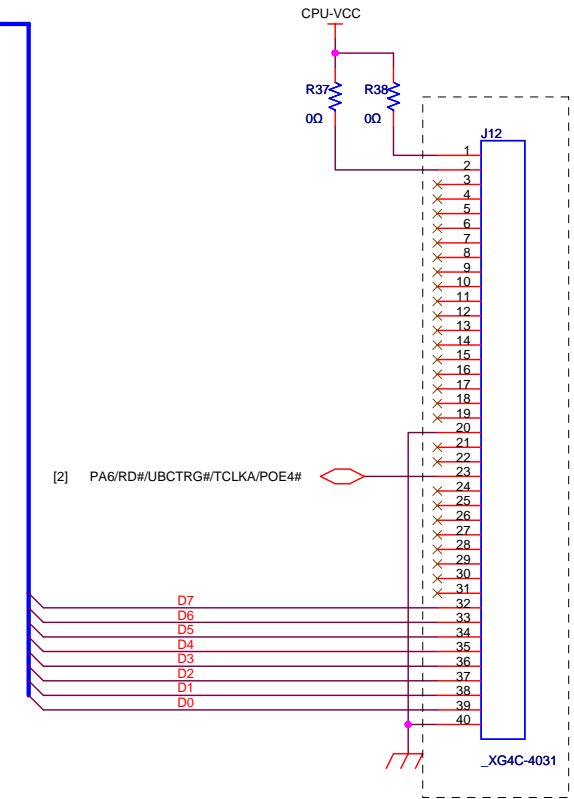
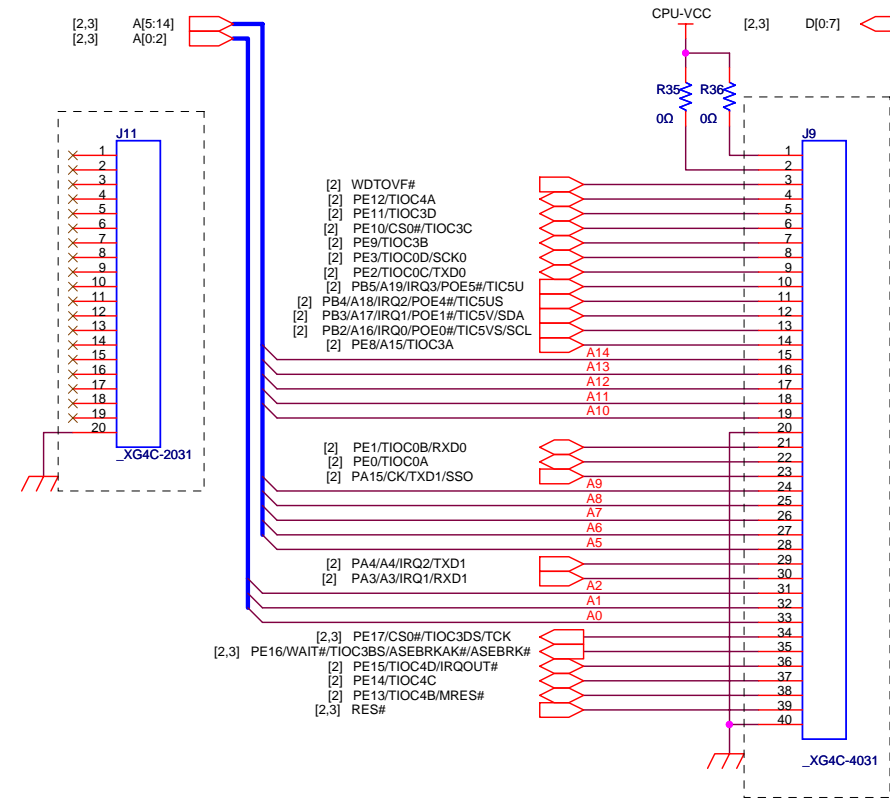
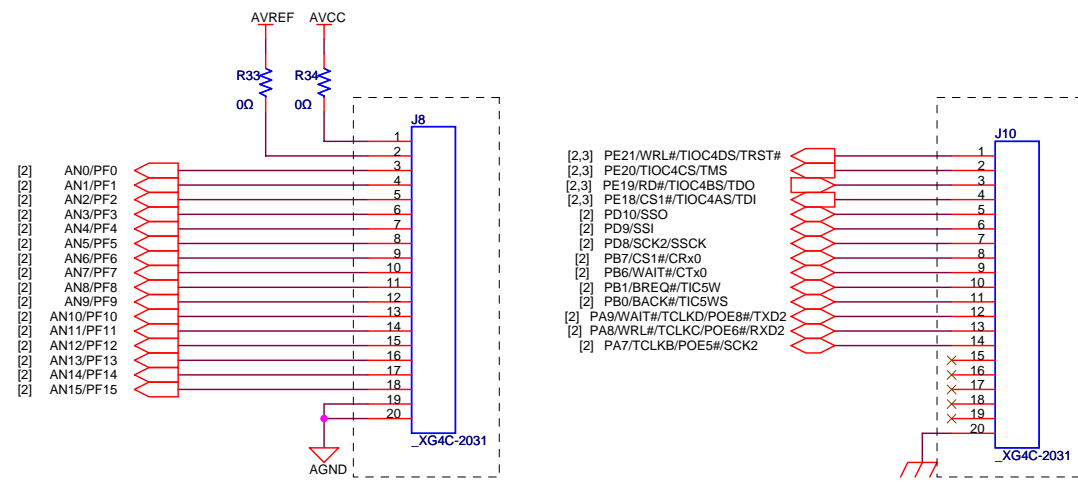


# POWER TEST PIN

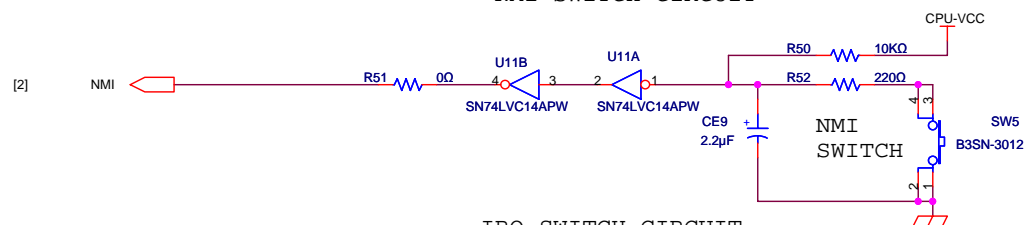


CHANGE	RENESAS SOLUTIONS CORPORATION				M3A-HS37	
	DRAWN    CHECKED    DESIGNED    APPROVED				H-UDI, Power, Reset	
	SCALE				( 3 / 4 )	
DATE		08-04-14		DK30714A		
Ver. 1.00						

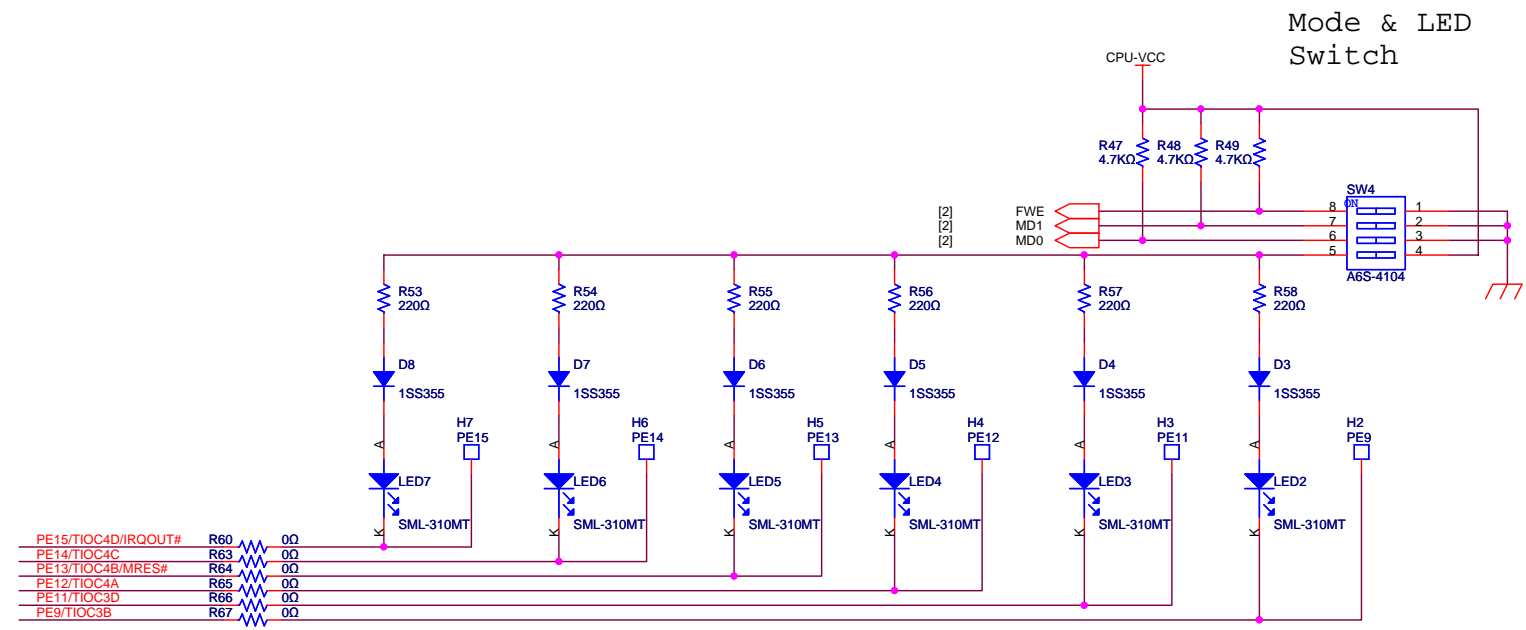
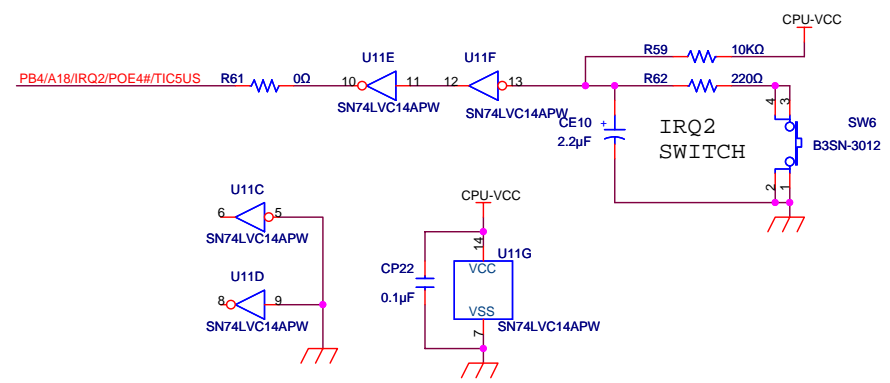
# SH7137 Extension Connector



## NMI SWITCH CIRCUIT



## IRQ SWITCH CIRCUIT



CHANGE	Ver. 1.00		RENESAS SOLUTIONS CORPORATION				M3A-HS37	
	SCALE		DRAWN	CHECKED	DESIGNED	APPROVED	Connectors, PUSH_SW, LED ( 4 / 4 )	
	DATE	08-04-14					DK30714A	

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SH7137 CPU Board  
User's Manual  
M3A-HS37

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M3A-HS37  
User's Manual



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