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User's Manual

Renesas Starter Kit for SH7211

User's Manual

RENESAS SINGLE-CHIP MICROCOMPUTER
SuperH™RISC engine

Renesas Electronics
www.renesas.com

Rev.1.00 2007.03

Table of Contents

Chapter 1. Preface

Cautions

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Glossary

BRR	Baud Rate Register	CPU	Central Processing Unit
HMON	Embedded Monitor	LCD	Liquid Crystal Display
LED	Light Emitting Diode	RSK	Renesas Starter Kit

Chapter 2. Purpose

This RSK is an evaluation tool for Renesas microcontrollers.

Features include:

- Renesas Microcontroller Programming.
- User Code Debugging.
- User Circuitry such as switches, LEDs and potentiometer(s).
- Sample Application.
- Sample peripheral device initialisation code.

The CPU board contains all the circuitry required for microcontroller operation.

This manual describes the technical details of the RSK hardware. The Quick Start Guide and Tutorial Manual provide details of the software installation and debugging environment.

Chapter 3. Power Supply

3.1. Requirements

This CPU board operates from a 5V power supply.

A diode provides reverse polarity protection only if a current limiting power supply is used.

All CPU boards are supplied with an E8 debugger. This product is able to power the CPU board with up to 300mA. When the CPU board is connected to another system that system should supply power to the CPU board.

All CPU boards have an optional centre positive supply connector using a 2.0mm barrel power jack.

Warning

The CPU board is neither under not over voltage protected. Use a centre positive supply for this board.

3.2. Power – Up Behaviour

When the RSK is purchased the CPU board has the 'Release' or stand alone code from the example tutorial code pre-programmed into the Renesas microcontroller. On powering up the board the user LEDs will start to flash. Pressing any switch will cause the LEDs to flash at a rate controlled by the potentiometer.

Chapter 4. Board Layout

4.1. Component Layout

The following diagram shows top layer component layout of the board.

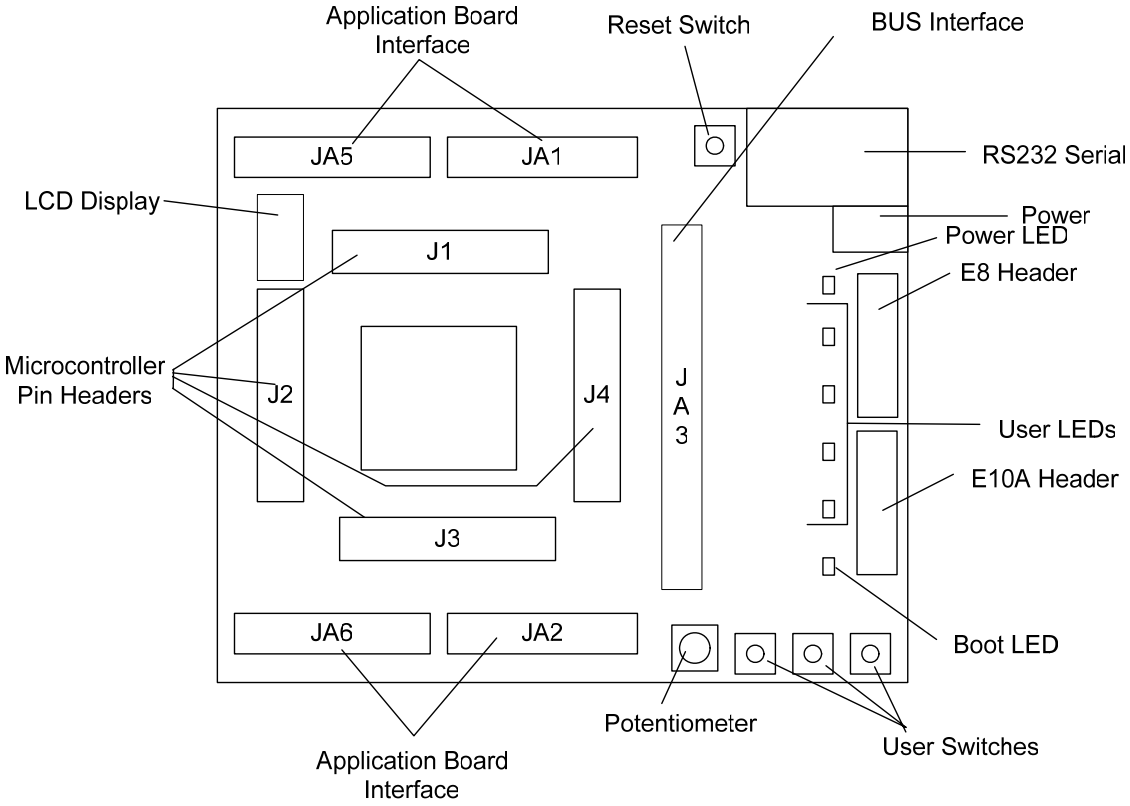

Figure 4-1: Board Layout

4.2. Board Dimensions

The following diagram gives the board dimensions and connector positions. All through hole connectors are on a common 0.1" grid for easy interfacing.

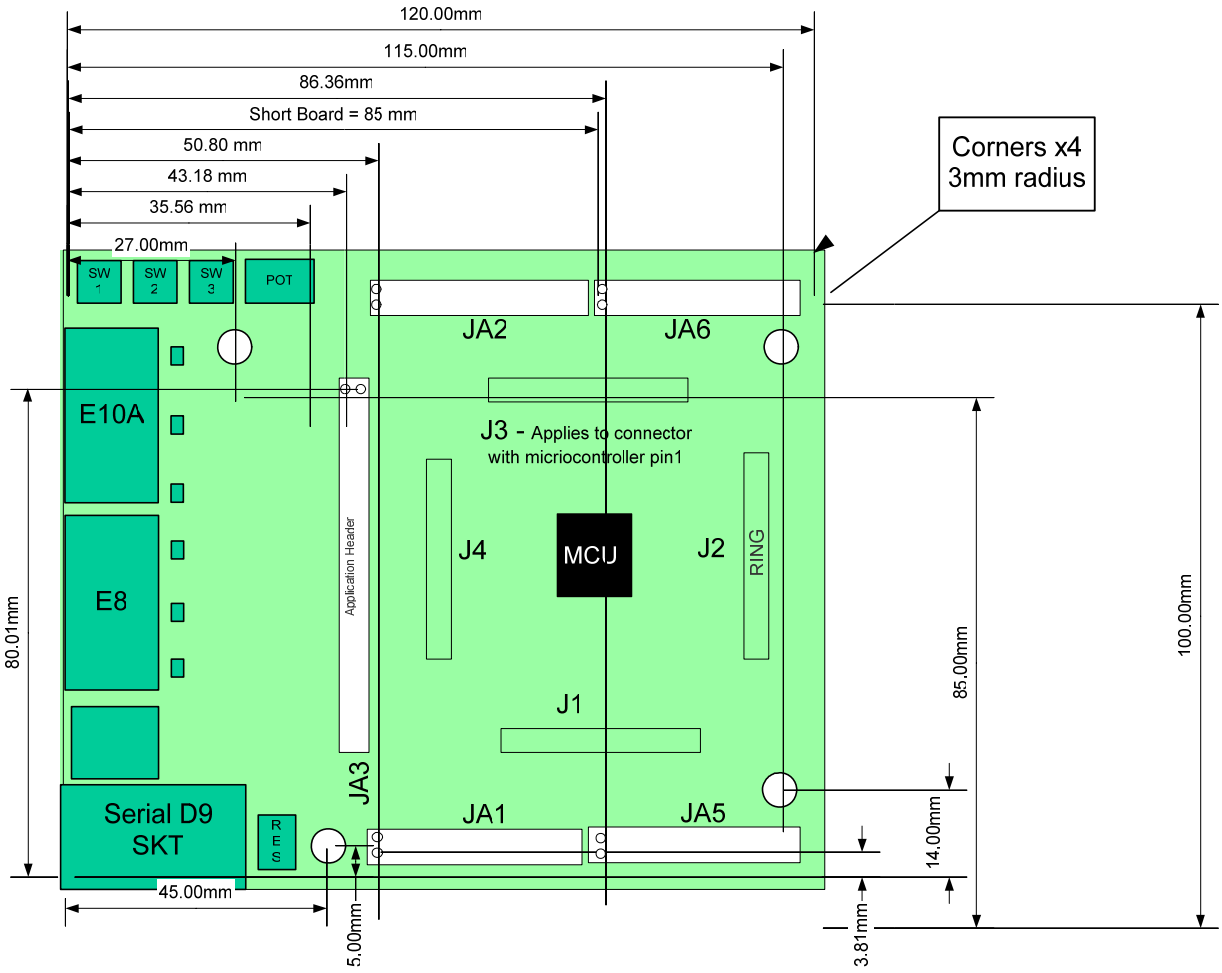

Figure 4-2 : Board Dimensions

Chapter 5. Block Diagram

Figure 5-5-1 shows the CPU board components and their connectivity.

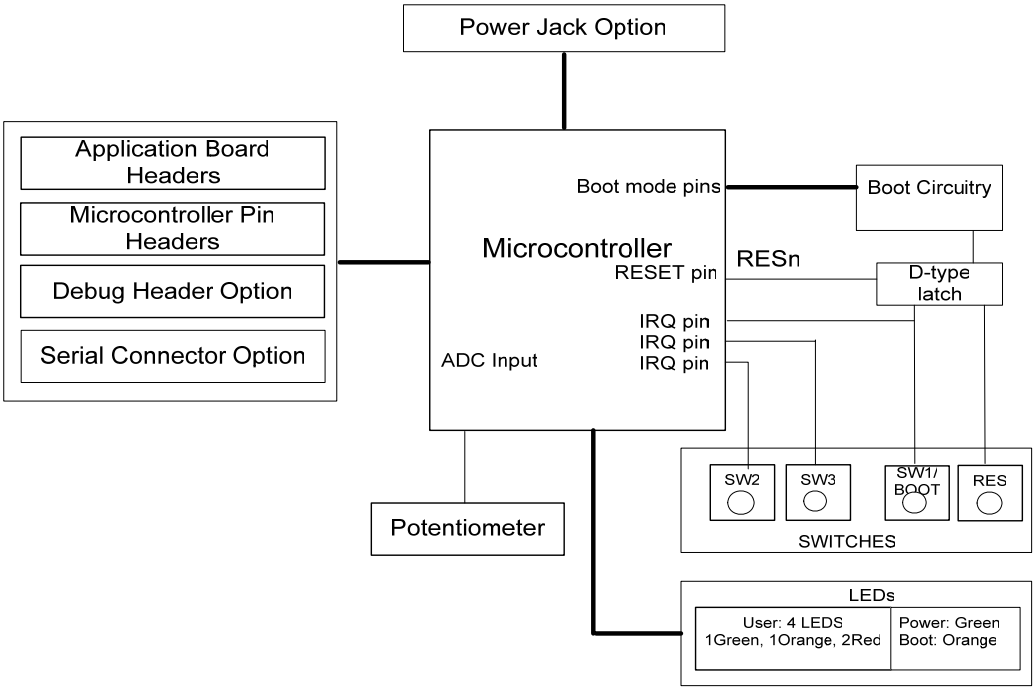

Figure 5-5-1: Block Diagram

Figure 5-5-2 shows the connections to the RSK.

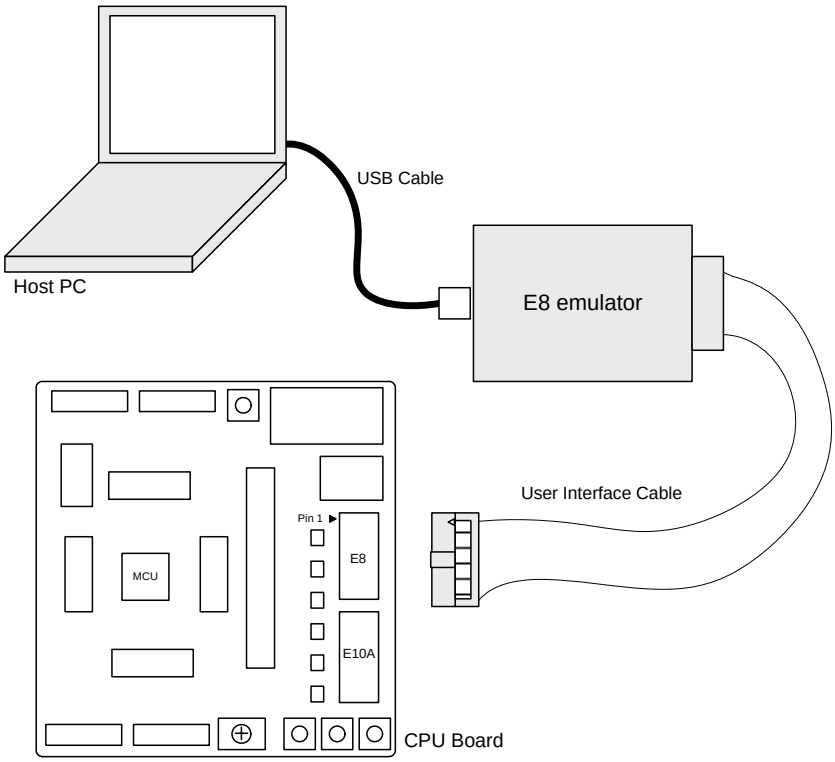

Figure 5-5-2 : RSK Connctions

Chapter 6. User Circuitry

6.1. Switches

There are four switches located on the CPU board. The function of each switch and its connection are shown in Table 6-1.

Switch	Function	Microcontroller
RES	When pressed; the CPU board microcontroller is reset.	RESn, Pin 22
SW1/BOOT*	Connects to an IRQ input for user controls. The switch is also used in conjunction with the RES switch to place the device in BOOT mode when not using the E8 debugger.	IRQ0, Pin 92 (Port B, bit 21)
SW2*	Connects to an IRQ line for user controls.	IRQ4, Pin 87 (Port B, bit 18)
SW3*	Connects to an IRQ line for user controls. Same pin functions as ADC trigger input.	IRQ6, Pin 88 (Port B, bit 19)

Table 6-1: Switch Functions

*Refer to schematic for detailed connectivity information.

6.2. LEDs

There are six LEDs on the CPU board. The green 'POWER' LED lights when the board is powered. The orange BOOT LED indicates the device is in HMON BOOT mode when lit. The four user LEDs are connected to an IO port and will light when their corresponding port pin is set low.

Table 6-2, below, shows the LED pin references and their corresponding microcontroller port pin connections.

LED Reference (As shown on silkscreen)	Microcontroller Port Pin function	Microcontroller Pin Number	Polarity
LED0	Port B bit 10	75	Active Low
LED1	Port B bit 11	76	Active Low
LED2	Port B bit 12	79	Active Low
LED3	Port B bit 13	80	Active Low

Table 6-2: LED Port

6.3. Potentiometer

A single turn potentiometer is connected to pin 'AN0' of the microcontroller. This may be used to vary the input analog voltage value to this pin between AVCC and Ground.

6.4. Serial port

The microcontroller programming serial port (SCI1) is connected to the E8 connector. SCI2 is connected to the RS232 connector SERIAL.

SCI1 can optionally be connected to the RS232 transceiver by fitting option resistors. The connections to be fitted are listed in Table 6-3: Serial Option Links

The E8 connector and SCI 2 are then disconnected.

Description	Function	Fit for RS232	Remove for RS232	Fit for E8	Remove for E8
TxD1	Programming Serial Port	R47	R21, R56	R21	R47,R56
RxD1	Programming Serial Port	R38	R20,R48	R20	R38,R48

Table 6-3: Serial Option Links

The board is designed to accept a straight through RS232 cable.

6.5. LCD Module

The LCD module supplied with the RSK can be connected to the connector 'LCD' for use with the tutorial code. Any module that conforms to the pin connections and has a KS0066u compatible controller can be used. The LCD module uses a 4 bit interface to reduce the pin allocation. No contrast control is provided; this must be set on the display module.

Table 6-4 shows the pin allocation and signal names used on this connector.

The module supplied with the CPU board only supports 5V operation.

LCD					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	Ground	-	2	5V Only	-
3	No Connection	-	4	DLCDRS	112
5	R/W (Wired to Write only)	-	6	DLCDE	111
7	No Connection	-	8	No connection	-
9	No Connection	-	10	No connection	-
11	DLCD4	63	12	DLCD5	65
13	DLCD6	66	14	DLCD7	67

Table 6-4: LCD Module Connections

6.6. Option Links

Table 6-5 below describes the function of the option links contained on this CPU board. The default configuration is indicated by **BOLD** text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R20	Serial Port Configuration	**Connects programming port (Rx) to E8 connector.**	Disconnects programming port (Rx) from E8 connector.	R38, R42, R48
R21	Serial Port Configuration	**Connects programming port (Tx) to E8 connector.**	Disconnects programming port (Tx) from E8 connector.	R47, R55, R56
R32	Serial Port Configuration	**Connects serial port RXD0 to RS232 Buffer.**	Disconnects serial port RXD0 from SERIAL D-type connector.	R52
R38	Serial Port Configuration	Connects programming port (Rx) to external serial connectors.	**Disconnects programming port (Rx) to external serial connectors.**	R20, R42, R48
R40	Serial Port Configuration	Disables RS232 Serial Transceiver	**Enables RS232 Serial Transceiver**	-
R42	Serial Port Configuration	Routes RS232 serial port Rx to application connector (JA6).	**Disconnects RS232 serial port Rx from application connector (JA6).**	R48, R38
R47	Serial Port Configuration	Connects programming port (Tx) to external connectors.	**Disconnects programming port (Tx) to external serial connectors.**	R34, R20, R22
R48	Serial Port Configuration	**Connects Alternate serial (CH2) to D connector**	Disconnects Alternate serial from D connector.	R20, R38, R42
R52	Serial Port Configuration	**Connects serial port TXD0 to RS232 Buffer.**	Disconnects serial port TXD0 from SERIAL D-type connector.	R32
R55	Serial Port Configuration	Routes RS232 serial port Tx to application connector (JA6).	**Disconnects RS232 serial port Tx from application connector (JA6).**	R4, R56
R56	Serial Port Configuration	**Connects Alternate serial (CH2) to D connector**	Disconnects Alternate serial from D connector.	R21,R47, R57
R58	Serial Port Configuration	Connects Alternate serial (CH0) to D connector	**Disconnects Alternate serial from D connector.**	R59
R59	Serial Port Configuration	Connects Alternate serial (CH0) to D connector	**Disconnects Alternate serial from D connector.**	R58

Table 6-5: Serial configuration links

Table 6-6 below describes the function of the option links associated with Power configuration. The default configuration is indicated by BOLD text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R4	Power Source	**Board can be powered from PWR connector.**	Disconnects the supply from PWR connector.	R11, R28
R11	Power Source	**Board can be powered by E8**	Disconnects the supply from E8 connector.	R4, R8
R22	Microcontroller Power Supply	E8A_VCC2 can drive microcontroller core	**E8A_VCC2 disconnected from microcontroller core.**	R27
R27	Microcontroller Power Supply	**Regulated 1V5 can drive microcontroller core**	Regulated 1V5 disconnected from microcontroller core.	R22
R28	Power	**Board input power connected to CON_5V**	Disconnects the supply from Con_5V	R4, R11
R44	Microcontroller Power Supply	**I/O Supply power to Microcontroller.**	Fit Low ohm resistor to measure current.	R53
R45	Power	**Connects Board_VCC to CON_3V3.**	Disconnect Board_VCC from CON_3V3	R49
R49	Power Source	**Connects regulated 3V3 voltage source to Board_VCC.**	Disconnects regulated 3V3 voltage source from Board_VCC.	R45
R53	Microcontroller Power Supply	**Core Supply power to Microcontroller.**	Fit Low ohm resistor to measure current.	R44

Table 6-6: Power configuration links

Table 6-7 below describes the function of the option links associated with Analog configuration. The default configuration is indicated by BOLD text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R60	Analog Voltage Source	**Connects AVCC to Board_5V**	Disconnects AVCC from CON_VREF.	R71
R70	Analog Voltage Source	**Links analog ground to digital ground.**	Isolates analog ground from digital ground.	
R71	Analog Voltage Source	Connects AVCC to CON_VREF	**Disconnects AVCC from CON_VREF.**	R60
R73	Voltage Reference Source	**Connects Board_5V to VREF**	Disconnects Board_5V from VREF.	R77
R77	Voltage Reference Source	Connects CON_VREF to VREF	**Disconnects CON_VREF from VREF**	R73

Table 6-7: Analog configuration links

Table 6-8 below describes the function of the option links associated with Clock configuration. The default configuration is indicated by BOLD text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R61	Pin function select	**Connects PIN 109 to RxD2 on JA6.**	Disconnects PIN 109 from RxD2.	R126
R62	Pin function select	**Connects PIN 110 to TxD2 on JA6.**	Disconnects PIN 110 from TxD2.	R119
R63	Pin function select	**Connects PIN 80 to LED3.**	Disconnects PIN 80 from LED3.	R105
R64	Pin function select	**Connects PIN 115 to M1_Vn on JA2.**	Disconnects PIN 115 from M1_Vn.	R93
R65	Pin function select	**Connects PIN 79 to LED2.**	Disconnects PIN 79 from LED2.	R108
R66	Pin function select	**Connects PIN 76 to LED1.**	Disconnects PIN 76 from LED1.	R116
R67	Pin function select	**Connects PIN 75 to LED0.**	Disconnects PIN 75 from LED0.	R118
R68	Pin function select	**Connects PIN 82 to CS5n on JA3.**	Disconnects PIN 82 from CS5n.	R78
R69	Pin function select	**Connects PIN 72 to WE1n on JA3.**	Disconnects PIN 72 from WE1n.	R125
R72	Pin function select	Connects PIN 60 to TxD0 on JA2.	**Disconnects PIN 60 from TxD0.**	R122
R74	Pin function select	Connects PIN 59 to RxD0 on JA2.	**Disconnects PIN 59 from RxD0.**	R123
R75	Pin function select	Connects PIN 6 to TIOC0B on JA5.	**Disconnects PIN 6 from TIOC0B.**	R124
R76	Pin function select	**Connects PIN 81 to ADTRGn on JA1.**	Disconnects PIN 81 from ADTRGn.	R117
R79	Pin function select	Connects PIN 97 to AN0 on JA1.	**Disconnects PIN 97 from AN0.**	R84
R80	Pin function select	Connects PIN 8 to TIOC0D on JA5.	**Disconnects PIN 8 from TIOC0D.**	R120
R81	Pin function select	Connects PIN 7 to TIOC0C on JA5.	**Disconnects PIN 7 from TIOC0C.**	R127
R82	Pin function select	**Connects PIN 117 to M1_Up on JA2.**	Disconnects PIN 117 from M1_Up.	R88, R103
R83	Pin function select	**Connects PIN 120 to M1_Un on JA2.**	Disconnects PIN 120 from M1_Un.	R91, R111
R84	Pin function select	**Connects PIN 97 to AD_POT.**	Disconnects PIN 97 from AD_POT.	R79
R86	Pin function select	**Connects PIN 116 to M1_Vp on JA2.**	Disconnects PIN 116 from M1_Vp.	R96, R113
R87	Pin function select	**Connects PIN 70 to M1_Wp on JA2.**	Disconnects PIN 70 from M1_Wp.	R95
R88	Pin function select	Connects PIN 117 to TMR0 on JA2.	**Disconnects PIN 117 from TMR0.**	R82, R103
R91	Pin function select	Connects PIN 120 to TMR1 on JA2.	**Disconnects PIN 120 from TMR1.**	R83, R111
R93	Pin function select	Connects PIN 115 to TRIGa on JA2.	**Disconnects PIN 115 from JA2.**	R64
R95	Pin function select	Connects PIN 70 to IRQ7 on JA1.	**Disconnects PIN 70 from IRQ7.**	R87
R96	Pin function select	Connects PIN 116 to TRIGb on JA2.	**Disconnects PIN 116 from TRIGb.**	R86, R113
R103	Pin function select	Connects PIN 117 to DACK0 on JA6.	**Disconnects PIN 117 from DACK0.**	R82, R88
R105	Pin function select	Connects PIN 80 to M2_Up on .	**Disconnects PIN 80 from M2_Up.**	R63
R108	Pin function select	Connects PIN 79 to M2_Un on JA5.	**Disconnects PIN 79 from M2_Un.**	R65

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R111	Pin function select	Connects PIN 120 to DREQ0 on JA6.	**Disconnects PIN 120 from DREQ0.**	R83, R91
R113	Pin function select	Connects PIN 116 to DTEND0 on JA6.	**Disconnects PIN 116 from DTEND0.**	R86, R96
R116	Pin function select	Connects PIN 76 to M2_Vp on JA5.	**Disconnects PIN 76 from M2_Vp.**	R66
R117	Pin function select	Connects PIN 81 to M2_TRISTn on JA5.	**Disconnects PIN 81 from M2_TRISTn.**	R76
R118	Pin function select	Connects PIN 75 to M2_Vn on JA5.	**Disconnects PIN 75 from M2_Vn.**	R67
R119	Pin function select	Connects PIN 110 to TCLKC on JA5.	**Disconnects PIN 110 from TCLKC.**	R62
R120	Pin function select	**Connects PIN 8 to PTTX on JA6.**	Disconnects PIN 8 from PTTX.	R80
R122	Pin function select	**Connects PIN 60 to WRn on JA3.**	Disconnects PIN 60 from WRn.	R72
R123	Pin function select	**Connects PIN 59 to RDn on JA3.**	Disconnects PIN 59 from RDn.	R74
R124	Pin function select	**Connects PIN 6 to SCK1 on JA6.**	Disconnects PIN 6 from SCK1.	R75
R125	Pin function select	Connects PIN 72 to M2_Wp on JA5.	**Disconnects PIN 72 from M2_Wp.**	R69
R126	Pin function select	Connects PIN 109 to TCLKD on JA5.	**Disconnects PIN 109 from TCLKD.**	R61
R127	Pin function select	**Connects PIN 7 to PTRX on JA6.**	Disconnects PIN 7 from PTRX.	R81
R128	Pin function select	**Connects PIN 71 to WE0n on JA3.**	Disconnects PIN 71 from WE0n.	R132
R132	Pin function select	**Connects PIN 71 to M2_Wn on JA5.**	Disconnects PIN 71 from M2_Wn.	R128

Table 6-8: Pin function select links

Table 6-9 below describes the function of the option links associated with Clock configuration. The default configuration is indicated by BOLD text.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R75	Clock Oscillator	Parallel resistor for crystal	**Not fitted**	-
R76	Clock Oscillator	Connects on board clock to MCU	External Clock Source can be connected.	R74, R77, R108
R108	Clock Oscillator	Connects on board clock to MCU	External Clock Source can be connected.	R74, R77, R76
R74	Clock Oscillator	Connects external clock to MCU	**Disconnects external clock connection to MCU**	R77, R76
R77	Clock Oscillator	Connects external clock to MCU	**Disconnects external clock connection to MCU**	R74, R76

Table 6-9: Clock configuration links

6.7.Oscillator Sources

A crystal oscillator is fitted on the CPU board and used to supply the main clock input to the Renesas microcontroller.

Table 6-10: Oscillators / Resonators details the oscillators that are fitted and alternative footprints provided on this CPU board:

Component		
Crystal (X1)	Fitted	10MHz (HC49/4H package)

Table 6-10: Oscillators / Resonators

Warning: When replacing the default oscillator with that of another frequency, the debugging monitor will not function unless the following are corrected:

- FDT programming kernels supplied are rebuilt for the new frequency
- The supplied HMON debugging monitor is updated for baud rate register settings.

The user is responsible for code written to support operating speeds other than the default. See the HMON User Manual for details of making the appropriate modifications in the code to accommodate different operating frequencies.

6.8. Reset Circuit

The CPU Board includes a simple latch circuit that links the mode selection and reset circuit. This provides an easy method for swapping the device between HMON Boot Mode and User mode. This circuit is not required on customers' boards as it is intended for providing easy evaluation of the operating modes of the device on the RSK. Please refer to the hardware manual for more information on the requirements of the reset circuit.

The reset circuit operates by latching the state of the boot switch (SW1) on pressing the reset button. This control is subsequently used to modify a port pin state to select which code is executed.

The reset is held in the active state for a fixed period by a pair of resistors and a capacitor. Please check the reset requirements carefully to ensure the reset circuit on the user's board meets all the reset timing requirements.

Chapter 7. Modes

This CPU board supports four MCU operating modes and three on-chip flash memory programming modes. Jumpers can be used to set the appropriate modes while E8 is not in use. User Program mode (Mode 6) may be used to run and debug user code, while Boot mode may only be used to program the Renesas microcontroller with program code.

When using the E8 debugger supplied with the RSK the mode transitions between Boot mode and User Program mode are executed automatically. The CPU board provides the capability of changing between User mode and HMON Boot mode using a latch circuit. This is only to provide a simple boot control on this board when the E8 is in use with HMON.

To manually enter HMON Boot mode, press and hold the SW1/BOOT. The mode pins are held in their boot states while reset is pressed and released. Release the boot button. The BOOT LED will be illuminated to indicate that the microcontroller is in HMON boot mode. In this mode the E8 can be used to make an HMON connection in HEW.

More information on SH7211 operating modes can be found in the device hardware manual.

7.1. FDT Settings

In the following sections the tables identify the FDT settings required to connect to the board using the E8Direct debugger interface. The E8 Debugger contains the following 'pull' resistors.

E8 Pin	Resistor
A	Pull Down (100K)
B	Pull Up (100K)
C	Pull Down (100K)
D	Pull Up (100K)

Table 7-1: E8 Mode Pin Drives

7.1.1. Boot mode

The boot mode settings for this CPU board are shown in Table 7-2: Boot mode pin settings below:

FWE	MD1	MD0	LSI State after Reset End	FDT Settings		
				A	B	D
1	0	0	Boot Mode	0	0	1

Table 7-2: Boot mode pin settings

The following picture shows these settings made in the E8Direct configuration dialog from HEW.

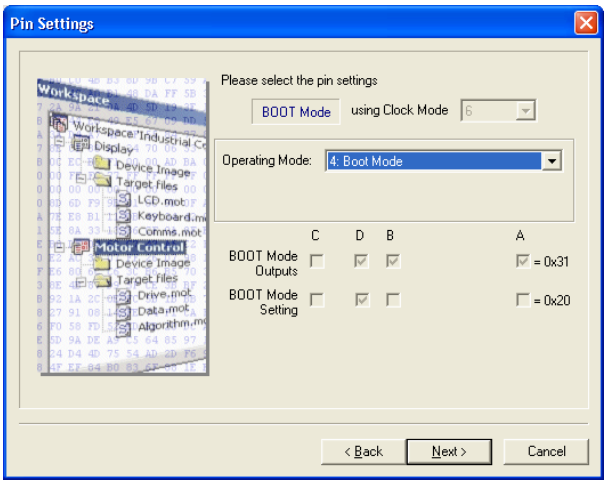

Figure 7-1: Boot mode FDT configuration

7.1.2.User Mode

For the device to enter User Mode, reset must be held active while the microcontroller mode pins are held in states specified for User Mode operation. 100K pull up and pull down resistors are used to set the pin states during reset.

FWE	MD1	MD0	LSI State after Reset End	FDT Settings		
				A	B	D
1	1	0	User Program Mode	0	1	1

Table 7-3: User Mode pin settings

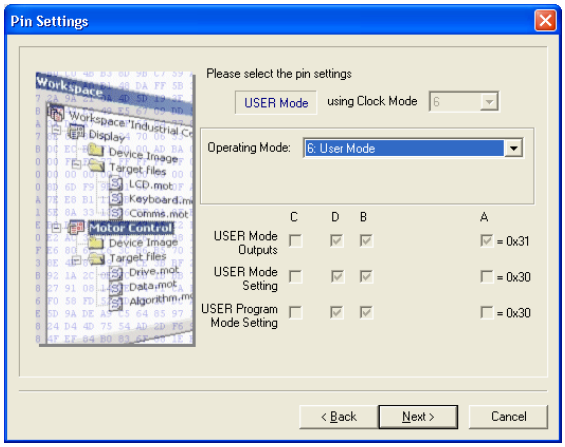

Figure 7-2: User mode FDT configuration

Chapter 8.Programming Methods

All of the Flash ROM on the device can be programmed when the device is in Boot mode. In boot mode, the boot-loader program pre-programmed into the microcontroller executes and attempts a connection with the host (for example a PC). On establishing a connection with the microcontroller, the host may then transmit program data to the microcontroller via the appropriate programming port.

Table 8-1: Serial Port Boot Channel below shows the programming port for this Renesas Microcontroller and its associated pins.

Programming Port Table – Programming port pins and their CPU board signal names		
SCI1	TXD1, Pin 8	RXD1, Pin 7
CPU board Signal Name	PTTX	PTRX

Table 8-1: Serial Port Boot Channel

8.1.Programming with the E8

The Flash Development Toolkit (FDT) is supplied to allow programs to be loaded directly on to the board using the E8. The E8 resets the CPU invoking the User Program mode described above. This starts the FDT User Program mode programming kernel. For further information see the User program sample code and the FDT kernel code.

8.2. E10A Header

This device supports E10A debugging interface. The E10A provides additional debugging features including hardware breakpoints and hardware trace capability. (Check with the website at www.renesas.com or your distributor for a full feature list).

8.3. Serial Port Programming

This sequence is not required when debugging using the E8 supplied with the kit.

The microcontroller must enter boot mode for programming, and the programming port must be connected to a host for program download. To execute the boot transition, and allow programs to download to the microcontroller, the user must perform the following procedure:

Ensure the relevant option links are made from Table 6-3: Serial Option Links

Connect a 1:1 serial cable between the host PC and the CPU board.

Depress the BOOT switch and keep this held down.

Depress the RESET switch once, and release.

Release the BOOT switch.

The Flash Development Toolkit (FDT) is supplied to allow programs to be loaded directly on to the board using this method.

Chapter 9. Headers

9.1. Microcontroller Headers

Table 9-1 to Table 9-4 show the microcontroller pin headers and their corresponding microcontroller connections. The header pins connect directly to the microcontroller pin unless otherwise stated.

J1					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	A18	1	19	WDT_OVFn	19
2	A19	2	20	VCC	20
3	A20	3	21	GND	21
4	A21	4	22	RESn	22
5	A22	5	23	FWE	23
6	SCK1_TIOC0B	6	24	GND	24
7	PTRX_TIOC0C	7	25	CON_XTAL	25
8	PTTX_TIOC0D	8	26	CON_EXTAL	26
9	VCCQ	9	27	GND	27
10	GND	10	28	VCCQ	28
11	NMI	11	29	ASEMDn	29
12	TDI	12	30	ASEBRKn	30
13	VCC	13	31	MD_CLK0	31
14	GND	14	32	MD_CLK2	32
15	TDO	15	33	MD0	33
16	TCK	16	34	MD1	34
17	TMS	17	35	VCC	35
18	TRSTn	18	36	GND	36

Table 9-1: J1 microcontroller header

J2					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	D0	37	19	GND	55
2	D1	38	20	D13	56
3	D2	39	21	D14	57
4	D3	40	22	D15	58
5	GND	41	23	RDn_RxD0	59
6	VCCQ	42	24	WRn_TxD0	60
7	D4	43	25	GND	61
8	D5	44	26	VCC	62
9	D6	45	27	DLCD4	63
10	D7	46	28	DLCD5	64
11	VCC	47	29	DLCD6	65
12	GND	48	30	DLCD7	66
13	D8	49	31	VCCQ	67
14	D9	50	32	GND	68
15	D10	51	33	M1_Wn	69
16	D11	52	34	M1Wp_IRQ7	70
17	D12	53	35	WE0n_M2Wn	71
18	VCCQ	54	36	WE1n_M2Wp	72

Table 9-2: J2 microcontroller header

J3					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	VCC	73	19	M1_TRISTn	91
2	GND	74	20	IRQ0	92
3	LED0_M2Vn	75	21	AVSS	93
4	LED1_M2Vp	76	22	AVCC	94
5	GND	77	23	DA1	95
6	VCCQ	78	24	DA0	96
7	LED2_M2Un	79	25	ADPOT_AN0	97
8	LED3_M2Up	80	26	AN1	98
9	ADTRGn_M2TRISTn	81	27	AN2	99
10	CS5n_UD	82	28	AN3	100
11	CS1n	83	29	AN4	101
12	CS3n	84	30	AN5	102
13	VCC	85	31	AN6	103
14	GND	86	32	AN7	104
15	IRQ4	87	33	AN8	105
16	IRQ6	88	34	AVSS	106
17	GND	89	35	PIN107	107
18	VCCQ	90	36	PIN108	108

Table 9-3: J3 microcontroller header

J4					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	RXD2_TCLKD	109	19	A4	127
2	TXD2_TCLKC	110	20	A5	128
3	DLCDE	111	21	A6	129
4	DLCDRS	112	22	A7	130
5	GND	113	23	GND	131
6	VCCQ	114	24	VCC	132
7	M1Vn_TRIGa	115	25	A8	133
8	M1Vp_DTEND0_TRIGb	116	26	A9	134
9	M1Up_DACK0_TMR0	117	27	A10	135
10	GND	118	28	A11	136
11	VCC	119	29	A12	137
12	M1Un_DREQ0_TMR1	120	30	A13	138
13	A0	121	31	VCCQ	139
14	A1	122	32	GND	140
15	A2	123	33	A14	141
16	VCCQ	124	34	A15	142
17	GND	125	35	A16	143
18	A3	126	36	A17	144

Table 9-4: J4 microcontroller header

9.2. Application Headers

Table 9-5 to Table 9-9 below show the standard application header connections.

* marks pins where a link to the microcontroller pin is via a fitted 0R link

** marks pins where a link to the microcontroller pin is via a fitted 100R link

JA1							
Pin	Header Name	CPU board Signal Name	Device Pin	Pin	Header Name	CPU board Signal Name	Device Pin
1	5V	CON_5V	---	14	DAC1	DA1	95
2	0V(5V)	GROUND	---	15	IO_0	---	---
3	3V3	CON_3V3	---	16	IO_1	---	---
4	0V(3V3)	GROUND	---	17	IO_2	---	---
5	AVcc	CON_AVCC	94	18	IO_3	---	---
6	AVss	AVSS	93	19	IO_4	---	---
7	AVref	CON_VREF	105	20	IO_5	---	---
8	ADTRG	ADTRGn	81*	21	IO_6	---	---
9	AD0	AN0	97*	22	IO_7	---	---
10	AD1	AN1	98	23	IRQ3	IRQ7	70*
11	AD2	AN2	99	24	IIC_EX	---	---
12	AD3	AN3	100	25	IIC_SDA	IIC_SDA	108**
13	DAC0	DA0	96	26	IIC_SCL	IIC_SCL	107**

Table 9-5: Memory Map for HMON Components

JA2							
Pin	Header Name	CPU board Signal Name	Device Pin	Pin	Header Name	CPU board Signal Name	Device Pin
1	RESn	RESn	22	14	Un	M1_Un	120*
2	EXTAL	CON_EXTAL	26*	15	Vp	M1_Vp	116*
3	NMIn	NMI	11	16	Vn	M1_Vn	115*
4	Vss1	GROUND	14	17	Wp	M1_Wp	70*
5	WDT_OVF	WDT_OVFn	19	18	Wn	M1_Wn	69*
6	SCIaTX	TxD0	60*	19	TMR0	TMR0	117*
7	IRQ0	IRQ0	92	20	TMR1	TMR1	120*
8	SCIaRX	RXD0	59*	21	TRIGa	TRIGa	115*
9	IRQ1	IRQ1n	87	22	TRIGb	TRIGb	116*
10	SCIaCK	SCK0	---	23	IRQ2	IRQ6	88
11	UD	UD	82*	24	TRISTn	M1_TRISTn	91
12	CTSRTS	---	---	25	Reserved		
13	Up	M1_Up	117*	26	Reserved		

Table 9-6: JA2 Standard Generic Header

JA3							
Pin	Header Name	CPU board Signal Name	Device Pin	Pin	Header Name	CPU board Signal Name	Device Pin
1	Address Bus	A0	121	26	Read/Write Control	WRn	60*
2	Address Bus	A1	122	27	Memory Select	CS1n	83
3	Address Bus	A2	123	28	Memory Select	CS3n	84
4	Address Bus	A3	126	29	Data Bus	D8	49
5	Address Bus	A4	127	30	Data Bus	D9	50
6	Address Bus	A5	128	31	Data Bus	D10	51
7	Address Bus	A6	129	32	Data Bus	D11	52
8	Address Bus	A7	130	33	Data Bus	D12	53
9	Address Bus	A8	133	34	Data Bus	D13	56
10	Address Bus	A9	134	35	Data Bus	D14	57
11	Address Bus	A10	135	36	Data Bus	D15	58
12	Address Bus	A11	136	37	Address Bus	A16	143
13	Address Bus	A12	137	38	Address Bus	A17	144
14	Address Bus	A13	138	39	Address Bus	A18	1
15	Address Bus	A14	141	40	Address Bus	A19	2
16	Address Bus	A15	142	41	Address Bus	A20	3
17	Data Bus	D0	37	42	Address Bus	A21	4
18	Data Bus	D1	38	43	Address Bus	A22	5
19	Data Bus	D2	39	44	External Device Clock	---	---
20	Data Bus	D3	40	45	Memory Select	CS5n	82*
21	Data Bus	D4	43	46	Bus Control	---	---
22	Data Bus	D5	44	47	Data Bus Strobe	WE1n	72*
23	Data Bus	D6	45	48	Data Bus Strobe	WE0n	71*
24	Data Bus	D7	46	49	Reserved		
25	Read/Write Control	RDn	59*	50	Reserved		

Table 9-7: JA3 Standard Generic Header

JA5							
Pin	Header Name	CPU board Signal Name	Device Pin	Pin	Header Name	CPU board Signal Name	Device Pin
1	AD4	AN4	101	13	TIOC0A	TIOC0B	6
2	AD5	AN5	102	14	TIOC0B	TIOC0C	7
3	AD6	AN6	103	15	TIOC0C	TIOC0D	8
4	AD7	AN7	104	16	M2_TRISTn	M2_TRISTn	81
5	CAN1TX	---	---	17	TCLKC	TCLKC	110
6	CAN1RX	---	---	18	TCLKD	TCLKD	109
7	CAN2TX	---	---	19	M2_Up	M2_Up	80
8	CAN2TX	---	---	20	M2_Un	M2_Un	79
9	AD8	---	---	21	M2_Vp	M2_Vp	76
10	AD9	---	---	22	M2_Vn	M2_Vn	75
11	AD10	---	---	23	M2_Wp	M2_Wp	72
12	AD11	---	---	24	M2_Wn	M2_Wn	71

Table 9-8: JA5 Standard Generic Header

JA6							
Pin	Header Name	CPU board Signal Name	Device Pin	Pin	Header Name	CPU board Signal Name	Device Pin
1	DREQ	DREQ0	120	13	Reserved		
2	DACK	DACK0	117	14	Reserved		
3	TEND	DTEND0	116	15	Reserved		
4	STBYn	---	---	16	Reserved		
5	RS232TX	RS232TX	---	17	Reserved		
6	RS232RX	RS232RX	---	18	Reserved		
7	SCIbRX	RxD2	109*	19	Reserved		
8	SCIbTX	TxD2	110*	20	Reserved		
9	SCIcTX	PTTX	8	21	Reserved		
10	SCIbCX	---	---	22	Reserved		
11	SCIcCK	SCK1	6	23	Reserved		
12	SCIcRX	PTRX	7	24	Reserved		

Table 9-9: JA6 Standard Generic Header

Chapter 10. Code Development

10.1. Overview

Note: For all code debugging using Renesas software tools, the CPU board must either be connected to a PC serial port via a serial cable or a PC USB port via an E8. An E8 is supplied with the RSK product.

The HMON embedded monitor code is modified for each specific Renesas microcontroller. HMON enables the High-performance Embedded Workshop (HEW) development environment to establish a connection to the microcontroller and control code execution. Breakpoints may be set in memory to halt code execution at a specific point.

Unlike other embedded monitors, HMON is designed to be integrated with the user code. HMON is supplied as a library file and several configuration files. When debugging is no longer required, removing the monitor files and library from the code will leave the user's code operational.

The HMON embedded monitor code must be compiled with user software and downloaded to the CPU board, allowing the users' code to be debugged within HEW.

Due to the continuous process of improvements undertaken by Renesas the user is recommended to review the information provided on the Renesas website at www.renesas.com to check for the latest updates to the Compiler and Debugger manuals.

10.2. Compiler Restrictions

The compiler supplied with this RSK is fully functional for a period of 60 days from first use. After the first 60 days of use have expired, the compiler will default to a maximum of 256k code and data. To use the compiler with programs greater than this size you will need to purchase the full tools from your distributor.

Warning: The protection software for the compiler will detect changes to the system clock. Changes to the system clock back in time may cause the trial period to expire prematurely.

10.3.Mode Support

The HMON library is built to support Single Chip mode only, for the SH7211 family.

10.4. Breakpoint Support

Limited breakpoints can be located in ROM code. However, code located in RAM may have unlimited breakpoints. To debug with less intrusion you need to purchase the E10A-USB on-chip debugger at additional cost.

10.5. Code located in RAM

Double clicking in the breakpoint column in the HEW code window sets the breakpoint. Breakpoints will remain unless they are double clicked to remove them. (See the Tutorial Manual for more information on debugging with the HEW environment.)

10.6. HMON Components

HMON is built along with the user's code. Certain elements of the HMON code must remain at a fixed location in memory. Table 10-1 details the HMON components and their size and location in memory. For more information, refer to the map file when building the code.

Section	Description	Start Location	Size (H'bytes)
RESET_VECTOR	HMON Reset Vector (Vector 0) Required for Start-up of HMON	H' 0000 0000	0x0004
SCI_VECTORS	HMON Serial Port Vectors (Vector 244, 245, 246, 247)	H' 0000 03D0	0x0010
PHMON	HMON Code	H' 0000 4000	0x29A4
CHMON	HMON Constant Data	H' 0000 69A4	0x0148
BHMON	HMON Un-initialised data	H' FFF8 7600	0x055D
UGenU	FDT User Mode Micro Kernel This is at a fixed location and must not be moved. Should the kernel need to be moved it must be re-compiled.	H' 0000 1000	0x17D0
CUser_Vectors	Pointer used by HMON to point to the start of user code.	H'0000 0800	0x0004

Table 10-1: Memory Map for HMON Components

10.7. Memory Map

The memory map shown in this section visually describes the locations of program code sections related to HMON, the FDT kernels and the supporting code within the ROM / RAM memory areas of the microcontroller.

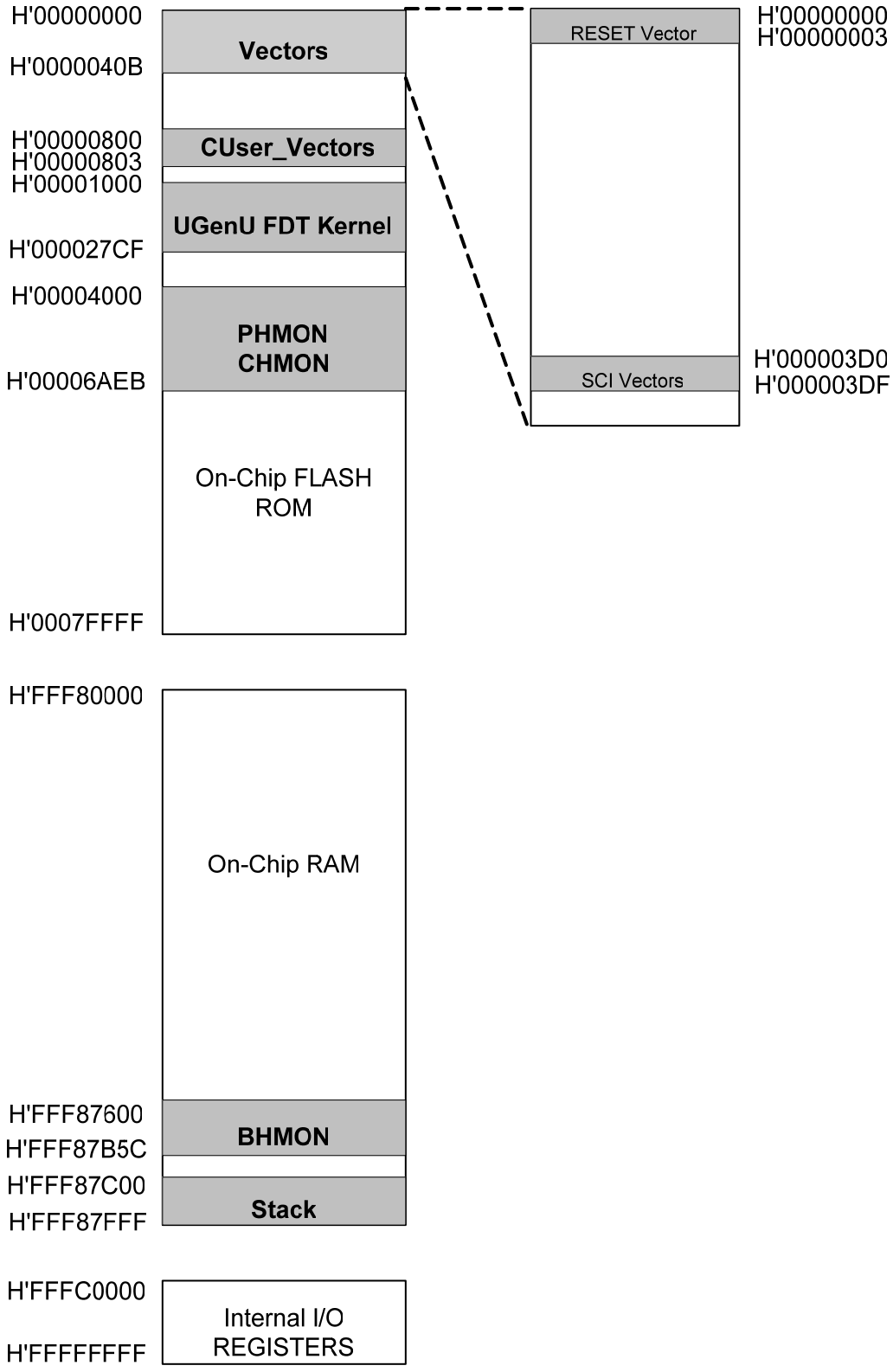

Figure 10-1: Memory Map

10.8. Baud Rate Setting

HMON is initially set to connect at 250000 Baud. The value set in the baud rate register for the microcontroller must be altered if the user wishes to change either the serial communication baud rate of the serial port or the operating frequency of the microcontroller. This value is defined in the hmonserialconfiguser.h file, as SCI_CFG_BRR (see the Serial Port section for baud rate register setting values). The project must be re-built and the resulting code downloaded to the microcontroller once the BRR value is changed. Please refer to the HMON User Manual for further information.

10.9. Interrupt mask sections

HMON has an interrupt priority of 15. Modules using interrupts should be set to lower than this value (14 or below), so that serial communications and debugging capability is maintained.

Chapter 11. Component Placement

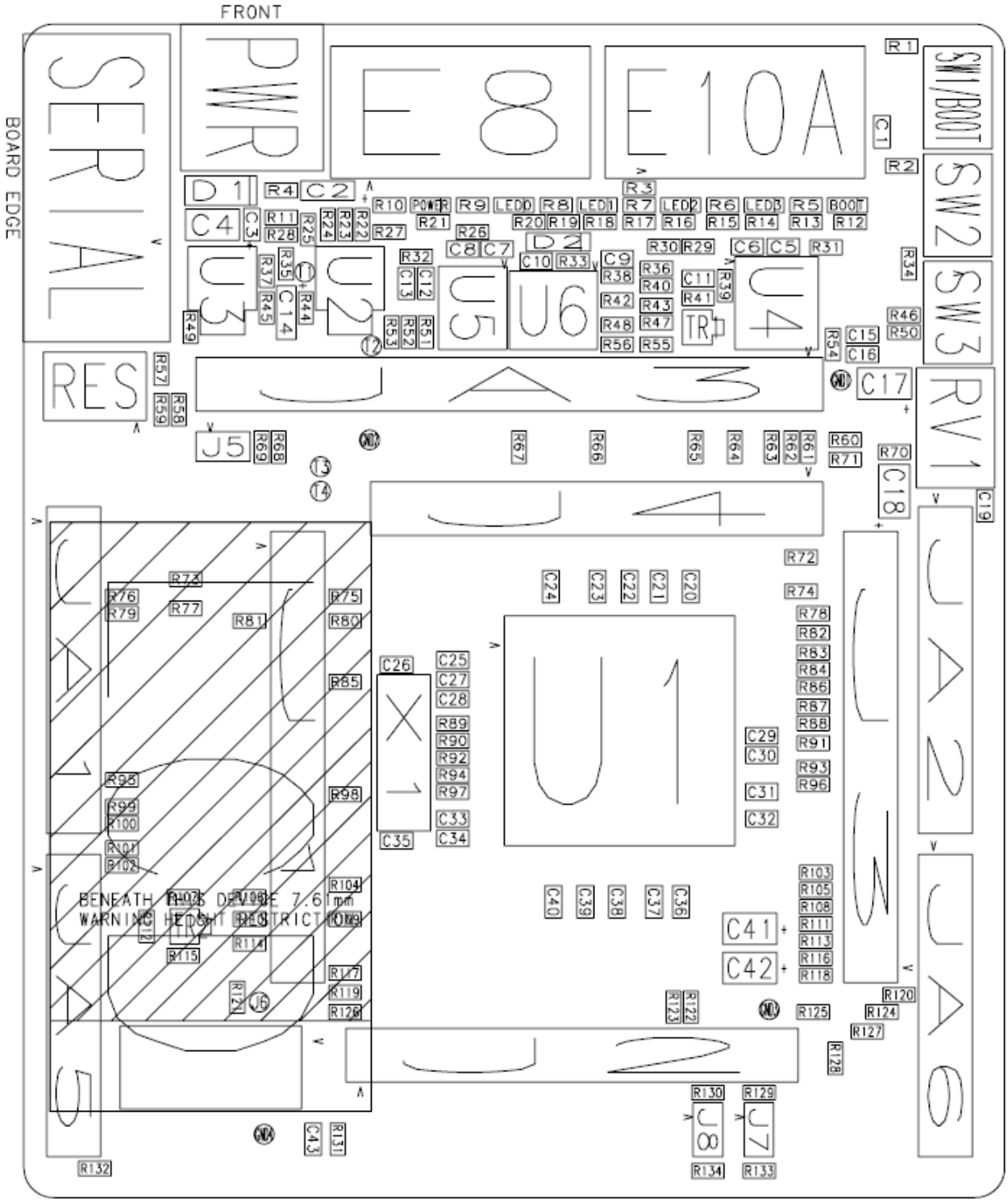

Figure 11-1: Component Placement (Top Layer)

Chapter 12. Additional Information

For details on how to use High-performance Embedded Workshop (HEW), refer to the HEW manual available on the CD or installed in the Manual Navigator.

For information about the SH7211 microcontrollers refer to the *SH7211 Group Hardware Manual*.

For information about the SH7211 assembly language, refer to the *SH-2A, SH2A-FPU Software Manual*.

Online technical support and information is available at: http://www.renesas.com/renesas_starter_kits

Technical Contact Details

America: techsupport.rta@renesas.com

Europe: tools.support.eu@renesas.com

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General information on Renesas Microcontrollers can be found on the Renesas website at: http://www.renesas.com/

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