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April 1st, 2010
Renesas Electronics Corporation

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User's Manual

Renesas Starter Kit2+ for SH7216

User's Manual

Renesas 32-Bit RISC Microcomputer
SuperH™ RISC engine family

Renesas Electronics
www.renesas.com

Rev.1.00 2010.01

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Precautions

This Renesas Starter Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures;

- ensure attached cables do not lie across the equipment
- reorient the receiving antenna
- increase the distance between the equipment and the receiver
- connect the equipment into an outlet on a circuit different from that which the receiver is connected
- power down the equipment when not is use
- consult the dealer or an experienced radio/TV technician for help NOTE: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken;

- The user is advised that mobile phones should not be used within 10m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Renesas Starter Kit does not represent an ideal reference design for an end product and does not fulfil the regulatory standards for an end product.

Table of Contents

Chapter 1. Preface

Cautions

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Glossary

ADC	Analog to Digital Converter	LED	Light Emitting Diode
CPU	Central Processing Unit	MCU	Microcontroller Unit
DAC	Digital to Analog Converter	NC	No Connection
E10A	'E10A for Starter Kits' Debugger	PC	Program Counter
EMC	Electromagnetic compatibility	RAM	Random Access Memory
ESD	Electrostatic Discharge	RCAN	Renesas Controller Area Network
HEW	High-performance Embedded Workshop	ROM	Read-Only Memory
I/O	Input / Output	RSK	Renesas Starter Kit
LCD	Liquid Crystal Display	SDRAM	Synchronous Dynamic Random Access Memory

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.
- User or Example Application.
- Sample peripheral device initialisation code.

The RSK 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 RSK operates from a external 5V power supply.

This RSK board is supplied with an E10A debugger. These boards have centre positive supply connector using a 2.0mm barrel power jack.

Warning

The RSK is neither under nor over voltage protected. Use a centre positive supply for this board.

3.2. Power – Up Behaviour

When the RSK is purchased the RSK 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. After 200 flashes, or after pressing a switch the LEDs will 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.

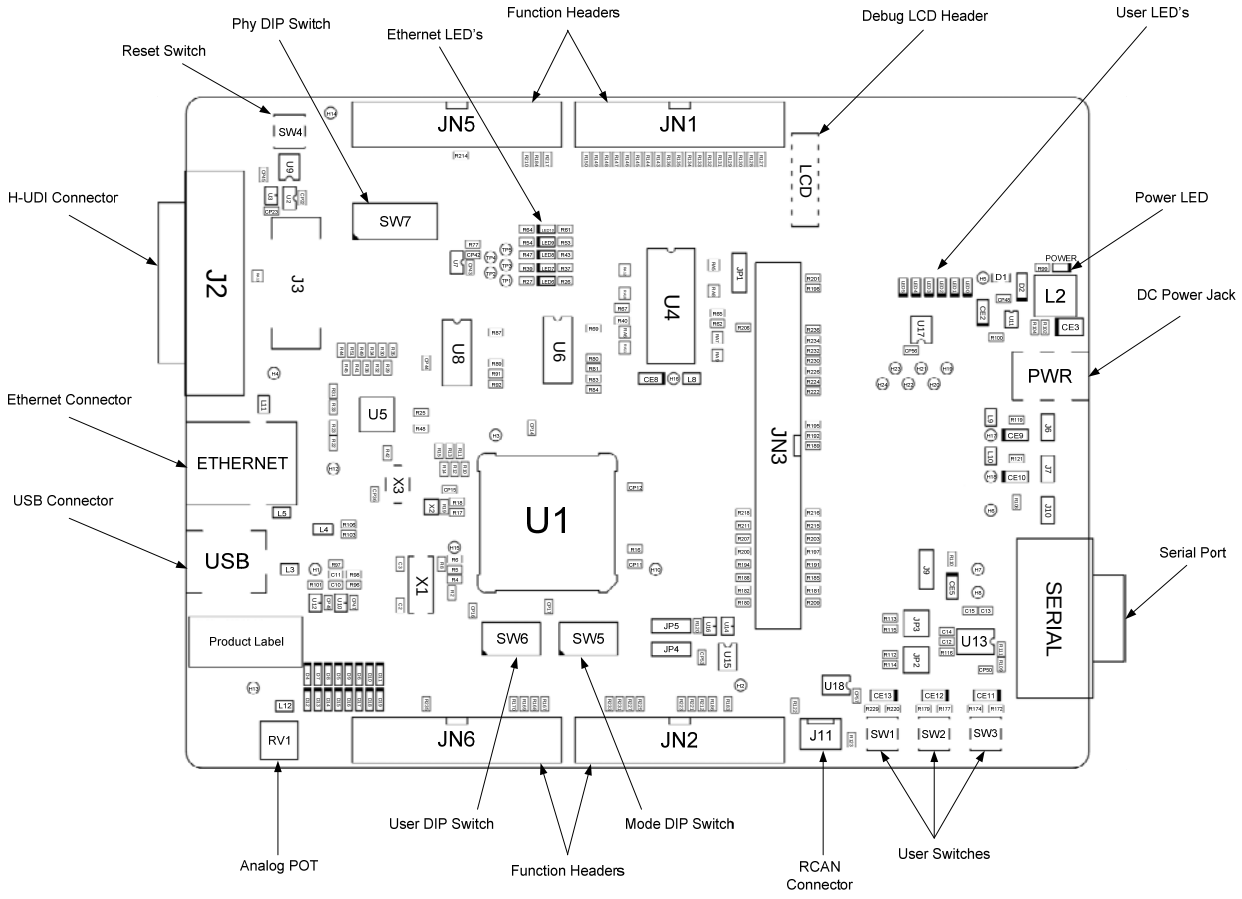

Figure 4-1: Board Layout

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.

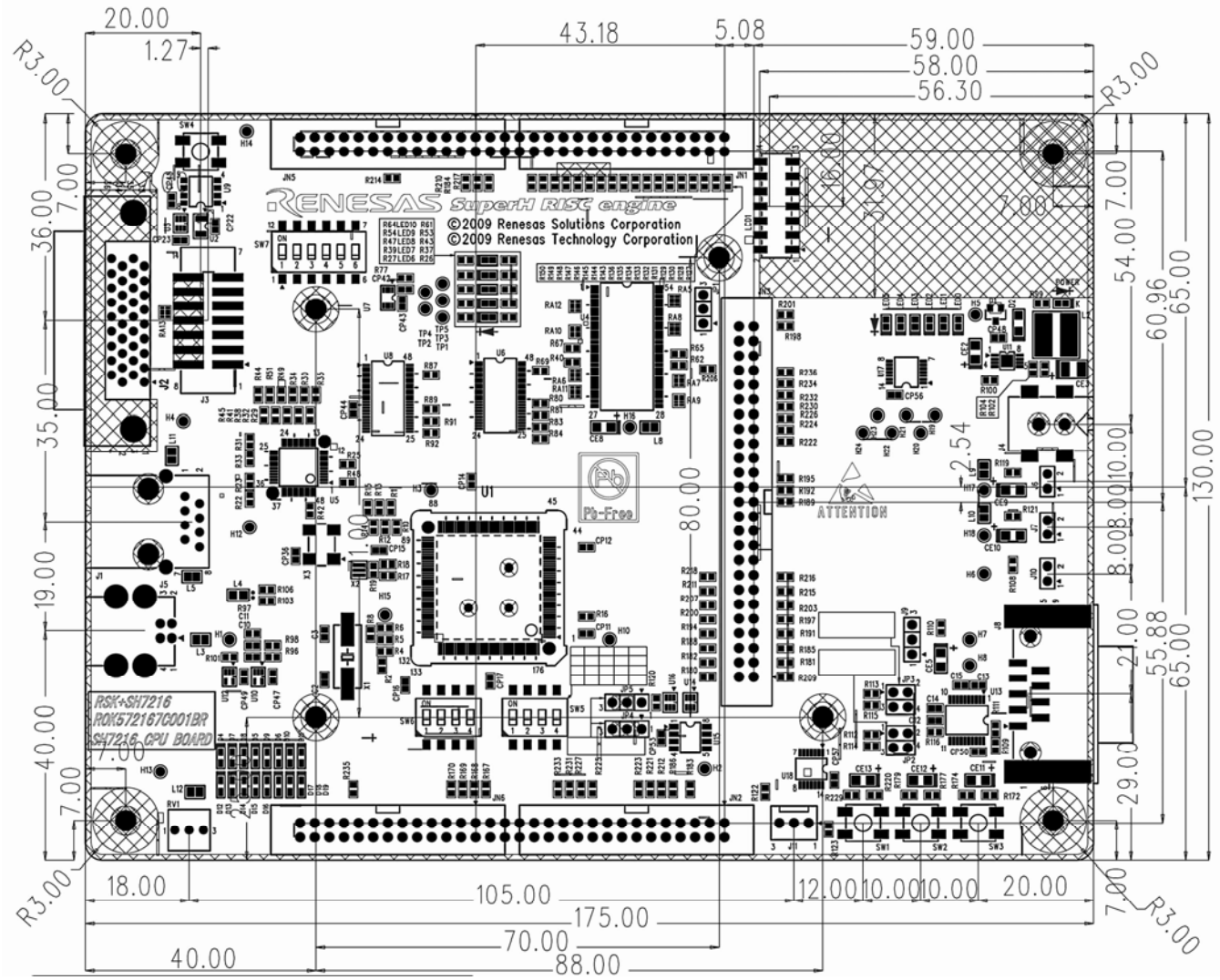

Figure 4-2: Board Dimensions

Chapter 5. Block Diagram

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

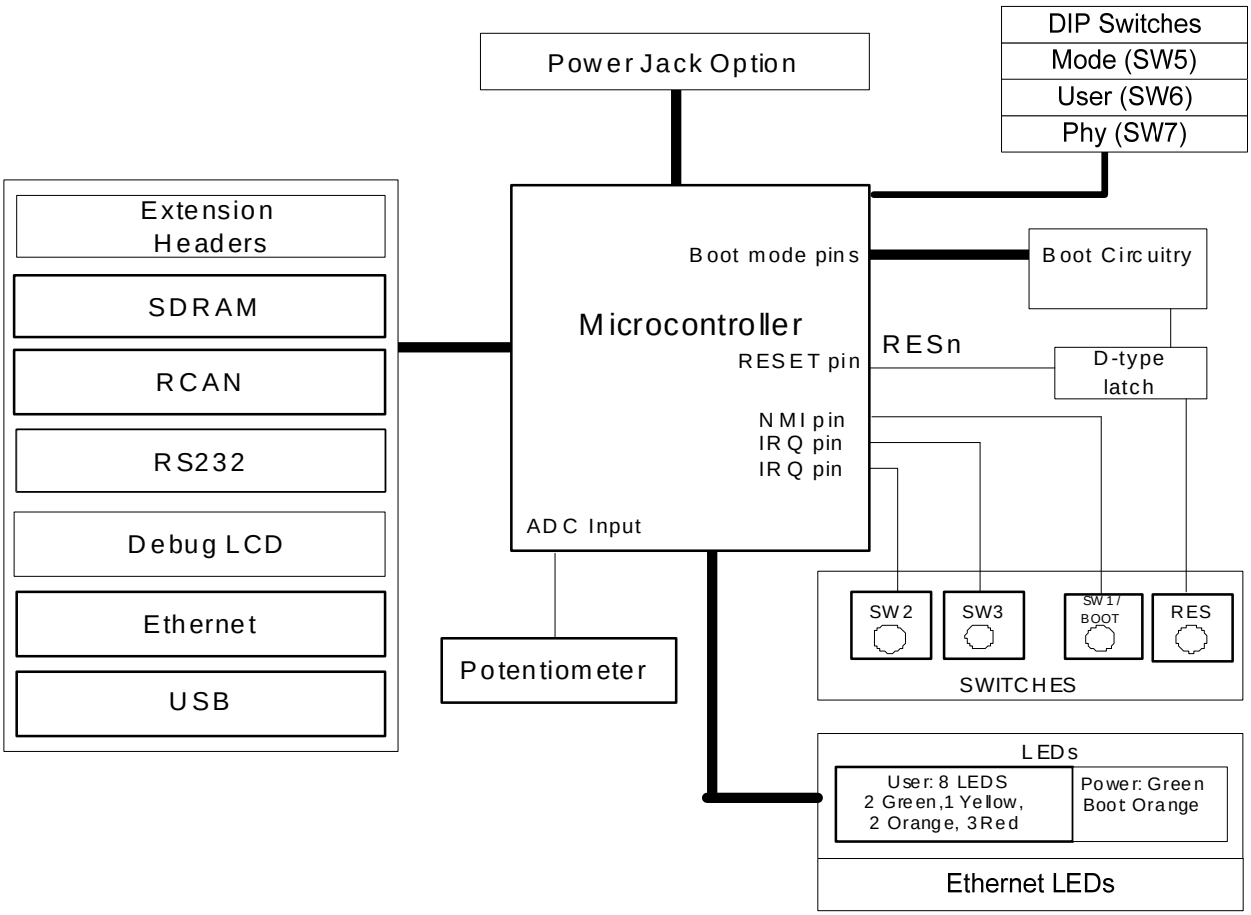

Figure 5-1: Block Diagram

Figure 5-2 shows E10A connections to the RSK+ board.

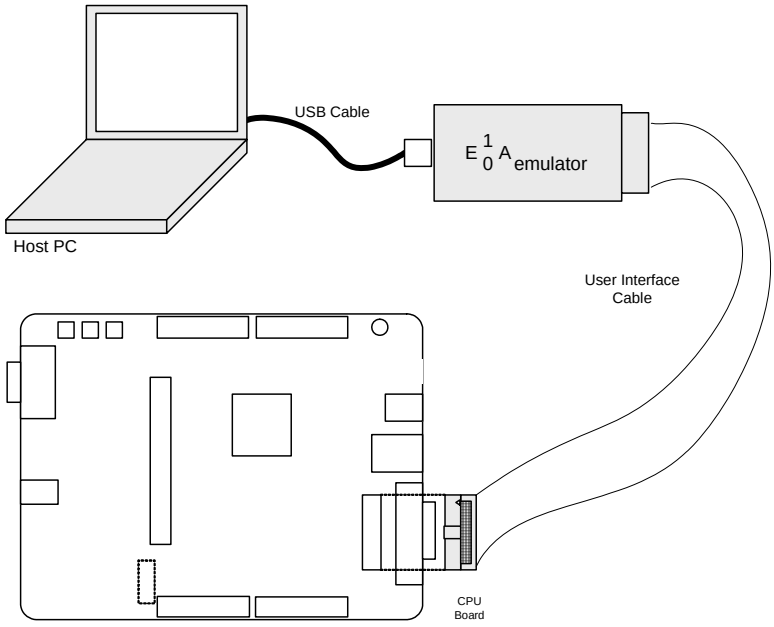

Figure 5-2: RSK Connections

Chapter 6. User Circuitry

6.1. Switches

There are four tactile switches and three DIP switches located on the CPU board. The function of each switch and its connection are shown below,

Switch	Function	Microcontroller
RES	When pressed, the RSK microcontroller is reset.	RESn, Pin 133
SW1*	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 E10A debugger.	IRQ0, Pin 77 (Port D pin 16)
SW2*	Connects to an IRQ line for user controls.	IRQ6, Pin 10 (Port A, pin 20)
SW3*	Connects to the Non-Maskable Interrupt (NMI) line.	NMI, Pin 123

Table 6-1: Switch Functions

*Refer to schematic for detailed connectivity information.

SW-5	Function	Microcontroller
1	Changes the operating mode of the MCU*.	U1, Pin-134
2	Changes the operating mode of the MCU*.	U1, Pin-153
3	Changes the operating mode of the MCU*.	U1, Pin-152
4	Changes the operating mode of the MCU*.	-

Table 6-2: Mode Switch Functions

*Refer to chapter-7 for more detail.

SW-6	Function	Microcontroller
1	Connected to analog input AN4 via “R156” *.	U1, Pin-146
2	Connected to analog input AN5 via “R155” *.	U1, Pin-147
3	Connected to analog input AN6 via “R154” *.	U1, Pin-148
4	Connected to analog input AN7 via “R158” *.	U1, Pin-149

Table 6-3: User Switch Functions

*Refer to schematic for detailed connectivity information.

SW-7	Function	Ethernet Phy (U5)
1	Sets up the Ethernet Phy (U5) in isolate Mode*.	U5, Pin-43
2	Sets up the Ethernet Phy (U5) in repeater Mode*.	U5, Pin-40
3	Sets up the speed of the Ethernet Phy (U5) to 100Mbps*.	U5, Pin-39
4	Sets up the Ethernet Phy (U5) in full duplex Mode*.	U5, Pin-38
5	Sets up the Ethernet Phy (U5) in Auto-negotiation Mode*.	U5, Pin-37
6	Sets up the Ethernet Phy (U5) in LDPS (Link down Power saving) Mode*.	U5, Pin-41

Table 6-4: Ethernet Phy Mode Switch Functions

*Refer to schematic for detailed connectivity information.

6.2. LEDs

There are 12 LEDs on the RSK board. The green 'POWER' LED lights when the board is powered. The 6 user LEDs (LED0 – LED5) are connected to an IO port and will light when their corresponding port pin is set low. The remaining 5 LEDs (LED6 – LED10) are Ethernet specific, and are not accessed directly from the MCU.

Table 6-5, below, shows the user LED pin references and their corresponding microcontroller port pin connections.

LED Reference (As shown on silkscreen)	Colour	Microcontroller Port Pin	Microcontroller Pin Number
LED0	Green	PE9	168
LED1	Yellow	PE11	169
LED2	Orange	PE12	170
LED3	Red	PE13	171
LED4	Red	PE14	172
LED5	Red	PE15	173

Table 6-5: LED Port

6.3. Potentiometer

A single turn potentiometer is connected to channel AN0 (Port pin PF0, CPU pin 138) of the microcontroller. This may be used to vary the input analogue voltage value to this pin between AVCC and Ground.

Note: The potentiometer is fitted to offer an easy way of supplying a variable analogue input to the controller. It does not necessarily reflect the accuracy of the controllers ADC. Please see the device manual for details.

6.4. Serial port

The Serial module can be controlled by the MCU through the RXD1 and TXD1 lines, or controlled externally through the header connections RS232RX and RS232TX. To select between these two inputs, the jumpers JP2 and JP3 must be set appropriately (see the table of jumper settings in section 6.9). Table 6-6 contains details of the specific pin functions and their locations.

Description	Function	MCU Pin	Header Pin
TXD1	Serial Transmission Pin	161	JN5, Pin 5
RXD1	Serial Reception Pin	160	JN5, Pin 6

Table 6-6: Serial port pin details

6.5. RCAN

The RCAN module can be controlled by the MCU through the CTx0 (Port pin PA1) and CRx0 (Port pin PA0) lines, or controlled externally through the header connections CTx0 and CRx0. To select between these two inputs, the jumpers JP4 and JP5 must be set appropriately (see the table of jumper settings in section 6.9). The Table 6-7 contains details of the specific pin functions and their locations.

Description	Function	MCU Pin	Header Pin
CTx0	RCAN Transmission Pin	158	JN6, Pin 5
CRx0	RCAN Reception Pin	157	JN6, Pin 6

Table 6-7: RCAN port pin details

6.6. USB

The USB function module can be used for USB communication with host.

Table 6-8 contains details of the signal descriptions and pin connections.

Description	Function	Microcontroller Pin Number
VBUS	USB cable connection monitor pin	118
USD+	USB data I/O pin	113
USD-	USB data I/O pin	114
DrVcc	Power supply pin for USB built-in transceiver	112
DrVss	Ground pin for USB built-in transceiver	115
PUPD	Pull-up control pin	117
USBXTAL	USB clock pin	107
USBEXTAL	USB clock pin	109

Table 6-8: USB module settings

6.7. Ethernet

The Ethernet module conforms to the Ethernet or IEEE802.3 media access control (MAC) standard. Ethernet controller is connected to the direct memory access controller for Ethernet controller (E-DMAC) and carries out high-speed data transfer to and from the memory. In addition, Ethernet controller is connected to RTL8201CP physical receiver chip enabling it to perform transmission and reception of Ethernet frames.

There are 6 Ethernet configuration modes which must be pulled to VCC or grounded to make a selection. For ease of use, these lines have been connected to both VCC and ground via a physical switch, SW7. The configuration options connected to the switch are:

- ISOLATE – Pulling this line high will isolate the Ethernet LSI from the Mac controller and the MDC/MDIO interface.
- RPTR – Pulling this line high will put the Ethernet LSI into repeater mode.
- SPEED – Pulling this line high will set the Ethernet link speed to 100Mbps; grounding will set it to 10Mbps.
- ANE – Pulling this line high will put the Ethernet LSI into auto negotiation mode; grounding will put it into force mode.
- LDPS – Pulling this line high will put the Ethernet LSI into 'Link Down Power Saving Mode'.

Table 6-9 contains details of the signal descriptions and pin connections. All connections to the MCU are direct unless indicated otherwise with an asterisk *.

Net Name	Function	MCU Pin Number
TX_CLK	Transmit/Receive Clock	97*
TX_EN	Transmit Enable	98*
MII_TXD0	Transmit Data, Bit 1	99*
MII_TXD1	Transmit Data, Bit 2	100*
MII_TXD2	Transmit Data, Bit 3	101*
MII_TXD3	Transmit Data, Bit 4	102*
TX_ER	Transmit Error Output	103*
MII_RXD0	Receive Data, Bit 1	89
MII_RXD1	Receive Data, Bit 2	90
MII_RXD2	Receive Data, Bit 3	91
MII_RXD3	Receive Data, Bit 4	92
CRS	Carrier Sense	87
COL	Collision Detection	84
MDC	Management Data Clock	81*
MDIO	Management data I/O	79*

Table 6-9: Ethernet module pins

*These signal lines are buffered through either signal switch U6 or U8.

6.8. Debug LCD Module

A debug LCD module is supplied to be connected to the connector LCD1. Care should be taken to ensure the pins are inserted correctly into LCD. The debug LCD module uses a 4 bit interface to reduce the pin allocation. No contrast control is provided; this is set by a resistor on the supplied display module. The module supplied with the RSK only supports 5V operation.

Table 6-10 shows the pin allocation and signal names used on this connector.

LCD1					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	Ground	-	2	5VCC	-
3	No Connection	-	4	DLCDRS (PB9)	53
5	R/W (Wired to Write only)	-	6	DLCDE + 47k pull down to ground (PB14)	116
7	No Connection	-	8	No connection	-
9	No Connection	-	10	No connection	-
11	DLCDD4 (PE0)	176	12	DLCDD5 (PE1)	1
13	DLCDD6 (PE2)	2	14	DLCDD7 (PE3)	3

Table 6-10: Debug LCD Module Connections

6.9. Option Links and Jumper Settings

Table 6-11 to Table 6-17 below describes the function of the various option links contained on this RSK board. The default configuration is indicated by BOLD text.

SDRAM Configuration Options				
Reference	Function	Fitted	Alternative (Removed)	Related To
R62	SDRAM	**If R63 is not fitted, enables the clock on the SDRAM module**	If R63 is fitted, disables the clock on the SDRAM module.	R63
R63	SDRAM	If R62 is not fitted, disables the clock on the SDRAM module.	**If R62 is fitted, enables the clock SDRAM module.**	R62
R65	SDRAM	**If R66 is not fitted, disables the upper byte data mask on the SDRAM module.**	If R66 is fitted, enables the upper byte data mask on the SDRAM module.	R66
R66	SDRAM	If R65 is not fitted, enables the upper byte data mask of the SDRAM module.	**If R65 is fitted, disables the upper byte data mask on the SDRAM module. (NB. R65 & R66 should never both be fitted)**	R65
R67	SDRAM	**If R68 is not fitted, disables the lower byte data mask on the SDRAM module.**	If R68 is fitted, enables the lower byte data mask on the SDRAM module.	R68
R68	SDRAM	If R67 is not fitted, enables the lower byte data mask on the SDRAM module.	**If R67 is fitted, disables the lower byte data mask on the SDRAM module. (NB. R67 & R68 should never both be fitted)**	R67

Table 6-11: SDRAM Configuration Options

Interrupt Configuration Options				
Reference	Function	Fitted	Alternative (Removed)	Related To
R171	Interrupt Configuration	Connects the NMI pin of the MCU to the header pin JN2-3	Disconnects the NMI pin of the MCU from the header pin JN2-3	-
R219	Interrupt Configuration	Connects the IRQ0 pin of the MCU to the header pin JN2-7	Disconnects the IRQ0 pin of the MCU from the header pin JN2-7	-
R176	Interrupt Configuration	Connects the IRQ6 pin of the MCU to the header pin JN6-7	Disconnects the IRQ6 pin of the MCU from the header pin JN6-7	-

Table 6-12: Interrupt Configuration Options

E10A Configuration Options				
Reference	Function	Fitted	Alternative (Removed)	Related To
R74	E10A Configuration	Connects AUDCK pin of the MCU to pin 1 of AUD connector	Disconnects AUDCK pin from the MCU to pin 1 of AUD connector	R76, R78, R75, R79, R82
R76	E10A Configuration	Connects AUDATA0 pin of the MCU to pin 3 of AUD connector	Disconnects AUDATA0 pin from the MCU to pin 3 of AUD connector	R74, R78, R75, R79, R82
R78	E10A Configuration	Connects AUDATA1 pin of the MCU to pin 5 of AUD connector	Disconnects AUDATA1 pin from the MCU to pin 5 of AUD connector	R76, R74, R75, R79, R82
R75	E10A Configuration	Connects AUDATA2 pin of the MCU to pin 7 of AUD connector	Disconnects AUDATA2 pin from the MCU to pin 7 of AUD connector	R76, R78, R74, R79, R82
R79	E10A Configuration	Connects AUDATA3 pin of the MCU to pin 9 of AUD connector	Disconnects AUDATA3 pin from the MCU to pin 9 of AUD connector	R76, R78, R75, R74, R82
R82	E10A Configuration	Connects AUDSYNC pin of the MCU to pin 11 of AUD connector	Disconnects AUDSYNC pin from the MCU to pin 11 of AUD connector	R76, R78, R75, R79, R74

Table 6-13: E10A Configuration Options

Clock Configuration Options				
R4	MCU Clock Configuration	Connects MCU clock pin EXTAL to the header pin JN2-2	Disconnects MCU clock pin EXTAL from the header pin JN2-2	R5
R5	MCU Clock Configuration	Connects EXTAL clock pin of the MCU to the on board crystal X1	Disconnects EXTAL clock pin of the MCU from the on board crystal X1	R4
R17	USB Clock Configuration	Connects USBEXTAL clock pin of the MCU to the on board crystal X2	Disconnects USBEXTAL clock pin of the MCU from the on board crystal X2	R18
R18	USB Clock Configuration	Connects USBXTAL clock pin of the MCU to the on board crystal X2	Disconnects USBXTAL clock pin of the MCU from the on board crystal X2	R17

Table 6-14: Clock Configuration Options

Extension Header Configuration Options				
Reference	Function	Fitted	Alternative (Removed)	Related To
R127	Extension Header Configuration	Connects the 5VCC signal to the header pin JN1-1	Connects the 5VCC signal from the header pin JN1-1	-
R128	Extension Header Configuration	Connects the 3VCC signal to the header pin JN1-3	Disconnects the 3VCC signal from the header pin JN1-3	-
R129	Extension Header Configuration	Connects the AVREF signal to the header pin JN1-7	Disconnects the AVREF signal from the header pin JN1-7	-
R130	Extension Header Configuration	Connects the AVCC signal to the header pin JN1-5	Disconnects the AVCC signal from the header pin JN1-5	-
R135	Extension Header Configuration	Connects the MCU port pin PB9 to the header pin JN1-15	Disconnects the MCU port pin PB9 from the header pin JN1-15	-
R136	Extension Header Configuration	Connects the MCU port pin PA19 to the header pin JN1-16	Disconnects the MCU port pin PA19 from the header pin JN1-16	-
R143	Extension Header Configuration	Connects the MCU port pin PE1 to the header pin JN1-17	Disconnects the MCU port pin PE1 from the header pin JN1-17	-
R144	Extension Header Configuration	Connects the MCU port pin PE2 to the header pin JN1-18	Disconnects the MCU port pin PE2 from the header pin JN1-18	-
R145	Extension Header Configuration	Connects the MCU port pin PE3 to the header pin JN1-19	Disconnects the MCU port pin PE3 from the header pin JN1-19	-
R146	Extension Header Configuration	Connects the MCU port pin PA6 to the header pin JN1-20	Disconnects the MCU port pin PA6 from the header pin JN1-20	-
R147	Extension Header Configuration	Connects the MCU port pin PD22 to the header pin JN1-21	Disconnects the MCU port pin PD22 from the header pin JN1-21	-
R148	Extension Header Configuration	Connects the MCU port pin PDX21 to the header pin JN1-22	Disconnects the MCU port pin PDX21 from the header pin JN1-22	-
R149	Extension Header Configuration	Connects the MCU port pin PB13 (SDA) to the header pin JN1-25	Disconnects the MCU port pin PB13 (SDA) from the header pin JN1-25	R150
R150	Extension Header Configuration	Connects the MCU port pin PB12 (SCL) to the header pin JN1-26	Disconnects the MCU port pin PB12 (SCL) from the header pin JN1-26	R149

Table 6-15: Extension Header Configuration Options

Ethernet Configuration Options				
Reference	Function	Fitted	Alternative (Removed)	Related To
R25	Ethernet Configuration	Connects the MCU port pin PA12 (TX_CLK) to pin 7 of the Ethernet PHYceiver chip via U6	Disconnects the MCU port pin PA12 (TX_CLK) from the Ethernet PHYceiver chip	-
R29	Ethernet Configuration	Connects the MCU port pin PD29 (MII_RXD3) to pin 18 of the Ethernet PHYceiver chip	Disconnects the MCU port pin PD29 (MII_RXD3) from the Ethernet PHYceiver chip	R30, R32, R34,
R30	Ethernet Configuration	Connects the MCU port pin PD28 (MII_RXD2) to pin 19 of the Ethernet PHYceiver chip	Disconnects the MCU port pin PD28 (MII_RXD2) from pin 19 of the Ethernet PHYceiver chip	R29, R32, R34,
R32	Ethernet Configuration	Connects the MCU port pin PD27 (MII_RXD1) to pin 20 of the Ethernet PHYceiver chip	Disconnects the MCU port pin PD27 (MII_RXD1) from pin 20 of the Ethernet PHYceiver chip	R30, R29, R34,
R34	Ethernet Configuration	Connects the MCU port pin PD26 (MII_RXD0) to pin 21 of the Ethernet PHYceiver chip	Disconnects the MCU port pin PD26 (MII_RXD0) from pin 21 of the Ethernet PHYceiver chip	R30, R32, R29,
R35	Ethernet Configuration	Connects the MCU port pin PD25 (RX_CLK) to pin 16 of the Ethernet PHYceiver chip via U6	Disconnects the MCU port pin PD25 (MII_RXD3) from pin 16 of the Ethernet PHYceiver chip	-
R38	Ethernet Configuration	Connects the MCU port pin PD31 (RX_DV) to pin 22 of the Ethernet PHYceiver chip via U6	Disconnects the MCU port pin PD31 (RX_DV) from pin 22 of the Ethernet PHYceiver chip	-
R41	Ethernet Configuration	Connects the MCU port pin PD30 (RX_ER) to pin 24 of the Ethernet PHYceiver chip via U6	Disconnects the MCU port pin PD30 (RX_ER) from pin 24 of the Ethernet PHYceiver chip	-
R42	Ethernet Configuration	Connects the 25 MHz external crystal oscillator to the pin X1 (pin 46) of the Ethernet PHYceiver chip	Disconnects the 25 MHz external crystal oscillator from the pin X1 (pin 46) of the Ethernet PHYceiver chip	-
R36	Ethernet Configuration	Connects pin 8 of the Ethernet connector to the ground	Disconnects pin 8 of the Ethernet connector from the ground	-

Table 6-16: Ethernet Configuration Options

Miscellaneous Configuration Options				
Reference	Function	Fitted	Alternative (Removed)	Related To
R111	SCI Configuration	Disables the RS232 transceiver	Enables the RS232 transceiver	-
R116	SCI Configuration	Connects the channel 2 TX pin of the RS232 transceiver to the ground	Disconnects the channel 2 TX pin of the RS232 transceiver from the ground	-
R10	Signal Configuration	Connects the MCU port pin PA11 to pin 6 of the signal switch (U8)	Disconnects the MCU port pin PA11 from pin 6 of the signal switch (U8)	-
R11	Signal Configuration	Connects the MCU port pin PA10 to pin 5 of the signal switch (U8)	Disconnects the MCU port pin PA10 from pin 5 of the signal switch (U8)	-
R12	Signal Configuration	Connects the MCU port pin PA9 to pin 12 of the signal switch (U6)	Disconnects the MCU port pin PA9 from pin 12 of the signal switch (U6)	-
R13	Signal Configuration	Connects the MCU port pin PA8 to pin 2 of the signal switch (U8)	Disconnects the MCU port pin PA8 from pin 2 of the signal switch (U8)	-
R14	Signal Configuration	Connects the MCU port pin PA7 to pin 3 of the signal switch (U8)	Disconnects the MCU port pin PA7 from pin 3 of the signal switch (U8)	-
R15	Signal Configuration	Connects the MCU port pin PA6 to pin 4 of the signal switch (U8)	Disconnects the MCU port pin PA6 from pin 4 of the signal switch (U8)	-
R20	USB Boot Mode	Configures the MCU to use the system clock for the USB module.	Configures the MCU to use the external USB clock for the USB module.	R21
R21	USB Boot Mode	Configures the MCU to use the external USB clock for the USB module.	Configures the MCU to use the system clock for the USB module. (Note: R20 & R21 should never both be fitted)	R20
R93	Reset Configuration	Uses the output of the Reset IC M51957BFP as a reset signal for the MCU	Disconnects the output of the Reset IC M51957BFP from the MCU reset pin	-

Table 6-17: Miscellaneous Configuration Options

Table 6-18 below describes the function of the jumper headers.

Jumper Settings				
Reference	Function	Position 1	Position 2	Position 3
JP1	SDRAM	Jumper across pins 1 and 2. Allows the SDRAM module to be accessed by the MCU.	Jumper across pins 2 and 3. Disables the MCU from accessing the SDRAM module.	No Jumper – same as position 2.
JP2	RS232	Jumper across pins 1 and 2. Connects the MCU RS232 Tx line to the RS232 controller.	Jumper across pins 3 and 4. Connects the RS232 Tx header pin JN5-5 to the RS232 controller.	Jumper across pins 1 and 3, or 2 and 4, or no jumper. Disconnects MCU and header from RS232 controller Tx pin.
JP3	RS232	Jumper across pins 1 and 2. Connects the MCU RS232 Rx line to the RS232 controller.	Jumper across pins 3 and 4. Connects the RS232 Rx header pin JN5-6 to the RS232 controller.	Jumper across pins 1 and 3 connects the MCU RS232 Rx pin , or 2 and 4, or no jumper. Disconnects the MCU and header from the RS232 Rx pin.
JP4	RCAN	Jumper across pins 1 and 2. Connects the MCU RCAN Tx line to the RCAN transceiver.	Jumper across pins 2 and 3. Connects the MCU RCAN Tx line to the header RCAN Tx pin JN6-5	Disconnects the MCU RCAN Tx pin from the header JN6 and the transceiver
JP5	RCAN	Jumper across pins 1 and 2. Connects the MCU RCAN Rx line to the RCAN transceiver.	Across pins 2 and 3. Connects the header MCU RCAN Rx pin JN6-6 to the RCAN transceiver.	Disconnects the MCU RCAN Rx pin from the header JN6 and the transceiver

Table 6-18: Jumper header settings

6.10. Oscillator Sources

A crystal oscillator is fitted on the RSK and used to supply the main clock input to the Renesas microcontroller. Table 6-19 details the oscillators that are fitted and alternative footprints provided on this RSK:

Component	Function	Frequency
Crystal (X1)	CPU Clock	12.5 MHz
Crystal (X2)	USB Clock	48 MHz
Crystal (X3)	Ethernet Clock	25 MHz

Table 6-19: Oscillators / Resonators

6.11. Reset Circuit

The CPU Board includes a Reset IC M51957 (U9) to meet the minimum reset period of the MCU. Please refer to the hardware manual for more information on the requirements of the reset circuit. 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 RSK supports Boot mode, User Boot mode, User Program Mode and User mode, USB Boot Mode,

Details of programming the FLASH memory is described in the SH7216 Group Hardware Manual.

Mode No.	SW5-1 FWE	SW5-2 MD1	SW5-3 MD0	Mode Name	On-Chip ROM	Bus Width of CS0 Space
Mode 0	ON	ON	ON	MCU Extension Mode 0	Not Active	32
Mode 1	ON	ON	OFF	MCU Extension Mode 1	Not Active	16
Mode 2	ON	OFF	ON	MCU Extension Mode 2	Active	Set by CS0BCR in BSC
Mode 3	ON	OFF	OFF	Single Chip Mode	Active	---
Mode 4*1	OFF	ON	ON	Boot Mode	Active	Set by CS0BCR in BSC
Mode 5*1	OFF	ON	OFF	User Boot Mode	Active	Set by CS0BCR in BSC
Mode 6*1	OFF	OFF	ON	User Program Mode	Active	Set by CS0BCR in BSC
Mode 7*1*2	OFF	OFF	OFF	USB Boot Mode	Active	---
Mode 7*1*3	OFF	OFF	OFF	User Program Mode	Active	---

Table 7-1: MCU Operating Modes Table

*1Flash memory programming mode

*2 When always FWE = 1, after power has been on.

*3 If FWE = 0 when power-on reset has been released, and if FWE = 1 when MCU operation as been set, transition to the user program mode is executed in single chip state.

Note:

The default boot mode of this RSK2+ is indicated by BOLD text.

Ensure that SW5-4 is ON.

For more information on the boot modes listed above, please refer to the *SH7216 group hardware manual*.

Chapter 8. Programming Methods

The board is intended for use with HEW and the supplied E10A debugger. Refer to SH7216 Group Hardware Manual for details of programming the microcontroller without using these tools.

Chapter 9. Headers

9.1. Extension Headers

Table 9-1 to Table 9-5 show the microcontroller pin headers and their corresponding microcontroller connections. The header pins connect directly to the microcontroller pin unless otherwise indicated with an asterisk *.

JN1 Extension Header					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	5VCC	-	2	Ground	-
3	3VCC	-	4	Ground	-
5	AVCC	142, 145	6	AGND	137, 150
7	AVREF	143, 144	8	POE4/ADTRG	78
9	AN0	138	10	AN1	139
11	AN2	140	12	AN3	141
13	NC	-	14	NC	-
15	PB9	53	16	PA19	11
17	PE1	1	18	PE2	2
19	PE3	3	20	PA6	103
21	PD22	83	22	PDX21	82*
23	NC	-	24	NC	-
25	SDA	111	26	SCL	110

Table 9-1: JN1 Extension Header

** The connections to the header from this pin are not direct – they are routed through the signal switch U6.*

JN2 Extension Header					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	RESET#	133*1	2	EXTAL	121
3	NMIIN	-	4	Ground	-
5	WDTOVF#	154*2	6	TXD0	99
7	IRQ0IN	-	8	RXD0	98
9	TCLKA	162	10	TCLKB	52
11	TIOC3C	167	12	TIOC3A	166
13	PE9/TIOC3B	168	14	PE11/TIOC3D	169
15	PE12/TIOC4A	170	16	PE14/TIOC4C	172
17	PE13/TIOC4B	171	18	PE15/TIOC4D	173
19	TIOC1A	4	20	TIOC1B	5
21	TIOC2A	6	22	TIOC2B	165
23	D2/TIC5U	59	24	A0/POE0	21
25	D3/TIC5V	60	26	D4/TIC5W	61

Table 9-2: JN2 Extension Header

*1 The RESET# signal connects to the MCU via the two NOT gates U2A and U2B; where the net name directly connected is $\overline{\text{RES}}$

*2 The WDTOVF# signal connects to the MCU via a signal buffer, to the line $\overline{\text{WDTOVF\#}}$

JN3 Extension Header					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	A0	21	2	A1	22
3	A2	23	4	A3	24
5	A4	25	6	A5	26
7	A6	27	8	A7	28
9	A8	30	10	A9	31
11	A10	32	12	A11	33
13	A12	34	14	A13	35
15	A14	36	16	A15	37
17	D0	57	18	D1	58
19	D2	59	20	D3	60
21	D4	61	22	D5	62
23	D6	63	24	D7	64
25	PA17/RD#	14	26	RDWR	41
27	CS6#/CS2#/CS0#	54	28	CS7#/CS3#/CS1#	55
29	D8	67	30	D9	68
31	D10	69	32	D11	70
33	D12	71	34	D13	72
35	D14	73	36	D15	74
37	A16	41	38	A17	42
39	A18	43	40	A19	44
41	A20	45	42	A21	46
43	A22	47	44	CK	12*1
45	PA19/(WAIT)	11	46	CKE	9
47	WRH/DQMLU	16	48	WRL/DQMLL	15
49	CAS	18	50	RAS	17

Table 9-3: JN3 Extension Header

*1 The CK signal is connected to the MCU through the CLKOUT line via a 22Ω resistor (R16).

JN5 Extension Header					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	TCLKB/DREQ0	52	2	PB9/DACK0	53
3	TCLKC/TEND0	48	4	NC	-
5	RS232Tx	-	6	RS232Rx	-
7	RSPCK	103*1	8	MOSI	102*1
9	MISO	101*1	10	SSL0	100*2
11	SSL1	97*2	12	SSL2	94*2
13	SSL3	93*2	14	PE0	176
15	PB14	116	16	PB15	117
17	NC	-	18	NC	-
19	MD0	152	20	MD1	153
21	FWE	134	22	NC	-
23	NC	-	24	Ground	-
25	NC	-	26	NC	-

Table 9-4: JN5 Extension Header

*1 These signals are independently connected to the MCU via the signal switch U8

*2 These signals are independently connected to the MCU via the signal switch U6

JN6 Extension Header					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	AN4	146	2	AN5	147
3	AN6	148	4	AN7	149
5	CTx0	-	6	CRx0	-
7	IRQ6IN	10	8	D5	62
9	D6	63	10	D7	64
11	POE4/ADTRG	78	12	A17	42
13	A18	43	14	A19	44
15	D8	67	16	D9	68
17	TCLKC/TEND0	48	18	TCLKD	159
19	D10	69	20	D11	70
21	D12	71	22	D14	73
23	D13	72	24	D15	74
25	NC	-	26	NC	-

Table 9-5: JN6 Extension Header

Chapter 10. Code Development

10.1. Overview

Note: For all code debugging using Renesas software tools, the CPU board must be connected to a PC USB port via an E10A. An E10A is supplied with the RSK+ product.

An E10A supplied with this kit is an on-chip debugging emulator which supports the H-UDI interface of the target device. The H-UDI uses a 14-pin interface and marked as *E10A* on the RSK2+SH7216 board.

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 version tools from your Renesas 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. Breakpoint Support

Limited Event Conditions can be located in ROM code which is directly supported by E10A emulator. To enable breakpoints in RAM following command needs to be included in the script –

> SH2A_SBSTK enable

For more information on this, please refer to the *SuperH™ Family E10A-USB Emulator Additional Document for User's Manual* for SH7216.

10.4. Memory Map

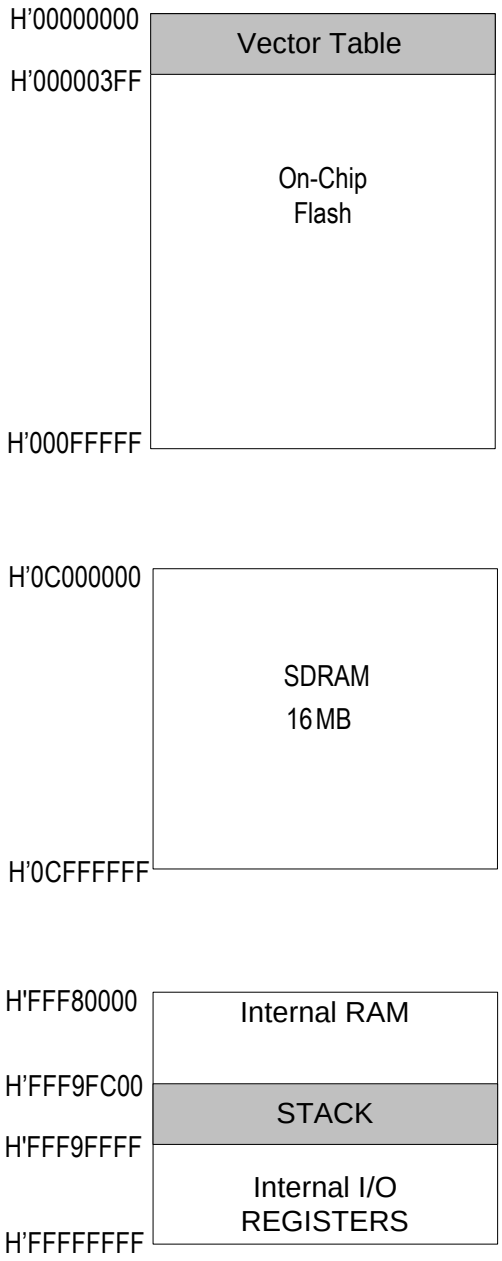

Figure 10-1: Memory Map

Chapter 11. Component Placement

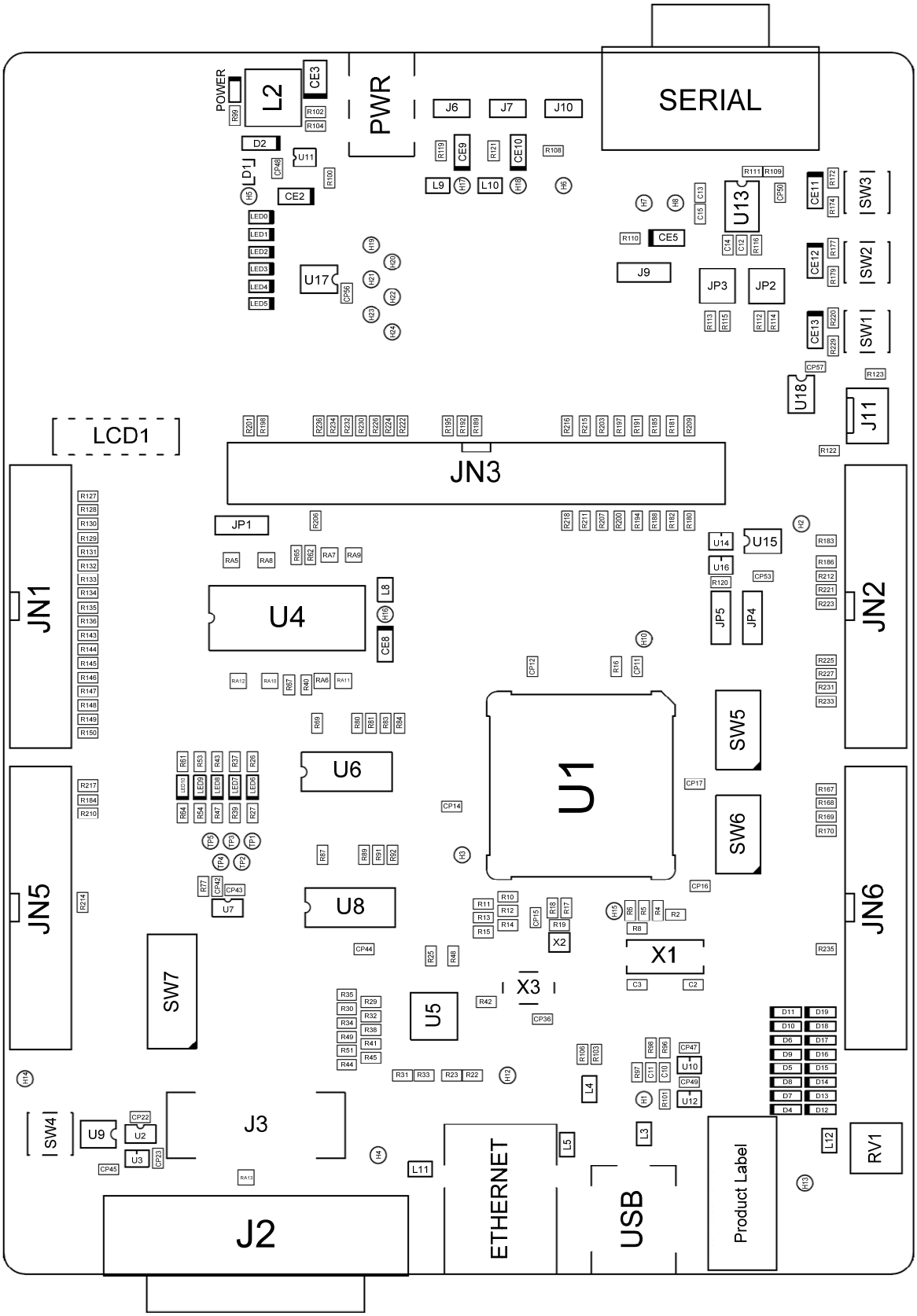

Figure 11-1: Component Placement – Front view

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 from the web site.

For information about the SH7216 series microcontrollers refer to the SH7216 Group hardware manual.

For information about the SH7216 assembly language, refer to the SuperH Series Software Manual.

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

Technical Contact Details

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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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