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Renesas Starter Kit for R8C/38C

User's Manual

RENESAS SINGLE-CHIP MICROCOMPUTER
R8C FAMILY R8C/3X SERIES

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- ensure attached cables do not lie across the equipment
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- 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
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- 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.

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Chapter 1. Preface

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Glossary

ADC	Analog to Digital Converter	LED	Light Emitting Diode
CD	Compact Disc	LIN	Local Interconnect Network
CPU	Central Processing Unit	MCU	Microcontroller Unit
DAC	Digital to Analog Converter	PC	Personal Computer
E8a	E8a on-chip debugger module	RAM	Random Access Memory
EMC	Electromagnetic compatibility	ROM	Read-Only Memory
ESD	Electrostatic Discharge	RSK	Renesas Starter Kit
HEW	High-Performance Embedded Workshop	UART	Universal Asynchronous Receiver Transmitter
I/O	Input / Output	USB	Universal Serial Bus
LCD	Liquid Crystal Display		

Chapter 2. Purpose

This RSK is an evaluation tool for Renesas microcontrollers.

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.

Features include:

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

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

Chapter 3. Power Supply

3.1. Requirements

This RSK board operates from a 5V DC power supply.

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

All RSK boards are supplied with an E8a debugger. This product is able to power the RSK board with up to 300mA. When the RSK is connected to another system then that system should supply power to the RSK.

All RSK boards have an optional centre positive supply connector using a 2.1mm barrel power jack.

Warning

The RSK board 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 any switch the LEDs will flash at a rate controlled by the potentiometer.

Chapter 4. Board Layout

4.1. Component Layout

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

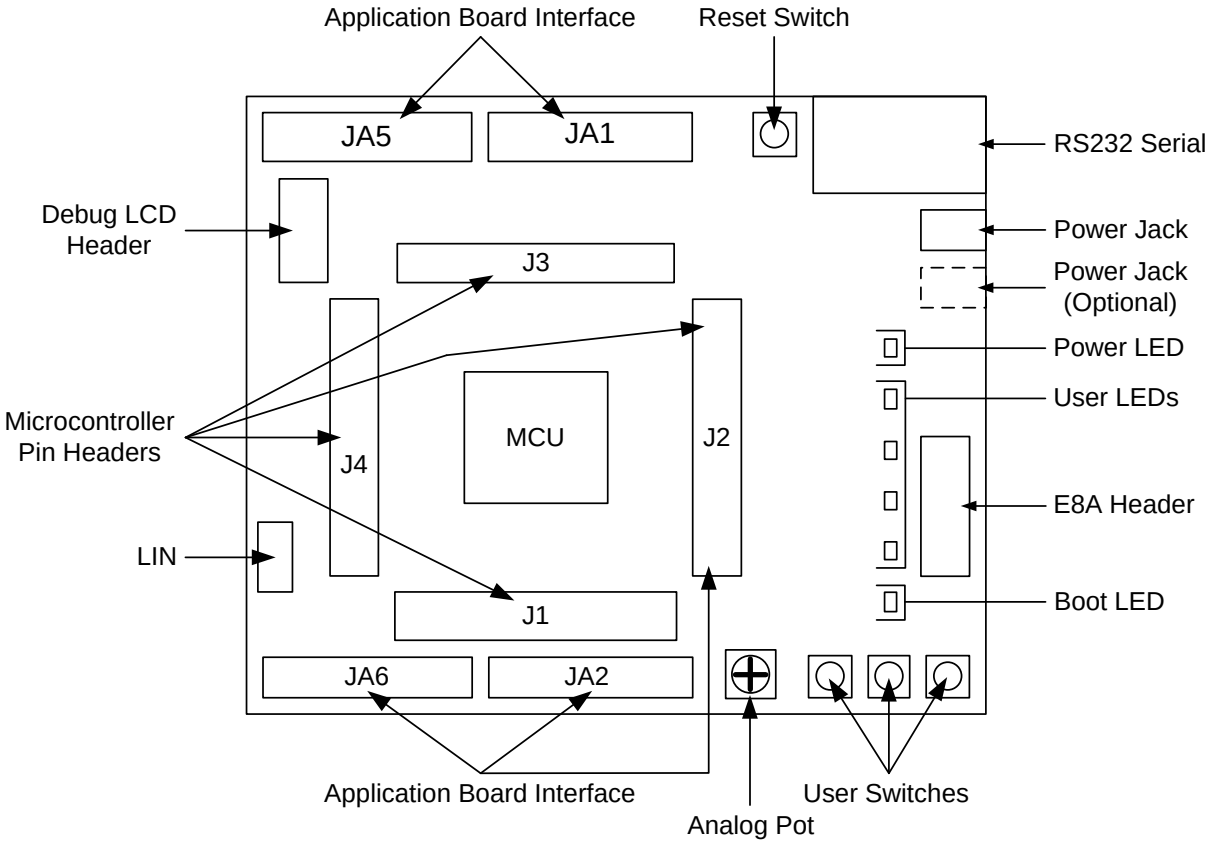


Figure 4-1: Board Layout

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.

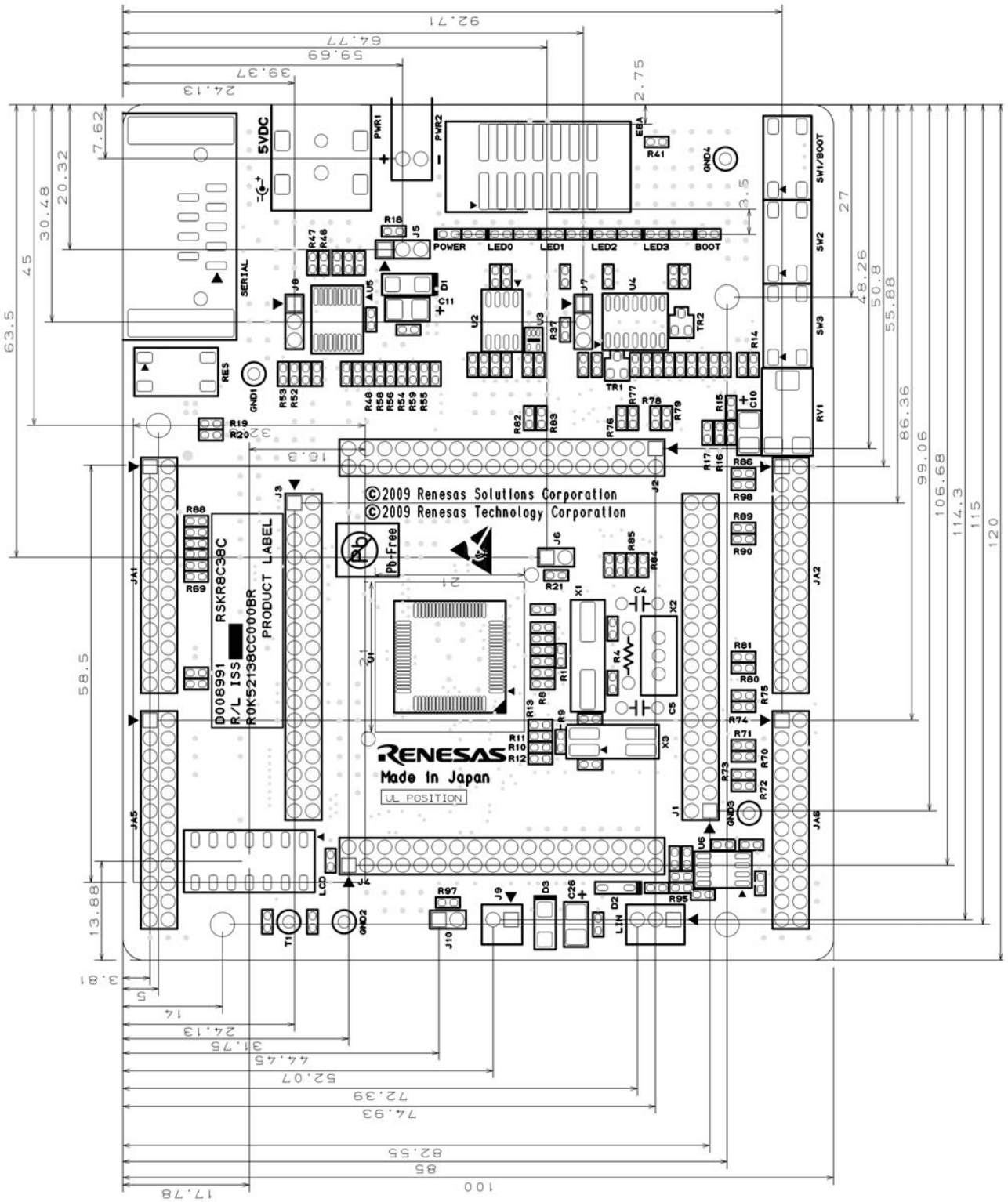


Figure 4-2: Board Dimensions

Chapter 5. Block Diagram

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

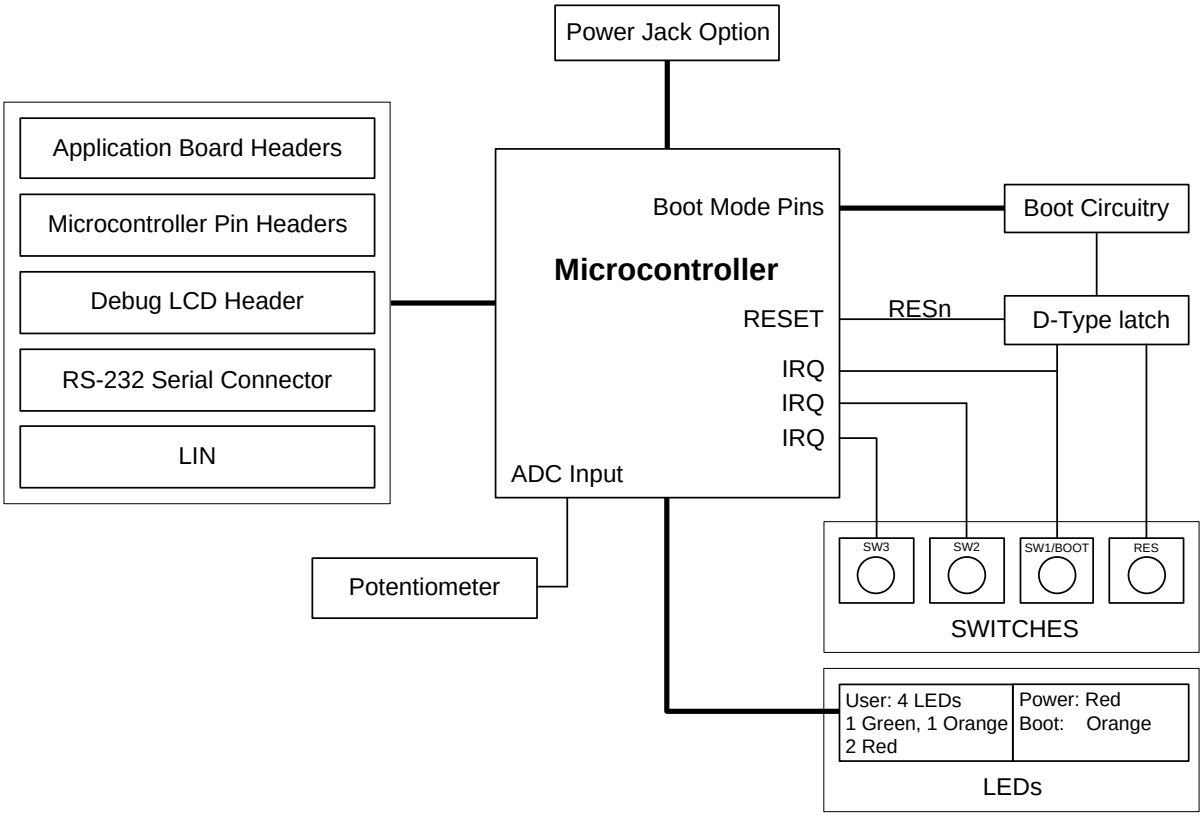


Figure 5-1: Block Diagram

Figure 5-2 shows E8a connections to the RSK.

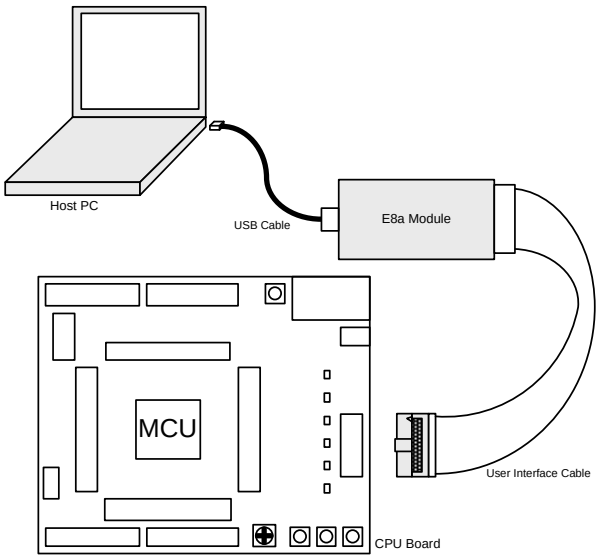


Figure 5-2: E8a RSK Connections

Chapter 6. User Circuitry

6.1. Switches

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

Switch	Function	Microcontroller
RES	When pressed, the microcontroller is reset.	RESETn, Pin 9
SW1 / BOOT*	Connects to an INT 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 E8a debugger.	INT1n, Pin 35 (Port 3, bit 6)
SW2*	Connects to an INT line for user controls.	INT2n, Pin 46 (Port 6, bit 6)
SW3 / ADTRG*	Connects to an INT line for user controls. The same MCU pin also functions as ADC trigger input.	INT0n, Pin 48 (Port 4, bit 5)

Table 6-1: Switch Functions

*Refer to the schematic for detailed connectivity information.

6.2. LEDs

There are six LEDs on the RSK board. The green 'POWER' LED lights when the board is powered. The orange 'BOOT' LED indicates the device is in BOOT mode when lit. The four user LEDs are connected to an I/O 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)	Colour	Microcontroller Port Pin function	Microcontroller Pin Number
LED0	Green	Port 0, bit 0	72
LED1	Orange	Port 0, bit 1	71
LED2	Red	Port 0, bit 2	70
LED3	Red	Port 0, bit 3	69

Table 6-2: LED Port

6.3. Potentiometer

A single-turn potentiometer is connected to pin AN8 (Port 1 bit 0, pin 56) of the microcontroller. This may be used to vary the input analog voltage value to this pin between AVCC and Ground.

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

6.4. Serial port

Serial port UART2 is connected to the standard RS232 header. Serial port UART0 can optionally be connected to the RS232 transceiver by moving option resistors. The connections to be moved are listed in the Table 6-3.

Description	Function	Microcontroller Port Pin	Fit for RS232	Remove for RS232
UART0	Spare Serial Port (TX)	52 (Port 1, bit 4)	R58, R71	R56, R54, R70
UART0	Spare Serial Port (RX)	51 (Port 1, bit 5)	R59, R73	R57, R55, R72
UART1	Spare Serial Port (TX)	74 (Port 6, bit 3)	R52	R56
UART1	Spare Serial Port (RX)	73 (Port 6, bit 4)	R53	R57
UART2	Default serial port (TX)	19 (Port 3, bit 7)	R56, R84	R58, R54, R85
UART2	Default serial port (RX)	21 (Port 3, bit 4)	R57, R78	R59, R55, R79

Table 6-3: Serial port settings

The serial channel UART0 can also be accessed at J3 and JA6; UART1 can be accessed at J4 and JA6; UART2 can be accessed at JA2 and J1, J2.

The board is designed to accept a straight-through RS-232 male-to-female cable.

Serial port UART1 can be connected to a 0.1" header, 'J8' by fitting 0Ω link resistors to R52 and R53.

The UART0 port is shared with the LIN module. For more details please refer to the section 6.6.

6.5. Debug LCD Module

A debug LCD module is supplied to be connected to the connector LCD. This should be fitted so that the debug LCD module lies over J3. 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.

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

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

LCD					
Pin	Circuit Net Name	Device Pin	Pin	Circuit Net Name	Device Pin
1	Ground	-	2	5V	-
3	No Connection	-	4	DLCDRS	78 (Port 9, bit 5)
5	R/W (Wired to write only using 10K pull down))	-	6	DLCDE (+ 100k pull down to ground)	79 (Port 9, bit 4)
7	No Connection	-	8	No Connection	-
9	No Connection	-	10	No Connection	-
11	DLCDD4	34 (Port 9, bit 0)	12	DLCDD5	33 (Port 9, bit 1)
13	DLCDD6	32 (Port 9, bit 2)	14	DLCDD7	31 (Port 9, bit 3)

Table 6-4: Debug LCD Module Connections

6.6. LIN

The serial port UART0 also functions as LIN port pins. The options links to be configured are listed in the Table 6-5

Description	Function	Circuit Net Name	Device Pin	Fit for Hardware LIN	Remove for Hardware LIN
LIN	TXD	LINTXD	52	R70	R71
LIN	RXD	LINRXD	51	R72	R73
LIN	NSLP	LINNSLP	50	R74	R75

Table 6-5: Hardware LIN Settings

For more details regarding configuring the RSK to operate in LIN master and slave mode, refer to table 6-6.

6.7. Option Links

In this section, the default configuration is indicated by BOLD text.

Table 6-6 below describes the function of the option links associated with serial port configuration.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R46	Serial Port Configuration	Connects channel 2 (Tx pin) of the RS232 transceiver to pin 8 of the D-type serial port connector	**Disconnects Channel 2 (TX pin) of the RS232 transceiver from the D-type serial port connector**	R52
R47	Serial Port Configuration	Connects channel 2 (Rx pin) of the RS232 transceiver to pin 7 of the D-type serial port connector	**Disconnects Channel 2 (RX pin) of the RS232 transceiver from the D-type serial port connector**	R53
R48	Serial Port Configuration	Disables the RS-232 Transceiver.	**Enables the RS-232 Transceiver**	-
R52	Serial Port Configuration	Connects the TxD pin of serial port UART1 to the header 'J8' via the RS232 transceiver	**Disconnects the TxD pin of serial port UART1 from the header 'J8'**	R46, R53
R53	Serial Port Configuration	Connects the RxD pin of serial port UART1 to the header 'J8' via the RS232 transceiver	**Disconnects the RxD pin of serial port UART1 from the header 'J8'**	R47, R52
R54	Serial Port Configuration	Connects the RS232 serial port (Tx) to the application board interface (JA6-5).	**Disconnects the RS232 serial port (Tx) from application board interface (JA6-5)**	R55, R56, R58
R55	Serial Port Configuration	Connects the RS-232 serial port (Rx) to application board interface (JA6-6)	**Disconnects the RS-232 serial port (Rx) from application board interface (JA6-6)**	R54, R57, R59
R56	Serial Port Configuration	**Connects the TxD pin of serial port UART2 to the D-type connector via the RS232 transceiver**	Disconnects the TxD pin of serial port UART2 from the D-type connector	R54, R58, R84, R85
R57	Serial Port Configuration	**Connects the RxD pin of serial port UART2 to the D-type connector via the RS232 transceiver**	Disconnects the RxD pin of serial port UART2 from the D-type connector	R55, R59, R78, R79
R58	Serial Port Configuration	Connects the TxD pin of serial port UART0 to the D-type connector via the RS232 transceiver	**Disconnects the TxD pin of serial port UART0 from the D-type connector**	R54, R56, R70, R71
R59	Serial Port Configuration	Connects the RxD pin of serial port UART0 to the D-type connector via the RS232 transceiver	**Disconnects the RxD pin of serial port UART0 from the D-type connector**	R55, R57, R72, R73

Table 6-6: Serial port configuration links

R95	LIN Mode Configuration	When fitted in conjunction with R96, the LIN operates in master mode.	When removed in conjunction with R96, the LIN operates in slave mode	R96
R96	LIN Mode Configuration	When fitted in conjunction with R95, the LIN operates in master mode.	When removed in conjunction with R95, the LIN operates in slave mode.	R95

Table 6-6: Serial port configuration links

Table 6-7 below describes the function of the option links associated with Power Source configuration.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R18	Power Source	Connects the voltage source from PWR1 to Board_VCC	Disconnects the Board_VCC from PWR1 connector	-
R19	Power Source	Connects the net CON_5V (JA1-1) to Board_VCC. External 5V supply can be connected at CON_5V. (R18 and R20 Must be removed if supplying 5V from CON_5V)	Disconnects CON_3V3 from Board_VCC	R20
R20	Power Source	Connects the net CON_3V3 (JA1-3) to Board_VCC. External 3.3V supply can be connected at CON_3V3. (R18 and R19 Must be removed if supplying 3.3V from CON_3V3)	Disconnects CON_3V3 from Board_VCC	R19
R21	Microcontroller Power Supply	Supply power to the Microcontroller VCC pin	Disables 5V power supply to the microcontroller VCC pins. Supply current to the MCU can be measured across 'J6'	-

Table 6-7: Power configuration links

Table 6-8 below describes the function of the option links associated with Analog Voltage Source configuration.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R14	Analog Input	Connects on-board potentiometer ADPOT to the analog input pin AN8 of the MCU (Port pin p1_0)	Disconnects the ADPOT from analog input AN8	-
R15	Analog Reference Voltage	MCU pin VREF can be connected to either UC_VCC (when R16 is fitted) or CON_VREF (JA1-7) (when R17 is fitted)	Disconnects MCU pin VREF from UC_VCC and CON_VREF	R16, R17
R16	Analog Voltage Source	Connects UC_VCC to the potentiometer RV1 and MCU pin VREF via R15	Disconnects UC_VCC from potentiometer RV1 and MCU pin VREF	R15, R17
R17	Analog Reference Voltage	Connects MCU pin VREF to CON_VREF (JA1-7) (when R15 is fitted)	Disconnects MCU pin VREF from UC_VCC and CON_VREF	R15, R16

Table 6-8: Analog Configuration Links

Table 6-9 below describes the function of the option links associated with application board interface.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R66	Application Board Interface	Connects MCU port pin P0_6 (pin 66) to AN1 at JA1-10	Disconnects MCU port pin P0_6 (pin 66) from AN1	R67
R67	Application Board Interface	Connects MCU port pin P0_6 (pin 66) to DA0 at JA1-13	Disconnects MCU port pin P0_6 (pin 66) from DA0	R66
R68	Application Board Interface	Connects MCU port pin P0_7 (pin 65) to AN0 at JA1-9	Disconnects MCU port pin P0_7 (pin 65) from AN0	R69
R69	Application Board Interface	Connects MCU port pin P0_7 (pin 65) to DA1 at JA2-23	Disconnects MCU port pin P0_7 (pin 65) from DA1	R68
R70	Application Board Interface	Connects MCU port pin P1_4 (pin 52) to TXD pin of LIN transceiver	Disconnects MCU port pin P1_4 (pin 52) from TXD pin of LIN transceiver	R71, R58
R71	Application Board Interface	Connects MCU port pin P1_4 (pin 52) to TXD0 at JA6-8	Disconnects MCU port pin P1_4 (pin 52) from TXD0	R70, R58
R72	Application Board Interface	Connects MCU port pin P1_5 (pin 51) to RXD pin of LIN transceiver	Disconnects MCU port pin P1_5 (pin 51) from RXD pin of LIN transceiver	R73, R59
R73	Application Board Interface	Connects MCU port pin P1_5 (pin 51) to RXD0 at JA6-7	Disconnects MCU port pin P1_5 (pin 51) from RXD0	R72, R59
R74	Application Board Interface	Connects MCU port pin P1_6 (pin 50) to NSLP pin of LIN transceiver	Disconnects MCU port pin P1_6 (pin 50) from NSLP pin of LIN transceiver	R75,
R75	Application Board Interface	Connects MCU port pin P1_6 (pin 50) to CLK0 at JA6-10	Disconnects MCU port pin P1_6 (pin 50) from CLK0	R74
R76	Application Board Interface	Connects MCU port pin P3_3 (pin 22) to CTS2RTS2 at JA2-12	Disconnects MCU port pin P3_3 (pin 22) from CTS2RTS2	R77
R77	Application Board Interface	Connects MCU port pin P3_3 (pin 22) to IVCMP3 at JA2-26	Disconnects MCU port pin P3_3 (pin 22) from IVCMP3	R76
R78	Application Board Interface	Connects MCU port pin P3_4 (pin 21) to RXD2 at JA2-8	Disconnects MCU port pin P3_4 (pin 21) from RXD2	R79, R57
R79	Application Board Interface	Connects MCU port pin P3_4 (pin 21) to IVREF3 at JA2-25	Disconnects MCU port pin P3_4 (pin 21) from IVREF3	R78, R57
R80	Application Board Interface	Connects MCU port pin P3_5 (pin 20) to CLK2 at JA2-8	Disconnects MCU port pin P3_5 (pin 20) from CLK2	R81
R81	Application Board Interface	Connects MCU port pin P3_5 (pin 20) to SCL at JA1-26	Disconnects MCU port pin P3_5 (pin 20) from SCL	R80

Table 6-9: Application Board Interface configuration links

R82	Application Board Interface	Connects MCU port pin P3_6 (pin 35) to user switch SW1	Disconnects MCU port pin P3_6 (pin 35) from SW1	R83
R83	Application Board Interface	Connects MCU port pin P3_6 (pin 35) to INT1n at JA2-7	Disconnects MCU port pin P3_6 (pin 35) from INT1n	R82
R84	Application Board Interface	Connects MCU port pin P3_7 (pin 19) to TXD2 at JA2-8	Disconnects MCU port pin P3_7 (pin 19) from TXD2	R85, R56
R85	Application Board Interface	Connects MCU port pin P3_7 (pin 19) to SDA at JA2-25	Disconnects MCU port pin P3_7 (pin 19) from SDA	R84, R56
R86	Application Board Interface	Connects MCU port pin P4_5 (pin 48) to user switch SW3	Disconnects MCU port pin P4_5 (pin 48) from SW3	R87, R88, R98
R87	Application Board Interface	Connects MCU port pin P4_5 (pin 48) to ADTRGn at JA1-8	Disconnects MCU port pin P4_5 (pin 48) from ADTRGn	R86, R88, R98
R88	Application Board Interface	Connects MCU port pin P4_5 (pin 48) to TRISTn at JA2-24	Disconnects MCU port pin P4_5 (pin 48) from TRISTn	R86, R87, R98
R98	Application Board Interface	Connects MCU port pin P4_5 (pin 48) to INT0n at JA2-3	Disconnects MCU port pin P4_5 (pin 48) from INT0n	R86, R87, R88
R89	Application Board Interface	Connects MCU port pin P6_6 (pin 46) to user switch SW2	Disconnects MCU port pin P6_6 (pin 46) from SW2	R90
R90	Application Board Interface	Connects MCU port pin P6_6 (pin 46) to INT2n at JA2-25	Disconnects MCU port pin P6_6 (pin 46) from INT2n	R89

Table 6-9: Application Board Interface configuration links

Table 6-10 below describes the function of the option links associated with Clock configuration.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R1	Main clock	Parallel resistor for oscillator 'X1'	Not fitted	-
R2	Main clock	On board clock X1 connected to the MCU as main clock	External clock source can be connected to the MCU	R3, R5, R6, R7, R8
R3	Main clock	On board clock X1 connected to the MCU as main clock	External clock source can be connected to the MCU	R2, R5, R6, R7, R8
R4	Main clock	Parallel resistor for oscillator 'X2'	Not fitted	-
R5	Main clock	On board clock X2 can be connected to the MCU as main clock	X2 is disconnected from MCU main clock input pins	R2, R3, R6, R7, R8
R6	Main clock	On board clock X2 can be connected to the MCU as main clock	X2 is disconnected from MCU main clock input pins	R2, R3, R5, R7, R8
R7	Main clock	Routes MCU clock input pin XIN to J1 header (at J1-12)	MCU pin XIN is disconnected from J1 header	R2, R3, R5, R6, R8
R8	Main clock	Routes MCU clock output pin XOUT to J1 (at J1-10) and JA2 (at JA2-2) headers (External clock source is used for XOUT)	MCU pin XOUT is disconnected from J1 and JA2 headers	R2, R3, R5, R6, R7
R9	Sub clock	Parallel resistor for on-board sub clock X3	Not fitted	-
R10	Sub clock	On board clock X3 connected to the MCU as sub clock	X3 is disconnected for XCIN	R11, R12, R13
R11	Sub clock	On board clock X3 connected to the MCU as sub clock	X3 is disconnected for XCOUT	R10, R12, R13
R12	Sub clock	Routes MCU clock input pin XCIN to J1 header (at J1-7)	MCU pin XCIN is disconnected from J1 header	R10, R11, R13
R13	Sub clock	Routes MCU clock input pin XCOUT to J1 header (at J1-8)	MCU pin XCOUT is disconnected from J1 header	R10, R11, R12

Table 6-10: Clock configuration links

Table 6-11 below describes miscellaneous options links.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R37	HW Reset Circuit	Connects the reset signal generated from on-board reset circuit to the MCU at reset pin (pin 9)	Disconnects the reset signal generated from on-board reset circuit from the MCU reset pin (pin 9)	-
R41	HW Reset Circuit	Connects the pin 14 of E8a to GROUND	Disconnect pin 14 of E8A connector from ground	-
R97	LIN	Connects the Board_VCC to VBAT	Disconnects the Board_VCC from VBAT	-

Table 6-11: Miscellaneous Option Links

6.8. Oscillator Sources

Crystal oscillators are fitted on the board and used to supply the main/sub clock input to the Renesas microcontroller.

Table 6-12 details the oscillators that are fitted on this RSK:

Component		
Crystal (X1)	Fitted	20 MHz (HC49/4U package)
Crystal (X2)	Not Fitted	For test purpose only
Crystal (X3)	Fitted	32.768 KHz (90 SMX package)

Table 6-12: Oscillators / Resonators

6.9. Reset Circuit

A reset control IC (i.e. RNA51957BFP) has been used to generate the reset signal required for the R8C/38C CPU.

Please check the hardware manual for the detailed reset requirements to ensure the reset circuit on the user's board meets all the reset timing requirements.

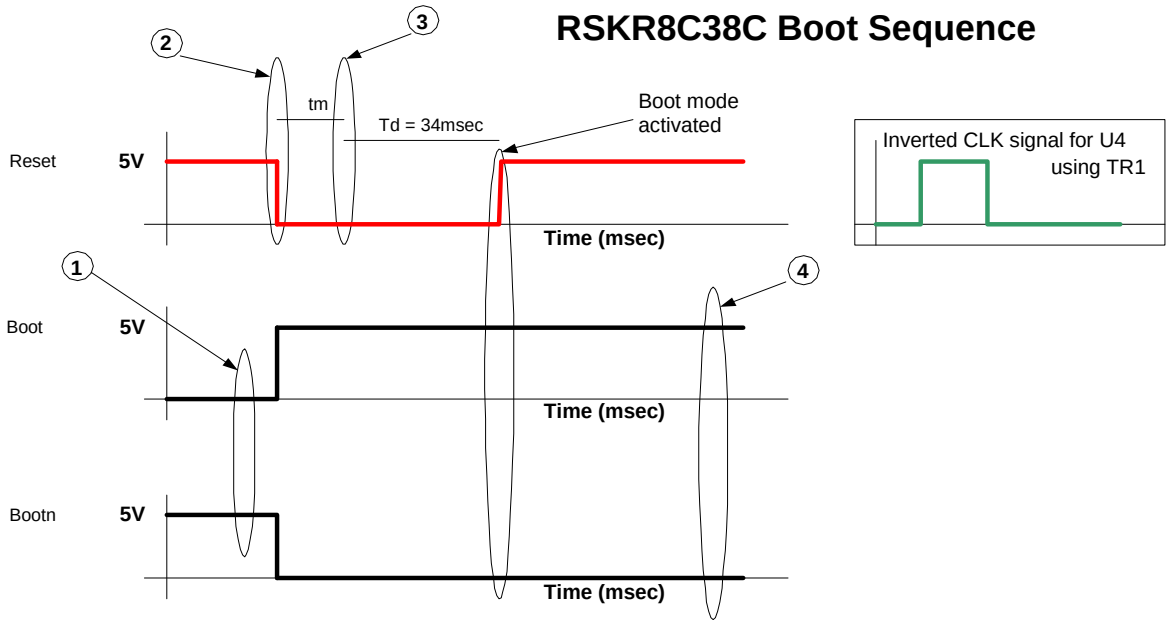
Chapter 7. Modes

The Renesas Starter Kit supports Boot mode and Single chip mode.

Details of programming the FLASH memory is described in the R8C/38C Group Hardware Manual.

This circuit is not required on customer's boards as it is intended for providing easy evaluation of the operating modes of the device on the RSK.

To manually enter the 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 boot mode.



Boot Procedure

1- Press and Hold SW1/Boot switch
2- Press and Hold Reset switch
3- Release Reset switch
4- Release SW1/Boot switch

tm = Time in msec during the Reset switch is pressed.
td = Reset time in msec for the Renesas reset chip after Reset switch released

Note:

Please note that the Reset signal is also acting as CLK signal for the U4. CLK signal logic is inverted using TR1 on the schematics.

Figure 7-1: RSKR8C38C Boot Sequence

When neither the E8a is connected nor the board is placed in Boot mode, the MODE pin is pulled high by a 4.7k resistor.

When an E8a is used the MODE pin is controlled by the E8a.

More information on the operating modes and programming the flash memory can be found in the R8C/38C Group hardware manual.

7.1. Boot modes

The Boot mode settings for this Renesas Starter Kit are shown in Table 7-1 below:

Mode	LSI State after Reset End
Low	Boot Mode

Table 7-1: Boot Mode pin settings

7.2. Single chip mode

Because the MODE pin is pulled high, this Renesas Starter Kit will always boot in Single chip mode when the E8a is not connected and the boot switch is not depressed. Refer to R8C/38C Group Hardware Manual for details of Single chip mode.

Mode	LSI State after Reset End
High	Single chip Mode

Table 7-2: Single chip mode settings

Chapter 8. Programming Methods

The board is intended for use with HEW and the supplied E8a debugger. Refer to R8C/38C Group Hardware Manual for details of programming the microcontroller without using these tools.

Chapter 9. Headers

9.1. Microcontroller Ring Headers

The microcontroller pin headers and their corresponding microcontroller connections are detailed in Table 9-1 to Table 9-4.

Header Pin	Circuit Net Name	Device pin	Header Pin	Circuit Net Name	Device pin
1	TRGIOA	1	2	TRAIO	2
3	TRGCLKB	3	4	TRGCLKA	4
5	VREF	5	6	MODE	6
7	CON_XCIN	7	8	CON_XCOUT	8
9	RESETn	9	10	CON_XOUT	10
11	GROUND	11	12	CON_XIN	12
13	UC_VCC	13	14	PIN14	14
15	PIN15	15	16	TRCIOB	16
17	UD	17	18	PIN18	18
19	TXD2_SDA	19	20	CLK2_SCL	20
21	-	-	22	-	-
23	-	-	24	-	-
25	-	-	26	-	-
27	-	-	28	-	-
29	-	-	30	-	-
31	-	-	32	-	-
33	-	-	34	-	-
35	-	-	36	-	-

Table 9-1: J1 microcontroller header

Header Pin	Circuit Net Name	Device pin	Header Pin	Circuit Net Name	Device pin
1	RXD2_IVREF3	21	2	CTS2RTS2_IVCMP3	22
3	Wn	23	4	Vn	24
5	Wp	25	6	Vp	26
7	Un	27	8	Up	28
9	TRDIOC0	29	10	TRDIOA0	30
11	DLCDD7	31	12	DLCDD6	32
13	DLCDD5	33	14	DLCDD4	34
15	SW1_INT1n	35	16	PIN36	36
17	IO7	37	18	IO6	38
19	IO5	39	20	IO4	40
21	-	-	22	-	-
23	-	-	24	-	-
25	-	-	26	-	-
27	-	-	28	-	-
29	-	-	30	-	-
31	-	-	32	-	-
33	-	-	34	-	-
35	-	-	36	-	-

Table 9-2: J2 microcontroller header

Header Pin	Circuit Net Name	Device pin	Header Pin	Circuit Net Name	Device pin
1	IO3	41	2	IO2	42
3	IO1	43	4	IO0	44
5	INT3n	45	6	SW2_INT2n	46
7	INT4n	47	8	SW3_ADTRGn_TRISTn	48
9	PIN49	49	10	LINNSLP_CLK0	50
11	LINRXD0_RXD0	51	12	LINTXD0_TXD0	52
13	PIN53	53	14	PIN54	54
15	PIN55	55	16	ADPOT	56
17	AN19	57	18	AN18	58
19	AN17	59	20	AN16	60
21	-	-	22	-	-
23	-	-	24	-	-
25	-	-	26	-	-
27	-	-	28	-	-
29	-	-	30	-	-
31	-	-	32	-	-
33	-	-	34	-	-
35	-	-	36	-	-

Table 9-3: J3 microcontroller header

Header Pin	Circuit Net Name	Device pin	Header Pin	Circuit Net Name	Device pin
1	AN15	61	2	AN14	62
3	AN13	63	4	AN12	64
5	AN0_DA1	65	6	AN1_DA0	66
7	AN2	67	8	AN3	68
9	LED3	69	10	LED2	70
11	LED1	71	12	LED0	72
13	RXD1	73	14	TXD1	74
15	CLK1	75	16	PIN76	76
17	TREO	77	18	DLCDRS	78
19	DLCDE	79	20	TRGIOB	80
21	-	-	22	-	-
23	-	-	24	-	-
25	-	-	26	-	-
27	-	-	28	-	-
29	-	-	30	-	-
31	-	-	32	-	-
33	-	-	34	-	-
35	-	-	36	-	-

Table 9-4: J4 microcontroller header

9.2. Application Headers

Standard application header connections are detailed in Table 9-5 to Table 9-8.

Header Pin	Generic Header Name	RSK board Signal Name	Device Pin	Header Pin	Generic Header Name	RSK board Signal Name	Device pin
1	5V	CON_5V	---	2	0V(5V)	GROUND	---
3	3V3	CON_3V3	---	4	0V(3V3)	GROUND	---
5	AVcc	---	---	6	AVss	---	---
7	AVref	CON_VREF	---	8	ADTRG	ADTRGn	48*
9	AD0	AN0	65*	10	AD1	AN1	66*
11	AD2	AN2	67	12	AD3	AN3	68
13	DAC0	DA0	66*	14	DAC1	DA1	65*
15	IO_0	IO0	44	16	IO_1	IO1	43
17	IO_2	IO2	42	18	IO_3	IO3	41
19	IO_4	IO4	40	20	IO_5	IO5	39
21	IO_6	IO6	38	22	IO_7	IO7	37
23	IRQ3	INT4n	47	24	IIC_EX	---	---
25	IIC_SDA	JA1_25	19*	26	IIC_SCL	JA1_26	20*

Table 9-5: JA1 Standard Generic Header

Header Pin	Generic Header Name	RSK board Signal Name	Device Pin	Header Pin	Generic Header Name	RSK board Signal Name	Device Pin
1	RESET	RESETn	9	2	EXTAL	CON_XOUT	---
3	NMI	INT0n	48*	4	Vss1	GROUND	---
5	WDT_OVF	---	---	6	SCIaTX	TXD2	19*
7	IRQ0/WKUP	INT1n	35*	8	SCIaRX	RXD2	21*
9	IRQ1	INT2n	46*	10	SCIaCK	CLK2	20*
11	MO_up/down	UD	17	12	CTSRTS	CTS2RTS2	22*
13	MO_Up	Up	28	14	MO_Un	Un	27*
15	MO_Vp	Vp	26	16	MO_Vn	Vn	24*
17	MO_Wp	Wp	25	18	MO_Wn	Wn	23*
19	TimerOut	TRDIOC0	29	20	TimerOut	TREO	77
21	TimerIn	TRDIOA0	30	22	TimerIn	TRAIO	2
23	IRQ2	INT3n	45	24	TRISTn	TRISTn	48*
25	Spare	IVREF3	21*	26	Spare	IVCMP3	22*

Table 9-6: JA2 Standard Generic Header

Header Pin	Generic Header Name	RSK board Signal Name	Device Pin	Header Pin	Generic Header Name	RSK board Signal Name	Device Pin
1	AD4	AN12	64	2	AD5	AN13	63
3	AD6	AN14	62	4	AD7	AN15	61
5	CAN1TX	---	---	6	CAN1RX	---	---
7	CAN2TX	---	---	8	CAN2RX	---	---
9	AD8	AN16	60	10	AD9	AN17	59
11	AD10	AN18	58	12	AD11	AN19	57
13	TIOCOA	TRGIOA	1	14	TIOCOB	TRGIOB	80
15	TIOCOC	TRCIOB	16	16	M2_TRISTn	---	---
17	TCLKC	TRGCLKA	4	18	TCLKD	TRGCLKB	3
19	M2_Up	---	---	20	M2_Un	---	---
21	M2_Vp	---	---	22	M2_Vn	---	---
23	M2_Wp	---	---	24	M2_Wn	---	---

Table 9-7: JA5 Standard Generic Header

Header Pin	Generic Header Name	RSK board Signal Name	Device Pin	Header Pin	Generic Header Name	RSK board Signal Name	Device Pin
1	DREQ	---	---	2	DACK	NC	---
3	TEND	---	---	4	STBYn	NC	---
5	RS232TX	RS232TX	---	6	RS232RX	RS232RX	---
7	SCIbRX	RXD0	51*	8	SCIbTX	TXD0	52*
9	SCIcTX	TXD1	74	10	SCIbCK	CLK0	50*
11	SCIcCK	CLK1	75	12	SCIcRX	RXD1	73
13	Reserved	---	---	14	Reserved	---	---
15	Reserved	---	---	16	Reserved	---	---
17	Reserved	---	---	18	Reserved	---	---
19	Reserved	---	---	20	Reserved	---	---
21	Reserved	---	---	22	Reserved	---	---
23	Unregulated_Vcc	---	---	24	Vss	GROUND	---

Table 9-8: JA6 Standard Generic Header

Header Pin	Generic Header Name	RSK board Signal Name	Device Pin
1	VBAT	VBAT	---
2	LIN	LIN	51* & 52*
3	GROUND	GROUND	---

Table 9-9: LIN Header

Note: Pins marked with '*' are connected via option links.

Chapter 10. Code Development

10.1. Overview

Note: For all code debugging using Renesas software tools, the RSK board must be connected to a PC USB port via an E8a.

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 linker will limit the object size to a maximum of 64k 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. Breakpoint Support

This RSK is supplied with an E8a emulator which supports breakpoints in ROM and RAM. Double clicking in the breakpoint column in the code sets the breakpoint. Breakpoints will be retained unless they are double clicked to remove them. For more details on breakpoints & E8a functions please refer to the '*E8A-USB Emulator User's Manual*'.

10.4. Mode Support

High-performance Embedded Workspace connects to the Microcontroller and programs it via the E8a. Mode support is handled transparently to the user.

10.5. Memory Map

The memory map shown below gives the locations of each memory area.

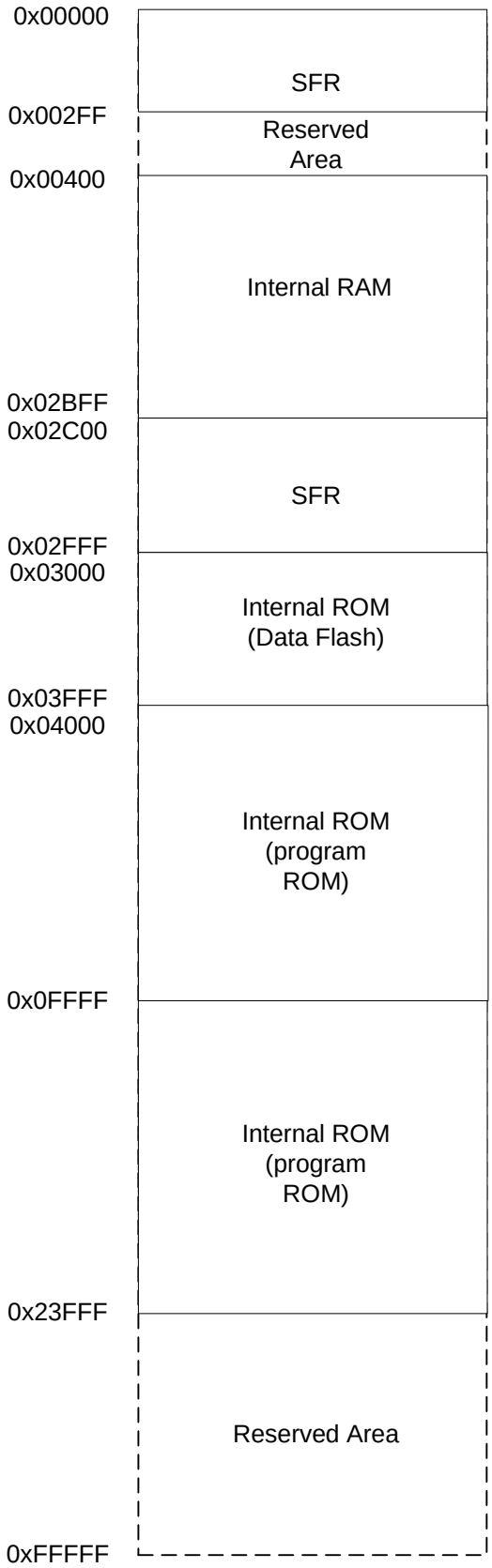


Figure 10-1: CPU memory map (Part Number - R5F2138CCDFP)

Chapter 11. Component Placement

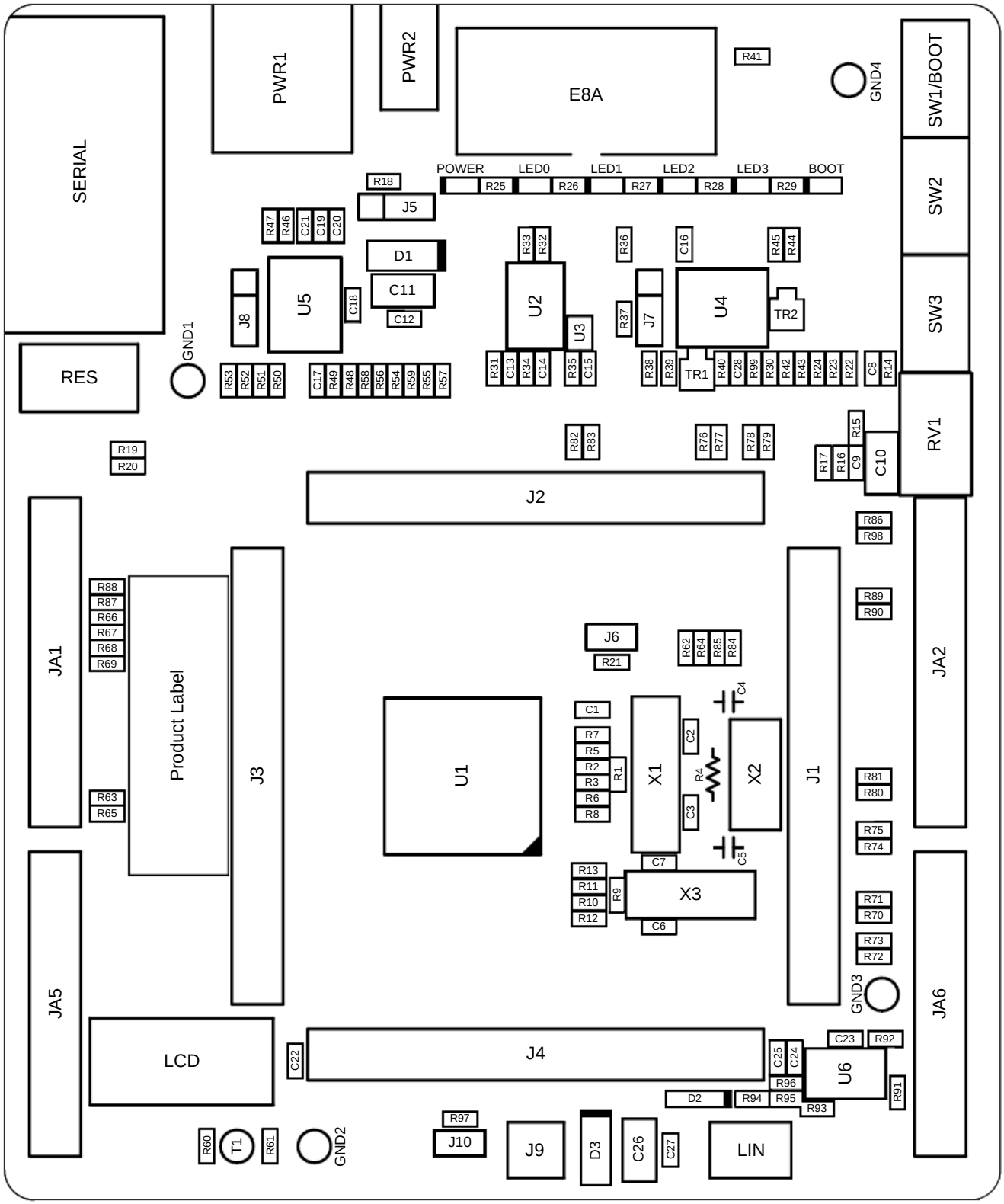


Figure 11-1: Component Placement (Top Layer)

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 R8C/38C microcontrollers refer to the R8C/38C Group Hardware Manual

For information about the R8C/38C assembly language, refer to the R8C Family Software Programming Manual

For information about the E8a Emulator, please refer to the E8A-USB Emulator User's Manual

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

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

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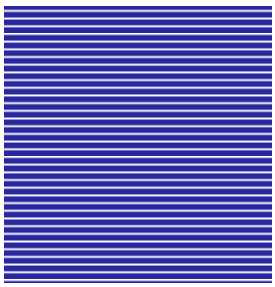

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