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April 1st, 2010
Renesas Electronics Corporation

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Renesas Starter Kit for R32C/111

User's Manual

RENESAS SINGLE-CHIP MICROCOMPUTER
R32C/100 Series

WS TOOL

Disclaimer

By using this Renesas Starter Kit (RSK), the user accepts the following terms. The RSK is not guaranteed to be error free, and the entire risk as to the results and performance of the RSK is assumed by the User. The RSK is provided by Renesas on an "as is" basis without warranty of any kind whether express or implied, including but not limited to the implied warranties of satisfactory quality, fitness for a particular purpose, title and non-infringement of intellectual property rights with regard to the RSK. Renesas expressly disclaims all such warranties. Renesas or its affiliates shall in no event be liable for any loss of profit, loss of data, loss of contract, loss of business, damage to reputation or goodwill, any economic loss, any reprogramming or recall costs (whether the foregoing losses are direct or indirect) nor shall Renesas or its affiliates be liable for any other direct or indirect special, incidental or consequential damages arising out of or in relation to the use of this RSK, even if Renesas or its affiliates have been advised of the possibility of such damages.

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 in 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	1
Chapter 2. Purpose	2
Chapter 3. Power Supply	3
3.1. Requirements	3
3.2. Power-up Behaviour	3
Chapter 4. Board Layout	4
4.1. Component Layout	4
4.2. Board Dimensions	5
Chapter 5. Block Diagram	6
Chapter 6. User Circuitry	7
6.1. Switches	7
6.2. LEDs	7
6.3. Potentiometer	7
6.4. Serial port	7
6.5. Debug LCD Module	8
6.6. Option Links	8
6.7. Oscillator Sources	15
6.8. Reset Circuit	15
Chapter 7. Modes	17
7.1. Boot mode	17
7.2. User Mode	17
Chapter 8. Programming Methods	18
Chapter 9. Headers	19
9.1. Microcontroller Ring Headers	19
9.2. Application Headers	23
Chapter 10. Code Development	26
10.1. Overview	26
10.2. Compiler Restrictions	26
10.3. Breakpoint Support	26
10.4. Memory Map	27
Chapter 11. Component Placement	29
Chapter 12. Additional Information	30

Chapter 1. Preface

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Glossary

ADC	Analog to Digital Converter	DAC	Digital to Analog Converter
E8A	“E8A ” emulator	HEW	High-Performance Embedded Workshop
I/O	Input / Output	LCD	Liquid Crystal Display
LED	Light Emitting Diode	MCU	Microcontroller Unit
RSK	Renesas Starter Kit	UART	Universal Asynchronous Receiver / Transmitter
USB	Universal Serial Bus	PC	Personal Computer

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 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 board operates from a 5V DC power supply (supplied).

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.

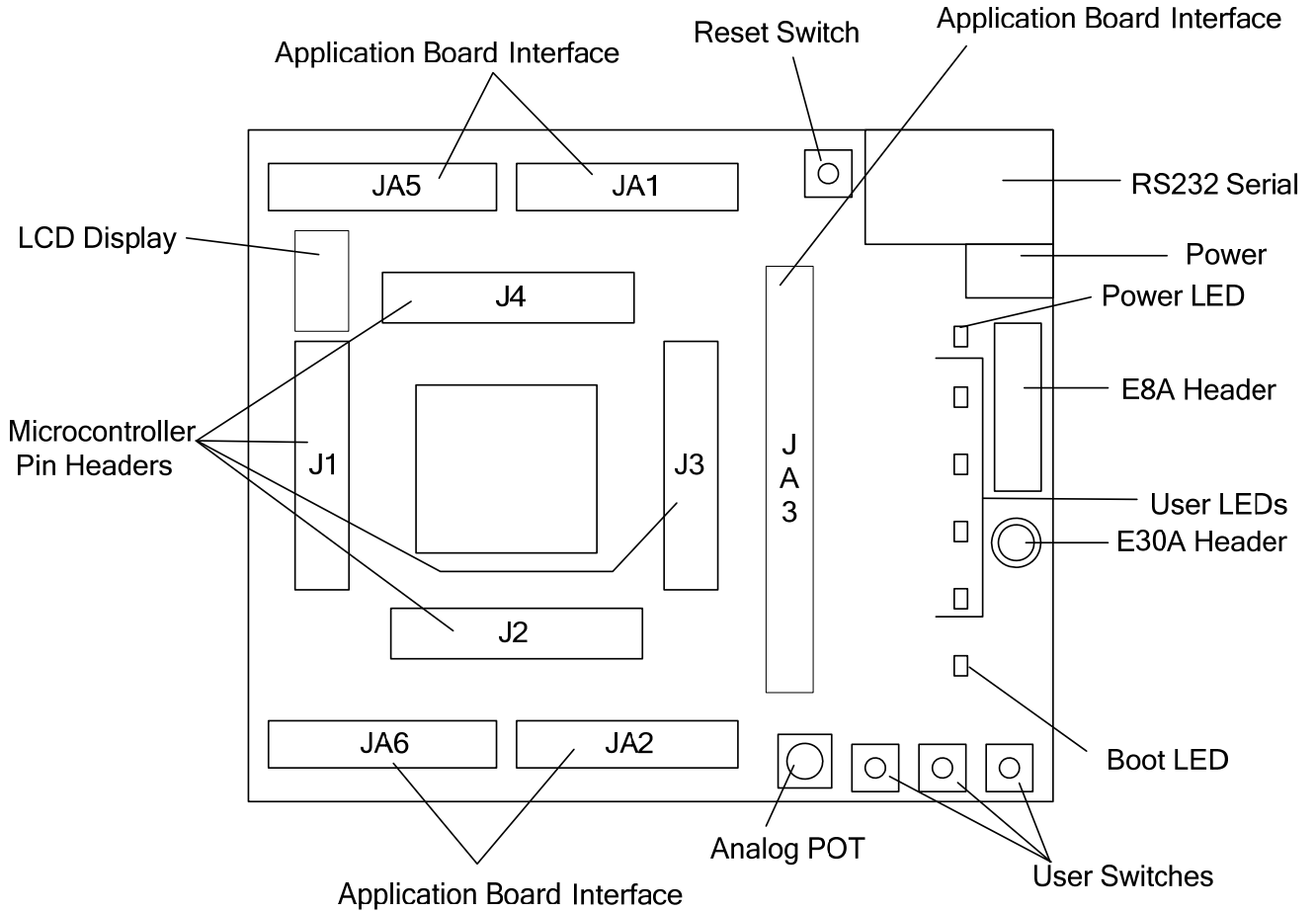


Figure 4-1: Board Layout

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.

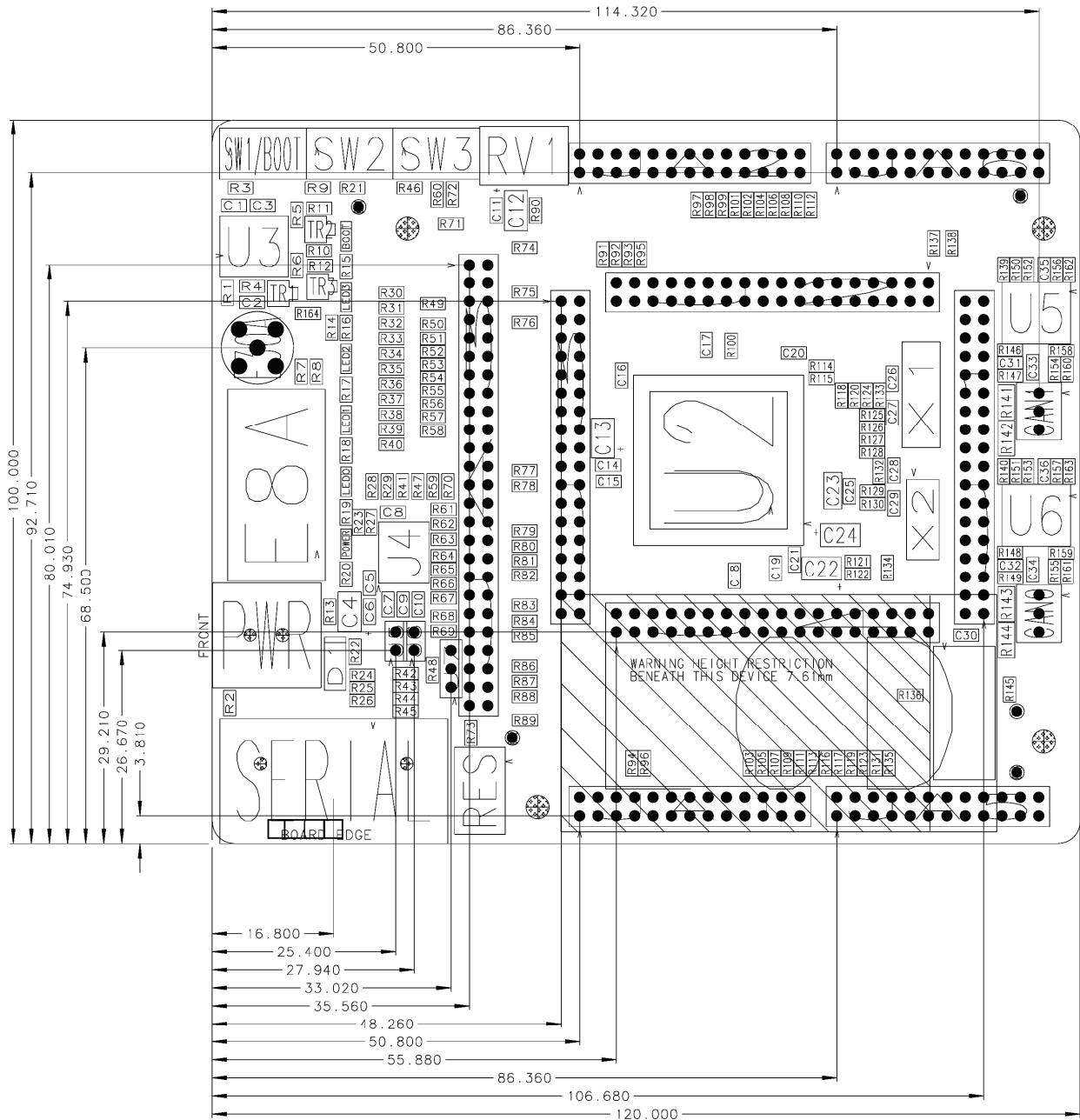


Figure 4-2 : Board Dimensions

Chapter 5. Block Diagram

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

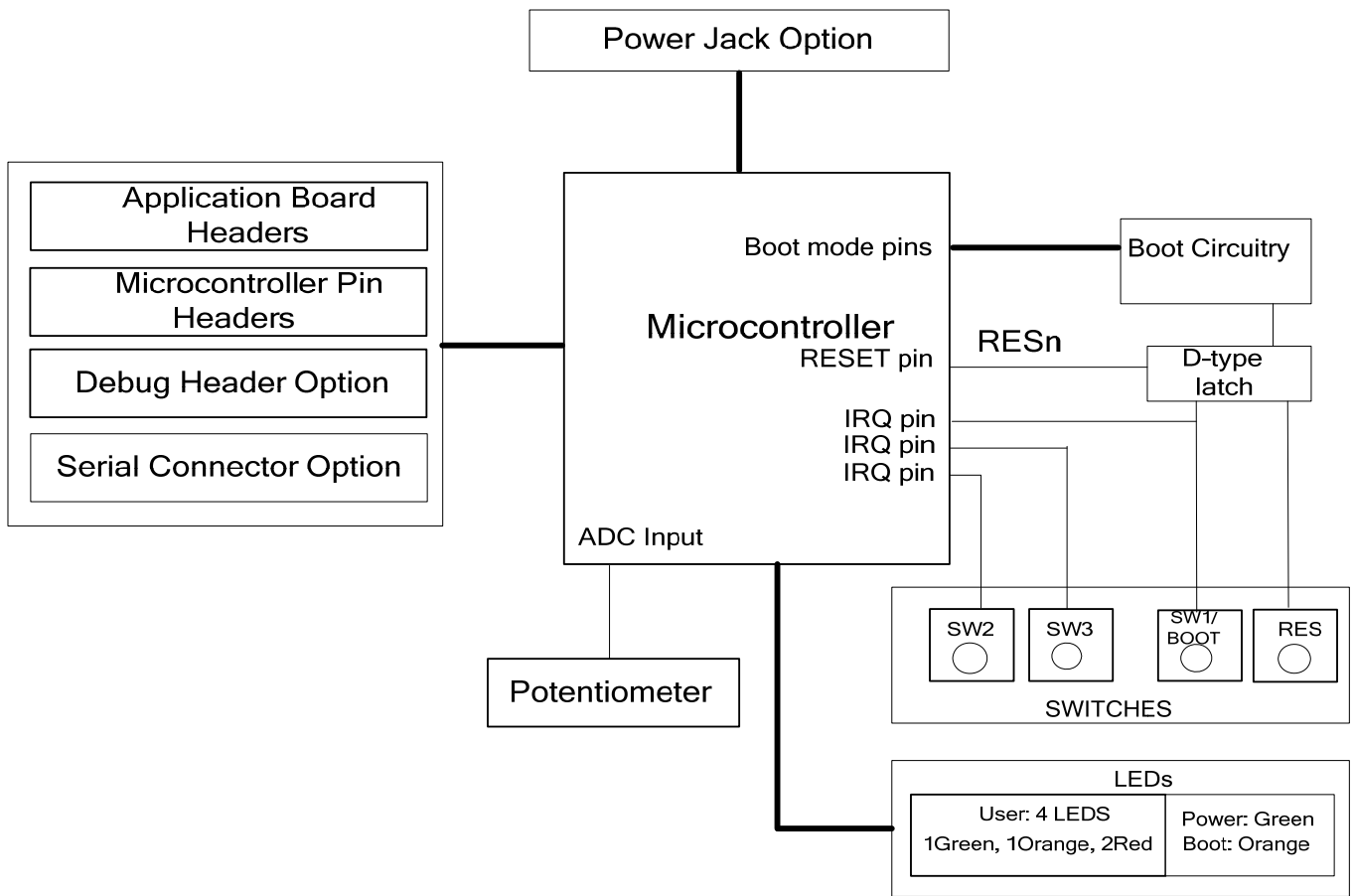


Figure 5-1: Block Diagram

Figure 5-2 shows the E8A connections to the RSK.

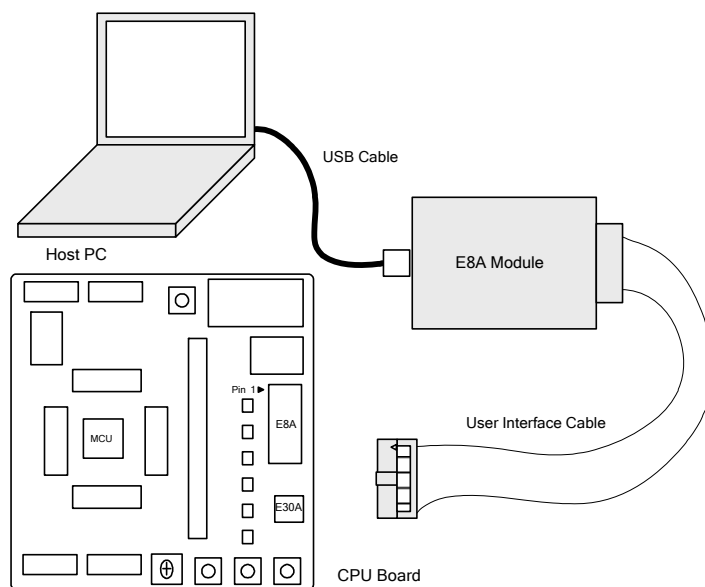


Figure 5-2: E8A RSK Connections

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 Functions

Switch	Function	Microcontroller
RES	When pressed, the microcontroller is reset.	RESn, Pin 10
SW1 / BOOT*	Connects to an IRQ input for user controls.	INT0n, Pin 18 (Port 8, bit 2)
SW2*	Connects to an IRQ line for user controls.	INT1n, Pin 17 (Port 8, bit 3)
SW3*	Connects to an IRQ line for user controls. The same switch may also function as an ADC trigger input.	INT2n, Pin 16 (Port 8, bit 4)

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 4 bit 0	52
LED1	Orange	Port 4 bit 1	51
LED2	Red	Port 4 bit 2	50
LED3	Red	Port 4 bit 3	49

Table 6-2: LED Port

6.3. Potentiometer

A single-turn potentiometer is connected to pin AN0 (p10_0, pin 95) of the microcontroller. This may be used to vary the voltage at this pin between AVCC and Ground.

6.4. Serial port

Serial port UART0 is connected to the standard RS232 header. Serial port UART1 can optionally be connected to the RS232. The connections to be fitted are listed in the Table 6-3.

Description	Function	Microcontroller Port Pin	Fit for RS232	Remove for RS232
UART0	Default serial port (TX)	Port 6_3	R47	R70, R59
UART0	Default serial port (RX)	Port 6_2	R41	R28, R29
UART1	Spare Serial Port (TX)	Port 6_7	R59	R47, R70
UART1	Spare Serial Port (RX)	Port 6_6	R28	R29, R41

Table 6-3: Serial Options Links

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

The second transceiver channels are connected to a 0.1" header, J7. UART2 can be connected to this channel by fitting 0Ω link resistors to R63 and R64.

6.5. Debug 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 RSK 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 (p2_0)	70
5	R/W (Wired to Write only)	-	6	DLCDE (p2_1)	69
7	No Connection	-	8	No Connection	-
9	No Connection	-	10	No Connection	-
11	DLCCDD4 (p2_4)	66	12	DLCCDD5 (p2_5)	65
13	DLCCDD6 (p2_6)	64	14	DLCCDD7 (p2_7)	63

Table 6-4: Debug LCD Module Connections

6.6. Option Links

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

Table 6-5 below describes the function of the option links associated with serial port configuration.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R23	Serial Port Configuration	Disables the RS-232 Transceiver. (Must be removed if R27 is fitted.)	Enables the RS-232 Transceiver	R27
R27	Serial Port Configuration	Enables the RS-232 Transceiver. (Must be removed if R23 is fitted.)	Disables the RS-232 Transceiver	R23
R28	Serial Port Configuration	Connects the programming port (Rx) to external serial connectors	Disconnects the programming port (Rx) to external serial connectors	R29, R30, R41
R29	Serial Port Configuration	Routes the RS-232 serial port (Rx) to application board interface (JA6-5)	Disconnects the RS-232 serial port (Rx) from application board interface (JA6-5)	R28, R41
R41	Serial Port Configuration	Connects serial port RXD0 to the D-type connector	Disconnects serial port pin RXD1 from the D-type connector	R28, R29
R47	Serial Port Configuration	Connects serial port TXD0 to the D-type connector.	Disconnects serial port pin TXD1 from the SERIAL D-type connector	R59, R70
R59	Serial Port Configuration	Connects the serial programming port (Tx) to external connectors (not E8A)	Disconnects the serial programming port (Tx) to external serial connectors	R36, R47, R70
R63	Serial Port Configuration	Connects UART2 (Tx) to the RS-232 transceiver	Disconnects UART2 (Tx) from the RS-232 transceiver	R69
R64	Serial Port Configuration	Connects UART2 (Rx) to the RS-232 transceiver	Disconnects UART2 (Rx) from the RS-232 transceiver	R73
R69	Serial Port Configuration	Connects UART2 (Rx) to the D-type connector	Disconnects UART2 (Rx) from the D-type connector	R64
R70	Serial Port Configuration	Routes RS232 serial port (Tx) to application connector (JA6-6).	Disconnects RS232 serial port (Tx) from application board interface (JA6-6)	R47, R59
R73	Serial Port Configuration	Connects UART2 (Tx) to the D-type connector	Disconnects UART2 (Tx) from the D-type connector	R63

Table 6-5: Serial port configuration links

Table 6-6 below describes the function of the option links associated with E8A configuration.

Option Link Settings				
Reference	Function	Fitted	Alternative (Removed)	Related To
R30	E8A Configuration	Connects the serial programming port (Rx) to the E8A connector	Disconnects the serial programming port (Rx) from the E8A connector	R28
R36	E8A Configuration	Connects the serial programming port (Tx) to the E8A connector	Disconnects the serial programming port (Tx) from the E8A connector	R59
R40	E8A Configuration	Connects the serial programming port (CK) to the E8A connector	Disconnects the serial programming port (CK) from the E8A connector	-
R33	E8A Configuration	Connects the CPU port pin p5_0 to the E8A connector	Disconnects the CPU port pin p5_0 from the E8A connector	-

Table 6-6: E8A 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
R13	Power Source	Board can be powered from the PWR connector.	Disconnects the supply from the PWR connector.	R22, R44
R22	Power source	Connects Board_VCC2 to PWR supply.	Disconnects Board_VCC2 from PWR supply.	R13, R25, R26
R24	Microcontroller Power Supply	Supply power to the Microcontroller pin VCC2.	Disables 5V power supply to the MCU pin VCC2. Supply current to the sections powered from VCC2 pin of the MCU can be measured across J5	-
R25	Power source	Connect Board_VCC2 to CON_3V3.	Disconnect Board_VCC2 from CON_3V3.	R22, R26
R26	Power source	Connect Board_VCC2 to CON_5V.	Disconnect Board_VCC2 from CON_5V.	R22, R25
R42	Power source	Connect Board_VCC1 to CON_3V3.	Disconnect Board_VCC1 from CON_3V3.	R43, R44
R43	Power source	Connect Board_VCC1 to CON_5V.	Disconnect Board_VCC1 from CON_5V.	R42, R44
R44	Power source	Connect Board_VCC1 to PWR supply.	Disconnect Board_VCC1 from PWR supply.	R13, R22, R42, R43
R48	Microcontroller Power Supply	Supply power to the Microcontroller pin VCC1.	Disables 5V power supply to the MCU pin VCC1 Supply current to the sections powered from VCC1 pin of 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
R89	Analog Voltage Source	Links the analog ground to the digital ground.	Isolates the analog ground from the digital ground.	-
R90	Analog Voltage Source	Connects AVCC to CON_AVCC on JA1.	Disconnects AVCC from CON_AVCC.	R134
R121	Voltage Reference Source	Connects VREF to Board_VCC1.	Disconnects VREF from Board_VCC1.	R122
R122	Voltage Reference Source	Connects VREF to CON_VREF on JA1.	Disconnects VREF from CON_VREF.	R121
R134	Analog Voltage Source	Connects AVCC to Board_VCC1.	Disconnects AVCC from Board_VCC1.	R90

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
R49	Application Board Interface	Connects MCU port pin p2_4 (pin 66) to DLCDD4 on Debug LCD Header	Disconnects MCU port pin p2_4 (pin 66) from DLCDD4 on Debug LCD Header	R75, R50, R76
R50	Application Board Interface	Connects MCU port pin p2_6 (pin 64) to DLCDD6 on Debug LCD Header	Disconnects MCU port pin p2_6 (pin 64) from DLCDD6 on Debug LCD Header	R75, R49, R76
R51	Application Board Interface	Connects MCU port pin p3_0 (pin 61) to IO0 at JA1-15	Disconnects MCU port pin p3_0 (pin 61) from IO0	-
R52	Application Board Interface	Connects MCU port pin p3_1 (pin 59) to IO1 at JA1-16	Disconnects MCU port pin p3_1 (pin 59) from IO1	-
R53	Application Board Interface	Connects MCU port pin p3_2 (pin 58) to IO2 at JA1-17	Disconnects MCU port pin p3_2 (pin 58) from IO2	-
R54	Application Board Interface	Connects MCU port pin p3_3 (pin 57) to IO3 at JA1-18	Disconnects MCU port pin p3_3 (pin 57) from IO3	-
R55	Application Board Interface	Connects MCU port pin p3_4 (pin 56) to IO4 at JA1-19	Disconnects MCU port pin p3_4 (pin 56) from IO4	-
R56	Application Board Interface	Connects MCU port pin p3_5 (pin 55) to IO5 at JA1-20	Disconnects MCU port pin p3_5 (pin 55) from IO5	-
R57	Application Board Interface	Connects MCU port pin p3_6 (pin 54) to IO6 at JA1-21	Disconnects MCU port pin p3_6 (pin 54) from IO6	-
R58	Application Board Interface	Connects MCU port pin p3_7 (pin 53) to IO7 at JA1-22	Disconnects MCU port pin p3_7 (pin 53) from IO7	-
R65	Application Board Interface	Connects MCU port pin p1_5 (pin 73) to D13 at JA3-34	Disconnects MCU port pin p1_5 (pin 73) from D13	R66
R66	Application Board Interface	Connects MCU port pin p1_5 (pin 73) to INT3n at JA1-23	Disconnects MCU port pin p1_5 (pin 73) from INT3n	R65
R67	Application Board Interface	Connects MCU port pin p4_0 (pin 52) to LED0.	Disconnects MCU port pin p4_0 (pin 52) from LED0.	-
R68	Application Board Interface	Connects MCU port pin p4_2 (pin 50) to LED2.	Disconnects MCU port pin p4_2 (pin 50) from LED2.	-
R71	Application Board Interface	Connects MCU port pin p2_0 (pin 70) to DLCDRS on Debug LCD Header	Disconnects MCU port pin p2_0 (pin 70) from DLCDRS on Debug LCD Header	-
R74	Application Board Interface	Connects MCU port pin p2_1 (pin 69) to DLCDE on Debug LCD Header	Disconnects MCU port pin p2_1 (pin 69) from DLCDE on Debug LCD Header	-

R75	Application Board Interface	Connects MCU port pin p2_5 (pin 65) to DLCDD5 on Debug LCD Header	Disconnects MCU port pin p2_5 (pin 65) from DLCDD5 on Debug LCD Header	-
R76	Application Board Interface	Connects MCU port pin p2_7 (pin 63) to DLCDD7 on Debug LCD Header	Disconnects MCU port pin p2_7 (pin 63) from DLCDD7 on Debug LCD Header	-
R77	Application Board Interface	Connects MCU port pin p5_0 (pin 44) to WRn at JA3-26	Disconnects MCU port pin p5_0 (pin 44) from WRn	R78
R78	Application Board Interface	Connects MCU port pin p5_0 (pin 44) to WRLn at JA3-48	Disconnects MCU port pin p5_0 (pin 44) from WRLn	R77
R79	Application Board Interface	Connects MCU port pin p1_7 (pin 71) to CAN1_ERR	Disconnects MCU port pin p1_7 (pin 71) from CAN1_ERR	R80
R80	Application Board Interface	Connects MCU port pin p1_7 (pin 71) to D15 at JA3-36	Disconnects MCU port pin p1_7 (pin 71) from D15	R79
R81	Application Board Interface	Connects MCU port pin p1_6 (pin 72) to CAN0_ERR	Disconnects MCU port pin p1_6 (pin 72) from CAN0_ERR	R82
R82	Application Board Interface	Connects MCU port pin p1_6 (pin 72) to D14 at JA3-35	Disconnects MCU port pin p1_6 (pin 72) from D14	R81
R83	Application Board Interface	Connects MCU port pin p4_1 (pin 51) to LED1.	Disconnects MCU port pin p4_1 (pin 51) from LED1.	-
R84	Application Board Interface	Connects MCU port pin p4_3 (pin 49) to LED3.	Disconnects MCU port pin p4_3 (pin 49) from LED3.	-
R85	Application Board Interface	Connects MCU port pin p4_5 (pin 47) to A21 at JA3-42	Disconnects MCU port pin p4_5 (pin 71) from A21	R86
R86	Application Board Interface	Connects MCU port pin p4_5 (pin 47) to CS2n at JA3-45	Disconnects MCU port pin p4_5 (pin 71) from CS2n	R85
R87	Application Board Interface	Connects MCU port pin p4_6 (pin 46) to A22 at JA3-43	Disconnects MCU port pin p4_6 (pin 46) from A22	R88
R88	Application Board Interface	Connects MCU port pin p4_6 (pin 46) to CS1n at JA3-28	Disconnects MCU port pin p4_6 (pin 46) from CS1n	R87
R94	Application Board Interface	Connects MCU port pin p10_0 (pin 95) to Analog pot	Disconnects MCU port pin p10_0 (pin 95) from Analog pot	R96
R96	Application Board Interface	Connects MCU port pin p10_0 (pin 95) to AN0 at JA1-9	Disconnects MCU port pin p10_0 (pin 95) from AN0	R94
R97	Application Board Interface	Connects MCU port pin p7_2 (pin 26) to CLK2 at JA6-10	Disconnects MCU port pin p7_2 (pin 26) from CLK2	R98
R98	Application Board Interface	Connects MCU port pin p7_2 (pin 26) to Vp at JA2-15	Disconnects MCU port pin p7_2 (pin 26) from Vp	R97

R99	Application Board Interface	Connects MCU port pin p7_4 (pin 24) to Wp at JA2-17	Disconnects MCU port pin p7_4 (pin 24) from Wp	R101
R101	Application Board Interface	Connects MCU port pin p7_4 (pin 24) to TA2OUT at JA2-19	Disconnects MCU port pin p7_4 (pin 24) from TA2OUT	R99
R102	Application Board Interface	Connects MCU port pin p7_5 (pin 23) to Wn at JA2-18	Disconnects MCU port pin p7_5 (pin 23) from Wn	R104
R103	Application Board Interface	Connects MCU port pin p7_0 (pin 28) to TxD2 at JA6-8 via a 22R resistor	Disconnects MCU port pin p7_0 (pin 28) from TxD2	R105
R104	Application Board Interface	Connects MCU port pin p7_5 (pin 23) to TA2IN at JA2-21	Disconnects MCU port pin p7_5 (pin 23) from TA2IN	R102
R105	Application Board Interface	Connects MCU port pin p7_0 (pin 28) to IIC_SDA at JA1-25 via a 22R resistor	Disconnects MCU port pin p7_0 (pin 28) from IIC_SDA	R103
R106	Application Board Interface	Connects MCU port pin p8_0 (pin 20) to Up at JA2-13	Disconnects MCU port pin p8_0 (pin 20) from Up	R108
R107	Application Board Interface	Connects MCU port pin p7_1 (pin 27) to RxD2 at JA6-7 via a 22R resistor	Disconnects MCU port pin p7_1 (pin 27) from RxD2	R109
R108	Application Board Interface	Connects MCU port pin p8_0 (pin 20) to TA4OUT at JA2-20	Disconnects MCU port pin p8_0 (pin 20) from TA4OUT	R106
R109	Application Board Interface	Connects MCU port pin p7_1 (pin 27) to IIC_SCL at JA1-26 via a 22R resistor	Disconnects MCU port pin p7_1 (pin 27) from IIC_SCL	R107
R110	Application Board Interface	Connects MCU port pin p8_1 (pin 19) to Un at JA2-14	Disconnects MCU port pin p8_1 (pin 19) from Un	R112
R111	Application Board Interface	Connects MCU port pin p10_4 (pin 90) to CAN0_EN	Disconnects MCU port pin p10_4 (pin 90) from CAN0_EN	R113
R112	Application Board Interface	Connects MCU port pin p8_1 (pin 19) to TA4IN at JA2-22	Disconnects MCU port pin p8_1 (pin 19) from TA4IN	R110
R113	Application Board Interface	Connects MCU port pin p10_4 (pin 90) to AN4 at JA5-1	Disconnects MCU port pin p10_4 (pin 90) from AN0	R111
R116	Application Board Interface	Connects MCU port pin p10_5 (pin 89) to AN5 at JA5-2	Disconnects MCU port pin p10_5 (pin 89) from AN5	R117
R117	Application Board Interface	Connects MCU port pin p10_5 (pin 89) to CAN0_STBn	Disconnects MCU port pin p10_5 (pin 89) from CAN0_STBn	R116
R119	Application Board Interface	Connects MCU port pin p10_6 (pin 88) to AN6 at JA5-3	Disconnects MCU port pin p10_6 (pin 88) from AN6	R123
R123	Application Board Interface	Connects MCU port pin p10_6 (pin 88) to CAN1_EN	Disconnects MCU port pin p10_6 (pin 88) from CAN1_EN	R119
R131	Application Board Interface	Connects MCU port pin p10_7 (pin 87) to AN7 at JA5-4	Disconnects MCU port pin p10_7 (pin 87) from AN7	R135

R135	Application Board Interface	Connects MCU port pin p10_7 (pin 87) to CAN1_STBn	Disconnects MCU port pin p10_7 (pin 87) from CAN1_STBn	R131
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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
R120	Main clock	Connects the external clock to the MCU.	On-board clock (X1) can be connected	R124
R124	Main clock	Connects the on-board clock (X1) to the MCU.	External Clock Source can be connected.	R120
R125	Main clock	Connects the on-board clock (X1) from the MCU.	External Clock Source can be connected.	R126
R126	Main clock	Connects the external clock from the MCU.	On-board clock (X1) can be connected	R125
R127	Sub-clock	Connects the external clock from the MCU.	On-board sub-clock (X2) can be connected	R128
R128	Sub-clock	Connects the on-board clock from the MCU.	External Clock Source can be connected.	R127
R129	Sub-clock	Connects the on-board clock to the MCU.	External Clock Source can be connected.	R130
R130	Sub-clock	Connects the external clock to the MCU.	On-board sub-clock (X2) can be connected	R129
R132	Sub-clock	Parallel resistor for X2	Not fitted.	-
R133	Main clock	Parallel resistor for X1	Not fitted.	-

Table 6-10: Clock configuration links

6.7. Oscillator Sources

A crystal oscillator is fitted on the RSK board and used to supply the main clock input to the Renesas microcontroller. The oscillators that are fitted and alternative footprints provided on this RSK board are detailed in Table 6-11

Component		
Crystal (X1)	Fitted	16.0MHz (HC49/4H package)
Crystal (X2)	Fitted	32.768 KHz (90SMX package)

Table 6-11: Oscillators / Resonators

Warning: When replacing the default oscillator with that of another frequency, the debugging monitor may not function until the debugger settings are modified to suit the debugger.

6.8. Reset Circuit

The RSK board includes a simple latch circuit that links the mode selection and reset circuit. This provides an easy method for swapping the device between 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 resistor / capacitor network. 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

The MCU can be configured in User mode and Boot mode. User mode may be used to run and debug user code, while Boot mode may only be used to program the MCU with program code via the serial interface. Further details of programming the flash are available in the R32C/111 device hardware manual.

The RSK board provides the capability of changing between User and Boot / User Boot modes using a simple latch circuit. This is only to provide a simple mode control on this board when the E8A debugger is not in use.

To manually enter 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.

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

7.1. Boot mode

The boot mode settings for this RSK board are shown in Table 7-1 below:

CNVSS	CEn	EPMn	LSI State after Reset End
1	1	0	Boot Mode

Table 7-1: Boot Mode pin settings

7.2. User Mode

The R32C/111 supports single-chip and microprocessor modes. The default user mode for the RSKR32C111 is Single-chip.

CNVSS	CEn	EPMn	LSI State after Reset End
0	0	1	Single-chip Mode
1	0	1	Microprocessor Mode

Table 7-2: User Mode pin settings

Chapter 8. Programming Methods

The board is intended for use with HEW and the supplied E8A debugger only. Please refer to R32C/111 Group Hardware Manual for details of the programming methods using the on-chip serial port and without using E8A debugger.

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.

Pin	Circuit Net Name	Device pin	Pin	Circuit Net Name	Device pin
1	CAN1_OUT	99	2	CAN1_IN	100
3	DA1	1	4	DA0	2
5	P9_2	-	6	P9_1	4
7	P9_0	-	8	P14_6	-
9	P14_5	-	10	P14_4	-
11	P14_3	-	12	NC	-
13	P14_1	-	14	NC	-
15	NC	-	16	E8_CNVS	7
17	CON_XCIN	8 (via R130)	18	CON_XCOUT	9 (via R127)
19	RESn	10	20	CON_XOUT	11 (via R126)
21	GROUND	12	22	CON_XIN	13 (via R120)
23	UC_VCC1	14	24	NMIIn	15
25	INT2n	16	26	INT1n	17
27	INT0n	18	28	TA4IN_Un	19
29	TA4OUT_Up	20	30	CAN0_IN	21
31	CAN0_OUT	22	32	TA2IN_Wn	23
33	TA2OUT_Wp	24	34	Vn	25
35	CLK2_Vp	26	36	IIC_SCL_RxD2	27 (via R115)

Table 9-1: J1 microcontroller header

Pin	Circuit Net Name	Device pin	Pin	Circuit Net Name	Device pin
1	IIC_SDA_TxD2	28 (via R114)	2	PTTX	29
3	UC_VCC1	-	4	PTRX	30
5	GROUND	-	6	PTCK	31
7	E8_BUSY	32	8	TxD0	33
9	RxD0	34	10	CLK0	35
11	CTSRTS	36	12	P13_7	-
13	P13_6	-	14	P13_5	-
15	P13_4	-	16	RDYn	37
17	ALE	38	18	E8_EPM	39
19	UD	40	20	P13_3	-
21	GROUND	-	22	P13_2	-
23	UC_VCC1	-	24	P13_1	-
25	P13_0	-	26	TRSTn	41
27	RDn	42	28	WRHn	43
29	WRLn_WRn	44	30	P12_7	-
31	P12_6	-	32	P12_5	-
33	A23_CS0n	45	34	A22_CS1n	46
35	A21_CS2n	47	36	A20_CS3n	48

Table 9-2: J2 microcontroller header

Pin	Circuit Net Name	Device pin	Pin	Circuit Net Name	Device pin
1	A19_LED3	49	2	UC_VCC1	-
3	A18_LED2	50	4	GROUND	-
5	A17_LED1	51	6	A16_LED0	52
7	A15_IO7	53	8	A14_IO6	54
9	A13_IO5	55	10	A12_IO4	56
11	A11_IO3	57	12	A10_IO2	58
13	A9_IO1	59	14	P12_4	-
15	P12_3	-	16	P12_2	-
17	P12_1	-	18	P12_0	-
19	UC_VCC2	60	20	A8_IO0	61
21	GROUND	62	22	A7_DLCDD7	63
23	A6_DLCDD6	64	30	A5_DLCDD5	65
25	A4_DLCDD4	66	31	A3	67
27	A2	68	32	A1_DLCDE	69
29	A0_DLCDRS	70	33	D15_CAN1_ERR	71
31	D14_CAN0_ERR	72	34	D13_INT3n	73
33	D12	74	35	D11	75
35	D10	76	36	D9	77

Table 9-3: J3 microcontroller header

Pin	Circuit Net Name	Device pin	Pin	Circuit Net Name	Device pin
1	D8	78	2	D7	79
3	D6	80	4	D5	81
5	D4	82	6	P11_4	-
7	P11_3	-	8	P11_2	-
9	P11_1	-	10	P11_0	-
11	D3	83	12	D2	84
13	D1	85	14	D0	86
15	P15_7	-	16	P15_6	-
17	P15_5	-	18	P15_4	-
19	P15_3	-	20	P15_2	-
21	P15_1	-	22	GROUND	-
23	P15_0	-	24	UC_VCC1	-
25	AN7_CAN1_STBn	87	26	AN6_CAN1_EN	88
27	AN5_CAN0_STBn	89	28	AN4_CAN0_EN	90
29	AN3	91	30	AN2	92
31	AN1	93	32	AVSS	94
33	ADPOT_AN0	95	34	CON_VREF	96 (via R122)
35	CON_AVCC	97 (via R90)	36	ADTRGn	98

Table 9-4: J4 microcontroller header

9.2. Application Headers

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

Pin	Generic Header Name	RSK board Signal Name	Device Pin	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	CON_AVCC	-	6	AVss	AVSS	94
7	AVref	CON_VREF	-	8	ADTRG	ADTRGn	98
9	AD0	AN0	95	10	AD1	AN1	93
11	AD2	AN2	92	12	AD3	AN3	91
13	DAC0	DA0	2	14	DAC1	DA1	1
15	IO_0	IO0	61	16	IO_1	IO1	59
17	IO_2	IO2	58	18	IO_3	IO3	57
19	IO_4	IO4	56	20	IO_5	IO5	55
21	IO_6	IO6	54	22	IO_7	IO7	53
23	IRQ3	INT3n	73	24	IIC_EX	NC	---
25	IIC_SDA	IIC_SDA	28 (via R114)	26	IIC_SCL	IIC_SCL	27 (via R115)

Table 9-5: JA1 Standard Generic Header

Pin	Generic Header Name	RSK board Signal Name	Device Pin	Pin	Generic Header Name	RSK board Signal Name	Device Pin
1	RESn	RESn	10	2	EXTAL	CON_XIN	-
3	NMIIn	NMIIn	15	4	Vss1	GROUND	-
5	WDT_OVF	NC	---	6	SClATX	TxD0	33
7	IRQ0	INT0n	18	8	SClARX	RXD0	34
9	IRQ1	INT1n	17	10	SClACK	CLK0	35
11	UD	UD	40	12	CTSRTS	CTSRTS	36
13	Up	Up	20	14	Un	Un	19
15	Vp	Vp	26	16	Vn	Vn	25
17	Wp	Wp	24	18	Wn	Wn	23
19	TMR0	TA2OUT	24	20	TMR1	TA4OUT	20
21	TRIGa	TA2IN	23	22	TRIGb	TA4IN	19
23	IRQ2	INT2n	16	24	TRISTn	TRSTn	41
25	Reserved	NC	---	26	Reserved	NC	---

Table 9-6: JA2 Standard Generic Header

Pin	Generic Header Name	RSK board Signal Name	Device Pin	Pin	Generic Header Name	RSK board Signal Name	Device Pin
1	A0	A0_DLCDRS	70	2	A1	A1_DLCDE	69
3	A2	A2	68	4	A3	A3	67
5	A4	A4_DLCDD4	66	6	A5	A5_DLCDD5	65
7	A6	A6_DLCDD6	64	8	A7	A7_DLCDD7	63
9	A8	A8_IO0	61	10	A9	A9_IO1	59
11	A10	A10_IO2	58	12	A11	A11_IO3	57
13	A12	A12_IO4	56	14	A13	A13_IO5	55
15	A14	A14_IO6	54	16	A15	A15_IO7	53
17	D0	D0	86	18	D1	D1	85
19	D2	D2	84	20	D3	D3	83
21	D4	D4	82	22	D5	D5	81
23	D6	D6	80	24	D7	D7	79
25	RDn	RDn	42	26	WRn	WRn	44
27	CSan	A23_CS0n	45	28	CSbn	CS1n	46
29	D8	D8	78	30	D9	D9	77
31	D10	D10	76	32	D11	D11	75
33	D12	D12	74	34	D13	D13	73
35	D14	D14	72	36	D15	D15	71
37	A16	A16_LED0	52	38	A17	A17_LED1	51
39	A18	A18_LED2	50	40	A19	A19_LED3	49
41	A20	A20_CS3n	48	42	A21	A21	47
43	A22	A22	46	44	SDCLK	NC	---
45	CScn	CS2n	47	48	LWRn	WRLn	44
47	HWRn	WRHn	43	46	ALE	ALE	38
49	CASn	NC	---	50	RASn	NC	---

Table 9-7: JA3 Standard Generic Header

Pin	Generic Header Name	RSK board Signal Name	Device Pin	Pin	Generic Header Name	RSK board Signal Name	Device Pin
1	AD4	AN4	90	2	AD5	AN5	89
3	AD6	AN6	88	4	AD7	AN7	87
5	CAN1TX	CAN0_OUT	22	6	CAN1RX	CAN0_IN	21
7	CAN2TX	CAN1_OUT	99	8	CAN2TX	CAN1_IN	100
9	AD8	NC	---	10	AD9	NC	---
11	AD10	NC	---	12	AD11	NC	---
13	TIOC0A	NC	---	14	TIOC0B	NC	---
15	TIOC0C	NC	---	16	M2_TRISTn	NC	---
17	TCLKC	NC	---	18	TCLKD	NC	---
19	M2_Up	NC	---	20	M2_Un	NC	---
21	M2_Vp	NC	---	22	M2_Vn	NC	---
23	M2_Wp	NC	---	24	M2_Wn	NC	---

Table 9-8: JA5 Standard Generic Header

Pin	Generic Header Name	RSK board Signal Name	Device Pin	Pin	Generic Header Name	RSK board Signal Name	Device Pin
1	DREQ	NC	---	2	DACK	NC	---
3	TEND	NC	---	4	STBYn	NC	---
5	RS232TX	RS232TX	---	6	RS232RX	RS232RX	---
7	SCIbRX	RxD2	27	8	SCIbTX	TxD2	28
9	SCIcTX	NC	---	10	SCIbCK	CLK2	26
11	SCIcCK	NC	---	12	SCIcRX	NC	---
13	Reserved	NC	---	14	Reserved	NC	---
15	Reserved	NC	---	16	Reserved	NC	---
17	Reserved	NC	---	18	Reserved	NC	---
19	Reserved	NC	---	20	Reserved	NC	---
21	Reserved	NC	---	22	Reserved	NC	---
23	Reserved	NC	---	24	Reserved	NC	---

Table 9-9: JA6 Standard Generic Header

Chapter 10. Code Development

10.1. Overview

Note: For all code debugging using Renesas software tools, the RSK board must either be connected to a PC serial port via a serial cable or 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 64kB. 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. For more details on breakpoints & E8A functions please refer to the '*E8A-USB Emulator User's Manual*'.

10.4. Memory Map

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

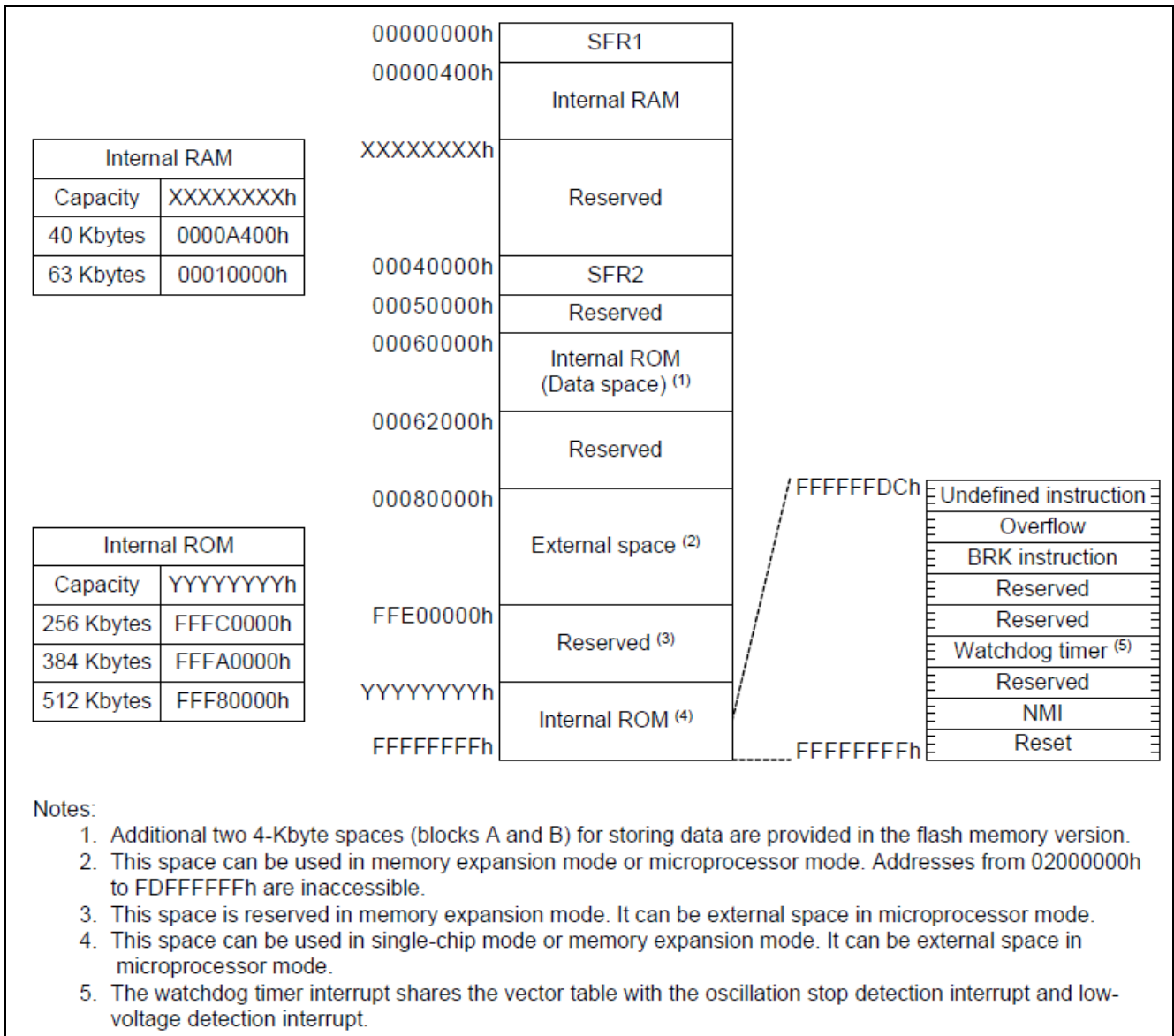


Figure 10-1: Memory Map

For more details please refer to the R32C/111 Hardware manual.

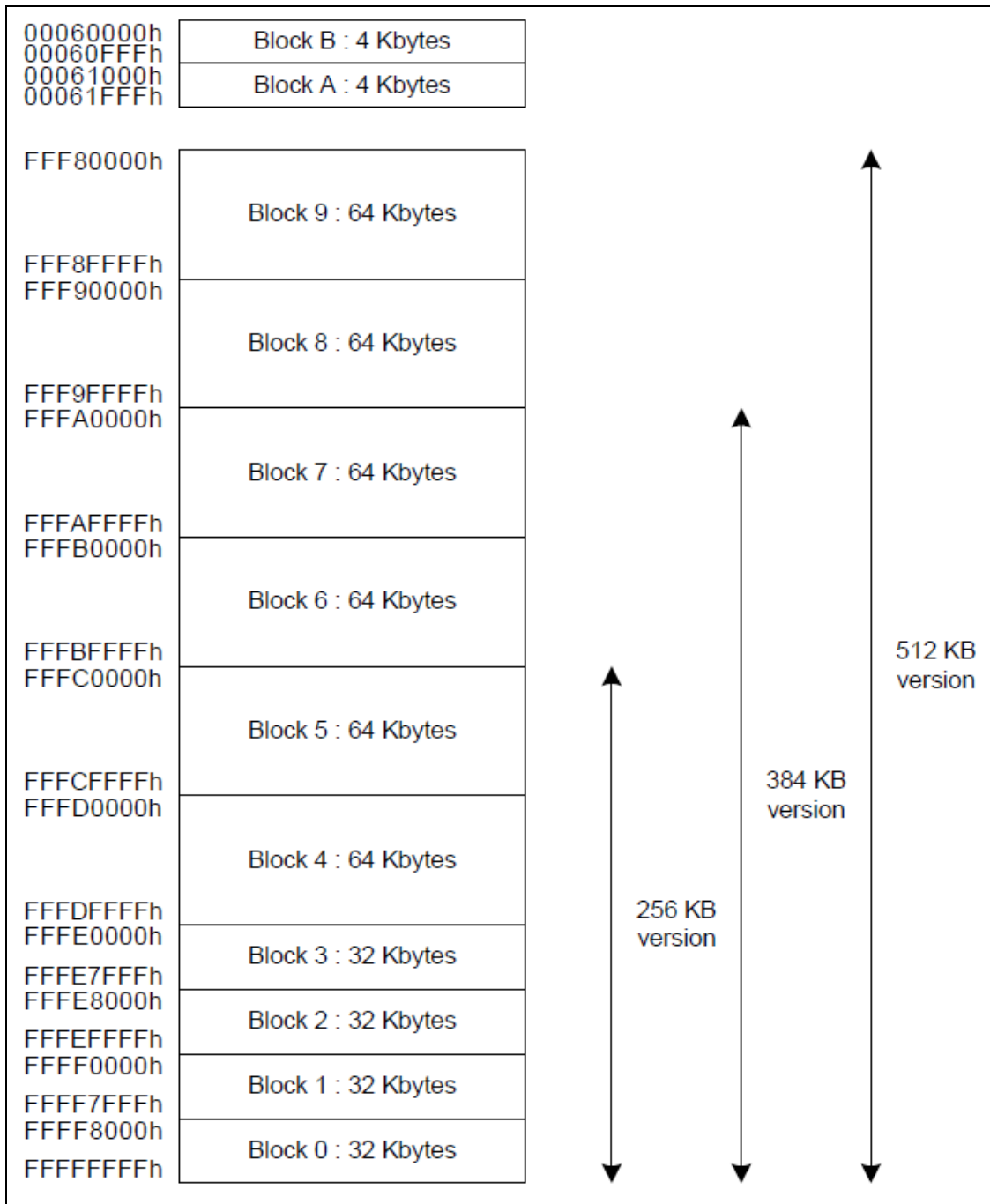


Figure 10-2: Flash memory map

Chapter 11. Component Placement

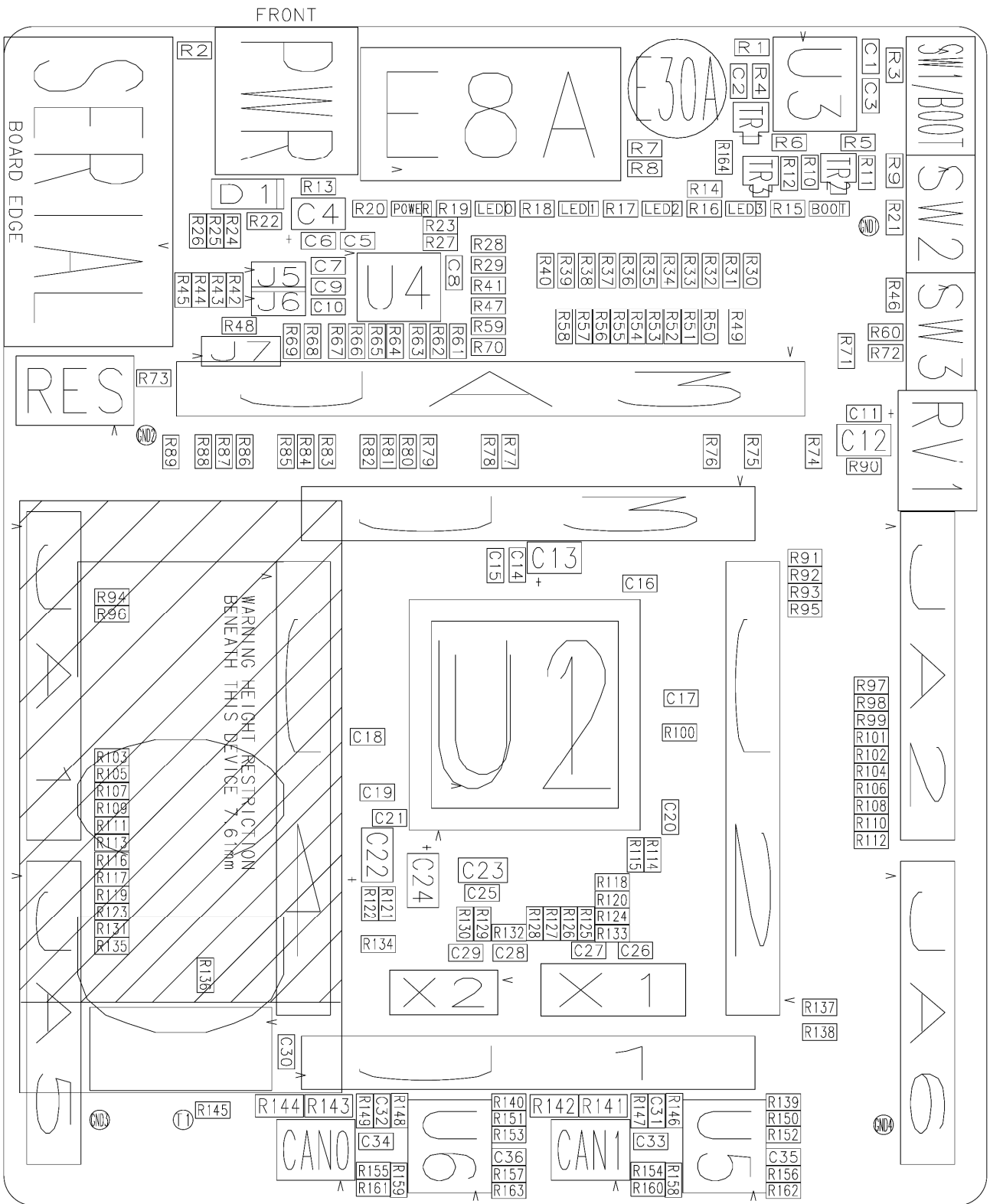


Figure 11-1: Component Placement (Top Layer)

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 R32C/111 microcontrollers refer to the R32C/111 Group *Hardware Manual*

For information about the R32C/111 assembly language, refer to the R32C/100 *Software Manual*

For information about the E8A Emulator, please refer to the *E8A Emulator User's Manual*

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

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Renesas Starter Kit for R32C/111

User's Manual

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