User's Manual

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RX63T Group

Renesas Starter Kit User's Manual For CubeSuite+

RENESAS MCU
RX Family / RX600 Series

Renesas Electronics
www.renesas.com

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Precautions

The following precautions should be observed when operating any RSK product:

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.

How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the RSK hardware functionality, and electrical characteristics. It is intended for users designing sample code on the RSK platform, using the many different incorporated peripheral devices.

The manual comprises of an overview of the capabilities of the RSK product, but does not intend to be a guide to embedded programming or hardware design. Further details regarding setting up the RSK and development environment can found in the tutorial manual.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the RSKRX63T (144 pin). Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the RSK hardware.	RSKRX63T144 User Manual for CubeSuite+	R20UT2117EG
Tutorial Manual	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRX63T144 Tutorial Manual for CubeSuite+	R20UT2118EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRX63T144 Quick Start Guide CubeSuite+	R20UT2119EG
Schematics	Full detail circuit schematics of the RSK.	RSKRX63T144 Schematics	R20UT2116EG
Hardware Manual	Provides technical details of the RX63T microcontroller.	RX63T Group Hardware Manual	R01UH0238EJ

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analog-to-Digital Converter
bps	Bits per second
CAN	Controller Area Network
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DAC	Digital-to-Analog Converter
DIP	Dual In-line Package
DMA	Direct Memory Access
DMAC	Direct Memory Access Controller
E1	Renesas On-chip Debugging Emulator
EEPROM	Electronically Erasable Programmable Read Only Memory
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
GPT	General PWM Timer
IIC	Philips™ Inter-Integrated Circuit Connection Bus
IRQ	Interrupt Request
LCD	Liquid Crystal Display
LED	Light Emitting Diode
LIN	Local Interconnect Network
MCU	Micro-controller Unit
MTU	Multi-Function Timer Pulse Unit
n/a (NA)	Not applicable
n/c (NC)	Not connected
NMI	Non-maskable Interrupt
OTG	On The Go™
PC	Personal Computer
PDC	Parallel Data Capture Unit
PLL	Phase Locked Loop
POE	Port Output Enable
PWM	Pulse Width Modulation
RAM	Random Access Memory
ROM	Read Only Memory
RSK	Renesas Starter Kit
RTC	Realtime Clock
SAU	Serial Array Unit
SCI	Serial Communications Interface
SFR	Special Function Registers
SPI	Serial Peripheral Interface
SSI	Serial Sound Interface
TAU	Timer Array Unit
TFT	Thin Film Transistor
TPU	Timer Pulse Unit
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
WDT	Watchdog timer

Table of Contents

1. Overview

1.1 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.

1.2 Features

This RSK provides an evaluation of the following features:

- Renesas microcontroller programming
- User code debugging
- User circuitry such as switches, LEDs and a potentiometer
- Sample application
- Sample peripheral device initialisation code

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

2. Power Supply

2.1 Requirements

This RSK is supplied with an E1 debugger. The debugger is able to power the RSK board with up to 200mA. When the RSK is connected to another system then that system should supply power to the RSK. All RSK and RSK+ boards have an optional centre positive supply connector using a 2.0mm barrel power jack.

Details of the external power supply requirements for the RSK, and connections are shown in **Table 2-1** below.

Connector	Supply Voltages
PWR	Regulated, 5V DC

Table 2-1: Main Power Supply Requirements

The following jumper settings must be made for the different power supply options:

Device type	J8 setting	Powered Supply
5V edition*	Jumper across pins 2 and 3.	PWR / VBUS / CON_5V / E1(5V)
3V edition	Jumper across pins 1 and 2.	PWR / VBUS / CON_3V3 / E1(3.3V)

Table 2-2: Main Power Supply Options

* This board mounts 5V edition microcontroller.

The main power supply connected to PWR should supply a minimum of 5W to ensure full functionality.

2.2 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.

3. Board Layout

3.1 Component Layout

Figure 3-1 below shows the top component layout of the board.

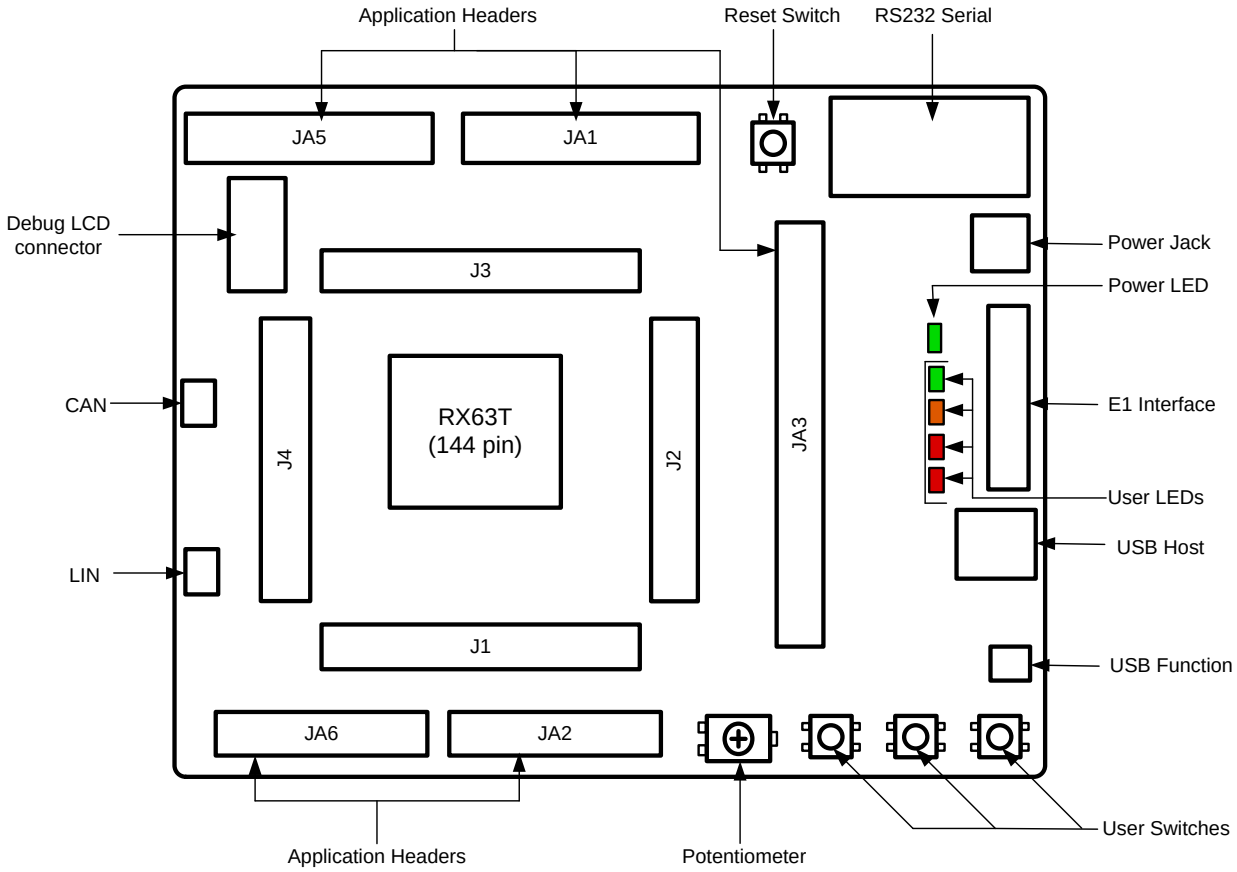


Figure 3-1: Board Layout

3.2 Board Dimensions

Figure 3-2 below gives the board dimensions and connector positions. All the through-hole connectors are on a common 0.1 inch grid for easy interfacing.

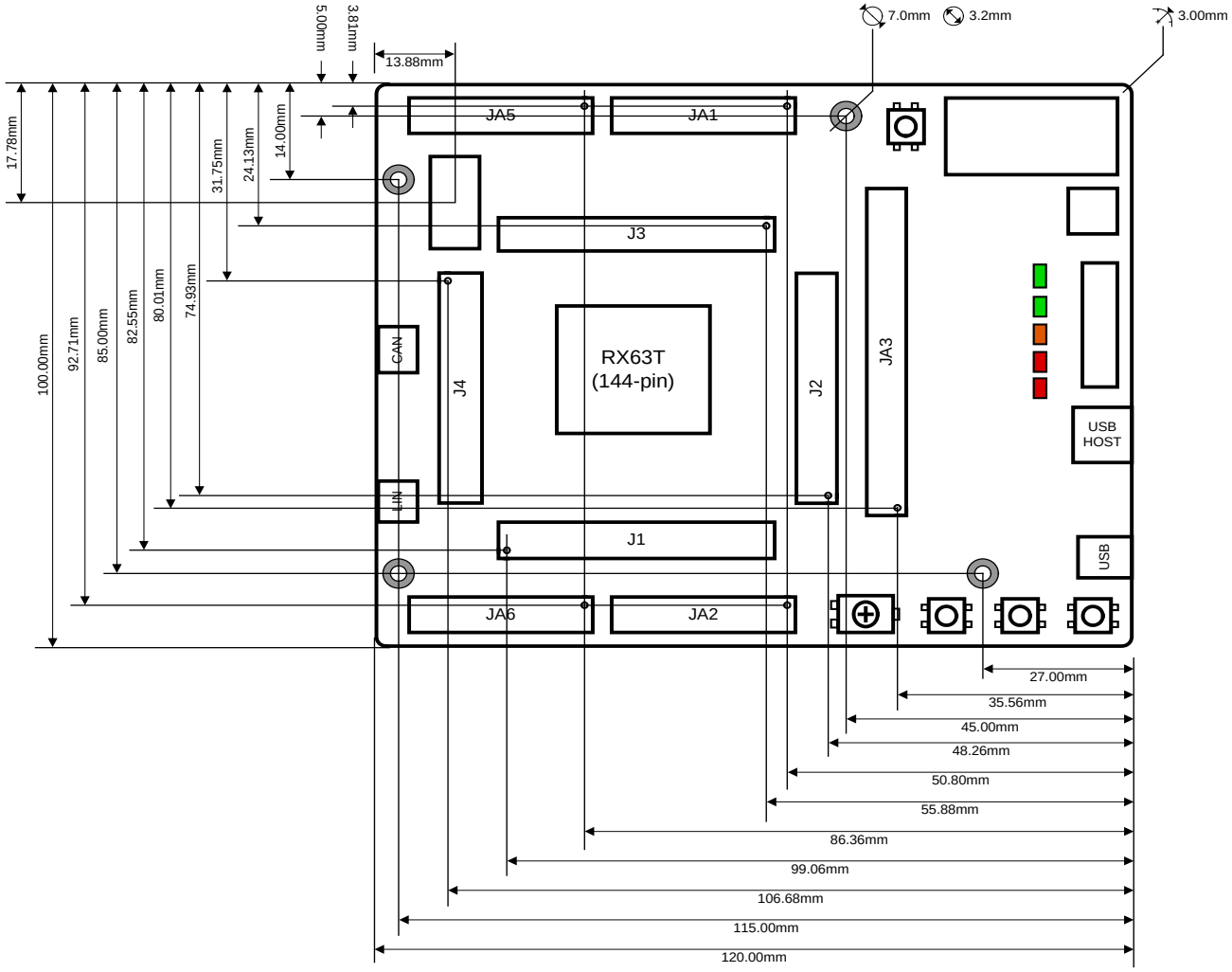


Figure 3-2: Board Dimensions

3.3 Component Placement

Figure 3-3 below shows placement of individual components on the top-side PCB. Component types and values can be looked up using the board schematics.

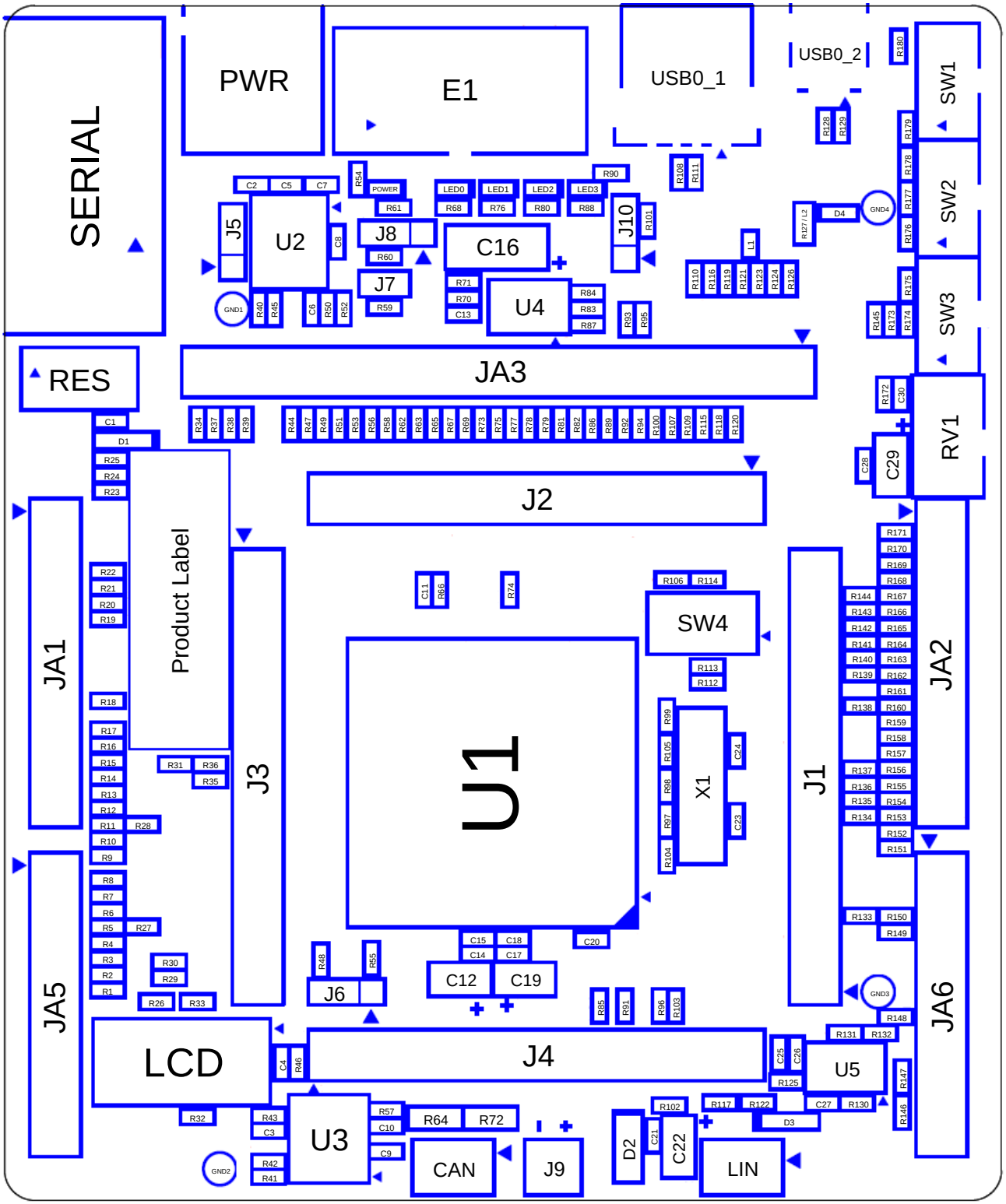


Figure 3-3: Top-Side Component Placement

Figure 3-4 below shows placement of individual components on the bottom-side PCB. Component types and values can be looked up using the board schematics.

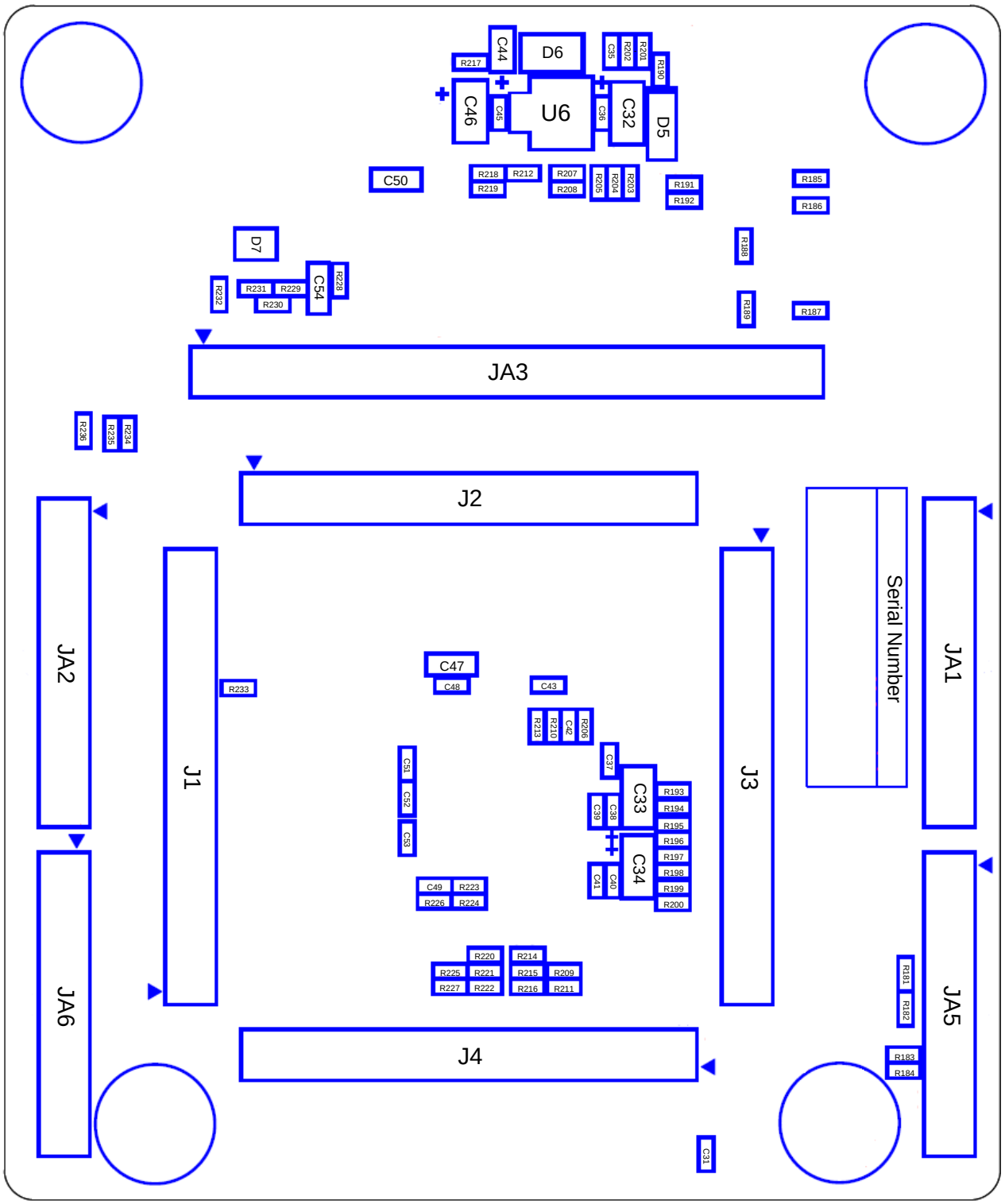


Figure 3-4: Bottom-Side Component Placement

4. Connectivity

4.1 Internal RSK Connections

The diagram below shows the RSK board components and their connectivity to the MCU.

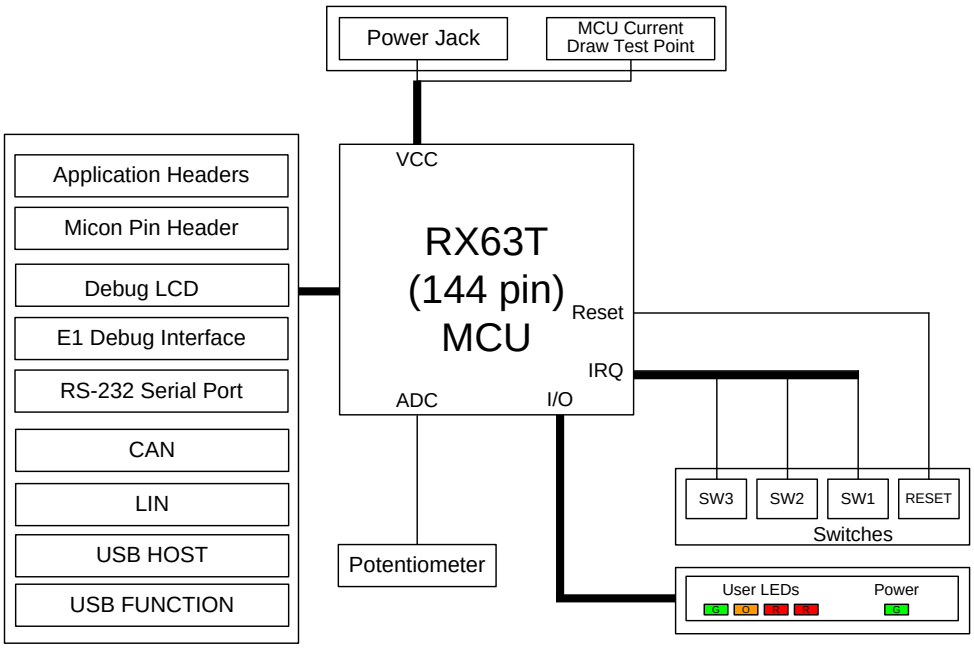


Figure 4-1: Internal RSK Block Diagram

4.2 Debugger Connections

The diagram below shows the connections between the RSK, E1 debugger and the host PC.

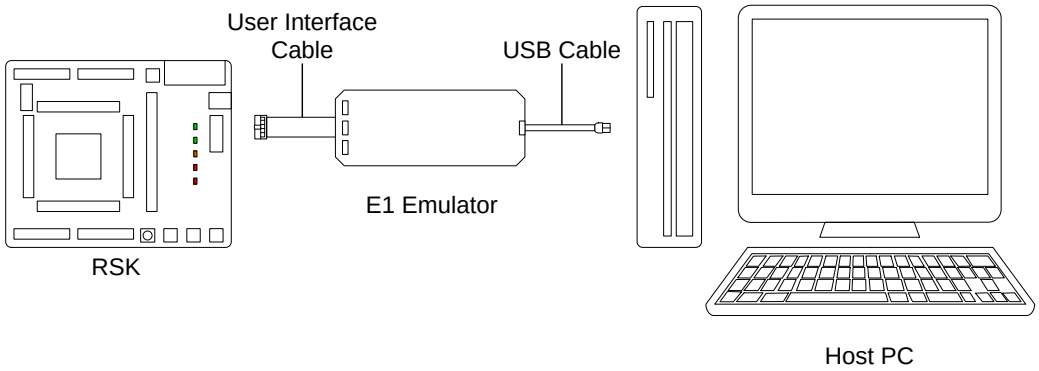


Figure 4-2: Debugger Connection Diagram

5. User Circuitry

5.1 Reset Circuit

A reset control circuit is not fitted to the RSK, as the MCU is capable of voltage and power-on detection. Resets are handled internally, and reset switch is connected directly to RESn on the MCU (pin 16).

5.2 Clock Circuit

A clock circuit is fitted to the RSK to generate the required clock signal to drive the MCU, and associated peripherals. Refer to the RX63T hardware manual for details regarding the clock signal requirements, and the RSKRX63T144 board schematics for information regarding the clock circuitry in use on the RSK. Details of the oscillators fitted to the RSK are listed in **Table 5-1** below.

Crystal	Function	Default Placement	Frequency	Device Package
X1	Main MCU crystal.	Fitted	12MHz	HC49, SMT

Table 5-1: Oscillators

5.3 Switches

There are four switches located on the RSK board. The function of each switch and its connection is shown in **Table 5-2**. For further information regarding switch connectivity, refer to the RSKRX63T144 board schematics.

Switch	Function	MCU Connection	
		Port	Pin
RES	When pressed, the microcontroller is reset.	RESn,	Pin 16
SW1	Connects to an IRQ input for user controls.	IRQ0-DS, (P10)	Pin 137
SW2	Connects to an IRQ input for user controls.	IRQ1-DS, (P11)	Pin 136
SW3	Connects to an IRQ input for user controls.	IRQ2-DS, (PE3)	Pin 12
	The switch is also connected to an ADTRG input, and is used to trigger AD conversions.	ADTRG0#, (PA4)	Pin 53
		ADTRG1#, (PA5)	Pin 52

Table 5-2: Switch Connections

5.4 LEDs

There are five LEDs on the RSK board. The function of each LED, its colour, and its connections are shown in **Table 5-3**.

LED	Colour	Function	MCU Connection	
			Port	Pin
POWER	Green	Indicates the power status	-	-
LED0	Green	User operated LED.	P71	Pin 81
LED1	Orange	User operated LED.	P72	Pin 80
LED2	Red	User operated LED.	P73	Pin 79
LED3	Red	User operated LED.	P33	Pin 83

Table 5-3: LED Connections

5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analog input AN000, pin 126. The potentiometer can be used to create a voltage between AVCC0 and ground (by default, AVCC0 is connected to the board power supply Board_VCC).

The potentiometer is fitted to offer an easy method of supplying a variable analog input to the microcontroller. It does not necessarily reflect the accuracy of the controller's ADC. Refer to the device hardware manual for further details.

5.6 Debug LCD Module

A debug LCD module is supplied with the RSK, and should be connected to the LCD header.

Care should be taken when installing the LCD module to ensure pins are not bent or damaged. The LCD module is vulnerable to electrostatic discharge (ESD); therefore appropriate ESD protection should be used.

The debug LCD module uses a 4-bit interface to reduce pin allocation. No contrast control is provided, as this is set by a resistor supplied on the display module. Connection information for the debug LCD module is provided in **Table 5-4** below.

Debug LCD Header							
Pin	**Circuit Net Name**	**MCU Pin**		**Pin**	**Circuit Net Name**	**MCU Pin**	
		Port	**Pin**			**Port**	**Pin**
1	Ground	-	-	2	Board_5V	-	-
3	No Connection	-	-	4	DLCDRS	PG4	Pin 71
5	R/W (pulled to ground)	-	-	6	DLCDE	PG5	Pin 70
7	No Connection	-	-	8	No Connection	-	-
9	No Connection	-	-	10	No Connection	-	-
11	DLCDD4	PG0	Pin 75	12	DLCDD5	PG1	Pin 74
13	DLCDD6	PG2	Pin 73	14	DLCDD7	PG3	Pin 72

Table 5-4: LCD Header Connections

5.7 RS232 Serial Port

Serial port SCI1 is connected to the standard RS232 header fitted to the RSK. Alternatively, serial port SCI0 or SCI2 can be connected to the RS232 transceiver by making changes to the configurations to the jumpers and option links (refer to §6). Connections between the RS232 header and the microcontroller are listed in **Table 5-5** below.

Circuit Net Name	Function	MCU Connection		RS232 Connection
		Port	Pin	
TXD0	SCI0 TXD0 Transmit Signal.	PB2	48	Pin 2*
RXD0	SCI0 RXD0 Receive Signal.	PB1	49	Pin 3*
TXD1	SCI1 TXD1 Transmit Signal.	PD3	29	Pin 2
RXD1	SCI1 RXD1 Receive Signal.	PD5	26	Pin 3
TXD2	SCI2 TXD2 Transmit Signal.	P02	5	Pin 8*
RXD2	SCI2 RXD2 Receive Signal.	P03	4	Pin 7*
RS232TX	External RS232 Transmit Signal.	N/A	-	Pin 2*
RS232RX	External RS232 Receive Signal.	N/A	-	Pin 3*
TDO(SCI Boot)	SCI Boot Transmit Signal.	TDO	46	Pin 2*
TDI(SCI Boot)	SCI Boot Receive Signal.	TDI	44	Pin 3*

Table 5-5: Serial Port Connections

* This connection is a not available in the default RSK configuration - refer to §6 for the required modifications.

5.8 Local Interconnect Network (LIN)

A LIN transceiver IC is fitted to the RSK, and connected to the SCI12 MCU peripheral. For further details regarding the LIN protocol and supported modes of operation, please refer to the RX63T Group hardware manual.

Connections between the LIN connector and the microcontroller are listed in **Table 5-6** below.

LIN Signal	Function	MCU Connection	
		Port	Pin
LINTXD	LIN Transmit Signal	PB5	40
LINRXD	LIN Receive Signal	PB6	39
LINNSLP	LIN Transceiver Device Sleep Control	PG6	62

Table 5-6: LIN Connections

5.9 Controller Area Network (CAN)

A CAN transceiver IC is fitted to the RSK, and connected to the CAN MCU peripheral. For further details regarding the CAN protocol and supported modes of operation, please refer to the RX63T Group hardware manual.

Connections between the CAN connector and the microcontroller are listed in **Table 5-7** below.

CAN Signal	Function	MCU Connection	
		Port	Pin
CTX1	CAN Transmit Signal	P23	92
CRX1	CAN Receive Signal	P22	93
CANEN	CAN Enable Signal	P35	58
CANSTB	CAN Strobe Signal	P12	135
CANERRn	CAN Error Signal	PC5	96

Table 5-7: CAN Connections

5.10 Universal Serial Bus (USB)

This RSK device is fitted with a USB host socket (type A) and a function socket (type Mini B). USB module USB0 is connected to the host and function socket, and can operate as either a host or function device. The connections for the USB0 module are shown in **Table 5-8** on the next page.

USB Signal	Function	MCU Connection	
		Port	Pin
USB0DP	Positive differential data signal.	USB0_DP	144
USB0DM	Negative differential data signal.	USB0_DM	143
USB0VBUS	Function VBUS Cable monitor pin.	PE5	2
USB0VBUSEN	VBUS power supply enable.	P13	15
USB0OVRCURA	Over-current detection signal A.	PE1	22
USB0DPUPE	Positive differential data pull-up control signal (Function).	USB0_DPUPE	141

Table 5-8: USB0 Module Connections

6. Configuration

6.1 Modifying the RSK

This section lists the option links that are used to modify the way RSK operates in order to access different configurations. Configurations are made by modifying link resistors or headers with movable jumpers or by configuration DIP switches

A link resistor is a 0Ω surface mount resistor, which is used to short or isolate parts of a circuit. Option links are listed in the following sections, detailing their function when fitted or removed. Bold, blue text indicates the default configuration that the RSK is supplied with. Refer to the component placement diagram (§3) to locate the option links, jumpers and DIP switches.

When removing soldered components, always ensure that the RSK is not exposed to a soldering iron for intervals greater than 5 seconds. This is to avoid damage to nearby components mounted on the RSK.

When modifying a link resistor, always check the related option links to ensure there is no possible signal contention or short circuits. Because some of the MCU's pins are multiplexed, some of the peripherals must be used exclusively. Refer to the RX63T Group hardware manual and RSKRX63T144 board schematics for further information.

6.2 MCU Operating Modes

Table 6-1 below details the option links associated with configuring the MCU operating modes.

Reference	Pin 1	Pin2	Comment	Related Ref.
SW4	**OFF**	**OFF**	**Single Chip Mode**	-
	OFF	ON	Single Chip Mode	-
	ON	OFF	User Boot Mode USB Boot Mode	R114
	ON	ON	Boot Mode (SCI)	-

Table 6-1: MCU Operating Mode Option Links

Table 6-2 below details the option links associated with configuring the USB Boot Mode Power Configuration.

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
R114	Self-Powered	**Bus Powered**	SW4

Table 6-2: USB Boot Mode Power Option Links

Table 6-3 below details the function of the jumpers associated with the emulator.

Reference	Position One	Position Two	Position Three	Related Ref.
J6	Pin 1 and Pin 2 shorted: E1 debugs with Hot plug-in. (Connects Board_VCC via R55)	**Pin 2 and Pin 3 shorted:** **E1 debugs normally.** **Microcontroller single operation (without E1).** **(Connects GROUND via R48)**	All open: DO NOT SET.	-

Table 6-3: Emulator Configuration

6.3 Power Supply Configuration

Table 6-4 below details the function of the option links associated with power supply configuration.

Signal Name	Exclusive Function		Header connection		
	Function	IC Pin	Header Pin	Fit	Remove
PWR	**Connected to the power supply circuit.**	**-**	**-**	**R190**	**-**
	Disconnect.	-	-	-	R190
CON_5V	**Connected to the power supply circuit.**	**-**	**JA1.1**	**R23**	**-**
	Disconnect.	-		-	R23
Unregulated_VCC	Connected to the power supply circuit.	-	JA6.23	R202	-
	Disconnect.	**-**		**-**	**R202**
Board_5V	**Connects Board_5V to Board_VCC.**	**-**	**-**	**J8:2-3**/R60	**-**
	Disconnect.	-	-	J8:1-2/Open	**R60**
Board_3V3	Connects Board_3V3 to Board_VCC via regulator IC.	U6.OUT	-	J8:1-2	**R60**
	Disconnect.	**-**	**-**	**J8:2-3**/J8:Open/R60	**-**
CON_3V3	Connected to the power supply circuit.	-	JA1.3	R24	-
	Disconnect.	**-**		**-**	**R24**
UC_VCC	**Connected to the power supply MCU.**	**-**	**-**	**R59**/J7:1-2shorted	**-**
	Enable current probe(J7*) for MCU	-	-	J7:Open	R59
VBUS	Self-Powered	-	-	R231	R217, R232
	Bus-Powered	**-**	**-**	**R217, R232**	**R231**
5VUSB Board_VCC	Connects 5VUSB to USB HOST power supply IC.	**U4.7**	-	R71, **R201**	R70
	Connects Board_VCC to USB HOST power supply IC.		**-**	**R70**	**R71,** R201
VBAT Board_5V	Connects VBAT (J9.1) to BAT Pin of LIN Transceiver.	**U5.7**	J9.1	-	R102
	Connects Board_5V to BAT Pin of LIN Transceiver.		**-**	**R102**	**-**

Table 6-4: Power Supply Option Links

* J7 is used for measuring current consumption. Remove R59 when measuring current on J7.

6.4 Clock Configuration

Table 6-5 below details the function of the option links associated with Clock configuration.

Signal Name	Exclusive Function	Header connection		
	Function	Header Pin	Fit	Remove
CON_EXTAL	Connects external clock or Micro controller pin headers to MCU (pin 19).	JA2.2, J1.19	R99	R105
	Disconnect.		**-**	**R99**
EXTAL	**Connects X1 (MCU. pin 19) to the crystal X1.**	**-**	**R105**	**R99**
	Disconnect.	-	-	R105
CON_XTAL	Connects Micro controller pin headers to MCU (pin 17).	J1.17	R104	R97
	Disconnect.		**-**	**R104**
XTAL	**Connects X1 (MCU. pin 17) to the crystal X1.**	**-**	**R97**	**R99**
	Disconnect.	-	-	R97

Table 6-5: Clock Option Links

6.5 ADC & Analog power supply Configuration

Table 6-6 below details the function of the option links associated with ADC & Analog power supply configuration.

Signal Name	MCU		Exclusive function			Header connection		
	Port	MCU Pin	Signal	Fit	Remove	Header Pin	Fit	Remove
AVREFH0	-	128	**UC_VCC**	**R220**	**R221, R222**	**-**	**-**	**-**
			CON_AVREFH0	R222	R220, **R221**	JA1.7, J4.20	-	-
			Board_5V	R221	R220, **R222**	-	-	-
AVREFL0	-	129	**GROUND**	**R225**	**R227**	**-**	**-**	**-**
			CON_AVREFL0	R227	R225	J4.21	-	-
AVCC0	-	127	**UC_VCC**	**R214**	**R215, R216**	**-**	**-**	**-**
			CON_AVCC0	R216	R214, **R215**	JA1.5, J4.19	-	-
			Board_5V	R215	R214, **R216**	-	-	-
AVSS0	-	130	**GROUND**	**R209**	**R211**	**-**	**-**	**-**
			CON_AVSS0	R211	R209	JA1.6, J4.22	-	-
AVREF	-	103	**UC_VCC**	**R196**	**R197, R198**	**-**	**-**	**-**
			CON_AVREF	R198	R196, **R197**	J3.31	-	-
			Board_5V	R197	R196, **R198**	-	-	-
AVCC	-	102	**UC_VCC**	**R195**	**R193, R194**	**-**	**-**	**-**
			CON_AVCC	R193	**R194**, R195	J3.30	-	-
			Board_5V	R194	**R193**, R195	-	-	-
AVSS	-	104	**GROUND**	**R199**	**R200**	**-**	**-**	**-**
			CON_AVSS	R200	R199	J3.32	-	-
power supply for AN000 (RV1)	P40	126	**Board_VCC**	**R235**	**R234, R236**	**-**	**-**	**-**
			CON_AVCC0	R234	R235, **R236**	JA1.5	-	-
			Board_5V	R236	**R234**, R235	-	-	-
AN000 (RV1)			**AN000(RV1)**	**R172**	**-**	**JA1.9, J4.18**	**-**	**-**

Table 6-6: ADC & Analog power supply Option Links

6.6 Bus Configuration

Table 6-7 and Table 6-8 below details the function of the option links associated with Bus configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
A11_IRQ2-DS	PE3	12	A11	-	R115	R134	JA3.12	-	-
			IRQ2-DS	**-**	**R134**	**R115**	**JA2.23**	**R156**	**R154, R155**
			IRQ2-DS(SW3)	**-**	**R134, R174**	**R115, R145, R173**			
WR0n_WRn_USB0OVRCURA	PE1	22	WR0n	-	R37	**R77**, R83	JA3.48	-	-
			WRn	-	R77	**R37**, R83	JA3.26	-	-
			USB0OVRCURA	**U4.2**	**R83**	**R37, R77**	**-**	**-**	**-**
A12_GTIOC3B	PD0	32	A12	-	R109	R157	JA3.13	-	-
			GTIOC3B	**-**	**R157**	**R109**	**JA2.22**	**-**	**-**
LINRXD_A18	PB6	39	**LINRXD**	**U5.1**	**R146**	**R44**	**LIN.2**	**-**	**-**
			A18	-	R44	R146	JA3.39	-	-

Table 6-7: Bus Option Links (1)

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
LINTXD_A17	PB5	40	LINTXD	U5.4	R132	R47	LIN.2	-	-
			A17	-	R47	R132	JA3.38	-	-
A16_IRQ3-DS	PB4	42	A16	-	R49	R15	JA3.37	-	-
			IRQ3-DS	-	R15	R49	JA1.23	R16	R17
A15_MTIOC0A_SCK0	PB3	47	A15	-	R100	R107, R165	JA3.16	-	-
			MTIOC0A	-	R107	R100, R165	JA1.23	R17	R16
			SCK0	-	R165	R100, R107	JA2.10	-	-
A13_POE4n	P96	61	A13	-	R66, R95	R93	JA3.14	-	-
			POE4n	-	R66, R93	R95	JA5.16	-	-
A8_MTIC5V	P81	132	A8	-	R120	R85	JA3.9	-	-
			MTIC5V	-	R85	R120	JA5.13	R182	-
							JA6.15	-	-
A9_MTIC5W	P80	134	A9	-	R118	R91	JA3.10	-	-
			MTIC5W	-	R91	R118	JA6.16	-	-
							JA5.14	R29	-
D0_MTIOC4D	P76	76	D0	-	R92	R94	JA3.17	-	-
			MTIOC4D	-	R94	R92	JA2.18	-	-
D1_MTIOC4C	P75	77	D1	-	R89	R138	JA3.18	-	-
			MTIOC4C	-	R138	R89	JA2.16	-	-
D2_MTIOC3D	P74	78	D2	-	R86	R161	JA3.19	-	-
			MTIOC3D	-	R161	R86	JA2.14	-	-
D3_MTIOC4B	P73	79	D3	-	R82	R159	JA3.20	-	-
			MTIOC4B(LED2)	-	R159	R82	JA2.17	-	-
			MTIOC4B						
D4_MTIOC4A	P72	80	D4	-	R81	R160	JA3.21	-	-
			MTIOC4A(LED1)	-	R160	R81	JA2.15	-	-
			MTIOC4A						
D5_MTIOC3B	P71	81	D5	-	R79	R162	JA3.22	-	-
			MTIOC3B(LED0)	-	R162	R79	JA2.13	-	-
			MTIOC3B						
D6_POE0n	P70	82	D6	-	R206, R213	R210	JA3.23	-	-
			POE0n	-	R206, R210	R213	JA2.24	-	-
D7_MTIOC3A	P33	83	D7	-	R78	R148	JA3.24	-	-
			MTIOC3A(LED3)	-	R148	R78	JA6.13	-	-
			MTIOC3A						
D8_MTIOC3C	P32	84	D8	-	R65	R164	JA3.29	-	-
			MTIOC3C	-	R164	R65	JA2.11	-	-
D9_MTCLKC	P31	86	D9	-	R63	R183	JA3.30	-	-
			MTCLKC	-	R183	R63	JA5.17	-	-
D10_MTCLKD	P30	88	D10	-	R62	R184	JA3.31	-	-
			MTCLKD	-	R184	R62	JA5.18	-	-
CS0n_SDA1	P26	89	CS0n	-	R31	R36	JA3.27	-	-
			SDA1	-	R36	R31	JA1.25	R9	-
CS1n_SCL1	P25	90	CS1n	-	R67	R35	JA3.28	-	-
			SCL1	-	R35	R67	JA1.26	R13	-
D12_CTX1	P23	92	D12	-	R58	R8	JA3.33	-	-
			CTX1	U3.1	R8, R46	R58	JA5.5	-	-
				-	R8				
D13_CRX1	P22	93	D13	-	R56	R7	JA3.34	-	-
			CRX1	U3.4	R6, R7	R56	JA5.6	-	-
				-	R7				
D14_MTCLKA	P21	94	D14	-	R53	R152	JA3.35	-	-
			MTCLKA	-	R152	R53	JA2.25	-	-
D15_MTCLKB	P20	95	D15	-	R51	R151	JA3.36	-	-
			MTCLKB	-	R151	R51	JA2.26	-	-
ALE_IRQ1-DS	P11	136	ALE	-	R39	R144	JA3.46	-	-
			IRQ1-DS(SW2)	-	R144, R176	R39	JA2.9	R166	R140
			IRQ1-DS	-	R144				

Table 6-8: Bus Option Links (2)

6.7 CAN Configuration

Table 6-9 below details the function of the option links associated with CAN configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
D12_CTX1	P23	92	D12	-	R58	R8	JA3.33	-	-
			CTX1	**U3.1**	**R8, R46**	**R58**	**JA5.5**	**-**	**-**
				-	**R8**				
D13_CRX1	P22	93	D13	-	R56	R7	JA3.34	-	-
			CRX1	**U3.4**	**R6, R7**	**R56**	**JA5.6**	**-**	**-**
				-	**R7**				

Table 6-9: CAN Option Links

6.8 GPT & MTU & POE Configuration

Table 6-10 and Table 6-11 below details the function of the option links associated with GPT & MTU & POE configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
GTIOC0A_CTS0RTS0	PD7	24	GTIOC0A	-	R158	R163	JA2.19	-	-
			CTS0RTS0	**-**	**R163**	**R158**	**JA2.12**	**-**	**-**
A12_GTIOC3B	PD0	32	A12	-	R109	R157	JA3.13	-	-
			GTIOC3B	**-**	**R157**	**R109**	**JA2.22**	**-**	**-**
A15_MTIOC0A_SCK0	PB3	47	A15	-	R100	R107, **R165**	JA3.16	-	-
			MTIOC0A	**-**	**R107**	**R100, R165**	JA1.23	R17	R16
			SCK0	-	R165	**R100**, R107	JA2.10	-	-
MTIOC0B_TXD0	PB2	48	MTIOC0B	-	R141	R142	JA2.9	R140	R166
							JA5.9	R2	R4, **R3**
			TXD0	U2.13	**R142**, R170	**R141, R150**, R171, **R208**	**JA2.6**	**-**	**-**
MTIOC0C_RXD0	PB1	49	**MTIOC0C**	**-**	**R1**	**R167**	JA2.23	R154	**R155**, R156
							JA5.10	**R181**	**-**
			RXD0	U2.15	R139, R167	R1, **R149**, R233, **R219**	JA2.8	-	-
MTIOC1A_ADTRG1n	PA5	52	MTIOC1A	-	R136	R74	JA2.23	R155	R156, **R154**
			ADTRG1n (SW3)	-	**R74,** R173	**R136, R145,** R174	JA1.8	R21	R20
			ADTRG1n	**-**	**R74**	**R136**			
A13_POE4n	P96	61	A13	-	**R66**, R95	R93	JA3.14	-	-
			POE4n	**-**	**R66, R93**	**R95**	**JA5.16**	**-**	**-**
MTIC5U	P82	131	**MTIC5U**	**-**	**-**	**-**	**JA5.12**	**R30**	**-**
							JA6.14 J4.23	**-**	**-**
A8_MTIC5V	P81	132	A8	-	R120	R85	JA3.9	-	-
			MTIC5V	**-**	**R85**	**R120**	**JA5.13**	**R182**	**-**
							JA6.15	**-**	**-**

Table 6-10: GPT & MTU & POE Option Links (1)

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
A9_MTIC5W	P80	134	A9	-	R118	R91	JA3.10	-	-
			MTIC5W	**-**	**R91**	**R118**	**JA6.16**	**-**	**-**
							JA5.14	**R29**	**-**
D0_MTIOC4D	P76	76	D0	-	R92	R94	JA3.17	-	-
			MTIOC4D	**-**	**R94**	**R92**	**JA2.18**	**-**	**-**
D1_MTIOC4C	P75	77	D1	-	R89	R138	JA3.18	-	-
			MTIOC4C	**-**	**R138**	**R89**	**JA2.16**	**-**	**-**
D2_MTIOC3D	P74	78	D2	-	R86	R161	JA3.19	-	-
			MTIOC3D	**-**	**R161**	**R86**	**JA2.14**	**-**	**-**
D3_MTIOC4B	P73	79	D3	-	R82	R159	JA3.20	-	-
			MTIOC4B(LED2)	**-**	**R159**	**R82**	**JA2.17**	**-**	**-**
			MTIOC4B						
D4_MTIOC4A	P72	80	D4	-	R81	R160	JA3.21	-	-
			MTIOC4A(LED1)	**-**	**R160**	**R81**	**JA2.15**	**-**	**-**
			MTIOC4A						
D5_MTIOC3B	P71	81	D5	-	R79	R162	JA3.22	-	-
			MTIOC3B(LED0)	**-**	**R162**	**R79**	**JA2.13**	**-**	**-**
			MTIOC3B						
D6_POE0n	P70	82	D6	-	**R206**, R213	**R210**	JA3.23	-	-
			POE0n	**-**	**R206, R210**	**R213**	**JA2.24**	**-**	**-**
D7_MTIOC3A	P33	83	D7	-	R78	R148	JA3.24	-	-
			MTIOC3A(LED3)	**-**	**R148**	**R78**	**JA6.13**	**-**	**-**
			MTIOC3A						
D8_MTIOC3C	P32	84	D8	-	R65	R164	JA3.29	-	-
			MTIOC3C	**-**	**R164**	**R65**	**JA2.11**	**-**	**-**
D9_MTCLKC	P31	86	D9	-	R63	R183	JA3.30	-	-
			MTCLKC	**-**	**R183**	**R63**	**JA5.17**	**-**	**-**
D10_MTCLKD	P30	88	D10	-	R62	R184	JA3.31	-	-
			MTCLKD	**-**	**R184**	**R62**	**JA5.18**	**-**	**-**
D14_MTCLKA	P21	94	D14	-	R53	R152	JA3.35	-	-
			MTCLKA	**-**	**R152**	**R53**	**JA2.25**	**-**	**-**
D15_MTCLKB	P20	95	D15	-	R51	R151	JA3.36	-	-
			MTCLKB	**-**	**R151**	**R51**	**JA2.26**	**-**	**-**

Table 6-11: GPT & MTU & POE Option Links (2)

6.9 I2C Configuration

Table 6-12 below details the function of the option links associated with the I2C configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
CS0n_SDA1	P26	89	CS0n	-	R31	R36	JA3.27	-	-
			SDA1	**-**	**R36**	**R31**	**JA1.25**	**R9**	**-**
CS1n_SCL1	P25	90	CS1n	-	R67	R35	JA3.28	-	-
			SCL1	**-**	**R35**	**R67**	**JA1.26**	**R13**	**-**
Board_VCC	-	-	**Pull-up**	**-**	**R11**	**R28**	**-**	**-**	**-**
Board_5V	-	-	Pull-up	-	R28	R11	-	-	-

Table 6-12: I2C Option Links

6.10 I/O Port Configuration

Table 6-13 below details the function of the option links associated with the I/O Port configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
IO2_IRQ5	PF2	35	IO2	-	R18	R27	JA1.17	-	-
			IRQ5	**-**	**R27**	**R18**	**JA5.9**	**R4**	**R3, R2**

Table 6-13: I/O Port Option Links

6.11 IRQ & Switch Configuration

Table 6-14 below details the function of the option links associated with the IRQ & Switches configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
IO2_IRQ5	PF2	35	IO2	-	R18	R27	JA1.17	-	-
			IRQ5	**-**	**R27**	**R18**	**JA5.9**	**R4**	**R3, R2**
A11_IRQ2-DS	PE3	12	A11	-	R115	R134	JA3.12	-	-
			IRQ2-DS	**-**	**R134**	**R115**	**JA2.23**	**R156**	**R154, R155**
			IRQ2-DS(SW3)	**-**	**R134, R174**	**R115, R145, R173**			
A16_IRQ3-DS	PB4	42	A16	-	R49	R15	JA3.37	-	-
			IRQ3-DS	**-**	**R15**	**R49**	**JA1.23**	**R16**	**R17**
MTIOC1A_ADTRG1n	PA5	52	MTIOC1A	-	R136	R74	JA2.23	R155	R156, **R154**
			ADTRG1n(SW3)	-	**R74,** R173	**R136, R145,** R174	JA1.8	R21	R20
			ADTRG1n	**-**	**R74**	**R136**			
ADTRG0n	PA4	53	ADTRG0n(SW3)	-	R145	**R173,** R174	**JA1.8**	**R20**	**R21**
							J2.17	**-**	**-**
			ADTRG0n	**-**	**-**	**-**	**JA1.8**	**R20**	**R21**
							J2.17	**-**	**-**
ALE_IRQ1-DS	P11	136	ALE	-	R39	R144	JA3.46	-	-
			IRQ1-DS(SW2)	**-**	**R144, R176**	**R39**	**JA2.9**	**R166**	**R140**
			IRQ1-DS	**-**	**R144**				
IRQ0-DS	P10	137	**IRQ0-DS**	**-**	**-**	**-**	**JA2.7**	**R168**	**R169**
							J4.29	**-**	**-**
			IRQ0-DS(SW1)	**-**	**R178**	**-**	**JA2.7**	**R168**	**R169**
							J4.29	**-**	**-**

Table 6-14: IRQ & Switches Option Links

6.12 LIN Configuration

Table 6-15 below details the function of the option links associated with the LIN transceiver.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
LINTXD_A17	PB5	40	**LINTXD**	**U5.4**	**R132**	**R47**	**LIN.2**	**-**	**-**
			A17	-	R47	R132	JA3.38	-	-
LINRXD_A18	PB6	39	**LINRXD**	**U5.1**	**R146**	**R44**	**LIN.2**	**-**	**-**
			A18	-	R44	R146	JA3.39	-	-
VBAT Board_5V	-	-	Connects VBAT (J9.1) to BAT Pin of LIN Transceiver.	**U5.7**	-	-	J9.1	-	R102
			Connects Board_5V to BAT Pin of LIN Transceiver.		**-**	**-**	**-**	**R102**	**-**

Table 6-15: LIN Option Links

Table 6-16 below details the function of the option links associated with the LIN mode select.

Mode	Resistor	
	Fit	Remove
LIN Master mode*	**R117, R125**	**-**
LIN Slave mode*	-	R117, R125

Table 6-16: LIN Option Links

*In case of check LIN operation, prepare CPU board two sets and change one set into a slave mode setting.

6.13 SCI & RS232 Serial Port Configuration

Table 6-17 below details the function of the option links associated with serial port configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
A15_MTIOC0A_SCK0	PB3	47	A15	-	R100	R107, **R165**	JA3.16	-	-
			MTIOC0A	**-**	**R107**	**R100, R165**	JA1.23	R17	R16
			SCK0	-	R165	**R100**, R107	JA2.10	-	-
MTIOC0B_TXD0	PB2	48	MTIOC0B	-	R141	R142	JA2.9	R140	R166
							JA5.9	R2	R4, **R3**
			TXD0	U2.13	**R142**, R170	**R141, R150,** R171, **R208**	**JA2.6**	**-**	**-**
MTIOC0C_RXD0	PB1	49	**MTIOC0C**	**-**	**R1**	**R167**	JA2.23	R154	**R155**, R156
							JA5.10	**R181**	**-**
			RXD0	U2.15	R139, R167	R1, **R149**,R233, **R219**	JA2.8	-	-
TXD1	PD3	29	**TXD1**	**U2.13**	**R171**	**R150, R170, R208**	**JA6.8,J1.29**	-	-
RXD1	PD5	26	**RXD1**	**U2.15**	**R233**	**R149, R139, R219**	**JA6.7, J1.26**	-	-
TDO	TDO	46	TDO	U2.13	R208	**R150**, **R170**, R171	**J2.10**	**-**	**-**
			TDO	**E1.5**	**-**	**-**			
TDI	TDI	44	TDI	U2.15	R219	**R149**, **R139**,R223,	**J2.8**	**-**	**-**
			TDI	**E1.11**	**-**	**-**			
TXD2	P02	5	**TXD2**	U2.12	R189	-	**JA6.9,J1.5**	**-**	**-**
RXD2	P03	4	**RXD2**	U2.10	R188	-	**JA6.12,J1.4**	**-**	**-**
RS232TX	-	-	**RS232TX**	U2.13	R150	**R170**, R171,**R208**	**JA6.5**	**-**	**-**
RS232RX	-	-	**RS232RX**	U2.15	R149	**R139**, R233,**R219**	**JA6.6**	**-**	**-**

Table 6-17: SCI & RS232 Serial Port Option Links

6.14 USB Configuration

Table 6-18 below details the function of the option links associated with the USB Configuration.

Switch Function	MCU		Exclusive function			Header connection		
	Port	Pin	Signal	Fit	Remove	Header Pin	Fit	Remove
WR0n_WRn_USB0OVRCURA	PE1	22	WR0n	-	R37	R77, R83	JA3.48	-
			WRn	-	R77	R37, R83	JA3.26	-
			USB0OVRCURA	**U4.2**	**R83**	**R37, R77**	**-**	**-**
USB0VBUS	PE5	2	Self-Powered	-	R231	R217,R232,	-	-
			Bus-Powered	**-**	**R217,R232**	**R231**	**-**	**-**
5VUSB, Board_VCC	-	-	5VUSB	U4.7	R71,**R201**	R70	-	-
			Board_VCC	**U4.7**	**R70**	**R71,** R201	**-**	**-**

Table 6-18: USB Option Links

Table 6-19 below details the function of the option links associated with the USB mode select.

Mode	Jumper Position	Resistor	
		Fit	Remove
Host mode	J10:1-2 shorted.	R110, R126	**R101**
Function mode	**J10:2-3 shorted. (**or Fit R101)	**-**	**R110, R126**

Table 6-19: USB Option Links (mode)

7. Headers

7.1 Application Headers

This RSK is fitted with application headers, which can be used to connect compatible Renesas application devices or as easy access to MCU pins.

Table 7-1 below lists the connections of the application header, JA1.

Application Header JA1					
Pin	**Header Name** **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** **Circuit Net Name**	**MCU Pin**
1	5V CON_5V	-	2	0V GROUND	-
3	3V3 CON_3V3	-	4	0V GROUND	-
5	AVCC CON_AVCC0	127*	6	AVSS CON_AVSS	130*
7	AVREF CON_AVREFH0	128*	8	ADTRG ADTRG0n/ADTRG1n	53(ADTRG0), 52(ADTRG1)*
9	ADC0 AN000	126	10	ADC1 AN001	125
11	ADC2 AN002	124	12	ADC3 AN003	123
13	DAC0 DA0	114	14	DAC1 DA1	113
15	IO_0 IO0	33	16	IO_1 IO1	34
17	IO_2 IO2	35*	18	IO_3 IO3	30
19	IO_4 IO4	140	20	IO_5 IO5	55
21	IO_6 IO6	51	22	IO_7 IO7	59
23	IRQ3/IRQAEC/M2_HSIN0 IRQ3-DS/NC/MTIOC0A	42/NC/47*	24	IIC_EX NC	NC
25	IIC_SDA JA1_SDA (SDA1)	89	26	IIC_SCL JA1_SCL (SCL1)	90

Table 7-1: Application Header JA1 Connections

* Connection made through option link.

Table7-2 below lists the connections of the application header, JA2.

Application Header JA2					
Pin	**Header Name** **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** **Circuit Net Name**	**MCU Pin**
1	RESET RESn	16	2	EXTAL CON_EXTAL	19
3	NMI NMI	21	4	Vss1 GROUND	-
5	WDT_OVF NC	NC	6	SCIaTX TXD0	48
7	IRQ0/WKUP/M1_HSIN0 IRQ0-DS/NC/MTIOC0A	137/NC/47*	8	SCIaRX RXD0	49*
9	IRQ1/M1_HSIN1 IRQ1-DS/MTIOC0B	136/48*	10	SCIaCK SCK0	47*
11	M1_UD MTIOC3C	84	12	CTSRTS CTS0RTS0	24
13	M1_UP MTIOC3B	81	14	M1_UN MTIOC3D	78
15	M1_VP MTIOC4A	80	16	M1_VN MTIOC4C	77
17	M1_WP MTIOC4B	79	18	M1_WN MTIOC4D	76
19	TimerOut GTIOC0A	24*	20	TimerOut GTIOC3A	31
21	TimerIn GTIOC0B	25	22	TimerIn GTIOC3B	32
23	IRQ2/M1_EncZ/M1_HSIN2 IRQ2-DS/MTIOC1A/MTIOC0C	12/52*/49*	24	M1_POE POE0n	82
25	M1_TRCCLK MTCLKA	94	26	M1_TRDCLK MTCLKB	95

Table 7-2: Application Header JA2 Connections

* Connection made through option link.

Table7-3 and **Table7-4** below lists the connections of the application header, JA3.

Application Header JA3 (Bus)					
Pin	**Header Name** **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** **Circuit Net Name**	**MCU Pin**
1	A0 A0	98	2	A1 A1	99
3	A2 A2	107	4	A3 A3	108
5	A4 A4	109	6	A5 A5	110
7	A6 A6	115	8	A7 A7	116
9	A8 A8	132*	10	A9 A9	134*
11	A10 A10	11	12	A11 A11	12*
13	A12 A12	32*	14	A13 A13	61*
15	A14 A14	50	16	A15 A15	47*
17	D0 D0	76*	18	D1 D1	77*
19	D2 D2	78*	20	D3 D3	79*
21	D4 D4	80*	22	D5 D5	81*
23	D6 D6	82*	24	D7 D7	83*
25	RDn RDn	7	26	WR/SDWE WRn/NC	22*/NC
27	CSa CS0n	89*	28	CSb CS1n	90*
29	D8 D8	84*	30	D9 D9	86*
31	D10 D10	88*	32	D11 D11	91
33	D12 D12	92*	34	D13 D13	93*
35	D14 D14	94*	36	D15 D15	95*

Table 7-3: Application Header JA3 Connections (1)

* Connection made through option link.

Application Header JA3 (Bus)					
Pin	Header Name Circuit Net Name	MCU Pin	Pin	Header Name Circuit Net Name	MCU Pin
37	A16 A16	42*	38	A17 A17	40*
39	A18 A18	39*	40	A19 A19	38
41	A20 NC	NC	42	A21 NC	NC
43	A22 NC	NC	44	SDCLK NC	NC
45	CSc/Wait CS2n_WAITn	138	46	ALE/SDCKE ALE/NC	136*/NC
47	HWRn/DQM1 WR1n/NC	23/NC	48	LWRn/DQM0 WR0n/NC	22*/NC
49	CAS NC	NC	50	RAS NC	NC

Table 7-4: Application Header JA3 Connections (2)

* Connection made through option link.

Table 7-5 below lists the connections of the application header, JA5.

Application Header JA5					
Pin	**Header Name** **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** **Circuit Net Name**	**MCU Pin**
1	ADC4 AN100	122	2	ADC5 AN101	121
3	ADC6 AN102	120	4	ADC7 AN103	119
5	CAN1TX CTX1	92	6	CAN1RX CRX1	93
7	CAN2TX NC	NC	8	CAN2RX NC	NC
9	IRQ4/M2_EncZ/M2HSIN1 IRQ5/MTIOC2A/MTIOC0B	35/54*/48*	10	IRQ5/M2_HSIN2 MTIOC0C	49
11	M2_UD MTIOC6C	57	12	M2_Uin MTIC5U	131
13	M2_Vin MTIC5V	132	14	M2_Win MTIC5W	134
15	M2_Toggle MTIOC6A	56	16	M2_POE POE4n	61
17	M2_TRCCLK MTCLKC	86	18	M2_TRDCLK MTCLKD	88
19	M2_UP MTIOC6B	64	20	M2_UN MTIOC6D	67
21	M2_VP MTIOC7A	65	22	M2_VN MTIOC7C	68
23	M2_WP MTIOC7B	66	24	M2_WN MTIOC7D	69

Table 7-5: Application Header JA5 Connections

* Connection made through option link.

Table 7-6 below lists the connections of the application header, JA6.

Application Header JA6					
Pin	**Header Name** / **Circuit Net Name**	**MCU Pin**	**Pin**	**Header Name** / **Circuit Net Name**	**MCU Pin**
1	DREQ / NC	NC	2	DACK / NC	NC
3	TEND / NC	NC	4	STBYn / NC	NC
5	RS232TX / RS232TX	-	6	RS232RX / RS232RX	-
7	SCIbRX / RXD1	26	8	SCIbTX / TXD1	29
9	SCIcTX / TXD2	5	10	SCIbCK / SCK1	28
11	SCIcCK / SCK2	13	12	SCIcRX / RXD2	4
13	M1_Toggle / MTIOC3A	83	14	M1_Uin / MTIC5U	131
15	M1_Vin / MTIC5V	132	16	M1_Win / MTIC5W	134
17	Reserved / NC	NC	18	Reserved / NC	NC
19	Reserved / NC	NC	20	Reserved / NC	NC
21	Reserved / NC	NC	22	Reserved / NC	NC
23	Unregulated_VCC / Unregulated_VCC	-	24	Vss / GROUND	-

Table 7-6: Application Header JA6 Connections

7.2 Microcontroller Pin Headers

This RSK is fitted with MCU pin headers, which are used to access all the MCU's pins.

Table 7-7 below lists the connections of the microcontroller pin header, J1.

Microcontroller Pin Header J1					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	VCCUSB	1	2	USB0VBUS	2
3	EMLE	3	4	RXD2	4
5	TXD2	5	6	GROUND	-
7	RDn	7	8	NC	-
9	P00	9	10	MD_FINED	10
11	A10	11	12	A11_IRQ2-DS	12
13	SCK2	13	14	UC_VCC	-
15	USB0VBUSEN	15	16	RESn	16
17	CON_XTAL	17*	18	GROUND	-
19	CON_EXTAL	19*	20	UC_VCC	-
21	NMI	21	22	WR0n_WRn_USB0OVRCURA	22
23	WR1n	23	24	GTIOC0A_CTS0RTS0	24
25	GTIOC0B	25	26	RXD1	26
27	GROUND	-	28	SCK1	28
29	TXD1	29	30	IO3	30
31	GTIOC3A	31	32	A12_GTIOC3B	32
33	IO0	33	34	IO1	34
35	IO2_IRQ5	35	36	TRSTn	36

Table 7-7: Microcontroller Pin Header J1 Connections

* Connection made through option link.

Table 7-8 below lists the connections of the microcontroller pin header, J2.

Microcontroller Pin Header J2					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	TMS	37	2	A19	38
3	LINRXD_A18	39	4	LINTXD_A17	40
5	NC	-	6	A16_IRQ3-DS	42
7	NC	-	8	TDI	44
9	TCK_FINEC	45	10	TDO	46
11	A15_MTIOC0A_SCK0	47	12	MTIOC0B_TXD0	48
13	MTIOC0C_RXD0	49	14	A14	50
15	IO6	51	16	MTIOC1A_ADTRG1n	52
17	ADTRG0n	53	18	MTIOC2A	54
19	IO5	55	20	MTIOC6A	56
21	MTIOC6C	57	22	CANEN	58
23	IO7	59	24	UC_VCC	-
25	A13_POE4n	61	26	LINNSLP	62
27	GROUND	-	28	MTIOC6B	64
29	MTIOC7A	65	30	MTIOC7B	66
31	MTIOC6D	67	32	MTIOC7C	68
33	MTIOC7D	69	34	DLCDE	70
35	DLCDRS	71	36	DLCDD7	72

Table 7-8: Microcontroller Pin Header J2 Connections

Table 7-9 below lists the connections of the microcontroller pin header, J3.

Microcontroller Pin Header J3					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	DLCDD6	73	2	DLCDD5	74
3	DLCDD4	75	4	D0_MTIOC4D	76
5	D1_MTIOC4C	77	6	D2_MTIOC3D	78
7	D3_MTIOC4B	79	8	D4_MTIOC4A	80
9	D5_MTIOC3B	81	10	D6_POE0n	82
11	D7_MTIOC3A	83	12	D8_MTIOC3C	84
13	UC_VCC	-	14	D9_MTCLKC	86
15	GROUND	-	16	D10_MTCLKD	88
17	CS0n_SDA1	89	18	CS1n_SCL1	90
19	D11	91	20	D12_CTX1	92
21	D13_CRX1	93	22	D14_MTCLKA	94
23	D15_MTCLKB	95	24	CANERRn	96
25	PC4	97	26	A0	98
27	A1	99	28	PC3	100
29	PC2	101	30	CON_AVCC	102*
31	CON_AVREF	103*	32	CON_AVSS	104*
33	PC1	105	34	PC0	106
35	A2	107	36	A3	108

Table 7-9: Microcontroller Pin Header J3 Connections

* Connection made through option link.

Table 7-10 below lists the connections of the microcontroller pin header, J4.

Microcontroller Pin Header J4					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	A4	109	2	A5	110
3	P57	111	4	P56	112
5	DA1	113	6	DA0	114
7	A6	115	8	A7	116
9	P51	117	10	P50	118
11	AN103	119	12	AN102	120
13	AN101	121	14	AN100	122
15	AN003	123	16	AN002	124
17	AN001	125	18	AN000	126
19	CON_AVCC0	127*	20	CON_AVREFH0	128*
21	CON_AVREFL0	129*	22	CON_AVSS0	130*
23	MTIC5U	131	24	A8_MTIC5V	132
25	GROUND	-	26	A9_MTIC5W	134
27	CANSTB	135	28	ALE_IRQ1-DS	136
29	IRQ0-DS	137	30	CS2n_WAITn	138
31	UC_VCC	-	32	IO4	140
33	USB0DPUPE	141	34	GROUND	-
35	NC	-	36	NC	-

Table 7-10: Microcontroller Pin Header J4 Connections

* Connection made through option link.

8. Code Development

8.1 Overview

For all code debugging using Renesas software tools, the RSK board must be connected to a PC via an E1/E20 debugger. An E1 debugger is supplied with this RSK product.

For further information regarding the debugging capabilities of the E1/E20 debuggers, refer to E1/E20 Emulator Additional Document for User's Manual.

8.2 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 128k code and data. To use the compiler with programs greater than this size you need to purchase the full tools from your distributor.

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.

8.3 Mode Support

The MCU supports Single Chip and Boot modes, which are configured on the RSK board. Details of the modifications required can be found in §6. All other MCU operating modes are configured within the MCU's registers, which are listed in the RX63T group hardware manual.

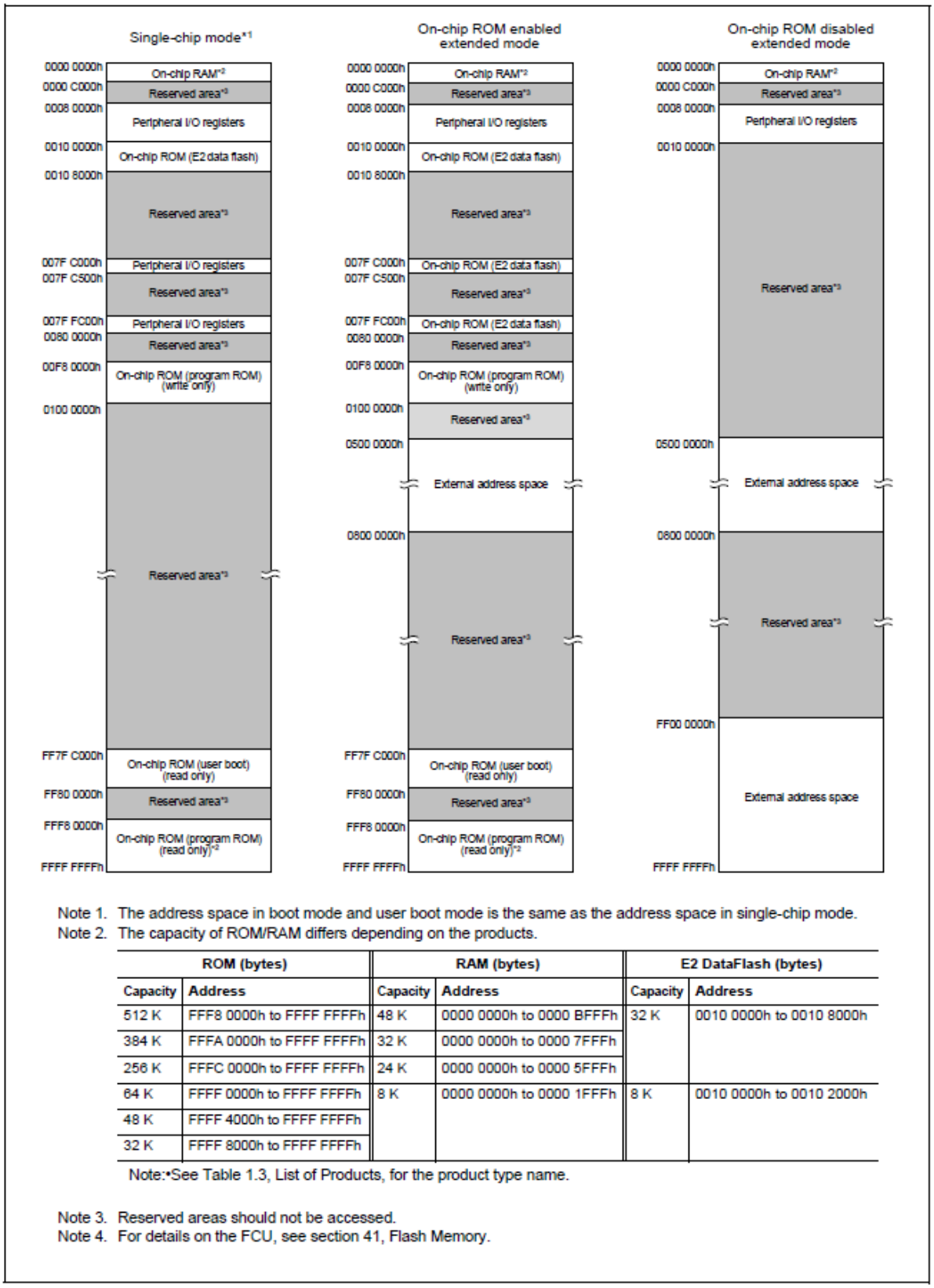
Only ever change the MCU operating mode whilst the RSK is in reset, or turned off; otherwise the MCU may become damaged as a result.

8.4 Debugging Support

The E1 emulator (as supplied with this RSK) supports break points, event points (including mid-execution insertion) and basic trace functionality. It is limited to a maximum of 8 on-chip event points, 256 software breaks and 256 branch/cycle trace. For further details, refer RX Family E1/E20 Emulator User's Manual.

8.5 Address Space

Figure 8-1 below details the address space of MCU. For further details, refer to the RX63T Group Hardware Manual.



Note 1. The address space in boot mode and user boot mode is the same as the address space in single-chip mode.
Note 2. The capacity of ROM/RAM differs depending on the products.

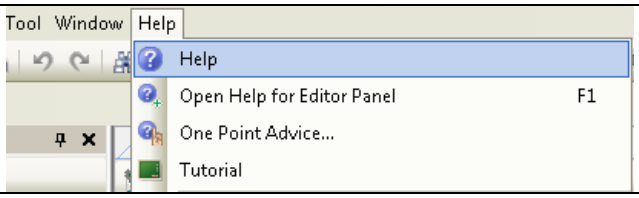
ROM (bytes)		RAM (bytes)		E2 DataFlash (bytes)	
Capacity	Address	Capacity	Address	Capacity	Address
512 K	FFF8 0000h to FFFF FFFFh	48 K	0000 0000h to 0000 BFFFh	32 K	0010 0000h to 0010 8000h
384 K	FFFA 0000h to FFFF FFFFh	32 K	0000 0000h to 0000 7FFFh		
256 K	FFFC 0000h to FFFF FFFFh	24 K	0000 0000h to 0000 5FFFh		
64 K	FFFF 0000h to FFFF FFFFh	8 K	0000 0000h to 0000 1FFFh	8 K	0010 0000h to 0010 2000h
48 K	FFFF 4000h to FFFF FFFFh				
32 K	FFFF 8000h to FFFF FFFFh				

Note:•See Table 1.3, List of Products, for the product type name.

Note 3. Reserved areas should not be accessed.
Note 4. For details on the FCU, see section 41, Flash Memory.

Figure 8-1: MCU Address Space Diagram

9. Additional Information

For details on how to use CubeSuite+, refer to the help file by opening CubeSuite+ and clicking ‘Help’ and selecting ‘Contents’.	

For information about the RX63T Group microcontrollers refer to the RX63T Group Hardware Manual.

For information about the RX assembly language, refer to the RX Family User’s Manual: Software.

Technical Contact Details

***Please refer to the contact details listed in section 8 of the* "Quick Start Guide".**

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

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REVISION HISTORY	RSKRX63T144 User's Manual

Rev.	Date	Description	
		Page	Summary
1.00	Dec 12, 2013	—	First Edition issued
1.01	Mar 19,2014	—	[2. List of Abbreviations and Acronyms] was updated.
		—	[Table of Contents] was updated.
		8	Notice was added to Table 2-1.
		11, 12	Font type of Figure 3-3 and 3-4 were changed.
		15 to 18	Table format of Table 5-2 to 5-8 were updated.
		19 to 29	Chapter 6 was renewed. (Clerical error correction is included) Table 6-1(old Table 6-1): No change Table 6-2(old Table 6-2): No change Table 6-3(old Table 6-3): No change Table 6-4 (old Table 6-9): Clerical errors were fixed. New setting was added. Table 6-5: New table was added. Table 6-6: Clerical errors were fixed. New setting was added. Table 6-7, 6-8: New tables were added. Table 6-9 (old Table 6-10): New settings were added. Table 6-10, 6-11: New tables were added. Table 6-12 (old Table 6-5): Clerical errors were fixed. Table 6-13: New table was added. Table 6-14 (old Table 6-8): New settings were added. Table 6-15 (old Table 6-4): Clerical errors were fixed. New setting was added. Table 6-16: New table was added. Table 6-17 (old Table 6-7): Clerical errors were fixed. New setting was added. Table 6-18 (old Table 6-11): Clerical errors were fixed. New setting was added. Table 6-19 (old Table 6-12): Table format was changed.
		30 to 35	Table 7-1 to 7-6 were renewed. (Clerical error correction is included) Table 7-1: Table format was changed. Table 7-2: Table format was changed. Clerical errors were fixed. Table 7-3, 7-4: Table format was changed. Clerical errors were fixed. Table 7-5: Table format was changed. Clerical errors were fixed. Table 7-6: Table format was changed. Clerical errors were fixed.
		36 to 39	Clerical errors of Table 7-7 to 7-10 were fixed.
		41	Figure 8-1 was updated.
1.02	Apr 24, 2014	16	"(pulled to ground)" was removed from Table 5-4 (DLCDE).

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