User's Manual

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RX63T144 Group

Renesas Starter Kit User's Manual
For e^{2}studio

RENESAS MCU
RX Family / RX600 Series

Renesas Electronics
www.renesas.com

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By using this Renesas Starter Kit (RSK), the user accepts the following terms:

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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 RX63T Group. 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 e^{2}studio	R20UT2121EG
Tutorial Manual	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRX63T144 Tutorial Manual for e^{2}studio	R20UT2122EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRX63T144 Quick Start Guide for e^{2}studio	R20UT2123EG
Schematics	Full detail circuit schematics of the RSK.	RSKRX63T144 Schematics	R20UT2116EG
Hardware Manual	Provides technical details of the RX63T microcontroller.	RX63T Group Hardware Manual	R01UH0331EJ

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analog-to-Digital Converter
DIP	Dual In-line Package
E1	On-chip Debugger
ESD	Electrostatic Discharge
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
NMI	Non Maskable Interrupt
PC	Personal Computer
RSK	Renesas Starter Kit

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

In order for the debug LCD to operate, the following jumper settings must be made for the different power supply options:

Jumper	RSK Powered By E1 Debugger	RSK Powered by External 5V Supply
J6	Jumper across pins 1 and 2.	Jumper across pins 2 and 3.
J7	Jumper across pins 1 and 2.	Jumper across pins 2 and 3.

Table 2-2: LCD Power Supply Options

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.

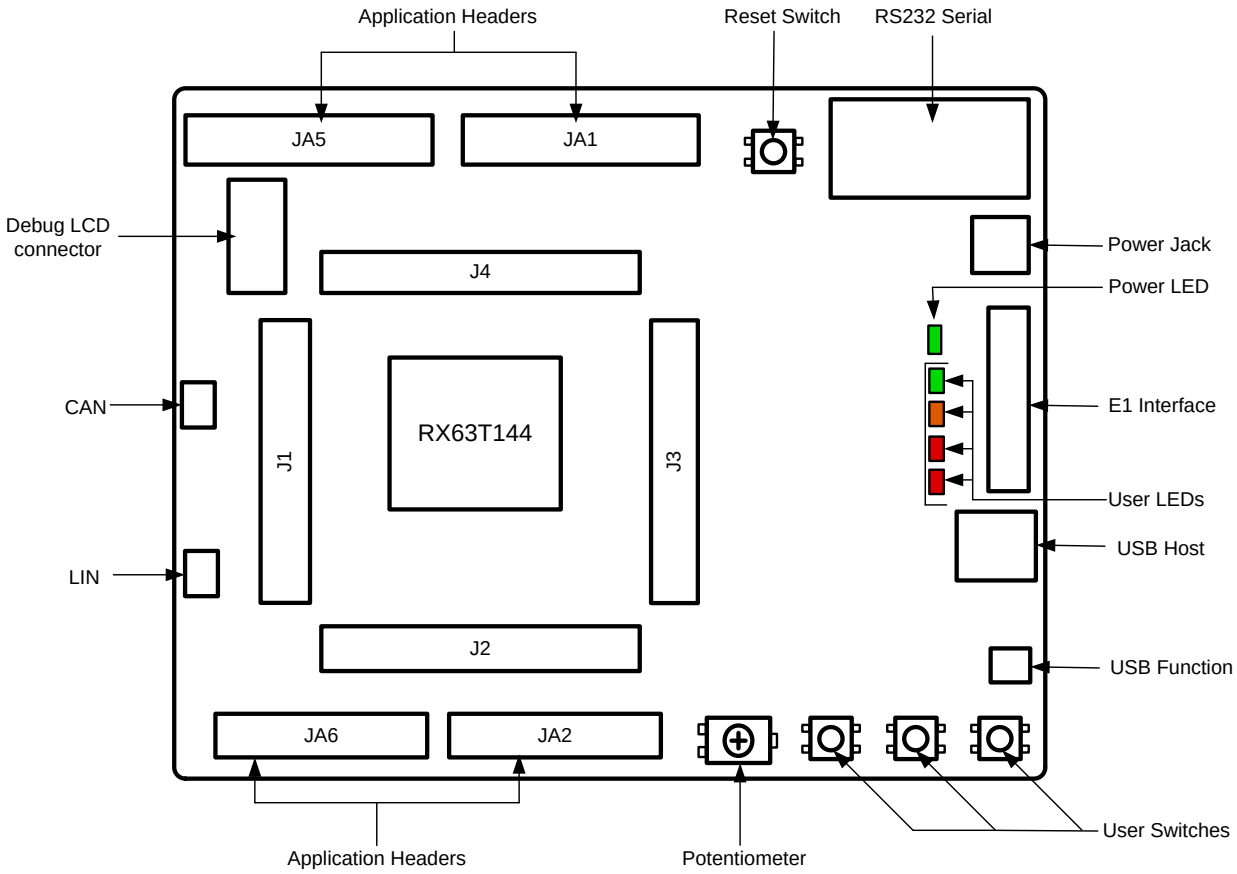


Figure 3-1: Board Layout

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.

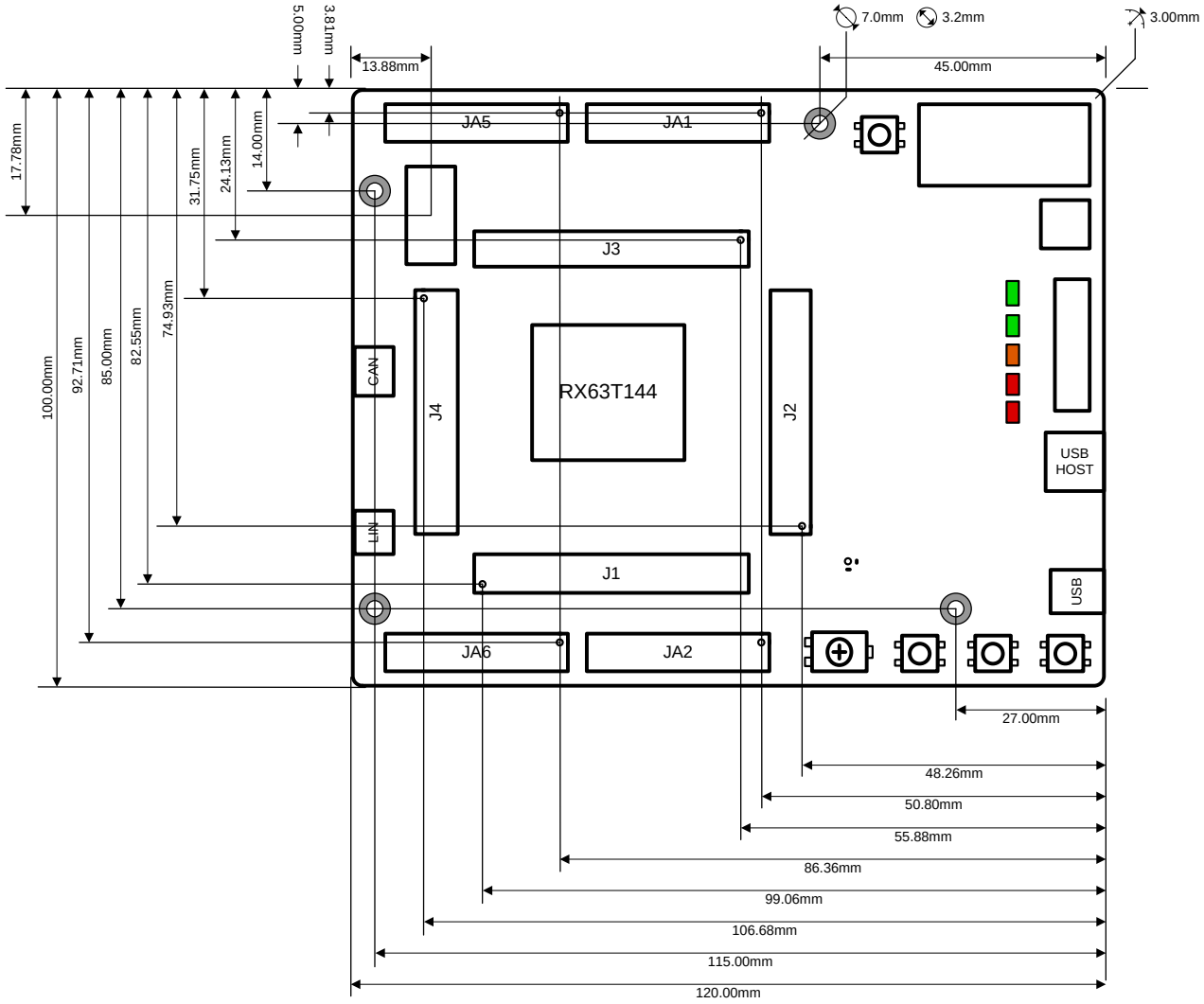


Figure 3-2: Board Dimensions

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.

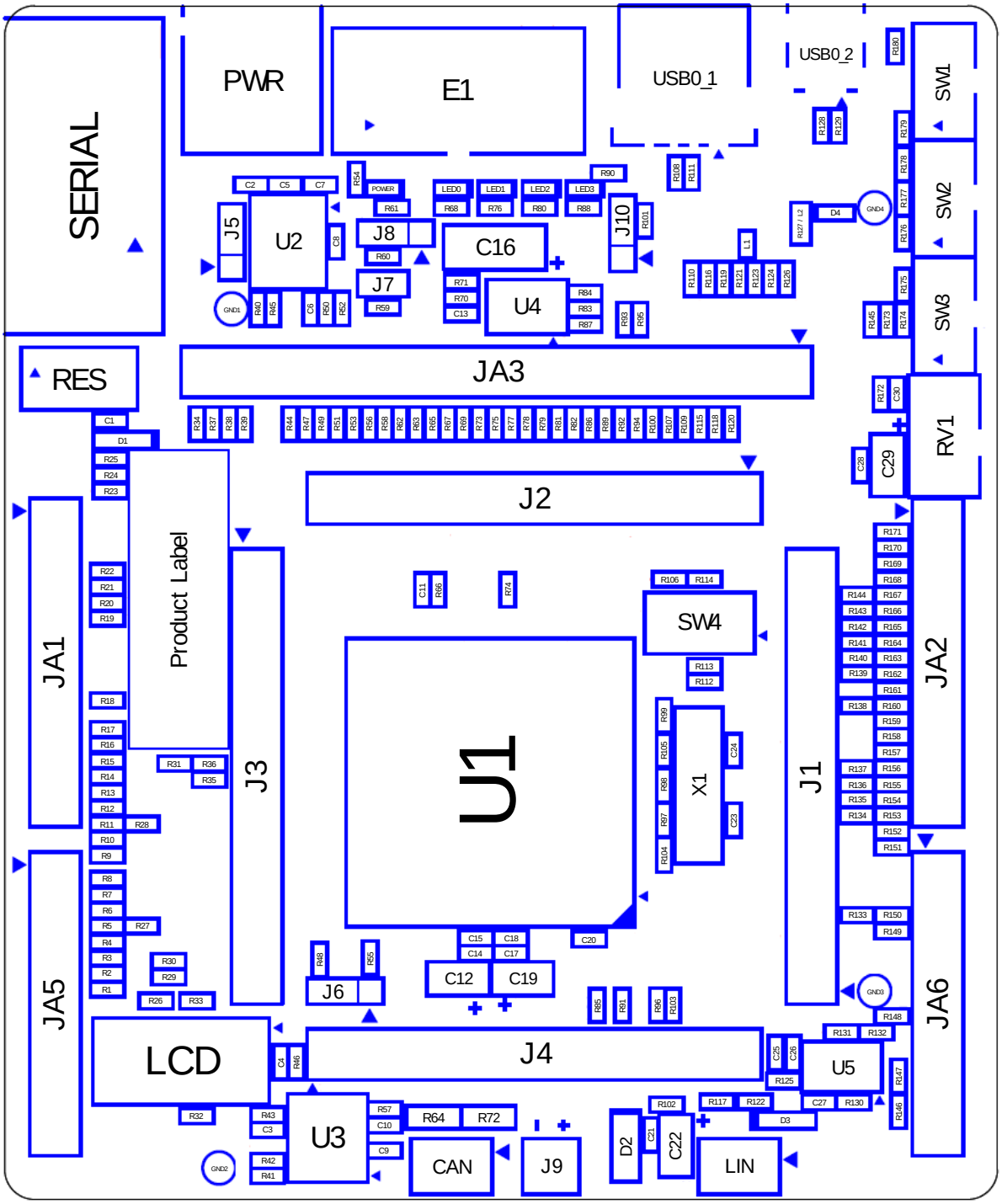


Figure 3-3: Top-Side Component Placement

4. Connectivity

4.1 Internal RSK Connections

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

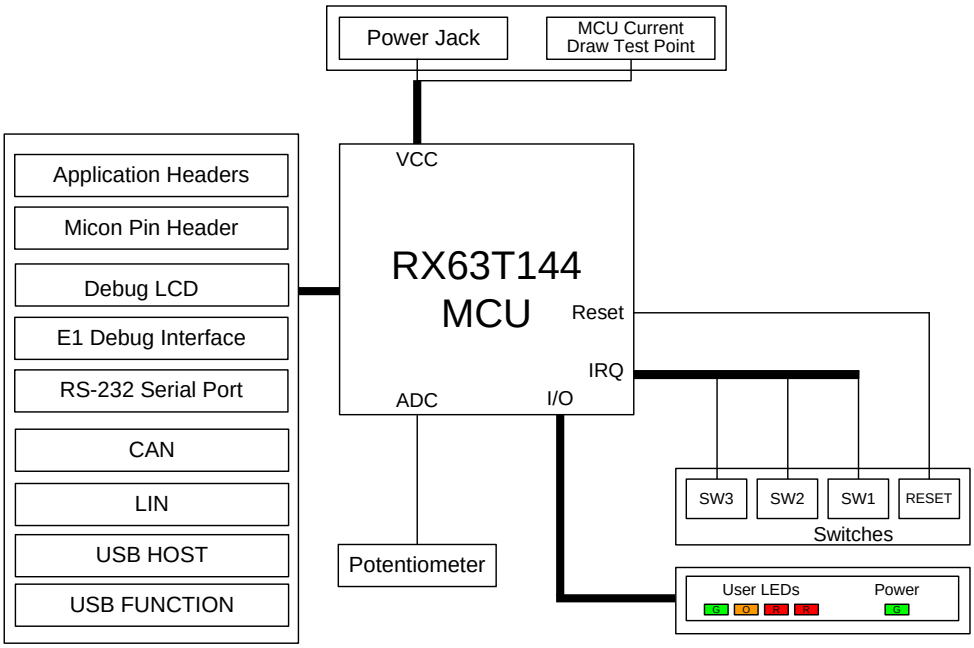


Figure 4-1: Internal RSK Block Diagram

4.2 Debugger Connections

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

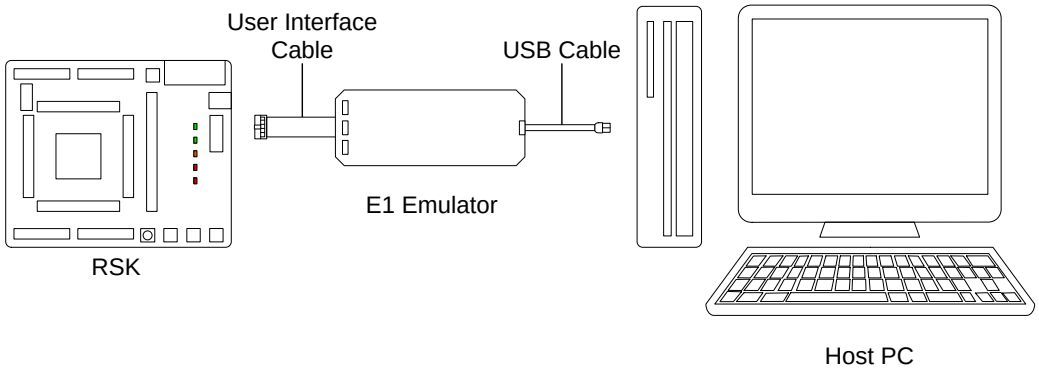


Figure 4-2: Debugger Connection Diagram

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 6).

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 RSKRX63T board schematics.

Switch	Function	MCU Connection
RES	When pressed, the microcontroller is reset.	RESn, Pin 16
SW1	Connects to an IRQ input for user controls.	IRQ0-DS, Pin 137 (P10)
SW2	Connects to an IRQ input for user controls.	IRQ1-DS, Pin 136(P11)
SW3/ADTRG	Connects to an IRQ input for user controls. The switch is also connected to an ATRG input, and is used to trigger AD conversions.	IRQ2-DS, Pin 12(PE3) and ADTRG0n, Pin 53(PA4)

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
POWER	Green	Indicates the power status	No connection
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**
1	Ground	-	2	Board_5V	-
3	No Connection	-	4	DLCDRS	PG4, pin 71
5	R/W (pulled to ground)	-	6	DLCDE (pulled to ground)	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 73

Table 5-4: LCD Header Connections

5.7 RS232 Serial Port

Serial port SCI0 is connected to the standard RS232 header fitted to the RSK. Alternatively, serial port SCI1 or SCI12 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.

SCI Signal	Function	MCU Connection	RS232 Connection
TXD0	TXD0 Transmit Signal.	PB2, Pin 48	Pin 2*
RXD0	RXD0 Receive Signal.	PB1, Pin 49	Pin 3*
TXD1	TXD1 Transmit Signal.	PD3, Pin 29	Pin 2
RXD1	RXD1 Receive Signal.	PD5, Pin 26	Pin 3
TXD2	TXD2 Transmit Signal.	P02, Pin 5	Pin 8*
RXD2	RXD2 Receive Signal.	P03, Pin 4	Pin 7*

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 RX63T144 hardware manual.

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

LIN Signal	Function	MCU Connection
LINTXD	LIN Transmit Signal	PB5, pin 40
LINRXD	LIN Receive Signal	PB6, pin 39
LINNSLP	LIN Transceiver Device Sleep Control	PG6, pin 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 RX63T144 hardware manual.

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

CAN Signal	Function	MCU Connection
CTX1	CAN Transmit Signal	P23, pin 92
CRX1	CAN Receive Signal	P22, pin 93
CANEN	CAN Enable Signal	P35, pin 58
CANSTB	CAN Strobe Signal	P12, pin 135
CANERRn	CAN Error Signal	PC5, pin 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** below.

USB Signal	Function	MCU Connection
USB0DP	Positive differential data signal.	USB0_DP, Pin 144
USB0DM	Negative differential data signal.	USB0_DM, Pin 143
USB0VBUS	Cable monitor pin.	PE5, Pin 2
USB0VBUSEN	VBUS power supply enable (Host).	P13, Pin 15
USB0OVRCURA	Over-current detection signal A.	PE1, pin 22
USB0ID	USB ID pin.	P20, Pin 45
USB0DPUPE	Positive differential data pull-up control signal (Function).	USB0_DPUPE, Pin 141

Table 5-7: 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 hardware manual and RSKRX63T board schematics for further information.

6.2 MCU Operating Modes

Table 6-1 below details the function of the jumpers associated with the MCU operating modes.

Reference	SW4 pin 1	SW4 pin2	Comment	Related Ref.
SW4	**OFF**	**Don't care**	**Single Chip Mode**	-
	ON	**OFF**	**User Boot Mode** **USB Boot Mode**	
	ON	**ON**	**Boot Mode (SCI)**	

Table 6-1: MCU Operating Mode Configuration

Table 6-2 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 (H pin connected to middle pin), E1 debugs with Hot plug-in.	**Pin 2 and pin 3 shorted (L pin connected to middle pin), E1 debugs normally. Microcontroller single operation (without E1)**	All open. DO NOT SET.	-

Table 6-2: Emulator Configuration

6.3 LIN Configuration

Table 6-4 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_A17 - LINTXD**	U5,4	**R132**	**R47**	-	-	-
			n/c		**R47**	**R132**	JA3, 38	-	-
LINRXD_A18	PB6	39	**LINRXD_A18 – LIN_RXD**	U5, 1	**R146**	**R44**	-	-	-
			n/c	-	**R44**	**R146**	JA3,39	-	-
			RS232 as UART (§6.2)	-	**R36**	**R35**	-	-	-

Table 6-3: LIN Option Links

6.4 I2C Configuration

Table 6-4 below details the function of the option links associated with the I2C configuration.

Signal Name	MCU		Header connection			
	Port	Pin	Signal	Header Pin	Fit	Remove
IIC Pull up	-	-	**Board_VDD**	**-**	**R11**	**R28**
			Board_5V		R28	R11
CS1n_SCL1	P25	90	**SCL1**	**J3, 18**	**R67**	**R35**
			CS1n	J3, 18	R35	R67
CS0n_SDA1	P26	89	**SDA1**	**J3. 17**	**R31**	**R36**
			CS0n	J3, 17	R36	R31

Table 6-4: I2C Option Links

6.5 ADC Configuration

Table 6-5 below details the function of the option links associated with the Analog-to-Digital circuit.

Signal Name	MCU		Header connection			
	Port	Pin	Signal	Header Pin	Fit	Remove
AVREFH0	-	128	**UC_VCC**	**-**	**R220**	**R221, R222**
			CON_AVREFH0		R222	R220, R221
			Board_5V		R221	R220, R222
AVREFL0	-	129	**GROUND**	**-**	**R225**	**R227**
			CON_AVREFL0		R227	R225
AVCC0	-	128	**UC_VCC**	**-**	**R214**	**R215, R216**
			CON_AVCC0		R216	R214, R215
			Board_5V		R215	R214, R216
AVSS0	-	128	**GROUND**	**-**	**R209**	**R211**
			CON_AVSS0		R211	R209
AVREF	-	103	**UC_VCC**	**-**	**R196**	**R197, R198**
			CON_AVREF		R198	R196, R198
			Board_5V		R197	R196, R198
AVCC	-	102	**UC_VCC**	**-**	**R195**	**R193, R194**
			CON_AVCC		R193	R194, R195
			Board_5V		R194	R193, R195
AVSS	-	104	**GROUND**	**-**	**R199**	**R200**
			CON_AVSS		R200	R199
AN000 (RV1)	P40	126	**Board_VCC**	**-**	**R235**	**R234, R236**
			CON_AVCC0		R234	R235, R236
			Board_5V		R236	R234, R235

Table 6-5: ADC Option Links

6.6 RS232 Serial Port Configuration

Table 6-7 below details the function of the option links associated with serial port configuration.

Signal Name	MCU		Exclusive function			Header connection		
	Port	Pin	Signal	Fit	Remove	Header Pin	Fit	Remove
TXD0	**PB2**	**48**	**T1IN**	**R170**	**R150, R171, R208**	**JA2-6**		
RXD0	**PB1**	**49**	**R1OUT**	**R139**	**R149, R233, R219**	**JA2-8**		
TXD1	PD3	29	T1IN	R171	R150, R170, R208	JA6-8 J1-29		
RXD1	PD5	26	R1OUT	R233	R149, R139, R219	JA6-7 J1-26		
TDO	TDO	46	T1IN	R208	R150, R170, R171	J2-10		
TDI	TDI	44	R1OUT	R219	R139, R149, R233	J2-8		
RS232TX	-	-	T1IN	R150	R170, R171 R208	JA6-5		
RS232RX	-	-	R1OUT	R149	R139, R219, R233	JA6-6		
TXD2	P02	5	T2IN	R189		JA6-9 J1-3		
RXD2	P03	4	R2OUT	R188		JA6-12 J1-4		

Table 6-5: RS232 Serial Port Option Links

6.7 Switch Configuration

Table 6-7 below details the function of the option links associated with the I2C EEPROM Configuration.

Switch Function	MCU		Exclusive function			Header connection		
	Port	Pin	Signal	Fit	Remove	Header Pin	Fit	Remove
SW1 Enabled	**P10**	**137**	**IRQ0_DS**	**R178**	**-**	**JA2-7**	**R168**	**R169**
SW1 Disabled	P10	137		-	R178	**JA2-7**	**R168**	**R169**
SW2 Enabled	**P11**	**136**	**IRQ1_DS**	**R144 R176**	**R39**	**JA2-9**	**R166**	**R140**
SW2 Disabled	P11	136		-	R176	**JA2-9**	**R166**	**R140**
SW3 Enabled	**PE3**	**12**	**IRQ2_DS**	**R115 R174**	**R145, R173, R115**	**JA2-23**	**R156**	**R155 R154**
SW3 Disabled	PE3	12		-	R174	**JA2-23**	**R156**	**R155 R154**

Table 6-7: Switch Option Links

6.8 Power Supply Configuration

Table 6-8 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
Board_5V	Supply VBUS/EXT PWR	-	J8	2-3	-
	Not connected to VBUS/EXT PWR	-	J8	1-2 / Open	-
Board_5V	Connected to CON_5V	-	JA1-1	R23	-
	Not connected to CON_5V	-	JA1-1	-	R23
Board_5V	Connected to Unregulated_VCC	-	JA6-23	R202	-
	Not connected to Unregulated_VCC	-	JA6-23	-	R202
Board_3V3	Connected to U6 OUT	-	-	-	-
	Connected to CON_3V3	-	JA1-3	R24	-
Board_3V3	Bypass current probe (J7) for MCU	-	-	R59	-
	Enable current probe(J7) for MCU	-	J7	J7	R59
USB Bus Power	Host Power	-	J10	1-2	2-3
	Function VBus	-	J10	2-3	1-2
USB Bus Power	Self Powered	-	J10	1-2	2-3
	Bus Powered	-	J10	2-3	1-2

Table 6-8 Power Supply Jumpers

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	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	5V	-	2	0V	-
3	3V3	-	4	0V	-
5	AVCC	127*	6	AVSS	104*
7	AVREF	103*	8	ADTRG	64
9	ADC0	126	10	ADC1	125
11	ADC2	124	12	ADC3	123
13	DAC0	114	14	DAC1	113
15	IO_0	33	16	IO_1	34
17	IO_2	35*	18	IO_3	30
19	IO_4	140	20	IO_5	55
21	IO_6	51	22	IO_7	59
23	IRQ3/IRQAEC/M2_HSIN0	12*	24	IIC_EX	nc
25	IIC_SDA	89*	26	IIC_SCL	90*

Table 7-1: Application Header JA1 Connections

* Connection made through option link

Table 7-2 below lists the connections of the application header, JA2.

Application Header JA2					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	RESET	16	2	EXTAL	19*
3	NMI	21	4	Vss1	-
5	WDT_OVF	nc	6	SCIaTX	48*
7	IRQ0/M1_HSIN0	137*/47*	8	SCIaRX	49*
9	IRQ1/M1_HSIN1	136*/48*	10	SCIaCK	47*
11	M1_UD	84*	12	CTSRTS	24*
13	M1_UP	81*	14	M1_UN	78*
15	M1_VP	80*	16	M1_VN	77*
17	M1_WP	79*	18	M1_WN	76*
19	TimerOut	24*	20	TimerOut	31*
21	TimerIn	25*	22	TimerIn	32*
23	IRQ2/M1_EncZ/M1_HSIN2	42*/47*	24	M1_POE	82*
25	M1_TRCCLK	94*	26	M1_TRDCLK	95*

Table 7-2: Application Header JA2 Connections

* Connection made through option link

Table 7-3 below lists the connections of the application header, JA5.

Application Header JA5					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	AD4	122	2	AD5	121
3	AD6	120	4	AD7	119
5	CAN1TX	92*	6	CAN1RX	93*
7	CAN2TX	nc	8	CAN2RX	nc
9	IRQ4/M2_EncZ/M2_HSIN1	35*/54*/48*	10	IRQ5/M2_HSIN2	49*
11	M2_UD	84*	12	M2_Uin	131
13	M2_Vin	132*	14	M2_Win	nc
15	M2_Toggle	56	16	M2_POE	11*
17	M2_TRCCLK	86*	18	M2_TRDCLK	88
19	M2_UP	64	20	M2_UN	67
21	M2_VP	65	22	M2_VN	68
23	M2_WP	66	24	M2_WN	69

Table 7-3: Application Header JA5 Connections

Table 7-4 below lists the connections of the application header, JA6.

Application Header JA6					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	DREQ	nc	2	DACK	nc
3	TEND	nc	4	STBYn	nc
5	RS232TX	-	6	RS232RX	-
7	SCIbRX	26	8	SCIbTX	129
9	SCIcTX	5	10	SCIbCK	28
11	SCIcCK	13	12	SCIcRX	4
13	M1_Toggle	83*	14	M1_Uin	131
15	M1_Vin	132*	16	M1_Win	134
17	Reserved	nc	18	Reserved	nc
19	Reserved	nc	20	Reserved	nc
21	Reserved	nc	22	Reserved	nc
23	Unregulated_VCC	-	24	GROUND Vss	-

Table 7-4: 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 7-5 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	nc	2	USB0VBUS	2
3	EMLE	3	4	RXD2	4
5	TXD2	5	6	GROUND	6
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	14
15	USB0VBUSEN	15	16	RESn	16
17	CON_XTAL	17	18	GROUND	18
19	CON_EXTAL	19	20	UC_VCC	20
21	NMI	21	22	WR0n_WR0_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	GTIOC0A	31	32	A12_GTIOC3B	32
33	IO0	33	34	IO1	34
35	IO2_IRQ5	35	36	TRSTn	36

Table 7-5: Microcontroller Pin Header J1 Connections

Table 7-6 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 7-6: Microcontroller Pin Header J2 Connections

Table 7-7 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	-
31	CON_AVREF	-	32	CON_AVSS	-
33	PC1	105	34	PC0	106
35	A2	107	36	A3	108

Table 7-7: Microcontroller Pin Header J3 Connections

* Connection made through option link**.**

Table 7-8 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	-	20	CON_AVREFH0	-
21	CON_AVREFL0	-	22	CON_AVSS0	-
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 7-8: Microcontroller Pin Header J4 Connections

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 (R20UT0399EJ).

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 (R20UT0398EJ).

8.5 Address Space

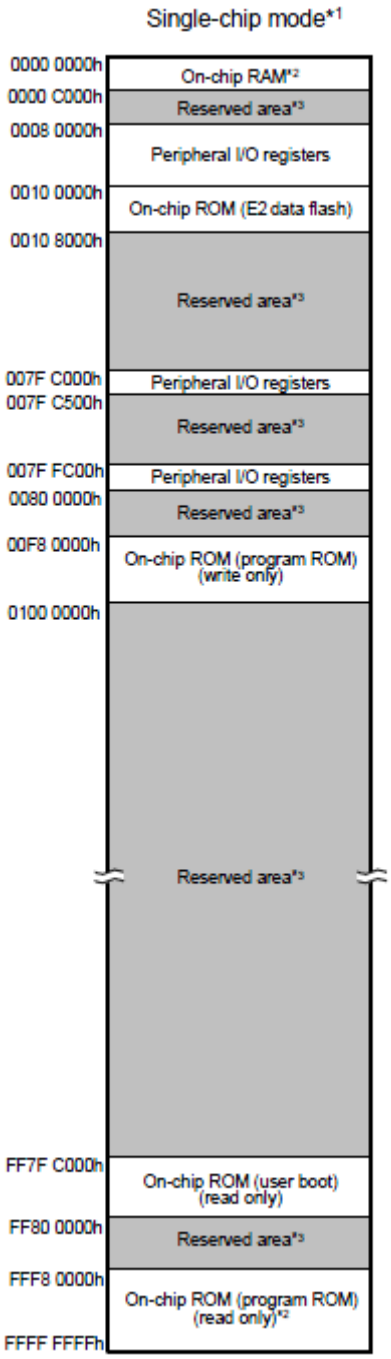
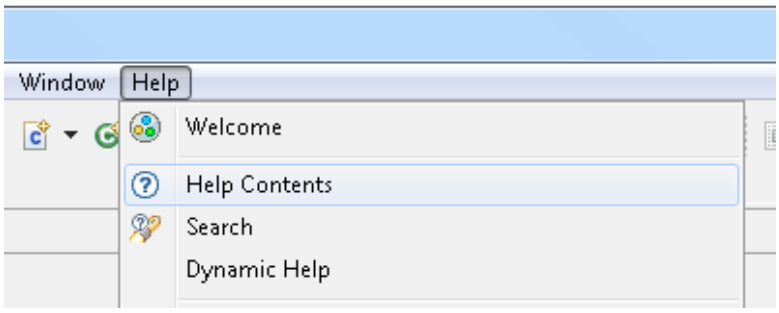


Figure 8-1: MCU Address Space Diagram

Figure 8-1 below details the address space of MCU. For further details, refer to the RX63T group hardware manual.

9. Additional Information

Technical Support
For details on how to use e2studio, refer to the help file by opening e2studio, then selecting Help > Help Contents from the menu bar.



For information about the RX63T series microcontrollers refer to the RX63T Group hardware manual.

For information about the RX assembly language, refer to the RX600 Series Software Manual.

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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