

# RX231 Group

Renesas Starter Kit User's Manual

RENESAS MCU  
RX Family / RX200 Series

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EEDT-ST-004-10

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ボード Board	X	○	○	○	○	○
ケーブル Cable	X	○	○	○	○	○
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外壳 Case	O	O	O	O	O	O
电路板 Board	X	O	O	O	O	O
连接线 Cable	X	O	O	O	O	O
插座 Socket	X	O	O	O	O	O
AC 适配器 AC-Adapter	X	O	O	O	O	O

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- 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 RSKRX231. 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.	RSKRX231 User's Manual	R20UT3027EG
Tutorial Manual	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRX231 Tutorial Manual	CS+: R20UT3028EG e <sup>2</sup> studio: R20UT3032EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRX231 Quick Start Guide	CS+: R20UT3029EG e <sup>2</sup> studio: R20UT3033EG
Code Generator Tutorial Manual	Provides a guide to code generation and importing into the IDE (Integrated Development Environment).	RSKRX231 Code Generator Tutorial Manual	CS+: R20UT3030EG e <sup>2</sup> studio: R20UT3034EG
Schematics	Full detail circuit schematics of the RSK.	RSKRX231 Schematics	R20UT3026EG
Hardware Manual	Provides technical details of the RX231 microcontroller.	RX231 Group Hardware Manual	R01UH0496EJ

## 2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analog-to-Digital Converter
BC	Battery Charging
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
DNF	Do Not Fit
E1	Renesas On-chip Debugging Emulator
EEPROM	Electrically Erasable Programmable Read Only Memory
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
GPT	General PWM Timer
I <sup>2</sup> C (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
Pmod™	This is a Digilent Pmod™ Compatible connector. Pmod™ is registered to <a href="#">Digilent Inc.</a> Digilent-Pmod_Interface_Specification
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

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## **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.

### 1.3 Board specification

Board specification was shown in **Table 1-1** below.

Item	Specification
Microcontroller	Part No : R5F52318ADFP
	Package : 100-pin LQFP
	On-Chip Memory : ROM 512KB+8KB, RAM 64KB
On-Board Memory	I <sup>2</sup> C EEPROM : 16Kbit
Input Clock	RX231 Main : 8MHz
	RX231 Sub : 32.768kHz
	RL78/G1C Main: 12MHz
Power Supply	DC Power Jack : 5 V Input
	Power Supply IC : 5V Input, 3.3V/1.8V Output
Debug Interface	E1 14-pin box header
DIP Switch	Mode Configuration : 2-pole x 1
Push Switch	Reset Switch x 1
	User Switch x 3
Potentiometer (for ADC)	Single-turn, 10kΩ
LED	Power indicator: green x 1
	User : green x 1, orange x 1, red x 2
CAN	Connector : 2.54mm pitch, 3-pin x 1
	Driver : R2A25416SP (ISO-11898-2 compliance, support for high-speed communication of 1Mbps (max))
USB	USB0 Functiont : USB-MiniB
	USB0 Host : USB-TypeA
Touch Interface	Slider x1, key x2
USB to Serial Converter Interface	Connector : USB-MiniB
	Driver : RL78/G1C Microcontroller (Part No R5F10JBCANA)
Pmod™	PMOD1 : Angle type, 12-pin Connector
	PMOD2 : Straight type, 12-pin Connector
Application Board Interface *1	2.54mm pitch, 26-pin x 2 (JA1, JA2), 24-pin x 2 (JA5, JA6), 50-pin x 1(JA3)

**Table 1-1: Board Specification**

\*1: The Application Board Interface connectors are not fitted on this product.

## 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. This board has an optional centre positive supply connector using a 2.0mm barrel power jack.

Details of the external power supply requirements for the RSK, and configuration are shown in **Table 2-1** below. The default RSK power configuration is shown in **bold, blue text**.

Connector	Supply voltage
PWR	Input 5VDC

**Table 2-1: PWR Connector Requirements**

J9 Setting	J11 Setting	R244 Setting	Supply Source	Board_5V	Board_VCC UC_VCC
<b>All open</b>	All open	Don't care	DO NOT USE	DO NOT USE	DO NOT USE
	<b>Pin1-2 shorted</b>	Fit	PWR Connector/ CON_5V/ Unregulated_VCC	5V	1.8V
		<b>DNF</b>			3.3V
	<b>Pin2-3 shorted</b>	Fit	CON_3V3/ <b>E1(3V3)</b>	<b>n/a</b>	<b>3.3V</b>
<b>DNF</b>					
	Pin2-3 shorted	Don't care	PWR Connector/ CON_5V, Unregulated_VCC/ E1(5V)	5V	5V
Pin1-2 shorted	All open	Don't care	DO NOT USE	DO NOT USE	DO NOT USE
	Pin1-2 shorted	Fit	EXT_BATT	5V	1.8V
		<b>DNF</b>			3.3V
Pin2-3 shorted	Don't care	5V			
Pin2-3 shorted	All open	Don't care	DO NOT USE	DO NOT USE	DO NOT USE
	Pin1-2 shorted	Fit	VBUS0	5V	1.8V
		<b>DNF</b>			3.3V
Pin2-3 shorted	Don't care	5V			

**Table 2-2: Main Power Supply Requirements**

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' build of the example tutorial software pre-programmed into the Renesas microcontroller. Please consult the 'Renesas Starter Kit Code Generator Tutorial Manual' for further information of this example.

### 3.Board Layout

#### 3.1 Component Layout

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

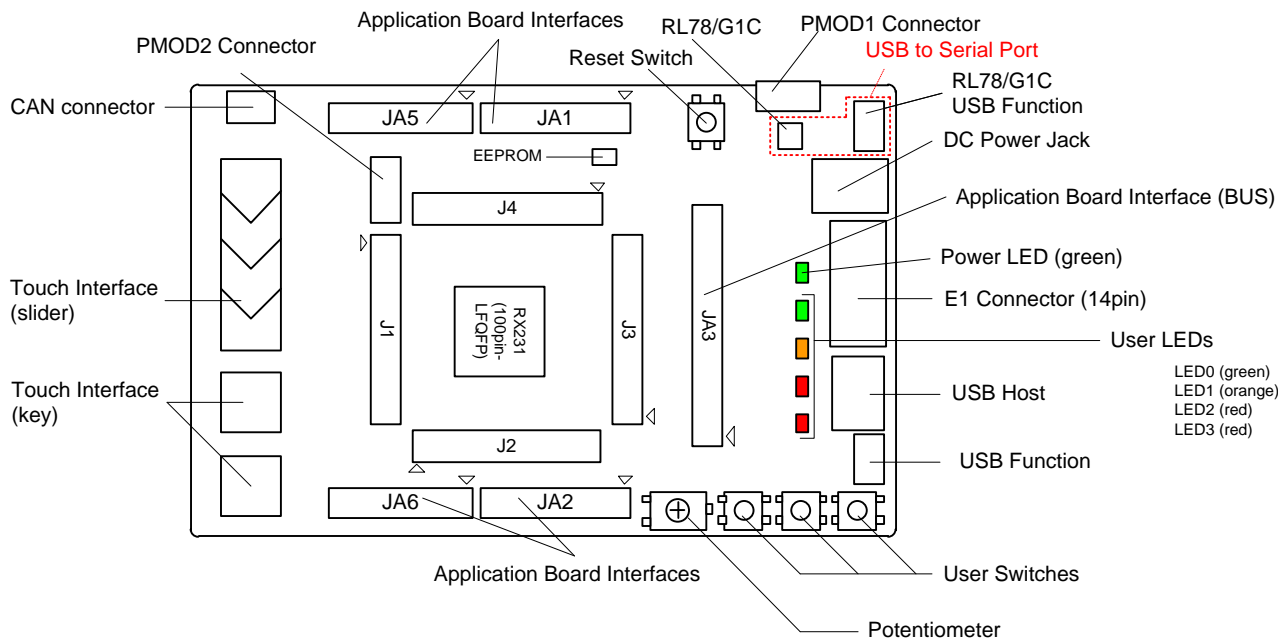


Figure 3-1: Board Layout

### 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.

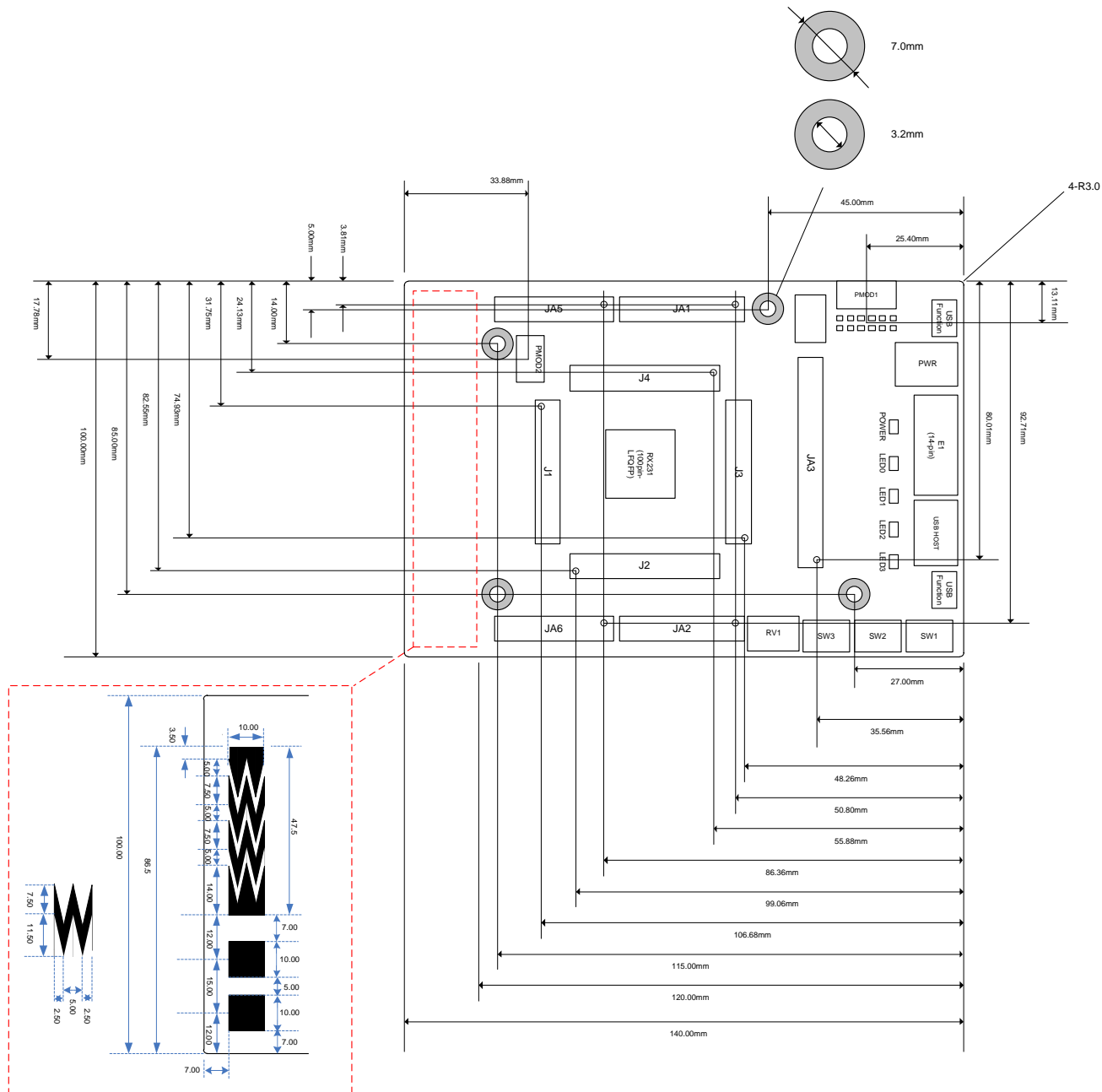


Figure 3-2: Board Dimensions

### 3.3 Component Placement

Figure 3-3 below shows placement of individual components on the top-side PCB – bottom-side component placement can be seen in Figure 3-4. Component types and values are shown on the board schematics.

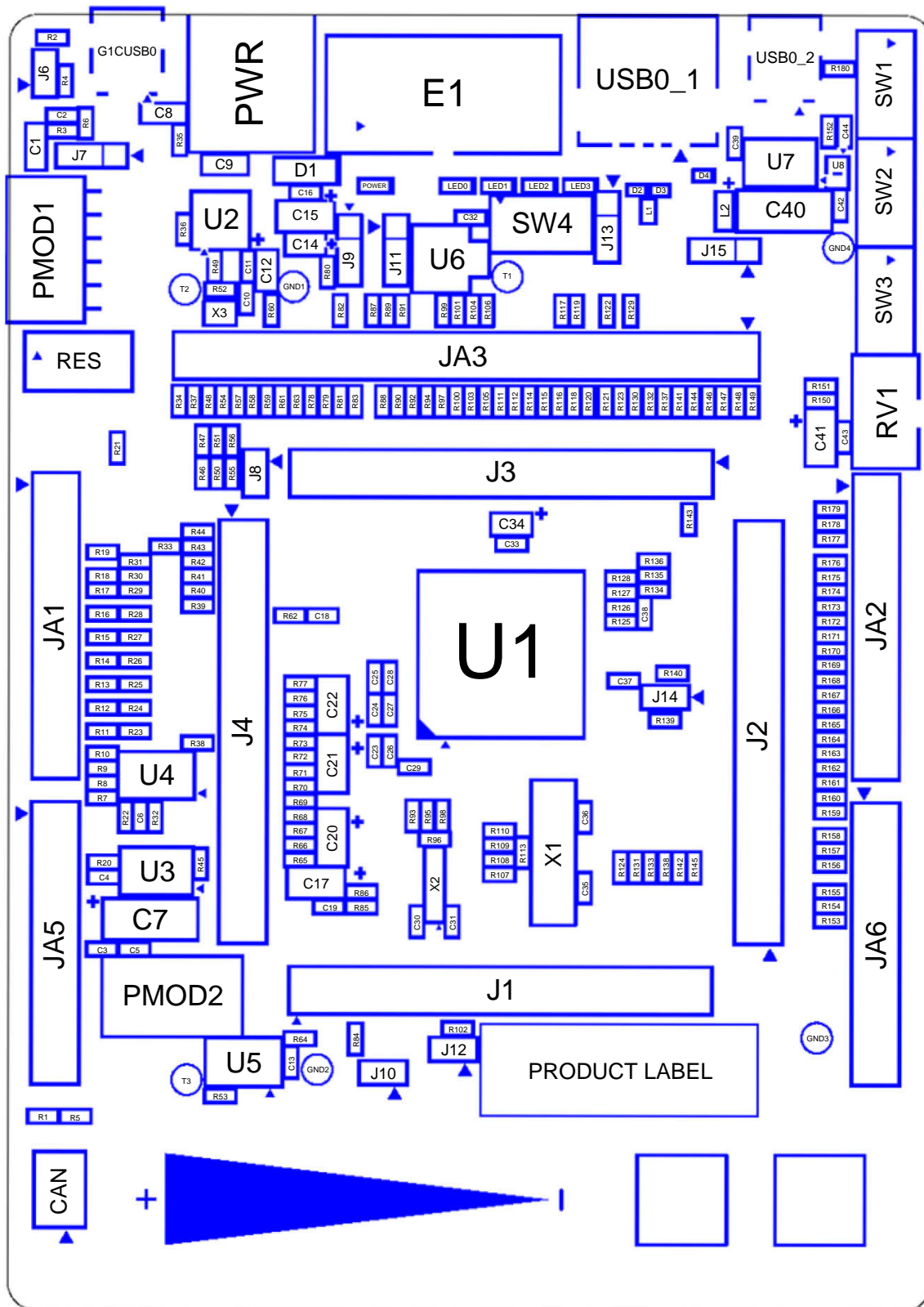


Figure 3-3 Top-Side Component Placement



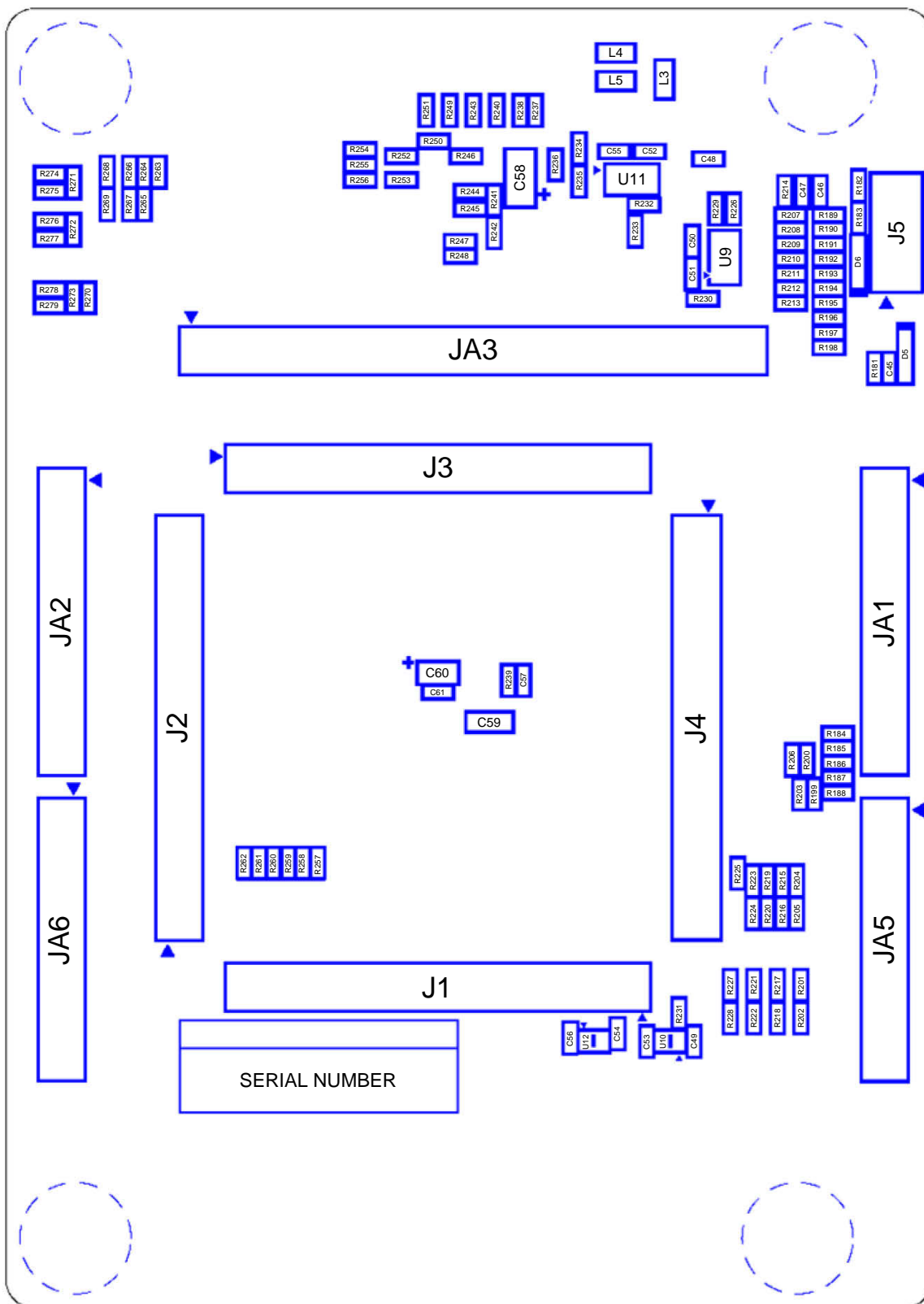
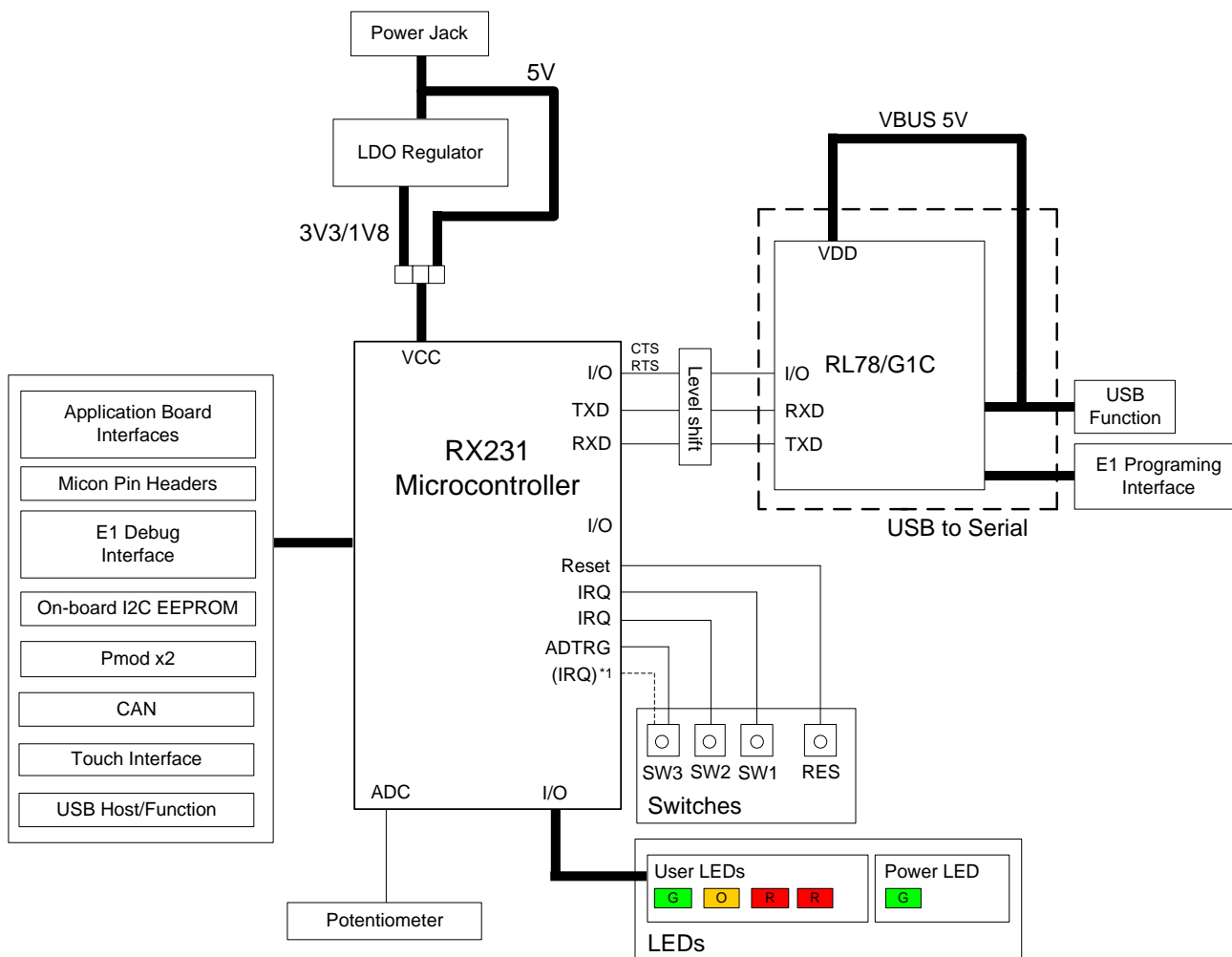


Figure 3-4 Bottom-Side Component Placement

## 4.Connectivity

### 4.1 Internal RSK Connections

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



\*1: This connection is not available in the default RSK configuration - refer to §6 for the required modifications.

**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.

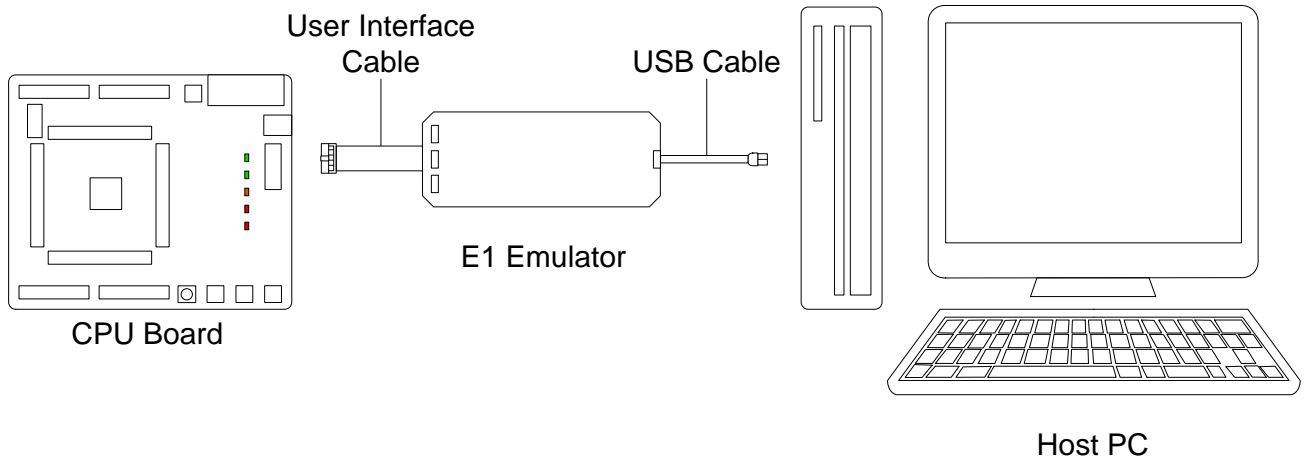


Figure 4-2: Debugger Connection Diagram

## 5. User Circuitry

### 5.1 Reset Circuit

A reset control circuit is fitted to the RSK to generate a reset signal from the RES switch. Refer to the RX231 hardware manual for details regarding the reset signal timing requirements, and the RSK schematics for information regarding the reset circuitry in use on the board.

### 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 RX231 Group Hardware Manual for details regarding the clock signal requirements, and the RSKRX231 board schematics for information regarding the clock circuitry in use on the RSK. Details of the oscillators fitted to the board are listed in **Table 5-1** below.

Crystal	Function	Default Placement	Frequency	Device Package
X1	RX231 Main oscillator.	Fitted	8MHz	Encapsulated, SMT
X2	RX231 Sub oscillator	Fitted	32.768kHz <sup>**1</sup>	Encapsulated, SMT
X3	RL78/G1C Main oscillator	Fitted	12MHz	Encapsulated, SMT

**Table 5-1: Oscillators**

<sup>\*\*1</sup>: The Sub clock oscillator drive circuit is low power to achieve excellent standby power consumption. The Crystal and associated capacitors must have a capacitance equal or less than 6pF to ensure this oscillator is accurate. The oscillator will function at higher loads, but operation to specification is not guaranteed.

### 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 RSK schematics.

Switch	Function	MCU	
		Signal (Port)	Pin
RES	When pressed, the microcontroller is reset	RES#	10
SW1	Connects to an IRQ input for user controls	IRQ1 (P31)	19
SW2	Connects to an IRQ input for user controls.	IRQ4 (P34)	16
SW3	Connects to an IRQ input for user controls. <sup>**1</sup>	IRQ0 (PD0)	86
	Connects to an ADTRG input, and is used to trigger AD conversions.	ADTRG0# (P07)	98

**Table 5-2: Switch Connections**

<sup>\*\*1</sup>: This connection is not available in the default RSK configuration - refer to §6 for the required modifications.

## 5.4 LEDs

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

LED	Colour	Function	MCU	
			Port	Pin
POWER	Green	Indicates the status of the Board_VCC power rail	-	-
LED0	Green	User operated LED	P17	29
LED1	Orange	User operated LED	P50	44
LED2	Red	User operated LED	P51	43
LED3	Red	User operated LED	P52	42

**Table 5-3: LED Connections**

## 5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analog input AN000 (Port P40, Pin 95). The potentiometer can be used to create a voltage between Board\_VCC and ground. Refer to the maker site for specification of the potentiometer (PIHER with part number N6 series).

The potentiometer offers 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 RX231 Group Hardware Manual for further details.

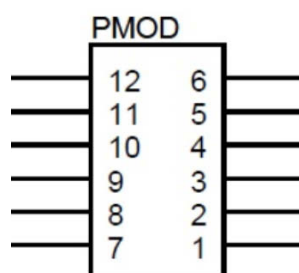
## 5.6 Pmod™(PMOD1)

The RSK board are equipped with connectors for Digilent Pmod™ interface. Please connect the PMOD1 connector that is compatible with Debug LCD.

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 Digilent Pmod™ Compatible headers uses an SPI interface. **Figure 5-1** below shows Digilent Pmod™ Compatible Header Pin Numbering(top view). Connection information for the Digilent Pmod™ Compatible header is provided in **Table 5-4** below.

Please note that the connector numbering adheres to the Digilent Pmod™ standard and is different from all other connectors on the RSK designs. Details can be found in the Digilent Pmod™ Interface Specification Revision: November 20, 2011.



**Figure 5-1: Digilent Pmod™ Compatible Header Pin Numbering**

Digilent Pmod™ Compatible Header (PMOD1) Connections							
Pin	Circuit Net Name	MCU		Pin	Circuit Net Name	MCU	
		Port	Pin			Port	Pin
1	PMOD1_PIN1	P33/PC4	17/48	7	IRQ6	PE6	72
2	TXD8	PC7	45	8	IRQ7	PE7	71
3	RXD8	PC6	46	9	PE3	PE3	75
4	SCK8	PC5	47	10	PE4	PE4	74
5	GROUND	-	-	11	GROUND	-	-
6	Board_3V3	-	-	12	Board_3V3	-	-

**Table 5-4: Pmod™1 Header Connections**

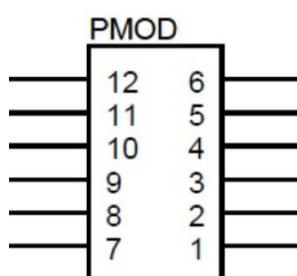
### 5.7 Pmod™(PMOD2)

The RSK board are equipped with connectors for Digilent Pmod™ interface. Please connect the PMOD2 connector that is compatible with the optional PmodSD.

To develop a host device corresponding to the SD standard, it requires the conclusion of SD Host / Ancillary Product License Agreement (SD HALA).

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

The Digilent Pmod™ Compatible headers uses an SD interface. **Figure 5-2** below shows Digilent Pmod™ Compatible Header Pin Numbering(top view). Connection information for the Digilent Pmod™ Compatible header is provided in **Table 5-5** below.



**Figure 5-2: Digilent Pmod™ Compatible Header Pin Numbering**

Digilent Pmod™ Compatible Header (PMOD2) Connections							
Pin	Circuit Net Name	MCU		Pin	Circuit Net Name	MCU	
		Port	Pin			Port	Pin
1	SDD3	PC2	50	7	SDD1	PB6	54
2	SDCMD	PB0	61	8	SDD2	PB7	53
3	SDD0	PC3	49	9	SDCD	PB5	55
4	SDCLK	PB1	59	10	SDWP	PB3	57
5	GROUND	-	-	11	GROUND	-	-
6	PMOD2_3V3	-	-	12	PMOD2_3V3	-	-

**Table 5-5: Pmod™2 Header Connections**

## 5.8 USB Serial Port

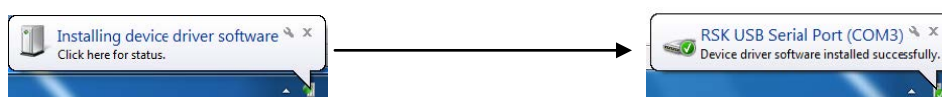
A USB serial port is implemented in a Renesas low power microcontroller (RL78/G1C) and is connected to the RX231 Serial Communications Interface (SCI) module. Multiple options are provided to allow the selection of the connected SCI5 port. Connections between the USB to Serial converter and the microcontroller are listed in **Table 5-6** below.

Signal Name	Function	MCU	
		Port	Pin
TXD1 * <sup>1</sup>	SCI1 Transmit Signal	P26	22
RXD1 * <sup>1</sup>	SCI1 Receive Signal	P30	20
TXD5	SCI5 Transmit Signal	PA4	66
RXD5	SCI5 Receive Signal	PA3	67
TXD12 * <sup>1</sup>	SCI12 Transmit Signal	PE1	77
RXD12 * <sup>1</sup>	SCI12 Receive Signal	PE2	76
RS232TX * <sup>1</sup>	External SCI Transmit Signal	-	-
RS232RX * <sup>1</sup>	External SCI Receive Signal	-	-
RL78G1CCTS	Clear To Send	P15	31
RL78G1CRTS	Request to Send	PC0	52

**Table 5-6: Serial Port Connections**

\*<sup>1</sup>: This connection is not available in the default RSK configuration - refer to §6 for the required modifications.

When the RSK board is first connected to a PC running Windows™ with the USB/Serial connection, the PC will look for a driver. This driver is installed during the installation process, so the PC should be able to find it. The PC will report that it is installing for a driver and then report that a driver has been installed successfully, as shown in **Figure 5-3**. The exact messages may vary depending upon operating system.



**Figure 5-3: USB-Serial Windows™ Installation message**



## 5.9 Controller Area Network (CAN)

A CAN transceiver IC is fitted to the RSK board, and connected to the CAN MCU peripheral. For further details regarding the CAN protocol and supported modes of operation, please refer to the RX231 Group User's Manual: Hardware.

The connections for the CAN microcontroller signals are listed in **Table 5-7** below.

LIN Signal	Function	MCU	
		Port	Pin
CTX0	CAN Transmit Signal	P54	40
CRX0	CAN Receive Signal	P55	39

**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. The host device is not available in the default RSK configuration - refer to §6 for the required modifications

USB Signal	Function	MCU	
		Port	Pin
USB0DP	Positive differential data signal	USB0_DP	37
USB0DM	Negative differential data signal	USB0_DM	36
USB0VBUS	Cable monitor pin	P16	30
USB0VBUSEN	VBUS power supply enable	P32	18
USB0OVRCURA	Over-current detection signal A	P14	32

**Table 5-8: USB0 Module Connections**

## 5.11 I<sup>2</sup>C Bus (Inter-IC Bus)

The RX231 features one I<sup>2</sup>C (Inter-IC Bus) interface modules. RIIC is connected to a 16Kbit EEPROM. Specific details of the EEPROM device and the connections can be found in the board schematics.

On board EEPROM only supports single device on bus. To allow external I<sup>2</sup>C device, option links have to be modified – refer to §6 for further details.

## 5.12 Touch Interface

The RSK Board is fitted with a Touch Interface (slider) and two Touch Interfaces (key). Table 5-9 below details the connected devices, and their connections to the MCU.

Touch Interface Signal	Function	MCU	
		Port	Pin
TS4	Electrostatic capacitive measurement pin(touch slider)	P25	23
TS5	Electrostatic capacitive measurement pin(touch slider)	P24	24
TS6	Electrostatic capacitive measurement pin(touch slider)	P23	25
TS7	Electrostatic capacitive measurement pin(touch slider)	P22	26
TS8	Electrostatic capacitive measurement pin(touch key)	P21	27
TS9	Electrostatic capacitive measurement pin(touch key)	P20	28
TSCAP	LPF(Low-pass filter) connection pin	PC4	48

**Table 5-9: Touch Interface 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 connect 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 board.

When modifying a link resistor, always check the related option links to ensure there is no possible signal contention or short circuits. Because many of the MCU's pins are multiplexed, some of the peripherals must be used exclusively. Refer to the RX231 Group Hardware Manual and RSKRX231 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	Pin 2	Explanation	Related Ref.
SW4	<b>OFF</b>	<b>OFF</b>	<b>Single Chip Mode</b>	-
	OFF	ON	Single Chip Mode	-
	ON	OFF	Boot Mode (SCI)	-
	ON	ON	Boot Mode (USB)	J12

**Table 6-1: MCU Option Links (1)**

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

Reference	Link Fitted Configuration	Link Removed Configuration	Related Ref.
J12	Self-Powered	<b>Bus-Powered</b>	SW4

**Table 6-2: MCU Option Links (2)**

### 6.3 Power Supply Configuration

**Table 6-3 and Table 6-4** below details the function of the option links associated with power supply configuration.

Reference	Configuration	Explanation	Related Ref.
J8 *1	Shorted Pin1-2	Connects Board_VCC to UC_VCC.	R55
	All open	Enables current probe for MCU current consumption.	R55
J9	Shorted Pin1-2	Connects EXT_BATT to 5V power rail.	-
	Shorted Pin2-3	Connects VBUS0 to 5V power rail.	J15
	All open	Disconnects EXT_BATT and VBUS0 from 5V power rail.	-
R244	Fit	Enables 1.8V regulator output.	U6
	DNF	Enables 3.3V regulator output.	U6
J11	Shorted Pin1-2	Connects regulator output to Board_VCC.	U6
	Shorted Pin2-3	Disconnects regulator output from Board_VCC.	U6
	All open	DO NOT USE	U6

**Table 6-3: Power Supply Option Links (1)**

\*1: By default, jumper J8 is not fitted to the RSK. R55 is fitted by default and becomes the same setting as 'J8 Shorted Pin1-2'.

Reference	Explanation	Fit	DNF	Related Ref.
Board_5V	Connects 5V power rail to Board_5V.	R80	-	U4, U5, U8, U10, U12
SD_3V3	Connects Board_VCC to SD_3V3	R20	-	U3
CON_3V3	Connects CON_3V3 to Board_VCC.	R21	-	JA1.3
	Disconnects CON_3V3 from Board_VCC.	-	R21	-
Board_3V3	Connects Board_VCC to Board_3V3.	R214	-	U1(USB0VBUS), PMOD1
Board_VCC	Connects Board_VCC to UC_VCC.	R55/J8.1-2	-	U1(VCC, AVCC0, VREFH0, VREFH)
	Enables current probe for MCU current consumption.	J8.Open	R55	U1(VCC, AVCC0, VREFH0, VREFH)
VBATT	Connects UC_VCC to VBATT. (Battery Backup function used)	R86	R85	-
	Disconnects UC_VCC from VBATT. (Battery Backup function unused)	R85	R86	J10
UC_VCC	Connects UC_VCC to 3.3V power rail.	R55/J8.1-2	-	U1(VCC)
	Disconnects UC_VCC from 3.3V power rail.	J8.Open	R55	-
VCCUSB	Connects UC_VCC to U1 VCC_USB pin. (UC_VCC: 3.3V)	R140, R139/J14.1-2	-	U1(VCC_USB)
	Disconnects UC_VCC from U1 VCC_USB pin. (UC_VCC: 5V)	-	R140, R139, J14.Open	-

**Table 6-4: Power Supply Option Links (2)**

### 6.4 Clock Configuration

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

Reference	Explanation	Fit	DNF	Related Ref.
XTAL, EXTAL, CON_EXTAL	Connects 8MHz crystal (X1) to RX231.	R108, R109	R110, R107	U1(EXTAL, XTAL)
	Connects CON_EXTAL to RX231.	R110	R108, R109	U1(EXTAL), JA2.2
XCIN, XCOU	Connects 32.768kHz crystal (X2) to RX231.	R95, R98	-	U1(XCIN, XCOU)
	Disconnects 32.768kHz crystal (X2) from RX231.	-	R95, R98	U1(XCIN, XCOU)

**Table 6-5: Clock Option Links**

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 6.5 Analog Power ADC & DAC Configuration

**Table 6-6** below details the function of the option links associated with Analog Power ADC & DAC configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
IO0_DA0	2	P03	IO0	R14	R15	JA1.15	-	-
			DA0	<b>R15</b>	<b>R14</b>	<b>JA1.13</b>	-	-
IO1_DA1	100	P05	IO1	R26	R27	JA1.16	-	-
			DA1	<b>R27</b>	<b>R26</b>	<b>JA1.14</b>	-	-
ADTRG0n	98	P07	ADTRG0n	-	-	SW3 JA1.8	<b>R270</b>	<b>R273</b>
AN000	95	P40	AN000	-	-	RV1	<b>R239</b>	-
						JA1.9 (Direct Input via JA1.9)	R17	R29, R18
						JA1.9 (Input via Voltage Division Resistor)	R29, R18	R17
IO2_AN002	92	P42	IO2	R13	R16	JA1.17	-	-
			AN002	<b>R16</b>	<b>R13</b>	<b>JA1.11</b>	-	-
IO3_AN003	91	P43	IO3	R25	R28	JA1.18	-	-
			AN003	<b>R28</b>	<b>R25</b>	<b>JA1.12</b>	-	-
IO4_AN004	90	P44	IO4	R12	R200	JA1.19	-	-
			AN004	<b>R200</b>	<b>R12</b>	<b>JA5.1</b>	-	-
IO5_AN005	89	P45	IO5	R24	R199	JA1.20	-	-
			AN005	<b>R199</b>	<b>R24</b>	<b>JA5.2</b>	-	-
IO6_AN006	88	P46	IO6	R11	R206	JA1.21	-	-
			AN006	<b>R206</b>	<b>R11</b>	<b>JA5.3</b>	-	-
IO7_AN007	87	P47	IO7	R23	R203	JA1.22	-	-
			AN007	<b>R203</b>	<b>R23</b>	<b>JA5.4</b>	-	-
VREFH	1	-	UC_VCC	<b>R68</b>	<b>R67</b>	-	-	-
			CON_VREFH	R67	R68	J1.1	-	-
VREFL	3	-	GROUND	<b>R65</b>	<b>R66</b>	-	-	-
			CON_VREFL	R66	R65	J1.3	-	-
AVCC0	97	-	UC_VCC	<b>R73</b>	<b>R72, R150</b>	-	-	-
			CON_AVCC0	R72	R73, R150	JA1.5	-	-
			Board_VCC	R150, <b>R151</b>	R73, <b>R72</b>	-	-	-
AVSS0	99	-	GROUND	<b>R71</b>	<b>R70</b>	-	-	-
			CON_AVSS0	R70	R71	<b>JA1.6</b>	<b>R69</b>	<b>R38</b>
VREFH0	96	-	UC_VCC	<b>R74</b>	<b>R75</b>	-	-	-
			CON_VREFH0	R75	R74	JA1.7	-	-
VREFL0	94	-	GROUND	<b>R77</b>	<b>R76</b>	-	-	-
			CON_VREFL0	R76	R77	JA1.6	R69	R38

**Table 6-6: Analog Power ADC & DAC Option Links**

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 6.6 E1 Debugger Configuration

Table 6-7 below details the function of the option links associated with E1 Debugger configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
CS2n_TXD1	22	P26	CS2n	R97	R237	JA3.28	-	-
			TXD1	<b>R237</b>	<b>R97</b>	E1.5	R238	-
						U11.3	R234	<b>R156, R154, R179</b>
						<b>JA6.8</b>	-	-
RXD1	20	P30	RXD1	-	-	E1.11	R249	-
						U9.3	R251	<b>R157, R153, R176</b>
						JA6.7	R155	-
CS0n_TXD8_PC7	45	PC7	CS0n	R101	R212, R248	JA3.27	-	-
			TXD8	<b>R212</b>	<b>R101</b>	PMOD1.2	-	-
						E1.10	<b>R243</b>	-
						<b>SW4.2</b>	-	-

**Table 6-7: E1 Debugger Option Links**

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 6.7 General I/O & LED Configuration

Table 6-8 below details the function of the option links associated with the General I/O & LED configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
IO0_DA0	2	P03	IO0	R14	R15	JA1.15	-	-
			DA0	R15	R14	JA1.13	-	-
IO1_DA1	100	P05	IO1	R26	R27	JA1.16	-	-
			DA1	R27	R26	JA1.14	-	-
MTIOC3B	29	P17	MTIOC3B	-	-	LED0	-	-
						JA2.13	R172	R167
						JA2.19	R167	R172
IO2_AN002	92	P42	IO2	R13	R16	JA1.17	-	-
			AN002	R16	R13	JA1.11	-	-
IO3_AN003	91	P43	IO3	R25	R28	JA1.18	-	-
			AN003	R28	R25	JA1.12	-	-
IO4_AN004	90	P44	IO4	R12	R200	JA1.19	-	-
			AN004	R200	R12	JA5.1	-	-
IO5_AN005	89	P45	IO5	R24	R199	JA1.20	-	-
			AN005	R199	R24	JA5.2	-	-
IO6_AN006	88	P46	IO6	R11	R206	JA1.21	-	-
			AN006	R206	R11	JA5.3	-	-
IO7_AN007	87	P47	IO7	R23	R203	JA1.22	-	-
			AN007	R203	R23	JA5.4	-	-
WRn_WR0n	44	P50	WRn_WR0n	-	-	LED1	-	-
			WR0n	R34	R100	JA3.48	-	-
			WRn	R100	R34	JA3.26	-	-
WR1n	43	P51	WR1n	-	-	LED2	-	-
						JA3.47	-	-
RDn	42	P52	RDn	-	-	LED3	-	-
						JA3.25	-	-
D11_PE3	75	PE3	D11	R92	R192	JA3.32	-	-
			PE3	R192	R92	PMOD1.9	-	-
D12_MTI0C1A_PE4	74	PE4	D12	R87	R89, R190	JA3.33	-	-
			MTIOC1A	R89	R190, R87	JA2.23	R91	R162
			PE4	R190	R87, R89	PMOD1.10	-	-

Table 6-8: General I/O & LED Option Links

## 6.8 I<sup>2</sup>C & EEPROM Configuration

Table 6-9 below details the function of the option links associated with I<sup>2</sup>C & EEPROM configuration.

Signal name /Reference	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
SCL	34	P12	SCL	-	-	U4.6	R9	-
						JA1.26	-	-
SDA_MTI0C0B_IRQ3	33	P13	SDA	R184	R175	U4.5	R10	-
			MTIOC0B_IRQ3	R175	R184	JA2.9	-	-
Board_5V (Pull-up)	-	-	-	R32	R22	SDA, SCL, U4	-	-
Board_VCC (Pull-up)	-	-	-	R22	R32	SDA, SCL, U4	-	-
Write Protect enable	-	-	-	R7	-	U4.7	-	-
Write Protect disable	-	-	-	-	R7	U4.7	-	-

Table 6-9: I<sup>2</sup>C & EEPROM Option Links

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 6.9 IRQ & Switch Configuration

**Table 6-10** below details the function of the option links associated with the IRQ & Switches configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
ADTRG0n	98	P07	ADTRG0n	-	-	SW3 JA1.8	R270 -	R273 -
SDA_MTIOC0B_IRQ3	33	P13	SDA MTIOC0B_IRQ3	R184 R175	R175 R184	U4.5 JA1.25 JA2.9	R10 - -	- - -
IRQ1	19	P31	IRQ1	-	-	SW1 JA1.23	R271 -	- -
USB0VBUSEN_MTIOC0C_IRQ2	18	P32	USB0VBUSEN MTIOC0C_IRQ2	R263 R160	R160 R263	U8.3 JA2.23	- R162	- R91
MTIOC0A_IRQ4	16	P34	MTIOC0A_IRQ4	-	-	SW2 JA2.7	R272 -	- -
D0_IRQ0	86	PD0	D0 IRQ0	R117 R119	R119 R117	JA3.17 SW3	- R273	- R270
D14_IRQ6	72	PE6	D14 IRQ6	R81 R198	R198 R81	JA3.35 PMOD1.7	- -	- -
D15_IRQ7	71	PE7	D15 IRQ7	R83 R194	R194 R83	JA3.36 PMOD1.8	- -	- -

**Table 6-10: IRQ & Switch Option Links**

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.



## 6.10 External Bus Configuration

Table 6-11 and Table 6-12 below details the function of the option links associated with the External Bus configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
CS2n_TXD1	22	P26	CS2n	R97	R237	JA3.28	-	-
						E1.5	R238	-
			TXD1	R237	R97	U11.3	R234	R156, R154, R179
						JA6.8	-	-
CS3n_SCK1	21	P27	CS3n	R51	R47	JA3.45	R54	R57
			SCK1	R47	R51	JA6.10	-	-
WRn_WR0n	44	P50	WRn_WR0n	-	-	LED1	-	-
			WR0n	R34	R100	JA3.48	-	-
			WRn	R100	R34	JA3.26	-	-
WR1n	43	P51	WR1n	-	-	LED2	-	-
						JA3.47	-	-
RDn	42	P52	RDn	-	-	LED3	-	-
						JA3.25	-	-
CTX0_ALE	40	P54	CTX0	R58	R59	JA5.5	-	-
						U12.3	R84	-
			ALE	R59	R58	JA3.46	-	-
CRX0_WAITn	39	P55	CRX0	R46	R50	JA5.6	-	-
			WAITn	R50	R46	JA3.45	R57	R54
A0_MTI0C4A	70	PA0	A0	R147	R170	JA3.1	-	-
			MTI0C4A	R170	R147	JA2.15	-	-
A1_SCK5	69	PA1	A1	R148	R149	JA3.2	-	-
			SCK5	R149	R148	JA2.10	-	-
A3_RXD5	67	PA3	A3	R146	R177	JA3.4	-	-
						JA2.8	-	-
			RXD5	R177	R146	U9.3	R176	R157, R251, R153
A4_TXD5	66	PA4	A4	R141	R178	JA3.5	-	-
						JA2.6	-	-
			TXD5	R178	R141	U11.3	R179	R156, R234, R154
A5_TI0CB1	65	PA5	A5	R144	R166	JA3.6	-	-
			TI0CB1	R166	R144	JA2.22	-	-
A6_CTS5RTS5	64	PA6	A6	R137	R174	JA3.7	-	-
			CTS5RTS5	R174	R137	JA2.12	-	-
A8_SDCMD	61	PB0	A8	R130	R219	JA3.9	-	-
			SDCMD	R219	R130	PMOD2.2	-	-
A9_SDCLK	59	PB1	A9	R132	R204	JA3.10	-	-
			SDCLK	R204	R132	PMOD2.4	-	-
A10_SDPWRCTL	58	PB2	A10	R129	R255	JA3.11	-	-
			SDPWRCTL	R225	R129	U3.1	-	-
A11_SDWP	57	PB3	A11	R123	R201	JA3.12	-	-
			SDWP	R201	R123	PMOD2.10	-	-
A12_TI0CA4	56	PB4	A12	R122	R168	JA3.13	-	-
			TI0CA4	R168	R122	JA2.20	-	-
A13_SDCD	55	PB5	A13	R121	R217	JA3.14	-	-
			SDCD	R217	R121	PMOD2.9	-	-
A14_SDD1	54	PB6	A14	R118	R227	JA3.15	-	-
			SDD1	R227	R118	PMOD2.7	-	-
A15_SDD2	53	PB7	A15	R120	R221	JA3.16	-	-
			SDD2	R221	R120	PMOD2.8	-	-

Table 6-11: External BUS Option Links (1)

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
A16_RL78G1CRTS	52	PC0	A16	R82	R233	JA3.37	-	-
			RL78G1CRTS	R233	R82	U11.2	-	-
A17_MTI0C3A	51	PC1	A17	R79	R143	JA3.38	-	-
			MTI0C3A	R143	R79	JA6.13	-	-
A18_SDD3	50	PC2	A18	R63	R223	JA3.39	-	-
			SDD3	R223	R63	PMOD2.1	-	-
A19_SDD0	49	PC3	A19	R78	R215	JA3.40	-	-
			SDD0	R215	R78	PMOD2.3	-	-
A20_CTS8RTS8 (TSCAP)	48	PC4	A20	R126, R128	R125, R127	JA3.41	-	-
			CTS8RTS8	R126, R127	R125, R128	PMOD1.1	R134	R135
			TSCAP	R125	R126	-	-	-
A21_SCK8	47	PC5	A21	R61	R208	JA3.42	-	-
			SCK8	R208	R61	PMOD1.4	-	-
A22_RXD8	46	PC6	A22	R60	R210	JA3.43	-	-
			RXD8	R210	R60	PMOD1.3	-	-
CS0n_TXD8_PC7	45	PC7	CS0n	R101	R212, R248	JA3.27	-	-
			TXD8	R212	R101	PMOD1.2	-	-
			PC7	R248	R101	E1.10 SW4.2	R243	-
D0_IRQ0	86	PD0	D0	R117	R119	JA3.17	-	-
			IRQ0	R119	R117	SW3	R273	R270
D1_MTI0C4B	85	PD1	D1	R116	R169	JA3.18	-	-
			MTI0C4B	R169	R116	JA2.17	-	-
D2_MTI0C4D	84	PD2	D2	R114	R115	JA3.19	-	-
			MTI0C4D	R115	R114	JA2.18	-	-
D4_POE3n	82	PD4	D4	R62, R111	R163	JA3.21	-	-
			POE3n	R62, R163	R111	JA2.24	-	-
D5_MTI0C5W	81	PD5	D5	R112	R39	JA3.22	-	-
			MTI0C5W	R39	R112	JA6.16	-	-
D6_MTI0C5V	80	PD6	D6	R103	R40	JA3.23	-	-
			MTI0C5V	R40	R103	JA6.15	-	-
D7_MTI0C5U	79	PD7	D7	R105	R41	JA3.24	-	-
			MTI0C5U	R41	R105	JA6.14	-	-
D8_SCK12	78	PE0	D8	R94	R42	JA3.29	-	-
			SCK12	R42	R94	JA6.11	-	-
D9_TXD12	77	PE1	D9	R33	R43	JA3.30	-	-
			TXD12	R43	R33	JA6.9 U11.3	R154	R156, R234, R179
			D10	R90	R44	JA3.31	-	-
D10_RXD12	76	PE2	RXD12	R44	R90	JA6.12 U9.3	R153	R157, R251, R176
			D11	R92	R192	JA3.32	-	-
D11_PE3	75	PE3	PE3	R192	R92	PMOD1.9	-	-
			D12	R87	R89, R190	JA3.33	-	-
D12_MTI0C1A_PE4	74	PE4	MTI0C1A	R89	R190, R87	JA2.23	R91	R162
			PE4	R190	R87, R89	PMOD1.10	-	-
			D13	R88	R171	JA3.34	-	-
D13_MTI0C4C	73	PE5	MTI0C4C	R171	R88	JA2.16	-	-
			D14	R81	R198	JA3.35	-	-
D14_IRQ6	72	PE6	IRQ6	R198	R81	PMOD1.7	-	-
			D15	R83	R194	JA3.36	-	-
D15_IRQ7	71	PE7	IRQ7	R194	R83	PMOD1.8	-	-

Table 6-12: External BUS Option Links (2)

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 6.11 CAN Configuration

Table 6-13 below details the function of the option links associated with the CAN configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal /Function	Fit	DNF	Interface /Function	Fit	DNF
CTX0_ALE	40	P54	CTX0	R58	R59	JA5.5	-	-
			ALE	R59	R58	U12.3	R84	-
CRX0_WAITn	39	P55	CRX0	R46	R50	JA5.6	-	-
			WAITn	R50	R46	U10.3	R231	-
						JA3.45	R57	R54

Table 6-13: CAN Option Links

## 6.12 TPU & MTU & POE Configuration

Table 6-14 and Table 6-15 below details the function of the option links associated with TPU & MTU & POE configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
SDA_MTI0C0B_IRQ3	33	P13	SDA	R184	R175	U4.5	R10	-
			MTI0C0B_IRQ3	R175	R184	JA1.25	-	-
MTCLKA_USB00VRCURA	32	P14	MTCLKA	R158	R269	JA2.25	-	-
			USB00VRCURA	R269	R158	U7.2	-	-
MTI0C3D_USB0VBUS	30	P16	MTI0C3D	R173	R6	JA2.14	-	-
			USB0VBUS	R6	R173	J7.2	-	-
MTCLKB_RL78G1CCTS	31	P15	MTCLKB	R159	R230	JA2.26	-	-
			RL78G1CCTS	R230	R159	U9.2	-	-
MTI0C3B	29	P17	MTI0C3B	-	-	LED0	-	-
						JA2.13	R172	R167
						JA2.19	R167	R172
USB0VBUSEN_MTI0C0C_IRQ2	18	P32	USB0VBUSEN	R263	R160	U8.3	-	-
			MTI0C0C_IRQ2	R160	R263	JA2.23	R162	R91
P33_MTI0C0D	17	P33	P33	R136	R165	PMOD1.1	R135	R134
			MTI0C0D	R165	R136	JA2.21	-	-
MTI0C0A_IRQ4	16	P34	MTI0C0A_IRQ4	-	-	SW2	R272	-
						JA2.7	-	-
A0_MTI0C4A	70	PA0	A0	R147	R170	JA3.1	-	-
			MTI0C4A	R170	R147	JA2.15	-	-
A5_TI0CB1	65	PA5	A5	R144	R166	JA3.6	-	-
			TI0CB1	R166	R144	JA2.22	-	-
A12_TI0CA4	56	PB4	A12	R122	R168	JA3.13	-	-
			TI0CA4	R168	R122	JA2.20	-	-
A17_MTI0C3A	51	PC1	A17	R79	R143	JA3.38	-	-
			MTI0C3A	R143	R79	JA6.13	-	-

Table 6-14: TPU & MTU & POE Option Links (1)

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
D1_MTI0C4B	85	PD1	D1	R116	R169	JA3.18	-	-
			<b>MTI0C4B</b>	<b>R169</b>	<b>R116</b>	<b>JA2.17</b>	-	-
D2_MTI0C4D	84	PD2	D2	R114	R115	JA3.19	-	-
			<b>MTI0C4D</b>	<b>R115</b>	<b>R114</b>	<b>JA2.18</b>	-	-
D4_POE3n	82	PD4	D4	<b>R62, R111</b>	R163	JA3.21	-	-
			<b>POE3n</b>	<b>R62, R163</b>	<b>R111</b>	<b>JA2.24</b>	-	-
D5_MTI0C5W	81	PD5	D5	R112	R39	JA3.22	-	-
			<b>MTI0C5W</b>	<b>R39</b>	<b>R112</b>	<b>JA6.16</b>	-	-
D6_MTI0C5V	80	PD6	D6	R103	R40	JA3.23	-	-
			<b>MTI0C5V</b>	<b>R40</b>	<b>R103</b>	<b>JA6.15</b>	-	-
D7_MTI0C5U	79	PD7	D7	R105	R41	JA3.24	-	-
			<b>MTI0C5U</b>	<b>R41</b>	<b>R105</b>	<b>JA6.14</b>	-	-
D12_MTI0C1A_PE4	74	PE4	D12	R87	<b>R89, R190</b>	JA3.33	-	-
			MTI0C4C	R89	<b>R87, R190</b>	JA2.23	R91	R162
			<b>PE4</b>	<b>R190</b>	<b>R87, R89</b>	<b>PMOD1.10</b>	-	-
D13_MTI0C4C	73	PE5	D13	R88	R171	JA3.34	-	-
			<b>MTI0C4C</b>	<b>R171</b>	<b>R88</b>	<b>JA2.16</b>	-	-

Table 6-15: TPU &amp; MTU &amp; POE Option Links (2)

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

### 6.13 PMOD1 Interface Configuration

Table 6-16 below details the function of the option links associated with PMOD1 Interface configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection			
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF	
P33_MTIOC0D	17	P33	P33	R136	R165	PMOD1.1	R135	R134	
			MTIOC0D	R165	R136	JA2.21	-	-	
A20_CTS8RTS8 (TSCAP)	48	PC4	A20	R126, R128	R125, R127	JA3.41	-	-	
			CTS8RTS8	R126, R127	R125, R128	PMOD1.1	R134	R135	
			TSCAP	R125	R126	-	-	-	
A21_SCK8	47	PC5	A21	R61	R208	JA3.42	-	-	
			SCK8	R208	R61	PMOD1.4	-	-	
A22_RXD8	46	PC6	A22	R60	R210	JA3.43	-	-	
			RXD8	R210	R60	PMOD1.3	-	-	
CS0n_TXD8_PC7	45	PC7	CS0n	R101	R212, R248	JA3.27	-	-	
			TXD8	R212	R101	PMOD1.2	-	-	
			PC7	R248	R101	E1.10	R243	-	-
						SW4.2	-	-	
D11_PE3	75	PE3	D11	R92	R192	JA3.32	-	-	
			PE3	R192	R92	PMOD1.9	-	-	
D12_MTIOC1A_PE4	74	PE4	D12	R87	R89, R190	JA3.33	-	-	
			MTIOC1A	R89	R190, R87	JA2.23	R91	R162	
			PE4	R190	R87, R89	PMOD1.10	-	-	
D14_IRQ6	72	PE6	D14	R81	R198	JA3.35	-	-	
			IRQ6	R198	R81	PMOD1.7	-	-	
D15_IRQ7	71	PE7	D15	R83	R194	JA3.36	-	-	
			IRQ7	R194	R83	PMOD1.8	-	-	

Table 6-16: PMOD1 Interface Option Links

### 6.14 PMOD2 Interface Configuration

Table 6-17 below details the function of the option links associated with PMOD2 Interface configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
A8_SDCMD	61	PB0	A8	R130	R219	JA3.9	-	-
			SDCMD	R219	R130	PMOD2.2	-	-
A9_SDCLK	59	PB1	A9	R132	R204	JA3.10	-	-
			SDCLK	R204	R132	PMOD2.4	-	-
A11_SDWP	57	PB3	A11	R123	R201	JA3.12	-	-
			SDWP	R201	R123	PMOD2.10	-	-
A13_SDCD	55	PB5	A13	R121	R217	JA3.14	-	-
			SDCD	R217	R121	PMOD2.9	-	-
A14_SDD1	54	PB6	A14	R118	R227	JA3.15	-	-
			SDD1	R227	R118	PMOD2.7	-	-
A15_SDD2	53	PB7	A15	R120	R221	JA3.16	-	-
			SDD2	R221	R120	PMOD2.8	-	-
A18_SDD3	50	PC2	A18	R63	R223	JA3.39	-	-
			SDD3	R223	R63	PMOD2.1	-	-
A19_SDD0	49	PC3	A19	R78	R215	JA3.40	-	-
			SDD0	R215	R78	PMOD2.3	-	-

Table 6-17: PMOD2 Interface Option Links

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 6.15 Serial & USB to Serial Configuration

Table 6-18 below details the function of the option links associated with Serial & USB to Serial configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
MTCLKB_RL78G1CCTS	31	P15	MTCLKB	<b>R159</b>	<b>R230</b>	JA2.26	-	-
			RL78G1CCTS	R230	R159	U9.2	-	-
CS2n_TXD1	22	P26	CS2n	R97	R237	JA3.28	-	-
			TXD1	<b>R237</b>	<b>R97</b>	E1.5	R238	-
						U11.3	R234	<b>R156, R154, R179</b>
JA6.8	-	-						
CS3n_SCK1	21	P27	CS3n	R51	R47	JA3.45	<b>R54</b>	<b>R57</b>
			SCK1	<b>R47</b>	<b>R51</b>	JA6.10	-	-
RXD1	20	P30	RXD1	-	-	E1.11	R249	-
						JA6.7	R155	-
						U9.3	R251	<b>R157, R153, R176</b>
D8_SCK12	78	PE0	D8	R94	R42	JA3.29	-	-
			SCK12	<b>R42</b>	<b>R94</b>	JA6.11	-	-
D9_TXD12	77	PE1	D9	R33	R43	JA3.30	-	-
			TXD12	<b>R43</b>	<b>R33</b>	U11.3	R154	<b>R156, R234, R179</b>
						JA6.9	-	-
D10_RXD12	76	PE2	D10	R90	R44	JA3.31	-	-
A1_SCK5	69	PA1	A1	R148	R149	JA3.2	-	-
			SCK5	<b>R149</b>	<b>R148</b>	JA2.10	-	-
A3_RXD5	67	PA3	A3	R146	R177	JA3.4	-	-
			RXD5	<b>R177</b>	<b>R146</b>	U9.3	R176	<b>R157, R153, R251</b>
						JA2.8	-	-
A4_TXD5	66	PA4	A4	R141	R178	JA3.5	-	-
A6_CTS5RTS5	64	PA6	A6	R137	R174	JA3.7	-	-
			CTS5RTS5	<b>R174</b>	<b>R137</b>	JA2.12	-	-
A16_RL78G1CRTS	52	PC0	A16	<b>R82</b>	<b>R233</b>	JA3.37	-	-
			RL78G1CRTS	R233	R82	U11.2	-	-
A21_SCK8	47	PC5	A21	R61	R208	JA3.42	-	-
			SCK8	<b>R208</b>	<b>R61</b>	PMOD1.4	-	-
A22_RXD8	46	PC6	A22	R60	R210	JA3.43	-	-
			RXD8	<b>R210</b>	<b>R60</b>	PMOD1.3	-	-
CS0n_TXD8_PC7	45	PC7	CS0n	R101	R212	JA3.27	-	-
			TXD8	<b>R212</b>	<b>R101</b>	PMOD1.2	-	-
			PC7	<b>R248</b>	<b>R101</b>	SW4.2	-	-
						E1.10	<b>R243</b>	-
RS232TX	-	-	RS232TX	R156	<b>R154, R234, R179</b>	JA6.5	-	-
RS232RX	-	-	RS232RX	R157	<b>R153, R251, R176</b>	JA6.6	-	-

**Table 6-18: Serial & USB to Serial Option Links**

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 6.16 USB Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
MTCLKA_USB0OVRCURA	32	P14	MTCLKA	R158	R269	JA2.25	-	-
			<b>USB0OVRCURA</b>	<b>R269</b>	<b>R158</b>	<b>U7.2</b>	-	-
MTIOC3D_USB0VBUS	30	P16	MTIOC3D	R173	R6	JA2.14	-	-
			<b>USB0VBUS</b>	<b>R6</b>	<b>R173</b>	<b>J7.2</b>	-	-
USB0VBUSEN_MTIOC0C_IRQ2	18	P32	<b>USB0VBUSEN</b>	<b>R263</b>	<b>R160</b>	<b>U8.3</b>	-	-
			MTIOC0C_IRQ2	R160	R263	JA2.23	<b>R162</b>	<b>R91</b>

Table 6-19: USB Option Links (1)

Table 6-20 below details the function of the option links associated with the USB mode select.

Reference	Jumper Position	Explanation	Related Ref.
J7	Shorted Pin1-2	Enables Bus-Powered.	J15
	<b>Shorted Pin2-3</b>	<b>Enables Self-Powered.</b>	J6, J15
	All open	Please do not set.	-
J6 <sup>*1</sup>	Shorted Pin1-2	Enables BC feature.	J7, J15
	<b>All open</b>	<b>Disables BC feature.</b>	J7, J15
J15	Shorted Pin1-2	Enables Host Mode.	-
	<b>Shorted Pin2-3</b>	<b>Enables Function Mode.</b>	J7, J6
	All open	Please do not set.	-
J13 <sup>*1</sup>	Shorted Pin1-2	Connects VBUS line to EXT_BUS.	J15
	Shorted Pin2-3	Connects VBUS line to EXT_CHG.	J15
	<b>All Open</b>	<b>Disconnects EXT_CHG and EXT_VBUS from VBUS line.</b>	J7, J6, J15

Table 6-20: USB Option Links (2)

<sup>\*1</sup>: By default, jumper J6 and J13 are not fitted to the RSK.

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 6.17 Touch Interface Configuration

Table 6-21 below details the function of the option links associated with Touch Interface configuration..

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
A20_CTS8RTS8 (TSCAP)	48	PC4	A20	R126, R128	R125, R127	JA3.41	-	-
			CTS8RTS8	R126, <b>R127</b>	R125, <b>R128</b>	PMOD1.1	R134	R135
			<b>TSCAP</b>	<b>R125</b>	<b>R126</b>	-	-	-
TS4	23	P25	<b>TS4</b>	<b>R257</b>	<b>R124</b>	<b>touch slider</b>	-	-
TS4_CON			TS4_CON	R124	R257	-	-	-
TS5	24	P24	<b>TS5</b>	<b>R258</b>	<b>R131</b>	<b>touch slider</b>	-	-
TS5_CON			TS5_CON	R131	R258	-	-	-
TS6	25	P23	<b>TS6</b>	<b>R259</b>	<b>R133</b>	<b>touch slider</b>	-	-
TS6_CON			TS6_CON	R133	R259	-	-	-
TS7	26	P22	<b>TS7</b>	<b>R260</b>	<b>R138</b>	<b>touch slider</b>	-	-
TS7_CON			TS7_CON	R138	R260	-	-	-
TS8	27	P21	<b>TS8</b>	<b>R261</b>	<b>R142</b>	<b>touch key</b>	-	-
TS8_CON			TS8_CON	R142	R261	-	-	-
TS9	28	P20	<b>TS9</b>	<b>R262</b>	<b>R145</b>	<b>touch key</b>	-	-
TS9_CON			TS9_CON	R145	R262	-	-	-

Table 6-21: Touch Interface Option Links

Items shown in **bold** are the Fit / Do Not Fit (DNF) default configuration that the RSK is supplied with.

## 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	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	5V	-	2	0V	-
	CON_5V			GROUND	
3	3V3	-	4	0V	-
	CON_3V3			GROUND	
5	AVCC	97	6	AVSS	99/94
	CON_AVCC0			CON_AVSS0/ CON_VREFL0	
7	AVREF	96	8	ADTRG	98
	CON_VREFH0			ADTRG0n	
9	ADC0	95	10	ADC1	93
	JA1_AN000 (AN000)			AN001	
11	ADC2	92	12	ADC3	91
	AN002			AN003	
13	DAC0	2	14	DAC1	100
	DA0			DA1	
15	IO_0	2	16	IO_1	100
	IO0			IO1	
17	IO_2	92	18	IO_3	91
	IO2			IO3	
19	IO_4	90	20	IO_5	89
	IO4			IO5	
21	IO_6	88	22	IO_7	87
	IO6			IO7	
23	IRQ3/IRQAEC/M2_HSINO	19	24	IIC_EX	NC
	IRQ6			NC	
25	IIC_SDA	33	26	IIC_SCL	34
	JA1_SDA (SDA0)			JA1_SCL (SCL0)	

**Table 7-1: Application Header JA1 Connections**



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

Application Header JA2					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	RESET	10	2	EXTAL	13
	RESn			CON_EXTAL	
3	NMI	15	4	Vss1	-
	NMI			GROUND	
5	WDT_OVF	NC	6	SCIaTX	66
	NC			TXD5	
7	IRQ0/WKUP/M1_HSIN0	16	8	SCIaRX	67
	MTIOC0A_IRQ4			RXD5	
9	IRQ1/M1_HSIN1	33	10	SCIaCK	69
	MTIOC0B_IRQ3			SCK5	
11	M1_UD	4	12	CTSRTS	64
	MTIOC3C			CTS5RTS5	
13	M1_UP	29	14	M1_UN	30
	MTIOC3B			MTIOC3D	
15	M1_VP	70	16	M1_VN	73
	MTIOC4A			MTIOC4C	
17	M1_WP	85	18	M1_WN	84
	MTIOC4B			MTIOC4D	
19	TimerOut	29	20	TimerOut	56
	MTIOC3B			TIOCA4	
21	TimerIn	17	22	TimerIn	65
	MTIOC0D			TIOCB1	
23	IRQ2/M1_EncZ/M1_HSIN2	18/74	24	M1_POE	82
	MTIOC0C_IRQ2/MTIOC1A			POE3n	
25	M1_TRCCLK	32	26	M1_TRDCLK	31
	MTCLKA			MTCLKB	

Table 7-2: Application Header JA2 Connections

**Table 7-5** and **Table 7-4** below lists the connections of the application header, JA3.

Application Header JA3					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	A0	70	2	A1	69
	A0			A1	
3	A2	68	4	A3	67
	A2			A3	
5	A4	66	6	A5	65
	A4			A5	
7	A6	64	8	A7	63
	A6			A7	
9	A8	61	10	A9	59
	A8			A9	
11	A10	58	12	A11	57
	A10			A11	
13	A12	56	14	A13	55
	A12			A13	
15	A14	54	16	A15	53
	A14			A15	
17	D0	86	18	D1	85
	D0			D1	
19	D2	84	20	D3	83
	D2			D3	
21	D4	82	22	D5	81
	D4			D5	
23	D6	80	24	D7	79
	D6			D7	

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

Application Header JA3					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
25	RDn	42	26	WR/SDWE	44
	RDn			WRn	
27	CSa	45	28	CSb	22
	CS0n			CS2n	
29	D8	78	30	D9	77
	D8			D9	
31	D10	76	32	D11	75
	D10			D11	
33	D12	74	34	D13	73
	D12			D13	
35	D14	72	36	D15	71
	D14			D15	
37	A16	52	38	A17	51
	A16			A17	
39	A18	50	40	A19	49
	A18			A19	
41	A20	48	42	A21	47
	A20			A21	
43	A22	46	44	SDCLK	41
	A22			BCLK	
45	CSc/Wait	21/39	46	ALE/SDCKE	40
	JA3_PIN45			ALE	
47	HWRn/DQMH	43	48	LWRn/DQML	44
	WR1n			WR0n	

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

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

Application Header JA5					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	ADC4	90	2	ADC5	89
	AN004			AN005	
3	ADC6	88	4	ADC7	87
	AN006			AN007	
5	CAN1TX	40	6	CAN1RX	39
	CTX0			CRX0	
7	CAN2TX	NC	8	CAN2RX	NC
	NC			NC	
9	IRQ4/M2_EncZ/M2_H SIN1	NC/NC/NC	10	IRQ5/M2_H SIN2	NC/NC
	NC/NC/NC			NC/NC	
11	M2_UD	NC	12	M2_Uin	NC
	NC			NC	
13	M2_Vin	NC	14	M2_Win	NC
	NC			NC	
15	M2_Toggle	NC	16	M2_POE	NC
	NC			NC	
17	M2_TRCCLK	NC	18	M2_TRDCLK	NC
	NC			NC	
19	M2_UP	NC	20	M2_UN	NC
	NC			NC	
21	M2_VP	NC	22	M2_VN	NC
	NC			NC	
23	M2_WP	NC	24	M2_WN	NC
	NC			NC	

Table 7-5: Application Header JA5 Connections

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

Application Header JA6					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	DREQ	NC	2	DACK	NC
	NC			NC	
3	TEND	NC	4	STBYn	NC
	NC			NC	
5	RS232TX	NC	6	RS232RX	NC
	RS232TX			RS232RX	
7	SCIbRX	20	8	SCIbTX	22
	RXD1			TXD1	
9	SCIcTX	77	10	SCIbCK	21
	TXD12			SCK1	
11	SCIcCK	78	12	SCIcRX	76
	SCK12			RXD12	
13	M1_Toggle	51	14	M1_Uin	79
	MTIOC3A			MTIC5U	
15	M1_Vin	80	16	M1_Win	81
	MTIC5V			MTIC5W	
17	EXT_USB_VBUS	-	18	Reserved	NC
	EXT_VBUS			NC	
19	EXT_USB_BATT	-	20	Reserved	NC
	EXT_BATT			NC	
21	EXT_USB_CHG	-	22	Reserved	NC
	EXT_CHG			NC	
23	Unregulated_VCC	-	24	Vss	-
	Unregulated_VCC			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	CON_VREFH	1	2	IO0_DA0	2
3	CON_VREFL	3	4	MTIOC3C	4
5	NC	NC	6	VBATT	6
7	MD_FINED	7	8	NC	NC
9	NC	NC	10	RESn	10
11	CON_XTAL	11	12	GROUND	-
13	CON_EXTAL	13	14	UC_VCC	-
15	NMI	15	16	MTIOC0A_IRQ4	16
17	P33_MTIOC0D	17	18	USB0VBUSEN_MTIOC0C_IRQ2	18
19	IRQ1	19	20	RXD1	20
21	CS3n_SCK1	21	22	CS2n_TXD1	22
23	TS4_CON	23	24	TS5_CON	24
25	TS6_CON	25	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

**Table 7-7: Microcontroller Pin Header, J1**

**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	TS7_CON	26	2	TS8_CON	27
3	TS9_CON	28	4	MTIOC3B	29
5	MTIOC3D_USB0VBUS	30	6	MTCLKB_RL78G1CCTS	31
7	MTCLKA_USB0OVRCUR A	32	8	SDA_MTIOC0B_IRQ3	33
9	SCL	34	10	VCCUSB	-
11	NC	NC	12	NC	NC
13	GROUND	-	14	CRX0_WAITn	39
15	CTX0_ALE	40	16	BCLK	41
17	RDn	42	18	WR1n	43
19	WRn_WR0n	44	20	CS0n_TXD8_PC7	45
21	A22_RXD8	46	22	A21_SCK8	47
23	A20_CTS8RTS8	48	24	A19_SDD0	49
25	A18_SDD3	50	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

**Table 7-8: Microcontroller Pin Header, J2**

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	A17_MTI0C3A	51	2	A16_RL78G1CRTS	52
3	A15_SDD2	53	4	A14_SDD1	54
5	A13_SDCD	55	6	A12_TIOCA4	56
7	A11_SDWP	57	8	A10_SDPWRCTL	58
9	A9_SDCLK	59	10	UC_VCC	-
11	A8_SDCMD	61	12	GROUND	-
13	A7	63	14	A6_CTS5RTS5	64
15	A5_TIOCB1	65	16	A4_TXD5	66
17	A3_RXD5	67	18	A2	68
19	A1_SCK5	69	20	A0_MTI0C4A	70
21	D15_IRQ7	71	22	D14_IRQ6	72
23	D13_MTI0C4C	73	24	D12_MTI0C1A_PE4	74
25	D11_PE3	75	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

Table 7-9: Microcontroller Pin Header, J3

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	D10_RXD12	76	2	D9_TXD12	77
3	D8_SCK12	78	4	D7_MTI0C5U	79
5	D6_MTI0C5V	80	6	D5_MTI0C5W	81
7	D4_POE3n	82	8	D3	83
9	D2_MTI0C4D	84	10	D1_MTI0C4B	85
11	D0_IRQ0	86	12	IO7_AN007	87
13	IO6_AN006	88	14	IO5_AN005	89
15	IO4_AN004	90	16	IO3_AN003	91
17	IO2_AN002	92	18	AN001	93
19	CON_VREFL0	94	20	AN000	95
21	CON_VREFH0	96	22	CON_AVCC0	97
23	ADTRG0n	98	24	CON_AVSS0	99
25	IO1_DA1	100	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

Table 7-10: Microcontroller Pin Header, J4

## 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 (SCI and USB), which are configured on the RSK board. Details of the modifications required can be found in §6.2. All other MCU operating modes are configured within the MCU's registers, which are listed in the RX231 group hardware manual.

Only 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

For the MCU address space details, refer to the 'Address Space' section of RX231 Group Hardware Manual.



## 9. Additional Information

### Technical Support

For information about the RX231 Group microcontrollers refer to the RX231 Group Hardware Manual.

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

### Technical Contact Details

*Please refer to the contact details listed in section 9 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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**SALES OFFICES****Renesas Electronics Corporation**<http://www.renesas.com>Refer to "<http://www.renesas.com/>" for the latest and detailed information.**Renesas Electronics America Inc.**2801 Scott Boulevard Santa Clara, CA 95050-2549, U.S.A.  
Tel: +1-408-588-6000, Fax: +1-408-588-6130**Renesas Electronics Canada Limited**9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3  
Tel: +1-905-237-2004**Renesas Electronics Europe Limited**Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K  
Tel: +44-1628-585-100, Fax: +44-1628-585-900**Renesas Electronics Europe GmbH**Arcadiastrasse 10, 40472 Düsseldorf, Germany  
Tel: +49-211-6503-0, Fax: +49-211-6503-1327**Renesas Electronics (China) Co., Ltd.**Room 1709, Quantum Plaza, No.27 ZhiChunLu Haidian District, Beijing 100191, P.R.China  
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679**Renesas Electronics (Shanghai) Co., Ltd.**Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, P. R. China 200333  
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999**Renesas Electronics Hong Kong Limited**Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong  
Tel: +852-2265-6688, Fax: +852 2886-9022**Renesas Electronics Taiwan Co., Ltd.**13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan  
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670**Renesas Electronics Singapore Pte. Ltd.**80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949  
Tel: +65-6213-0200, Fax: +65-6213-0300**Renesas Electronics Malaysia Sdn.Bhd.**Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia  
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510**Renesas Electronics India Pvt. Ltd.**No.777C, 100 Feet Road, HALII Stage, Indiranagar, Bangalore, India  
Tel: +91-80-67208700, Fax: +91-80-67208777**Renesas Electronics Korea Co., Ltd.**12F., 234 Teheran-ro, Gangnam-Gu, Seoul, 135-080, Korea  
Tel: +82-2-558-3737, Fax: +82-2-558-5141

RX231 Group