

# RX24U Group

Renesas Starter Kit User's Manual

RENESAS 32-Bit MCU  
RX Family / RX200 Series

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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 be 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 RSKRX24U. 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.	RSKRX24U User's Manual	R20UT3758EG
Tutorial Manual	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRX24U Tutorial Manual	CS+: R20UT3759EG e <sup>2</sup> studio: R20UT3762EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRX24U Quick Start Guide	CS+: R20UT3760EG e <sup>2</sup> studio: R20UT3763EG
Code Generator Tutorial Manual	Provides a guide to code generation and importing into the IDE (Integrated Development Environment).	RSKRX24U Code Generator Tutorial Manual	CS+: R20UT3761EG e <sup>2</sup> studio: R20UT3764EG
Schematics	Full detail circuit schematics of the RSK.	RSKRX24U Schematics	R20UT3757EG
Hardware Manual	Provides technical details of the RX24U microcontroller.	RX24U Group Hardware Manual	R01UH0658EJ

## 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/E2 Lite	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	Real Time 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 : R5F524UEADFB
	Package : 144-pin LQFP
	On-Chip Memory : ROM 512KB+8KB, RAM 32KB
On-Board Memory	ƒC EEPROM : 2Kbit
Input Clock	RX24U Main : 20MHz
	RL78/G1C Main: 12MHz
Power Supply *1	DC Power Jack : 5 V Input
	Power Supply IC : 5V Input, 3.3V Output
Debug Interface	E1/E2 Lite 14-pin box header
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
	CAN Driver x 1
USB to Serial Converter Interface	Connector : USB-MiniB
	Driver : RL78/G1C Microcontroller (Part No R5F10JBCANA)
Pmod™	PMOD1 : Angle type, 12-pin Connector
	PMOD2 *2 : Straight type, 12-pin Connector
Application Board Interface *c	2.54mm pitch, 26-pin x 2 (JA1, JA2), 24-pin x 2 (JA5, JA6)

**Table 1-1: Board Specification**

\*1: Board can also supply 5V into RX24U microcontroller without LDO regulator.

\*2: The Application Board & PMOD2 Interface connectors are not fitted on this product.



## 2. Power Supply

### 2.1 Requirements

This RSK is supplied with an E1 debugger or E2 Lite 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**, **Table 2-2** below. The default RSK power configuration is shown in **bold, blue text**.

Connector	Supply voltage
PWR	Input 5VDC

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

J6 Setting(DNF)	R83 Setting	Supply Source	Board_5V	Board_3V3	Board_VCC UC_VCC
<b>All open</b>	<b>Fit</b>	<b>E1(3V3) / E2 Lite(3V3) / JA1-3V3</b>	<b>0V</b>	<b>3.3V</b>	<b>3.3V<sup>*2</sup></b>
		<b>PWR Connector / JA1-5V / Unregulated_VCC</b>	<b>5V</b>	<b>3.3V</b>	<b>3.3V</b>
Pin1-2 shorted	DNF	E1(3V3) / E2 Lite(3V3) / JA1-3V3	0V	3.3V	3.3V
		PWR Connector / JA1-5V / Unregulated_VCC	5V	3.3V	3.3V <sup>*2</sup>
Pin2-3 shorted	DNF	PWR Connector / Unregulated_VCC / JA1-5V / E1(5V)	5V	3.3V	5V <sup>*1</sup>

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

\*1: Can not use Pmod™.

\*2: Can not use CAN.

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.

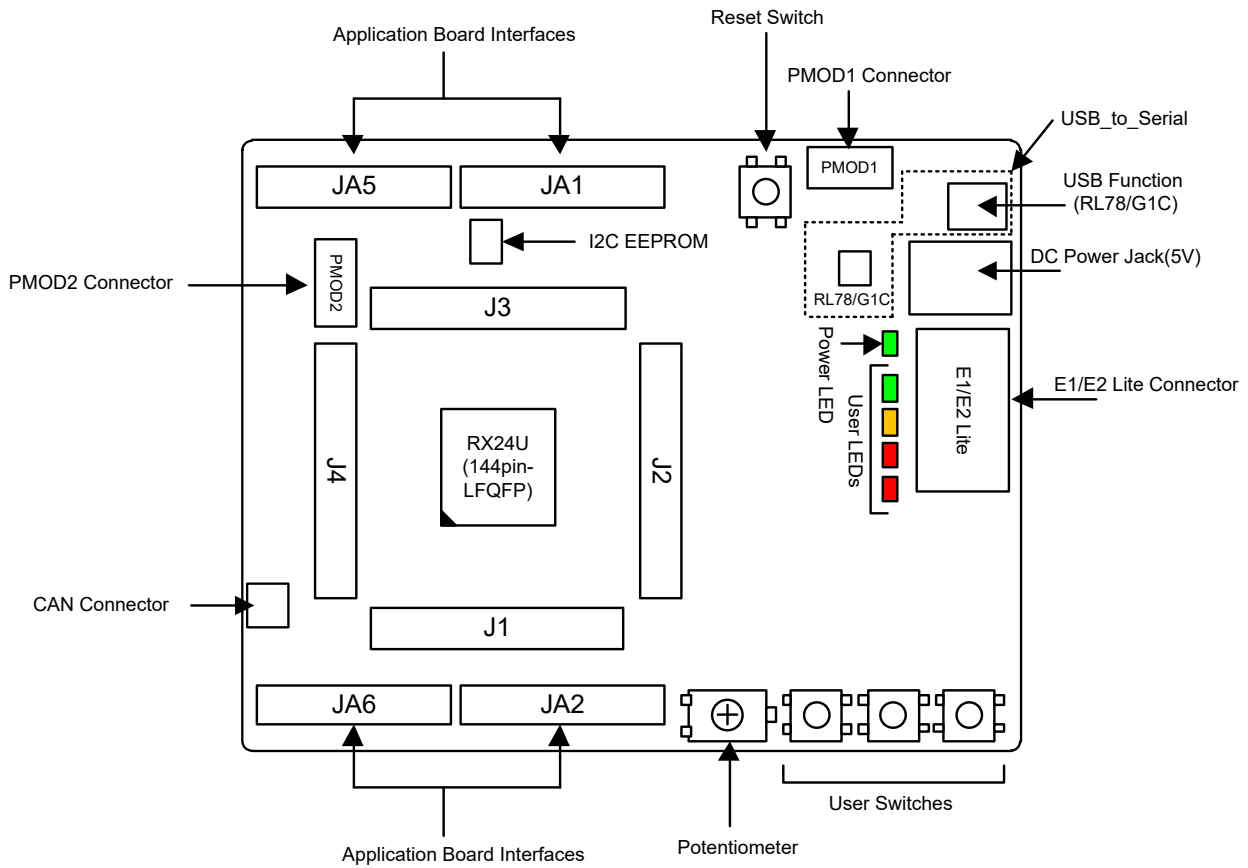


Figure 3-1: Board Layout

### 3.2 Board Dimensions

Figure 3-2 below gives the board dimensions and connector positions. All the through-hole connectors are on a common 2.54mm grid for easy interfacing.

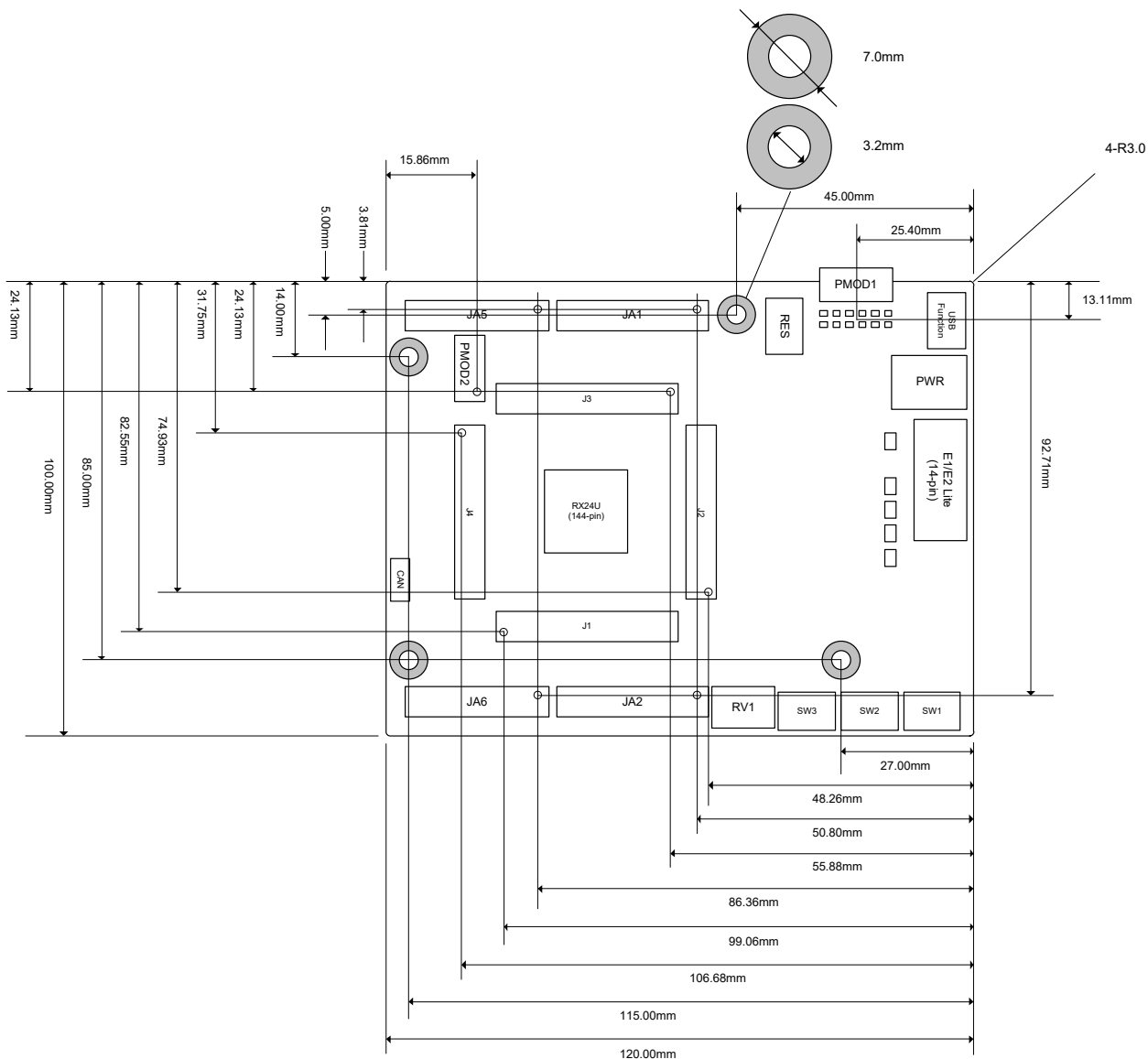


Figure 3-2: Board Dimensions

### 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.

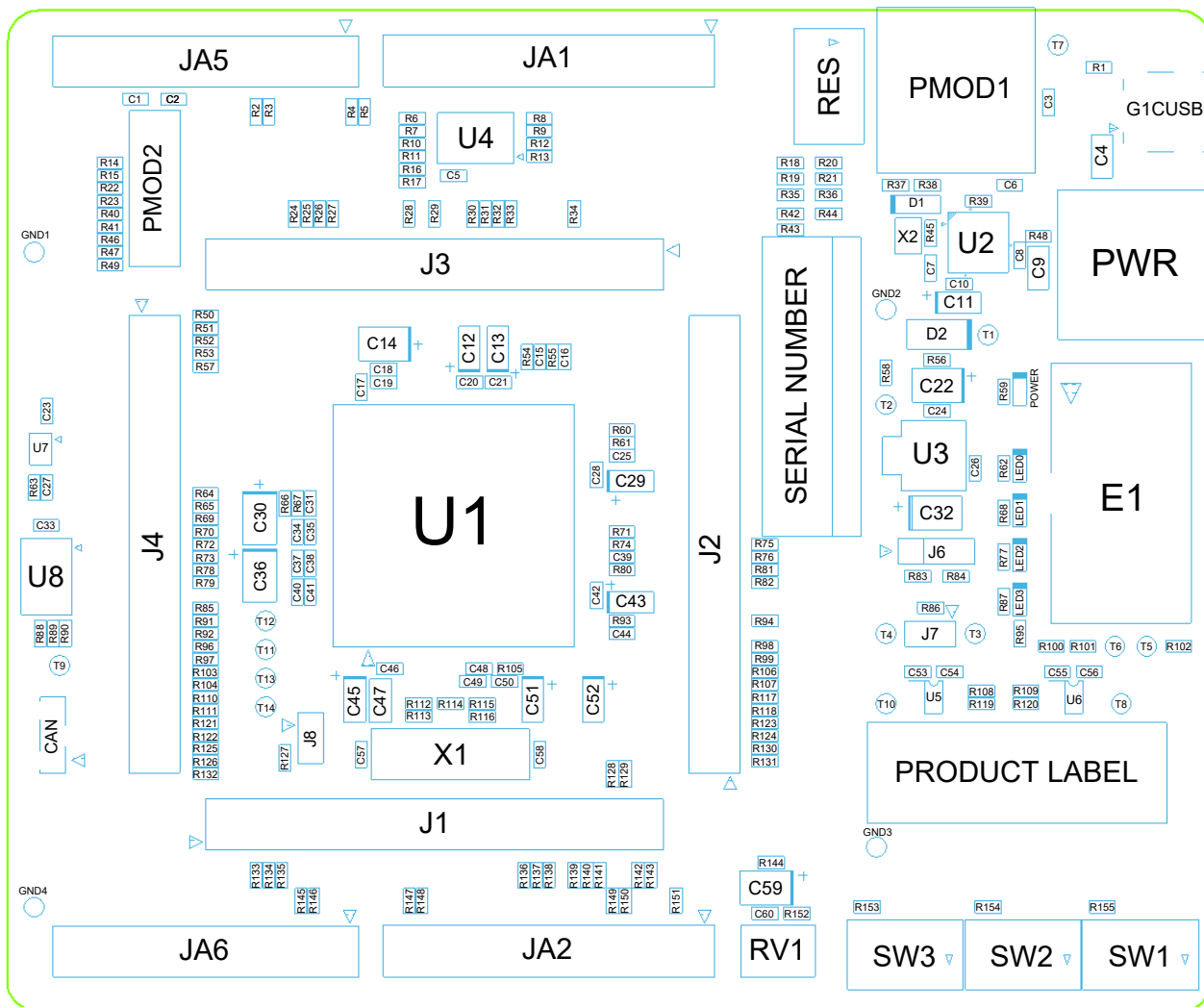


Figure 3-3 Top-Side Component Placement

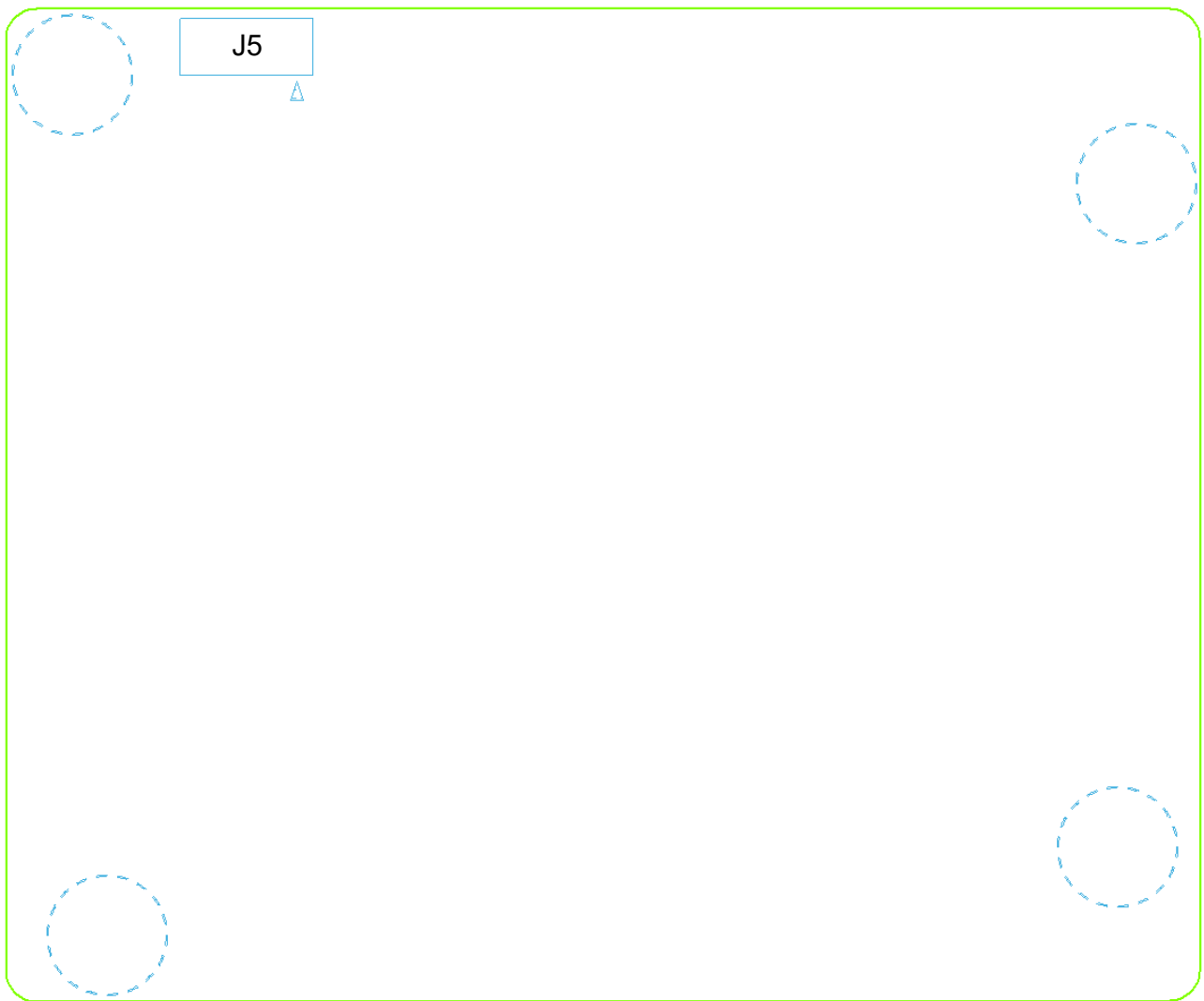


Figure 3-4 Bottom-Side Component Placement

## 4. Connectivity

### 4.1 Internal RSK Connections

Figure 4-1 below shows the RSK board components and their connectivity to the MCU.

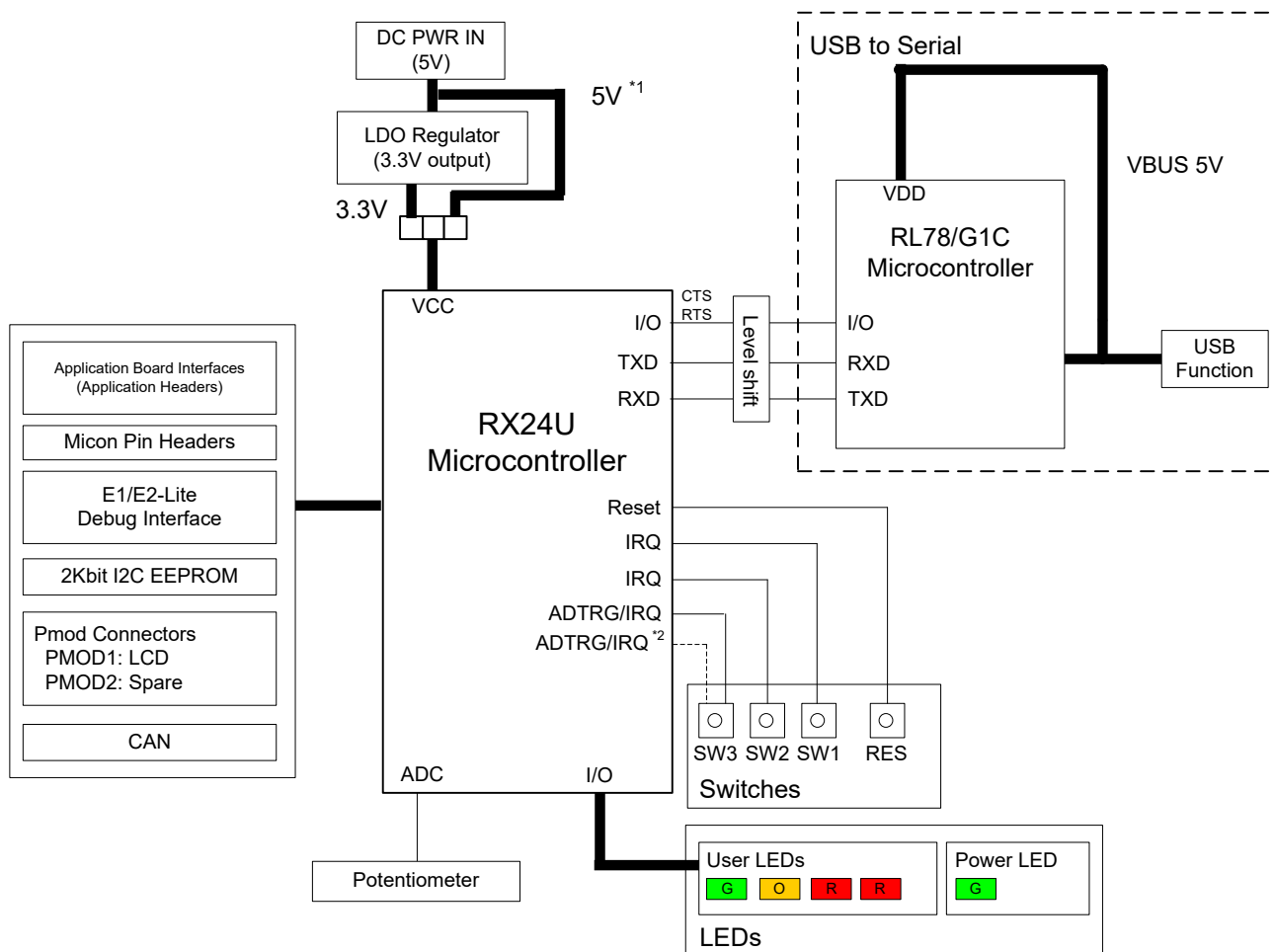


Figure 4-1: Internal RSK Block Diagram

\*1: Default setting is 3.3V - output refer to §2.1 or §6.4 for the required modifications.

\*2: Default is not connected. Refer to §6.6 for the required modifications.

## 4.2 Debugger Connections

Figure 4-2 below shows the connections between the RSK, E1/E2 Lite debugger and the host PC.

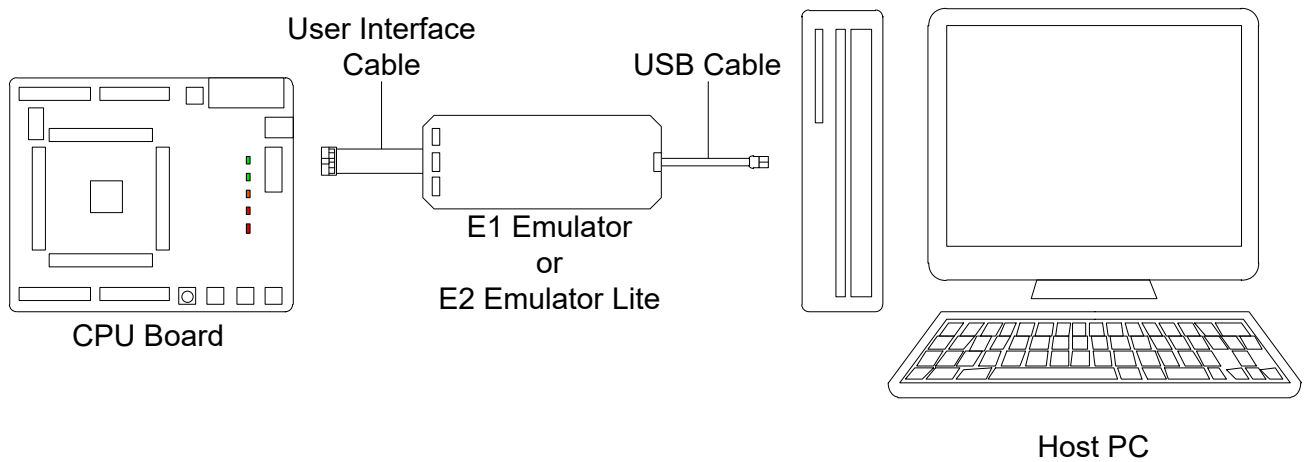


Figure 4-2: Debugger Connection Diagram

## 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 RX24U 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 RX24U Group Hardware Manual for details regarding the clock signal requirements, and the RSKRX24U 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	RX24U Main oscillator	Fitted	20MHz	Encapsulated, SMT
X2	RL78/G1C Main oscillator	Fitted	12MHz	Encapsulated, 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 RSK schematics.

Switch	Function	MCU	
		Signal	Pin
RES	When pressed, the microcontroller is reset.	RESn	16
SW1	Connects to an IRQ0 input for user controls.	P10	141
SW2	Connects to an IRQ4 input for user controls.	P60	110
SW3	Connects to IRQ7 and ADTRG0 input, and is used to trigger AD conversions.	P20	100
	Connects to IRQ1 and ADTRG1 input, and is used to trigger AD conversions. *1	PA5	53

**Table 5-2: Switch Connections**

\*1: 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	P21	99
LED1	Orange	User operated LED	P22	96
LED2	Red	User operated LED	PC3	98
LED3	Red	User operated LED	PC4	97

**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 125). The potentiometer can be used to create a voltage between Board\_VCC and ground.

Refer to the maker site for specification of the potentiometer (VISHAY with part number TS53 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 RX24U Group Hardware Manual for further details.

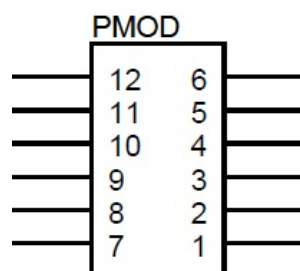
## 5.6 Pmod™

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. Connection information for the Digilent Pmod™ Compatible header is provided in **Table 5-4** and **Table 5-5** 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-CS	P34	60	7	PMOD1-IO0	P54	112
2	PMOD1-MOSI	PG1	81	8	PMOD1-IO1	P55	111
3	PMOD1-MISO	PG0	82	9	PMOD1-IO2	P27	91
4	PMOD1-SCK	PG2	80	10	PMOD1-IO3	P65	101
5	GROUND	-	-	11	GROUND	-	-
6	Board_3V3	-	-	12	Board_3V3	-	-

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

Digilent Pmod™ Compatible Header (PMOD2) Connections							
Pin	Circuit Net Name	MCU		Pin	Circuit Net Name	MCU	
		Port	Pin			Port	Pin
1	PMOD2-CS	P35	59	7	PMOD2-IO0	P10	141
2	PMOD2-MOSI	PC1	45	8	PMOD2-IO1	P02	7
3	PMOD2-MISO	PC0	46	9	PMOD2-IO2	P13	2
4	PMOD2-SCK	PC2	44	10	PMOD2-IO3	P14	1
5	GROUND	-	-	11	GROUND	-	-
6	Board_3V3	-	-	12	Board_3V3	-	-

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

## 5.7 USB Serial Port

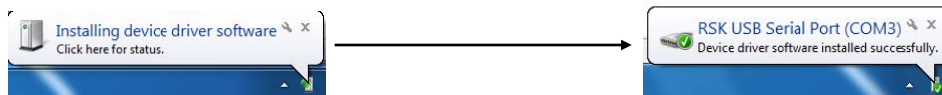
A USB serial port is implemented in a Renesas low power microcontroller (RL78/G1C) and is connected to the RX24U Serial Communications Interface (SCI) module. Multiple options are provided to allow the selection of the connected SCI1 port. Connections between the USB to Serial converter and the microcontroller are listed in **Table 5-6** below.

Signal Name	Function	MCU	
		Port	Pin
SERIAL-TXD	SCI1 Transmit Signal	PD3	29
	SCI5 Transmit Signal* <sup>1</sup>	PB5	39
	External SCI Transmit Signal* <sup>1</sup>	-	-
SERIAL-RXD	SCI1 Receive Signal	PD5	27
	SCI5 Receive Signal* <sup>1</sup>	PB6	38
	External SCI Receive Signal* <sup>1</sup>	-	-
SERIAL-CTS	Clear To Send	P31	87
SERIAL-RTS	Request To Send	PE0	24

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

\*1: 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 5-2**. The exact messages may vary depending upon operating system.



**Figure 5-2: USB-Serial Windows™ Installation message**

## 5.8 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 RX24U Group User's Manual: Hardware. The connections for the CAN microcontroller signals are listed in **Table 5-7** below.

CAN Signal	Function	MCU	
		Port	Pin
CAN1TX	CAN Data Transmission.	PF2	34
CAN1RX	CAN Data Reception.	PF3	33

**Table 5-7: CAN Connections**

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

The RX24U features one I<sup>2</sup>C (Inter-IC Bus) interface modules. RIIC0 is connected to a 2Kbit EEPROM. Specific details of the EEPROM device and the connections can be found in the board schematics.

## 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.

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 and jumpers.

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 RX24U Group Hardware Manual and RSKRX24U 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	Configuration	Explanation	Related Ref.
J8 *1	All open	Single Chip Mode	-
	Shorted Pin1-2	Boot Mode (SCI)	-

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

\*1: By default, jumper J8 is not fitted to the RSK. Therefore, it becomes the same setting as 'J8 All open'.

### 6.3 E1 / E2 Lite Debugger Configuration

**Table 6-2** below details the function of the option links associated with E1 / E2 Lite Debugger configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
PD3	29	PD3	<b>SERIAL-TXD</b>	R141	R123, R140	U6.3	-	R145
			<b>JA2-TXDa</b>	R139	R140	JA2.6	-	-
			E1-TXD	R140	R139, R141	E1.5	-	-
PD5	27	PD5	<b>SERIAL-RXD</b>	R137	R130, R136	U5.3	-	R146
			<b>JA2-RXDa</b>	R138	R136	JA2.8	-	-
			E1-RXD	R136	R137, R138	E1.11	-	-
MD_FINED	12	MD_FINED	<b>MD_FINED</b>	-	-	E1.7	-	-
						J8.2	-	-
RESn	16	RESn	<b>E1-RESn</b>	-	-	E1.13	-	-
			<b>SW-RESn</b>	-	-	RES	-	-
			<b>JA2-RESn</b>	-	-	JA2.1	-	-

**Table 6-2: E1 / E2 Lite Debugger Option Links**

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

## 6.4 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.
J6 *1	<b>Shorted Pin1-2</b>	<b>Connects regulator output (3.3V) to Board_VCC/UC_VCC</b>	<b>U3, R83</b>
	Shorted Pin2-3	Disconnects regulator output (3.3V) from Board_VCC/UC_VCC	U3, R83
	All open	Do not set when R83 is DNF.	U3, R83
J7 *2	<b>Shorted Pin1-2</b>	<b>Supply power to UC_VCC.</b>	<b>R86</b>
	All open	Enables current probe for MCU current consumption.	R86

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

\*1: By default, jumper J6 is not fitted to the RSK. R83 is fitted by default and becomes the same setting as 'J6 Shorted Pin1-2'.

\*2: By default, jumper J7 is not fitted to the RSK. R86 is fitted by default and becomes the same setting as 'J7 Shorted Pin1-2'.

Reference	Explanation	Fit	DNF	Related Ref.
Unregulated_VCC	<b>Connects Unregulated_VCC to 5V line.</b>	<b>R84</b>	-	<b>U3, JA6.23</b>
	Disconnects Unregulated_VCC from 5V line.	-	R84	
JA1-5V	<b>Connects JA1-5V to 5V line.</b>	<b>R56</b>	-	<b>U3, JA1.1</b>
	Disconnects JA1-5V from 5V line.	-	R56	
JA1-3V3	<b>Connects JA1-3V3 to 3V3 line.</b>	<b>R58</b>	-	<b>J6, JA1.3</b>
	Disconnects JA1-3V3 from 3V3 line.	-	R58	
Board_VCC	<b>Connects Board_VCC to UC_VCC.</b>	<b>R86/J7.1-2</b>	-	<b>U1(VCC, AVCC0-2, VREFH0-2)</b>
	Disconnects Board_VCC from UC_VCC.	<b>J7.Open</b>	R86	<b>U1(VCC, AVCC0-2, VREFH0-2)</b>
	Enables current probe for MCU current consumption.			

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

## 6.5 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	<b>Connects 20MHz crystal (X1) to RX24U.</b>	<b>R113, R116</b>	<b>R112, R115</b>	<b>U1(EXTAL, XTAL)</b>
	Connects CON_EXTAL to RX24U.	R115	R113, R116	U1(EXTAL), JA2.2

**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.

## 6.6 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
P20	100	P20	JA1-ADTRG(P20)	R26	R25, R75	JA1.8	-	-
			JA1-IRQd	R25	R26, R27	JA1.23	R4	R5
			SW3(P20)	R27	R25, R76	SW3(P20)	-	-
JA1-DAC1	95	P23	JA1-DAC1	-	-	JA1.14	-	-
JA1-DAC0	94	P24	JA1-DAC0	-	-	JA1.13	-	-
P40	125	P40	JA1-ADC0	R66	R67	JA1.9	-	-
			RV1-ADC	R67	R66	RV1	-	-
PA5	53	PA5	JA1-ADTRG(PA5)	R75	R26, R76, R82	JA1.8	-	-
			JA2-M1ENC_IRQc	R82	R75, R76	JA2.23	R147	R148
			SW3(PA5)	R76	R27, R75, R82	SW3(PA5)	-	-
PGAVSS1	121	-	AVSS0-2	R65	R64	JA1.6	R91	R85
			GROUND	R64	R65	GROUND	R85	R91
PGAVSS0	126	-	AVSS0-2	R69	R70	JA1.6	R91	R85
			GROUND	R70	R69	GROUND	R85	R91
VREFL2	106	-	VREFL0-2	-	-	JA1.6	R96	R92
VREFL1	134	-		-	-	GROUND	R92	R96
VREFL0	132	-		-	-	JA1.6	R96	R92
VREFH2	103	-	VREFH0-2	-	-	UC_VCC	R72	R73
				-	-	UC_VCC	R72	R73
VREFH1	128	-		-	-	JA1.7	R73	R72
VREFH0	130	-	-	-	UC_VCC	R72	R73	
			-	-	UC_VCC	R72	R73	
AVSS2	105	-	AVSS0-2	-	-	JA1.6	R91	R85
AVSS1	133	-		-	-	GROUND	R85	R91
				-	-	GROUND	R85	R91
AVSS0	131	-		-	-	JA1.6	R91	R85
AVCC2	104	-	AVCC0-2	-	-	UC_VCC	R78	R79
				-	-	UC_VCC	R78	R79
AVCC1	127	-		-	-	JA1.5	R79	R78
AVCC0	129	-		-	-	UC_VCC	R78	R79
			-	-	UC_VCC	R78	R79	

**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.

## 6.7 CAN Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	P.in	P.out	Signal	Fit	DNF	Interface /Function	Fit	DNF
PF2	34	PF2	<b>CAN1TX</b>	<b>R129</b>	<b>R128</b>	<b>U8.1</b>	-	-
			JA5-CAN1TX	R128	R129	JA5.5	-	-
PF3	33	PF3	<b>CAN1RX</b>	<b>R142</b>	<b>R143</b>	<b>U7.3</b>	-	-
			JA5-CAN1RX	R143	R142	JA5.6	-	-

Table 6-7: CAN Configuration Option Links

## 6.8 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		
	P.in	P.out	Signal	Fit	DNF	Interface /Function	Fit	DNF
P00	10	P00	<b>P00</b>	-	-	-	-	-
P01	13	P01	<b>P01</b>	-	-	-	-	-
P12	3	P12	<b>P12</b>	-	-	-	-	-
P15	144	P15	<b>P15</b>	-	-	-	-	-
P16	143	P16	<b>P16</b>	-	-	-	-	-
P17	142	P17	<b>P17</b>	-	-	-	-	-
LED0	99	P21	<b>LED0</b>	<b>R95</b>	-	<b>LED0</b>	-	-
LED1	96	P22	<b>LED1</b>	<b>R95</b>	-	<b>LED1</b>	-	-
JA1-IO7	116	P50	<b>JA1-IO7</b>	-	-	<b>JA1.22</b>	-	-
JA1-IO6	115	P51	<b>JA1-IO6</b>	-	-	<b>JA1.21</b>	-	-
JA1-IO5	114	P52	<b>JA1-IO5</b>	-	-	<b>JA1.20</b>	-	-
JA1-IO4	113	P53	<b>JA1-IO4</b>	-	-	<b>JA1.19</b>	-	-
JA1-IO3	109	P61	<b>JA1-IO3</b>	-	-	<b>JA1.18</b>	-	-
JA1-IO2	108	P62	<b>JA1-IO2</b>	-	-	<b>JA1.17</b>	-	-
JA1-IO1	107	P63	<b>JA1-IO1</b>	-	-	<b>JA1.16</b>	-	-
JA1-IO0	102	P64	<b>JA1-IO0</b>	-	-	<b>JA1.15</b>	-	-
P83	136	P83	<b>P83</b>	-	-	-	-	-
P84	135	P84	<b>P84</b>	-	-	-	-	-
PA4	54	PA4	<b>PA4</b>	-	-	-	-	-
PA6	52	PA6	<b>PA6</b>	-	-	-	-	-
PA7	51	PA7	<b>PA7</b>	-	-	-	-	-
PB3	47	PB3	<b>PB3</b>	-	-	-	-	-
PB4	41	PB4	<b>PB4</b>	-	-	-	-	-
LED2	98	PC3	<b>LED2</b>	<b>R95</b>	-	<b>LED2</b>	-	-
LED3	97	PC4	<b>LED3</b>	<b>R95</b>	-	<b>LED3</b>	-	-
PD0	32	PD0	<b>PD0</b>	-	-	-	-	-
PD1	31	PD1	<b>PD1</b>	-	-	-	-	-
PD2	30	PD2	<b>PD2</b>	-	-	-	-	-
PD7	25	PD7	<b>PD7</b>	-	-	-	-	-
PE1	23	PE1	<b>PE1</b>	-	-	-	-	-
PE5	5	PE5	<b>PE5</b>	-	-	-	-	-
PE6	4	PE6	<b>PE6</b>	-	-	-	-	-
PF0	36	PF0	<b>PF0</b>	-	-	-	-	-
PF1	35	PF1	<b>PF1</b>	-	-	-	-	-

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

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

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

Table 6-9 and Table 6-10 below detail the function of the option links associated with I2C & EEPROM Configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
PB1	49	PB1	E2P-SCL	-	-	U4.6	-	-
			JA1-SCL	-	-	JA1.26	-	-
PB2	48	PB2	E2P-SDA	-	-	U4.5	-	-
			JA1-SDA	-	-	JA1.25	-	-

Table 6-9: I2C & EEPROM Option Links (1)

Reference	Explanation	Fit	DNF	Related Ref.
E2P-SDA, E2P-SCL	Connect pull-up resistor to Board 5V.	R16	R17	U4
	Connect pull-up resistor to Board 3V3.	R17	R16	U4

Table 6-10: I2C & EEPROM Option Links (2)

## 6.10 IRQ & Switch Configuration

Table 6-11 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
P02	7	P02	JA5-IRQf_M2HSIN2	R134	R133	JA5.10	-	-
			PMOD2-IO1	R133	R134	PMOD2.8	-	-
P10	141	P10	JA5-M2HSIN1_IRQe	R126	R122, R125	JA5.9	R2	R3
			PMOD2-IO0	R125	R122, R126	PMOD2.7	-	-
			SW1	R122	R125, R126	SW1	-	-
P20	100	P20	JA1-ADTRG(P20)	R26	R25, R75	JA1.8	-	-
			JA1-IRQd	R25	R26, R27	JA1.23	R4	R5
			SW3(P20)	R27	R25, R76	SW3(P20)	-	-
P31	87	P31	JA2-IRQa_M1HSIN0	R31	R30, R32	JA2.7	-	-
			JA2-TIMIN1	R30	R31, R32	JA2.22	-	-
			SERIAL-CTS	R32	R30, R31	U5.2	-	-
P60	110	P60	JA2-IRQb	R52	R51	JA2.9	R149	R150
			SW2	R51	R52	SW2	-	-
PA5	53	PA5	JA1-ADTRG	R75	R26, R76, R82	JA1.8	-	-
			JA2-M1ENC_IRQc	R82	R75, R76	JA2.23	R147	R148
			SW3(PA5)	R76	R27, R75, R82	SW3(PA5)	-	-
JA2-NMIn	22	PE2	JA2-NMIn	-	-	JA2.3	-	-

Table 6-11: IRQ & Switch Option Links

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



## 6.11 MTU & POE Configuration

**Table 6-12** below details the function of the option links associated with MTU & POE configuration.

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
P02	7	P02	<b>JA5-IRQf_M2HSIN2</b>	<b>R134</b>	<b>R133</b>	<b>JA5.10</b>	-	-
			PMOD2-IO1	R133	R134	PMOD2.8	-	-
P10	141	P10	JA5-M2HSIN1_IRQe	R126	R122, <b>R125</b>	JA5.9	R2	R3
			PMOD2-IO0	R125	R122, <b>R126</b>	PMOD2.7	-	-
			<b>SW1</b>	<b>R122</b>	<b>R125, R126</b>	<b>SW1</b>	-	-
JA6-M1TOGGLE	140	P11	<b>JA6-M1TOGGLE</b>	-	-	<b>JA6.13</b>	-	-
JA2-TIMOUT0	93	P25	<b>JA2-TIMOUT0</b>	-	-	<b>JA2.19</b>	-	-
JA1-M2HSIN0	92	P26	<b>JA1-M2HSIN0</b>	-	-	<b>JA1.23</b>	<b>R5</b>	<b>R4</b>
JA2-M1HSIN1	90	P30	<b>JA2-M1HSIN1</b>	-	-	<b>JA2.9</b>	<b>R150</b>	<b>R149</b>
P31	87	P31	JA2-IRQa_M1HSIN0	R31	<b>R30, R32</b>	JA2.7	-	-
			JA2-TIMIN1	R30	<b>R31, R32</b>	JA2.22	-	-
			<b>SERIAL-CTS</b>	<b>R32</b>	<b>R30, R31</b>	<b>U5.2</b>	-	-
JA2-M1TRDCLK	84	P32	<b>JA2-M1TRDCLK</b>	-	-	<b>JA2.26</b>	-	-
JA2-M1TRCCLK	83	P33	<b>JA2-M1TRCCLK</b>	-	-	<b>JA2.25</b>	-	-
JA2-M1POE	79	P70	<b>JA2-M1POE</b>	<b>R55</b>	-	<b>JA2.24</b>	-	-
JA2-M1UP	78	P71	<b>JA2-M1UP</b>	-	-	<b>JA2.13</b>	-	-
JA2-M1VP	77	P72	<b>JA2-M1VP</b>	-	-	<b>JA2.15</b>	-	-
JA2-M1WP	76	P73	<b>JA2-M1WP</b>	-	-	<b>JA2.17</b>	-	-
JA2-M1UN	75	P74	<b>JA2-M1UN</b>	-	-	<b>JA2.14</b>	-	-
JA2-M1VN	74	P75	<b>JA2-M1VN</b>	-	-	<b>JA2.16</b>	-	-
JA2-M1WN	73	P76	<b>JA2-M1WN</b>	-	-	<b>JA2.18</b>	-	-
P80	139	P80	<b>JA5-M2WIN</b>	<b>R121</b>	<b>R111</b>	<b>JA5.14</b>	-	-
			JA6-M1WIN	R111	R121	JA6.16	-	-
P81	138	P81	<b>JA5-M2VIN</b>	<b>R104</b>	<b>R110</b>	<b>JA5.13</b>	-	-
			JA6-M1VIN	R110	R104	JA6.15	-	-
P82	137	P82	<b>JA5-M2UIN</b>	<b>R103</b>	<b>R97</b>	<b>JA5.12</b>	-	-
			JA6-M1UIN	R97	R103	JA6.14	-	-
JA5-M2WN	72	P90	<b>JA5-M2WN</b>	-	-	<b>JA5.24</b>	-	-
JA5-M2VN	71	P91	<b>JA5-M2VN</b>	-	-	<b>JA5.22</b>	-	-
JA5-M2UN	70	P92	<b>JA5-M2UN</b>	-	-	<b>JA5.20</b>	-	-
JA5-M2WP	69	P93	<b>JA5-M2WP</b>	-	-	<b>JA5.23</b>	-	-
JA5-M2VP	68	P94	<b>JA5-M2VP</b>	-	-	<b>JA5.21</b>	-	-
JA5-M2UP	67	P95	<b>JA5-M2UP</b>	-	-	<b>JA5.19</b>	-	-
JA5-M2POE	64	P96	<b>JA5-M2POE</b>	<b>R61</b>	-	<b>JA5.16</b>	-	-
JA5-M2UD	58	PA0	<b>JA5-M2UD</b>	-	-	<b>JA5.11</b>	-	-
JA5-M2TOGGLE	57	PA1	<b>JA5-M2TOGGLE</b>	-	-	<b>JA5.15</b>	-	-
JA2-TIMIN0	56	PA2	<b>JA2-TIMIN0</b>	-	-	<b>JA2.21</b>	-	-
JA5-M2ENC	55	PA3	<b>JA5-M2ENC</b>	-	-	<b>JA5.9</b>	<b>R3</b>	<b>R2</b>
JA2-M1HSIN2	50	PB0	<b>JA2-M1HSIN2</b>	-	-	<b>JA2.23</b>	<b>R148</b>	<b>R147</b>
JA2-TIMOUT1	62	PC5	<b>JA2-TIMOUT1</b>	-	-	<b>JA2.20</b>	-	-
JA2-M1UD	61	PC6	<b>JA2-M1UD</b>	-	-	<b>JA2.11</b>	-	-
JA5-M2TRDCLK	15	PE3	<b>JA5-M2TRDCLK</b>	-	-	<b>JA5.18</b>	-	-
JA5-M2TRCCLK	14	PE4	<b>JA5-M2TRCCLK</b>	-	-	<b>JA5.17</b>	-	-

**Table 6-12: MTU & POE Option Links**

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

## 6.12 PMOD1 Interface Configuration

Table 6-13 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
PMOD1-IO2	91	P27	<a href="#">PMOD1-IO2</a>	-	-	<a href="#">PMOD1.9</a>	-	-
PMOD1-CS	60	P34	<a href="#">PMOD1-CS</a>	-	-	<a href="#">PMOD1.1</a>	-	-
PMOD1-IO0	112	P54	<a href="#">PMOD1-IO0</a>	-	-	<a href="#">PMOD1.7</a>	-	-
PMOD1-IO1	111	P55	<a href="#">PMOD1-IO1</a>	-	-	<a href="#">PMOD1.8</a>	-	-
PMOD1-IO3	101	P65	<a href="#">PMOD1-IO3</a>	-	-	<a href="#">PMOD1.10</a>	-	-
PMOD1-MISO	82	PG0	<a href="#">PMOD1-MISO</a>	-	-	<a href="#">PMOD1.3</a>	-	-
PMOD1-MOSI	81	PG1	<a href="#">PMOD1-MOSI</a>	-	-	<a href="#">PMOD1.2</a>	-	-
PMOD1-SCK	80	PG2	<a href="#">PMOD1-SCK</a>	<a href="#">R54</a>	-	<a href="#">PMOD1.4</a>	-	-

Table 6-13: PMOD1 Interface Option Links

## 6.13 PMOD2 Interface Configuration

Table 6-14 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
P02	7	P02	<a href="#">JA5-IRQf_M2HSIN2</a>	<a href="#">R134</a>	<a href="#">R133</a>	<a href="#">JA5.10</a>	-	-
			PMOD2-IO1	R133	R134	PMOD2.8	-	-
P10	141	P10	JA5-M2HSIN1_IRQe	R126	R122, <a href="#">R125</a>	JA5.9	R2	R3
			PMOD2-IO0	R125	R122, <a href="#">R126</a>	PMOD2.7	-	-
			<a href="#">SW1</a>	<a href="#">R122</a>	<a href="#">R125, R126</a>	<a href="#">SW1</a>	-	-
PMOD2-IO2	2	P13	<a href="#">PMOD2-IO2</a>	-	-	<a href="#">PMOD2.9</a>	-	-
PMOD2-IO3	1	P14	<a href="#">PMOD2-IO3</a>	-	-	<a href="#">PMOD2.10</a>	-	-
PMOD2-CS	59	P35	<a href="#">PMOD2-CS</a>	-	-	<a href="#">PMOD2.1</a>	-	-
PC0	46	PC0	<a href="#">JA6-RXDc</a>	<a href="#">R107</a>	<a href="#">R106</a>	<a href="#">JA6.12</a>	-	-
			PMOD2-MISO	R106	R107	PMOD2.3	-	-
PC1	45	PC1	<a href="#">JA6-TXDc</a>	<a href="#">R99</a>	<a href="#">R98</a>	<a href="#">JA6.9</a>	-	-
			PMOD2-MOSI	R98	R99	PMOD2.2	-	-
PC2	44	PC2	<a href="#">JA6-SCKc</a>	<a href="#">R80, R118</a>	<a href="#">R117</a>	<a href="#">JA6.11</a>	-	-
			PMOD2-SCK	<a href="#">R80, R117</a>	R118	PMOD2.4	-	-

Table 6-14: PMOD2 Interface Option Links

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

## 6.14 Serial & USB to Serial Configuration

**Table 6-15** below details the function of the option links associated with Serial & USB to Serial configuration.

Signal name /Reference	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
P31	87	P31	JA2-IRQa_M1HSIN0	R31	<b>R30, R32</b>	JA2.7	-	-
			JA2-TIMIN1	R30	<b>R31, R32</b>	JA2.22	-	-
			<b>SERIAL-CTS</b>	<b>R32</b>	<b>R30, R31</b>	<b>U5.2</b>	-	-
PB5	39	PB5	SERIAL-TXD	R123	R124, R141	U6.3	-	<b>R145</b>
			<b>JA6-TXD<sub>b</sub></b>	<b>R124</b>	<b>R123</b>	<b>JA6.8</b>	-	-
PB6	38	PB6	SERIAL-RXD	R130	R131, R137	U5.3	-	<b>R146</b>
			<b>JA6-RXD<sub>b</sub></b>	<b>R131</b>	<b>R130</b>	<b>JA6.7</b>	-	-
JA6-SCK <sub>b</sub>	37	PB7	<b>JA6-SCK<sub>b</sub></b>	<b>R93</b>	-	<b>JA6.10</b>	-	-
PC0	46	PC0	<b>JA6-RXD<sub>c</sub></b>	<b>R107</b>	<b>R106</b>	<b>JA6.12</b>	-	-
			PMOD2-MISO	R106	R107	PMOD2.3	-	-
PC1	45	PC1	<b>JA6-TXD<sub>c</sub></b>	<b>R99</b>	<b>R98</b>	<b>JA6.9</b>	-	-
			PMOD2-MOSI	R98	R99	PMOD2.2	-	-
PC2	44	PC2	<b>JA6-SCK<sub>c</sub></b>	<b>R80, R118</b>	<b>R117</b>	<b>JA6.11</b>	-	-
			PMOD2-SCK	R117	R118	PMOD2.4	-	-
PD3	29	PD3	<b>SERIAL-TXD</b>	<b>R141</b>	<b>R123, R140</b>	<b>U6.3</b>	-	<b>R145</b>
			<b>JA2-TXD<sub>a</sub></b>	<b>R139</b>	<b>R140</b>	<b>JA2.6</b>	-	-
			E1-TXD	R140	R139, R141	E1.5	-	-
JA2-SCK <sub>a</sub>	28	PD4	<b>JA2-SCK<sub>a</sub></b>	<b>R105</b>	-	<b>JA2.10</b>	-	-
PD5	27	PD5	<b>SERIAL-RXD</b>	<b>R137</b>	<b>R130, R136</b>	<b>U5.3</b>	-	<b>R146</b>
			<b>JA2-RXD<sub>a</sub></b>	<b>R138</b>	<b>R136</b>	<b>JA2.8</b>	-	-
			E1-RXD	R136	R137, R138	E1.11	-	-
JA2-CTS <sub>a</sub> RTS <sub>a</sub>	26	PD6	<b>JA2-CTS<sub>a</sub>RTS<sub>a</sub></b>	-	-	<b>JA2.12</b>	-	-
SERIAL-RTS	24	PE0	-	-	-	<b>U6.2</b>	-	-

**Table 6-15: 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.

## 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	-
	JA1-5V			GROUND	
3	3V3	-	4	0V	-
	JA1-3V3			GROUND	
5	AVCC	104/127/129	6	AVSS	105/133/131
	JA1-AVCC			JA1-AVSS	
7	AVREF	103/128/130	8	ADTRG	53/100
	JA1-VREFH			JA1-ADTRG	
9	ADC0	125	10	ADC1	124
	JA1-ADC0			JA1-ADC1	
11	ADC2	123	12	ADC3	122
	JA1-ADC2			JA1-ADC3	
13	DAC0	94	14	DAC1	95
	JA1-DAC0			JA1-DAC1	
15	IO_0	102	16	IO_1	107
	JA1-IO0			JA1-IO1	
17	IO_2	108	18	IO_3	109
	JA1-IO2			JA1-IO3	
19	IO_4	113	20	IO_5	114
	JA1-IO4			JA1-IO5	
21	IO_6	115	22	IO_7	116
	JA1-IO6			JA1-IO7	
23	IRQd/IRQAEC/M2_HSIN0	100/NC/92	24	IIC_EX	NC
	JA1-23PIN			NC	
25	IIC_SDA	48	26	IIC_SCL	49
	JA1-SDA			JA1-SCL	

**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	16	2	EXTAL	19
	JA2-RESn			JA2-EXTAL	
3	NMI	22	4	Vss1	-
	JA2-NMIIn			GROUND	
5	WDT_OVF	NC	6	SCIaTX	29
	NC			JA2-TXDa	
7	IRQa/WKUP/M1_HSIN0	87	8	SCIaRX	27
	JA2-7PIN			JA2-RXDa	
9	IRQb/M1_HSIN1	110/90	10	SCIaCK	28
	JA2-9PIN			JA2-SCKa	
11	M1_UD	61	12	CTSaRTSa	26
	JA2-M1UD			JA2-CTSaRTSa	
13	M1_UP	78	14	M1_UN	75
	JA2-M1UP			JA2-M1UN	
15	M1_VP	77	16	M1_VN	74
	JA2-M1VP			JA2-M1VN	
17	M1_WP	76	18	M1_WN	73
	JA2-M1WP			JA2-M1WN	
19	TimerOut	93	20	TimerOut	62
	JA2-TIMOUT0			JA2-TIMOUT1	
21	TimerIn	56	22	TimerIn	87
	JA2-TIMIN0			JA2-TIMIN1	
23	IRQc/M1_EncZ/M1_HSIN2	53/53/50	24	M1_POE	79
	JA2-23PIN			JA2-M1POE	
25	M1_TRCCLK	83	26	M1_TRDCLK	84
	JA2-M1TRCCLK			JA2-M1TRDCLK	

Table 7-2: Application Header JA2 Connections

**Table 7-3** 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	120	2	ADC5	119
	JA5-ADC4			JA5-ADC5	
3	ADC6	118	4	ADC7	117
	JA5-ADC6			JA5-ADC7	
5	CAN1TX	34	6	CAN1RX	33
	JA5-CAN1TX			JA5-CAN1RX	
7	CAN2TX	NC	8	CAN2RX	NC
	NC			NC	
9	IRQe/M2_EncZ/M2_HSIN1	141/141/55	10	IRQf/M2_HSIN2	7
	JA5-9PIN			JA5-10PIN	
11	M2_UD	58	12	M2_Uin	137
	JA5-M2UD			JA5-M2UIN	
13	M2_Vin	138	14	M2_Win	139
	JA5-M2VIN			JA5-M2WIN	
15	M2_Toggle	57	16	M2_POE	64
	JA5-M2TOGGLE			JA5-M2POE	
17	M2_TRCCLK	14	18	M2_TRDCLK	15
	JA5-M2TRCCLK			JA5-M2TRDCLK	
19	M2_UP	67	20	M2_UN	70
	JA5-M2UP			JA5-M2UN	
21	M2_VP	68	22	M2_VN	71
	JA5-M2VP			JA5-M2VN	
23	M2_WP	69	24	M2_WN	72
	JA5-M2WP			JA5-M2WN	

**Table 7-3: Application Header JA5 Connections**

**Table 7-4** 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
	JA6-RS232TX			JA6-RS232RX	
7	SCIbRX	38	8	SCIbTX	39
	JA6-RXD <sub>b</sub>			JA6-TXD <sub>b</sub>	
9	SCIcTX	45	10	SCIbCK	37
	JA6-TXD <sub>c</sub>			JA6-SCK <sub>b</sub>	
11	SCIcCK	44	12	SCIcRX	46
	JA6-SCK <sub>c</sub>			JA6-RXD <sub>c</sub>	
13	M1_Toggle	140	14	M1_Uin	137
	JA6-M1TOGGLE			JA6-M1UIN	
15	M1_Vin	138	16	M1_Win	139
	JA6-M1VIN			JA6-M1WIN	
17	Reserved	NC	18	Reserved	NC
	NC			NC	
19	Reserved	NC	20	Reserved	NC
	NC			NC	
21	Reserved	NC	22	Reserved	NC
	NC			NC	
23	Unregulated_VCC	-	24	V <sub>ss</sub>	-
	Unregulated_VCC			GROUND	

**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	PMOD2-IO3	1	2	PMOD2-IO2	2
3	P12	3	4	PE6	4
5	PE5	5	6	UC_VCC	-
7	P02	7	8	GROUND	-
9	GROUND	-	10	P00	10
11	NC	-	12	MD_FINED	12
13	P01	13	14	JA5-M2TRCCLK	14
15	JA5-M2TRDCLK	15	16	RESn	16
17	XTAL	17	18	GROUND	-
19	JA2-EXTAL	19	20	UC_VCC	-
21	UC_VCC	-	22	JA2-NMIn	22
23	PE1	23	24	SERIAL-RTS	24
25	PD7	25	26	JA2-CTSaRTSa	26
27	PD5	27	28	JA2-SCKa	28
29	PD3	29	30	PD2	30
31	PD1	31	32	PD0	32
33	PF3	33	34	PF2	34
35	PF1	35	36	PF0	36

**Table 7-5: Microcontroller Pin Header, J1**

**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	JA6-SCKb	37	2	PB6	38
3	PB5	39	4	UC_VCC	40
5	PB4	41	6	GROUND	-
7	GROUND	-	8	PC2	44
9	PC1	45	10	PC0	46
11	PB3	47	12	PB2	48
13	PB1	49	14	JA2-M1HSIN2	50
15	PA7	51	16	PA6	52
17	PA5	53	18	PA4	54
19	JA5-M2ENC	55	20	JA2-TIMIN0	56
21	JA5-M2TOGGLE	57	22	JA5-M2UD	58
23	PMOD2-CS	59	24	PMOD1-CS	60
25	JA2-M1UD	61	26	JA2-TIMOUT1	62
27	UC_VCC	-	28	JA5-M2POE	64
29	GROUND	-	30	GROUND	-
31	JA5-M2UP	67	32	JA5-M2VP	68
33	JA5-M2WP	69	34	JA5-M2UN	70
35	JA5-M2VN	71	36	JA5-M2WN	72

**Table 7-6: Microcontroller Pin Header, J2**



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	JA2-M1WN	73	2	JA2-M1VN	74
3	JA2-M1UN	75	4	JA2-M1WP	76
5	JA2-M1VP	77	6	JA2-M1UP	78
7	JA2-M1POE	79	8	PMOD1-SCK	80
9	PMOD1-MOSI	81	10	PMOD1-MISO	82
11	JA2-M1TRCCLK	83	12	JA2-M1TRDCLK	84
13	UC_VCC	-	14	UC_VCC	-
15	P31	87	16	GROUND	-
17	GROUND	-	18	JA2-M1HSIN1	90
19	PMOD1-IO2	91	20	JA1-M2HSIN0	92
21	JA2-TIMOUT0	93	22	JA1-DAC0	94
23	JA1-DAC1	95	24	LED1	96
25	LED3	97	26	LED2	98
27	LED0	99	28	P20	100
29	PMOD1-IO3	101	30	JA1-IO0	102
31	VREFH0-2	103/128/130	32	AVCC0-2	104/127/129
33	AVSS0-2	105/133/131	34	VREFL0-2	106/132/134
35	JA1-IO1	107	36	JA1-IO2	108

Table 7-7: Microcontroller Pin Header, J3

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	JA1-IO3	109	2	P60	110
3	PMOD1-IO1	111	4	PMOD1-IO0	112
5	JA1-IO4	113	6	JA1-IO5	114
7	JA1-IO6	115	8	JA1-IO7	116
9	JA5-ADC7	117	10	JA5-ADC6	118
11	JA5-ADC5	119	12	JA5-ADC4	120
13	PGAVSS1	121	14	JA1-ADC3	122
15	JA1-ADC2	123	16	JA1-ADC1	124
17	P40	125	18	PGAVSS0	126
19	AVCC0-2	104/127/129	20	VREFH0-2	103/128/130
21	AVCC0-2	104/127/129	22	VREFH0-2	103/128/130
23	AVSS0-2	105/133/131	24	VREFL0-2	106/132/134
25	AVSS0-2	105/133/131	26	VREFL0-2	106/132/134
27	P84	135	28	P83	136
29	P82	137	30	P81	138
31	P80	139	32	JA6-M1TOGGLE	140
33	P10	141	34	P17	142
35	P16	143	36	P15	144

Table 7-8: 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/E2 Lite debugger.

For further information regarding the debugging capabilities of the E1/E20/E2 Lite debuggers, refer to E1/E20 Emulator, E2 Emulator Lite 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), 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 RX24U 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 or E2 Emulator Lite (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) or E2 Emulator Lite User's Manual (R20UT3240EJ).

### 8.5 Address Space

For the MCU address space details, refer to the 'Address Space' section of RX24U Group Hardware Manual.

## 9. Additional Information

### Technical Support

For information about the RX24U Group microcontrollers refer to the RX24U 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 8 of the “Quick Start Guide”*

General information on Renesas Microcontrollers can be found on the Renesas website at:

<https://www.renesas.com/>

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