

RX111 Group

Renesas Starter Kit User's Manual
For CubeSuite+

RENESAS MCU
RX Family / RX100 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 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 RX111 Group. Make sure to refer to the latest versions of these documents. The newest versions of the documents listed may be obtained from the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the RSK hardware.	RSKRX111 User's Manual	R20UT2193EG
Tutorial	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRX111 Tutorial Manual	R20UT2194EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRX111 Quick Start Guide	R20UT2195EG
Schematics	Full detail circuit schematics of the RSK.	RSKRX111 Schematics	R20UT2192EG
Hardware Manual	Provides technical details of the RX111 microcontroller.	RX111 Group Hardware Manual	R01UH0365EJ

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
ADC	Analog-to-Digital Converter
bps	Bits per second
CAN	Controller Area Network
CPU	Central Processing Unit
CRC	Cyclic Redundancy Check
DAC	Digital-to-Analog Converter
DIP	Dual In-line Package
DMA	Direct Memory Access
DMAC	Direct Memory Access Controller
E1	Renesas On-chip Debugging Emulator
EEPROM	Electrically Erasable Programmable Read Only Memory
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
GPT	General PWM Timer
I ² 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 Digilent Inc. Digilent-Pmod Interface Specification (Link valid at 14 Apr, 2014)
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

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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.

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 5.0mm 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**.

J6 Setting	J7 Setting	Supply Source	UC_VCC
Open	Open	E1(3.3V)/PWR Connector/CON_5V /Unregulated_VCC	3.3V
Open	Pin1-2 shorted	PWR Connector/CON_5V /Unregulated_VCC	1.8V
Pin2-3 shorted	Open	VBUS	3.3V
Pin2-3 shorted	Pin1-2 shorted	VBUS	1.8V
Pin1-2 shorted	Open	EXT_BATT	3.3V
Pin1-2 shorted	Pin1-2 shorted	EXT_BATT	1.8V

Table 2-1: Main Power Supply Requirements

The main power supply connected to PWR1 should supply a minimum of 5W to ensure full functionality.

2.2 Power-Up Behaviour

When the RSK is purchased, the RSK board has the 'Release' or stand-alone code from the example tutorial software pre-programmed into the Renesas microcontroller. On powering up the board the LEDs will start to flash. After 200 flashes or after pressing any switch, the text on the LCD display will change and the LED's will begin to flash at a rate controlled by the potentiometer.

3. Board Layout

3.1 Component Layout

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

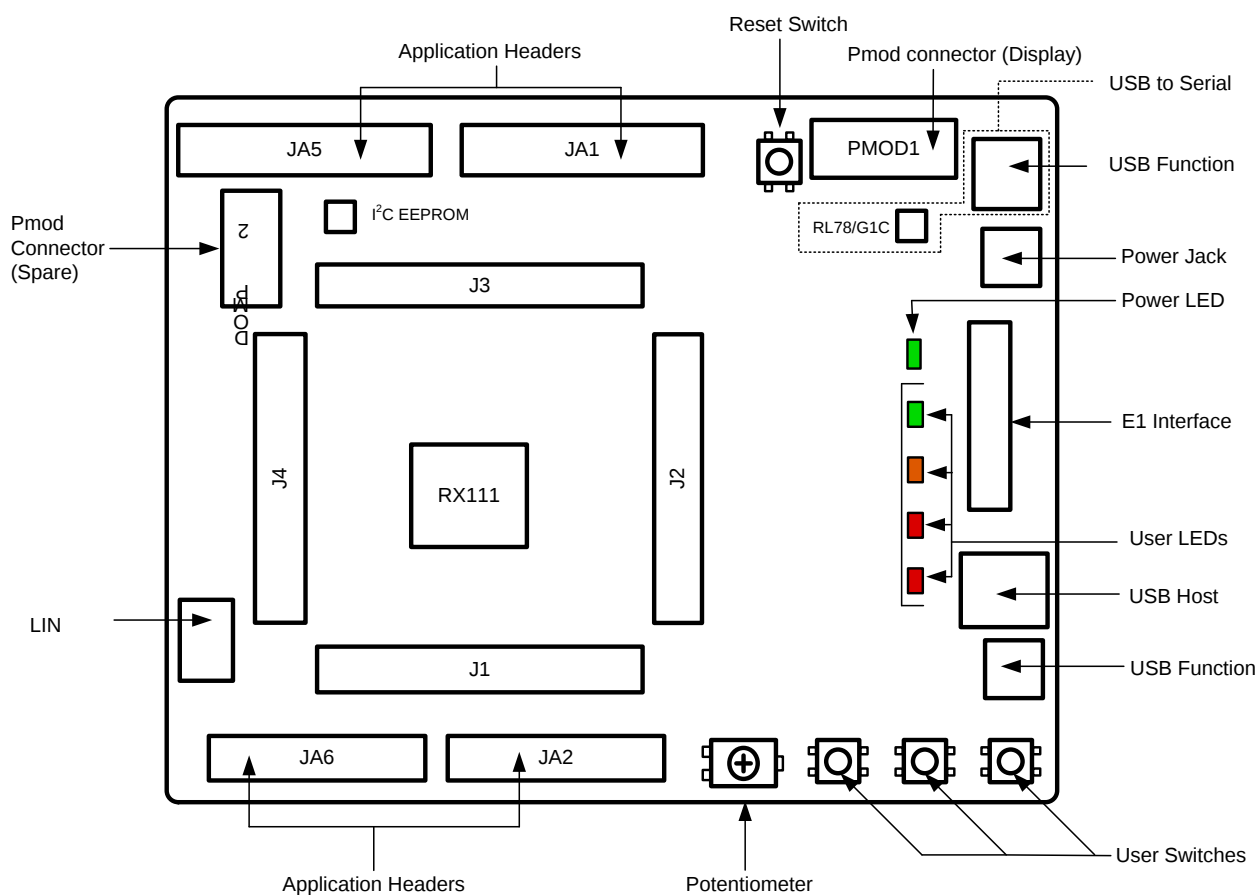


Figure 3-1: Board Layout

3.2 Board Dimensions

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

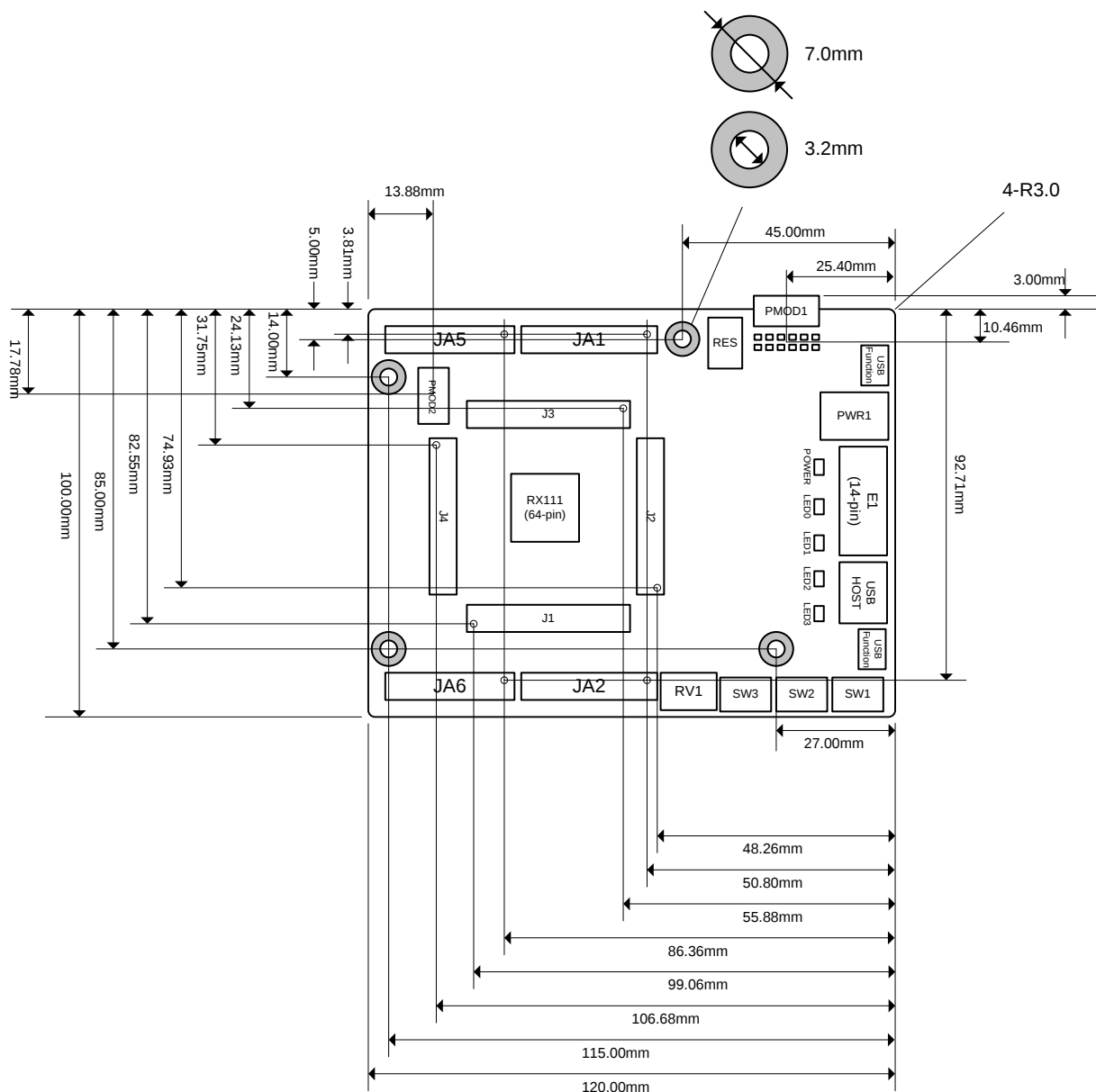


Figure 3-2: Board Dimensions

3.3 Component Placement

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

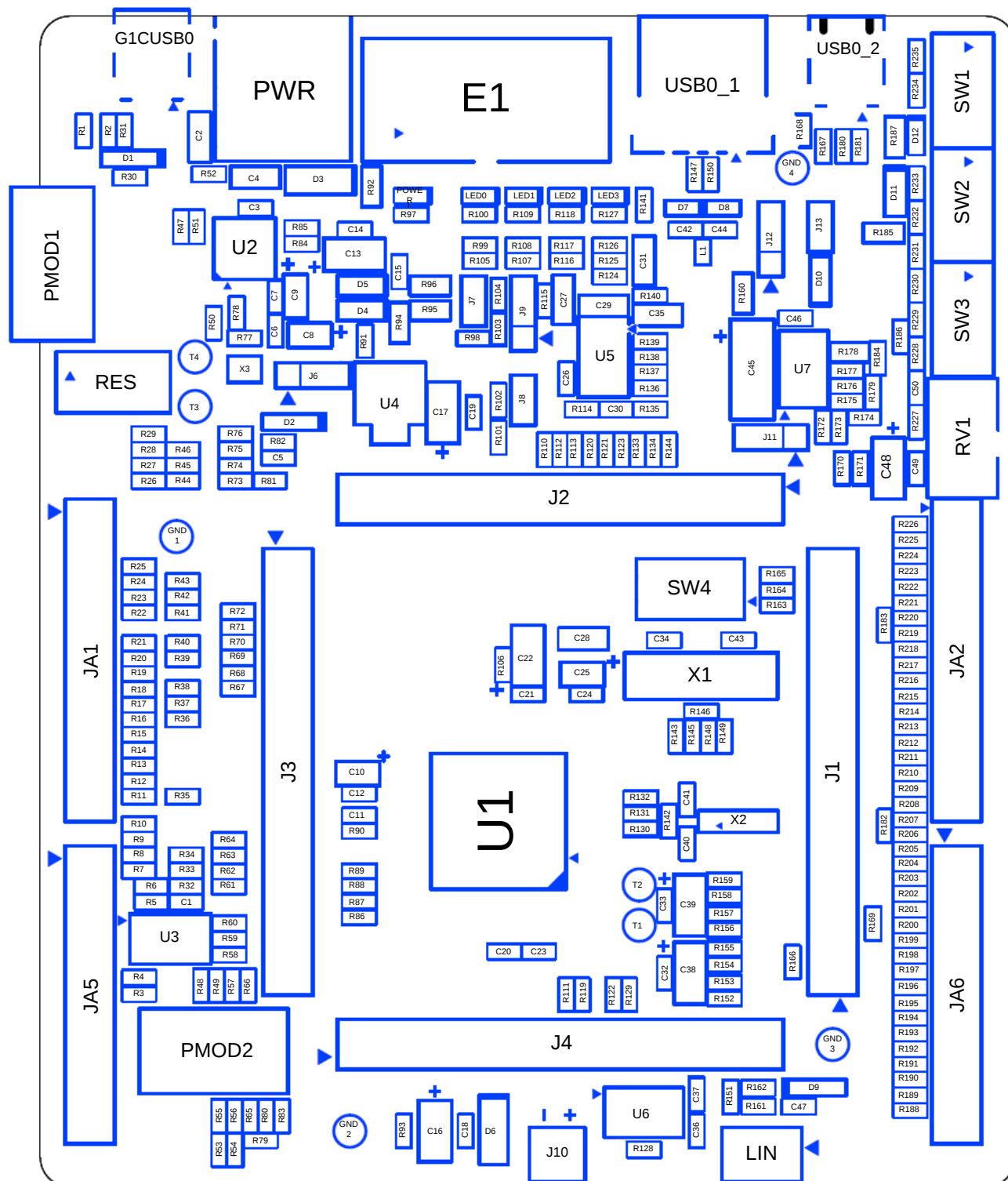


Figure 3-3: Top-Side Component Placement

4. Connectivity

4.1 Internal RSK Connections

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

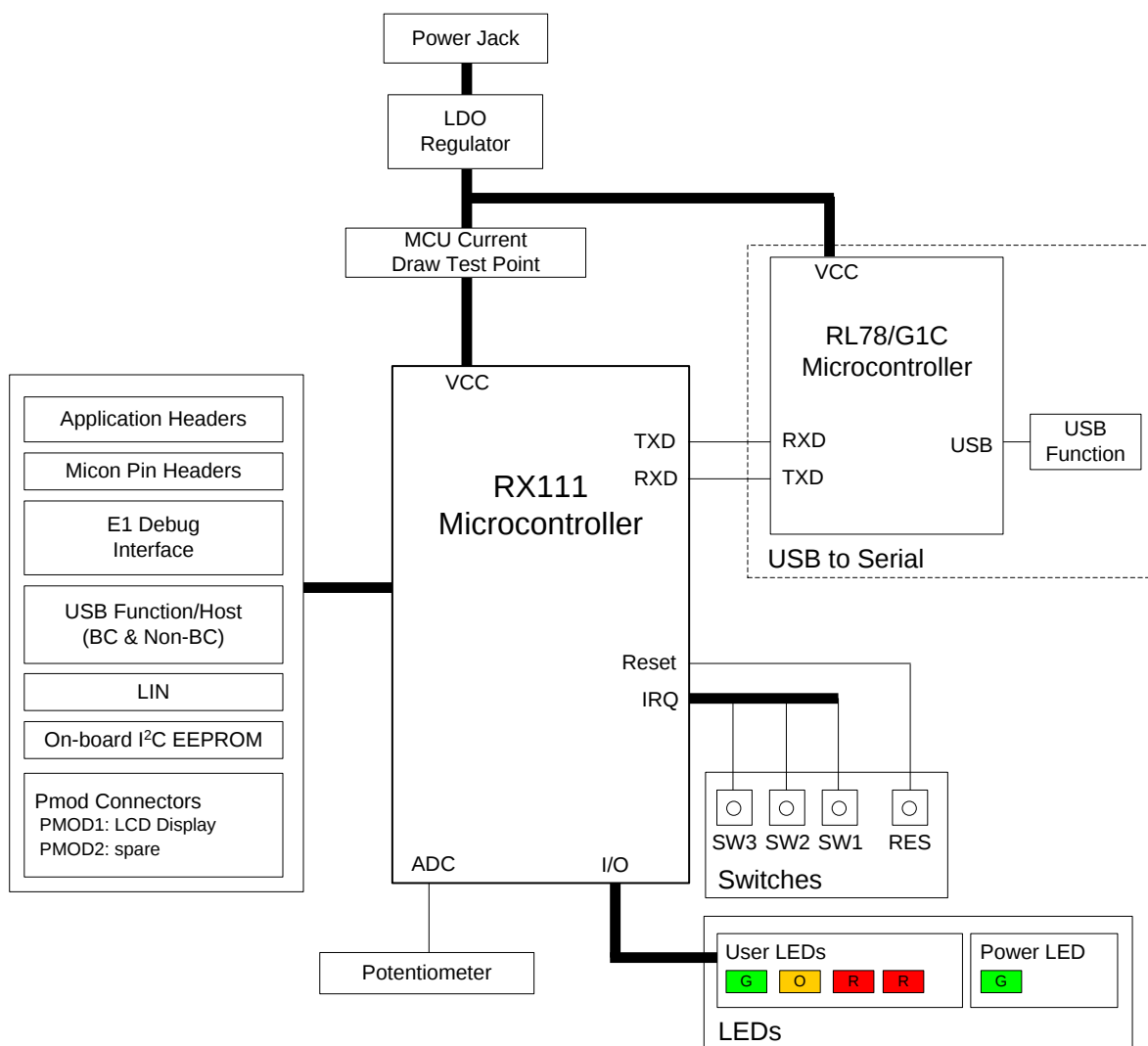


Figure 4-1: Internal RSK Block Diagram

4.2 Debugger Connections

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

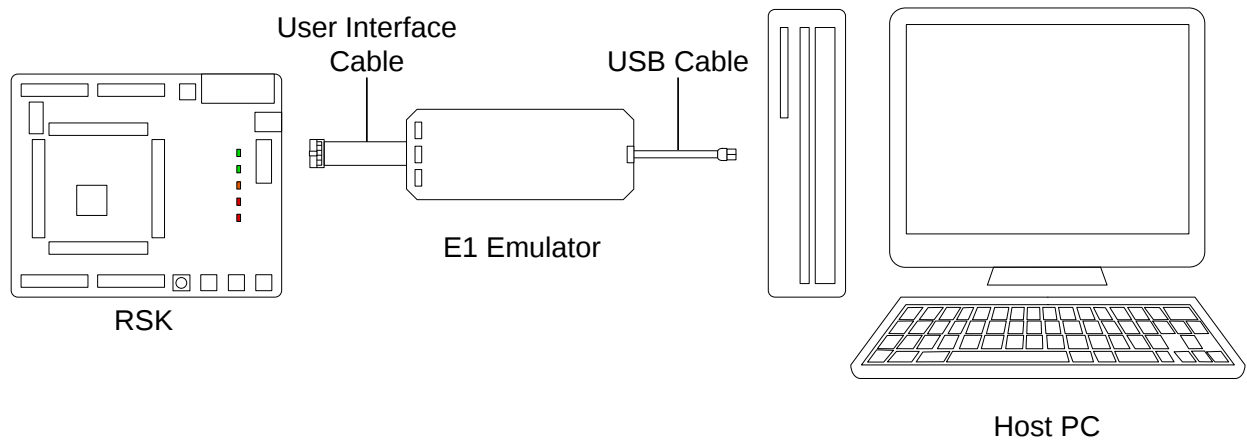


Figure 4-2: Debugger Connection Diagram

5. User Circuitry

5.1 Reset Circuit

A reset control circuit is fitted to the RSK to generate the required reset signal, and is triggered from the RES switch. Refer to the RX111 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 RX111 Group Hardware Manual for details regarding the clock signal requirements, and the RSKRX111 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	Main MCU oscillator.	Fitted	16MHz	Encapsulated, SMT
X2	RX111 Sub oscillator	Fitted	32.768kHz *	Encapsulated, SMT
X3	RL78/G1C Main oscillator	Fitted	12MHz	Encapsulated, SMT

Table 5-1: Oscillators

* 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#	7
SW1	Connects to an IRQ input for user controls.	IRQ0 (P30)	4
SW2	Connects to an IRQ input for user controls.	IRQ1 (P31)	5
SW3	Connects to an IRQ input for user controls. The switch is also connected to an ADTRG input, and is used to trigger AD conversions.	IRQ4 (PE4)	47
		ADTRG0# (PB0)	39

Table 5-2: Switch Connections

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_3V3 power rail.	-	-
LED0	Green	User operated LED.	PB7/PC1	33
LED1	Orange	User operated LED.	PA0	45
LED2	Red	User operated LED.	P54	26
LED3	Red	User operated LED.	PB6/PC0	34

Table 5-3: LED Connections

5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analogue input AN000, pin 60. The potentiometer can be used to create a voltage between Board_3V3 and ground.

The potentiometer offers an easy method of supplying a variable analogue input to the microcontroller. It does not necessarily reflect the accuracy of the controller's ADC. Refer to the RX111 Group Hardware Manual for further details.

5.6 Pmod™ Debug LCD Module

A Pmod™ Compatible debug LCD module is supplied with the RSK, and should be connected to the PMOD1 header.

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

The Digilent Pmod™ Compatible header uses a SPI interface. Some RSKs will be provided with a monochrome display, others will have a colour display. Code for the appropriate display will be included in the product software support. 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

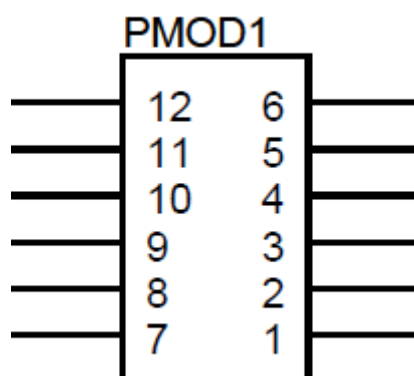


Figure 5-1: Digilent Pmod™ Compatible Header Pin Numbering

Digilent Pmod™ Compatible Header Connections							
Pin	Circuit Net Name	MCU		Pin	Circuit Net Name	MCU	
		Port	Pin			Port	Pin
1	PMOD1_PIN1*	PA6/PC7	41/27	7	IRQ5	PA4	42
2	P-TXD5	PC3	31	8	P-IRQ6	PA3	43
3	P-RXD5	PC2	32	9	P44	P44	55
4	P-SCK5	PA1	44	10	P46	P46	54
5	GROUND	-	-	11	GROUND	-	-
6	Board_3V3 / Board_5V *	-	-	12	Board_3V3 / Board_5V *	-	-

Table 5-4: Pmod™1 Header Connections

* It can be configured by modifying option links.

5.7 USB Serial Port

A USB serial port implemented in another Renesas low power microcontroller (RL78/G1C) is fitted on the RSK to the microcontroller Serial Communications Interface (SCI) module. Multiple options are provided to allow re-use of the serial interface.

Connections between the USB to Serial converter and the microcontroller are listed in **Table 5-5** below.

Signal Name	Function	MCU	
		Port	Pin
A-TXD1	SCI1 Transmit Signal.	P16	18
MTIOC0B_A-RXD1_P-RXD1	SCI1 Receive Signal	P15	19
A-TXD5_P-TXD5*	SCI5 Transmit Signal.	PC3	31
A-RXD5_P-RXD5*	SCI5 Receive Signal	PC2	32
LINTXD_IO1_TXD12*	SCI12 Transmit Signal.	PE1	50
LINRXD_IO2_RXD12*	SCI12 Receive Signal	PE2	49
RS232TX*	External SCI Transmit Signal.	-	-
RS232RX*	External SCI Receive Signal.	-	-
RL78G1C_CTS	Clear To Send	P03	1
RL78G1C_RTS	Request to Send	P05	64

Table 5-5: Serial Port Connections

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

5.8 Local Interconnect Network (LIN)

A LIN transceiver IC is fitted to the RSK, and connected to the Extended serial mode MCU peripheral. For further details regarding the supported modes of operation, please refer to the RX111 Group Hardware Manual.

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

LIN Signal	Function	MCU	
		Port	Pin
LINTXD	LIN Transmit Signal	PE1	50
LINRXD	LIN Receive Signal	PE2	49
LINNSLP	LIN Transceiver Device Sleep Control	PB1	37

Table 5-6: LIN Connections

5.9 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 5-7** below.

USB Signal	Function	MCU	
		Port	Pin
USB0DP	Positive differential data signal.	USB0_DP	23
USB0DM	Negative differential data signal.	USB0_DM	22
USB0VBUS	Cable monitor pin.	P16	18
USB0VBUSEN	VBUS power supply enable.	P26	3
USB0OVRCURA	Over-current detection signal A.	PB3	36
USB0OVRCURB	Over-current detection signal B.	PC7	27
USB0EXICEN	OTG Low-power control signal	PC6	28
USB0ID	ID input signal	PC5	29

Table 5-7: USB0 Module Connections

Note:

- When evaluating OTG, ensure to replace the default USB connector (USB0_3) with a USB Micro-AB connector.
- Connectors such as the one manufactured by Hirose Electric with part number ZX62R-AB-5P, can be used.

5.10 I²C Bus (Inter-IC Bus)

The RX111 features one I²C (Inter-IC Bus) interface modules. RIIC is connected to a 16Kbit EEPROM (Electrically-Erasable Programmable Read Only Memory). Specific details of the EEPROM device and the connections can be found in the board schematics.

The first bit of the device address can be configured by modifying option links – refer to §6 for further details.

6. Configuration

6.1 Modifying the RSK

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

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

When removing soldered components, always ensure that the RSK is not exposed to a soldering iron for intervals greater than 5 seconds. This is to avoid damage to nearby components mounted on the 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 RX111 Group Hardware Manual and RSKRX111 schematics for further information.

6.2 MCU Operating Modes

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

Reference	Pin 1	Pin2	Comment	Related Ref.
SW4	OFF	OFF	Single Chip Mode	-
	OFF	ON	Single Chip Mode	-
	ON	OFF	Boot Mode (SCI)	-
	ON	ON	Boot Mode (USB)	R225

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.
R225	Boot Mode (USB): Self-Powered	Boot Mode (USB): Bus Powered	SW4

Table 6-2: MCU Option Links (1)

6.3 Power Supply Configuration

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

Signal Name	Exclusive Function		Header connection		
	Function	IC Pin	Header Pin	Fit	Remove
VBUS	Connects VBUS to power supply line of 5V. Disconnect.	U4.IN	J6	2-3	-
	Bus-Powered	-	J6	1-2 / All open	-
VBUS	Self-Powered	-	J9	1-2	-
	Connects EXT_BATT to power supply line of 5V. Disconnect.	U4.IN	J9	2-3	-
EXT_BATT	Connects EXT_BATT to power supply line of 5V. Disconnect.	U4.IN	J6	1-2	-
	Connects EXT_BATT to power supply line of 5V. Disconnect.	-	J6	2-3 / All open	-
CON_5V	Connects CON_5V to power supply line of 5V. Disconnect.	U4.IN	JA1.1	R94	-
	Connects CON_5V to power supply line of 5V. Disconnect.	-	-	-	R94
USB_5V	Connects USB_5V to USB Host power control IC. Disconnect.	U7.VIN	-	R96, R178	-
	Connects USB_5V to USB Host power control IC. Disconnect.	-	-	-	R96
Unregulated_VCC	Connects Unregulated_VCC to power supply line of 5V. Disconnect.	U4.IN	JA6.23	R95	-
	Connects Unregulated_VCC to power supply line of 5V. Disconnect.	-	-	-	R95
REGSEL	Configures regulator IC output as 3V3. Disconnect.	U4.OUT	J7	open	-
	Configures regulator IC output as 1V8. Disconnect.	U4.OUT	J7	shorted-pin	-
CON_3V3	Connects CON_3V3 to power supply line of 3V3. Disconnect.	U4.OUT	JA1.3	R101	-
	Connects CON_3V3 to power supply line of 3V3. Disconnect.	-	-	-	R101
EXT_CHG	Enable Battery Charge Function. Disable Battery Charge Function.	-	J13	1-2	-
	Enable Battery Charge Function. Disable Battery Charge Function.	-	J13	open	-
EXT_VBUS	Connects EXT_VBUS to line of VBUS. Disconnect.	-	-	R185	-
	Connects EXT_VBUS to line of VBUS. Disconnect.	-	JA6.17	-	R185
PWR	Connects PWR connector to power supply line of 5V. Disconnect.	-	-	R92	-
	Connects PWR connector to power supply line of 5V. Disconnect.	-	-	-	R92
PWR/VBUS/EXT_BATT /CON_5V /Unregulated_VCC	Connects PWR/VBUS/EXT_BATT /CON_5V/Unregulated_VCC to Board_5V and regulator IC. Disconnect.	U4.IN	-	R91	-
	Connects PWR/VBUS/EXT_BATT /CON_5V/Unregulated_VCC to Board_5V and regulator IC. Disconnect.	-	-	-	R91
UC_VCC	Connected to the power supply MCU. Enable current probe(J7) for MCU	-	J8	R102 / J8:shorted	-
	Connected to the power supply MCU. Enable current probe(J7) for MCU	-	J8	J8: open	R102
VBAT, Board_5V	Connects VBAT to BAT of LIN transceiver. Disconnect.	-	J10.1	-	R93
	Connects VBAT to BAT of LIN transceiver. Disconnect.	U5.7	-	R93	-

Table 6-3: Power Supply Option Links

6.4 Clock Configuration

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

Signal Name	Exclusive Function		Header connection		
	Function		Header Pin	Fit	Remove
CON_XTAL	Connects external clock or Micro controller pin headers to MCU. Disconnect.		JA2.2, J1.11	R149	R148
	Connects external clock or Micro controller pin headers to MCU. Disconnect.			-	R149
XTAL	Connect the crystal X1.1. Disconnect.	-		R148	R149
	Connect the crystal X1.1. Disconnect.	-		-	R148
CON_EXTAL	Connect Micro controller pin headers to MCU. Disconnect.		J1.12	R143	R145
	Connect Micro controller pin headers to MCU. Disconnect.			-	R143
EXTAL	Connect the crystal X1.2. Disconnect.	-		R145	R143
	Connect the crystal X1.2. Disconnect.	-		-	R145
XCOUT	Connect the crystal X2.1. Disconnect.	-		R130	-
	Connect the crystal X2.1. Disconnect.	-		-	R130
XCIN	Connect the crystal X2.4. Disconnect.	-		R131	R132
	Connect the crystal X2.4. Disconnect.	-		R132	R131

Table 6-4: Clock Option Links

6.5 ADC & DAC Configuration

Table 6-5 below details the function of the option links associated with ADC & DAC configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	Fit	Remove	Header Pin	Fit	Remove	Port
VREFL0	PJ7	59	GROUND	-	R153	R152	-	-	-
			CON_VREFL0	-	R152	R153	J4.11	-	-
VREFH0	PJ6	61	UC_VCC	-	R155	R154	-	-	-
			CON_VREFH0	-	R154	R155	JA1.7, J4.13	-	-
IO7_AN015	PE7	52	IO7	-	R12	R7	JA1.22	-	-
			AN015	-	R7	R12	JA5.4	-	-
IO6_AN014	PE6	53	IO6	-	R13	R8	JA1.21	-	-
			AN014	-	R8	R13	JA5.3	-	-
P46_AN006	P46	54	P46	-	R44	R9	PMOD1.10	-	-
			AN006	-	R9	R44	JA5.2	-	-
P44_AN004	P44	55	P44	-	R45	R10	PMOD1.9	-	-
			AN004	-	R10	R45	JA5.1	-	-
AN000	R40	60	ADPOT(RV1)	-	R227	R22, R43	JA1.9	-	-
			AN000	-	R23	R22, R43	JA1.9	-	-
			AN000 (partial pressure)	-	R22, R43,	R23, R227	JA1.9	-	-
RL78G1C_RTS_DA1	P05	64	RL78G1C_RTS	U2.9	R39	R20	-	-	-
			DA1	-	R20	R39	JA1.14	-	-
RL78G1C_CTS_DA0	P03	1	RL78G1C_CTS	U2.10	R40	R21	-	-	-
			DA0	-	R21	R40	JA1.13	-	-
AVCC0	-	63	UC_VCC	-	R159	R158, R170/R171	-	-	-
			CON_AVCC0	-	R158	R159, R170/R171	JA1.5, J4.15	-	-
			Board_3V3	-	R170, R171	R159, R158	-	-	-
AVSS0	-	62	GROUND	-	R157	R156	-	-	-
			CON_AVSS0	-	R156	R157	JA1.6, J4.14	-	-

Table 6-5: ADC & DAC Option Links

6.6 E1 Debugger Configuration

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

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	Fit	Remove	Header Pin	Fit	Remove	Port
P27	P27	2	P27	-	R105	-	E1.1	-	-
				-	-	-	J1.2	-	-
MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	P16	18	MTIOC3C	-	R216	R87, R107, J11: open	JA2.11	-	-
			A-TXD1	U2.15	R224, J11.1-2	R38, R87, R107, R120, R199, R216	JA2.6	-	-
				-	J11.1-2	R87, R107, R216			
			P-TXD1	-	R87	R216, R107, J11: open	PMOD2.2	-	-
			USB0VBUS	-	J11.2-3	R87, R107, R216	J9.2	R144	R121
MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	P16	18	MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	-	R107	R87, R216, J11: open	E1.5	-	-
				-	-	-	J2.2	-	-
MTIOC0B_A-RXD1_P-RXD1	P15	19	MTIOC0B	-	R183	R88, R125, R220	JA2.9	R219	R218
			A-RXD1	-	R220	R88, R125, R183	JA2.8	-	-
			P-RXD1	-	R88	R183, R125, R220	PMOD2.3	-	-
			MTIOC0B_A-RXD1_P-RXD1	U2.16	R116	R37, R88, R110, R125, R183, R198, R220	-	-	-
				-	R125	R88, R183, R220	E1.11	-	-
P14_A-CTS1RTS1_P-CTS1RTS1	P14	20		-	-	-	J2.3	-	-
				-	R117, R165	R86, R215	E1.10	-	-
				SW4.2	R165		-	-	-
			A-CTS1RTS1	-	R215	R86, R165	JA2.12	-	-
			P-CTS1RTS1	-	R86	R165, R215	PMOD2.1	-	-

Table 6-6: E1 Debugger Option Links

6.7 I2C EEPROM Configuration

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

Signal Name/Function	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Fit	Remove	Port
MTIC5W_SCL_ADTRG0n	PB0	39	MTIC5W	-	R188	R25, R61	JA6.16	-	-
			SCL	U3.6	R59, R61	R25, R188	JA1.26	-	-
				-	R61				
			ADTRG0n	-	R25, R186	R61, R188, R229	SW3	-	-
MTIC5V_SDA_CTS5RTS5	PA6	41		-	R25	-	JA1.8	-	-
			MTIC5V	-	R189	R64, R69	JA6.15	-	-
			SDA	U3.5	R58, R64	R69, R189	JA1.25	-	-
				-	R64				
			CTS5RTS5	-	R70, R69	R71, R64, R189	PMOD1.1	-	-
Board_5V (Pull-up)	-	-	-	-	R6	R5	-	-	-
Board_3V3 (Pull-up)	-	-	-	-	R5	R6	-	-	-
Enable write protect	-	-	-	U3.7	R32	-	-	-	-
Disable write protect	-	-	-	U3.7	-	R32	-	-	-

Table 6-7: I2C EEPROM Option Links

6.8 I/O Port Configuration

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

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
IO7_AN015	PE7	52	IO7	-	R12	R7	JA1.22	-	-
			AN015	-	R7	R12	JA5.4	-	-
IO6_AN014	PE6	53	IO6	-	R13	R8	JA1.21	-	-
			AN014	-	R8	R13	JA5.3	-	-
IO5_MTI0C4C	PE5	46	IO5	-	R14	R213	JA1.20	-	-
			MTI0C4C	-	R213	R14	JA2.16	-	-
IO4_MTI0C1A_IRQ4	PE4	47	IO4	-	R15	R204, R203	JA1.19	-	-
			MTI0C1A	-	R204	R15, R203	JA2.23	R205	R206, R207
			IRQ4	-	R203	R15, R204	JA2.23	R206	R205, R207
				SW3	R203, R229	R15, R186, R204	-	-	-
IO3_MTI0C0A	PE3	48	IO3	-	R16	R36	JA1.18	-	-
			MTI0C0A	-	R36	R16	JA2.7	R221	R222
LINRXD_IO2_RXD12	PE2	49	LINRXD	U6.1	R122	R17, R192	-	-	-
			IO2	-	R17	R122, R192	JA1.17	-	-
			RXD12	-	R192	R17, R122	JA6.12	-	-
			LINRXD_IO2_RXD12	U2.16	R37	R17, R110, R116, R122, R192, R198	-	-	-
LINTXD_IO1_TXD12	PE1	50	-	-	-	-	J4.1	-	-
			LINTXD	U6.4	R111	R18, R195	-	-	-
			IO1	-	R18	R111, R195	JA1.16	-	-
			TXD12	-	R195	R18, R111	JA6.9	-	-
IO0_SCK12	PE0	51	LINTXD_IO1_TXD12	U2.15	R38	R18, R120, R111, R195, R199, R224	-	-	-
				-	-	-	J4.2	-	-
			IO0	-	R19	R193	JA1.15	-	-
IO0_SCK12	PE0	51	SCK12	-	R193	R19	JA6.11	-	-

Table 6-8: I/O Port Option Links

6.9 IRQ & Switch Configuration

Table 6-9 below details the function of the option links associated with the IRQ & Switches configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
IO4_MTI0C1A_IRQ4	PE4	47	IO4	-	R15	R204, R203	JA1.19	-	-
			MTI0C1A	-	R204	R15, R203	JA2.23	R205	R206, R207
			IRQ4	-	R203	R15, R204	JA2.23	R206	R205, R207
				SW3	R203, R229	R15, R186, R204	-	-	-
MTIC5W_SCL_ADTRG0n	PB0	39	MTIC5W	-	R188	R25, R61	JA6.16	-	-
			SCL	U3.6	R59, R61	R25, R188	JA1.26	-	-
				-	R61	-	-	-	-
			ADTRG0n	-	R25, R186	R61, R188, R229	SW3	-	-
IRQ5_MTI0C5U	PA4	42	IRQ5	-	R68	R190	PMOD1.7	-	-
			MTIC5U	-	R190	R68	JA6.14	-	-
POE0_A-IRQ6_P-IRQ6	PA3	43	POE0	-	R90, R202	R11, R46	JA2.24	-	-
			A-IRQ6	-	R11, R90	R46, R202	JA1.23	-	-
			P-IRQ6	-	R46, R90	R202, R11	PMOD1.8	-	-
A-IRQ1_P-IRQ1	P31	5	A-IRQ1	-	R169	R79	JA2.9	R218	R219
			P-IRQ1	-	R79	R169	PMOD2.8	-	-
			A-IRQ1_P-IRQ1	SW2	R231	R79, R169	-	-	-
			-	-	-	-	J1.5	-	-
A-IRQ0_P-IRQ0	P30	4	A-IRQ0	-	R223	R83	JA2.7	R222	R221
			P-IRQ0	-	R83	R223	PMOD2.7	-	-
			A-IRQ0_P-IRQ0	SW1	R234	R83, R223	-	-	-
				-	-	-	J1.4	-	-

Table 6-9: IRQ & Switches Option Links

6.10 LIN Configuration

Table 6-10 below details the function of the option links associated with the LIN configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
LINRXD_IO2_RXD12	PE2	49	LINRXD	U6.1	R122	R17, R192	-	-	-
			IO2	-	R17	R122, R192	JA1.17	-	-
			RXD12	-	R192	R17, R122	JA6.12	-	-
			LINRXD_IO2_RXD12	U2.16	R37	R110, R116, R198	-	-	-
LINTXD_IO1_TXD12	PE1	50	LINTXD	U6.4	R111	R18, R195	-	-	-
			IO1	-	R18	R111, R195	JA1.16	-	-
			TXD12	-	R195	R18, R111	JA6.9	-	-
			LINTXD_IO1_TXD12	U2.15	R38	R120, R199, R224	-	-	-
LIN Master mode	-	-	-	-	R151, R161	-	-	-	-
LIN Slave mode	-	-	-	-	-	R151, R161	-	-	-

Table 6-10: LIN Option Links

6.11 MTU & POE Configuration

Table 6-11 and Table 6-12 below details the function of the option links associated with MTU & POE configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
MTIC5W_SCL_ADTRG0n	PB0	39	MTIC5W	-	R188	R25, R61	JA6.16	-	-
			SCL	U3.6	R59, R61	R25, R188	JA1.26	-	-
				-	R61				
			ADTRG0n	-	R25, R186	R61, R188, R229	SW3	-	-
MTIC5V_SDA_CTS5RTS5	PA6	41	MTIC5V	-	R189	R64, R69	JA6.15	-	-
			SDA	U3.5	R58, R64	R69, R189	JA1.25	-	-
				-	R64				
			CTS5RTS5	-	R70, R69	R71, R64, R189	PMOD1.1	-	-
IRQ5_MTIC5U	PA4	42	IRQ5	-	R68	R190	PMOD1.7	-	-
			MTIC5U	-	R190	R68	JA6.14	-	-
POE0_A-IRQ6_P-IRQ6	PA3	43	POE0	-	R90, R202	R11, R46	JA2.24	-	-
			A-IRQ6	-	R11, R90	R46, R202	JA1.23	-	-
			P-IRQ6	-	R46, R90	R202, R11	PMOD1.8	-	-
P32_MTIOC0C	P32	16	P32	-	R54	R182	PMOD2.9	-	-
			MTIOC0C	-	R182	R54	JA2.23	R207	R205, R206
							JA2.19	R211	-
MTIOC3A_A-SCK1_P-SCK1	P17	17	MTIOC3A	-	R191	R89, R217	JA6.13	-	-
			A-SCK1	-	R217	R89, R191	JA2.10	-	-
			P-SCK1	-	R89	R191, R217	PMOD2.4	-	-
MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	P16	18	MTIOC3C	-	R216	R87, R107, J11: open	JA2.11	-	-
			A-TXD1	U2.15	R224, J11.1-2	R38, R87, R107, R120, R199, R216	JA2.6	-	-
				-	J11.1-2	R87, R107, R216		-	-
			P-TXD1	-	R87	R216, R107, J11: open	PMOD2.2	-	-
			USB0VBUS	-	J11.2-3	R87, R107, R216	J9.2	R144	R121
			MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	-	R107	R87, R216, J11: open	E1.5	-	-
MTIOC0B_A-RXD1_P-RXD1	P15	19	MTIOC0B	-	R183	R88, R125, R220	JA2.9	R219	R218
			A-RXD1	-	R220	R88, R125, R183	JA2.8	-	-
			P-RXD1	-	R88	R183, R125, R220	PMOD2.3	-	-
			MTIOC0B_A-RXD1_P-RXD1	U2.16	R116	R37, R88, R110, R125, R183, R198, R220	-	-	-
				-	R125	R88, R183, R220	E1.11	-	-
				-	-	-	J2.3	-	-

Table 6-11: MTU & POE Option Links (1)

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
PC7_MTCLKB_USB0OVR CURB	PC7	27	PC7	-	R71, R72	R70,R200, R134	PMOD1.1	-	-
			MTCLKB	-	R200	R72, R134	JA2.26	-	-
			USB0OVRCURB	U5.6	R134	R72, R200	-	-	-
MTCLKA_USB0EXICEN	PC6	28	MTCLKA	-	R201	R133	JA2.25	-	-
			USB0EXICEN	U5.11	R133	R201	-	-	-
IO5_MTI0C4C	PE5	46	IO5	-	R14	R213	JA1.20	-	-
IO4_MTI0C1A_IRQ4	PE4	47	MTI0C4C	-	R213	R14	JA2.16	-	-
			IO4	-	R15	R204,R203	JA1.19	-	-
			MTI0C1A	-	R204	R15,R203	JA2.23	R205	R206, R207
			IRQ4	SW3	R203	R15,R204	JA2.23	R206	R205, R207
IO3_MTI0C0A	PE3	48	IO3	-	R16	R36	JA1.18	-	-
			MTI0C0A	-	R36	R16	JA2.7	R221	R222
MTI0C3D	PB6 /PC0	34	MTI0C3D	LED3	-	-	JA2.14	R214	-
					-	-	JA2.20	R210	-
					-	-	J3.2	-	-
PB5_MTI0C1B	PB5	35	PB5	-	R53	R209	PMOD2.10	-	-
			MTI0C1B	-	R209	R53	JA2. 21	-	-
MTI0C4D	P55	25	MTI0C4D	-	-	-	JA2.18	R212	-
					-	-	JA2.22	R208	-
					-	-	J2.9	-	-

Table 6-12: MTU & POE Option Links (2)

6.12 PMOD1 Interface Configuration

Table 6-13 below details the function of the option links associated with PMOD1 Interface configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
PC7_MTCLKB_USB0_OVRCURB	PC7	27	PC7	-	R71, R72	R70, R200, R134	PMOD1.1	-	-
			MTCLKB	-	R200	R72, R134	JA2.26	-	-
			USB0OVRCURB	U5.6	R134	R72, R200	-	-	-
A-TXD5_P-TXD5	PC3	31	A-TXD5	-	R196	R113	JA6.8	-	-
			P-TXD5	-	R113	R196	PMOD1.2	-	-
			A-TXD5_P-TXD5	U2.15	R120	R199, R224, R38	-	-	-
			-	-	-	-	J2.15	-	-
A-RXD5_P-RXD5	PC2	32	A-RXD5	-	R197	R112	JA6.7	-	-
			P-RXD5	-	R112	R197	PMOD1.3	-	-
			A-RXD5_P-RXD5	U2.16	R110	R37, R116, R198	-	-	-
			-	-	-	-	J2.16	-	-
MTIC5V_SDA_CTS5RTS5	PA6	41	MTIC5V	-	R189	R64, R69	JA6.15	-	-
			SDA	U3.5	R58, R64	R69, R189	JA1.25	-	-
			-	-	R64	-	-	-	-
CTS5RTS5	-	-	CTS5RTS5	-	R70, R69	R71, R64, R189	PMOD1.1	-	-
			-	-	-	-	-	-	-
IRQ5_MTIC5U	PA4	42	IRQ5	-	R68	R190	PMOD1.7	-	-
POE0_A-IRQ6_P-IRQ6	PA3	43	MTIC5U	-	R190	R68	JA6.14	-	-
			POE0	-	R90, R202	R11, R46	JA2.24	-	-
			A-IRQ6	-	R11, R90	R46, R202	JA1.23	-	-
A-SCK5_P-SCK5	PA1	44	P-IRQ6	-	R46, R90	R202, R11	PMOD1.8	-	-
			A-SCK5	-	R194	R81	JA6.10	-	-
P46_AN006	P46	54	P-SCK5	-	R81	R194	PMOD1.4	-	-
			P46	-	R44	R9	PMOD1.10	-	-
P44_AN004	P44	55	AN006	-	R9	R44	JA5.2	-	-
			P44	-	R45	R10	PMOD1.9	-	-
Board_5V	-	-	AN004	-	R10	R45	JA5.1	-	-
Board_3V3	-	-	-	-	R51	R47	PMOD1.6,	-	-
					R47	R51	PMOD1.12	-	-

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		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
PB5_MTIOC1B	PB5	35	PB5	-	R53	R209	PMOD2.10	-	-
			MTIOC1B	-	R209	R53	JA2.21	-	-
P32_MTIOC0C	P32	16	P32	-	R54	R182	PMOD2.9	-	-
			MTIOC0C	-	R182	R54	JA2.23	R207	R205, R206
A-IRQ1_P-IRQ1	P31	5	A-IRQ1	-	R169	R79	JA2.9	R218	R219
			P-IRQ1	-	R79	R169	PMOD2.8	-	-
			A-IRQ1_P-IRQ1	SW2	R231	R79, R169	-	-	-
A-IRQ0_P-IRQ0	P30	4	A-IRQ0	-	R223	R83	JA2.7	R222	R221
			P-IRQ0	-	R83	R223	PMOD2.7	-	-
			A-IRQ0_P-IRQ0	SW1	R234	R83, R223	-	-	-
MTIOC3A_A-SCK1_P-SCK1	P17	17	MTIOC3A	-	R191	R89, R217	JA6.13	-	-
			A-SCK1	-	R217	R89, R191	JA2.10	-	-
			P-SCK1	-	R89	R191, R217	PMOD2.4	-	-
MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	P16	18	MTIOC3C	-	R216	R87, R107, J11: open	JA2.11	-	-
			A-TXD1	U2.15	R224, J11.1-2	R38, R87, R107, R120, R199, R216	JA2.6	-	-
				-	J11.1-2	R87, R107, R216		-	-
			P-TXD1	-	R87	R216, R107, J11: open	PMOD2.2	-	-
			USB0VBUS	-	J11.2-3	R87, R107, R216	J9.2	R144	R121
			MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	-	R107	R87, R216, J11: opne	E1.5	-	-
MTIOC0B_A-RXD1_P-RXD1	P15	19	-	-	-	-	J2.2	-	-
			MTIOC0B	-	R183	R88, R125, R220	JA2.9	R219	R218
			A-RXD1	-	R220	R88, R125, R183	JA2.8	-	-
			P-RXD1	-	R88	R183, R125, R220	PMOD2.3	-	-
			MTIOC0B_A-RXD1_P-RXD1	U2.16	R116	R37, R88, R110, R125, R183, R198, R220	-	-	-
P14_A-CTS1RTS1_P-CTS1RTS1	P14	20	-	-	-	-	J2.3	-	-
			P14	-	R117, R165	R86, R215	E1.10	-	-
			A-CTS1RTS1	SW4.2	R165	-	-	-	-
			P-CTS1RTS1	-	R215	R86, R165	JA2.12	-	-
Board_5V	-	-	-	-	R3	R4	PMOD2.6,	-	-
Board_3V3	-	-	-	-	R4	R3	PMOD2.12	-	-

Table 6-14: PMOD2 Interface Option Links

6.14 SCI & RS232 Serial Port Configuration

Table 6-15 below details the function of the option links associated with serial port configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
LINRXD_IO2_RXD12	PE2	49	LINRXD	U6.1	R122	R17, R192	-	-	-
			IO2	-	R17	R122, R192	JA1.17	-	-
			RXD12	-	R192	R17, R122	JA6.12	-	-
			LINRXD_IO2_RXD12	U2.16	R37	R17, R110, R116, R122, R192, R198	-	-	-
LINTXD_IO1_TXD12	PE1	50	-	-	-	-	J4.1	-	-
			LINTXD	U6.4	R111	R18, R195	-	-	-
			IO1	-	R18	R111, R195	JA1.16	-	-
			TXD12	-	R195	R18, R111	JA6.9	-	-
			LINTXD_IO1_TXD12	U2.15	R38	R18, R120, R111, R195, R199, R224	-	-	-
IO0_SCK12	PE0	51	-	-	-	-	J4.2	-	-
			IO0	-	R19	R193	JA1.15	-	-
A-TXD5_P-TXD5	PC 3	31	SCK12	-	R193	R19	JA6.11	-	-
			A-TXD5	-	R196	R113	JA6.8	-	-
			P-TXD5	-	R113	R196	PMOD1.2	-	-
			A-TXD5_P-TXD5	U2.15	R120	R199, R224, R38	-	-	-
A-RXD5_P-RXD5	PC 2	32	-	-	-	-	J2.15	-	-
			A-RXD5	-	R197	R112	JA6.7	-	-
			P-RXD5	-	R112	R197	PMOD1.3	-	-
			A-RXD5_P-RXD5	U2.16	R110	R37, R116, R198	-	-	-
MTIC5V_SDA_CTS5RTS5	PA6	41	-	-	-	-	J2.16	-	-
			MTIC5V	-	R189	R64, R69	JA6.15	-	-
			SDA	U3.5	R58, R64	R69, R189	JA1.25	-	-
			-	-	R64	-	-	-	-
A-SCK5_P-SCK5	PA1	44	CTS5RTS5	-	R70, R69	R71, R64, R189	PMOD1.1	-	-
			A-SCK5	-	R194	R81	JA6.10	-	-
MTIOC3A_A-SCK1_P-SCK1	P17	17	P-SCK5	-	R81	R194	PMOD1.4	-	-
			MTIOC3A	-	R191	R89, R217	JA6.13	-	-
			A-SCK1	-	R217	R89, R191	JA2.10	-	-
			P-SCK1	-	R89	R191, R217	PMOD2.4	-	-
MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	P16	18	MTIOC3C	-	R216	R87, R107, J11: open	JA2.11	-	-
			A-TXD1	U2.15	R224, J11.1-2	R38, R87, R107, R120, R199, R216	JA2.6	-	-
			-	-	J11.1-2	R87, R107, R216	-	-	-
			P-TXD1	-	R87	R216, R107, J11: open	PMOD2.2	-	-
			USB0VBUS	-	J11.2-3	R87, R107, R216	J9.2	R144	R121
			MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	-	R107	R87, R216, J11: open	E1.5	-	-
MTIOC0B_A-RXD1_P-RXD1	P15	19	-	-	-	-	J2.2	-	-
			MTIOC0B	-	R183	R88, R125, R220	JA2.9	R219	R218
			A-RXD1	-	R220	R88, R125, R183	JA2.8	-	-
			P-RXD1	-	R88	R183, R125, R220	PMOD2.3	-	-
			MTIOC0B_A-RXD1_P-RXD1	U2.16	R116	R37, R88, R110, R125, R183, R198, R220	-	-	-
			-	-	R125	R88, R183, R220	E1.11	-	-
P14_A-CTS1RTS1_P-CTS1RTS1	P14	20	-	-	-	-	J2.3	-	-
			P14	-	R117, R165	R86, R215	E1.10	-	-
			-	SW4.2	R165	-	-	-	-
			A-CTS1RTS1	-	R215	R86, R165	JA2.12	-	-
RS232TX	-	-	P-CTS1RTS1	-	R86	R165, R215	PMOD2.1	-	-
RS232RX	-	-	RS232TX	U2.15	R199	R38, R120, R224	JA6.5	-	-
			RS232RX	U2.16	R198	R37, R110, R116	JA6.6	-	-

Table 6-15: SCI & RS232 Serial Port Option Links

6.15 USB Configuration

Table 6-16 below details the function of the option links associated with the USB Configuration.

Signal Name	MCU		Exclusive function				Header connection		
	Port	MCU Pin	Signal	IC Pin	Fit	Remove	Header Pin	Fit	Remove
PC7_MTCLKB_USB0OVR RCURB	PC7	27	PC7	-	R71, R72	R70, R200, R134	PMOD1.1	-	-
			MTCLKB	-	R200	R72, R134	JA2.26	-	-
			USB0OVRCURB	U5.6	R134	R72, R200	-	-	-
MTCLKA_USB0EXICEN	PC6	28	MTCLKA	-	R201	R133	JA2.25	-	-
			USB0EXICEN	U5.11	R133	R201	-	-	-
RL78G1C_RES_USB0ID	PC5	29	RL78G1C_RES	U2.3	R123	R139	-	-	-
			USB0ID	U5.3	R139	R123	-	-	-
USB0OVRCURA (HOST)	PB3	36	USB0OVRCURA	U7.2	R175	R136	J3.4	-	-
USB0OVRCURA (OTG)	PB3	36	USB0OVRCURA	U5.5	R136	R175	-	-	-
USB0VBUSEN (HOST)	P26	3	USB0VBUSEN	U7.1	R173	R137	J1.3	-	-
USB0VBUSEN (OTG)	P26	3	USB0VBUSEN	U5.4	R137	R173	-	-	-
MTIOC3C_A-TXD1_P- TXD1_USB0VBUS	P16	18	MTIOC3C	-	R216	R87, R107, J11: open	JA2.11	-	-
			A-TXD1	U2.15	R224, J11.1-2	R38, R87, R107, R120, R199, R216	JA2.6	-	-
				-	J11.1-2	R87, R107, R216		-	-
			P-TXD1	-	R87	R216, R107, J11: open	PMOD2.2	-	-
			USB0VBUS	-	J11.2-3	R87, R107, R216	J9.2	R144	R121
			MTIOC3C_A-TXD1_P- TXD1_USB0VBUS	-	R107	R87, R216, J11: open	E1.5	-	-
				-	-	-	J2.2	-	-

Table 6-16: USB Option Links

Table 6-17 below details the function of the option links associated with the USB mode select.

Mode	Jumper Position	Option Link Resistor	
		Fit	Remove
Host mode	J12: 1-2 shorted.	-	R140
Function mode	J12: 2-3 shorted		
OTG mode	J12: All open	R140	-

Table 6-17: USB Option Links (mode)

7. Headers

7.1 Application Headers

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

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

Application Header JA1					
Pin	Header Name	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	63	6	AVSS	62
	CON_AVCC0			CON_AVSS0	
7	AVREF	61	8	ADTRG	39
	CON_VREFH0			ADTRG0n	
9	ADC0	60	10	ADC1	58
	JA1_AN000			AN001	
11	ADC2	57	12	ADC3	56
	AN002			AN003	
13	DA0	1	14	DA1	64
	DA0			DA1	
15	IO_0	51	16	IO_1	50
	IO0			IO1	
17	IO_2	49	18	IO_3	48
	IO2			IO3	
19	IO_4	47	20	IO_5	46
	IO4			IO5	
21	IO_6	53	22	IO_7	52
	IO6			IO7	
23	IRQ3/IRQAEC/M2_HSIN0	43/NC/NC	24	IIC_EX	NC
	A-IRQ6/NC/NC			NC	
25	IIC_SDA	41	26	IIC_SCL	39
	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	7	2	EXTAL	11
	RESn			CON_XTAL	
3	NMI	10	4	Vss1	-
	NMIIn			GROUND	
5	WDT_OVF	NC	6	SCIaTX	18
	NC			A-TXD1	
7	IRQ0/WKUP/M1_HSIN0	4/NC/48	8	SCIaRX	19
	A-IRQ0/NC/MTIOC0A			A-RXD1	
9	IRQ1/M1_HSIN1	5/19	10	SCIaCK	17
	A-IRQ1/MTIOC0B			A-SCK1	
11	M1_UD	18	12	CTSRTS	20
	MTIOC3C			A-CTS1RTS1	
13	M1_Up	33	14	M1_Un	34
	MTIOC3B			MTIOC3D	
15	M1_Vp	45	16	M1_Vn	46
	MTIOC4A			MTIOC4C	
17	M1_Wp	26	18	M1_Wn	25
	MTIOC4B			MTIOC4D	
19	TimerOut	16	20	TimerOut	34
	MTIOC0C			MTIOC3D	
21	TimerIn	35	22	TimerIn	25
	MTIOC1B			MTIOC4D	
23	IRQ2/M1_EncZ/M1_HSIN2	47/47/16	24	M1_POE	43
	IRQ4/MTIOC1A/MTIOC0C			POE0	
25	M1_TRCCLK	28	26	M1_TRDCLK	27
	MTCLKA			MTCLKB	

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	55	2	ADC5	54
	AN004			AN006	
3	ADC6	53	4	ADC7	52
	AN014			AN015	
5	CAN1TX	NC	6	CAN1RX	NC
	NC			NC	
7	CAN2TX	NC	8	CAN2RX	NC
	NC			NC	
9	IRQ4/M2_EncZ/M2HSIN1	NC / NC / NC	10	IRQ5/M2_HSIN2	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 7-3: 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
	RS232TX			RS232RX	
7	SCIbRX	32	8	SCIbTX	31
	A-RXD5			A-TXD5	
9	SCIcTX	50	10	SCIbCK	44
	TXD12			A-SCK5	
11	SCIcCK	51	12	SCIcRX	49
	SCK12			RXD12	
13	M1_Toggle	17	14	M1_Uin	42
	MTIOC3A			MTIC5U	
15	M1_Vin	41	16	M1_Win	39
	MTIC5V			MTIC5W	
17	EXT_USB_VBUS *	NC	18	Reserved	NC
	EXT_VBUS			NC	
19	EXT_USB_BATT *	NC	20	Reserved	NC
	EXT_BATT			NC	
21	EXT_USB_CHG *	NC	22	Reserved	NC
	EXT_CHG			NC	
23	Unregulated_VCC	NC	24	Vss	-
	Unregulated_VCC			GROUND	

Table 7-4: Application Header JA6 Connections

: Pins marked with an '' have connections that are on reserved pins of for the application headers and are intended to support the USB Battery charging functions of the device. Be aware that connection of incompatible Application boards will be possible and may cause a failure.

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	RL78G1C_CTS_DA0	1	2	P27	2
3	USB0VBUSEN	3	4	A-IRQ0_P-IRQ0	4
5	A-IRQ1_P-IRQ1	5	6	MD_FINED	6
7	RESn	7	8	NC	-
9	NC	-	10	NMIn	10
11	CON_XTAL	11	12	CON_EXTAL	12
13	NC	-	14	GROUND	-
15	UC_VCC	15	16	P32_MTIOC0C	16
17	NC	-	18	NC	-
19	NC	-	20	NC	-
21	NC	-	22	NC	-
23	NC	-	24	NC	-
25	NC	-	26	NC	-
27	NC	-	28	NC	-
29	NC	-	30	NC	-
31	NC	-	32	NC	-
33	NC	-	34	NC	-
35	NC	-	36	NC	-

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	MTIOC3A_A-SCK1_P-SCK1	17	2	MTIOC3C_A-TXD1_P-TXD1_USB0VBUS	18
3	MTIOC0B_A-RXD1_P-RXD1	19	4	P14_A-CTS1RTS1_P-CTS1RTS1	20
5	VCCUSB	21	6	NC	-
7	NC	-	8	GROUND	24
9	MTIOC4D	25	10	MTIOC4B	26
11	PC7_MTCLKB_USB00VRCURB	27	12	MTCLKA_USB0EXICEN	28
13	RL78G1C_RES_USB0ID	29	14	PC4	30
15	A-TXD5_P-TXD5	31	16	A-RXD5_P-RXD5	32
17	NC	-	18	NC	-
19	NC	-	20	NC	-
21	NC	-	22	NC	-
23	NC	-	24	NC	-
25	NC	-	26	NC	-
27	NC	-	28	NC	-
29	NC	-	30	NC	-
31	NC	-	32	NC	-
33	NC	-	34	NC	-
35	NC	-	36	NC	-

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	MTIOC3B	33	2	MTIOC3D	34
3	PB5_MTI0C1B	35	4	USB0OVRCURA	36
5	LINNSLP	37	6	UC_VCC	38
7	MTIC5W_SCL_ADTRG On	39	8	GROUND	40
9	MTIC5V_SDA_CTS5RT S5	41	10	IRQ5_MTIC5U	42
11	POE0_A-IRQ6_P-IRQ6	43	12	A-SCK5_P-SCK5	44
13	MTIOC4A	45	14	IO5_MTI0C4C	46
15	IO4_MTI0C1A_IRQ4	47	16	IO3_MTI0C0A	48
17	NC	-	18	NC	-
19	NC	-	20	NC	-
21	NC	-	22	NC	-
23	NC	-	24	NC	-
25	NC	-	26	NC	-
27	NC	-	28	NC	-
29	NC	-	30	NC	-
31	NC	-	32	NC	-
33	NC	-	34	NC	-
35	NC	-	36	NC	-

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	LINRXD_IO2_RXD12	49	2	LINTXD_IO1_TXD12	50
3	IO0_SCK12	51	4	IO7_AN015	52
5	IO6_AN014	53	6	P46_AN006	54
7	P44_AN004	55	8	AN003	56
9	AN002	57	10	AN001	58
11	CON_VREFL0	59	12	AN000	60
13	CON_VREFH0	61	14	CON_AVSS0	62
15	CON_AVCC0	63	16	RL78G1C_RTS_DA1	64
17	NC		18	NC	
19	NC		20	NC	
21	NC		22	NC	
23	NC		24	NC	
25	NC		26	NC	
27	NC		28	NC	
29	NC		30	NC	
31	NC		32	NC	
33	NC		34	NC	
35	NC		36	NC	

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 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 RX111 group hardware manual.

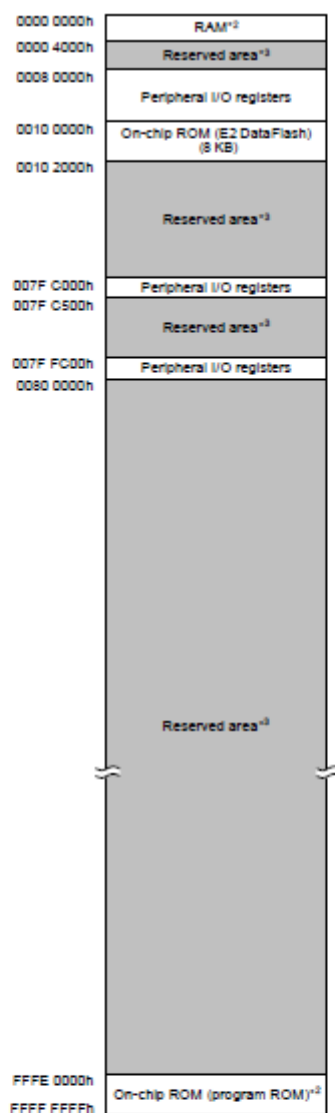
Only ever change the MCU operating mode whilst the RSK is in reset, or turned off; otherwise the MCU may become damaged as a result.

8.4 Debugging Support

The E1 emulator (as supplied with this RSK) supports break points, event points (including mid-execution insertion) and basic trace functionality. It is limited to a maximum of 8 on-chip event points, 256 software breaks and 256 branch/cycle trace. For further details, refer RX Family E1/E20 Emulator User's Manual (R20UT0398EJ).

8.5 Address Space

Figure 8-1 below details the address space of the MCU. This diagram is taken from the Hardware Manual version 0.2. The MCU fitted to the RSK has 128KB of ROM. For further details, refer to the RX111 Group Hardware Manual.



Note 1. The address space in boot mode is the same as the address space in single-chip mode.

Note 2. The capacity of ROM/RAM differs depending on the products.

ROM (bytes)		RAM (bytes)	
Capacity	Address	Capacity	Address
128 K	FFFE 0000h to FFFF FFFFh	16 K	0000 0000h to 0000 3FFFh
96 K	FFFE 8000h to FFFF FFFFh		
64 K	FFFF 0000h to FFFF FFFFh	10 K	0000 0000h to 0000 27FFh
32 K	FFFF 8000h to FFFF FFFFh		
16 K	FFFF C000h to FFFF FFFFh	8 K	0000 0000h to 0000 1FFFh

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

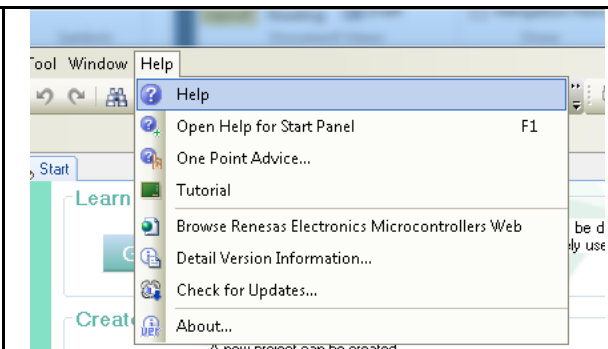
Note 3. Reserved areas should not be accessed.

Figure 8-1: MCU Address Space Diagram

9. Additional Information

Technical Support

For details on how to use CubeSuite+, refer to the manual available on the DVD or from the web site. Alternatively, refer to the help file by opening CubeSuite+ then selecting Help > Help from the menu bar.



For information about the RX111 Group microcontrollers refer to the RX111 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:

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

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