

RX113 Group

Renesas Starter Kit User's Manual

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 RSKRX113. 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.	RSKRX113 User's Manual	R20UT2756EG
Tutorial Manual	Provides a guide to setting up RSK environment, running sample code and debugging programs.	RSKRX113 Tutorial Manual	CS+: R20UT2757EG e ² studio: R20UT2760EG
Quick Start Guide	Provides simple instructions to setup the RSK and run the first sample, on a single A4 sheet.	RSKRX113 Quick Start Guide	CS+: R20UT2758EG e ² studio: R20UT2761EG
Code Generator Tutorial Manual	Provides a guide to code generation and importing into the IDE (Integrated Development Environment).	RSKRX113 Code Generator Tutorial Manual	CS+: R20UT3254EG e ² studio: R20UT3255EG
Schematics	Full detail circuit schematics of the RSK.	RSKRX113 Schematics	R20UT2755EG
Hardware Manual	Provides technical details of the RX113 microcontroller.	RX113 Group Hardware Manual	R01UH0448EJ

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
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
POE	Port Output Enable
PWM	Pulse Width Modulation
RAM	Random Access Memory
ROM	Read Only Memory
RSK	Renesas Starter Kit
RTC	Realtime Clock
SAU	Serial Array Unit
SCI	Serial Communications Interface
SFR	Special Function Registers
SPI	Serial Peripheral Interface
SSI	Serial Sound Interface
TAU	Timer Array Unit
TFT	Thin Film Transistor
TPU	Timer Pulse Unit
UART	Universal Asynchronous Receiver/Transmitter
USB	Universal Serial Bus
WDT	Watchdog timer

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1. Overview

1.1 Purpose

This RSK is an evaluation tool for Renesas microcontrollers. This manual describes the technical details of the RSK hardware. The Quick Start Guide and Tutorial Manual provide details of the software installation and debugging environment.

1.2 Features

This RSK provides an evaluation of the following features:

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

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

1.3 Board specification

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

Item	Specification
Microcontroller	Part No : R5F51138ADFP
	Package : 100-pin LFQFP
	On-Chip Memory : ROM 512KB+8KB, RAM 64KB
On-Board Memory	I ² C EEPROM : 16Kbit
Input Clock	RX113 Main : 16MHz
	RX113 Sub : 32.768kHz
	RL78/G1C Main: 12MHz
Power Supply	DC Power Jack : 5 V Input
	Power Supply IC : 5V Input, 3.3V/1.8V Output
Debug Interface	E1 14-pin box header
DIP Switch	Mode Configuration : 2-pole x 1
Push Switch	Reset Switch x 1
	User Switch x 3
Potentiometer (for ADC)	Single-turn, 10kΩ
LED	Power indicator: green x 1
	User : green x 1, orange x 1, red x 2
LIN	Connector : 2.54mm pitch, 3-pin x 1
	Driver : TJA1020T/CM
USB	USB0 Function : USB-MiniB
	USB0 Host : USB-TypeA
USB to Serial Converter Interface	Connector : USB-MiniB
	Driver : RL78/G1C Microcontroller (Part No R5F10JBCANA)
Pmod™	PMOD1 : Angle type, 12-pin Connector * ¹
	PMOD2 : Straight type, 12-pin Connector
Application Board Interface (LCD)	2.54mm pitch, 50-pin x 1 (JA4)
Application Board Interface * ²	2.54mm pitch, 26-pin x 2 (JA1, JA2), 24-pin x 2 (JA5, JA6)

Table 1-1: Board Specification

*¹: Pmod™ Compatible debug LCD module is not included to this product. Instead, LCD Application Board V2 is included.

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

2. Power Supply

2.1 Requirements

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

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

Connector	Supply voltage
PWR	Input 5VDC

Table 2-1: PWR Connector Requirements

J6 Setting	J9 Setting (DNF)	Supply Source	Board_5V	UC_VCC
All open	All open	PWR Connector, CON_5V, Unregulated_VCC	5V	3.3V
		CON_3V3, E1(3V3)	n/a	3.3V
	Pin1-2 shorted	PWR Connector, CON_5V, Unregulated_VCC	5V	1.8V
		CON_3V3, E1(3V3)	n/a	3.3V
Pin1-2 shorted	All open	EXT_BATT	5V	3.3V
	Pin1-2 shorted	EXT_BATT	5V	1.8V
Pin2-3 shorted	All open	VBUS	5V	3.3V
	Pin1-2 shorted	VBUS	5V	1.8V

Table 2-2: Main Power Supply Requirements

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

2.2 Power-Up Behaviour

When the RSK is purchased, the RSK board has the 'Release' build of the example tutorial software pre-programmed into the Renesas microcontroller. Please consult the 'Renesas Starter Kit Code Generator Tutorial Manual' for further information of this example.

3. Board Layout

3.1 Component Layout

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

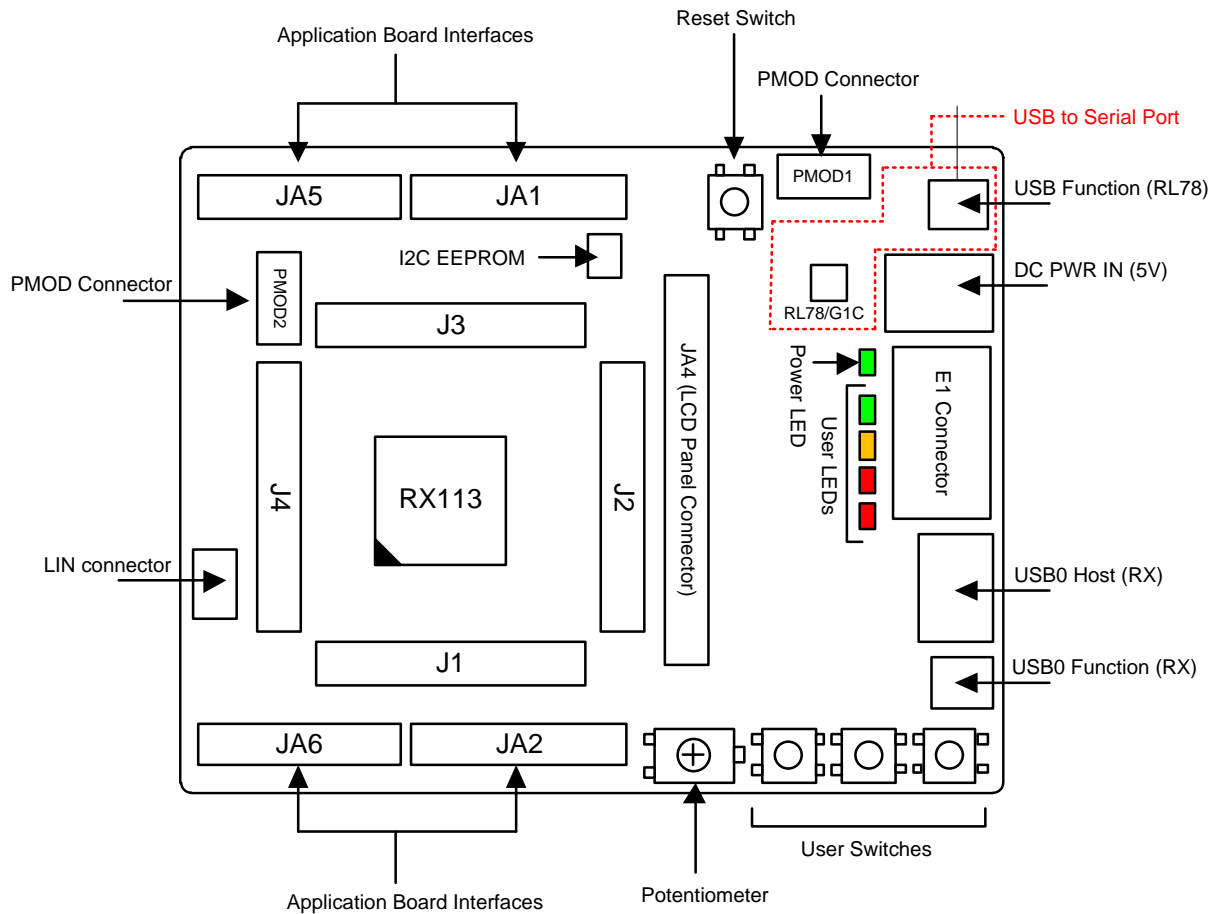


Figure 3-1: Board Layout

3.2 Board Dimensions

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

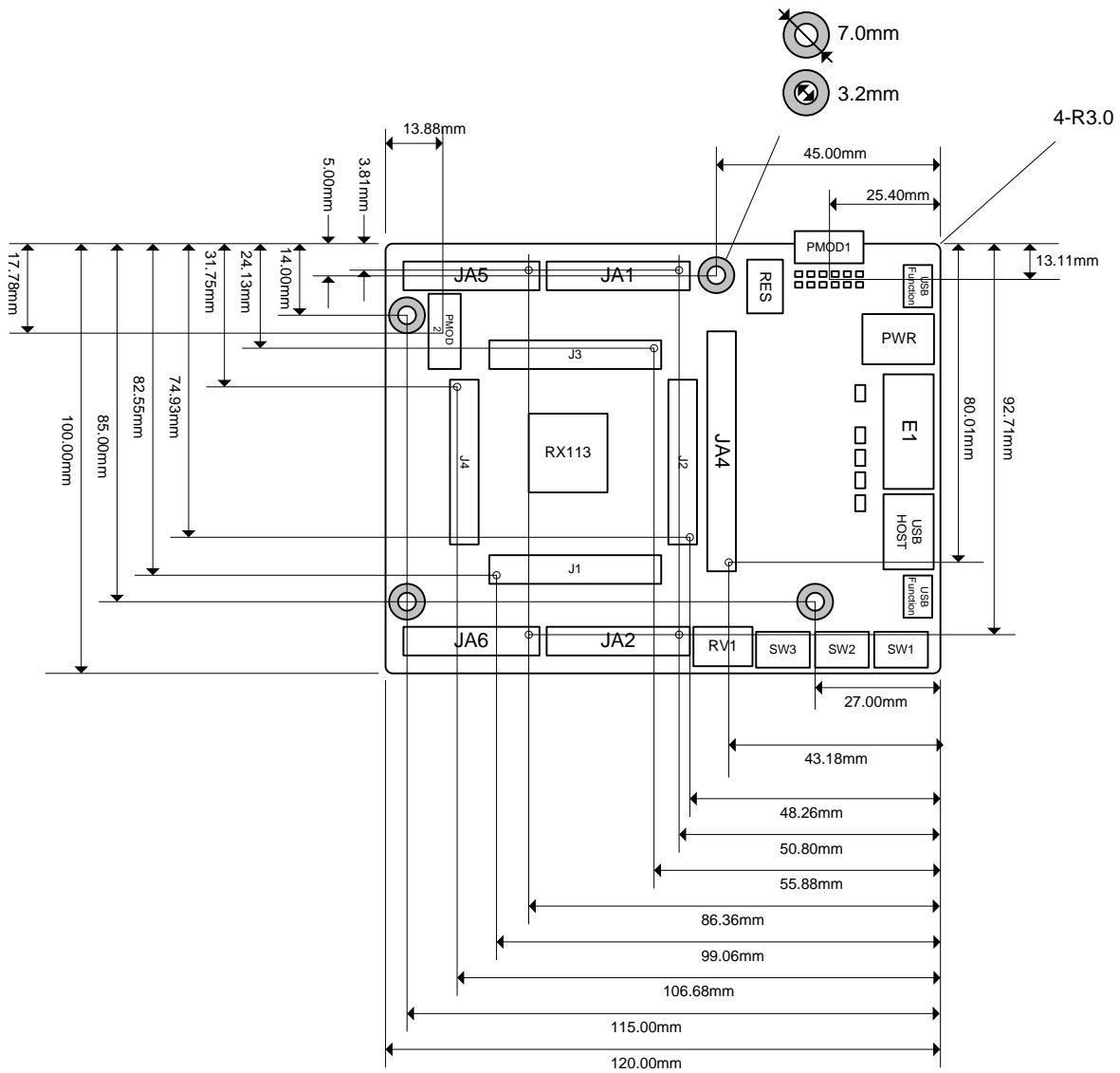


Figure 3-2: Board Dimensions

3.3 Component Placement

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

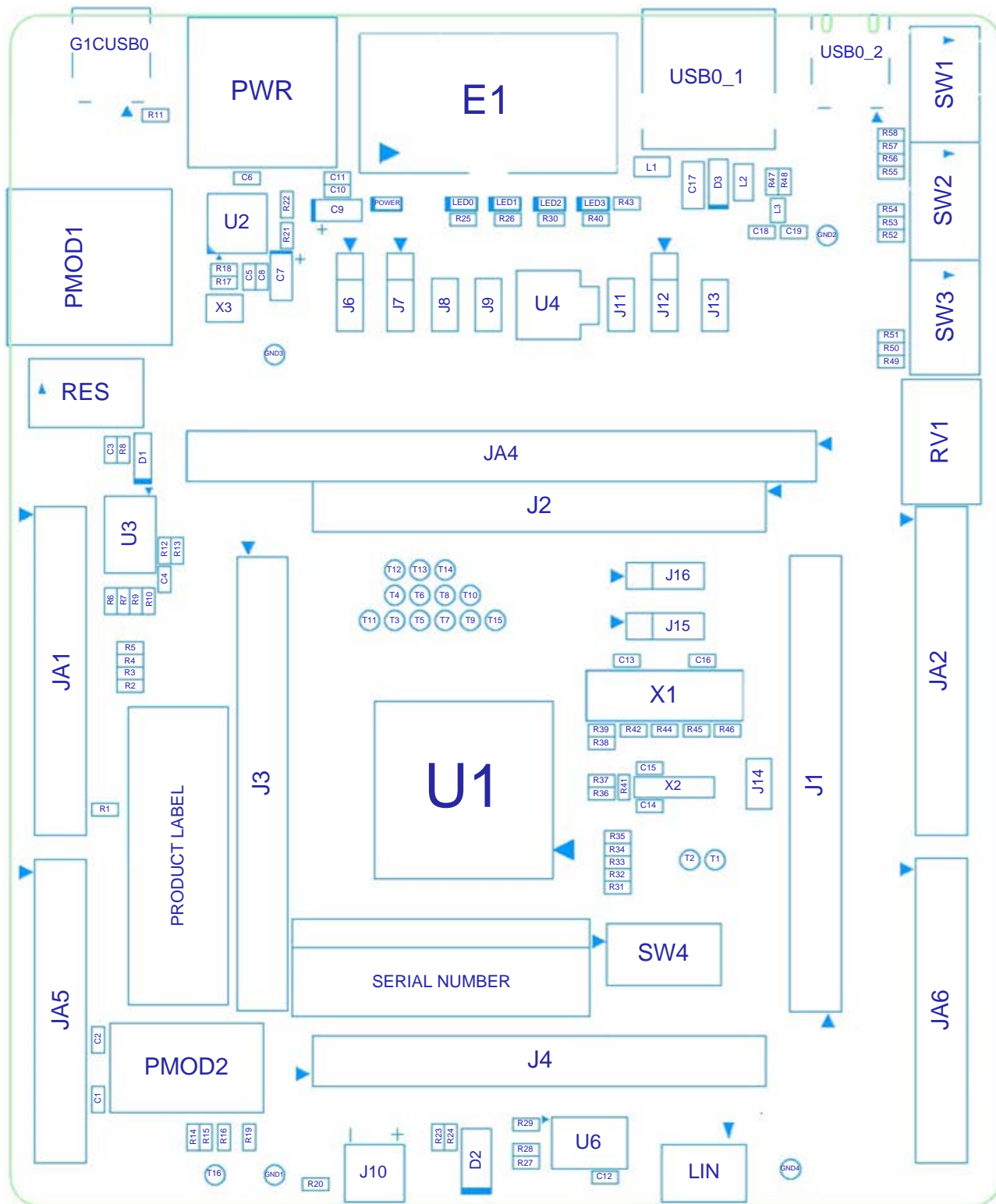


Figure 3-3: Top-Side Component Placement

Figure 3-4 below shows the component placement on the bottom-side of the RSK board.

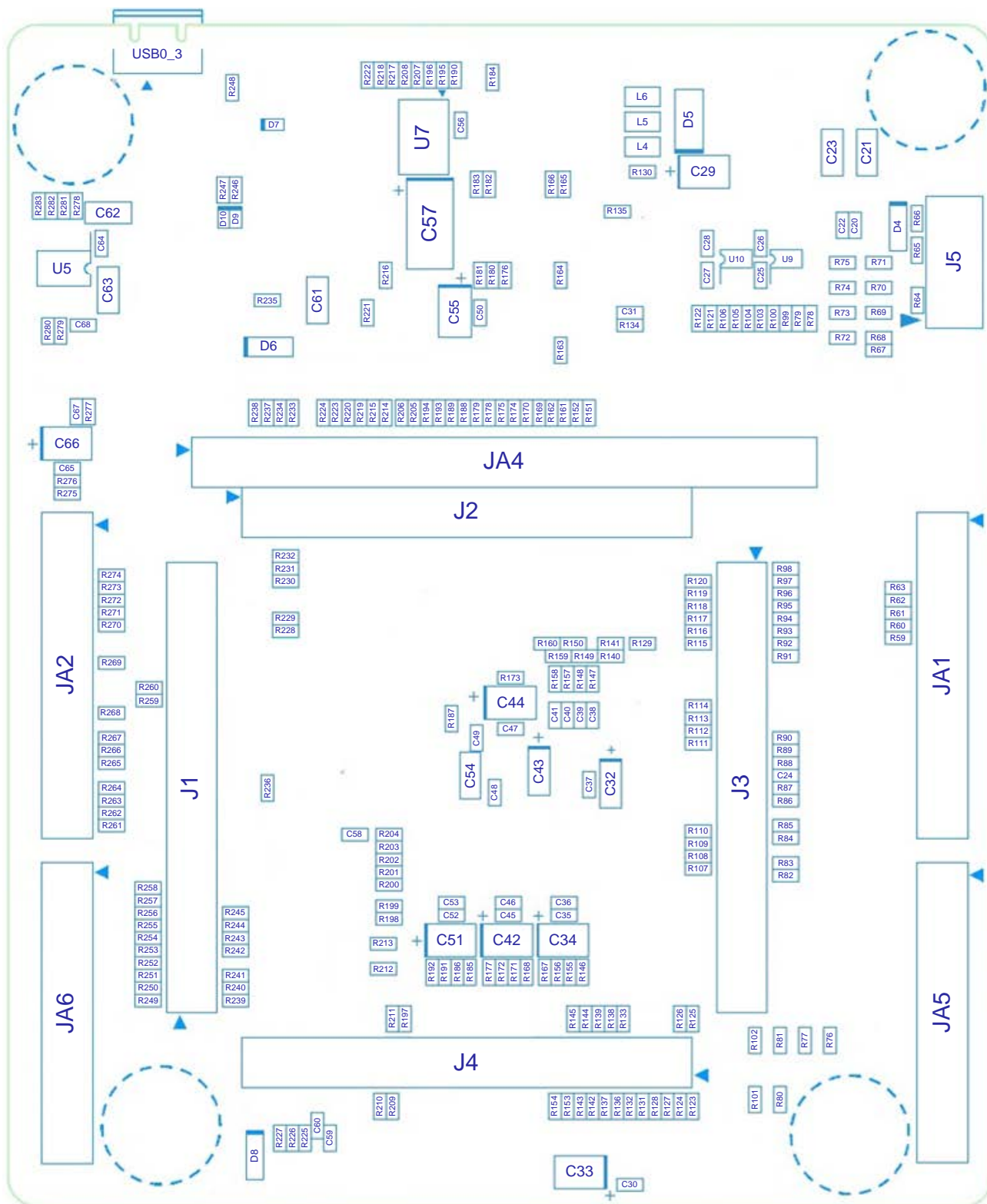


Figure 3-4: Bottom-Side Component Placement

4. Connectivity

4.1 Internal RSK Connections

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

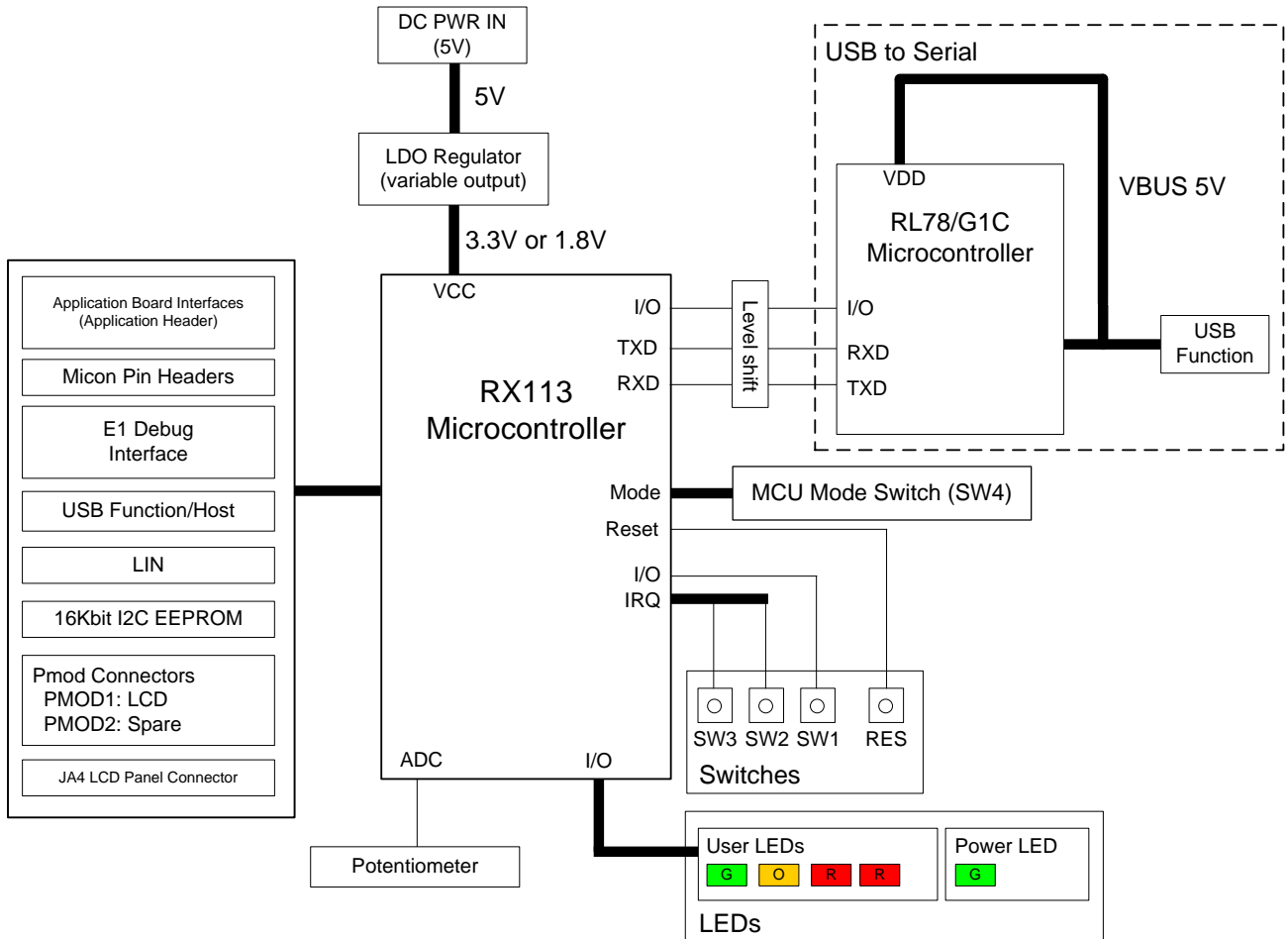


Figure 4-1: Internal RSK Block Diagram

4.2 Debugger Connections

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

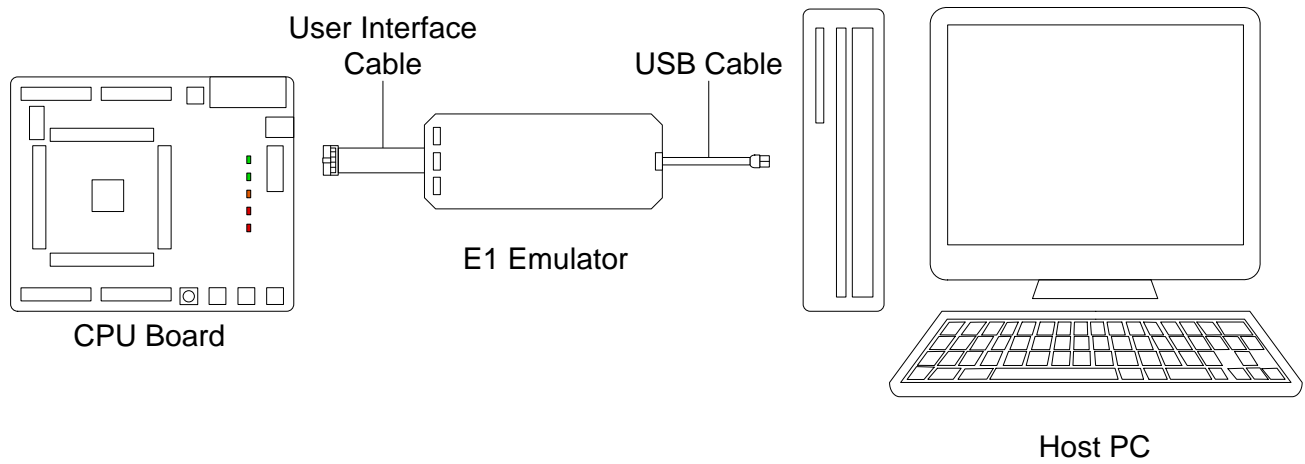


Figure 4-2: Debugger Connection Diagram

5. User Circuitry

5.1 Reset Circuit

A reset control circuit is fitted to the RSK to generate a reset signal from the RES switch. Refer to the RX113 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 RX113 Group Hardware Manual for details regarding the clock signal requirements, and the RSKRX113 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	RX113 Main oscillator.	Fitted	16MHz	Encapsulated, SMT
X2	RX113 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#	16
SW1	Connects to an IRQ input for user controls	IRQ5 (PA4)	66
	Connects to a General I/O input for user controls	PJ0	2
SW2	Connects to an IRQ input for user controls.	IRQ2 (P32)	25
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.	IRQ3 (P27)	11
		ADTRG0# (P27)	11

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	P22	8
LED1	Orange	User operated LED	P23	7
LED2	Red	User operated LED	P24	6
LED3	Red	User operated LED	P25	5

Table 5-3: LED Connections

5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analog input AN000 (Port P40, Pin 95). The potentiometer can be used to create a voltage between Board_3V3 and ground.

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 RX113 Group Hardware Manual for further details.

5.6 LCD Panel

A versatile LCD display panel is supplied with the RSK, and should be connected to the JA4 header. The panel is directly driven by circuitry inside the MCU. Connection information for the LCD panel is provided in **Table 5-4** below.

Application Header JA4 (LCD)							
Pin	Circuit Net Name	MCU		Pin	Circuit Net Name	MCU	
		Port	Pin			Port	Pin
1	VL4	PC6	46	2	VL3	PC7	45
3	VL2	P54	44	4	VL1	P55	43
5	GROUND	-	-	6	GROUND	-	-
7	COM0	PC5	47	8	COM1	PC4	48
9	COM2	PC3	49	10	COM3	PC2	50
11	SEG0	P13	34	12	SEG1	P12	35
13	SEG2	P11	36	14	SEG3	P10	37
15	SEG4	P56	38	16	SEG5	P53	39
17	SEG6	P52	40	18	SEG7	P51	41
19	SEG8	P50	42	20	SEG9	PC1	51
21	SEG10	PC0	52	22	SEG11	PB7	53
23	SEG12	PB6	54	24	SEG13	PB5	55
25	SEG14	PB4	56	26	SEG15	PB3	57
27	SEG16	PB2	58	28	SEG17	PB1	59
29	SEG18	PA7	64	30	SEG19	PA5	65
31	SEG20	PA4	66	32	SEG21	PA3	67
33	SEG22	PA2	68	34	SEG23	PA1	69
35	SEG24	PA0	70	36	SEG25	PF7	71
37	SEG26	PF6	72	38	SEG27	PE5	73
39	SEG28	PE4	74	40	SEG29	PE3	75
41	SEG30	PE2	76	42	SEG31	PE1	77
43	SEG32	PE0	78	44	SEG33	PE7	79
45	SEG34	PE6	80	46	SEG35	PD4	81
47	SEG36	PD3	82	48	SEG37	PD2	83
49	SEG38	PD1	84	50	SEG39	PD0	85

Table 5-4: LCD Panel Connections

5.7 Pmod™

A Pmod™ Compatible header is fitted to the RSK, however it is not possible to use this and the LCD Panel (LCD Application Board V2) at the same time, and they should not both be fitted to the RSK.

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. Connection information for the Digilent Pmod™ Compatible header is provided in **Table 5-5** and **Table 5-6** 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.

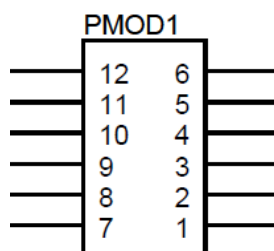


Figure 5-1: Digilent Pmod™ Compatible Header Pin Numbering

Digilent Pmod™ Compatible Header (PMOD1) Connections							
Pin	Circuit Net Name	MCU		Pin	Circuit Net Name	MCU	
		Port	Pin			Port	Pin
1	CTS6RTS6	PJ3	4	7	P-IRQ0	PD0	85
2	P-TXD6	P07	99	8	P-IRQ1	PD1	84
3	P-RXD6	P02	3	9	P92	P92	86
4	P-SCK6	P04	1	10	P20	P20	10
5	GROUND	-	-	11	GROUND	-	-
6	Board_3V3	-	-	12	Board_3V3	-	-

Table 5-5: 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	CTS9RTS9	PB4	56	7	P-IRQ6	PE6	80
2	TXD9	PB7	53	8	IRQ7	PE2	76
3	RXD9	PB6	54	9	PA7	PA7	64
4	SCK9	PB5	55	10	PA5	PA5	65
5	GROUND	-	-	11	GROUND	-	-
6	Board_3V3	-	-	12	Board_3V3	-	-

Table 5-6: Pmod™2 Header Connections

5.8 USB Serial Port

A USB serial port is implemented in a Renesas low power microcontroller (RL78/G1C) and is connected to the RX113 Serial Communications Interface (SCI) module. Multiple options are provided to allow the selection of the connected SCI port. Connections between the USB to Serial converter and the microcontroller are listed in **Table 5-7** below.

Signal Name	Function	MCU	
		Port	Pin
TXD1	SCI1 Transmit Signal	P16	27
RXD1	SCI1 Receive Signal	P15	28
TXD5 * ¹	SCI5 Transmit Signal	PC3	49
RXD5 * ¹	SCI5 Receive Signal	PC2	50
A-TXD6_P-TXD6 * ¹	SCI6 Transmit Signal	P07	99
A-RXD6_P-RXD6 * ¹	SCI6 Receive Signal	P02	3
RS232TX * ¹	External SCI Transmit Signal	-	-
RS232RX * ¹	External SCI Receive Signal	-	-
RL78G1C_CTS * ²	Clear To Send	PJ0	2
RL78G1C_RTS * ²	Request to Send	PJ2	100

Table 5-7: Serial Port Connections

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

*²: CTS & RTS control is not supported on this RSK.

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.

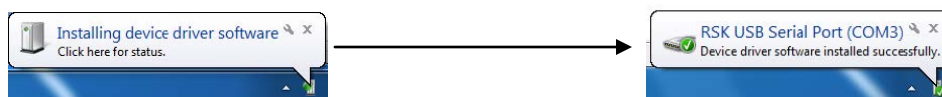


Figure 5-2: USB-Serial Windows Installation message

5.9 Local Interconnect Network (LIN)

A LIN transceiver IC is fitted to the RSK, and connected to the Serial Communications Interface extended (SCle) MCU peripheral. For further details regarding the supported modes of operation, please refer to the RX113 Group Hardware Manual.

Connections between the LIN connector and the microcontroller are listed in **Table 5-8** below.

LIN Signal	Function	MCU	
		Port	Pin
LINTXD [*]	LIN Transmit Signal	P14	29
LINRXD [*]	LIN Receive Signal	P17	26
LINNSLP [*]	LIN Transceiver Device Sleep Control	P21	9

Table 5-8: LIN Connections

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

5.10 Universal Serial Bus (USB)

This RSK device is fitted with a USB host socket (type A) and a function socket (type Mini B). USB module USB0 is connected to the host and function socket, and can operate as either a host or function device. The connections for the USB0 module are shown in **Table 5-9** below.

USB Signal	Function	MCU	
		Port	Pin
USB0DP	Positive differential data signal	USB0_DP	32
USB0DM	Negative differential data signal	USB0_DM	31
USB0VBUS ^{*1}	Cable monitor pin	P16	27
USB0VBUSEN	VBUS power supply enable	P26	12
USB0OVRCURA	Over-current detection signal A	P14	29
USB0OVRCURB ^{*2}	Over-current detection signal B	PC7	45
USB0EXICEN ^{*2}	OTG Low-power control signal	PC6	46
USB0ID ^{*2}	ID input signal	PC5	47

Table 5-9: USB0 Module Connections

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

^{*2}: This RSK board is equipped with the OTG (On The Go™) circuit for USB module USB0. When evaluating OTG, it is necessary to mount the socket for OTG separately. (Manufacture name: Model-name: Hirose Electric, ZX62 R-AB-5P)

5.11 I²C Bus (Inter-IC Bus)

The RX113 features one I²C (Inter-IC Bus) interface modules. RIIC is connected to a 16Kbit EEPROM. Specific details of the EEPROM device and the connections can be found in the board schematics.

On board EEPROM only supports single device on bus. To allow external I²C device, option links have to be modified – 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 connect or isolate parts of a circuit. Option links are listed in the following sections, detailing their function when fitted or removed. **Bold, blue text** indicates the default configuration that the RSK is supplied with. Refer to the component placement diagram (§3) to locate the option links, jumpers and DIP switches.

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

When modifying a link resistor, always check the related option links to ensure there is no possible signal contention or short circuits. Because many of the MCU's pins are multiplexed, some of the peripherals must be used exclusively. Refer to the RX113 Group Hardware Manual and RSKRX113 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	Explanation	Related Ref.
SW4	OFF	OFF	Single Chip Mode	-
	OFF	ON	Single Chip Mode	-
	ON	OFF	Boot Mode (SCI)	-
	ON	ON	Boot Mode (USB)	J14

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.
J14	Self-Powered	Bus-Powered	SW4

Table 6-2: MCU Option Links (2)

6.3 Power Supply Configuration

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

Reference	Jumper Position	Explanation	Related Ref.
J6	Shorted Pin1-2	Connects EXT_BATT to 5V Power rail.	-
	Shorted Pin2-3	Connects VBUS to 5V Power rail.	-
	All open	Disconnects EXT_BATT and VBUS from 5V Power rail.	-
J9 *1	Shorted Pin1-2	Enables 1.8V regulator output.	-
	All open	Enables 3.3V regulator output.	-
J11 *2	Shorted Pin1-2	Connects Board_3V3 to UC_VCC.	R221
	All open	Enables current probe for MCU current consumption.	R221

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

*1: By default, jumper J9 is not fitted to the RSK.

*2: By default, jumper J11 is not fitted to the RSK. R221 is fitted by default and becomes the same setting as 'J11 Shorted Pin1-2'.

Reference	Explanation	Fit	DNF	Related Ref.
Board_5V	Connects 5V power rail to Board_5V.	R130	-	U1(VL), U3(EEPROM), U4.IN, U6(LIN)
Board_3V3 (CON_3V3)	Connects CON_3V3 to 3.3V power rail.	R216	-	JA1.3
	Disconnects CON_3V3 from 3.3V power rail.	-	R216	-
Board_3V3 (UC_VCC)	Connects Board_3V3 to UC_VCC.	R221/J11.1-2	-	U1(VCC)
	Enables current probe for MCU current consumption.	J11.Open	R221	U1(VCC)
VCC_USB	Connects UC_VCC to U1 VCC_USB pin.	R173	-	U1(VCC_USB)

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

6.4 Clock Configuration

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

Reference	Explanation	Fit	DNF	Related Ref.
XTAL, EXTAL, CON_EXTAL	Connects 16MHz crystal (X1) to RX113.	R42, R45	R38, R39, R46	U1(EXTAL, XTAL)
	Connects CON_EXTAL to RX113.	R39	R38, R42, R45	U1(EXTAL), JA2.2
XCIN, XCOUT	Connects 32.768kHz crystal (X2) to RX113.	R36, R37	-	U1(XCIN, XCOUT)
	Disconnects X2 from RX113.	-	R36, R37	U1(XCIN, XCOUT)

Table 6-5: Clock Option Links

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

6.5 Analog Power ADC & DAC Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
IRQ3_ADTRG0n	11	P27	IRQ3_ADTRG0n	R35	-	SW3 JA1.8	R50 -	- -
AN000	95	P40	AN000	-	-	RV1 JA1.9 (Direct Input via JA1.9) JA1.9 (Input via Voltage Division Resistor)	R277 R60 R59, R61	- R59, R61 R60
SEG32_AN008	78	PE0	SEG32 AN008	R128 R127	R127 R128	JA4.43 JA5.3	- -	- -
SEG31_AN009	77	PE1	SEG31 AN009	R126 R125	R125 R126	JA4.42 JA5.4	- -	- -
PJ0_RL78G1C_CTS_DA0	2	PJ0	PJ0 RL78G1C_CTS DA0	R241 R240 R239	R239, R240 R239, R241 R240, R241	SW1 U10.2 JA1.13	R57 - -	R56 - -
RL78G1C_RTS_DA1	100	PJ2	RL78G1C_RTS DA1	R210 R209	R209 R210	U9.2 JA1.14	- -	- -
VREFH	93	P41	UC_VCC CON_VREFH	R167 R156	R156 R167	- -	- -	- -
VREFL	92	P42	GROUND CON_VREFL	R146 R155	R155 R146	- -	- -	- -
AVCC0	98	-	UC_VCC CON_AVCC0 Board_3V3	R192 R191 R275, R276	R191, R275 R192, R275 R191, R192	- JA1.5 -	- - -	- - -
AVSS0	97	-	GROUND CON_AVSS0	R185 R186	R186 R185	- JA1.6	- -	- -
VREFH0	96	PJ6	UC_VCC CON_VREFH0	R177 R172	R172 R177	- JA1.7	- -	- -
VREFL0	94	PJ7	GROUND CON_VREFL0	R168 R171	R171 R168	- -	- -	- -

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

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

6.6 E1 Debugger Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
MTIOC0B_RXD1	28	P15	MTIOC0B	R233	R234	JA2.9	R271	R270
			RXD1	R234	R233	E1.11	R183	-
						JA2.8	-	-
U10.3	R121	R105, R106, R122						
MTIOC3C_TXD1_USB0VBUS	27	P16	USB0VBUS	J15.1-2	-	J7.2	-	-
			TXD1	J15.2-3, R229	R228	E1.5	R166	-
						U9.3	R100	R79, R99, R103
						JA2.6	-	-
MTIOC3C	J15.2-3, R228	R229	JA2.11	-	-			
P14_LINTXD_CTS1RTS1_USB0VRCURA	29	P14	P14	J16.1-2	-	SW4.2	-	-
			LINTXD	J16.2-3, R230	R231, R232	E1.10	R184	-
						U6.4	-	-
						JA2.12	-	-
						U7.2	R207	R282
USB0VRCURA	J16.2-3, R232	R230, R231	U5.5	R282	R207			

Table 6-7: E1 Debugger Option Links

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

6.7 General I/O & LED Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
IO4_MTIIOC3B	8	P22	IO4	R202, R244	R245	JA1.19	-	-
			MTIIOC3B	R202, R245	R244	LED0	-	-
						JA2.13	-	-
IO5_MTIIOC3D	7	P23	IO5	R33, R256	R255	JA1.20	-	-
			MTIIOC3D	R33, R255	R256	JA2.14	R269	R267
						LED1	-	-
			JA2.20	R267	R269			
IO6_MTIIOC4A	6	P24	IO6	R201, R242	R243	JA1.21	-	-
			MTIIOC4A	R201, R243	R242	LED2	-	-
						JA2.15	-	-
IO7_MTIIOC4C	5	P25	IO7	R32, R254	R253	JA1.22	-	-
			MTIIOC4C	R32, R253	R254	LED3	-	-
						JA2.16	-	-
IO0_SEG16	58	PB2	IO0	R116	R115	JA1.15	-	-
			SEG16	R115	R116	JA4.27	-	-
IO1_SEG15	57	PB3	IO1	R91	R92	JA1.16	-	-
			SEG15	R92	R91	JA4.26	-	-
IO2_SEG37	83	PD2	IO2	R133	R138	JA1.17	-	-
			SEG37	R138	R133	JA4.48	-	-
IO3_SEG36	82	PD3	IO3	R137	R142	JA1.18	-	-
			SEG36	R142	R137	JA4.47	-	-

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

6.8 I²C & EEPROM Configuration

Table 6-9 below details the function of the option links associated with I²C & EEPROM configuration.

Signal name /Reference	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
SDA0	63	PA6	SDA0	-	-	U3.5	R6	-
						JA1.25	-	R6
SCL0	61	PB0	SCL0	-	-	U3.6	R7	-
						JA1.26	-	R7
Board_5V (Power and signal Pull-up)	-	-	-	R13	R12	SDA0, SCL0, U3	-	-
Board_3V3 (Power and signal Pull-up)	-	-	-	R12	R13	SDA0, SCL0, U3	-	-
Write Protect (Enable)	-	-	-	R10	-	U3.7	-	-
Write Protect (Disable)	-	-	-	-	R10	U3.7	-	-

Table 6-9: I²C & EEPROM Option Links

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

6.9 IRQ & Switch Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
IRQ3_ADTRG0n	11	P27	IRQ3_ADTRG0n	R35	-	SW3 JA1.8	R50 -	- -
MTIOC0C_IRQ2	25	P32	MTIOC0C	R187, R259	R260	JA2.23	R263	R261, R262
			IRQ2	R187, R260	R259	JA2.19	R266	R263
IRQ5_SEG20	66	PA4	IRQ5	R111	R112	SW1	R56	R57
			SEG20	R112	R111	JA4.31	-	-
SEG39_A-IRQ0_P-IRQ0	85	PD0	SEG39	R144	R139, R145	JA4.50	-	-
			A-IRQ0	R145	R139, R144	JA2.7	R273	R272
			P-IRQ0	R139	R144, R145	PMOD1.7	-	-
SEG38_A-IRQ1_P-IRQ1	84	PD1	SEG38	R143	R153, R154	JA4.49	-	-
			A-IRQ1	R154	R143, R153	JA2.9	R270	R271
			P-IRQ1	R153	R143, R154	PMOD1.8	-	-
SEG30_IRQ7	76	PE2	SEG30	R124	R123	JA4.41	-	-
			IRQ7	R123	R124	PMOD2.8	-	-
MTIOC1A_SEG28_IRQ4	74	PE4	MTIOC1A	R107	R108, R109	JA2.23	R262	R261, R263
			SEG28	R108	R107, R109	JA4.39	-	-
			IRQ4	R109	R107, R108	JA2.23	R261	R262, R263
SEG34_A-IRQ6_P-IRQ6	80	PE6	SEG34	R132	R131, R136	JA4.45	-	-
			A-IRQ6	R136	R131, R132	JA1.23	-	-
			P-IRQ6	R131	R132, R136	PMOD2.7	-	-
PJO_RL78G1C_CTS_DA0	2	PJO	PJO	R241	R239, R240	SW1	R57	R56
			RL78G1C_CTS	R240	R239, R241	U10.2	-	-
			DA0	R239	R240, R241	JA1.13	-	-

Table 6-10: IRQ & Switch Option Links

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

6.10 LCD Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
MTIC5V_SEG3	37	P10	MTIC5V	R223	R224	JA6.15	-	-
			SEG3	R224	R223	JA4.14	-	-
MTIC5U_SEG2	36	P11	MTIC5U	R219	R220	JA6.14	-	-
			SEG2	R220	R219	JA4.13	-	-
MTIOC4B_VL2	44	P54	MTIOC4B	R157, R188	R179	JA2.17	-	-
			VL2	R157, R179	R188	JA4.3	-	-
MTIOC4D_VL1	43	P55	MTIOC4D	R158, R206	R205	JA2.18	R268	R265
						JA2.22	R265	R268
			VL1	R158, R205	R206	JA4.4	-	-
MTIC5W_SEG4	38	P56	MTIC5W	R214	R215	JA6.16	-	-
			SEG4	R215	R214	JA4.15	-	-
POE0_SEG21	67	PA3	POE0	R87, R88	R86	JA2.24	-	-
			SEG21	R86, R88	R87	JA4.32	-	-
IROQ5_SEG20	66	PA4	IROQ5	R111	R112	SW1	R56	R57
			SEG20	R112	R111	JA4.31	-	-
PA5_SEG19	65	PA5	PA5	R90	R89	PMOD2.10	-	-
			SEG19	R89	R90	JA4.30	-	-
PA7_SEG18	64	PA7	PA7	R113	R114	PMOD2.9	-	-
			SEG18	R114	R113	JA4.29	-	-
IO0_SEG16	58	PB2	IO0	R116	R115	JA1.15	-	-
			SEG16	R115	R116	JA4.27	-	-
IO1_SEG15	57	PB3	IO1	R91	R92	JA1.16	-	-
			SEG15	R92	R91	JA4.26	-	-
CTS9RTS9_SEG14	56	PB4	CTS9RTS9	R118	R117	PMOD2.1	-	-
			SEG14	R117	R118	JA4.25	-	-
SCK9_SEG13	55	PB5	SCK9	R93	R94	PMOD2.4	-	-
			SEG13	R94	R93	JA4.24	-	-
RXD9_SEG12	54	PB6	RXD9	R119	R120	PMOD2.3	-	-
			SEG12	R120	R119	JA4.23	-	-
TXD9_SEG11	53	PB7	TXD9	R95	R96	PMOD2.2	-	-
			SEG11	R96	R95	JA4.22	-	-
SCK5_SEG9	51	PC1	SCK5	R97	R98	JA6.10	-	-
			SEG9	R98	R97	JA4.20	-	-
RXD5_COM3	50	PC2	RXD5	R152	R151	U10.3	R122	R105, R106, R121
						JA6.7	-	-
			COM3	R151	R152	JA4.10	-	-
TXD5_COM2	49	PC3	TXD5	R162	R161	U9.3	R103	R79, R99, R100
						JA6.8	-	-
			COM2	R161	R162	JA4.9	-	-

Table 6-11: LCD Option Links (1)

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
USB0ID_COM0	47	PC5	USB0ID	R170	R169	U5.3	-	-
			COM0	R169	R170	JA4.7	-	-
MTCLKA_USB0EXICEN_VL4	46	PC6	MTCLKA	R147, R178	R174, R175	JA2.25	-	-
			USB0EXICEN	R147, R175	R174, R178	U5.11	-	-
			VL4	R147, R174	R175, R178	JA4.1	-	-
MTCLKB_USB0OVR CURB_VL3	45	PC7	MTCLKB	R148, R194	R189, R193	JA2.26	-	-
			USB0OVR CURB	R148, R193	R189, R194	U5.6	-	-
			VL3	R148, R189	R193, R194	JA4.2	-	-
SEG39_A-IRQ0_P-IRQ0	85	PD0	SEG39	R144	R139, R145	JA4.50	-	-
			A-IRQ0	R145	R139, R144	JA2.7	R273	R272
			P-IRQ0	R139	R144, R145	PMOD1.7	-	-
SEG38_A-IRQ1_P-IRQ1	84	PD1	SEG38	R143	R153, R154	JA4.49	-	-
			A-IRQ1	R154	R143, R153	JA2.9	R270	R271
			P-IRQ1	R153	R143, R154	PMOD1.8	-	-
IO2_SEG37	83	PD2	IO2	R133	R138	JA1.17	-	-
			SEG37	R138	R133	JA4.48	-	-
IO3_SEG36	82	PD3	IO3	R137	R142	JA1.18	-	-
			SEG36	R142	R137	JA4.47	-	-
SEG32_AN008	78	PE0	SEG32	R128	R127	JA4.43	-	-
			AN008	R127	R128	JA5.3	-	-
SEG31_AN009	77	PE1	SEG31	R126	R125	JA4.42	-	-
			AN009	R125	R126	JA5.4	-	-
SEG30_IRQ7	76	PE2	SEG30	R124	R123	JA4.41	-	-
			IRQ7	R123	R124	PMOD2.8	-	-
MTIOC0A_SEG29	75	PE3	MTIOC0A	R83	R82	JA2.7	R272	R273
			SEG29	R82	R83	JA4.40	-	-
MTIOC1A_SEG28_IRQ4	74	PE4	MTIOC1A	R107	R108, R109	JA2.23	R262	R261, R263
			SEG28	R108	R107, R109	JA4.39	-	-
			IRQ4	R109	R107, R108	JA3.23	R261	R262, R263
SEG34_A-IRQ6_P-IRQ6	80	PE6	SEG34	R132	R131, R136	JA4.45	-	-
			A-IRQ6	R136	R131, R132	JA1.23	-	-
			P-IRQ6	R131	R132, R136	PMOD2.7	-	-
MTIOC3A_SEG25	71	PF7	MTIOC3A	R84	R85	JA6.13	-	-
			SEG25	R85	R84	JA4.36	-	-

Table 6-12: LCD Option Links (2)

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

6.11 LIN Configuration

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

Signal name /Reference	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal /Function	Fit	DNF	Interface /Function	Fit	DNF
P14_LINTXD_CTS1RTS1 _USB0OVRCURA	29	P14	P14	J16.1-2	-	SW4.2	-	-
			LINTXD	J16.2-3, R230	R231, R232	E1.10	R184	-
			CTS1RTS1	J16.2-3, R231	R230, R232	U6.4	-	-
			USB0OVRCURA	J16.2-3, R232	R230, R231	JA2.12	-	-
LINRXD_SCK1	26	P17	LINRXD	R237	R238	U7.2	R207	R282
			SCK1	R238	R237	U5.5	R282	R207
LINNSLP_MTIIOC1B	9	P21	LINNSLP	R34, R258	R257	U6.1	-	-
			MTIIOC1B	R34, R257	R258	JA2.10	-	-
LIN Operating Mode	-	-	Enables Master mode	R225, R226	-	-	-	-
			Enables Slave mode	-	R225, R226	-	-	-

Table 6-13: LIN Option Links

6.12 MTU & POE Configuration

Table 6-14 and Table 6-15 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
MTIC5V_SEG3	37	P10	MTIC5V	R223	R224	JA6.15	-	-
			SEG3	R224	R223	JA4.14	-	-
MTIC5U_SEG2	36	P11	MTIC5U	R219	R220	JA6.14	-	-
			SEG2	R220	R219	JA4.13	-	-
MTIIOC0B_RXD1	28	P15	MTIIOC0B	R233	R234	JA2.9	R271	R270
			RXD1	R234	R233	E1.11	R183	-
						JA2.8	-	-
U10.3	R121	R105, R106, R122						
MTIIOC3C_TXD1_USB0VBUS	27	P16	USB0VBUS	J15.1-2	-	J7.2	-	-
			TXD1	J15.2-3, R229	R228	E1.5	R166	-
						U9.3	R100	R79, R99, R103
JA2.6	-	-						
LINNSLP_MTIIOC1B	9	P21	MTIIOC3C	J15.2-3, R228	R229	JA2.11	-	-
			LINNSLP	R34, R258	R257	U6.2	-	-
MTIIOC1B	9	P21	MTIIOC1B	R34, R257	R258	JA2.21	-	-
			IO4	R202, R244	R245	JA1.19	-	-
IO4_MTIIOC3B	8	P22	MTIIOC3B	R202, R245	R244	LED0	-	-
			JA2.13	-	-			
IO5_MTIIOC3D	7	P23	IO5	R33, R256	R255	JA1.20	-	-
			MTIIOC3D	R33, R255	R256	JA2.14	R269	R267
						LED1	-	-
JA2.20	R267	R269						
IO6_MTIIOC4A	6	P24	IO6	R201, R242	R243	JA1.21	-	-
			MTIIOC4A	R201, R243	R242	LED2	-	-
						JA2.15	-	-
IO7_MTIIOC4C	5	P25	IO7	R32, R254	R253	JA1.22	-	-
MTIIOC4C	5	P25	MTIIOC4C	R32, R253	R254	LED3	-	-
						JA2.16	-	-

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

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
MTIIOC0C_IRO2	25	P32	MTIIOC0C	R187, R259	R260	JA2.23	R263	R261, R262
						JA2.19	R266	R263
			IRO2	R187, R260	R259	SW2	R53	-
MTIIOC4B_VL2	44	P54	MTIIOC4B	R157, R188	R179	JA2.17	-	-
			VL2	R157, R179	R188	JA4.3	-	-
MTIIOC4D_VL1	43	P55	MTIIOC4D	R158, R206	R205	JA2.18	R268	R265
			VL1	R158, R205	R206	JA2.22	R265	R268
MTIC5W_SEG4	38	P56	MTIC5W	R214	R215	JA6.16	-	-
			SEG4	R215	R214	JA4.15	-	-
POE0_SEG21	67	PA3	POE0	R87, R88	R86	JA2.24	-	-
			SEG21	R86, R88	R87	JA4.32	-	-
MTCLKA_USB0EXICEN_VL4	46	PC6	MTCLKA	R147, R178	R174, R175	JA2.25	-	-
			USB0EXICEN	R147, R175	R174, R178	U5.11	-	-
			VL4	R147, R174	R175, R178	JA4.1	-	-
MTCLKB_USB0OVR CURB_VL3	45	PC7	MTCLKB	R148, R194	R189, R193	JA2.26	-	-
			USB0OVR CURB	R148, R193	R189, R194	U5.6	-	-
			VL3	R148, R189	R193, R194	JA4.2	-	-
MTIIOC0A_SEG29	75	PE3	MTIIOC0A	R83	R82	JA2.7	R272	R273
			SEG29	R82	R83	JA4.40	-	-
MTIIOC1A_SEG28_IRO4	74	PE4	MTIIOC1A	R107	R108, R109	JA2.23	R262	R261, R263
			SEG28	R108	R107, R109	JA4.39	-	-
			IRO4	R109	R107, R108	JA3.23	R261	R262, R263
MTIIOC3A_SEG25	71	PF7	MTIIOC3A	R84	R85	JA6.13	-	-
			SEG25	R85	R84	JA4.36	-	-

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

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

6.13 PMOD1 Interface Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
A-RXD6_P-RXD6	3	P02	A-RXD6	R31, R252	R251	JA6.12	-	-
			P-RXD6	R31, R251	R252	PMOD1.3	-	-
			A-RXD6_P-RXD6	R31	-	U10.3	R106	R105, R121, R122
A-SCK6_P-SCK6	1	P04	A-SCK6	R199, R250	R249	JA6.11	-	-
			P-SCK6	R199, R249	R250	PMOD1.4	-	-
A-TXD6_P-TXD6	99	P07	A-TXD6	R198, R211	R197	JA6.9	-	-
			P-TXD6	R198, R197	R211	PMOD1.2	-	-
			A-TXD6_P-TXD6	R198	-	U9.3	R99	R79, R100, R103
SEG39_A-IRQ0_P-IRQ0	85	PD0	SEG39	R144	R139, R145	JA4.50	-	-
			A-IRQ0	R145	R139, R144	JA2.7	R273	R272
			P-IRQ0	R139	R144, R145	PMOD1.7	-	-
SEG38_A-IRQ1_P-IRQ1	84	PD1	SEG38	R143	R153, R154	JA4.49	-	-
			A-IRQ1	R154	R143, R153	JA2.9	R270	R271
			P-IRQ1	R153	R143, R154	PMOD1.8	-	-
CTS6RTS6	4	PJ3	CTS6RTS6	R200	-	PMOD1.1	-	-

Table 6-16: PMOD1 Interface Option Links

6.14 PMOD2 Interface Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
PA5_SEG19	65	PA5	PA5	R90	R89	PMOD2.10	-	-
			SEG19	R89	R90	JA4.30	-	-
PA7_SEG18	64	PA7	PA7	R113	R114	PMOD2.9	-	-
			SEG18	R114	R113	JA4.29	-	-
CTS9RTS9_SEG14	56	PB4	CTS9RTS9	R118	R117	PMOD2.1	-	-
			SEG14	R117	R118	JA4.25	-	-
SCK9_SEG13	55	PB5	SCK9	R93	R94	PMOD2.4	-	-
			SEG13	R94	R93	JA4.24	-	-
RXD9_SEG12	54	PB6	RXD9	R119	R120	PMOD2.3	-	-
			SEG12	R120	R119	JA4.23	-	-
TXD9_SEG11	53	PB7	TXD9	R95	R96	PMOD2.2	-	-
			SEG11	R96	R95	JA4.22	-	-
SEG30_IRQ7	76	PE2	SEG30	R124	R123	JA4.41	-	-
			IRQ7	R123	R124	PMOD2.8	-	-
SEG34_A-IRQ6_P-IRQ6	80	PE6	SEG34	R132	R131, R136	JA4.45	-	-
			A-IRQ6	R136	R131, R132	JA1.23	-	-
			P-IRQ6	R131	R132, R136	PMOD2.7	-	-

Table 6-17: PMOD2 Interface Option Links

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

6.15 Serial & USB to Serial Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Port	Signal	Fit	DNF	Interface /Function	Fit	DNF
A-RXD6_P-RXD6	3	P02	A-RXD6	R31, R252	R251	JA6.12	-	-
			P-RXD6	R31, R251	R252	PMOD1.3	-	-
			A-RXD6_P-RXD6	R31	-	U10.3	R106	R105, R121, R122
A-SCK6_P-SCK6	1	P04	A-SCK6	R199, R250	R249	JA6.11	-	-
			P-SCK6	R199, R249	R250	PMOD1.4	-	-
A-TXD6_P-TXD6	99	P07	A-TXD6	R198, R211	R197	JA6.9	-	-
			P-TXD6	R198, R197	R211	PMOD1.2	-	-
			A-TXD6_P-TXD6	R198	-	U9.3	R99	R79, R100, R103
MTIOC0B_RXD1	28	P15	MTIOC0B	R233	R234	JA2.9	R271	R270
			RXD1	R234	R233	E1.11	R183	-
						JA2.8	-	-
						U10.3	R121	R105, R106, R122
MTIOC3C_TXD1_USB0VB US	27	P16	USB0VBUS	J15.1-2	-	J7.2	-	-
			TXD1	J15.2-3, R229	R228	E1.5	R166	-
						U9.3	R100	R79, R99, R103
			MTIOC3C	J15.2-3, R228	R229	JA2.11	-	-
LINRXD_SCK1	26	P17	LINRXD	R237	R238	U6.1	-	-
			SCK1	R238	R237	JA2.10	-	-
SCK5_SEG9	51	PC1	SCK5	R97	R98	JA6.10	-	-
			SEG9	R98	R97	JA4.20	-	-
RXD5_COM3	50	PC2	RXD5	R152	R151	U10.3	R122	R105, R106, R121
			COM3	R151	R152	JA6.7	-	-
						JA4.10	-	-
TXD5_COM2	49	PC3	TXD5	R162	R161	U9.3	R103	R79, R99, R100
			COM2	R161	R162	JA6.8	-	-
						JA4.9	-	-
PJ0_RL78G1C_CTS_DA0	2	PJ0	PJ0	R241	R239, R240	SW1	R57	R56
			RL78G1C_CTS	R240	R239, R241	U10.2	-	-
			DA0	R239	R240, R241	JA1.13	-	-
RL78G1C_RTS_DA1	100	PJ2	RL78G1C_RTS	R210	R209	U9.2	-	-
			DA1	R209	R210	JA1.14	-	-
RS232TX	-	-	RS232TX	R79	R99, R100, R103	JA6.5	-	-
RS232RX	-	-	RS232RX	R105	R108, R121, R122	JA6.6	-	-

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

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

6.16 USB Configuration

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

Signal name	MCU		MCU Peripheral Selection			Destination Selection		
	Pin	Pot	Signal	Fit	DNF	Interface /Function	Fit	DNF
P14_LINTXD_CTS1RT1_USB0VRCURA	29	P14	P14	J16.1-2	-	SW4.2	-	-
			LINTXD	J16.2-3, R230	R231, R232	E1.10	R184	-
			CTS1RTS1	J16.2-3, R231	R230, R232	U6.4	-	-
			USB0VRCURA	J16.2-3, R232	R230, R231	JA2.12	-	-
MTIOC3C_TXD1_USB0VBUS	27	P16	USB0VBUS	J15.1-2	-	U7.2	-	-
			TXD1	J15.2-3, R229	R228	E1.5	R166	-
			MTIOC3C	J15.2-3, R228	R229	U9.3	R100	R79, R99, R103
						JA2.6	-	-
USB0VBUSEN	12	P26	USB0VBUSEN	R204	-	U7.1	R195	R281
						U5.4	R281	R195
MTCLKA_USB0EXICEN_VL4	46	PC6	MTCLKA	R147, R178	R174, R175	JA2.25	-	-
			USB0EXICEN	R147, R175	R174, R178	U5.11	-	-
			VL4	R147, R174	R175, R178	JA4.1	-	-
MTCLKB_USB0VRCURB_VL3	45	PC7	MTCLKB	R148, R194	R189, R193	JA2.26	-	-
			USB0VRCURB	R148, R193	R189, R194	U5.6	-	-
			VL3	R148, R189	R193, R194	JA4.2	-	-

Table 6-19: USB Option Links (1)

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

Reference	Jumper Position	Explanation	Related Ref.
J7	Shorted Pin1-2	Enables Bus-Powered.	J12, R235
	Shorted Pin2-3	Enables Self-Powered.	J8, J12, R235
	All open	Disables Function Mode.	-
J8*	Shorted Pin1-2	Enables BC feature.	J7, J12, R235
	All open	Disables BC feature.	J7, J12, R235
J12	Shorted Pin1-2	Enables Host Mode.	R235
	Shorted Pin2-3	Enables Function Mode.	J7, J8, R235
	All open	Disables Host & Function Mode. (USB0 become OTG Mode if R235 is fitted)	-
J13*	Shorted Pin1-2	Connects VBUS line to EXT_CHG.	-
	All Open	Disconnects VBUS line from EXT_CHG.	-

Table 6-20: USB Option Links (2)

*: By default, jumper J8 and J13 are not fitted to the RSK.

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

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	98	6	AVSS	97
	CON_AVCC0			CON_AVSS0	
7	AVREF	96	8	ADTRG	11
	CON_VREFH0			IRQ3_ADTRG0n	
9	ADC0	95	10	ADC1	91
	JA1_AN000 (AN000)			AN003	
11	ADC2	90	12	ADC3	89
	AN004			AN005	
13	DAC0	2	14	DAC1	100
	DA0			DA1	
15	IO_0	58	16	IO_1	57
	IO0			IO1	
17	IO_2	83	18	IO_3	82
	IO2			IO3	
19	IO_4	8	20	IO_5	7
	IO4			IO5	
21	IO_6	6	22	IO_7	5
	IO6			IO7	
23	IRQ3/IRQAEC/M2_HSIN0	80/NC/NC	24	IIC_EX	NC
	A-IRQ6/NC/NC			NC	
25	IIC_SDA	63	26	IIC_SCL	61
	JA1_SDA (SDA0)			JA1_SCL (SCL0)	

Table 7-1: Application Header JA1 Connections

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

Application Header JA2					
Pin	Header Name	MCU Pin	Pin	Header Name	MCU Pin
	Circuit Net Name			Circuit Net Name	
1	RESET	16	2	EXTAL	20
	RESn			CON_XTAL	
3	NMI	19	4	Vss1	-
	NMIIn			GROUND	
5	WDT_OVF	NC	6	SCIaTX	27
	NC			TXD1	
7	IRQ0/WKUP/M1_H SIN0	85/NC/75	8	SCIaRX	28
	A-IRQ0/NC/MTIOC0A			RXD1	
9	IRQ1/M1_H SIN1	84/28	10	SCIaCK	26
	A-IRQ1/MTIOC0B			SCK1	
11	M1_UD	27	12	CTSRTS	29
	MTIOC3C			CTS1RTS1	
13	M1_UP	8	14	M1_UN	7
	MTIOC3B			MTIOC3D	
15	M1_VP	6	16	M1_VN	5
	MTIOC4A			MTIOC4C	
17	M1_WP	44	18	M1_WN	43
	MTIOC4B			MTIOC4D	
19	TimerOut	25	20	TimerOut	7
	MTIOC0C			MTIOC3D	
21	TimerIn	9	22	TimerIn	43
	MTIOC1B			MTIOC4D	
23	IRQ2/M1_EncZ/M1_H SIN2	74/74/25	24	M1_POE	67
	IRQ4/MTIOC1A/MTIOC0C			POE0	
25	M1_TRCCLK	46	26	M1_TRDCLK	45
	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	88	2	ADC5	87
	AN006			AN007	
3	ADC6	78	4	ADC7	77
	AN008			AN009	
5	CAN1TX	NC	6	CAN1RX	NC
	NC			NC	
7	CAN2TX	NC	8	CAN2RX	NC
	NC			NC	
9	IRQ4/M2_EncZ/M2_H SIN1	NC/NC/NC	10	IRQ5/M2_H SIN2	NC/NC
	NC/NC/NC			NC/NC	
11	M2_UD	NC	12	M2_Uin	NC
	NC			NC	
13	M2_Vin	NC	14	M2_Win	NC
	NC			NC	
15	M2_Toggle	NC	16	M2_POE	NC
	NC			NC	
17	M2_TRCCLK	NC	18	M2_TRDCLK	NC
	NC			NC	
19	M2_UP	NC	20	M2_UN	NC
	NC			NC	
21	M2_VP	NC	22	M2_VN	NC
	NC			NC	
23	M2_WP	NC	24	M2_WN	NC
	NC			NC	

Table 7-3: 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	50	8	SCIbTX	49
	RXD5			TXD5	
9	SCIcTX	99	10	SCIbCK	51
	A-TXD6			SCK5	
11	SCIcCK	1	12	SCIcRX	3
	A-SCK6			A-RXD6	
13	M1_Toggle	71	14	M1_Uin	36
	MTIOC3A			MTIC5U	
15	M1_Vin	37	16	M1_Win	38
	MTIC5V			MTIC5W	
17	EXT_USB_VBUS	-	18	Reserved	NC
	EXT_VBUS			NC	
19	EXT_USB_BATT	-	20	Reserved	NC
	EXT_BATT			NC	
21	EXT_USB_CHG	-	22	Reserved	NC
	EXT_CHG			NC	
23	Unregulated_VCC	-	24	Vss	-
	Unregulated_VCC			GROUND	

Table 7-4: 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	A-SCK6_P-SCK6	1	2	PJ0_RL78G1C_CTS_DA0	2
3	A-RXD6_P-RXD6	3	4	CTS6RTS6	4
5	IO7_MTIOC4C	5	6	IO6_MTIOC4A	6
7	IO5_MTIOC3D	7	8	IO4_MTIOC3B	8
9	LINNSLP_MTIOC1B	9	10	P20	10
11	IRQ3_ADTRG0n	11	12	USB0VBUSEN	12
13	CAPH	13	14	CAPL	14
15	MD_FINED	15	16	RESn	16
17	NC	NC	18	NC	NC
19	NMIn	19	20	CON_XTAL	20
21	CON_EXTAL	21	22	NC	NC
23	GROUND	-	24	UC_VCC	-
25	MTIOC0C_IRQ2	25	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

Table 7-5: 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	LINRXD_SCK1	26	2	MTIOC3C_TXD1_USB0VB US	27
3	MTIOC0B_RXD1	28	4	P14_LINTXD_CTS1RTS1_ USB0OVRCURA	29
5	VCCUSB	30	6	GROUND	-
7	NC	NC	8	NC	NC
9	SEG0	34	10	SEG1	35
11	MTIC5U_SEG2	36	12	MTIC5V_SEG3	37
13	MTIC5W_SEG4	38	14	SEG5	39
15	SEG6	40	16	SEG7	41
17	SEG8	42	18	MTIOC4D_VL1	43
19	MTIOC4B_VL2	44	20	MTCLKB_USB0OVRCUR B_VL3	45
21	MTCLKA_USB0EXICEN_V L4	46	22	USB0ID_COM0	47
23	COM1	48	24	TXD5_COM2	49
25	RXD5_COM3	50	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

Table 7-6: 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	SCK5_SEG9	51	2	SEG10	52
3	TXD9_SEG11	53	4	RXD9_SEG12	54
5	SCK9_SEG13	55	6	CTS9RTS9_SEG14	56
7	IO1_SEG15	57	8	IO0_SEG16	58
9	SEG17	59	10	UC_VCC	-
11	SCL0	61	12	GROUND	-
13	SDA0	63	14	PA7_SEG18	64
15	PA5_SEG19	65	16	IRQ5_SEG20	66
17	POE0_SEG21	67	18	SEG22	68
19	SEG23	69	20	SEG24	70
21	MTIOC3A_SEG25	71	22	SEG26	72
23	SEG27	73	24	MTIOC1A_SEG28_IRQ4	74
25	MTIOC0A_SEG29	75	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

Table 7-7: 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	SEG30_IRQ7	76	2	SEG31_AN009	77
3	SEG32_AN008	78	4	SEG33	79
5	SEG34_A-IRQ6_P-IRQ6	80	6	SEG35	81
7	IO3_SEG36	82	8	IO2_SEG37	83
9	SEG38_A-IRQ1_P-IRQ1	84	10	SEG39_A-IRQ0_P-IRQ0	85
11	P92	86	12	AN007	87
13	AN006	88	14	AN005	89
15	AN004	90	16	AN003	91
17	CON_VREFL	92	18	CON_VREFH	93
19	CON_VREFL0	94	20	AN000	95
21	CON_VREFH0	96	22	CON_AVSS0	97
23	CON_AVCC0	98	24	A-TXD6_P-TXD6	99
25	RL78G1C_RTS_DA1	100	26	NC	NC
27	NC	NC	28	NC	NC
29	NC	NC	30	NC	NC
31	NC	NC	32	NC	NC
33	NC	NC	34	NC	NC
35	NC	NC	36	NC	NC

Table 7-8: 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 RX113 group hardware manual.

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

8.4 Debugging Support

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

8.5 Address Space

For the MCU address space details, refer to the 'Address Space' section of RX113 Group Hardware Manual.

9. Additional Information

Technical Support

For information about the RX113 Group microcontrollers refer to the RX113 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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