

RX140 Group

Renesas Starter Kit for RX140
User's Manual

RENESAS 32-Bit MCU
RX Family / RX100 Series

All information contained in these materials, including products and product specifications, represents information on the product at the time of publication and is subject to change by Renesas Electronics Corp. without notice. Please review the latest information published by Renesas Electronics Corp. through various means, including the Renesas Electronics Corp. website (<http://www.renesas.com>).

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
6. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.
"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.
Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.
7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION ("Vulnerability Issues"). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
8. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.5.0-1 October 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

Disclaimer

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

The RSK is not guaranteed to be error free, and the entire risk as to the results and performance of the RSK is assumed by the User. The RSK is provided by Renesas on an "as is" basis without warranty of any kind whether express or implied, including but not limited to the implied warranties of satisfactory quality, fitness for a particular purpose, title and non-infringement of intellectual property rights with regard to the RSK. Renesas expressly disclaims all such warranties. Renesas or its affiliates shall in no event be liable for any loss of profit, loss of data, loss of contract, loss of business, damage to reputation or goodwill, any economic loss, any reprogramming or recall costs (whether the foregoing losses are direct or indirect) nor shall Renesas or its affiliates be liable for any other direct or indirect special, incidental or consequential damages arising out of or in relation to the use of this RSK, even if Renesas or its affiliates have been advised of the possibility of such damages.

Precautions

The following precautions should be observed when operating any RSK product:

This Renesas Starter Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures;

- ensure attached cables do not lie across the equipment
- reorient the receiving antenna
- increase the distance between the equipment and the receiver
- connect the equipment into an outlet on a circuit different from that which the receiver is connected
- power down the equipment when not in use
- consult the dealer or an experienced radio/TV technician for help NOTE: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken;

- The user is advised that mobile phones should not be used within 10m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Renesas Starter Kit does not represent an ideal reference design for an end product and does not fulfil the regulatory standards for an end product.

How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the CPU Board hardware functionality, and electrical characteristics. It is intended for users designing sample code on the CPU Board 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.

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 RSKRX140. 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. | Renesas Starter Kit for RX140 User's Manual | R20UT5026EG |
| Tutorial Manual | Provides a guide to setting up RSK environment, running sample code and debugging programs. | Renesas Starter Kit for RX140 Tutorial Manual | CS+: R20UT5027EG e ² studio: R20UT5030EG |
| Quick Start Guide | Provides simple instructions to setup the RSK and run the first sample. | Renesas Starter Kit for RX140 Quick Start Guide | CS+: R20UT5028EG e ² studio: R20UT5031EG |
| Smart Configurator Tutorial | Provides a guide to code generation and importing into the e ² studio/CS+ IDE. | Renesas Starter Kit for RX140 Smart Configurator Tutorial Manual | CS+: R20UT5029EG e ² studio: R20UT5032EG |
| Schematics | Full detail circuit schematics of the CPU Board. | Renesas Starter Kit for RX140 Schematics | R20UT5025EG |
| Hardware Manual | Provides technical details of the RX140 microcontroller. | RX140 Group Hardware Manual | R01UH0905EJ |

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 |
| DAC | Digital-to-Analog Converter |
| DIP | Dual In-line Package |
| DMA | Direct Memory Access |
| DMAC | Direct Memory Access Controller |
| DNF | Do Not Fit |
| E1 / E2 Lite | Renesas On-chip Debugging Emulator |
| EEPROM | Electrically Erasable Programmable Read Only Memory |
| EMC | Electromagnetic Compatibility |
| ESD | Electrostatic Discharge |
| GLCDC | Graphic LCD Controller |
| I2C (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 | Real Time Clock |
| SCI | Serial Communications Interface |
| SPI | Serial Peripheral Interface |
| SSI | Serial Sound Interface |
| TFT | Thin Film Transistor |
| UART | Universal Asynchronous Receiver/Transmitter |
| USB | Universal Serial Bus |
| WDT | Watchdog Timer |

All trademarks and registered trademarks are the property of their respective owners.

Table of Contents

| | |
|---|----|
| 1. Overview..... | 9 |
| 1.1 Purpose | 9 |
| 1.2 Features | 9 |
| 1.3 Board specification | 10 |
| 2. Power Supply | 11 |
| 2.1 Requirements | 11 |
| 2.2 Power-Up Behaviour | 11 |
| 3. Board Layout | 12 |
| 3.1 Component Layout | 12 |
| 3.2 Board Dimensions | 13 |
| 3.3 Component Placement..... | 14 |
| 4. Connectivity | 16 |
| 4.1 Internal Board Connections | 16 |
| 4.2 Debugger Connections..... | 17 |
| 5. User Circuitry | 18 |
| 5.1 Reset Circuit | 18 |
| 5.2 Clock Circuit | 18 |
| 5.3 Switches | 18 |
| 5.4 LEDs..... | 19 |
| 5.5 Potentiometer | 19 |
| 5.6 Pmod™ | 20 |
| 5.7 USB Serial Port | 22 |
| 5.8 Controller Area Network (CAN)..... | 22 |
| 5.9 Local Interconnect Network (LIN)..... | 23 |
| 5.10 I ² C Bus (Inter-IC Bus)..... | 23 |
| 5.11 Touch Interface..... | 23 |
| 6. Configuration | 24 |
| 6.1 Modifying the RSK..... | 24 |
| 6.2 MCU Operating Modes..... | 24 |
| 6.3 E2 Lite Debugger Configuration | 24 |
| 6.4 Power Supply Configuration | 25 |
| 6.5 Clock Configuration | 25 |
| 6.6 Analog Power, ADC and DAC Configuration | 26 |
| 6.7 CAN Configuration..... | 26 |
| 6.8 General IO & LED Configuration | 27 |
| 6.9 I2C & EEPROM Configuration | 27 |
| 6.10 IRQ & Switch Configuration..... | 28 |
| 6.11 MTU & POE & Timer Configuration..... | 29 |
| 6.12 PMOD1 Configuration | 30 |
| 6.13 PMOD2 Configuration | 30 |
| 6.14 Serial & USB to Serial Configuration..... | 31 |
| 6.15 LIN Configuration..... | 31 |
| 6.16 Touch Interface Configuration | 32 |
| 7. Headers | 33 |
| 7.1 Application Headers | 33 |
| 7.2 Microcontroller Pin Headers | 37 |
| 8. Code Development | 39 |

| | | |
|-----|-----------------------------|----|
| 8.1 | Overview..... | 39 |
| 8.2 | Compiler Restrictions | 39 |
| 8.3 | Mode Support..... | 39 |
| 8.4 | Debugging Support..... | 39 |
| 8.5 | Address Space | 39 |
| 9. | Additional Information..... | 40 |

Renesas Starter Kit for RX140

User's Manual

1. Overview

1.1 Purpose

This CPU Board is an evaluation tool for Renesas microcontrollers. This manual describes the technical details of the CPU Board hardware.

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 applications
- 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.

Table 1-1: Board Specification

| Item | Specification |
|---|---|
| Microcontroller | Part No : R5F51406BDFN ^{*3} |
| | Package : 80-pin PLQP0080KB-B |
| | On-Chip Memory : ROM 256KB, RAM 64KB |
| On-Board Memory | I ² C EEPROM: 2Kbit |
| Input Clock | RX140 Main : 8MHz |
| | RX140 Sub : 32.768kHz |
| | RL78/G1C Main: 12MHz |
| Power Supply ^{*1} | DC Power Jack : 5 V Input |
| | Power Supply IC : 5V Input, 3.3V/1.8V Output |
| Debug Interface | E2 Lite 14-pin box header |
| Push Switch | Reset Switch x 1 |
| | User Switch x 3 |
| Potentiometer(for ADC) | Single-turn, 10k Ω |
| LED | Power indicator: green x 1 |
| | User : green x 1, orange x 1, red x 2 |
| CAN | Connector : 2.54mm pitch, 3-pin x 1 |
| | CAN Driver x 1 |
| LIN ^{*2} | Connector : 2.54mm pitch, 3-pin x 1 ^{*2} |
| | LIN Driver x 1 |
| USB to Serial Converter Interface | Connector : USB-MiniB |
| | Driver : RL78/G1C Microcontroller (Part No R5F10JBCANA) |
| Pmod TM | PMOD1 : Angle type, 12-pin Connector |
| | PMOD2 : Straight type, 12-pin Connector |
| Touch Interface | Slider x 1, Button x 2 |
| Application Board Interface ^{*1} | 2.54 mm pitch, 26-pin x 2 (JA1, JA2), 24-pin x 2 (JA5, JA6) |

^{*1}: Board can also supply 5V into RX140 microcontroller without Power Supply IC.

^{*2}: The connector is not included in the product.

^{*3}: R5F51406BDFN has a built-in security function.

2. Power Supply

2.1 Requirements

This board has an optional centre positive supply connector using a 2.0mm barrel power jack (PWR). The main power supply connected to PWR should supply a minimum of 10W to ensure full functionality. When the board is connected to another system then that system should supply power to the board.

This CPU board supports one external voltage input. Details of the external power supply connection are shown in **Table 2-1** and **Table 2-2** below. The default power configuration is shown in **bold, blue text**.

Table 2-1: PWR connector Requirements

| Connector | Supply voltage |
|-----------|----------------|
| PWR | Input 5VDC |

There are RSK products which supports the 12V voltage input. Since this board is supporting the 5V voltage input, be careful not to connect the power supply of a high-voltage output accidentally. Moreover, the main power supply connected to PWR should supply a minimum of 10W to ensure full functionality.

Table 2-2: Main Power Supply Requirements

| J6 Setting | J7 Setting | R37 | R44 ^{*1} | Supply Source | Board_VCC UC_VCC |
|--------------------|-------------|-------------------|-------------------|--------------------------------|--------------------------|
| 1-2 Shorted | Open | Don't care | Don't care | E2-Lite (3V3) / JA1-3V3 | 3.3V^{*2} |
| 1-2 Shorted | 1-2 Shorted | Fit | DNF | PWR / Unregulated_VCC / JA1-5V | 3.3V ^{*3} |
| 1-2 Shorted | 1-2 Shorted | DNF | Fit | PWR / Unregulated_VCC / JA1-5V | 1.8V ^{*4} |
| 2-3 Shorted | 1-2 Shorted | Don't care | Don't care | PWR / Unregulated_VCC / JA1-5V | 5V ^{*5} |

^{*1}: The resistor is not included to a product.

^{*2}: CAN, LIN and 5V Pmod™ interface can't be used.

^{*3}: 5V Pmod™ interface can't be used.

^{*4}: 5V Pmod™, Pmod™ LCD and LED, CAN, LIN can't be used.

^{*5}: Pmod™ LCD and 3V3 interface can't be used.

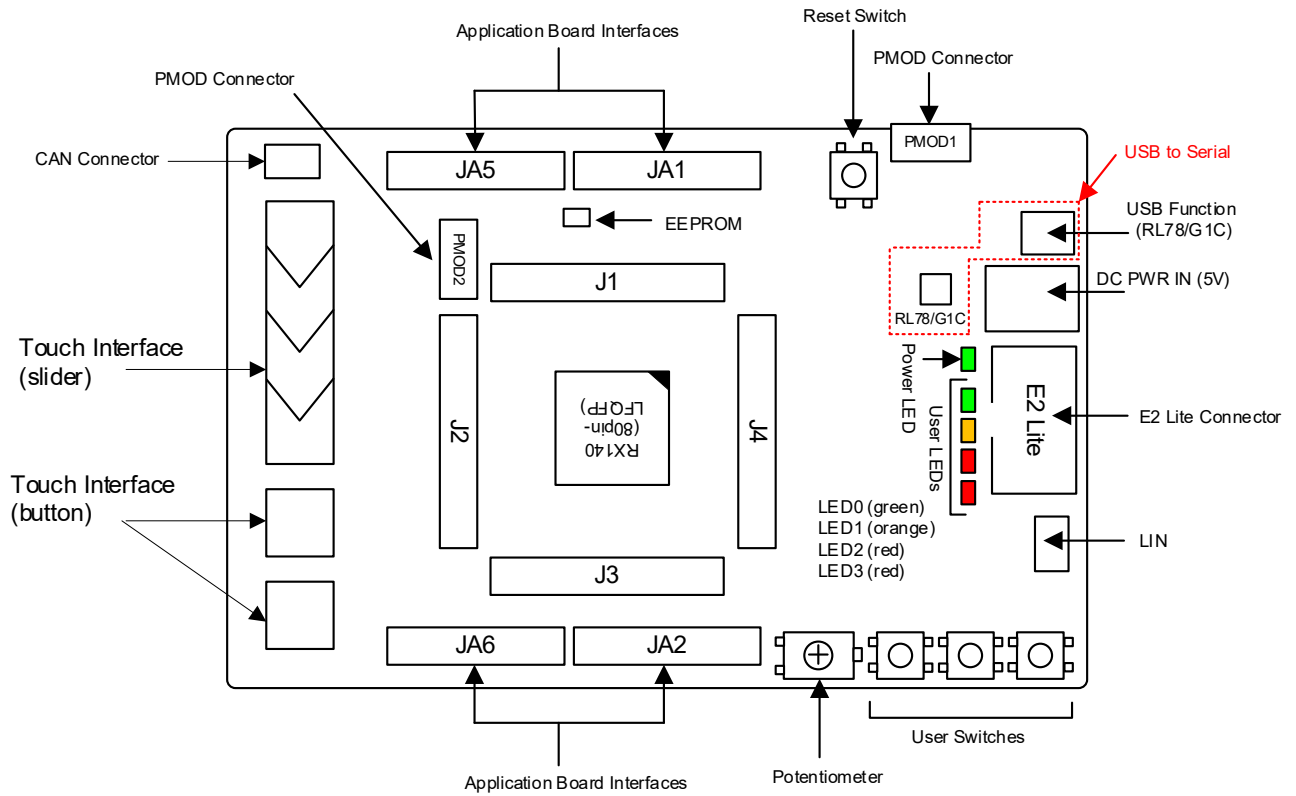
2.2 Power-Up Behaviour

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 Smart Configurator 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.



* J1 to J4 : 36-pin Micon Pin Headers

Figure 3-1: Board Layout

3.2 Board Dimensions

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

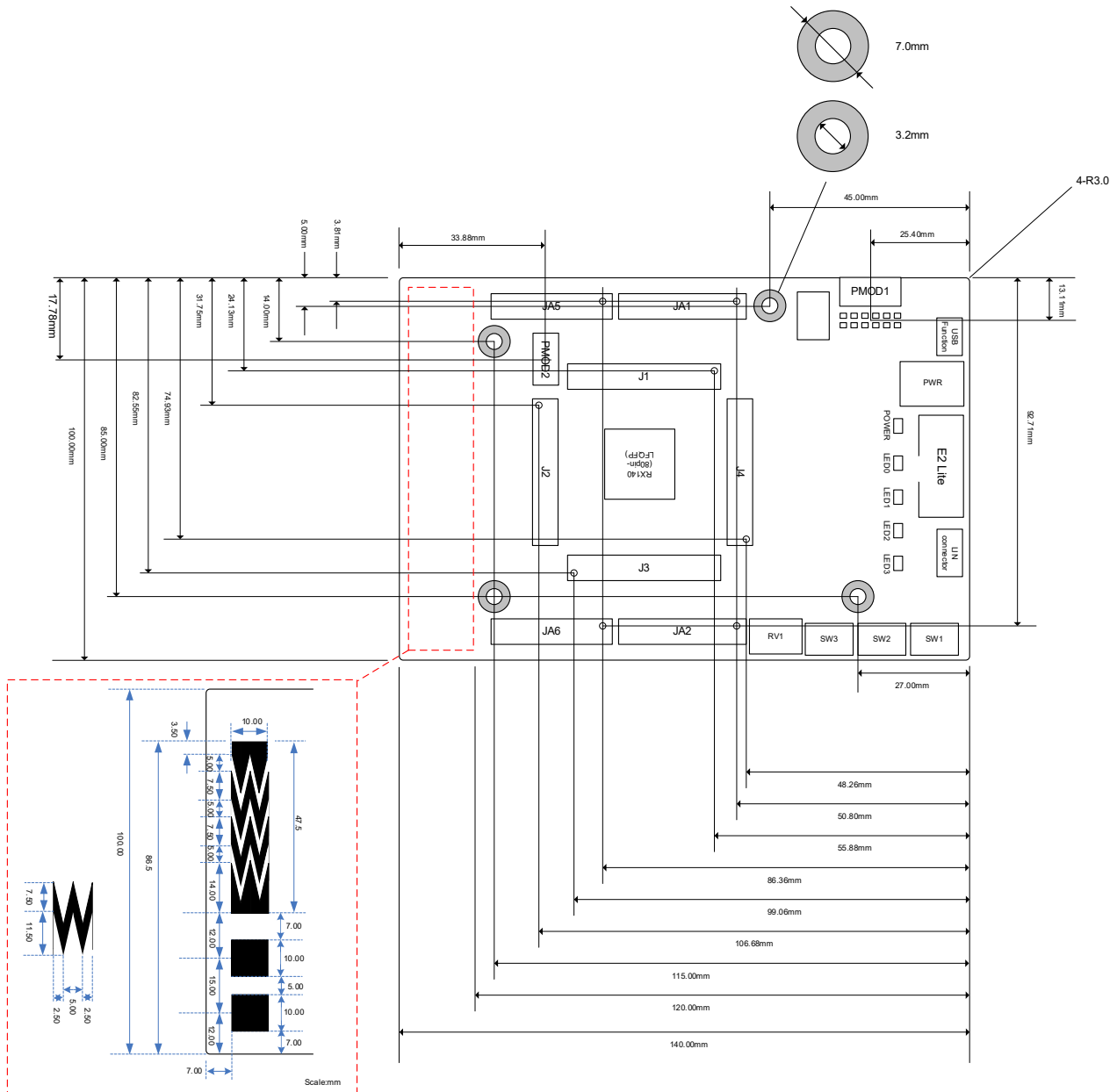


Figure 3-2: Board Dimensions

3.3 Component Placement

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

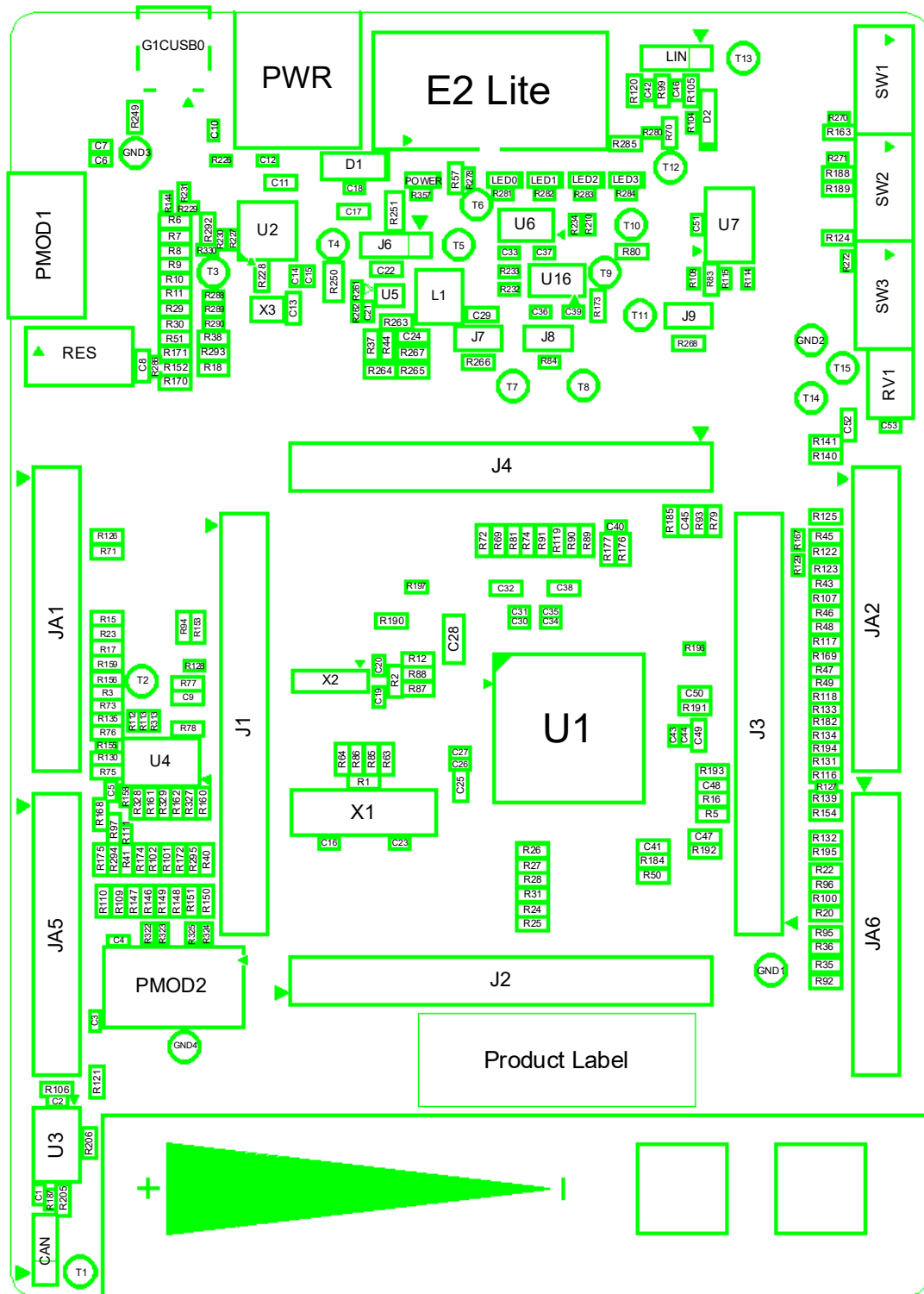


Figure 3-3: Top-Side Component Placement

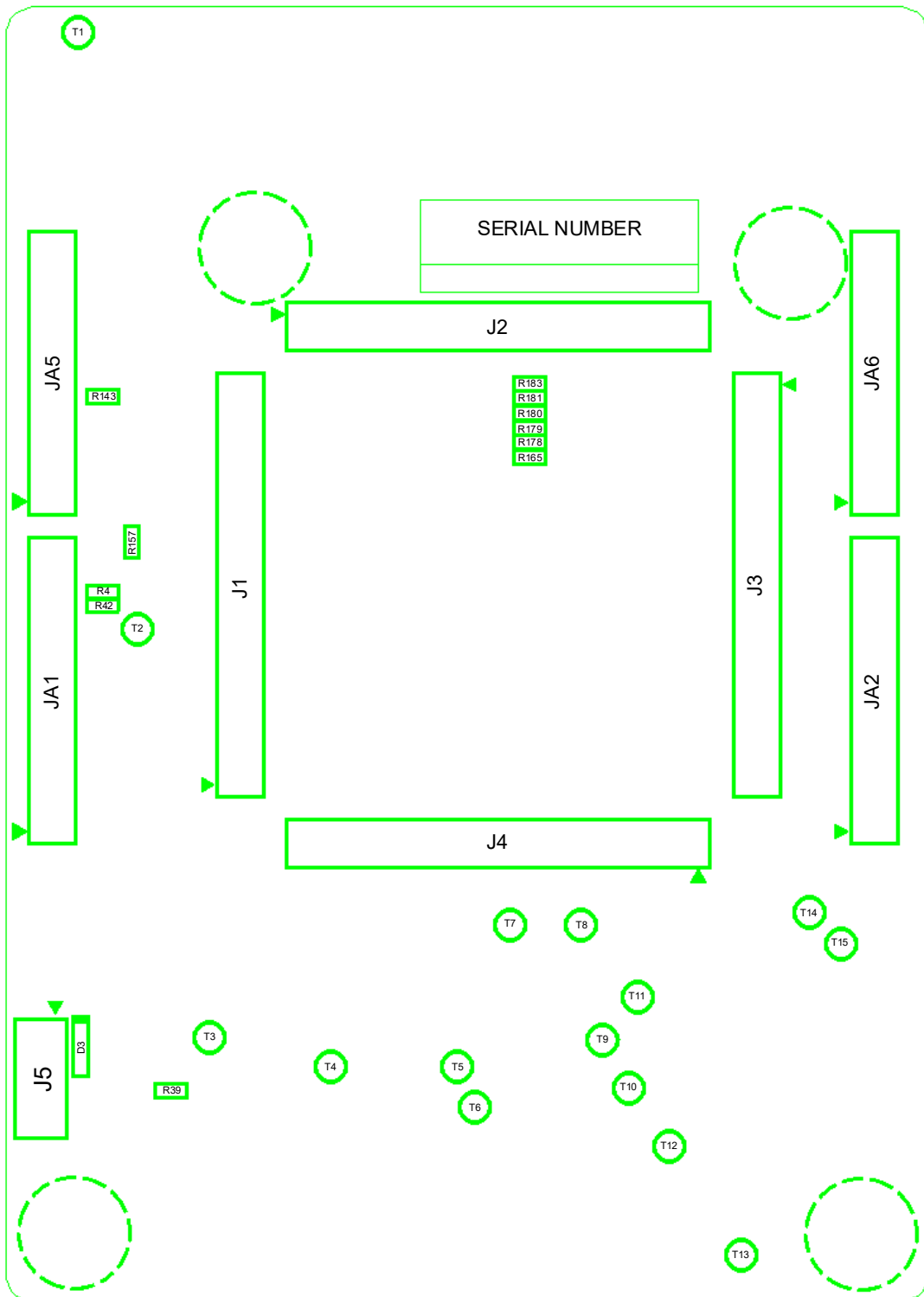


Figure 3-4: Bottom-Side Component Placement

4. Connectivity

4.1 Internal Board Connections

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

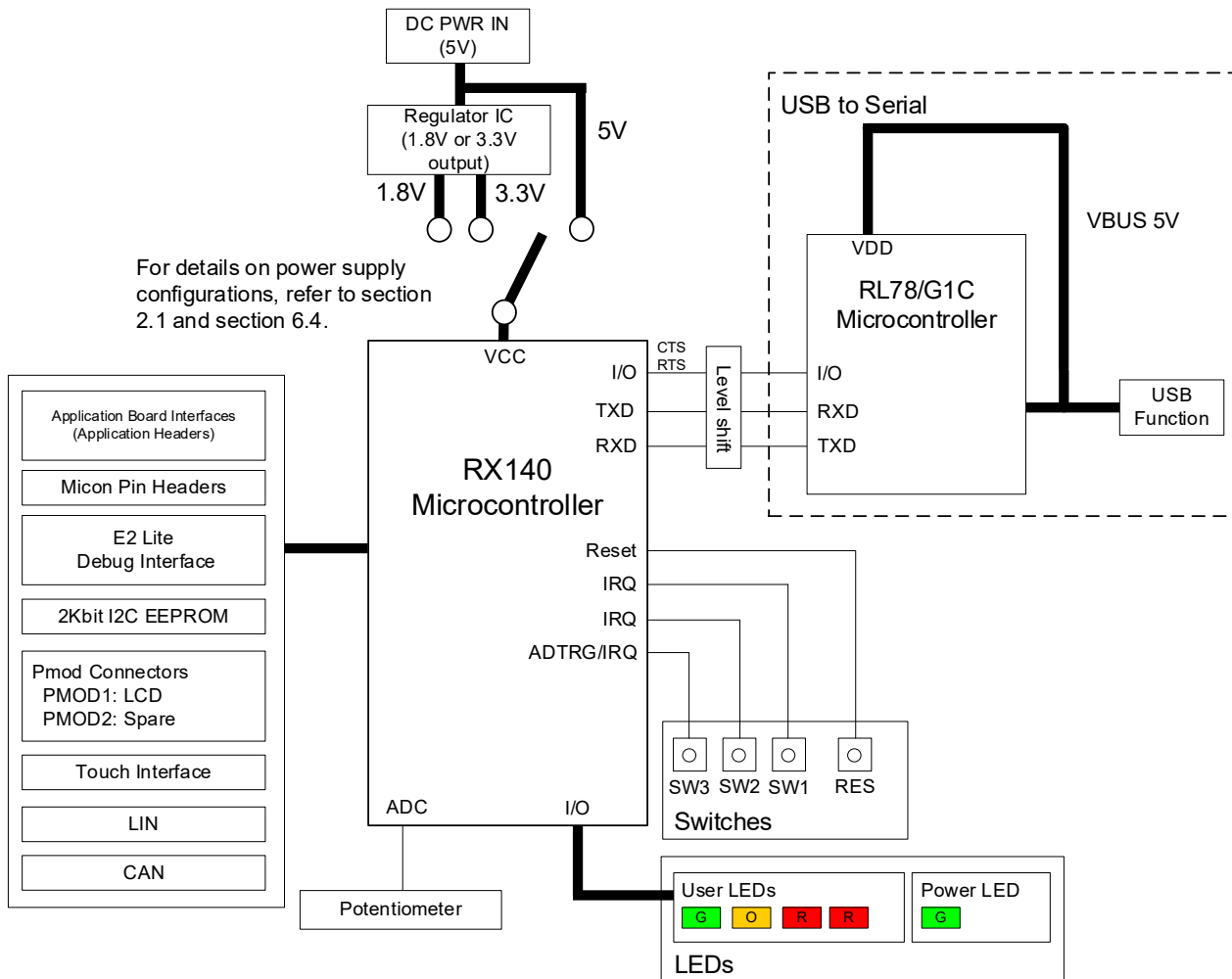


Figure 4-1: Internal Board Block Diagram

4.2 Debugger Connections

Figure 4-2 below shows the connections between the CPU board, E2 Lite debugger and the host PC.

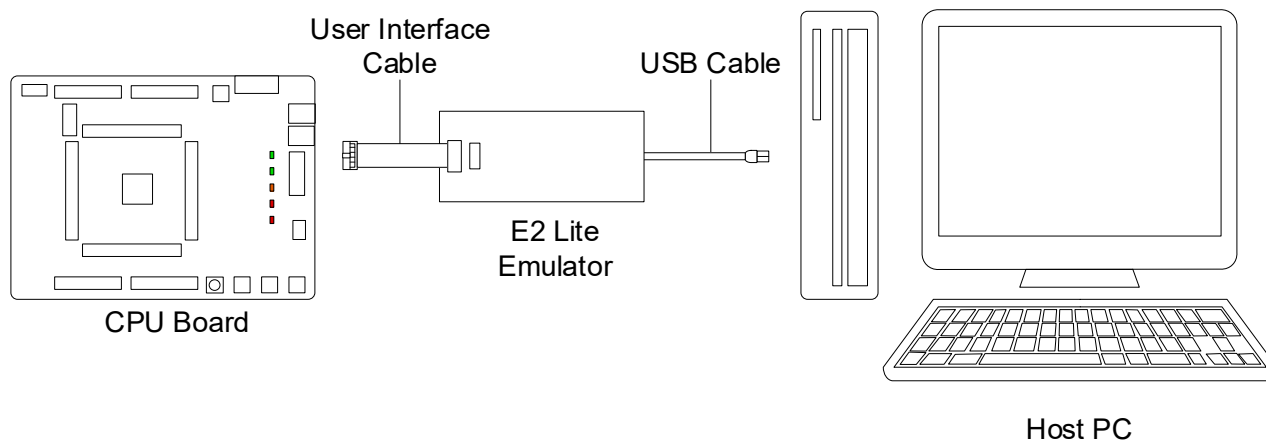


Figure 4-2: Debugger Connection Diagram

5. User Circuitry

5.1 Reset Circuit

A reset control circuit is fitted to the CPU board to generate the required reset signal, and is triggered from the RES switch. Refer to the RX140 Group User's Manual: Hardware for details regarding the reset signal timing requirements, and the CPU board schematics for information regarding the reset circuitry in use on the board.

5.2 Clock Circuit

A clock circuit is fitted to the CPU board to generate the required clock signal to drive the MCU, and associated peripherals. Refer to the RX140 Group Hardware Manual and the RL78/G1C hardware manual for details regarding the clock signal requirements, and the CPU board schematics for information regarding the clock circuitry in use on the CPU board. Details of the oscillators fitted to the board are listed in **Table 5-1** below.

Table 5-1: Crystal

| Crystal | Function | Default Placement | Frequency | Device Package |
|---------|-------------------------------|-------------------|-----------|-------------------|
| X1 | Main MCU crystal for RX140 | Fitted | 8MHz | Encapsulated, SMT |
| X2 | Real time Clock for RX140 | Fitted | 32.768kHz | Encapsulated, SMT |
| X3 | Main MCU crystal for RL78/G1C | Fitted | 12MHz | Encapsulated, SMT |

5.3 Switches

There are four switches located on the CPU board. The function of each switch and its connection is shown in **Table 5-2**. For further information regarding switch connectivity, refer to the CPU board schematics.

Table 5-2: Push Switch Connections

| Switch | Function | MCU | |
|--------|---|---------------|-----|
| | | Signal (Port) | Pin |
| RES | When pressed, the microcontroller is reset. | RES# | 9 |
| SW1 | Connects to an IRQ1 input for user controls. | P31 | 17 |
| SW2 | Connects to an IRQ2 input for user controls. | P32 | 16 |
| SW3 | Connects to an IRQ6 input for user controls. Connects to an ADTRG0 input for ADC controls. | P16 | 24 |

5.4 LEDs

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

Table 5-3: LED Connections

| LED | Colour | Function | MCU | |
|-------|--------|---|------|-----|
| | | | Port | Pin |
| POWER | Green | Indicates the status of the Board_VCC power rail. | NC | NC |
| LED0 | Green | User operated LED. | P21 | 21 |
| LED1 | Orange | User operated LED. | P04 | 3 |
| LED2 | Red | User operated LED. | P06 | 1 |
| LED3 | Red | User operated LED. | P07 | 78 |

5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analog input AN000 (Port P40, pin 75). The potentiometer can be used to create a voltage between Board_VCC and AVSS0. Refer to the maker site for specification of the potentiometer (VISHAY with part number TS53 series).

The potentiometer offers an easy method of supplying a variable analog input to the microcontroller. It does not necessarily reflect the accuracy of the controller's ADC. Refer to the RX140 Group User's Manual: Hardware for further details.

5.6 Pmod™

The RSK board is equipped with connectors for Digilent Pmod™ interface. Please connect the provided LCD module to the PMOD1 connector.

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.

Figure 5-1 below shows Digilent Pmod™ Compatible Header Pin Numbering. Connection information for the Digilent Pmod™ Compatible header is provided in **Table 5-4** and **Table 5-5** below.

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

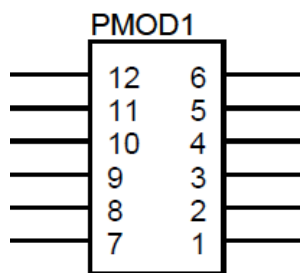


Figure 5-1: Digilent Pmod™ Compatible Header Pin Numbering

Table 5-4: Pmod™1 Header Connections

| Pin | Pmod™ Interface | | | MCU | |
|-----|-----------------|----------------|---------------|-------------------------|---------|
| | Type 2A (SPI) | Type 3A (UART) | Type 6A (I2C) | Port | Pin No. |
| 1 | CS | CTS/GPIO | INT | PB2/CTS6# | 46 |
| | | | | P17/IRQ7*2 | 23 |
| 2 | MOSI | TXD | RESET | PB1/TXD6/SMOSI6/SSDA6 | 47 |
| 3 | MISO | RXD | SCL | PB0/RXD6/SMISO6/SSCL6 | 49 |
| 4 | SCK | RTS/GPIO | SDA | PB3/SCK6 | 45 |
| | | | | PD0/TXD6/SMOSI6/SSDA6*2 | 66 |
| 5 | GND | GND | GND | - | - |
| 6 | 3V3/5V*1 | 3V3/5V*1 | 3V3/5V*1 | - | - |
| 7 | GPIO/INT | GPIO/INT | GPIO | P31/IRQ1*2 | 17 |
| 8 | GPIO/RESET | GPIO/RESET | GPIO | PE4 | 59 |
| 9 | GPIO/CS2 | GPIO | GPIO | PC7/TXD8/SMOSI8/SSDA8*3 | 35 |
| 10 | GPIO/CS3 | GPIO | GPIO | PC6/RXD8/SMISO8/SSCL8*3 | 36 |
| 11 | GND | GND | GND | - | - |
| 12 | 3V3/5V*1 | 3V3/5V*1 | 3V3/5V*1 | - | - |

*1: This board allows you to choose between 3V3 and 5V, and the default RSK configuration is 3V3.
 *2: This connection is a not available in the default RSK configuration - refer to section 6 for the required modifications.
 *3: TXD8 and RXD8 are special assignments for connecting with Renesas Silex WiFi Pmod.

Table 5-5: Pmod™2 Header Connections

| Pin | Pmod™ Interface | | | MCU | |
|-----|-----------------|----------------|---------------|-----------------------------|---------|
| | Type 2A (SPI) | Type 3A (UART) | Type 6A (I2C) | Port | Pin No. |
| 1 | CS | CTS/GPIO | INT | PA6/CTS5# | 51 |
| | | | | PE5/IRQ5*2 | 58 |
| 2 | MOSI | TXD | RESET | PA4/TXD5/SMOSI5/SSDA5 | 53 |
| 3 | MISO | RXD | SCL | PA2/RXD5/SMISO5/SSCL5 | 55 |
| 4 | SCK | RTS/GPIO | SDA | PA1/SCK5/SSLA2 | 56 |
| | | | | PC3/SSDA5*2 | 39 |
| 5 | GND | GND | GND | - | - |
| 6 | 3V3/5V*1 | 3V3/5V*1 | 3V3/5V*1 | - | - |
| 7 | GPIO/INT | GPIO/INT | GPIO | P34/IRQ4 | 15 |
| 8 | GPIO/RESET | GPIO/RESET | GPIO | PC2 | 40 |
| 9 | GPIO/CS2 | GPIO | GPIO | PB7/PC1/TXD9/SMOSI9/SSDA9*3 | 41 |
| 10 | GPIO/CS3 | GPIO | GPIO | PB6/PC0/RXD9/SMISO9/SSCL9*3 | 42 |
| 11 | GND | GND | GND | - | - |
| 12 | 3V3/5V*1 | 3V3/5V*1 | 3V3/5V*1 | - | - |

*1: This board allows you to choose between 3V3 and 5V, and the default RSK configuration is 3V3.

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

*3: TXD9 and RXD9 are special assignments for connecting with Renesas Silex WiFi Pmod.

5.7 USB Serial Port

A USB serial port is implemented in a Renesas low power microcontroller (RL78/G1C) and is connected to the RX140 Serial Communications Interface (SCI) module. Multiple options are provided to allow the selection of the connected SCI12 port. Connections between the USB to Serial converter and the microcontroller are listed in **Table 5-6** below.

Table 5-6: Serial Port Connections

| Signal Name | Function | MCU | |
|---------------|------------------------------------|------|-----|
| | | Port | Pin |
| SERIAL-TXD | SCI1 Transmit Signal. | P26 | 20 |
| | SCI12 Transmit Signal. *1 | PE1 | 62 |
| | External RS232 Transmit Signal. *1 | - | - |
| SERIAL-RXD | SCI1 Receive Signal. | P30 | 18 |
| | SCI12 Receive Signal. *1 | PE2 | 61 |
| | External RS232 Receive Signal. *1 | - | - |
| SERIAL-CTS *2 | Clear To Send. *1 | P34 | 15 |
| SERIAL-RTS *2 | Request To Send. | PE3 | 60 |

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

*2: Flow control is a signal provided for expansion and is not currently supported. There is no schedule of function expansion at present.

When the CPU 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 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.

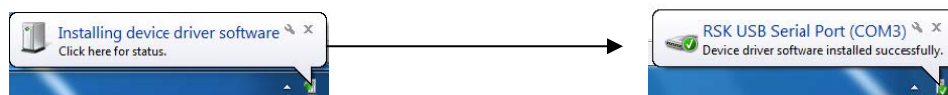


Figure 5-2: USB-Serial Windows™ Installation message

If you do not have the driver, please download the driver installer from the following URL.

<https://www.renesas.com/document/rsk-usb-serial-driver?language=en>

5.8 Controller Area Network (CAN)

A CAN transceiver IC is fitted to the RSK board, and connected to the CAN MCU peripheral. For further details regarding the CAN protocol and supported modes of operation, please refer to the RX140 Group User’s Manual: Hardware. The connections for the CAN microcontroller signals are listed in **Table 5-7** below.

Table 5-7: CAN Connections

| CAN Signal | Function | MCU | |
|---------------|------------------------|------|-----|
| | | Port | Pin |
| CAN-TX | CAN Data Transmission. | P14 | 26 |
| JA5-CAN1TX *1 | | | |
| CAN-RX | CAN Data Reception. | P15 | 25 |
| JA5-CAN1RX *1 | | | |

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

5.9 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 RX140 Group User's Manual: Hardware. Connections between the LIN connector and microcontroller are listed in **Table 5-8** below.

Table 5-8: LIN Connections

| LIN signal | Function | MCU | |
|------------|--------------------------------------|------|-----|
| | | Port | Pin |
| LIN-TX | LIN Transmit Signal | PE1 | 62 |
| LIN-RX | LIN Receive Signal | PE2 | 61 |
| LIN-NSLP | LIN Transceiver Device Sleep Control | PC5 | 37 |

5.10 I²C Bus (Inter-IC Bus)

The RX140 features I²C (Inter-IC Bus) interface (RIIcA). RIIc0 is connected to a 2Kbit EEPROM. The connections for the I²C Bus Interface signals are listed in **Table 5-9** below.

Table 5-9: I²C Bus Connections

| I ² C Bus signal | Function | MCU | |
|-----------------------------|----------|------|-----|
| | | Port | Pin |
| E2P-SDA | Data | P13 | 27 |
| E2P-SCL | Clock | P12 | 28 |

5.11 Touch Interface

The RSK Board is fitted with a Touch Interface (slider x 1, button x 2). The connections for the Touch Interface signals are listed in **Table 5-10** below.

Table 5-10: Touch Interface Connections

| Touch Interface signal | Function | MCU | |
|------------------------|---|------|-----|
| | | Port | Pin |
| TS12 | Electrostatic capacitive measurement pin (touch button) | P54 | 34 |
| TS11 | Electrostatic capacitive measurement pin (touch button) | P55 | 33 |
| TS10 | Electrostatic capacitive measurement pin (touch slider) | PH0 | 32 |
| TS9 | Electrostatic capacitive measurement pin (touch slider) | PH1 | 31 |
| TS8 | Electrostatic capacitive measurement pin (touch slider) | PH2 | 30 |
| TS7 | Electrostatic capacitive measurement pin (touch slider) | PH3 | 29 |
| TSCAP | LPF (Low-pass filter) connection pin | PC4 | 38 |

6. Configuration

6.1 Modifying the RSK

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

A link resistor is a 0Ω surface mount resistor, which is used to 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 CPU board is supplied with. Refer to the component placement diagram (section 3) to locate the option links, jumpers.

When removing soldered components, always ensure that the CPU board 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 RX140 Group User's Manual: Hardware and CPU board schematics for further information.

In the table in this section, "pin" expression is omitted, so please read as follows.
Example: U6.3 -> U6.3pin

6.2 MCU Operating Modes

Table 6-1 below details the function of the jumpers associated with configuring the MCU Operating Modes.

Table 6-1: MCU Operating Modes Configuration Jumper Settings

| J8 *1 | Explanation |
|-------------|------------------|
| Open / DNF | Single Chip Mode |
| Shorted Pin | Boot Mode (SCI) |

*1: Jumper J8 are not mounted on the board at the time of product shipment.

6.3 E2 Lite Debugger Configuration

Table 6-2 below details the function of the option links associated with E2 Lite Debugger Configuration.

Table 6-2: E2 Lite Debugger Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|--------------------------|------------|------------------|-----------------------|-----|------------------|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P30 | 18 | P30 | JA2-RXD _a | R122 | R70, R77 | JA2.8 | - | - |
| | | | RXD1 | R70 | R122, R77 | E2Lite.11 | - | - |
| | | | SERIAL-RXD | R77 | R122, R70 | U16.3 | - | R132, R79 |
| P26 | 20 | P26 | JA2-TXD _a | R125 | R57, R78 | JA2.6 | - | - |
| | | | TXD1 | R57 | R125, R78 | E2Lite.5 | - | - |
| | | | SERIAL-TXD | R78 | R125, R57 | U6.3 | - | R195, R80 |
| RES# | 9 | - | RES_n | - | - | E2Lite.13 | - | - |
| | | | | | | RES(Switch) | - | - |
| | | | | | | JA2.1 | - | - |
| MD_FINED | 6 | PG7 | MD_FINED | - | - | E2Lite.7 | - | - |
| | | | | | | J8.2 | - | - |

6.4 Power Supply Configuration

Table 6-3 below details the function of the option links associated with Power Supply Configuration.

Table 6-3: Power Supply Configuration Option Links

| Reference | Explanation | Fit | DNF |
|------------------------|--|------------------|---------------|
| Unregulated_VCC | Connect 5V power rail to Unregulated_VCC. | R251 | - |
| JA1-5V | Connect 5V power rail to JA1-5V. | R250 | - |
| Board_5V | Connect 5V power rail to Board_5V. | - | - |
| JA1-3V3 | Disconnect JA1-3V3 from Power Supply IC output. (Power supply source: E2 Lite (3.3V), JA1-3V3) | R266 | J7.Open |
| | Connect JA1-3V3 to Power Supply IC output. (Power supply source: Unregulated_VCC, JA1-5V) | R266, J7.Short | - |
| Board_3V3 | Disconnect Board_3V3 from Power Supply IC output. (Power supply source: E2 Lite (3.3V), JA1-3V3) | - | J7.Open |
| | Connect Board_3V3 to Power Supply IC output. (Power supply source: Unregulated_VCC, JA1-5V) | J7.Short | - |
| UC_VCC | Connect UC_VCC to Board_VCC power rail. | J9.Short or R268 | - |
| | Enable current probe for measurement MCU current consumption. | - | J9.Open, R268 |
| Power Supply IC output | 3.3V | R37 | R44 |
| | 1.8V | R44 | R37 |

Table 6-4 below details the function of the jumpers associated with the Power Supply Configuration.

Table 6-4: Power Supply Configuration Jumper Settings

| Reference | Jumper Position | Explanation |
|------------|-----------------|---|
| J9(DNF) *1 | Shorted | Connect UC_VCC to Board_VCC power rail. |
| | All open | Enable current probe for measurement MCU current consumption. |
| J6 | Shorted Pin 1-2 | Connect Board_3V3 to Board_VCC. |
| | Shorted Pin 2-3 | Connect Board_5V to Board_VCC. |
| | All open | DO NOT SET. |
| J7 | Shorted | Connect Power Supply IC output to Board_3V3. |
| | All open | Disconnect Power Supply IC output from Board_3V3. |

*1: Jumper J9 is not fitted on the default CPU board. Same as Jumper Position “shorted” setting by resistor R268.

6.5 Clock Configuration

Table 6-5 below details the function of the option links associated with Clock Configuration.

Table 6-5: Clock Configuration Option Links

| Reference | Explanation | Fit | DNF |
|-------------|--|----------|----------|
| XTAL, EXTAL | Connect 8MHz crystal (X1) to RX140. | R86, R85 | R64, R63 |
| | Connect JA2-EXTAL to RX140. | R64, R63 | R86, R85 |
| XCIN, XCOU | Connect 32.768kHz crystal (X2) to RX140. | R88, R87 | R12 |
| | Disconnect X2 from RX140. | R12 | R88, R87 |

6.6 Analog Power, ADC and DAC Configuration

Table 6-6 below details the function of the option links associated with Analog Power, ADC and DAC Configuration.

Table 6-6: Analog Power, ADC and DAC Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|--------------------------|------|-----------|-----------------------|-----|-----|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P16 | 24 | P16 | SW3 | R124 | - | SW3 | - | - |
| | | | JA1-ADTRG | R71 | - | JA1.8 | - | - |
| JA5-ADC7 | 67 | P47 | JA5-ADC7 | - | - | JA5.4 | - | - |
| JA5-ADC6 | 68 | P46 | JA5-ADC6 | - | - | JA5.3 | - | - |
| JA5-ADC5 | 69 | P45 | JA5-ADC5 | - | - | JA5.2 | - | - |
| JA5-ADC4 | 70 | P44 | JA5-ADC4 | - | - | JA5.1 | - | - |
| JA1-ADC3 | 71 | P43 | JA1-ADC3 | - | - | JA1.12 | - | - |
| JA1-ADC2 | 72 | P42 | JA1-ADC2 | - | - | JA1.11 | - | - |
| JA1-ADC1 | 73 | P41 | JA1-ADC1 | - | - | JA1.10 | - | - |
| P40 | 75 | P40 | RV1-ADC | R176 | R177 | RV1 | - | - |
| | | | JA1-ADC0 | R177 | R176 | JA1.9 | - | - |
| VREFH0 | 76 | PJ6 | UC_VCC | - | R91, R119 | - | - | - |
| | | | JA1-VREFH | - | R119, R91 | JA1.7 | - | - |
| VREFL0 | 74 | PJ7 | GROUND | - | R89, R90 | - | - | - |
| | | | JA1-AVSS_VREFL | - | R90, R89 | JA1.6 | - | - |
| AVCC0 | 77 | - | UC_VCC | R81 | R74, R141 | - | - | - |
| | | | JA1-AVCC | R74 | R81, R141 | JA1.5 | - | - |
| AVSS0 | 79 | - | GROUND | R69 | R72 | - | - | - |
| | | | JA1-AVSS_VREFL | R72 | R69 | JA1.6 | - | - |
| JA1-DAC0 | 2 | P03 | JA1-DAC0 | - | - | JA1.13 | - | - |
| JA1-DAC1 | 80 | P05 | JA1-DAC1 | - | - | JA1.14 | - | - |

6.7 CAN Configuration

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

Table 6-7: CAN Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|--------------------------|------|------------------|-----------------------|-----|-----|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P15 | 25 | P15 | CAN-RX | R106 | R154, R168 | U3.4 | - | - |
| | | | JA2-M1TRDCLK | R154 | R106, R168 | JA2.26 | - | - |
| | | | JA5-CAN1RX | R168 | R106, R154 | JA5.6 | - | - |
| P14 | 26 | P14 | CAN-TX | R121 | R107, R139, R143 | U3.1 | - | - |
| | | | JA2-CTSaRTSa | R107 | R121, R139, R143 | JA2.12 | - | - |
| | | | JA2-M1TRCCLK | R139 | R121, R107, R143 | JA2.25 | - | - |
| | | | JA5-CAN1TX | R143 | R121, R107, R139 | JA5.5 | - | - |

6.8 General IO & LED Configuration

Table 6-8 below details the function of the option links associated with General IO & LED Configuration.

Table 6-8: General IO & LED Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|--------------------------|------|------|-----------------------|------|-----|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| LED3 | 78 | P07 | LED3 | - | - | LED3.K | R285 | - |
| LED2 | 1 | P06 | LED2 | - | - | LED2.K | R285 | - |
| LED1 | 3 | P04 | LED1 | - | - | LED1.K | R285 | - |
| LED0 | 21 | P21 | LED0 | - | - | LED0.K | R285 | - |
| PC7 | 35 | PC7 | PMOD1-IO6_CS1_WIFITXD | R170 | R42 | PMOD1.9 | - | - |
| | | | JA1-IO7 | R42 | R170 | JA1.22 | - | - |
| PB5 | 43 | PB5 | JA2-M1POE | R116 | R4 | JA2.24 | - | - |
| | | | JA1-IO6 | R4 | R116 | JA1.21 | - | - |
| JA1-IO5 | 44 | PB4 | JA1-IO5 | - | - | JA1.20 | - | - |
| PB3 | 45 | PB3 | PMOD1-IO3_SCK_RTS | R5 | R16 | PMOD1.4 | R292 | R39 |
| | | | JA1-IO4 | R16 | R5 | JA1.19 | - | - |
| PB2 | 46 | PB2 | PMOD2-IO0_CS0_CTS | R18 | R17 | PMOD1.1 | R293 | R38 |
| | | | JA1-IO3 | R17 | R18 | JA1.18 | - | - |
| JA1-IO2 | 52 | PA5 | JA1-IO2 | - | - | JA1.17 | - | - |
| PA3 | 54 | PA3 | JA2-TIMIN0 | R118 | R15 | JA2.21 | - | - |
| | | | JA1-IO1 | R15 | R118 | JA1.16 | - | - |
| PA0 | 57 | PA0 | JA2-M1VP | R117 | R23 | JA2.15 | - | - |
| | | | JA1-IO0 | R23 | R117 | JA1.15 | - | - |

6.9 I2C & EEPROM Configuration

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

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

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|--------------------------|------|-----------|-----------------------|-----|-----|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P12 | 28 | P12 | E2P-SCL | R130 | - | U4.6 | - | - |
| | | | JA1-SCL | R75 | - | JA1.26 | - | - |
| P13 | 27 | P13 | E2P-SDA | R135 | R123 | U4.5 | - | - |
| | | | JA1-SDA | R76 | R123 | JA1.25 | - | - |
| | | | JA2-IRQb_M1HSIN1 | R123 | R135, R76 | JA2.9 | - | - |

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

| Reference | Explanation | Fit | DNF |
|--------------|---|------------------|------------------|
| EEPROM Power | Supply Board_3V3 and connect pull-up resistor to Board_3V3. | R159 | R156 |
| | Supply Board_5V and connect pull-up resistor to Board_5V. | R156 | R159 |
| WP | Disable EEPROM Write protect | - | R157 |
| | Enable EEPROM Write protect | R157 | - |
| A0, A1, A2 | Device address (0xA6). | R329, R328, R160 | R162, R161, R327 |
| | Device address (0xA4). | R162, R328, R160 | R329, R161, R327 |

6.10 IRQ & Switch Configuration

Table 6-11 below details the function of the option links associated with IRQ & Switch Configuration.

Table 6-11: IRQ & Switch Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|--------------------------|------|------------|-----------------------|------|------|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P16 | 24 | P16 | SW3 | R124 | - | SW3 | - | - |
| | | | JA1-ADTRG | R71 | - | JA1.8 | - | - |
| JA2-NMIn | 14 | P35 | JA2-NMIn | - | - | JA2.3 | - | - |
| P32 | 16 | P32 | SW2 | R188 | - | SW2 | - | - |
| | | | JA2-IRQc_M1HSIN2 | R189 | - | JA2.23 | R134 | R194 |
| P31 | 17 | P31 | SW1 | R163 | R51 | SW1 | - | - |
| | | | JA1-IRQd | R73 | R51 | JA1.23 | - | - |
| | | | PMOD1-IO4_INT1_WIFIWKUP | R51 | R163, R73 | PMOD1.7 | - | - |
| P13 | 27 | P13 | E2P-SDA | R135 | R123 | U4.5 | - | - |
| | | | JA1-SDA | R76 | R123 | JA1.25 | - | - |
| | | | JA2-IRQb_M1HSIN1 | R123 | R135, R76 | JA2.9 | - | - |
| P34 | 15 | P34 | PMOD2-IO4_INT1_WIFIWKUP | R172 | R173, R45 | PMOD2.7 | - | - |
| | | | SERIAL-CTS | R173 | R172, R45 | U16.2 | - | - |
| | | | JA2-IRQa_M1HSIN0 | R45 | R172, R173 | JA2.7 | - | - |
| RES# | 9 | - | RESn | - | - | E2Lite.13 | - | - |
| | | | | | | RES(Switch) | - | - |
| | | | | | | JA2.1 | - | - |

6.11 MTU & POE & Timer Configuration

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

Table 6-12: MTU & POE & Timer Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|--------------|-----|---------|---------------------------|------|------------------|-----------------------|------|------|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| JA6-M1TOGGLE | 5 | PJ1 | JA6-M1TOGGLE | - | - | JA6.13 | - | - |
| PB0 | 49 | PB0 | PMOD1-IO2_MISO_RXD_SCL | R152 | R92 | PMOD1.3 | - | - |
| | | | JA6-M1WIN | R92 | R152 | JA6.16 | - | - |
| PA6 | 51 | PA6 | PMOD2-IO0_CS0_CTS | R94 | R35 | PMOD2.1 | R295 | R40 |
| | | | JA6-M1VIN | R35 | R94 | JA6.15 | - | - |
| PA4 | 53 | PA4 | PMOD2-IO1_MOSI_TXD_RESET0 | R101 | R96, R36 | PMOD2.2 | - | - |
| | | | JA6-TXDb | R96 | R101, R36 | JA6.8 | - | - |
| | | | JA6-M1UIN | R36 | R101, R96 | JA6.14 | - | - |
| PA3 | 54 | PA3 | JA2-TIMIN0 | R118 | R15 | JA2.21 | - | - |
| | | | JA1-IO1 | R15 | R118 | JA1.16 | - | - |
| P15 | 25 | P15 | CAN-RX | R106 | R154, R168 | U3.4 | - | - |
| | | | JA2-M1TRDCLK | R154 | R106, R168 | JA2.26 | - | - |
| | | | JA5-CAN1RX | R168 | R106, R154 | JA5.6 | - | - |
| P14 | 26 | P14 | CAN-TX | R121 | R107, R139, R143 | U3.1 | - | - |
| | | | JA2-CTSaRTSa | R107 | R121, R139, R143 | JA2.12 | - | - |
| | | | JA2-M1TRCCLK | R139 | R121, R107, R143 | JA2.25 | - | - |
| | | | JA5-CAN1TX | R143 | R121, R107, R139 | JA5.5 | - | - |
| JA2-M1WN | 64 | PD2 | JA2-M1WN | - | - | JA2.18 | - | - |
| JA2-M1WP | 65 | PD1 | JA2-M1WP | - | - | JA2.17 | - | - |
| PE5 | 58 | PE5 | JA2-M1VN | R169 | R153 | JA2.16 | - | - |
| | | | PMOD2-INT0 | R153 | R169 | PMOD2.1 | R40 | R295 |
| PB5 | 43 | PB5 | JA2-M1POE | R116 | R4 | JA2.24 | - | - |
| | | | JA1-IO6 | R4 | R116 | JA1.21 | - | - |
| P13 | 27 | P13 | E2P-SDA | R135 | R123 | U4.5 | - | - |
| | | | JA1-SDA | R76, | R123 | JA1.25 | - | - |
| | | | JA2-IRQb_M1HSIN1 | R123 | R135, R76 | JA2.9 | - | - |
| PA0 | 57 | PA0 | JA2-M1VP | R117 | R23 | JA2.15 | - | - |
| | | | JA1-IO0 | R23 | R117 | JA1.15 | - | - |
| PB7/PC1 | 41 | PB7/PC1 | PMOD2-IO6_CS1_WIFITXD | R174 | R46, R47 | PMOD2.9 | - | - |
| | | | JA2-M1UP | R46 | R174, R47 | JA2.13 | - | - |
| | | | JA2-TIMOUT0 | R47 | R174, R46 | JA2.19 | - | - |
| PB6/PC0 | 42 | PB6/PC0 | PMOD2-IO7_CS2_WIFIRXD | R175 | R48, R49 | PMOD2.10 | - | - |
| | | | JA2-M1UN | R48 | R175, R49 | JA2.14 | - | - |
| | | | JA2-TIMOUT1 | R49 | R175, R48 | JA2.20 | - | - |
| P20 | 22 | P20 | JA2-M1ENC | R131 | R133 | JA2.23 | R194 | R134 |
| | | | JA2-TIMIN1 | R133 | R131 | JA2.22 | - | - |
| P34 | 15 | P34 | PMOD2-IO4_INT1_WIFIWKUP | R172 | R173, R45 | PMOD2.7 | - | - |
| | | | SERIAL-CTS | R173 | R172, R45 | U16.2 | - | - |
| | | | JA2-IRQa_M1HSIN0 | R45 | R172, R173 | JA2.7 | - | - |
| P32 | 16 | P32 | SW2 | R188 | - | SW2 | - | - |
| | | | JA2-IRQc_M1HSIN2 | R189 | - | JA2.23 | R134 | R194 |
| PC6 | 36 | PC6 | PMOD1-IO7_CS2_WIFIRXD | R171 | R43 | PMOD1.10 | - | - |
| | | | JA2-M1UD | R43 | R171 | JA2.11 | - | - |

6.12 PMOD1 Configuration

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

Table 6-13: PMOD1 Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|----------------------------|-----|------|----------------------------|------|-----------|-----------------------|------|------|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| PB2 | 46 | PB2 | PMOD1-IO0_CS0_CTS | R18 | R17 | PMOD1.1 | R293 | R38 |
| | | | JA1-IO3 | R17 | R18 | JA1.18 | - | - |
| PMOD1-INT0 | 23 | P17 | PMOD1-INT0 | - | - | PMOD1.1 | R38 | R293 |
| PMOD1-IO1_MOSI_TXD_RESET0 | 47 | PB1 | PMOD1-IO1_MOSI_TXD_RESET0 | - | - | PMOD1.2 | - | - |
| PB0 | 49 | PB0 | PMOD1-IO2_MISO_RXD_SCL | R152 | R92 | PMOD1.3 | - | - |
| | | | JA6-M1WIN | R92 | R152 | JA6.16 | - | - |
| PB3 | 45 | PB3 | PMOD1-IO3_SCK_RTS | R5 | R16 | PMOD1.4 | R292 | R39 |
| | | | JA1-IO4 | R16 | R5 | JA1.19 | - | - |
| PMOD1-SDA | 66 | PD0 | PMOD1-SDA | - | - | PMOD1.4 | R39 | R292 |
| P31 | 17 | P31 | SW1 | R163 | R51 | SW1 | - | - |
| | | | JA1-IRQd | R73 | R51 | JA1.23 | - | - |
| | | | PMOD1-IO4_INT1_WIFIWKUP | R51 | R163, R73 | PMOD1.7 | - | - |
| PMOD1-IO5_RESET1_WIFIMDRES | 59 | PE4 | PMOD1-IO5_RESET1_WIFIMDRES | - | - | PMOD1.8 | - | - |
| PC7 | 35 | PC7 | PMOD1-IO6_CS1_WIFITXD | R170 | R42 | PMOD1.9 | - | - |
| | | | JA1-IO7 | R42 | R170 | JA1.22 | - | - |
| PC6 | 36 | PC6 | PMOD1-IO7_CS2_WIFIRXD | R171 | R43 | PMOD1.10 | - | - |
| | | | JA2-M1UD | R43 | R171 | JA2.11 | - | - |

6.13 PMOD2 Configuration

Table 6-14 below details the function of the option links associated with PMOD2 Configuration.

Table 6-14: PMOD2 Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|----------------------------|-----|-----------|----------------------------|------|------------|-----------------------|------|------|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| PA6 | 51 | PA6 | PMOD2-IO0_CS0_CTS | R94 | R35 | PMOD2.1 | R295 | R40 |
| | | | JA6-M1VIN | R35 | R94 | JA6.15 | - | - |
| PE5 | 58 | PE5 | JA2-M1VN | R169 | R153 | JA2.16 | - | - |
| | | | PMOD2-INT0 | R153 | R169 | PMOD2.1 | R40 | R295 |
| PA4 | 53 | PA4 | PMOD2-IO1_MOSI_TXD_RESET0 | R101 | R96, R36 | PMOD2.2 | - | - |
| | | | JA6-TXDb | R96 | R101, R36 | JA6.8 | - | - |
| | | | JA6-M1UIN | R36 | R101, R96 | JA6.14 | - | - |
| PA2 | 55 | PA2 | PMOD2-IO2_MISO_RXD_SCL | R102 | R22 | PMOD2.3 | - | - |
| | | | JA6-RXDb | R22 | R102 | JA6.7 | - | - |
| PA1 | 56 | PA1 | PMOD2-IO3_SCK_RTS | R97 | R20 | PMOD2.4 | R294 | R41 |
| | | | JA6-SCKb | R20 | R97 | JA6.10 | - | - |
| PMOD2-SDA | 39 | PC3 | PMOD2-SDA | - | - | PMOD2.4 | R41 | R294 |
| P34 | 15 | P34 | PMOD2-IO4_INT1_WIFIWKUP | R172 | R173, R45 | PMOD2.7 | - | - |
| | | | SERIAL-CTS | R173 | R172, R45 | U16.2 | - | - |
| | | | JA2-IRQa_M1HSIN0 | R45 | R172, R173 | JA2.7 | - | - |
| PMOD2-IO5_RESET1_WIFIMDRES | 40 | PC2 | PMOD2-IO5_RESET1_WIFIMDRES | - | - | PMOD2.8 | - | - |
| PB7/PC1 | 41 | PB7 /PC 1 | PMOD2-IO6_CS1_WIFITXD | R174 | R46, R47 | PMOD2.9 | - | - |
| | | | JA2-M1UP | R46 | R174, R47 | JA2.13 | - | - |
| | | | JA2-TIMOUT0 | R47 | R174, R46 | JA2.19 | - | - |
| PB6/PC0 | 42 | PB6 /PC 0 | PMOD2-IO7_CS2_WIFIRXD | R175 | R48, R49 | PMOD2.10 | - | - |
| | | | JA2-M1UN | R48 | R175, R49 | JA2.14 | - | - |
| | | | JA2-TIMOUT1 | R49 | R175, R48 | JA2.20 | - | - |

6.14 Serial & USB to Serial Configuration

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

Table 6-15: Serial & USB to Serial Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|---------------------------|------|------------|-----------------------|------|-----------|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P34 | 15 | P34 | PMOD2-IO4_INT1_WIFIWKUP | R172 | R173, R45 | PMOD2.7 | - | - |
| | | | SERIAL-CTS | R173 | R172, R45 | U16.2 | - | - |
| | | | JA2-IRQa_M1HSIN0 | R45 | R172, R173 | JA2.7 | - | - |
| P30 | 18 | P30 | JA2-RXDa | R122 | R77, R70 | JA2.8 | - | - |
| | | | RXD1 | R70 | R77, R122 | E2Lite.11 | - | - |
| | | | SERIAL-RXD | R77 | R122, R70 | U16.3 | - | R132, R79 |
| JA2-SCKa | 19 | P27 | JA2-SCKa | - | - | JA2.10 | - | - |
| P26 | 20 | P26 | JA2-TXDa | R125 | R57, R78 | JA2.6 | - | - |
| | | | TXD1 | R57 | R125, R78 | E2Lite.5 | - | - |
| | | | SERIAL-TXD | R78 | R125, R57 | U6.3 | - | R195, R80 |
| SERIAL-RTS | 60 | PE3 | SERIAL-RTS | - | - | U6.2 | - | - |
| PE1 | 62 | PE1 | LIN-TX | R93 | R100, R80 | U7.4 | - | - |
| | | | JA6-TXDc | R100 | R93, R80 | JA6.9 | - | - |
| | | | SERIAL-TXD | R80 | R93, R100 | U6.3 | - | R195, R78 |
| PE2 | 61 | PE2 | LIN-RX | R83 | R95, R79 | U7.1 | - | - |
| | | | JA6-RXDc | R95 | R83, R79 | JA6.12 | - | - |
| | | | SERIAL-RXD | R79 | R83, R95 | U16.3 | - | R132, R77 |
| JA6-SCKc | 63 | PE0 | JA6-SCKc | - | - | JA6.11 | - | - |
| PA4 | 53 | PA4 | PMOD2-IO1_MOSI_TXD_RESET0 | R101 | R96, R36 | PMOD2.2 | - | - |
| | | | JA6-TXDb | R96 | R101, R36 | JA6.8 | - | - |
| | | | JA6-M1UIN | R36 | R101, R96 | JA6.14 | - | - |
| PA2 | 55 | PA2 | PMOD2-IO2_MISO_RXD_SCL | R102 | R22 | PMOD2.3 | - | - |
| | | | JA6-RXDc | R22 | R102 | JA6.7 | - | - |
| PA1 | 56 | PA1 | PMOD2-IO3_SCK_RTS | R97 | R20 | PMOD2.4 | R294 | R41 |
| | | | JA6-SCKb | R20 | R97 | JA6.10 | - | - |
| - | - | - | JA6-RS232RX | R132 | - | U16.3 | - | R77, R79 |
| - | - | - | JA6-RS232TX | R195 | - | U6.3 | - | R78, R80 |

6.15 LIN Configuration

Table 6-16 and Table 6-17 below details the function of the option links associated with LIN Configuration.

Table 6-16: LIN Configuration Option Links (1)

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|--------------------------|------|-----------|-----------------------|-----|-----------|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| LIN-NSLP | 37 | PC5 | LIN-NSLP | - | - | U7.2 | - | - |
| PE1 | 62 | PE1 | LIN-TX | R93 | R100, R80 | U7.4 | - | - |
| | | | JA6-RXDc | R100 | R93, R80 | JA6.9 | - | - |
| | | | SERIAL-RXD | R80 | R93, R100 | U6.3 | - | R195, R78 |
| PE2 | 61 | PE2 | LIN-RX | R83 | R95, R79 | U7.1 | - | - |
| | | | JA6-TXDc | R95 | R83, R79 | JA6.12 | - | - |
| | | | SERIAL-TXD | R79 | R83, R95 | U16.3 | - | R132, R77 |

Table 6-17: LIN Configuration Option Links (2)

| Reference | Explanation | Fit | DNF |
|--------------------|-------------|-----------|-----------|
| LIN Operating Mode | Master mode | R99, R105 | - |
| | Slave mode | - | R99, R105 |

6.16 Touch Interface Configuration

Table 6-18 below details the function of the option links associated with Touch Interface Configuration.

Table 6-18: Touch Interface Configuration Option Links

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|-------------|-----|------|--------------------------|------|------|-----------------------|-----|-----|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| TS12 | 34 | P54 | TS12 | - | - | BUTTON2 | - | - |
| TS11 | 33 | P55 | TS11 | - | - | BUTTON1 | - | - |
| TS10 | 32 | PH0 | TS10 | - | - | SLIDER1.S4 | - | - |
| TS9 | 31 | PH1 | TS9 | - | - | SLIDER1.S3 | - | - |
| TS8 | 30 | PH2 | TS8 | - | - | SLIDER1.S2 | - | - |
| TS7 | 29 | PH3 | TS7 | - | - | SLIDER1.S1 | - | - |
| PC4 | 38 | PC4 | TSCAP | R184 | R50 | C41 | - | - |
| | | | MCUPIN-TSCAP | R50 | R184 | - | - | - |

7. Headers

7.1 Application Headers

This RSK board 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.

Table 7-1: Application Header JA1 Connections

| Application Header JA1 | | | | | |
|------------------------|---------------------------|--------------|-----|------------------|---------|
| Pin | Header Name | MCU Pin | Pin | Header Name | MCU Pin |
| | Circuit Net Name | | | Circuit Net Name | |
| 1 | 5V | - | 2 | 0V | - |
| | JA1-5V | | | GROUND | |
| 3 | 3V3 | - | 4 | 0V | - |
| | JA1-3V3 | | | GROUND | |
| 5 | AVCC | 77 | 6 | AVSS | 74, 79 |
| | JA1-AVCC | | | JA1-AVSS_VREFL | |
| 7 | AVREF | 76 | 8 | ADTRG | 24 |
| | JA1-VREFH | | | JA1-ADTRG | |
| 9 | ADC0 | 75 | 10 | ADC1 | 73 |
| | JA1-ADC0 | | | JA1-ADC1 | |
| 11 | ADC2 | 72 | 12 | ADC3 | 71 |
| | JA1-ADC2 | | | JA1-ADC3 | |
| 13 | DAC0 | 2 | 14 | DAC1 | 80 |
| | JA1-DAC0 | | | JA1-DAC1 | |
| 15 | IO_0 | 57 | 16 | IO_1 | 54 |
| | JA1-IO0 | | | JA1-IO1 | |
| 17 | IO_2 | 52 | 18 | IO_3 | 46 |
| | JA1-IO2 | | | JA1-IO3 | |
| 19 | IO_4 | 45 | 20 | IO_5 | 44 |
| | JA1-IO4 | | | JA1-IO5 | |
| 21 | IO_6 | 43 | 22 | IO_7 | 35 |
| | JA1-IO6 | | | JA1-IO7 | |
| 23 | IRQd / IRQAEC / M2_H SIN0 | 17 / NC / NC | 24 | IIC_EX | NC |
| | JA1-IRQd | | | NC | |
| 25 | IIC_SDA | 27 | 26 | IIC_SCL | 28 |
| | JA1-SDA | | | JA1-SCL | |

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

Table 7-2: Application Header JA2 Connections

| Application Header JA2 | | | | | |
|------------------------|---------------------------------------|--------------|-----|---------------------------------------|---------|
| Pin | Header Name | MCU Pin | Pin | Header Name | MCU Pin |
| | Circuit Net Name | | | Circuit Net Name | |
| 1 | RESET | 9 | 2 | EXTAL | 12 |
| | RESn | | | JA2-EXTAL | |
| 3 | NMI | 14 | 4 | Vss1 | - |
| | JA2-NMIIn | | | GROUND | |
| 5 | WDT_OVF | NC | 6 | SClATX | 20 |
| | NC | | | JA2-TXD _a | |
| 7 | IRQ _a / WKUP / M1_HSIN0 | 15 / NC / 15 | 8 | SClARX | 18 |
| | JA2-IRQ _a _M1HSIN0 | | | JA2-RXD _a | |
| 9 | IRQ _b / M1_HSIN1 | 27 / 27 | 10 | SClACK | 19 |
| | JA2-IRQ _b _M1HSIN1 | | | JA2-SCK _a | |
| 11 | M1_UD | 36 | 12 | CTS _a RTS _a | 26 |
| | JA2-M1UD | | | JA2-CTS _a RTS _a | |
| 13 | M1_UP | 41 | 14 | M1_UN | 42 |
| | JA2-M1UP | | | JA2-M1UN | |
| 15 | M1_VP | 57 | 16 | M1_VN | 58 |
| | JA2-M1VP | | | JA2-M1VN | |
| 17 | M1_WP | 65 | 18 | M1_WN | 64 |
| | JA2-M1WP | | | JA2-M1WN | |
| 19 | TimerOut0 | 41 | 20 | TimerOut1 | 42 |
| | JA2-TIMOUT0 | | | JA2-TIMOUT1 | |
| 21 | TimerIn0 | 54 | 22 | TimerIn1 | 22 |
| | JA2-TIMIN0 | | | JA2-TIMIN1 | |
| 23 | IRQ _c / M1_EncZ / M1_HSIN2 | 16 / 22 / 16 | 24 | M1_POE | 43 |
| | JA2-23PIN | | | JA2-M1POE | |
| 25 | M1_TRCCLK | 26 | 26 | M1_TRDCLK | 25 |
| | JA2-M1TRCCLK | | | JA2-M1TRDCLK | |

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

Table 7-3: Application Header JA5 Connections

| Application Header JA5 | | | | | |
|------------------------|--------------------------|--------------|-----|------------------|---------|
| Pin | Header Name | MCU Pin | Pin | Header Name | MCU Pin |
| | Circuit Net Name | | | Circuit Net Name | |
| 1 | ADC4 | 70 | 2 | ADC5 | 69 |
| | JA5-ADC4 | | | JA5-ADC5 | |
| 3 | ADC6 | 68 | 4 | ADC7 | 67 |
| | JA5-ADC6 | | | JA5-ADC7 | |
| 5 | CAN1TX | 26 | 6 | CAN1RX | 25 |
| | JA5-CAN1TX | | | JA5-CAN1RX | |
| 7 | CAN2TX | NC | 8 | CAN2RX | NC |
| | NC | | | NC | |
| 9 | IRQe / M2_EncZ / M2HSIN1 | NC / NC / NC | 10 | IRQf / 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 7-4 below lists the connections of the application header, JA6.

Table 7-4: Application Header JA6 Connections

| Application Header JA6 | | | | | |
|------------------------|------------------|---------|-----|------------------|---------|
| Pin | Header Name | MCU Pin | Pin | Header Name | MCU Pin |
| | Circuit Net Name | | | Circuit Net Name | |
| 1 | DREQ | NC | 2 | DACK | NC |
| | NC | | | NC | |
| 3 | TEND | NC | 4 | STBYn | NC |
| | NC | | | NC | |
| 5 | RS232TX | NC | 6 | RS232RX | NC |
| | JA6-RS232TX | | | JA6-RS232RX | |
| 7 | SCIbRX | 55 | 8 | SCIbTX | 53 |
| | JA6-RXDb | | | JA6-TXDb | |
| 9 | SClckTX | 62 | 10 | SClck | 56 |
| | JA6-TXDc | | | JA6-SCKb | |
| 11 | SClck | 63 | 12 | SClckRX | 61 |
| | JA6-SCKc | | | JA6-RXDc | |
| 13 | M1_Toggle | 5 | 14 | M1_Uin | 53 |
| | JA6-M1TOGGLE | | | JA6-M1UIN | |
| 15 | M1_Vin | 51 | 16 | M1_Win | 49 |
| | JA6-M1VIN | | | JA6-M1WIN | |
| 17 | Reserved | NC | 18 | Reserved | NC |
| | NC | | | NC | |
| 19 | Reserved | NC | 20 | Reserved | NC |
| | NC | | | NC | |
| 21 | Reserved | NC | 22 | Reserved | NC |
| | NC | | | NC | |
| 23 | Unregulated_VCC | - | 24 | Vss | - |
| | Unregulated_VCC | | | GROUND | |

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.

Table 7-5: Microcontroller Pin Header, J1

| Microcontroller Pin Header J1 | | | | | |
|-------------------------------|------------------|---------|-----|------------------|---------|
| Pin | Circuit Net Name | MCU Pin | Pin | Circuit Net Name | MCU Pin |
| 1 | LED2 | 1 | 2 | JA1-DAC0 | 2 |
| 3 | LED1 | 3 | 4 | NC | NC |
| 5 | JA6-M1TOGGLE | 5 | 6 | MD_FINED | 6 |
| 7 | NC | NC | 8 | NC | NC |
| 9 | RESn | 9 | 10 | MCUPIN-XTAL | 10 |
| 11 | GROUND | - | 12 | JA2-EXTAL | 12 |
| 13 | UC_VCC | - | 14 | JA2-NMIn | 14 |
| 15 | P34 | 15 | 16 | P32 | 16 |
| 17 | P31 | 17 | 18 | P30 | 18 |
| 19 | JA2-SCKa | 19 | 20 | P26 | 20 |
| 21 | NC | NC | 22 | NC | NC |
| 23 | NC | NC | 24 | NC | NC |
| 25 | NC | NC | 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 below lists the connections of the microcontroller pin header, J2.

Table 7-6: Microcontroller Pin Header, J2

| Microcontroller Pin Header J2 | | | | | |
|-------------------------------|------------------|---------|-----|----------------------------|---------|
| Pin | Circuit Net Name | MCU Pin | Pin | Circuit Net Name | MCU Pin |
| 1 | LED0 | 21 | 2 | P20 | 22 |
| 3 | PMOD1-INT0 | 23 | 4 | P16 | 24 |
| 5 | P15 | 25 | 6 | P14 | 26 |
| 7 | P13 | 27 | 8 | P12 | 28 |
| 9 | MCUPIN-TS7 | 29 | 10 | MCUPIN-TS8 | 30 |
| 11 | MCUPIN-TS9 | 31 | 12 | MCUPIN-TS10 | 32 |
| 13 | MCUPIN-TS11 | 33 | 14 | MCUPIN-TS12 | 34 |
| 15 | PC7 | 35 | 16 | PC6 | 36 |
| 17 | LIN-NSLP | 37 | 18 | MCUPIN-TSCAP | 38 |
| 19 | PMOD2-SDA | 39 | 20 | PMOD2-IO5 RESET1_WIFIMDRES | 40 |
| 21 | NC | NC | 22 | NC | NC |
| 23 | NC | NC | 24 | NC | NC |
| 25 | NC | NC | 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 below lists the connections of the microcontroller pin header, J3.

Table 7-7: Microcontroller Pin Header, J3

| Microcontroller Pin Header J3 | | | | | |
|-------------------------------|--------------------------------|---------|-----|------------------|---------|
| Pin | Circuit Net Name | MCU Pin | Pin | Circuit Net Name | MCU Pin |
| 1 | PB7/PC1 | 41 | 2 | PB6/PC0 | 42 |
| 3 | PB5 | 43 | 4 | JA1-IO5 | 44 |
| 5 | PB3 | 45 | 6 | PB2 | 46 |
| 7 | PMOD1- IO1_MOSI_TXD_RESET0 | 47 | 8 | UC_VCC | - |
| 9 | PB0 | 49 | 10 | GROUND | - |
| 11 | PA6 | 51 | 12 | JA1-IO2 | 52 |
| 13 | PA4 | 53 | 14 | PA3 | 54 |
| 15 | PA2 | 55 | 16 | PA1 | 56 |
| 17 | PA0 | 57 | 18 | PE5 | 58 |
| 19 | PMOD1- IO5_RESET1_WIFIMDRES | 59 | 20 | SERIAL-RTS | 60 |
| 21 | NC | NC | 22 | NC | NC |
| 23 | NC | NC | 24 | NC | NC |
| 25 | NC | NC | 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 below lists the connections of the microcontroller pin header, J4.

Table 7-8: Microcontroller Pin Header, J4

| Microcontroller Pin Header J4 | | | | | |
|-------------------------------|------------------|---------|-----|------------------|---------|
| Pin | Circuit Net Name | MCU Pin | Pin | Circuit Net Name | MCU Pin |
| 1 | PE2 | 61 | 2 | PE1 | 62 |
| 3 | JA6-SCKc | 63 | 4 | JA2-M1WN | 64 |
| 5 | JA2-M1WP | 65 | 6 | PMOD1-SDA | 66 |
| 7 | JA5-ADC7 | 67 | 8 | JA5-ADC6 | 68 |
| 9 | JA5-ADC5 | 69 | 10 | JA5-ADC4 | 70 |
| 11 | JA1-ADC3 | 71 | 12 | JA1-ADC2 | 72 |
| 13 | JA1-ADC1 | 73 | 14 | VREFL0 | 74 |
| 15 | P40 | 75 | 16 | VREFH0 | 76 |
| 17 | AVCC0 | 77 | 18 | LED3 | 78 |
| 19 | AVSS0 | 79 | 20 | JA1-DAC1 | 80 |
| 21 | NC | NC | 22 | NC | NC |
| 23 | NC | NC | 24 | NC | NC |
| 25 | NC | NC | 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 |

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 E2 Lite debugger. An E2 Lite debugger is supplied with this RSK product.

For further information regarding the debugging capabilities of the E2 Lite debuggers, refer to E2 emulator Lite User's Manual (R20UT3240EJ), E1/E20/E2 Emulator, E2 Emulator Lite Additional Document for User's Manual (R20UT0399EJ).

8.2 Compiler Restrictions

The compiler supplied with this RSK is fully functional for a period of 60 days from first use. After the first 60 days of use have expired, the compiler will default to a maximum of 128k code and data. To use the compiler with programs greater than this size you need to purchase the full tools from your distributor.

The protection software for the compiler will detect changes to the system clock. Changes to the system clock back in time may cause the trial period to expire prematurely.

8.3 Mode Support

The MCU supports Single Chip and Boot Modes (SCI and FINE), which are configured on the RSK board. Details of the modifications required can be found in section 6.2. All other MCU operating modes are configured within the MCU's registers, which are listed in the RX140 Group User's Manual: Hardware.

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 E2 Emulator Lite (as supplied with this RSK) supports break points, event points (including mid-execution insertion) and basic trace functionality. It is limited to a maximum of 8 on-chip event points, 256 software breaks and 256 branch/cycle trace. For further details, refer E2 Emulator Lite User's Manual (R20UT3240EJ).

8.5 Address Space

For the MCU address space details, refer to the 'Address Space' section of RX140 Group User's Manual: Hardware.

9. Additional Information

Technical Support

For information about the RX140 Group microcontrollers refer to the 'RX140 Group Manual: Hardware'.

For information about the RX assembly language, refer to the 'RX Family User's Manual: Software'.

Technical Contact Details

America: techsupport.america@renesas.com

Europe: <https://www.renesas.com/eu/en/support/contact.html>

Global & Japan: <https://www.renesas.com/support/contact.html>

General information on this product can be found on the Renesas website at:

<https://www.renesas.com/rskrx140>

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

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

Trademarks

All brand or product names used in this manual are trademarks or registered trademarks of their respective companies or organisations.

Copyright

This document may be, wholly or partially, subject to change without notice. All rights reserved. Duplication of this document, either in whole or part is prohibited without the written permission of Renesas Electronics Europe GmbH.

© 2022 Renesas Electronics Europe GmbH. All rights reserved.

© 2022 Renesas Electronics Corporation. All rights reserved.

| | |
|-------------------------|--|
| REVISION HISTORY | RX140 Group Renesas Starter Kit for RX140 User's Manual |
|-------------------------|--|

| Rev. | Date | Description | |
|-------------|--------------|--------------------|----------------------|
| | | Page | Summary |
| 1.00 | Jan 17, 2022 | - | First Edition issued |

RX140 Group
Renesas Starter Kit for RX140 User's Manual

Publication Date: Rev.1.00 Jan 17, 2022

Published by: Renesas Electronics Corporation

RX140 Group