User's Manual

32

# RX72T Group

## Renesas Starter Kit for RX72T
## User's Manual

RENESAS 32-Bit MCU
RX Family / RX700 Series

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1. Handling of Unused Pins

   Handle unused pins in accordance with the directions given under Handling of Unused Pins in the manual.

   ¾ 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 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. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

   The state of the product is undefined at the moment when power is supplied.

   ¾ The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment 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 moment when power is supplied until the reset process is completed.
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   Access to reserved addresses is prohibited.

   ¾ The reserved addresses are provided for the possible future expansion of functions. Do not access these addresses; the correct operation of LSI is not guaranteed if they are accessed.

4. Clock Signals

   After applying a reset, only release the reset line after the operating clock signal has become stable. When switching the clock signal during program execution, wait until the target clock signal has stabilized.

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5. Differences between Products

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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.

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# How to Use This Manual

## 1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the RSK hardware functionality, and electrical characteristics. It is intended for users designing sample code on the RSK platform, using the many different incorporated peripheral devices.

The manual comprises of an overview of the capabilities of the RSK product, but does not intend to be a guide to embedded programming or hardware design. Further details regarding setting up the RSK and development environment can be found in the tutorial manual.

Particular attention should be paid to the precautionary notes when using the manual. These notes occur within the body of the text, at the end of each section, and in the Usage Notes section.

The revision history summarizes the locations of revisions and additions. It does not list all revisions. Refer to the text of the manual for details.

The following documents apply to the RSKRX72T. Please use the latest version of the document.
The latest version is posted on the Renesas Electronics website.

| Document Type | Description | Document Title | Document No. |
|---|---|---|---|
| User's Manual | Describes the technical details of the RSK hardware. | Renesas Starter Kit for RX72T User's Manual | R20UT4272EG (This manual) |
| Tutorial Manual | Provides a guide to setting up RSK environment, running sample code and debugging programs. | Renesas Starter Kit for RX72T Tutorial Manual | CS+: R20UT4273EG e$^2$ studio: R20UT4276EG |
| Quick Start Guide | Provides simple instructions to setup the RSK and run the first sample. | Renesas Starter Kit for RX72T Quick Start Guide | CS+: R20UT4274EG e$^2$ studio: R20UT4277EG |
| Smart Configurator Tutorial | Provides a guide to code generation and importing into the e$^2$ studio IDE. | Renesas Starter Kit for RX72T Smart Configurator Tutorial Manual | CS+: R20UT4275EG e$^2$ studio: R20UT4278EG |
| Schematics | Full detail circuit schematics of the RSK. | Renesas Starter Kit for RX72T Schematics | R20UT4271EG |
| Hardware Manual | Provides technical details of the RX72T microcontroller. | RX72T Group Hardware Manual | R01UH0803EJ |

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## 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 | Electronically Erasable Programmable Read Only Memory |
| EMC | Electromagnetic Compatibility |
| ESD | Electrostatic Discharge |
| GLCDC | Graphic LCD Controller |
| $I^2C$ (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 |

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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.



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## 1.3 Board specification

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

**Table 1-1: Board Specification**

| Item | Specification |
|---|---|
| Microcontroller | Part No: R5F572TKCDFB |
| | Package: 144-pin LFQFP |
| | On-Chip Memory: ROM 1MB+32KB, RAM 128KB+16KB |
| On-Board Memory | $I^2C$ EEPROM: 2Kbit |
| Input Clock | RX72T Main: 8MHz |
| | RL78/G1C Main: 12MHz |
| Power Supply | DC Power Jack: 5 V Input |
| | Power Supply IC: 5V Input, 3.3V Output |
| Debug Interface | E1/E2 Lite 14-pin box header |
| DIP Switch | Mode Configuration: 2-pole x 1 |
| Push Switch | Reset Switch x 1 |
| | User Switch x 3 |
| Potentiometer (for ADC) | Single-turn, 10kΩ |
| LED | Power indicator: green x 1 |
| | User: green x 1, orange x 1, red x 2 |
| CAN | Connector: 2.54mm pitch, 3-pin x 1 |
| | CAN Driver x 1 |
| LIN | Connector: 2.54mm pitch, 3-pin x 1 *1 |
| | LIN Driver x 1 |
| 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 |
| | PMOD2 *1: Straight type, 12-pin Connector |
| Application Board Interface *1 | 2.54 mm pitch, 26-pin x 2 (JA1, JA2), 50-pin x 1 (JA3), 24-pin x 2 (JA5, JA6) |

*1: The connector is not included to a product.



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# 2. Power Supply

## 2.1 Requirements

This RSK is supplied with an E1 debugger or E2 Lite debugger. The debugger is able to power the RSK board with up to 200mA. When the RSK is connected to another system then that system should supply power to the RSK. This board has an optional centre positive supply connector using a 2.0mm barrel power jack.

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

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

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

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

| J7 *1 Setting | J8 Setting | J9 Setting | J12 Setting | Supply Source | VCC_USB | Board_VCC UC_VCC | Board_5V |
|---|---|---|---|---|---|---|---|
| **Open** | **2-3 Shorted** | **2-3 Shorted** | **1-2 Shorted** | **E2-Lite / E1(3.3V)** | **3.3V *4, 5** | **3.3V *3** | **3.3V *7** |
| Open | 2-3 Shorted | 1-2 Shorted | 2-3 Shorted | E1(5V) | 3.3V *4, 5 | 5V *2 | 5V |
| Open | 2-3 Shorted | 2-3 Shorted | 1-2 Shorted | E1(5V) / PWR / Unregulated_VCC / JA1-5V | 5V *4, 5, 6 | 5V *2 | 5V |
| Open | 1-2 Shorted | 1-2 Shorted | 1-2 or 2-3 Shorted | PWR / Unregulated_VCC / JA1-5V | 3.3V *5 | 3.3V *3 | 5V |
| Open | 2-3 Shorted | 1-2 Shorted | 2-3 Shorted | PWR / Unregulated_VCC / JA1-5V | 3.3V *5 | 5V *2 | 5V |
| Shorted pin | 1-2 Shorted | 1-2 Shorted | 1-2 or 2-3 Shorted | VBUS | 3.3V *4, 6 | 3.3V *3 | 5V |
| Shorted pin | 2-3 Shorted | 1-2 Shorted | 2-3 Shorted | VBUS | 3.3V *4, 6 | 5V *2 | 5V |

*1: The connector is not included to a product.

*2: 3.3V Pmod™ interface and Pmod™ LCD module cannot be used.

*3: 5V Pmod™ interface and CAN, LIN cannot be used.

*4: USB Host interface cannot be used.

*5: USB Function interface (Bus-powered) cannot be used.

*6: USB Function interface (Self-powered) cannot be used.

*7: When 3.3 V is supplied from the emulator, Board_5 V becomes 3.3 V voltage.

When using the function of 5 V, prepare an AC adapter. Suitable plugs are center plus, outer diameter 5.5 mm, inner diameter 2.1 mm.

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 Smart Configurator Tutorial Manual' for further information of this example.

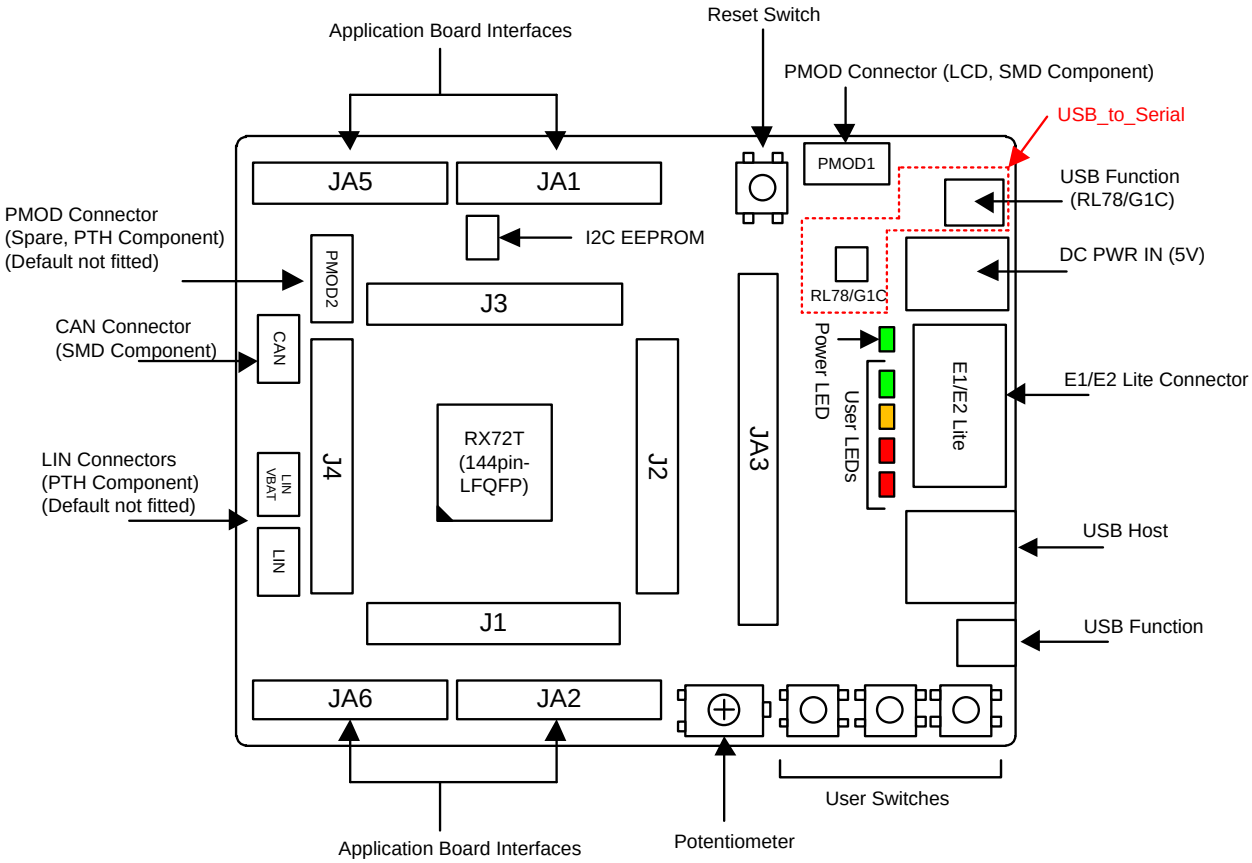


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# 3. Board Layout

## 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**



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## 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.

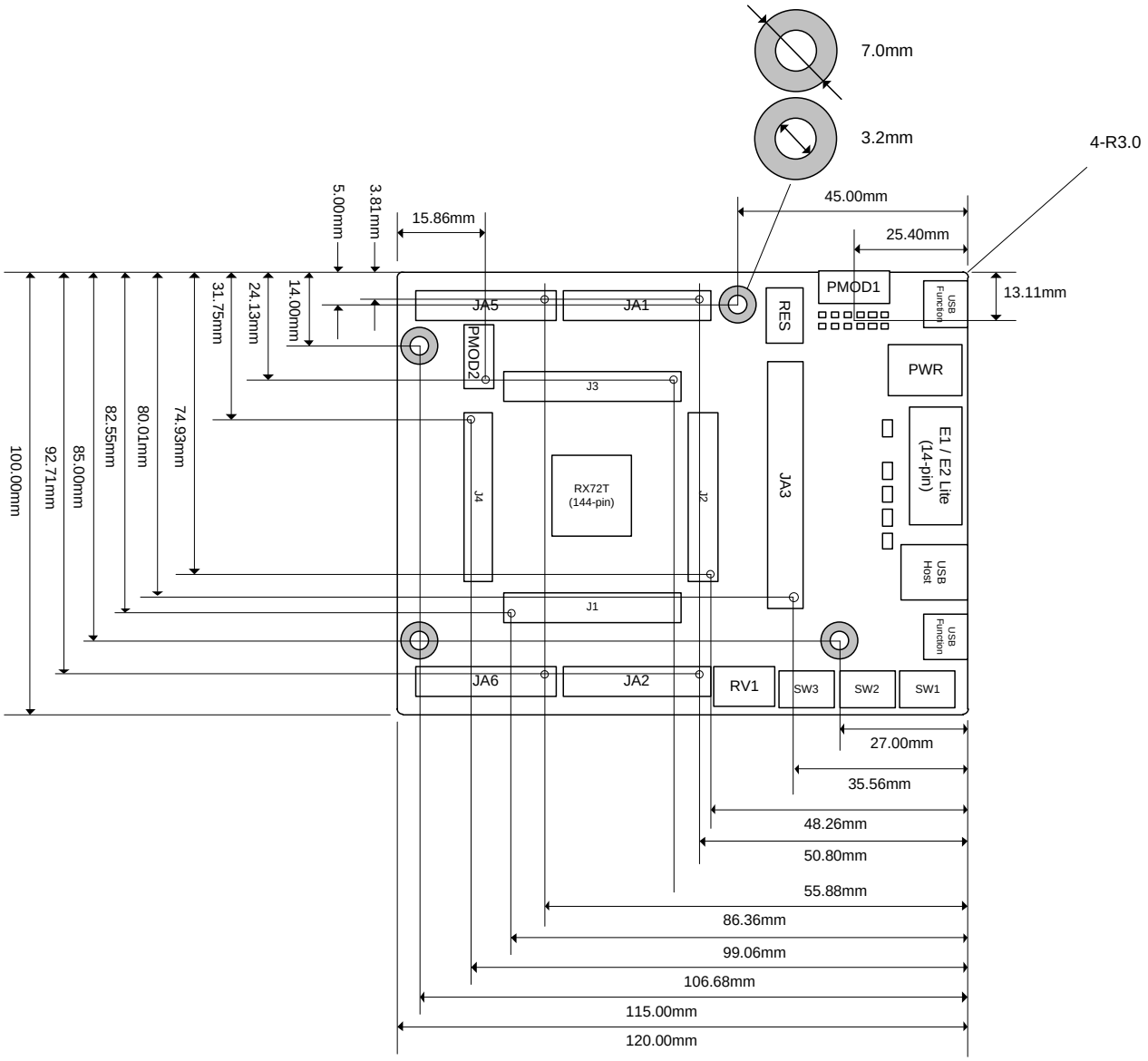



**Figure 3-2: Board Dimensions**



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## 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.

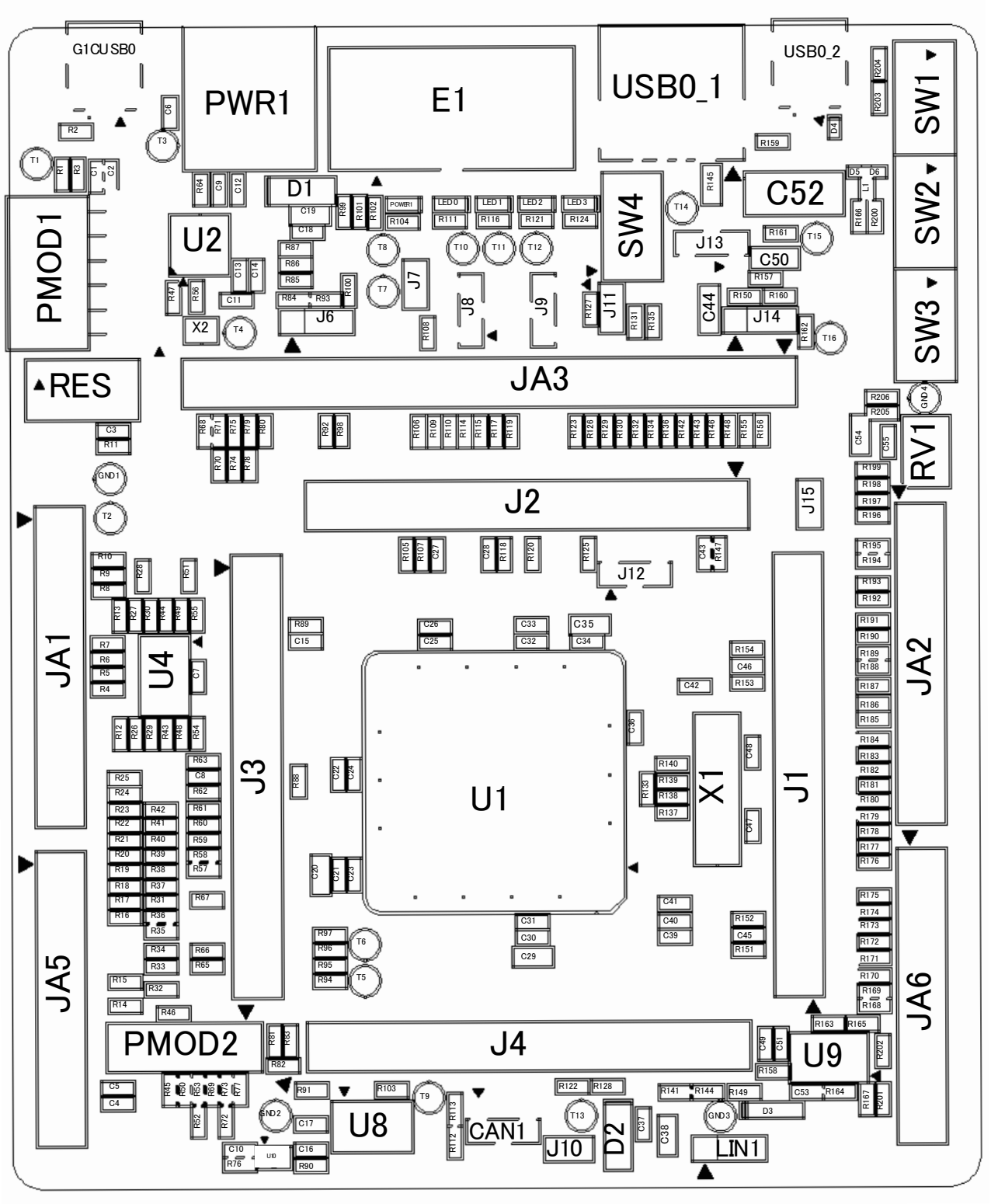



**Figure 3-3: Top-Side Component Placement**



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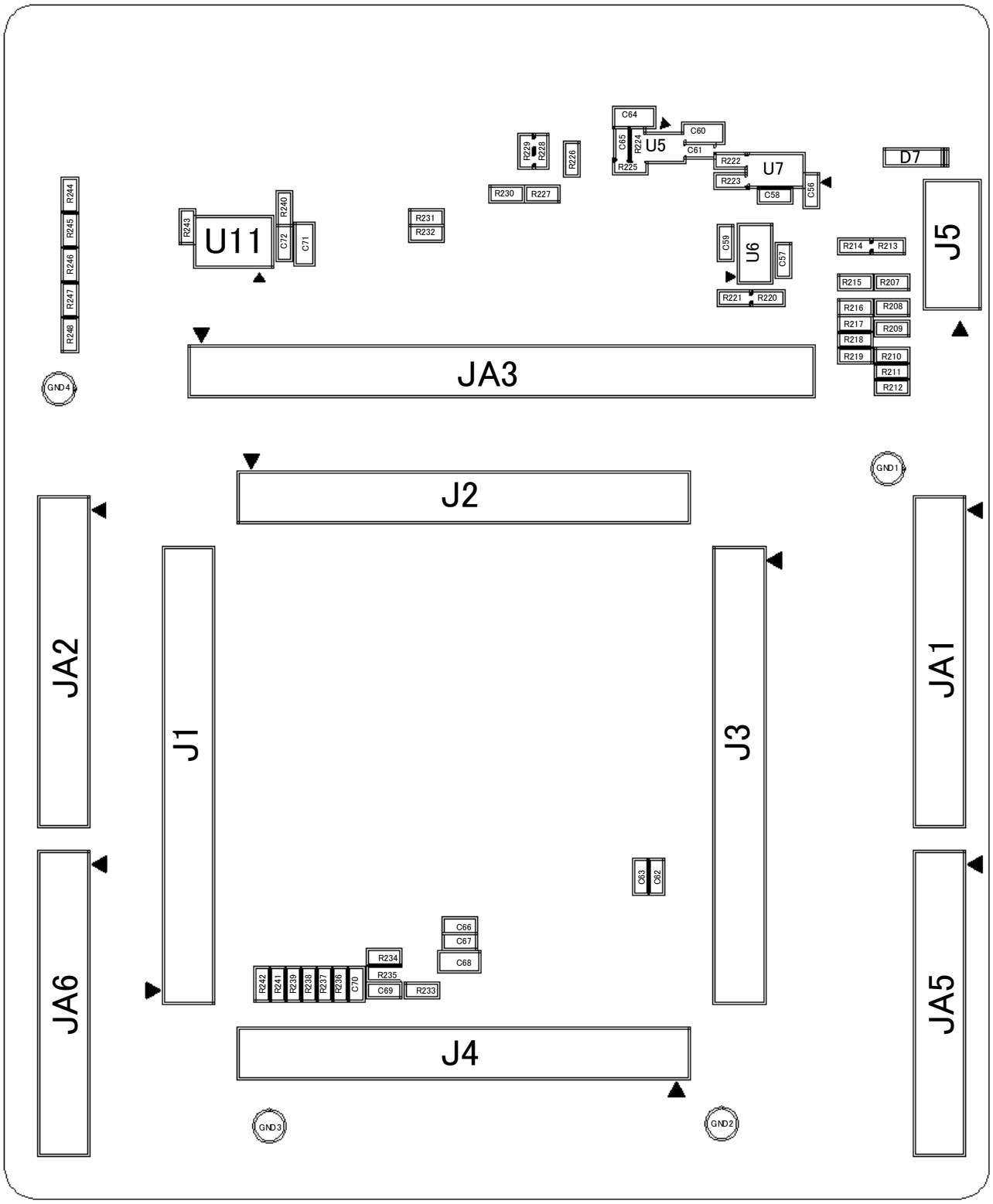



**Figure 3-4: Bottom-Side Component Placement**



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# 4. Connectivity

## 4.1 Internal Board Connections

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

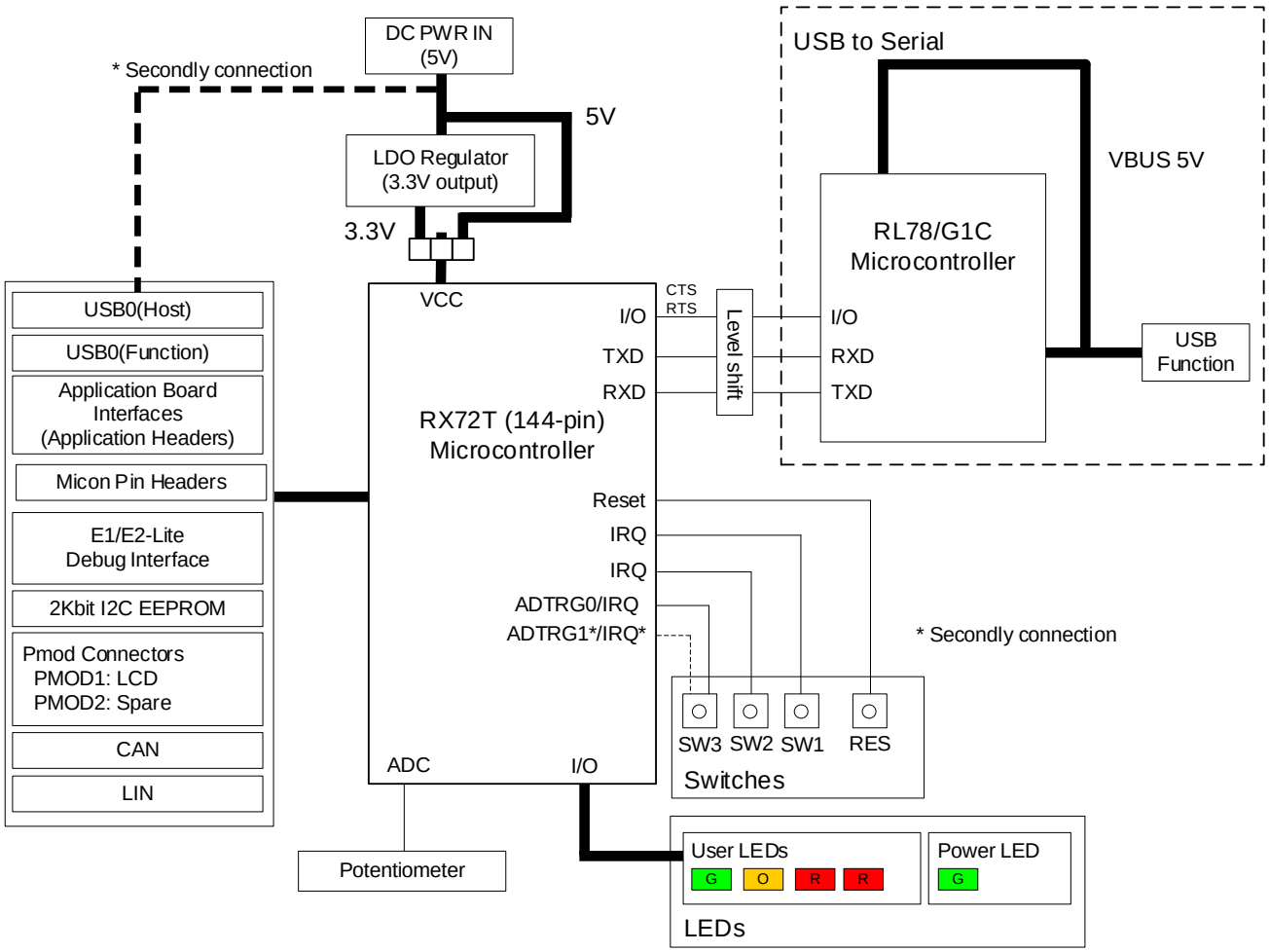



**Figure 4-1: Internal Board Block Diagram**



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## 4.2 Debugger Connections

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

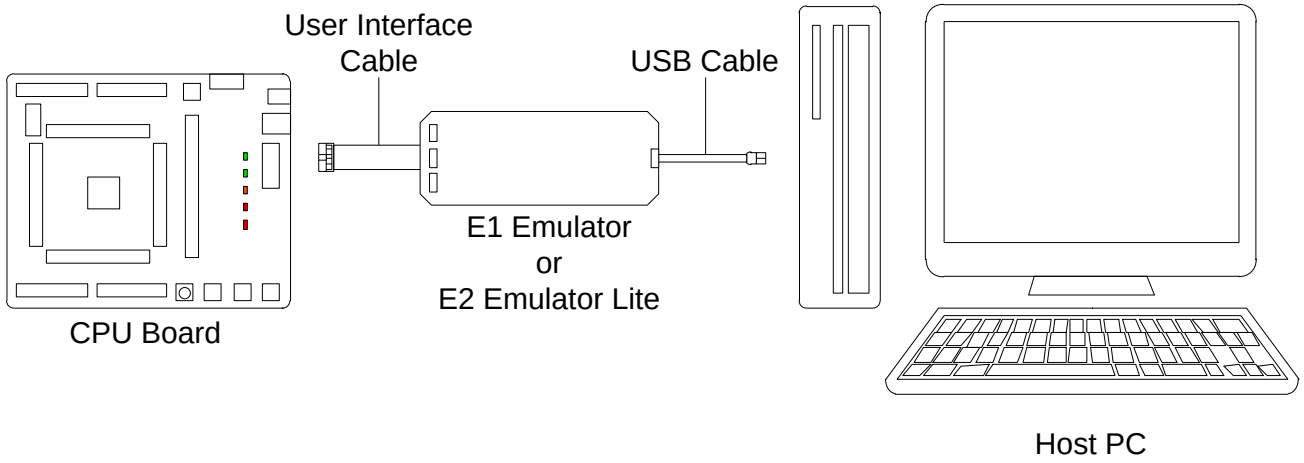



**Figure 4-2: Debugger Connection Diagram**



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# 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 RX72T 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 RX72T 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 RX72T | Fitted | 8MHz | Encapsulated, SMT |
| X2 | 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: Switch Connections**

| Switch | Function | MCU | |
|---|---|---|---|
| | | Signal (Port) | Pin |
| RES | When pressed, the microcontroller is reset. | RES# | 15 |
| SW1 | Connects to an IRQ0_DS input for user controls. | P10 | 141 |
| SW2 | Connects to an IRQ9 input for user controls. | PB3 | 48 |
| SW3 | Connects to an IRQ7_DS input for user controls.<br>Connects to an ADTRG0 input for ADC controls. | P20 | 101 |
| | Connects to an IRQ6_DS input for user controls.<br>Connects to an ADTRG1 input for ADC controls. | P21 | 100 |

## 5.4 LEDs

There are 5 LEDs on the CPU 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 |
| POWER1 | Green | Indicates the status of the Board_VCC power rail. | NC | NC |
| LED0 | Green | User operated LED. | P54 | 112 |
| LED1 | Orange | User operated LED. | P55 | 111 |
| LED2 | Red | User operated LED. | P60 | 110 |
| LED3 | Red | User operated LED. | P61 | 109 |



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## 5.5 Potentiometer

A single-turn potentiometer is connected as a potential divider to analog input AN000, pin 131. 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 RX72T Group User's Manual: Hardware for further details.

## 5.6 Pmod™

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

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

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

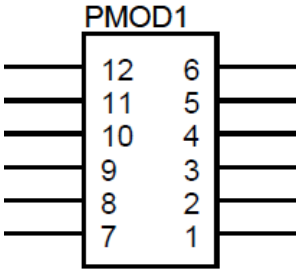



**Figure 5-1: Digilent Pmod™ Compatible Header Pin Numbering**

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

| Digilent Pmod™ Compatible Header Connections | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin | Circuit Net Name | MCU | | Pin | Circuit Net Name | MCU | |
| | | Port | Pin | | | Port | Pin |
| 1 | PMOD1-CS | PA2 | 57 | 7 | PMOD1-IO0 | PC6 | 62 |
| 2 | PMOD1-MOSI | PB0 | 51 | 8 | PMOD1-IO1 | PC5 | 63 |
| 3 | PMOD1-MISO | PA5 | 54 | 9 | PMOD1-IO2 | P25 | 94 |
| 4 | PMOD1-SCK | PA4 | 55 | 10 | PMOD1-IO3 | P26 | 93 |
| 5 | GROUND | - | - | 11 | GROUND | - | - |
| 6 | Board_VCC | - | - | 12 | Board_VCC | - | - |

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

| Digilent Pmod™ Compatible Header Connections | | | | | | | |
|---|---|---|---|---|---|---|---|
| Pin | Circuit Net Name | MCU | | Pin | Circuit Net Name | MCU | |
| | | Port | Pin | | | Port | Pin |
| 1 | PMOD2-CS | P24 | 95 | 7 | PMOD2-IO0 | PF0 | 34 |
| 2 | PMOD2-MOSI | P23 | 96 | 8 | PMOD2-IO1 | PK0 | 85 |
| 3 | PMOD2-MISO | P22 | 97 | 9 | PMOD2-IO2 | P63 | 107 |
| 4 | PMOD2-SCK | P30 | 91 | 10 | PMOD2-IO3 | P62 | 108 |
| 5 | GROUND | - | - | 11 | GROUND | - | - |
| 6 | Board_VCC | - | - | 12 | Board_VCC | - | - |



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## 5.7 USB Serial Port

A USB serial port is implemented in a Renesas low power microcontroller (RL78/G1C) and is connected to the RX72T Serial Communications Interface (SCI) module. Multiple options are provided to allow the selection of the connected SCI11 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. *1 | PD3 | 27 |
| | SCI11 Transmit Signal. | PB5 | 41 |
| | External RS232 Transmit Signal. *1 | - | - |
| SERIAL-RXD | SCI1 Receive Signal. *1 | PD5 | 25 |
| | SCI11 Receive Signal. | PB6 | 40 |
| | External RS232 Receive Signal. *1 | - | - |
| SERIAL-CTS*2 | Clear To Send. | PC3 | 99 |
| SERIAL-RTS*2 | Request To Send. | P31 | 89 |

*1: This connection is a not available in the default RSK configuration - refer to §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 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.

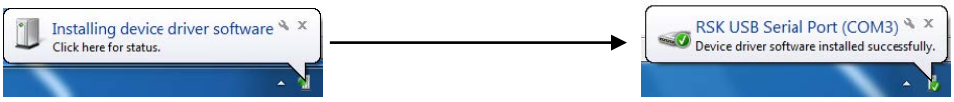



**Figure 5-2: USB-Serial Windows™ Installation message**

If you do not have the driver, please download the driver installer from the following URL.
https://www.renesas.com/en-eu/software/D6000699.html

## 5.8 Controller Area Network (CAN)

A CAN transceiver IC is fitted to the CPU board, and connected to the CAN MCU peripheral. For further details regarding the CAN protocol and supported modes of operation, please refer to the RX72T 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 |
| CAN1TX<br>JA5-CAN1TX *1 | CAN Data Transmission. | PA0 | 59 |
| CAN1RX<br>JA5-CAN1RX *1 | CAN Data Reception. | PA1 | 58 |

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



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## 5.9 External Bus

The RX72T features an external data bus, which is connected to various devices on the CPU board. Details of the devices connected to the external data bus are listed in **Table 5-8** below. Further details of the devices connected to the external bus can be found in the board schematics.

**Table 5-8: External Bus Address Space**

| Chip Select | Device Name | Device Description | Address Space |
|---|---|---|---|
| CS0(JA3-CSa) | JA3 | Application Header | FFE00000h – FFFFFFFFh (2MByte) |
| CS1 | - | Unused | 07E00000h – 07FFFFFFh (2MByte) |
| CS2(JA3-CSc) | JA3 | Application Header | 06E00000h – 06FFFFFFh (2MByte) |
| CS3(JA3-CSb) | JA3 | Application Header | 05E00000h – 05FFFFFFh (2MByte) |

## 5.10 I²C Bus (Inter-IC Bus)

The RX72T features one I²C (Inter-IC Bus) interface modules. RIIC0 is connected to a 2Kbit EEPROM. Specific details of the EEPROM device and the connections can be found in the board schematics.

## 5.11 Local-Interconnect Network (LIN)

A LIN transceiver IC is fitted to the CPU board, and connected to the LIN MCU peripheral. For further details regarding the LIN protocol and supported modes of operation, please refer to the RX72T Group User's Manual: Hardware. The connections for the LIN microcontroller signals are listed in **Table 5-9** below.

**Table 5-9: LIN Connections**

| CAN Signal | Function | MCU | |
|---|---|---|---|
| | | Port | Pin |
| LINTXD | LIN Data Transmission. | P23 | 96 |
| LINRXD | LIN Data Reception. | P22 | 97 |
| LINNSLP | LIN Transceiver Device Sleep Control. | P24 | 95 |

## 5.12 Universal Serial Bus (USB)

This CPU board 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 connection for the USB0 module is shown in **Table 5-10** below.

**Table 5-10: USB0**

| USB Signal | Function | MCU | |
|---|---|---|---|
| | | Port | Pin |
| USB0-DP | D+ I/O pin of the USB on-chip transceiver | USB0-DP | 36 |
| USB0-DM | D– I/O pin of the USB on-chip transceiver | USB0-DM | 35 |
| USB0-VBUS | USB cable connection monitor pin | PD2 | 28 |
| USB0-VBUSEN | VBUS (5V) supply enable signal for external power supply chip | PC1 | 46 |
| USB0-OVRCURA | External overcurrent detection signals | PC2 | 45 |



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# 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 or by configuration DIP switches

A link resistor is a 0Ω surface mount resistor, which is used to short or isolate parts of a circuit. Option links are listed in the following sections, detailing their function when fitted or removed. **Bold, blue text** indicates the default configuration that the CPU board 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 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 RX72T Group User's Manual: Hardware and CPU board schematics for further information.

## 6.2 MCU Operating Modes

**Table 6-1** below details the option links associated with configuring the MCU Operating Modes.

**Table 6-1: MCU Operating Modes Switch Settings (SW4)**

| Reference | Pin1 | Pin2 | Explanation | Related Ref. |
|---|---|---|---|---|
| SW4 | **OFF** | **OFF(don't care)** | **Single Chip Mode** | |
| | ON | OFF | User Boot Mode | R126 |
| | ON | ON | SCI Boot Mode | R126 |



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## 6.3 E1/E2 Lite Debugger Configuration

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

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

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P00 | 9 | P00 | E1-UB | R126, R24 | R129 | E1/E2 Lite.10 | - | - |
| | | | DSW-UB | | | SW4.2 | - | - |
| | | | JA1-IRQd_M2HSIN0 | R126, R24 | R129 | JA1.23 | - | - |
| | | | JA3-A11 | R129 | R126, R24 | JA3.12 | - | - |
| PD7 | 23 | PD7 | E1-TRSTn | - | - | E1/E2 Lite.3 | - | - |
| PD6 | 24 | PD6 | E1-TMS | - | - | E1/E2 Lite.9 | - | - |
| PD5 | 25 | PD5 | E1-TDI_RXD | R231 | R194, R172 | E1/E2 Lite.11 | - | - |
| | | | SERIAL-RXD | R194 | R231, R172 | U7.3 | - | R195, R175 |
| | | | JA6-RXDb | R172 | R231, R194 | JA6.7 | - | |
| PD4 | 26 | PD4 | E1-TCK_FINEC | R101, R154 | R99 | E1/E2 Lite.1 | - | - |
| | | | JA6-SCKb | R99, R154 | R101 | JA6.10 | - | - |
| PD3 | 27 | PD3 | E1-TDO_TXD | R230 | R142, R173 | E1/E2 Lite.5 | | |
| | | | SERIAL-TXD | R142 | R230, R173 | U6.3 | - | R143, R174 |
| | | | JA6-TXDb | R173 | R230, R142 | JA6.8 | | |
| RESn | 15 | - | E1-RESn | - | - | E1/E2 Lite.13 | - | - |
| | | | SW-RESn | - | - | RES1(Switch) | - | - |
| | | | JA2-RESn | - | - | JA2.1 | - | - |
| EMLE | 7 | - | E1-EMLE | - | - | E1/E2 Lite.4 | - | - |
| | | | JP-EMLE | - | - | J6.2 | R93 | - |
| MD_FINED | 11 | - | E1-MD_FINED | - | - | E1/E2 Lite.7 | - | - |
| | | | DSW-MD_FINED | - | - | SW4.1 | - | - |

**Table 6-3** below details the function of the jumpers associated with the E1/E2 Lite Debugger.

**Table 6-3: E1/E2 Lite Debugger Configuration Jumper Settings**

| Reference | Jumper Position | Explanation | Related Ref. |
|---|---|---|---|
| J11(DNF) *1 | Shorted Pin1-2 | Enable E1/E2 Lite debugging with Hot plug-in function. | - |
| | Shorted Pin2-3 | Enable E1/E2 Lite normal debugging and MCU single operation (without E1/E2 Lite). | R93 |
| | All open | DO NOT SET. | - |

*1: Jumper J11 is not fitted on the default CPU board. Same as Jumper Position “Shorted pin2-3” setting by resistor R93.



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## 6.4 Power Supply Configuration

**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 | Related Ref. |
|---|---|---|---|
| J7(DNF) *1 | Shorted | VBUS0 power rail to Board_5V. | U5 |
| | Open | Disconnects VBUS0 power rail from Board_5V. | |
| J8 *2 | Shorted Pin1-2 | Board_3V3 power rail to Board_VCC. | J9 |
| | Shorted Pin2-3 *4 | Board_5V power rail to Board_VCC. | |
| | All Open | DO NOT SET. | |
| J9 *2 | Shorted Pin1-2 | Regulator output(3.3V) to Board_3V3. | |
| | Shorted Pin2-3 *3 | Disconnects regulator output(3.3V) from Board_3V3. | |
| | All Open | Disconnects regulator output(3.3V) from Board_3V3. | |
| J11(DNF) *5 | Shorted | Board_VCC power rail to UC_VCC. | R127 |
| | Open | Enable current probe for measurement MCU current consumption. | |
| J12 | Shorted Pin1-2 | The operating voltage of VCC_USB is set to the same as the operating voltage of the MCU | |
| | Shorted Pin2-3 | Operating voltage of VCC_USB is fixed at 3.3 V | |
| | All open | Please do not set | |

*1: Jumper J7 is not fitted on the default CPU board.
*2: Same as Jumper Position “Shorted pin2-3” setting by jumper block.
*3: When the 3.3 V power supply source is the E1 / E2 Lite emulator or JA1-3V3, be sure to release it.
*4: When 5V power supply source is the E1 emulator, be sure to short Pin 2-3.
*5: Jumper J11 is not fitted on the default CPU board. Same as Jumper Position “Shorted” setting by resistor R127.

**Table 6-5** below details the function of the option links associated with Power Supply Configuration.

**Table 6-5: Power Supply Configuration Option Links**

| Reference | Explanation | Fit | DNF | Related Ref. |
|---|---|---|---|---|
| PWR | Connects PWR power rail to Board_5V. | - | - | U5, R141, J8, Simple IIC pull-up resistor |
| JA1-5V | Connects JA1-5V power rail to Board_5V. | R85 | - | U5, R141, J8, Simple IIC pull-up resistor |
| | Disconnects JA1-5V power rail from Board_5V. | - | R85 | |
| USB_5V | Connects USB_5V power rail to Board_5V. | R87 | - | U5, R141, J8, Simple IIC pull-up resistor |
| | Disconnects USB_5Vpower rail from Board_5V. | - | R87 | |
| Unregulated_VCC | Connects Unregulated_VCC power rail to Board_5V. | R86 | - | U5, R141, J8, Simple IIC pull-up resistor |
| | Disconnects Unregulated_VCC power rail from Board_5V. | - | R86 | |
| JA1-3V3 | Connects JA1-3V3 power rail to Board_3V3. | R108 | - | J9, J8 |
| | Disconnects JA1-3V3 power rail from Board_3V3. | - | R108 | |
| Board_VCC | Connects Board_VCC power rail to UC_VCC. | J11(Short) or R127 | - | U1, R97, R95 |
| | Enable current probe for measurement MCU current consumption. | - | J11(Open), R127 | |
| U5.VOUT | Connects Regulator output to Board_3V3. | J9(1-2 Short) | - | J9 |
| | Disconnects Regulator output from Board_3V3. | - | J9(1-2 Short), J9(Open) | |
| Board_5V | Connects Board_5V power rail to VBAT. | R141 | - | J10 |
| | Disconnects Board_5V power rail from VBAT. | - | R141 | |



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## 6.5 Clock Configuration

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

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

| Reference | Explanation | Fit | DNF | Related Ref. |
|---|---|---|---|---|
| XTAL, EXTAL | Connects 8MHz crystal (X1) to RX72T. | R138, R139 | R137, R140 | U1.16, U1.18 |
| | Connects JA2-EXTAL to RX72T. | R140 | R138, R139 | U1.18 |

## 6.6 Analog Power & ADC & DAC Configuration

**Table 6-7** below details the function of the option links associated with Analog Power & ADC & DAC Configuration.

**Table 6-7: Analog Power & ADC & DAC Configuration Option Links**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P21 | 100 | P21 | SW3 | R247 | R248 | SW3 | - | - |
| | | | JA1-ADTRG | R8 | R9 | JA1.8 | - | - |
| P20 | 101 | P20 | SW3 | R248 | R247 | SW3 | - | - |
| | | | JA1-ADTRG | R9 | R8 | JA1.8 | - | - |
| JA5-ADC6 | 121 | P46 | JA5-ADC6 | - | - | JA5.3 | - | - |
| JA5-ADC5 | 122 | P45 | JA5-ADC5 | - | - | JA5.2 | - | - |
| JA5-ADC4 | 123 | P44 | JA5-ADC4 | - | - | JA5.1 | - | - |
| JA1-ADC2 | 129 | P42 | JA1-ADC2 | - | - | JA1.11 | - | - |
| JA1-ADC1 | 130 | P41 | JA1-ADC1 | - | - | JA1.10 | - | - |
| P40 | 131 | P40 | RV1-ADC | R235 | R234 | RV1(Board_VCC) | R206 | R205 |
| | | | | | | RV1(AVCC0-2) | R205 | R206 |
| | | | JA1-ADC0 | R234 | R235 | JA1.9 | | |
| P65 | 102 | P65 | JA1-DAC1 | - | - | JA1.14 | - | - |
| P64 | 103 | P64 | JA1-DAC0 | - | - | JA1.13 | - | - |
| JA5-ADC7 | 124 | PH4 | JA5-ADC7 | - | - | JA5.4 | - | - |
| JA1-ADC3 | 132 | PH0 | JA1-ADC3 | - | - | JA1.12 | - | - |
| AVCC0-2 | 134,133, 104,105 | - | UC_VCC | R97 | R96 | - | - | - |
| | | | JA1-AVCC | R96 | R97 | JA1.5 | - | - |
| AVSS0-2 | 135,136,106 | - | GROUND | R95 | R94 | - | - | - |
| | | | JA1-AVSS | R94 | R95 | JA1.6 | - | - |



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## 6.7 BUS Configuration

**Table 6-8 and Table 6-9** below details the function of the option links associated with BUS Configuration.

**Table 6-8: BUS Configuration Option Links (1)**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P01 | 12 | P01 | JA5-M2HSIN2 | R35 | R123 | JA5.10 | - | - |
| | | | JA3-A10 | R123 | R35 | JA3.11 | - | - |
| P00 | 9 | P00 | E1-UB | R126, R24 | R129 | E1/E2 Lite.10 | - | - |
| | | | DSW-UB | | | SW4.2 | - | - |
| | | | JA1-IRQd_M2HSIN0 | R126, R24 | R129 | JA1.23 | - | - |
| | | | JA3-A11 | R129 | R126, R24 | JA3.12 | - | - |
| P27 | 92 | P27 | JA2-M1ENC | R60 | R61 | JA2.23 | R183 | R182 |
| | | | JA3-CSb | R61 | R60 | JA3.28 | - | - |
| JA3-A13 | 60 | P35 | JA3-A13 | - | - | JA3.14 | - | - |
| JA3-A12 | 61 | P34 | JA3-A12 | - | - | JA3.13 | - | - |
| P33 | 86 | P33 | JA2-M1TRCCLK | R178 | R179 | JA2.25 | - | - |
| | | | JA3-D7 | R179 | R178 | JA3.24 | - | - |
| P32 | 87 | P32 | JA2-M1TRDCLK | R177 | R176 | JA2.26 | - | - |
| | | | JA3-D8 | R176 | R177 | JA3.29 | - | - |
| P31 | 89 | P31 | JA3-D9 | R109 | R106 | JA3.30 | - | - |
| | | | SERIAL-RTS | R106 | R109 | U6.2 | - | - |
| P30 | 91 | P30 | JA3-D10 | R63, R88 | R62 | JA3.31 | - | - |
| | | | PMOD2-SCK | R62, R88 | R63 | PMOD2.4 | - | - |
| JA3-D0 | 73 | P76 | JA3-D0 | - | - | JA3.17 | - | - |
| JA3-D1 | 74 | P75 | JA3-D1 | - | - | JA3.18 | - | - |
| JA3-D2 | 75 | P74 | JA3-D2 | - | - | JA3.19 | - | - |
| JA3-D3 | 76 | P73 | JA3-D3 | - | - | JA3.20 | - | - |
| JA3-D4 | 77 | P72 | JA3-D4 | - | - | JA3.21 | - | - |
| JA3-D5 | 78 | P71 | JA3-D5 | - | - | JA3.22 | - | - |
| P70 | 79 | P70 | JA2-M1POE | R180, R89 | R119 | JA2.24 | - | - |
| | | | JA3-D6 | R119, R89 | R180 | JA3.23 | - | - |
| P82 | 137 | P82 | JA5-M2UIN | R238, R236 | R239, R241, R237, R242 | JA5.12 | - | - |
| | | | JA3-ALE | R239, R236 | R238, R241, R237, R242 | JA3.46 | - | - |
| | | | JA3-WAIT | R241, R236 | R238, R239, R237, R242 | JA3.45 | R75 | R79 |
| | | | JA6-M1UIN | R237, R236 | R238, R239, R241, R242 | JA6.14 | - | - |
| | | | JA6-SCKc | R242, R236 | R238, R239, R241, R237 | JA6.11 | - | - |
| P81 | 138 | P81 | JA5-M2VIN | R16 | R80, R168 | JA5.13 | - | - |
| | | | JA3-CSc | R80 | R16, R168 | JA3.45 | R79 | R75 |
| | | | JA6-M1VIN | R168 | R16, R80 | JA6.15 | - | - |
| JA3-A15 | 52 | PA7 | JA3-A15 | - | - | JA3.16 | - | - |
| JA3-A14 | 53 | PA6 | JA3-A14 | - | - | JA3.15 | - | - |
| PA2 | 57 | PA2 | PMOD1-CS | R212 | R155 | PMOD1.1 | - | - |
| | | | JA3-A0 | R155 | R212 | JA3.1 | - | - |
| PB7 | 39 | PB7 | JA2-SCKa | R192, R147 | R193 | JA2.10 | - | - |
| | | | JA3-A4 | R193, R147 | R192 | JA3.15 | - | - |
| PB6 | 40 | PB6 | SERIAL-RXD | R195, R198 | R148 | U7.3 | | R194, R175 |
| | | | JA2-RXDa | R195, R198 | R148 | JA2.8 | - | - |
| | | | JA3-A3 | R148 | R195, R198 | JA3.4 | - | - |
| PB5 | 41 | PB5 | SERIAL-TXD | R143, R199 | R146 | U6.3 | - | R142, R174 |
| | | | JA2-TXDa | R199, R143 | R146 | JA2.6 | - | - |
| | | | JA3-A2 | R146 | R143, R199 | JA3.3 | - | - |
| PB4 | 43 | PB4 | JA2-CTSaRTSa | R188 | R156 | JA2.12 | - | - |
| | | | JA3-A1 | R156 | R188 | JA3.2 | - | - |
| JA3-A20 | | PC4 | JA3-A20 | - | - | JA3.41 | - | - |
| PC1 | 46 | PC1 | USB0-VBUSEN | R98 | R92 | U11.4 | - | - |
| | | | JA3-A16 | R92 | R98 | JA3.37 | - | - |
| JA3-CSa | 47 | PC0 | JA3-CSa | - | - | JA3.27 | - | - |



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**Table 6-9: BUS Configuration Option Links (2)**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| PD2 | 28 | PD2 | USB0-VBUS | R132 | R134 | USB0_1.1, USB0_2.1 | J14 (2-3 short) or R162 | - |
| | | | JA3-A7 | R134 | R132 | JA3.8 | - | - |
| PD1 | 29 | PD1 | JA2-TIMOUT1 | R186 | R130 | JA2.20 | - | - |
| | | | JA3-A6 | R130 | R186 | JA3.7 | - | - |
| PD0 | 30 | PD0 | JA2-TIMIN1 | R184 | R136 | JA2.22 | - | - |
| | | | JA3-A5 | R136 | R184 | JA3.6 | - | - |
| JA3-RDn | 4 | PE6 | JA3-RDn | - | - | JA3.25 | - | - |
| JA3-BCLK | 5 | PE5 | JA3-BCLK | - | - | JA3.44 | - | - |
| PE4 | 13 | PE4 | JA5-M2TRCCLK | R34 | R66 | JA5.17 | - | - |
| | | | JA3-A9 | R66 | R34 | JA3.10 | - | - |
| PE3 | 14 | PE3 | JA5-M2TRDCLK | R33 | R65 | JA5.18 | - | - |
| | | | JA3-A8 | R65 | R33 | JA3.9 | - | - |
| PE1 | 21 | PE1 | JA3-WRLn | R68 | R115 | JA3.48 | - | - |
| | | | JA3-WRn | R115 | R68 | JA3.26 | - | - |
| JA3-WRHn | 22 | PE0 | JA3-WRHn | - | - | JA3.47 | - | - |
| JA3-A19 | 31 | PF3 | JA3-A19 | - | - | JA3.40 | - | - |
| JA3-A18 | 32 | PF2 | JA3-A18 | - | - | JA3.39 | - | - |
| JA3-A17 | 33 | PF1 | JA3-A17 | - | - | JA3.38 | - | - |
| JA3-D11 | 80 | PG2 | JA3-D11 | - | - | JA3.32 | - | - |
| JA3-D12 | 81 | PG1 | JA3-D12 | - | - | JA3.33 | - | - |
| JA3-D13 | 82 | PG0 | JA3-D13 | - | - | JA3.34 | - | - |
| JA3-D14 | 83 | PK2 | JA3-D14 | - | - | JA3.35 | - | - |
| JA3-D15 | 84 | PK1 | JA3-D15 | - | - | JA3.36 | - | - |

## 6.8 CAN Configuration

**Table 6-10** below details the function of the option links associated with CAN Configuration.

**Table 6-10: CAN Configuration Option Links**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| PA1 | 58 | PA1 | CAN1RX | R76 | R19, R38 | U10.3 | - | - |
| | | | JA5-CAN1RX | R19 | R76, R38 | JA5.15 | - | - |
| | | | JA5-M2TOGGLE | R38 | R76, R19 | JA5.6 | - | - |
| PA0 | 59 | PA0 | CAN1TX | R91 | R57 | U8.1 | - | - |
| | | | JA5-CAN1TX | R57 | R91 | JA5.5 | - | - |



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## 6.9 General IO & LED Configuration

**Table 6-11** below details the function of the option links associated with General IO & LED Configuration.

**Table 6-11: General IO & LED Configuration Option Links**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| LED1 | 111 | P55 | LED1 | - | - | LED1.K | R228 | - |
| LED0 | 112 | P54 | LED0 | - | - | LED0.K | R228 | - |
| JA1-IO7 | 115 | P51 | JA1-IO7 | - | - | - | - | - |
| JA1-IO6 | 116 | P50 | JA1-IO6 | - | - | - | - | - |
| LED3 | 109 | P61 | LED3 | - | - | LED3.K | R228 | - |
| LED2 | 110 | P60 | LED2 | - | - | LED2.K | R228 | - |
| JA1-IO5 | 117 | PH7 | JA1-IO5 | - | - | - | - | - |
| JA1-IO4 | 118 | PH6 | JA1-IO4 | - | - | - | - | - |
| JA1-IO3 | 119 | PH5 | JA1-IO3 | - | - | - | - | - |
| JA1-IO2 | 125 | PH3 | JA1-IO2 | - | - | - | - | - |
| JA1-IO1 | 126 | PH2 | JA1-IO1 | - | - | - | - | - |
| JA1-IO0 | 127 | PH1 | JA1-IO0 | - | - | - | - | - |

## 6.10 I2C & EEPROM Configuration

**Table 6-12 and Table 6-13** below detail the function of the option links associated with I2C & EEPROM Configuration.

**Table 6-12: I2C & EEPROM Configuration Option Links (1)**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| PB2 | 49 | PB2 | E2P-SDA | - | - | U4.5 | - | - |
| | | | JA1-SDA | - | - | JA1.25 | - | - |
| PB1 | 50 | PB1 | E2P-SCL | R189 | R190 | U4.6 | - | - |
| | | | JA1-SCL | R189 | R190 | JA1.26 | - | - |
| | | | JA2-IRQb_M1HSIN1 | R190 | R189 | JA2.9 | - | - |

**Table 6-13: I2C & EEPROM Configuration Option Links (2)**

| Reference | Explanation | Fit | DNF | Related Ref. |
|---|---|---|---|---|
| SDA, SCL | Connects pull-up resistor to Board_3V3. | R28 | R51 | U4 |
| | Connects pull-up resistor to Board_5V. | R51 | R28 | U4 |
| WP | EEPROM Write protect. | R48 | - | U4 |
| A0, A1, A2 | Device address (0xA6). | R49, R44, R13 | R27, R30, R55 | U4 |
| | Device address (0xA4). | R55, R44, R13 | R27, R30, R49 | U4 |



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## 6.11 IRQ & Switch Configuration

**Table 6-14** below details the function of the option links associated with IRQ & Switch Configuration.

**Table 6-14: IRQ & Switch Configuration Option Links**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P00 | 9 | P00 | E1-UB | R126, R24 | R129 | E1/E2 Lite.10 | - | - |
| | | | DSW-UB | | | SW4.2 | - | - |
| | | | JA1-IRQd_M2HSIN0 | R126, R24 | R129 | JA1.23 | - | - |
| | | | JA3-A11 | R129 | R126, R24 | JA3.12 | - | - |
| P10 | 141 | P10 | SW1 | R203, R67 | - | SW1 | - | - |
| | | | JA5-IRQe_M2HSIN1 | R203, R67 | - | JA5.9 | R17 | R18 |
| P21 | 100 | P21 | SW3 | R247 | R248 | SW3 | - | - |
| | | | JA1-ADTRG | R8 | R9 | JA1.8 | - | - |
| P20 | 101 | P20 | SW3 | R248 | R247 | SW3 | - | - |
| | | | JA1-ADTRG | R9 | R8 | JA1.8 | - | - |
| PB3 | 48 | PB3 | SW2 | R245 | - | SW2 | - | - |
| | | | JA2-IRQa_M1HSIN0 | R197 | - | JA2.7 | - | - |
| PB1 | 50 | PB1 | E2P-SCL | R189 | R190 | U4.6 | - | - |
| | | | JA1-SCL | R189 | R190 | JA1.26 | - | - |
| | | | JA2-IRQb_M1HSIN1 | R190 | R189 | JA2.9 | - | - |
| PB0 | 51 | PB0 | PMOD1-MOSI | R217 | R218 | PMOD1.2 | - | - |
| | | | JA2-IRQc_M1HSIN2 | R218 | R217 | JA2.23 | R182 | R183 |
| PMOD1-IO0 | 62 | PC6 | PMOD1-IO0 | - | - | PMOD1.7 | - | - |
| PMOD1-IO1 | 63 | PC5 | PMOD1-IO1 | - | - | PMOD1.8 | - | - |
| SERIAL-CTS | 99 | PC3 | SERIAL-CTS | - | - | U7.2 | - | - |
| PE2 | 20 | PE2 | JA2-NMIn | - | - | JA2.3 | - | - |
| | | | JP-UPSEL | - | - | J15.2 | - | - |
| PMOD2-IO0 | 34 | PF0 | PMOD2-IO0 | - | - | PMOD2.7 | - | - |
| PMOD2-IO1 | 85 | PK0 | PMOD2-IO1 | - | - | PMOD2.8 | - | - |
| RESn | 10 | - | E1-RESn | - | - | E1/E2 Lite.13 | - | - |
| | | | SW-RESn | - | - | RES1(Switch) | - | - |
| | | | JA2-RESn | - | - | JA2.1 | - | - |
| MD_FINED | 11 | - | E1-MD_FINED | - | - | E1/E2 Lite.7 | - | - |
| | | | DSW-MD_FINED | - | - | SW4.1 | - | - |

## 6.12 LIN Configuration

**Table 6-15 and Table 6-16** below details the function of the option links associated with LIN Configuration.

**Table 6-15: LIN Configuration Option Links (1)**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P24 | 95 | P24 | LINNSLP | R202 | R83 | U9.2 | - | - |
| | | | PMOD2-CS | R83 | R202 | PMOD2.1 | - | - |
| P23 | 96 | P23 | LINTXD | R165 | R171, R72 | U9.4 | - | - |
| | | | JA6-TXDc | R171 | R165, R72 | JA6.9 | - | - |
| | | | PMOD2-MOSI | R72 | R165, R171 | PMOD2.2 | - | - |
| P22 | 97 | P22 | LINRXD | R167 | R170, R52 | U9.1 | - | - |
| | | | JA6-RXDc | R170 | R167, R52 | JA6.12 | - | - |
| | | | PMOD2-MISO | R52 | R167, R170 | PMOD2.3 | - | - |

**Table 6-16: LIN Configuration Option Links (2)**

| Reference | Explanation | Fit | DNF | Related Ref. |
|---|---|---|---|---|
| U9.6 | Master | R144, R149 | - | U9 |
| | Slave | - | R144, R149 | U9 |



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## 6.13 MTU & POE Configuration

**Table 6-17 and Table 6-18** below details the function of the option links associated with MTU & POE Configuration.

**Table 6-17: MTU & POE Configuration Option Links (1)**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P01 | 12 | P01 | JA5-M2HSIN2 | R35 | R123 | JA5.10 | - | - |
| | | | JA3-A10 | R123 | R35 | JA3.11 | - | - |
| P00 | 9 | P00 | E1-UB | R126, R24 | R129 | E1/E2 Lite.10 | - | - |
| | | | DSW-UB | | | SW4.2 | - | - |
| | | | JA1-IRQd_M2HSIN0 | R126, R24 | R129 | JA1.23 | - | - |
| | | | JA3-A11 | R129 | R126, R24 | JA3.12 | - | - |
| P11 | 140 | P11 | JA6-M1TOGGLE | - | - | JA6.13 | - | - |
| P10 | 141 | P10 | SW1 | R203, R67 | - | SW1 | - | - |
| | | | JA5-IRQe_M2HSIN1 | R203, R67 | - | JA5.9 | R17 | R18 |
| P12 | 3 | P12 | JA2-M1UP | - | - | JA2.13 | - | - |
| P13 | 2 | P13 | JA2-M1VP | - | - | JA2.15 | - | - |
| P14 | 1 | P14 | JA2-M1WP | - | - | JA2.17 | - | - |
| P15 | 144 | P15 | JA2-M1UN | - | - | JA2.14 | - | - |
| P16 | 143 | P16 | JA2-M1VN | - | - | JA2.16 | - | - |
| P17 | 142 | P17 | JA2-M1WN | - | - | JA2.18 | - | - |
| P27 | 92 | P27 | JA2-M1ENC | R60 | R61 | JA2.23 | R183 | R182 |
| | | | JA3-CSb | R61 | R60 | JA3.28 | - | - |
| P33 | 86 | P33 | JA2-M1TRCCLK | R178 | R179 | JA2.25 | - | - |
| | | | JA3-D7 | R179 | R178 | JA3.24 | - | - |
| P32 | 87 | P32 | JA2-M1TRDCLK | R177 | R176 | JA2.26 | - | - |
| | | | JA3-D8 | R176 | R177 | JA3.29 | - | - |
| P53 | 113 | P53 | JA2-M1UD | - | - | JA2.11 | - | - |
| P52 | 114 | P52 | JA5-M2UD | - | - | JA5.11 | - | - |
| P70 | 79 | P70 | JA2-M1POE | R180, R89 | R119 | JA2.24 | - | - |
| | | | JA3-D6 | R119, R89 | R180 | JA3.23 | - | - |
| P82 | 137 | P82 | JA5-M2UIN | R238, R236 | R239, R241, R237, R242 | JA5.12 | | |
| | | | JA3-ALE | R239, R236 | R238, R241, R237, R242 | JA3.46 | | |
| | | | JA3-WAIT | R241, R236 | R238, R239, R237, R242 | JA3.45 | R75 | R79 |
| | | | JA6-M1UIN | R237, R236 | R238, R239, R241, R242 | JA6.14 | | |
| | | | JA6-SCKc | R242, R236 | R238, R239, R241, R237 | JA6.11 | | |



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**Table 6-18: MTU & POE Configuration Option Links (2)**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P81 | 138 | P81 | JA5-M2VIN | R16 | R80, R168 | JA5.13 | - | - |
| | | | JA3-CSc | R80 | R16, R168 | JA3.45 | R79 | R75 |
| | | | JA6-M1VIN | R168 | R16, R80 | JA6.15 | - | - |
| P80 | 139 | P80 | JA5-M2WIN | R15 | R169 | JA5.14 | - | - |
| | | | JA6-M1WIN | R169 | R15 | JA6.16 | - | - |
| P96 | 65 | P96 | JA5-M2POE | R107 | - | JA5.16 | - | - |
| P95 | 67 | P95 | JA5-M2UP | - | - | JA5.19 | - | - |
| P94 | 68 | P94 | JA5-M2VP | - | - | JA5.21 | - | - |
| P93 | 69 | P93 | JA5-M2WP | - | - | JA5.23 | - | - |
| P92 | 70 | P92 | JA5-M2UN | R32 | R187 | JA5.20 | - | - |
| | | | JA2-TIMOUT0 | R187 | R32 | JA2.19 | - | - |
| P91 | 71 | P91 | JA5-M2VN | R14 | R185 | JA5.22 | - | - |
| | | | JA2-TIMIN0 | R185 | R14 | JA2.21 | - | - |
| JA5-M2WN | 72 | P90 | JA5-M2WN | - | - | JA5.24 | - | - |
| JA5-M2ENC | 56 | PA3 | JA5-M2ENC | - | - | JA5.9 | R18 | R17 |
| PA1 | 58 | PA1 | CAN1RX | R76 | R19, R38 | U10.3 | - | - |
| | | | JA5-CAN1RX | R19 | R76, R38 | JA5.15 | - | - |
| | | | JA5-M2TOGGLE | R38 | R76, R19 | JA5.6 | - | - |
| PB3 | 48 | PB3 | SW2 | R245 | - | SW2 | - | - |
| | | | JA2-IRQa_M1HSIN0 | R197 | - | JA2.7 | - | - |
| PB1 | 50 | PB1 | E2P-SCL | R189 | R190 | U4.6 | - | - |
| | | | JA1-SCL | R189 | R190 | JA1.26 | - | - |
| | | | JA2-IRQb_M1HSIN1 | R190 | R189 | JA2.9 | - | - |
| PB0 | 51 | PB0 | PMOD1-MOSI | R217 | R218 | PMOD1.2 | - | - |
| | | | JA2-IRQc_M1HSIN2 | R218 | R217 | JA2.23 | R182 | R183 |
| PD1 | 29 | PD1 | JA2-TIMOUT1 | R186 | R130 | JA2.20 | - | - |
| | | | JA3-A6 | R130 | R186 | JA3.7 | - | - |
| PD0 | 30 | PD0 | JA2-TIMIN1 | R184 | R136 | JA2.22 | - | - |
| | | | JA3-A5 | R136 | R184 | JA3.6 | - | - |
| PE4 | 13 | PE4 | JA5-M2TRCCLK | R34 | R66 | JA5.17 | - | - |
| | | | JA3-A9 | R66 | R36 | JA3.10 | - | - |
| PE3 | 14 | PE3 | JA5-M2TRDCLK | R33 | R65 | JA5.18 | - | - |
| | | | JA3-A8 | R65 | R33 | JA3.9 | - | - |
| RESn | 10 | - | E1-RESn | - | - | E1/E2 Lite.13 | - | - |
| | | | SW-RESn | - | - | RES1(Switch) | - | - |
| | | | JA2-RESn | - | - | JA2.1 | - | - |



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## 6.14 PMOD1 Configuration

**Table 6-19** below details the function of the option links associated with PMOD1 Configuration.

**Table 6-19: PMOD1 Configuration Option Links**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| PMOD1-IO3 | 93 | P26 | PMOD1-IO3 | - | - | PMOD1.10 | - | - |
| PMOD1-IO2 | 94 | P25 | PMOD1-IO2 | - | - | PMOD1.9 | - | - |
| PMOD1-MISO | 54 | PA5 | PMOD1-MISO | - | - | PMOD1.3 | - | - |
| PMOD1-SCK | 55 | PA4 | PMOD1-SCK | R118 | - | PMOD1.4 | - | - |
| PMOD1-IO0 | 62 | PC6 | PMOD1-IO0 | - | - | PMOD1.7 | - | - |
| PMOD1-IO1 | 63 | PC5 | PMOD1-IO1 | - | - | PMOD1.8 | - | - |
| PA2 | 57 | PA2 | PMOD1-CS | R212 | R155 | PMOD1.1 | - | - |
| | | | JA3-A0 | R155 | R212 | JA3.1 | - | - |
| PB0 | 51 | PB0 | PMOD1-MOSI | R217 | R218 | PMOD1.2 | - | - |
| | | | JA2-IRQc_M1HSIN2 | R218 | R217 | JA2.23 | R182 | R183 |

## 6.15 PMOD2 Configuration

**Table 6-20** below details the function of the option links associated with PMOD2 Configuration.

**Table 6-20: PMOD2 Configuration Option Links**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P24 | 95 | P24 | LINNSLP | R202 | R83 | U9.2 | - | - |
| | | | PMOD2-CS | R83 | R202 | PMOD2.1 | - | - |
| P23 | 96 | P23 | LINTXD | R165 | R171, R72 | U9.4 | - | - |
| | | | JA6-TXDc | R171 | R165, R72 | JA6.9 | - | - |
| | | | PMOD2-MOSI | R72 | R165, R171 | PMOD2.2 | - | - |
| P22 | 97 | P22 | LINRXD | R167 | R170, R52 | U9.1 | - | - |
| | | | JA6-RXDc | R170 | R167, R52 | JA6.12 | - | - |
| | | | PMOD2-MISO | R52 | R167, R170 | PMOD2.3 | - | - |
| P30 | 91 | P30 | JA3-D10 | R63, R88 | R62 | JA3.31 | - | - |
| | | | PMOD2-SCK | R62, R88 | R63 | PMOD2.4 | - | - |
| PMOD2-IO2 | 107 | P63 | PMOD2-IO2 | - | - | PMOD2.9 | - | - |
| PMOD2-IO3 | 108 | P62 | PMOD2-IO3 | - | - | PMOD2.10 | - | - |
| PMOD2-IO0 | 34 | PF0 | PMOD2-IO0 | - | - | PMOD2.7 | - | - |
| PMOD2-IO1 | 85 | PK0 | PMOD2-IO1 | - | - | PMOD2.8 | - | - |



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## 6.16 Serial & USB to Serial Configuration

**Table 6-21** below details the function of the option links associated with Serial & USB to Serial Configuration.

**Table 6-21: Serial & USB to Serial Configuration Option Links**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| P23 | 96 | P23 | LINTXD | R165 | R171, R72 | U9.4 | - | - |
| | | | JA6-TXDc | R171 | R165, R72 | JA6.9 | - | - |
| | | | PMOD2-MOSI | R72 | R165, R171 | PMOD2.2 | - | - |
| P22 | 97 | P22 | LINRXD | R167 | R170, R52 | U9.1 | - | - |
| | | | JA6-RXDc | R170 | R167, R52 | JA6.12 | - | - |
| | | | PMOD2-MISO | R52 | R167, R170 | PMOD2.3 | - | - |
| P32 | 87 | P32 | JA2-M1TRDCLK | R177 | R176 | JA2.26 | - | - |
| | | | JA3-D8 | R176 | R177 | JA3.29 | - | - |
| P31 | 89 | P31 | JA3-D9 | R109 | R106 | JA3.30 | - | - |
| | | | SERIAL-RTS | R106 | R109 | U6.2 | - | - |
| P82 | 137 | P82 | JA5-M2UIN | R238, R236 | R239, R241, R237, R242 | JA5.12 | | |
| | | | JA3-ALE | R239, R236 | R238, R241, R237, R242 | JA3.46 | | |
| | | | JA3-WAIT | R241, R236 | R238, R239, R237, R242 | JA3.45 | R75 | R79 |
| | | | JA6-M1UIN | R237, R236 | R238, R239, R241, R242 | JA6.14 | | |
| | | | JA6-SCKc | R242, R236 | R238, R239, R241, R237 | JA6.11 | | |
| PB7 | 39 | PB7 | JA2-SCKa | R192, R147 | R193 | JA2.10 | - | - |
| | | | JA3-A4 | R193, R147 | R192 | JA3.15 | - | - |
| PB6 | 40 | PB6 | SERIAL-RXD | R195, R198 | R148 | U7.3 | | R194, R175 |
| | | | JA2-RXDa | R195, R198 | R148 | JA2.8 | - | - |
| | | | JA3-A3 | R148 | R195, R198 | JA3.4 | - | - |
| PB5 | 41 | PB5 | SERIAL-TXD | R143, R199 | R146 | U6.3 | - | R142, R174 |
| | | | JA2-TXDa | R199, R143 | R146 | JA2.6 | - | - |
| | | | JA3-A2 | R146 | R143, R199 | JA3.3 | - | - |
| PB4 | 43 | PB4 | JA2-CTSaRTSa | R188 | R156 | JA2.12 | - | - |
| | | | JA3-A1 | R156 | R188 | JA3.2 | - | - |
| PD5 | 25 | PD5 | E1-TDI_RXD | R231 | R194, R172 | E1/E2 Lite.11 | - | - |
| | | | SERIAL-RXD | R194 | R231, R172 | U7.3 | - | R195, R175 |
| | | | JA6-RXDb | R172 | R231, R194 | JA6.7 | - | |
| PD4 | 26 | PD4 | E1-TCK_FINEC | R101, R154 | R99 | E1/E2 Lite.1 | - | - |
| | | | JA6-SCKb | R99, R154 | R101 | JA6.10 | - | - |
| PD3 | 27 | PD3 | E1-TDO_TXD | R230 | R142, R173 | E1/E2 Lite.5 | | |
| | | | SERIAL-TXD | R142 | R230, R173 | U6.3 | - | R143, R174 |
| | | | JA6-TXDb | R173 | R230, R142 | JA6.8 | | |



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## 6.17 USB Configuration

**Table 6-22** below details the function of the option links associated with the USB Configuration.

**Table 6-22: USB Configuration Option Links**

| Signal name | MCU | | MCU Peripheral Selection | | | Destination Selection | | |
|---|---|---|---|---|---|---|---|---|
| | Pin | Port | Signal | Fit | DNF | Interface /Function | Fit | DNF |
| PC2 | 45 | PC2 | USB0-OVRCURA | - | - | U11.5 | - | - |
| PC1 | 46 | PC1 | USB0-VBUSEN | R98 | R92 | U11.4 | - | - |
| | | | JA3-A16 | R92 | R98 | JA3.37 | - | - |
| PD2 | 28 | PD2 | USB0-VBUS | R132 | R134 | USB0_1.1, USB0_2.1 | J14 (2-3 short) or R162 | - |
| | | | JA3-A7 | R134 | R132 | JA3.8 | - | - |
| PE2 | 20 | PE2 | JP-UPSEL | - | - | J15.2 | - | - |
| | | | JA2-NMIn | - | - | JA2.3 | - | - |
| USB0-DP | 36 | - | USB0-DP | - | - | USB0_1.3 | - | - |
| | | | | | | USB0_2.3 | - | - |
| USB0-DM | 35 | - | USB0-DM | - | - | USB0_1.2 | - | - |
| | | | | | | USB0_2.2 | - | - |

**Table 6-23** below details the function of the jumpers associated with the USB Configuration.

**Table 6-23: USB Configuration Jumper Option Links**

| Reference | Jumper Position | Explanation | Related Ref. |
|---|---|---|---|
| J12 | Shorted Pin1-2 | The operating voltage of VCC_USB is set to the same as the operating voltage of the MCU. | - |
| | Shorted Pin2-3 | Operating voltage of VCC_USB is fixed at 3.3V. | - |
| | All open | DO NOT SET. | - |
| J13 | Shorted Pin1-2 | USB0 Host mode | - |
| | Shorted Pin2-3 | USB0 Function mode | J14 |
| | All open | DO NOT SET. | - |
| J14(DNF) *1 | Shorted Pin1-2 | Bus-powered | J13, R162 |
| | Shorted Pin2-3 | Self-powered | J13, R162 |
| | All open | Self-powered by R162 | R162 |

*1: In case of fit J14, remove R162.



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# 7. Headers

## 7.1 Application Headers

This CPU 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**<br>**Circuit Net Name** | **MCU Pin** | **Pin** | **Header Name**<br>**Circuit Net Name** | **MCU Pin** |
| 1 | 5V<br>JA1-5V | - | 2 | 0V<br>GROUND | - |
| 3 | 3V3<br>JA1-3V3 | - | 4 | 0V<br>GROUND | - |
| 5 | AVCC<br>JA1-AVCC | 134,133,104 | 6 | AVSS<br>JA1-AVSS | 135,136,106 |
| 7 | AVREF<br>NC | NC | 8 | ADTRG<br>JA1-ADTRG | 101,100 |
| 9 | ADC0<br>JA1-ADC0 | 131 | 10 | ADC1<br>JA1-ADC1 | 130 |
| 11 | ADC2<br>JA1-ADC2 | 129 | 12 | ADC3<br>JA1-ADC3 | 132 |
| 13 | DAC0<br>JA1-DAC0 | 103 | 14 | DAC1<br>JA1-DAC1 | 102 |
| 15 | IO_0<br>JA1-IO0 | 127 | 16 | IO_1<br>JA1-IO1 | 126 |
| 17 | IO_2<br>JA1-IO2 | 125 | 18 | IO_3<br>JA1-IO3 | 119 |
| 19 | IO_4<br>JA1-IO4 | 118 | 20 | IO_5<br>JA1-IO5 | 117 |
| 21 | IO_6<br>JA1-IO6 | 116 | 22 | IO_7<br>JA1-IO7 | 115 |
| 23 | IRQd / IRQAEC / M2_HSIN0<br>JA1-IRQd_M2HSIN0 | 9/ NC / 9 | 24 | IIC_EX<br>NC | NC |
| 25 | IIC_SDA<br>JA1-SDA | 49 | 26 | IIC_SCL<br>JA1-SCL | 50 |



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**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**<br>**Circuit Net Name** | **MCU Pin** | **Pin** | **Header Name**<br>**Circuit Net Name** | **MCU Pin** |
| 1 | RESET<br>JA2-RESn | 15 | 2 | EXTAL<br>JA2-EXTAL | 18 |
| 3 | NMI<br>JA2-NMIn | 20 | 4 | Vss1<br>GROUND | - |
| 5 | WDT_OVF<br>NC | NC | 6 | SCIaTX<br>JA2-TXDa | 41 |
| 7 | IRQa / WKUP / M1_HSIN0<br>JA2-IRQa_M1HSIN0 | 48 / NC / 48 | 8 | SCIaRX<br>JA2-RXDa | 40 |
| 9 | IRQb / M1_HSIN1<br>JA2-IRQb_M1HSIN1 | 50 | 10 | SCIaCK<br>JA2-SCKa | 39 |
| 11 | M1_UD<br>JA2-M1UD | 113 | 12 | CTSaRTSa<br>JA2-CTSaRTSa | 43 |
| 13 | M1_UP<br>JA2-M1UP | 3 | 14 | M1_UN<br>JA2-M1UN | 144 |
| 15 | M1_VP<br>JA2-M1VP | 2 | 16 | M1_VN<br>JA2-M1VN | 143 |
| 17 | M1_WP<br>JA2-M1WP | 1 | 18 | M1_WN<br>JA2-M1WN | 142 |
| 19 | TimerOut0<br>JA2-TIMOUT0 | 70 | 20 | TimerOut1<br>JA2-TIMOUT1 | 29 |
| 21 | TimerIn0<br>JA2-TIMIN0 | 71 | 22 | TimerIn1<br>JA2-TIMIN1 | 30 |
| 23 | IRQc / M1_EncZ / M1_HSIN2<br>JA2-23PIN | 51 / 92 / 51 | 24 | M1_POE<br>JA2-M1POE | 79 |
| 25 | M1_TRCCLK<br>JA2-M1TRCCLK | 86 | 26 | M1_TRDCLK<br>JA2-M1TRDCLK | 87 |



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**Table 7-3** below lists the connections of the BUS application header, JA3.

**Table 7-3: Application Header JA3 Connections**

| Application Header JA3 | | | | | |
|---|---|---|---|---|---|
| Pin | Header Name<br>Circuit Net Name | MCU Pin | Pin | Header Name<br>Circuit Net Name | MCU Pin |
| 1 | A0<br>JA3-A0 | 57 | 2 | A1<br>JA3-A1 | 43 |
| 3 | A2<br>JA3-A2 | 41 | 4 | A3<br>JA3-A3 | 40 |
| 5 | A4<br>JA3-A4 | 39 | 6 | A5<br>JA3-A5 | 30 |
| 7 | A6<br>JA3-A6 | 29 | 8 | A7<br>JA3-A7 | 28 |
| 9 | A8<br>JA3-A8 | 14 | 10 | A9<br>JA3-A9 | 13 |
| 11 | A10<br>JA3-A10 | 12 | 12 | A11<br>JA3-A11 | 9 |
| 13 | A12<br>JA3-A12 | 61 | 14 | A13<br>JA3-A13 | 60 |
| 15 | A14<br>JA3-A14 | 53 | 16 | A15<br>JA3-A15 | 52 |
| 17 | D0<br>JA3-D0 | 73 | 18 | D1<br>JA3-D1 | 74 |
| 19 | D2<br>JA3-D2 | 75 | 20 | D3<br>JA3-D3 | 76 |
| 21 | D4<br>JA3-D4 | 77 | 22 | D5<br>JA3-D5 | 78 |
| 23 | D6<br>JA3-D6 | 79 | 24 | D7<br>JA3-D7 | 86 |
| 25 | RDn<br>JA3-RDn | 4 | 26 | WR / SDWE<br>JA3-WRn | 21 / NC |
| 27 | CSa<br>JA3-CSa | 47 | 28 | CSb<br>JA3-CSb | 92 |
| 29 | D8<br>JA3-D8 | 87 | 30 | D9<br>JA3-D9 | 89 |
| 31 | D10<br>JA3-D10 | 91 | 32 | D11<br>JA3-D11 | 80 |
| 33 | D12<br>JA3-D12 | 81 | 34 | D13<br>JA3-D13 | 82 |
| 35 | D14<br>JA3-D14 | 83 | 36 | D15<br>JA3-D15 | 84 |
| 37 | A16<br>JA3-A16 | 46 | 38 | A17<br>JA3-A17 | 33 |
| 39 | A18<br>JA3-A18 | 32 | 40 | A19<br>JA3-A19 | 31 |
| 41 | A20<br>JA3-A20 | 98 | 42 | A21<br>NC | NC |
| 43 | A22<br>NC | NC | 44 | SDCLK<br>JA3-BCLK | 5 |
| 45 | CSc / Wait<br>JA3-45PIN | 138 / 137 | 46 | ALE / SDCKE<br>JA3-ALE | 137 / NC |
| 47 | HWRn / DQMH<br>JA3-WRHn | 22 / NC | 48 | LWRn / DQML<br>JA3-WRLn | 21 / NC |
| 49 | CAS<br>NC | NC | 50 | RAS<br>NC | NC |



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**Table 7-4** below lists the connections of the application header, JA5.

**Table 7-4: Application Header JA5 Connections**

| Application Header JA5 | | | | | |
|---|---|---|---|---|---|
| **Pin** | **Header Name**<br>**Circuit Net Name** | **MCU Pin** | **Pin** | **Header Name**<br>**Circuit Net Name** | **MCU Pin** |
| 1 | ADC4<br>JA5-ADC4 | 123 | 2 | ADC5<br>JA5-ADC5 | 122 |
| 3 | ADC6<br>JA5-ADC6 | 121 | 4 | ADC7<br>JA5-ADC7 | 124 |
| 5 | CAN1TX<br>JA5-CAN1TX | 59 | 6 | CAN1RX<br>JA5-CAN1RX | 58 |
| 7 | CAN2TX<br>NC | NC | 8 | CAN2RX<br>NC | NC |
| 9 | IRQe / M2_EncZ / M2HSIN1<br>JA5-9PIN | 141 / 56 / 141 | 10 | IRQf / M2_HSIN2<br>JA5-M2HSIN2 | NC / 12 |
| 11 | M2_UD<br>JA5-M2UD | 114 | 12 | M2_Uin<br>JA5-M2UIN | 137 |
| 13 | M2_Vin<br>JA5-M2VIN | 138 | 14 | M2_Win<br>JA5-M2WIN | 139 |
| 15 | M2_Toggle<br>JA5-M2TOGGLE | 58 | 16 | M2_POE<br>JA5-M2POE | 65 |
| 17 | M2_TRCCLK<br>JA5-M2TRCCLK | 13 | 18 | M2_TRDCLK<br>JA5-M2TRDCLK | 14 |
| 19 | M2_UP<br>JA5-M2UP | 67 | 20 | M2_Un<br>JA5-M2UN | 70 |
| 21 | M2_VP<br>JA5-M2VP | 68 | 22 | M2_Vn<br>JA5-M2VN | 71 |
| 23 | M2_WP<br>JA5-M2WP | 69 | 24 | M2_Wn<br>JA5-M2WN | 72 |



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**Table 7-5** below lists the connections of the application header, JA6.

**Table 7-5: Application Header JA6 Connections**

| Application Header JA6 | | | | | |
|---|---|---|---|---|---|
| **Pin** | **Header Name**<br>**Circuit Net Name** | **MCU Pin** | **Pin** | **Header Name**<br>**Circuit Net Name** | **MCU Pin** |
| 1 | DREQ<br>NC | NC | 2 | DACK<br>NC | NC |
| 3 | TEND<br>NC | NC | 4 | STBYn<br>NC | NC |
| 5 | RS232TX<br>JA6-RS232TX | NC | 6 | RS232RX<br>JA6-RS232RX | NC |
| 7 | SCIbRX<br>JA6-RXDb | 25 | 8 | SCIbTX<br>JA6-TXDb | 27 |
| 9 | SCIcTX<br>JA6-TXDc | 96 | 10 | SCIbCK<br>JA6-SCKb | 26 |
| 11 | SCIcCK<br>JA6-SCKc | 137 | 12 | SCIcRX<br>JA6-RXDc | 97 |
| 13 | M1_Toggle<br>JA6-M1TOGGLE | 140 | 14 | M1_Uin<br>JA6-M1UIN | 137 |
| 15 | M1_Vin<br>JA6-M1VIN | 138 | 16 | M1_Win<br>JA6-M1WIN | 139 |
| 17 | EXT_USB_VBUS<br>NC | NC | 18 | Reserved<br>NC | NC |
| 19 | EXT_USB_BATT<br>NC | NC | 20 | Reserved<br>NC | NC |
| 21 | EXT_USB_CHG<br>NC | NC | 22 | Reserved<br>NC | NC |
| 23 | Unregulated_VCC<br>Unregulated_VCC | - | 24 | Vss<br>GROUND | - |



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## 7.2 Microcontroller Pin Headers

This RSK is fitted with MCU pin headers, which are used to access all the MCU's pins.
**Table 7-6** below lists the connections of the microcontroller pin header, J1.

**Table 7-6: Microcontroller Pin Header, J1**

| Microcontroller Pin Header J1 | | | | | |
|---|---|---|---|---|---|
| **Pin** | Circuit Net Name | **MCU Pin** | **Pin** | Circuit Net Name | **MCU Pin** |
| 1 | JA2-M1WP | 1 | 2 | JA2-M1VP | 2 |
| 3 | JA2-M1UP | 3 | 4 | JA3-RDN | 4 |
| 5 | JA3-BCLK | 5 | 6 | UC_VCC | - |
| 7 | EMLE | 7 | 8 | GROUND | - |
| 9 | P00 | 9 | 10 | NC | NC |
| 11 | MD_FINED | 11 | 12 | P01 | 12 |
| 13 | PE4 | 13 | 14 | PE3 | 14 |
| 15 | RESn | 15 | 16 | P37 | 16 |
| 17 | GROUND | - | 18 | JA2-EXTAL | 18 |
| 19 | UC_VCC | - | 20 | PE2 | 20 |
| 21 | PE1 | 21 | 22 | JA3-WRHn | 22 |
| 23 | E1-TRSTn | 23 | 24 | E1-TMS | 24 |
| 25 | PD5 | 25 | 26 | PD4 | 26 |
| 27 | PD3 | 27 | 28 | PD2 | 28 |
| 29 | PD1 | 29 | 30 | PD0 | 30 |
| 31 | JA3-A19 | 31 | 32 | JA3-A18 | 32 |
| 33 | JA3-A17 | 33 | 34 | PMOD2-IO0 | 34 |
| 35 | NC | NC | 36 | NC | NC |

**Table 7-7** below lists the connections of the microcontroller pin header, J2.

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

| Microcontroller Pin Header J2 | | | | | |
|---|---|---|---|---|---|
| **Pin** | **Circuit Net Name** | **MCU Pin** | **Pin** | **Circuit Net Name** | **MCU Pin** |
| 1 | GROUND | - | 2 | VCC_USB | 38 |
| 3 | PB7 | 39 | 4 | PB6 | 40 |
| 5 | PB5 | 41 | 6 | UC_VCC | - |
| 7 | PB4 | 43 | 8 | GROUND | - |
| 9 | USB0-OVRCURA | 45 | 10 | PC1 | 46 |
| 11 | JA3-CSa | 47 | 12 | PB3 | 48 |
| 13 | PB2 | 49 | 14 | PB1 | 50 |
| 15 | PB0 | 51 | 16 | JA3-A15 | 52 |
| 17 | JA3-A14 | 53 | 18 | PMOD1-MISO | 54 |
| 19 | PMOD1-SCK | 55 | 20 | JA5-M2ENC | 56 |
| 21 | PA2 | 57 | 22 | PA1 | 58 |
| 23 | PA0 | 59 | 24 | JA3-A13 | 60 |
| 25 | JA3-A12 | 61 | 26 | PMOD1-IO0 | 62 |
| 27 | MOD1-IO1 | 63 | 28 | UC_VCC | - |
| 29 | JA5-M2POE | 65 | 30 | GROUND | - |
| 31 | JA5-M2UP | 67 | 32 | JA5-M2VP | 68 |
| 33 | JA5-M2WP | 69 | 34 | P92 | 70 |
| 35 | P91 | 71 | 36 | JA5-M2WN | 72 |



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**Table 7-8** below lists the connections of the microcontroller pin header, J3.

**Table 7-8: Microcontroller Pin Header, J3**

| Microcontroller Pin Header J3 | | | | | |
|---|---|---|---|---|---|
| **Pin** | **Circuit Net Name** | **MCU Pin** | **Pin** | **Circuit Net Name** | **MCU Pin** |
| 1 | JA3-D0 | 73 | 2 | JA3-D1 | 74 |
| 3 | JA3-D2 | 75 | 4 | JA3-D3 | 76 |
| 5 | JA3-D4 | 77 | 6 | JA3-D5 | 78 |
| 7 | P70 | 79 | 8 | JA3-D11 | 80 |
| 9 | JA3-D12 | 81 | 10 | JA3-D13 | 82 |
| 11 | JA3-D14 | 83 | 12 | JA3-D15 | 84 |
| 13 | PMOD2-IO1 | 85 | 14 | P33 | 86 |
| 15 | P32 | 87 | 16 | UC_VCC | - |
| 17 | P31 | 89 | 18 | GROUND | - |
| 19 | P30 | 91 | 20 | P27 | 92 |
| 21 | PMOD1-IO3 | 93 | 22 | PMOD1-IO2 | 94 |
| 23 | P24 | 95 | 24 | P23 | 96 |
| 25 | P22 | 97 | 26 | JA3-A20 | 98 |
| 27 | SERIAL-CTS | 99 | 28 | P32 | 100 |
| 29 | P20 | 101 | 30 | JA1-DAC1 | 102 |
| 31 | JA1-DAC0 | 103 | 32 | AVCC0-2 | - |
| 33 | AVCC0-2 | - | 34 | AVSS0-2 | - |
| 35 | PMOD2-IO2 | 107 | 36 | PMOD2-IO3 | 108 |

**Table 7-9** below lists the connections of the microcontroller pin header, J4.

**Table 7-9: Microcontroller Pin Header, J4**

| Microcontroller Pin Header J4 | | | | | |
|---|---|---|---|---|---|
| **Pin** | **Circuit Net Name** | **MCU Pin** | **Pin** | **Circuit Net Name** | **MCU Pin** |
| 1 | LED3 | 109 | 2 | LED2 | 110 |
| 3 | LED1 | 111 | 4 | LED0 | 112 |
| 5 | JA2-M1UD | 113 | 6 | JA5-M2UD | 114 |
| 7 | JA1-IO7 | 115 | 8 | JA1-IO6 | 116 |
| 9 | JA1-IO5 | 117 | 10 | JA1-IO4 | 118 |
| 11 | JA1-IO3 | 119 | 12 | P47 | 120 |
| 13 | P46 | 121 | 14 | P45 | 122 |
| 15 | P44 | 123 | 16 | PH4 | 124 |
| 17 | JA1-IO2 | 125 | 18 | JA1-IO1 | 126 |
| 19 | JA1-IO0 | 127 | 20 | P43 | 128 |
| 21 | P42 | 129 | 22 | P41 | 130 |
| 23 | P40 | 131 | 24 | PH0 | 132 |
| 25 | AVCC0-2 | - | 26 | AVCC0-2 | - |
| 27 | AVSS0-2 | - | 28 | AVSS0-2 | - |
| 29 | P82 | 137 | 30 | P81 | 138 |
| 31 | P80 | 139 | 32 | JA6-M1TOGGLE | 140 |
| 33 | P10 | 141 | 34 | JA2-M1WN | 142 |
| 35 | JA2-M1VN | 143 | 36 | JA2-M1UN | 144 |



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# 8. Code Development

## 8.1 Overview

For all code debugging using Renesas software tools, the RSK board must be connected to a PC via an E1/E20/E2 Lite debugger. An E1/E2 Lite debugger is supplied with this RSK product.

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

## 8.2 Compiler Restrictions

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

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

## 8.3 Mode Support

The MCU supports Single Chip and Boot Modes (SCI), which are configured on the RSK board. Details of the modifications required can be found in §6.2. All other MCU operating modes are configured within the MCU's registers, which are listed in the RX72T 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 E1 Emulator or E2 Emulator Lite (as supplied with this RSK) supports break points, event points (including mid-execution insertion) and basic trace functionality. It is limited to a maximum of 8 on-chip event points, 256 software breaks and 256 branch/cycle trace. For further details, refer RX Family E1/E20 Emulator User's Manual (R20UT0398EJ) or E2 Emulator Lite User's Manual (R20UT3240EJ).

## 8.5 Address Space

For the MCU address space details, refer to the 'Address Space' section of RX72T Group User's Manual: Hardware.



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# 9. Additional Information

**Technical Support**

For information about the RX72T Group microcontrollers refer to the RX72T Group Hardware Manual.

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

**Technical Contact Details**

***Please refer to the contact details listed in section 8 of the "Quick Start Guide"***

General information on Renesas microcontrollers can be found on the Renesas website at:
https://www.renesas.com/

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