User's Manual

RENESAS

R9A02G021

Fast Prototyping Board for R9A02G021 Microcontroller
FPB-R9A02G021
User's Manual

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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.
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   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.
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   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.
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   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.
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   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.
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This Fast Prototyping Board 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. 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 10 m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Evaluation 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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FPB-R9A02G021 User's Manual

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Glossary

Table 1. List of Abbreviations and Acronyms

ADC	Analog to Digital Converter
BoM	Bill of Materials
CS	Chip Select
CTS	Clear to Send
EMC	Electro Magnetic Compatibility
EMI	Electro Magnetic Interference
EU	European Union
FPB	Fast Prototyping Board
GPIO	General Purpose Input Output
HWQFN	WQFN with Heat Sink
I^2C (or IIC)	Inter-Integrated Circuit
IDE	Integrated Development Environment
INT	Interrupt
I/O	Input/Output
IRQ	Interrupt Request
LED	Light Emitting Diode
MCU	Micro Controller Unit
MISO	Master In Slave Out
MOSI	Master Out Slave In
NC	Not Connected
PWM	Pulse Width Modulation
QFN	Quad Flat No Lead Package
REMC	Remote Control Signal Receiver
RTC	Real Time Clock
RTS	Request to Send
RXD	Receive Data
SAU	Serial Array Unit
SCK	Serial Clock
SCL	Serial Clock Line
SDA	Serial Data Line
SMD	Surface Mount Device
SPI	Serial Peripheral Interface
SRAM	Static Random Access Memory
TAU	Timer Array Unit
TP	Test Point
TXD	Transmit Data
UART	Universal Asynchronous Receiver Transmitter
USB	Universal Serial Bus
WQFN	Very-Very thin QFN

1. Board Overview

The FPB-R9A02G021, a Fast Prototyping Board for the R9A02G021 MCU, enables users to seamlessly evaluate the features of the R9A02G021 MCU and develop embedded systems applications using the e^2 studio IDE. The on-board features along with a choice of popular ecosystem add-on modules brings user's big ideas to life.

The key features of the FPB-R9A02G021 board are categorized in three groups as follows:

MCU Native Pin Access

- R9A02G0214CNE MCU (referred to as MCU)
- Max 48 MHz, RISC-V core
- 128 KB Code Flash, 4 KB Data Flash, 16 KB SRAM
- 48-pin, HWQFN package
- Native pin access through 2 x 24-pin male headers (not fitted)
- MCU current measurement point for precision current consumption measurement (not fitted)
- MCU internal clock
- Providing 32.768 kHz reference clock

Special Feature Access

- Remote Control Signal Receiver (not fitted)

System Control and Ecosystem Access

- Two +5 V input sources
  - USB
  - External power supply (using 2-pin header [not fitted])
- Built-in SEGGER J-Link OB debug probe (cJTAG: 2-wire compact JTAG)
- User LEDs and switches
  - Two User LEDs (green)
  - Power LED (green) indicating availability of regulated power
  - Debug LED (yellow) indicating the debug connection
  - One User switch
  - One Reset switch
- Three popular ecosystem expansions
  - Seeed Grove® (I^{2}C, Analog) connector (not fitted)
  - Two Digilent Pmod™ connectors
    Pmod 1: Type-2A (expanded SPI), Type-3A (expanded UART) and Type-6A (expanded I^{2}C)
    Pmod 2: Type-3A (expanded UART) and Type-6A (expanded I^{2}C)
  - Arduino® (Uno R3) connector
- MCU boot configuration jumper

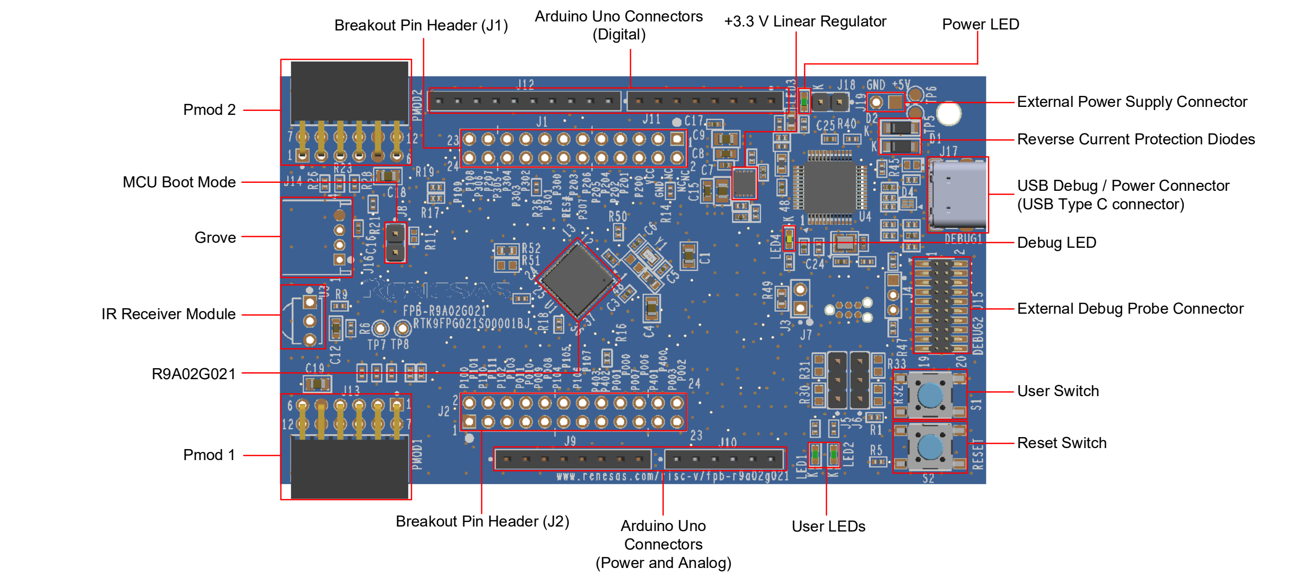

Figure 1. FPB-R9A02G021 Board Top Side

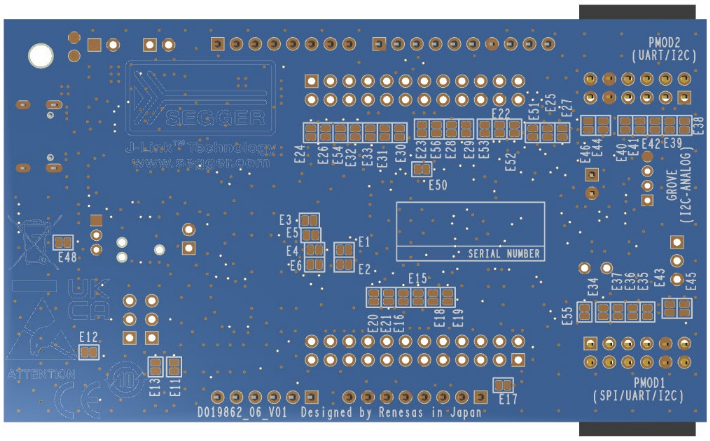

Figure 2. FPB-R9A02G021 Board Bottom Side

1.1 Assumptions and Advisory Notes

1. It is assumed that the user has a basic understanding of microcontrollers and embedded systems hardware.
2. An Integrated Development Environment (IDE) such as e[2] studio is required to develop embedded applications on FPB-R9A02G021 board.

2. Box Contents

The following components are included in the box:

1. FPB-R9A02G021 v1 board
2. Printed Quick Start Guide
3. Printed information for China RoHS

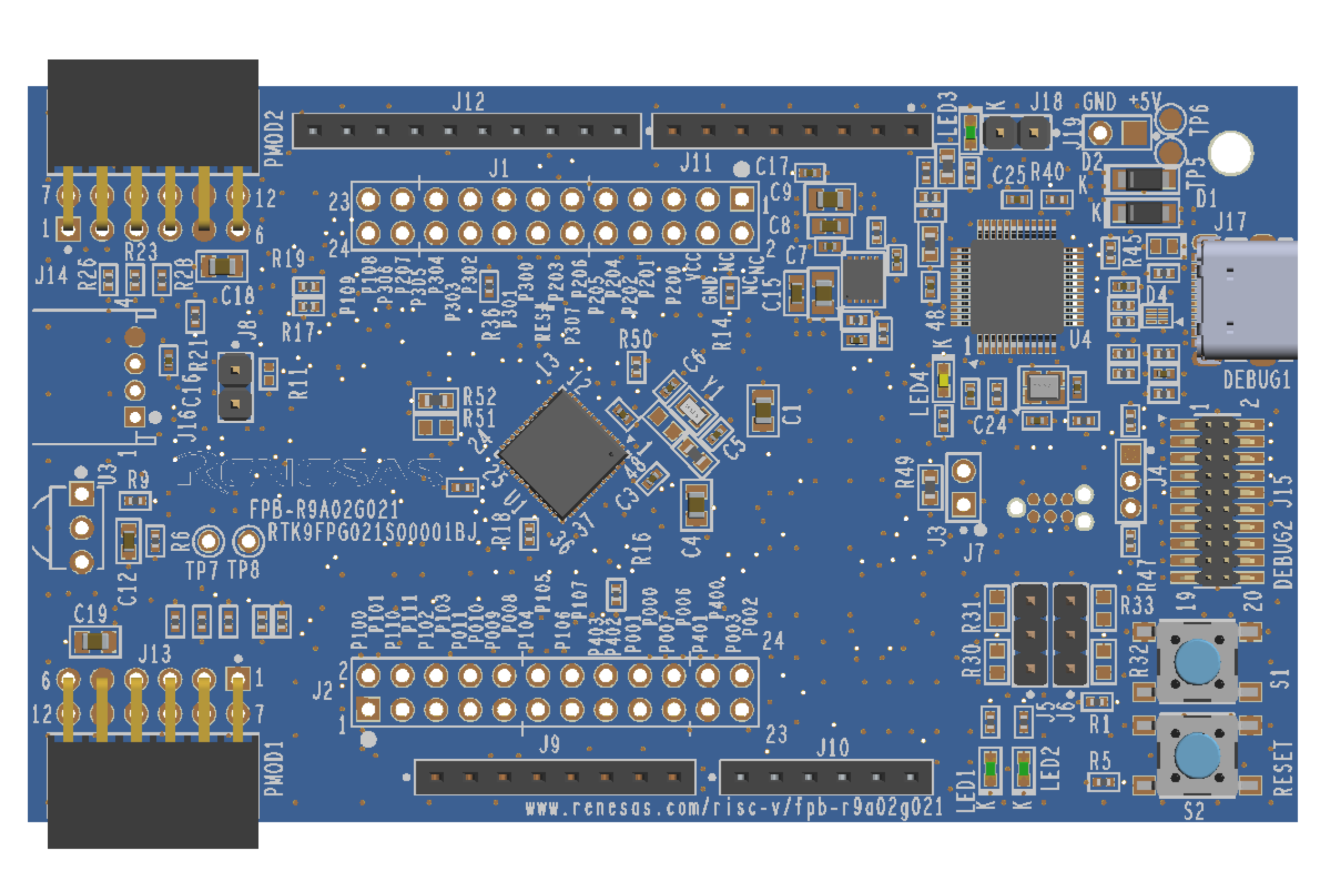

Figure 3. FPB-R9A02G021 Board

3. Ordering Information

- FPB-R9A02G021 v1 kit orderable part number: RTK9FPG021S00001BJ

  Note: The underlined character in the orderable part number represents the kit version.

4. Hardware Architecture and Default Configuration

4.1 Board Architecture

The FPB-R9A02G021 board is designed with an architecture similar to other boards in the Renesas FPB series. Alongside the MCU there is an on-board debug probe, pin headers for access to all the pins on the MCU, a power supply regulator, some LEDs and switches, and several ecosystem I/O connectors (Grove, Pmod and Arduino).

Table 2. Board Architecture

Board Functionality	Features	Function present on all similar boards	Functionality is:
MCU Native Pin Access	MCU, breakout pin headers for all MCU I/O and power (not fitted), 2-pin header for MCU current measurement (not fitted)	Yes	MCU dependent
Special Feature Access	MCU special features: Remote control signal receiver (not fitted)	Optional	MCU dependent
System Control and Ecosystem Access	Power, debugger, user LEDs and switch, reset switch, ecosystem connectors, boot configuration	Yes	Same or similar across other FPB boards

4.2 Block Diagram

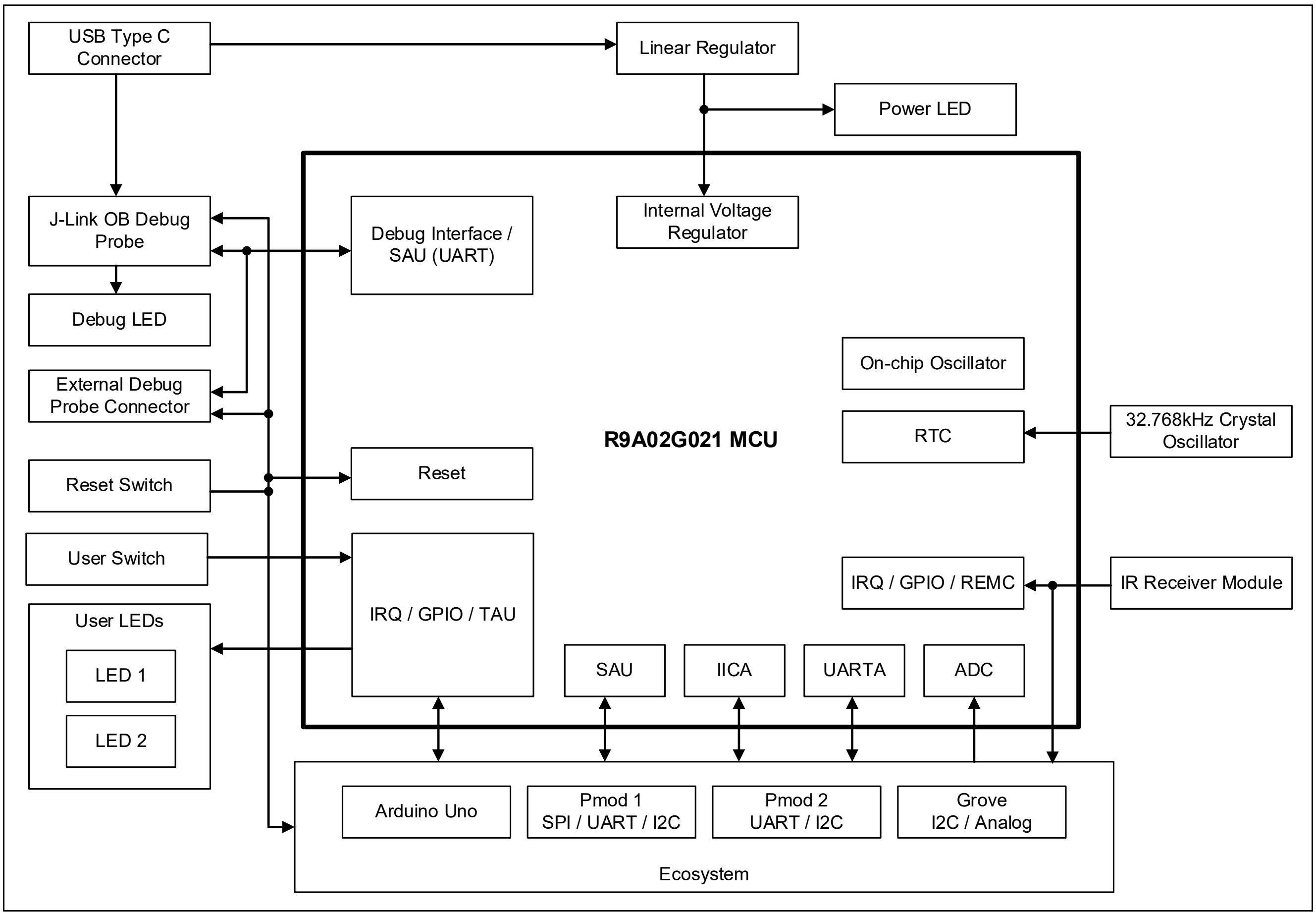

Figure 4. FPB-R9A02G021 Board Block Diagram

4.3 Component Placement Location and Dimension

Reference number for components on the FPB-R9A02G021 board is shown below.

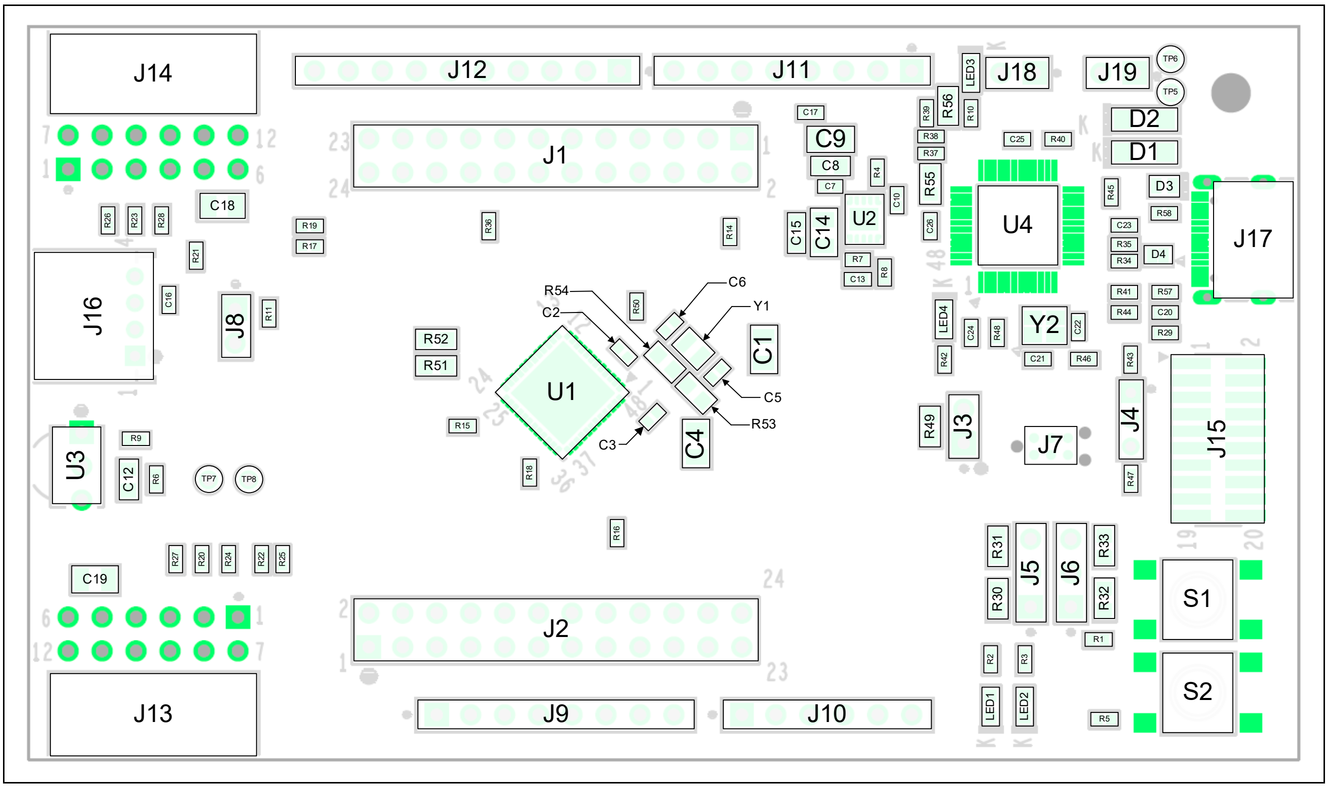

Figure 5. Reference number for components on the FPB-R9A02G021 board (top side)

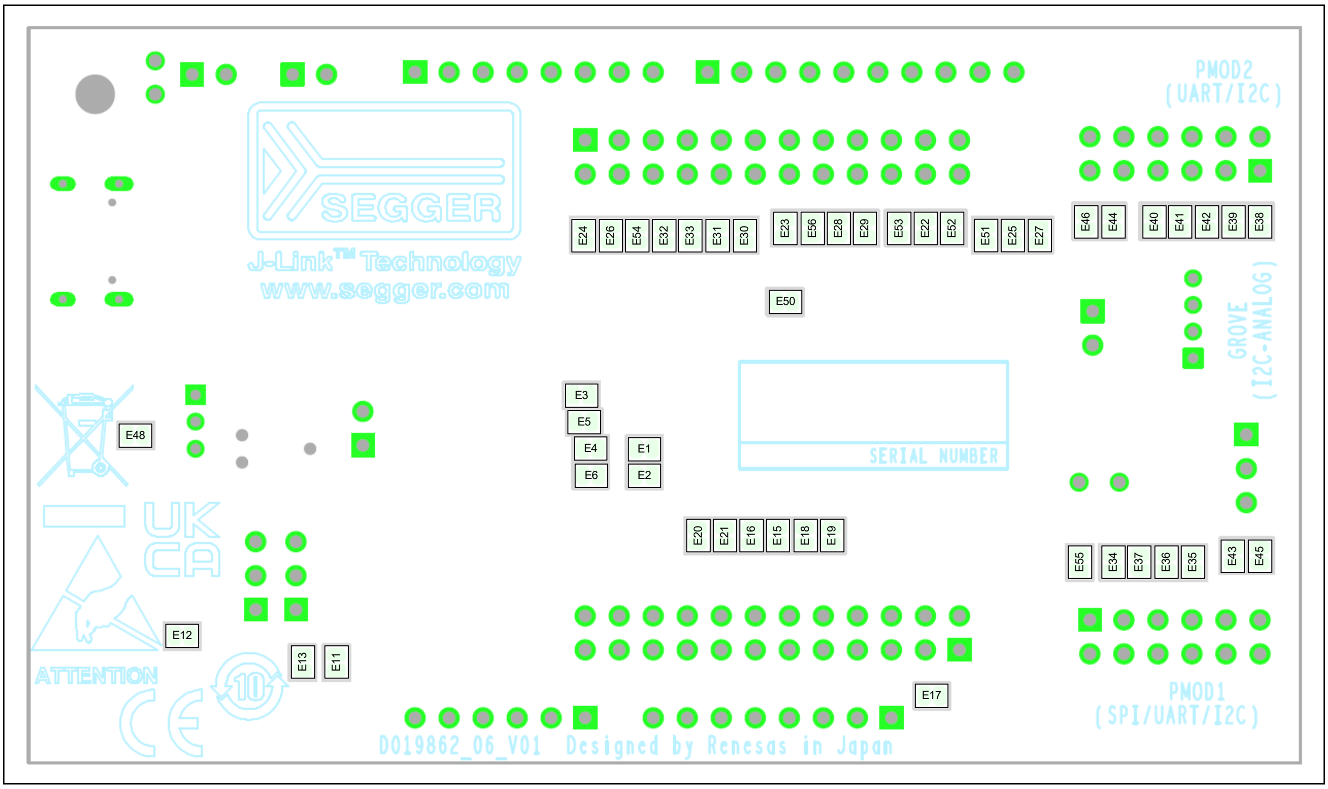

Figure 6. Reference number for components on the FPB-R9A02G021 board (bottom side)

Dimensional drawing for the FPB-R9A02G021 board is shown below.

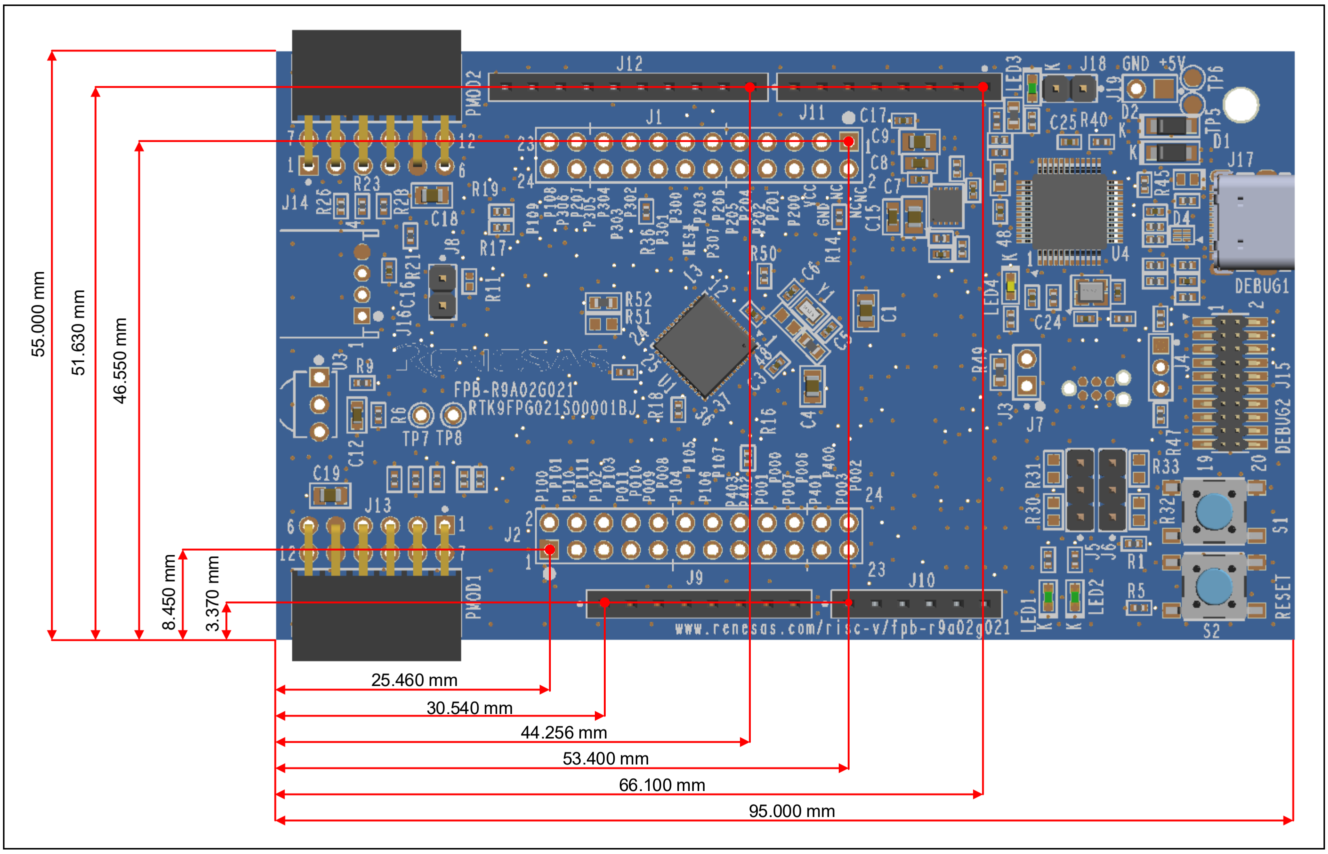

Figure 7. Dimensional drawing

4.4 Jumper Settings

Two types of jumpers are provided on the FPB-R9A02G021 board.

1. Copper jumpers (trace-cut type and solder-bridge type)
2. Traditional pin header jumpers

The following sections describe each type and their default configuration.

4.4.1 Copper Jumpers

Copper jumpers are of two types, designated **trace-cut** and **solder-bridge**.

A **trace-cut jumper** is provided with a narrow copper trace connecting its pads. To isolate the pads, cut the trace between pads adjacent to each pad, then remove the connecting copper foil either mechanically or with the assistance of heat. Once the etched copper trace is removed, the trace-cut jumper is turned into a solder-bridge jumper for any later changes.

A **solder-bridge** jumper is provided with two isolated pads that may be joined together by one of three methods:

- Solder may be applied to both pads to develop a bulge on each and the bulges joined by touching a soldering iron across the two pads.
- A small wire may be placed across the two pads and soldered in place.
- A SMD resistor may be placed across the two pads and soldered in place. A zero-ohm resistor shorts the pads together.

For any copper jumper, the connection is considered **closed** if there is an electrical connection between the pads (default for trace-cut jumpers.) The connection is considered **open** if there is no electrical connection between the pads (default for the solder-bridge jumpers).

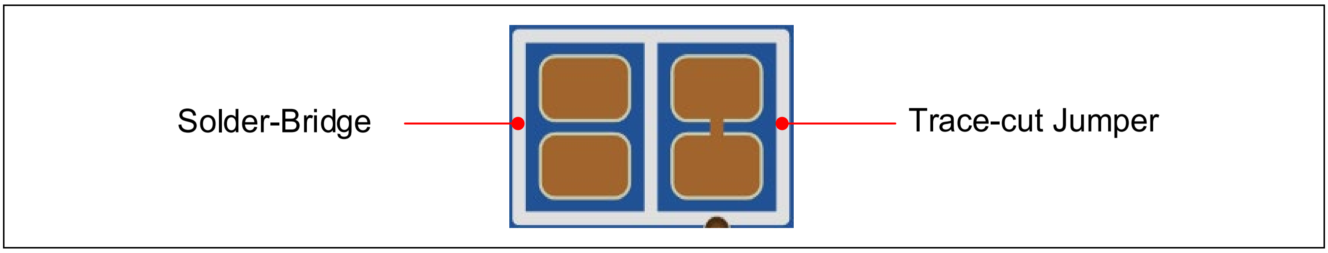

Figure 8. Copper Jumpers

4.4.2 Traditional Pin Header Jumpers

These jumpers are traditional small pitch jumpers that require an external shunt to open/close them. The traditional pin jumpers on the FPB-R9A02G021 board are 0.1” (2.54 mm) pitch headers and require compatible 2.54 mm shunt jumpers.

4.4.3 Default Jumper Configuration

The following table describes the default settings for each jumper on the FPB-R9A02G021 board. This includes copper jumpers (Ex designation) and traditional pin jumpers (Jx designation). This also includes some 0Ω resistors (Rx designation) because the resistors are used as jumper function.

The circuit group for each jumper is the designation found in the board schematic (available in the Design Package). Functional details for many of the listed jumpers may be found in sections associated with each functional area of the kits.

Table 3. Default Jumper Settings for the MCU

Location	Circuit Group	Default (Open / Closed) (Fitted / Not fitted)	Function
E1	MCU	Open	Closed: P003 (AVREFM) connects to breakout pin header J2. (Remove capacitor C3 at closed)
			Open: P003 (AVREFM) disconnects from breakout pin header J2.
E2	MCU	Closed	Closed: P003 (AVREFM) connects to GND.
			Open: P003 (AVREFM) disconnects from GND.
E3	MCU	Open	Closed: P002 (AVREFP) connects to +3V3_MCU.
			Open: P002 (AVREFP) disconnects from +3V3_MCU.
E4	MCU	Closed	Closed: P002 (AVREFP) connects to +3.3 V.
			Open: P002 (AVREFP) disconnects from +3.3 V.
E5	MCU	Open	Closed: P002 (AVREFP) connects to Arduino Uno (AREF).
			Open: P002 (AVREFP) disconnects from Arduino Uno (AREF).
E6	MCU	Open	Closed: P002 (AVREFP) connects to breakout pin header J2. (Remove capacitor C3 at closed)
			Open: P002 (AVREFP) disconnects from breakout pin header J2.
J8	MCU BOOT MODE	Open	Closed: The MCU is configured for UART boot mode.
			Open: The MCU is configured for single chip mode.
R49	MCU CURRENT MEASUREMENT	Fitted	Fitted: +3.3 V connects to the MCU.
			Not fitted: The MCU current can be measured over this jumper.

Table 4. Default Jumper Settings for J-Link OB and external debug probe

Location	Circuit Group	Default (Open / Closed) (Fitted / Not fitted)	Function
J18	J-Link OB	Open	Closed: J-Link OB debug probe is held in reset. (R9A02G021 MCU free-running operation.)
			Open: J-Link OB debug probe is enabled.
E50	External debug probe, J-Link OB	Closed	Closed: P300 (TCKC) connects to the connector for external debug probe J15 (TCKC) and J-Link OB debug probe.
			Open: P300 (TCKC) disconnects from the connector for external debug probe J15 (TCKC) and J-Link OB debug probe.
E56	External debug probe, J-Link OB	Closed	Closed: P303 (RXD0_B) connects to the connector for external debug probe J15 (RXD) and J-Link OB debug probe.
			Open: P303(TO04) can be connected to Arduino Uno (D10 / SS / PWM) by closing the copper jumper E28.
J5	External debug probe, J-Link OB	Jumper on pins 2-3	Jumper on pins 2-3: The MCU connects to a host PC by Virtual COM (VCOM).
			Jumper on pins 1-2: The external debug probe connection is selected (for Debug in or UART Boot via external debug probe mode).
J6	External debug probe, J-Link OB	Jumper on pins 2-3	Jumper on pins 2-3: The MCU connects to a host PC by Virtual COM (VCOM).
			Jumper on pins 1-2: The external debug probe connection is selected (for Debug in or UART Boot via external debug probe mode).
J4	J-Link OB	Not fitted	Do not fit and use this jumper.
E48	External Debugger	Closed	Do not open this copper jumper.

Table 5. Default Jumper Settings for Arduino Uno

Location	Circuit Group	Default (Open / Closed)	Function
E15	Arduino Uno	Closed	Closed: P105 (ANI18) connects to Arduino Uno (A4). Open: P105 (ANI18) disconnects from Arduino Uno (A4).
E16	Arduino Uno	Closed	Closed: P106 (ANI19) connects to Arduino Uno (A5). Open: P106 (ANI19) disconnects from Arduino Uno (A5).
E17	Arduino Uno	Open	Closed: +5 V connects to Arduino Uno (5V). Open: +5 V disconnects from Arduino Uno (5V).
E22	Arduino Uno	Closed	Closed: P102 (SI20) connects to Arduino Uno (D12 / MISO). Open: P102 (SI20) disconnects from Arduino Uno (D12 / MISO).
E23	Arduino Uno	Closed	Closed: P107 (TO03_A) connects to Arduino Uno (D9 / PWM). Open: P107 (TO03_A) disconnects from Arduino Uno (D9 / PWM).
E24	Arduino Uno	Open	Closed: +3.3V (pull-up) connects to Arduino Uno (D3 / INT / PWM). Open: +3.3V (pull-up) disconnects from Arduino Uno (D3 / INT / PWM).
E25	Arduino Uno	Closed	Closed: +3.3V (pull-up) connects to P011 (SCLA1) and P010 (SDAA1). Open: +3.3V (pull-up) disconnects from P011 (SCLA1) and P010 (SDAA1).
E26	Arduino Uno	Closed	Closed: P100 (IRQ6_C / TO05) connects to Arduino Uno (D3 / INT / PWM). Open: P100 (IRQ6_C / TO05) disconnects from Arduino Uno (D3 / INT / PWM).
E27	Arduino Uno	Open	Closed: +5 V (pull-up) connects to P011 (SCLA1) and P010 (SDAA1). Open: +5 V (pull-up) disconnects from P011 (SCLA1) and P010 (SDAA1).

Location	Circuit Group	Default (Open / Closed)	Function
E28	Arduino Uno	Open	Closed: P303 (TO04) connects to Arduino Uno (D10 / SS / PWM).
			Open: P303 (TO04) disconnects from Arduino Uno (D10 / SS / PWM).
E29	Arduino Uno	Closed	Closed: P009 connects to Arduino Uno (D10 / SS / PWM).
			Open: P009 disconnects from Arduino Uno (D10 / SS / PWM).
E30	Arduino Uno	Open	Closed: P011 (TO07_B) connects to Arduino Uno (D6 / PWM).
			Open: P011 (TO07_B) disconnects from Arduino Uno (D6 / PWM).
E31	Arduino Uno	Closed	Closed: P104 connects to Arduino Uno (D6 / PWM).
			Open: P104 disconnects from Arduino Uno (D6 / PWM).
E32	Arduino Uno	Closed	Closed: P402 connects to Arduino Uno (D5 / PWM).
			Open: P402 disconnects from Arduino Uno (D5 / PWM).
E33	Arduino Uno	Open	Closed: P102 (TO01) connects to Arduino Uno (D5 / PWM).
			Open: P102 (TO01) disconnects from Arduino Uno (D5 / PWM).
E51	Arduino Uno	Closed	Closed: P011 (SCLA1) connects to Arduino Uno (SCL).
			Open: P011 (SCLA1) disconnects from Arduino Uno (SCL).
E52	Arduino Uno	Closed	Closed: P101 (SCK20) connects to Arduino Uno (D13 / SCK).
			Open: P101 (SCK20) disconnects from Arduino Uno (D13 / SCK).
E53	Arduino Uno	Closed	Closed: P103 (SO20 / TO02_A) connects to Arduino Uno (D11 / MOSI / PWM).
			Open: P103 (SO20 / TO02_A) disconnects from Arduino Uno (D11 / MOSI / PWM).
E54	Arduino Uno	Open	Closed: P207 connects to Arduino Uno (D4).
			Open: P207 disconnects from Arduino Uno (D4).

Table 6. Default Jumper Settings for Pmod 1

Location	Circuit Group	Default (Open / Closed) (Fitted / Not fitted)	Function
E34	Pmod 1	Closed	Closed: P102 (RXD2 / SI20) connects to Pmod 1 (RXD / MISO / SCL).
			Open: P102 (RXD2 / SI20) disconnects from Pmod 1 (RXD / MISO / SCL).
E35	Pmod 1	Closed	Closed: P101 (SCK20) connects to Pmod 1 (RTS / SCK / SDA).
			Open: P101 (SCK20) disconnects from Pmod 1 (RTS / SCK / SDA).
E36	Pmod 1	Open	Closed: P010 (SDAA1) connects to Pmod 1 (RTS / SCK / SDA).
			Open: P010 (SDAA1) disconnects from Pmod 1 (RTS / SCK / SDA).
E37	Pmod 1	Open	Closed: P011 (SCLA1) connects to Pmod 1 (RXD / MISO / SCL).
			Open: P011 (SCLA1) disconnects from Pmod 1 (RXD / MISO / SCL).
E43	Pmod 1	Closed	Closed: +3.3 V connects to Pmod 1 (VCC).
			Open: +3.3 V disconnects from Pmod 1 (VCC).
E45	Pmod 1	Open	Closed: +5 V connects to Pmod 1 (VCC).
			Open: +5 V disconnects from Pmod 1 (VCC).
E55	Pmod 1	Closed	Closed: P103 (TXD2 / SO20) connects to Pmod 1 (TXD / MOSI).
			Open: P103 (TXD2 / SO20) disconnects from Pmod 1 (TXD / MOSI).

Table 7. Default Jumper Settings for Pmod 2

Location	Circuit Group	Default (Open / Closed) (Fitted / Not fitted)	Function
E38	Pmod 2	Closed	Closed: P108 (IRQ4_B) connects to Pmod 2 (CTS / INT).
			Open: P108 (IRQ4_B) disconnects from Pmod 2 (CTS / INT).
E39	Pmod 2	Closed	Closed: P000 (RXD1) connects to Pmod 2 (RXD / SCL).
			Open: P000 (RXD1) disconnects from Pmod 2 (RXD / SCL).
E40	Pmod 2	Closed	Closed: P207 connects to Pmod 2 (RTS / SDA).
			Open: P207 disconnects from Pmod 2 (RTS / SDA).
E41	Pmod 2	Open	Closed: P010 (SDAA1) connects to Pmod 2 (RTS / SDA).
			Open: P010 (SDAA1) disconnects from Pmod 2 (RTS / SDA).
E42	Pmod 2	Open	Closed: P011 (SCLA1) connects to Pmod 2 (RXD / SCL).
			Open: P011 (SCLA1) disconnects from Pmod 2 (RXD / SCL).
E44	Pmod 2	Closed	Closed: +3.3 V connects to Pmod 2 (VCC).
			Open: +3.3 V disconnects from Pmod 2 (VCC).
E46	Pmod 2	Open	Closed: +5 V connects to Pmod 2 (VCC).
			Open: +5 V disconnects from Pmod 2 (VCC).
R52	Pmod 2	Fitted	Fitted: P202 (IRQ2_C / RIN0) connects to Pmod 2 (INT).
			Not fitted: P202 (IRQ2_C / RIN0) disconnects from Pmod 2 (INT).

Table 8. Default Jumper Settings for Grove

Location	Circuit Group	Default (Open / Closed)	Function
E18	Grove	Open	Closed: P105 (ANI18) connects to Grove (SCL / AN). Open: P105 (ANI18) disconnects from Grove (SCL / AN).
E19	Grove	Closed	Closed: P011 (SCLA1) connects to Grove (SCL / AN). Open: P011 (SCLA1) disconnects from Grove (SCL / AN).
E20	Grove	Closed	Closed: P010 (SDAA1) connects to Grove (SDA / AN). Open: P010 (SDAA1) disconnects from Grove (SDA / AN).
E21	Grove	Open	Closed: P106 (ANI19) connects to Grove (SDA / AN). Open: P106 (ANI19) disconnects from Grove (SDA / AN).

Table 9. Default Jumper Settings for HMI Features

Location	Circuit Group	Default (Open / Closed) (Fitted / Not fitted)	Function
E11	USER LEDS	Closed	Closed: P107 (TO03_A) connects to LED1. Open: P107 (TO03_A) disconnects from LED1.
E13	USER LEDS	Closed	Closed: P100 (TO05) connects to LED2. Open: P100 (TO05) disconnects from LED2.
E12	USER PUSH-SWITCH	Closed	Closed: P108 (IRQ4_B) connects to user switch S1. Open: P108 (IRQ4_B) disconnects from user switch S1.
R51	IR RECEIVER	Not fitted	Fitted: P202 (IRQ2_C / RIN0) connects to OUT pin of IR Receiver Module (U3). Not fitted: P202 (IRQ2_C / RIN0) disconnects from OUT pin of IR Receiver Module (U3).

5. System Control and Ecosystem Access

The FPB-R9A02G021 provides a power supply regulator, an on-board debug probe, simple I/O (switches and LEDs), and popular I/O ecosystem connectors. These are all described in detail below.

5.1 Power

The FPB-R9A02G021 board is designed for +5 V operation. An on-board Linear Regulator is used to convert the +5 V supply to a +3.3 V supply. The +3.3 V supply is used to power the MCU and other peripheral features.

Note: Power to the FPB-R9A02G021 board can't be supplied by an external debug probe. An USB cable or external power supply must be used to power the board.

5.1.1 Power Supply Options

This section describes the different ways in which FPB-R9A02G021 board can be powered.

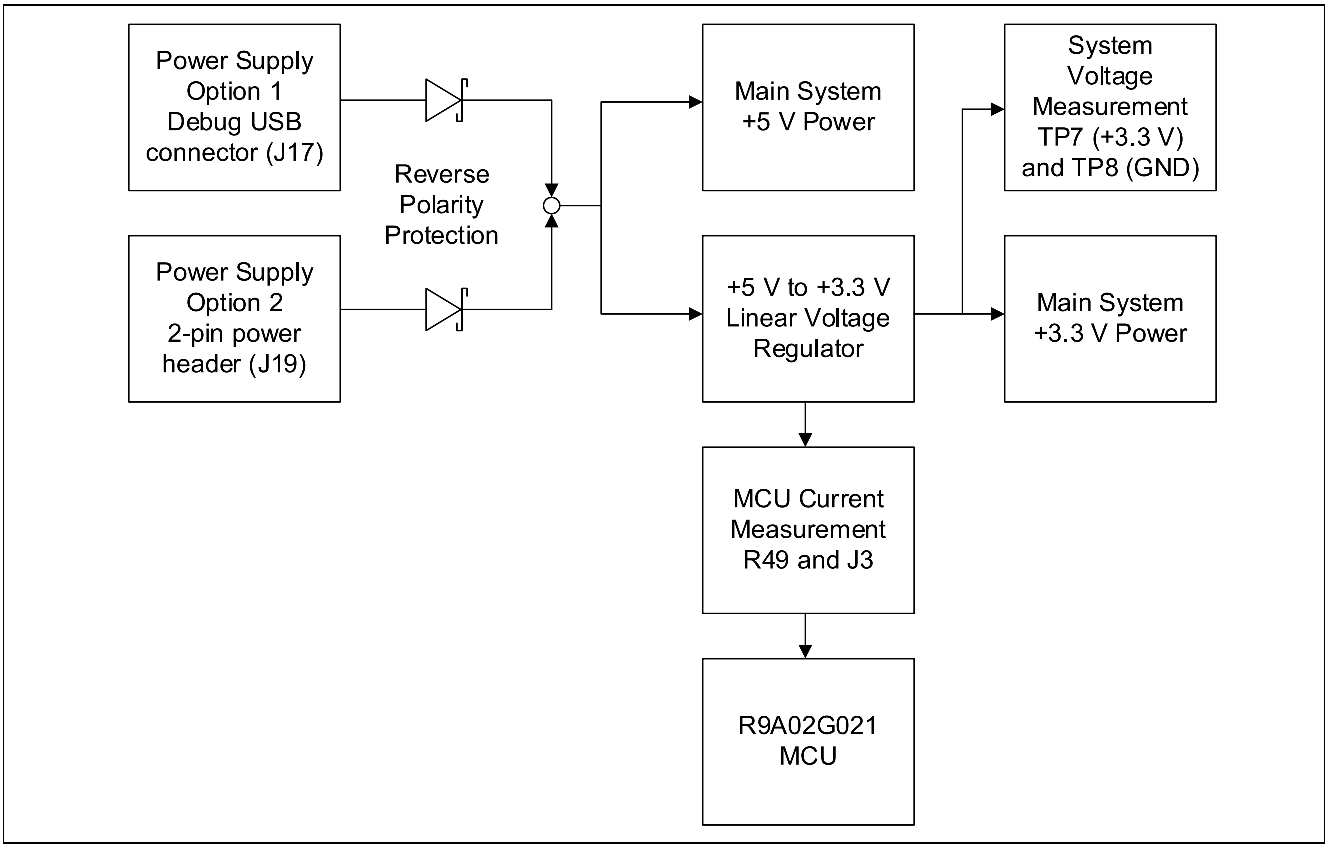

Figure 9. Power Supply Options

5.1.1.1 Option 1: USB

+5 V may be supplied from a host PC to the USB Type C connector (J17) labelled DEBUG1 on the board. Power from this source is connected to the main system +5 V power. Reverse current protection is provided between this connector and the main system +5 V power.

5.1.1.2 Option 2: Header Connector J19

+5 V may be supplied from an external power supply to connector J19. J19 can be fitted with a standard 2-pin header on a 0.1" (2.54 mm) pitch. Pin 1 is +5 V, and pin 2 is GND. Power from this source is connected to the main system +5 V power. Reverse current protection is provided between J19 and the main system +5 V power.

5.1.2 Power Supply Considerations

Voltage of Main System +5 V Power will be lower than the power supply voltage because of the forward voltage (max 0.55V@1A) of the reverse current protection diode. Please note the voltage drop, because Main System +5 V Power is +5 V power source which supplies to external devices connected to Arduino, Pmod 1 and Pmod 2.

Note: The maximum current that could be supplied to the FPB-R9A02G021 board is 1 A. Please be aware that the larger the current is, the higher the temperature of reverse current protection diode and +3.3V linear regulator will be.

5.1.3 Power-up Behavior

When powered, the green LED labelled LED3 will light up.

5.2 Debug and Programming

The FPB-R9A02G021 board can be debugged using the built-in J-Link OB debug probe (Debug on-board mode) and an external debug probe (Debug in mode).

Table 10. Debug Mode

Debug Mode	Debug MCU (the device that connects to the IDE on PC)	Target MCU (the device that is being debugged)	Debugging Interface / Protocol	Connector used
Debug on-board	J-Link OB debug probe	R9A02G021 (on-board)	cJTAG	USB DEBUG1 Connector (J17)
Debug in	External debug probe	R9A02G021 (on-board)	cJTAG	20-pin 1.27mm pitch SMD Connector

Notes:

- See Table 12 for the USB DEBUG1 connector pin definition.
- See Table 13 for the 20-pin 1.27 mm pitch SMD connector pin definition.

The built-in J-Link OB debug probe or an external debug probe can be used also for programming to the FPB-R9A02G021 board. The FPB-R9A02G021 board can be programmed using VCOM of the built-in J-Link OB debug probe (UART Boot via VCOM mode) or an external debug probe (UART Boot via external debug probe mode).
The following table summarizes the jumper configuration for debugging and programming.

Table 11. Jumper Configuration for Debugging and Programming

Debugging / Programming Mode	Debugging / Programming Interface	VCOM	J5 & J6	J8	J18
Debug on-board	cJTAG	Available	Jumper on pins 2-3	Open	Open
Debug in	cJTAG	Not available	Jumper on pins 1-2	Open	Closed
UART Boot via VCOM	UART Boot	Available as UART Boot resource	Jumper on pins 2-3	Closed	Open
UART Boot via external debug probe	UART Boot	Not available	Jumper on pins 1-2	Closed	Closed

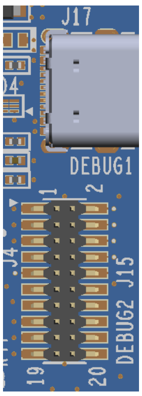

Figure 10. FPB-R9A02G021 Debug Interface

5.2.1 J-Link OB debug probe

USB DEBUG1 (Type C) connector (J17) connects the J-Link OB debug probe to a host PC, allowing re-programming and debugging of the MCU firmware.

The J-Link OB debug probe connects to the MCU using the cJTAG interface. Please note that connecting the same host PC to multiple FPB-R9A02G021 boards is not possible.

Table 12. USB Debug Connector

USB Debug Connector		**FPB-R9A02G021**
Pin	**Description**	**Signal / Bus**
J17-A4_B9	VBUS [0]	+5V_USB_DBG
J17-B4_A9	VBUS [1]	+5V_USB_DBG
J17-A5	CC1	5.1kΩ Pull-down
J17-B5	CC2	5.1kΩ Pull-down
J17-A6	DP1	USB_JLOB_DP
J17-B6	DP2	USB_JLOB_DP
J17-A7	DN1	USB_JLOB_DM
J17-B7	DN2	USB_JLOB_DM
J17-A8	SBU1	NC
J17-B8	SBU2	NC
J17-A1_B12	GND [0]	GND
J17-B1_A12	GND [1]	GND

The yellow LED4, shows the visual status of the debug interface. When the FPB-R9A02G021 board is powered on, and LED4 is blinking, it indicates that the J-Link OB debug probe is not connected to a host PC. When LED4 stays on, it indicates that it is connected to a host PC.

5.2.2 External debug probe

The 20-pin 1.27 mm pitch SMD connector at J15 supports cJTAG interface and UART boot. This connector may be used for external debug of the MCU.

The cable that comes with your emulator may have a pin stopper on pin7. In that case, remove the pin stopper from the socket.

The connector J15 doesn't have reverse insertion prevention mechanism. Match pin 1 of the cable to be connected with Pin 1 of connector J15, and be careful not to connect reversely.

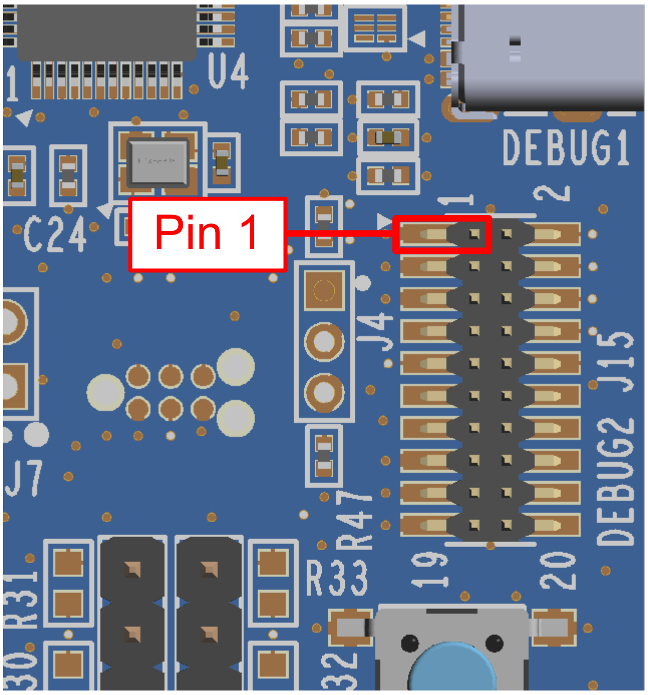

Figure 11. Connector for external debug probe

Table 13. External debug probe Connection

	External Debugger Connection		FPB-R9A02G021
Pin	**cJTAG Pin Name**	**UART Boot Pin Name**	**Signal / Bus**
J15-1	VTref		+3.3 V
J15-2	TMSC	Not used	P301 (TMSC)
J15-3	GND		GND
J15-4	TCKC	Not used	P300 (TCKC)
J15-5	GND		GND
J15-6	Not used	TXD	P302 (TXD0_B)
J15-7	Not used		NC
J15-8	Not used	RXD	P303 (RXD0_B)
J15-9	GNDDetect		GND (cut E48 to open)
J15-10	RESET		RES#
J15-11	5V-Supply		NC
J15-12	NC		NC
J15-13	5V-Supply		NC
J15-14	NC		NC
J15-15	GND		GND
J15-16	NC		NC
J15-17	GND		GND
J15-18	NC		NC
J15-19	GND		GND
J15-20	NC		NC

5.2.3 Settings in e² studio and Renesas Flash Programmer

FPB-R9A02G021 needs to be configured in Debug on-board shown in Table 11 when the MCU is debugged or re-programmed at Debug on-board mode with e² studio. Figure 12 shows the settings for e² studio when creating a new project for the FPB-R9A02G021 board.

[Debug hardware]: Select [J-Link RISC-V]

[Target Device]: Select [R9A02G021]

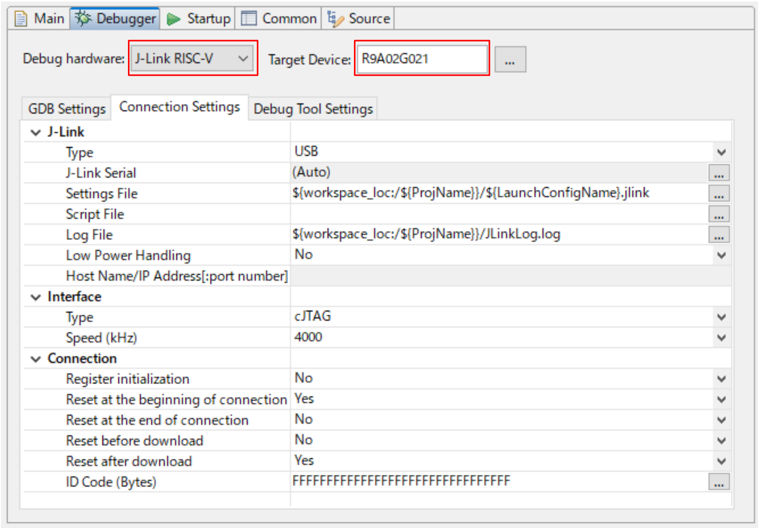

Figure 12. e² Studio Settings

FPB-R9A02G021 needs to be configured in UART Boot via VCOM shown in Table 11 when the MCU is re-programmed at UART Boot via VCOM mode with Renesas Flash Programmer. Figure 13 shows the settings for Renesas Flash Programmer when creating a new project for the FPB-R9A02G021 board.

Connect an USB cable between the FPB-R9A02G021 and a host PC and create a new project.

[Microcontroller]: Select [RISC-V MCU]

[Project Name]: Define project name

[Project Name]: Select project folder location

[Tool]: Select [COM port]

[Tool Details]: Select COM port which shows JLink CDC UART Port

The MCU doesn't enter into UART (SAU) boot mode by Power-on reset. Therefore, the user needs to push the reset switch on the FPB-R9A02G021 board and then click on Connect button.

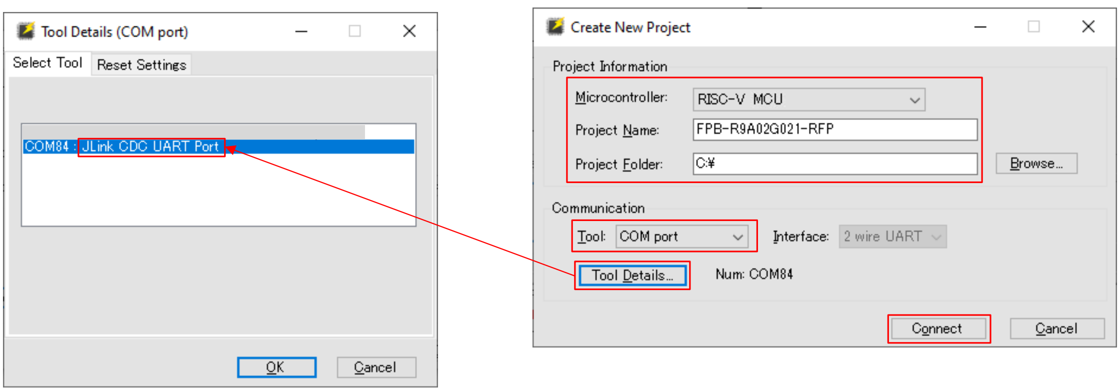

Figure 13. Renesas Flash Programmer Settings

5.3 Ecosystem

The Ecosystem connectors provide users the option to connect several third party add-on modules compatible with three popular ecosystems using the following connectors:

1. Seeed Grove® connector (not fitted)
2. Two Digilent Pmod™ connectors
   Pmod 1: Type-2A (expanded SPI), Type-3A (expanded UART) and Type-6A (expanded I²C)
   Pmod 2: Type-3A (expanded UART) and Type-6A (expanded I²C)
3. Arduino® (Uno R3) connectors

Note.1: We do not guarantee connection to all types of third party add-on modules. Confirm the specifications of this product against any third party add-on modules you intend to use.

Note.2: Third party add-on modules may not be able to connect the FPB-R9A02G021 board simultaneously because the MCU pins which are connected to third party add-on modules are multiplexed. Confirm the specifications of this product and R9A02G021 User's Manual: Hardware.

Table 14 summarizes connection between the MCU and the ecosystem connectors. The cells filled in green indicate that the signals are connected by default, and the cells filled in yellow indicate that the signals can be optionally connected by jumpers setting and resistors fitting. The blank cells indicate no connection between the MCU and the ecosystem connectors.

Due to port limitation of the MCU, one port may be connected to several ecosystem connectors. Please configure the jumpers and the resistors according to user's ecosystem configuration by referring Table 14.

■ I²C

I²C is connected to Pmod 1, Pmod 2, Grove and Arduino. The I²C channel in the MPU is same module, so that I²C slave devices are needed to select by slave address.

The I²C can be configured either +3.3 V or +5 V pull-up by solder jumper E25 and E27.

P011 (SCLA1 / TO07_B) of the I²C is shared with a PWM signal of Arduino. I²C is unavailable when P011 port is configured to PWM function.

■ SPI

SPI is connected to Pmod 1 and Arduino. The SPI channel in the MPU is same module, so that SPI slave devices are needed to select by chip select signal when both Pmod 1 and Arduino are connected to SPI slave devices.

P102 (SI20 / TO01) of the SPI is shared with a PWM signal of Arduino. SPI is unavailable when P102 port is configured to PWM function.

The P102 (SI20 / RXD2) and P103 (SO20 / TXD2) of the SPI are multiplexed with UART, and the UART is assigned to Pmod 1. SPI is unavailable when the ports are configured to the UART.

■ UART

UARTs are connected to Pmod 1, Pmod 2 and Arduino. The UART channels connected to Pmod 2 and Arduino is independent, so that devices that connected to Pmod 2 and Arduino can be used simultaneously.

The UART (RXD and TXD) connected to Pmod 1 is multiplexed MISO and MOSI of the SPI. UART for Pmod 1 is unavailable when configured to SPI.

■ Miscellaneous

The signals connected to ecosystem connectors are also shared with IR receiver, user LEDs and user switch. Please select the function you intend to use by jumper setting and resistor fitting.

Table 14. MCU and Ecosystem Connection

MCU	Ecosystem				
I/O Port	**Pmod 1**	**Pmod 2**	**Grove**	**Arduino**	**Misc. (LED, Switch, IR Receiver)**
P201	INT				
P202		INT			IR Receiver Module
P204	RESET				
P205	GPIO				
P206	GPIO				
P307		GPIO			
P303				PWM	
P304				D7	
P305				D8	
P207		RTS		D4	
P306		GPIO			
P108		CTS / INT			User Switch S1
P109	CTS / CS / INT				
P100				D3 / INT / PWM	User LED2
P101	RTS / SCK			D13 / SCK	
P110				D2 / INT	
P111		RESET			
P102	RXD / MISO			D12 / MISO PWM	
P103	TXD / MOSI			D11 / MOSI / PWM	
P011	SCL	SCL	SCL	SCL PWM	
P010	SDA	SDA	SDA	SDA	
P009				D10 / SS	
P008				D0 / RX	
P104				D6	
P105			AN	A4	
P106			AN	A5	
P107				D9 / PWM	User LED1
P403				D1 / TX	
P402				D5	
P001		TXD			
P000		RXD			
P007				A3	
P006				A2	
P401				A1	
P400				A0	

5.3.1 Seeed Grove® Connector

A Seeed Grove I²C / Analog connector is provided at J16 (not fitted). The MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave. Alternatively, this port can be configured to support two analog (ADC) inputs.

The signals connected to Grove connector are shared with other ecosystem connectors. See Table 14 and FPB-R9A02G021 board schematic in detail.

Table 15. Seeed Grove Connector

Seeed Grove Connector		FPB-R9A02G021	Seeed Grove Configuration	
Pin	**Description**	**Signal / Bus**	**Close**	**Open**
J16-1	SCL / AN	P011 (SCLA1)	E19	E18
		P105 (ANI18)	E18	E19
J16-2	SDA / AN	P010 (SDAA1)	E20	E21
		P106 (ANI19)	E21	E20
J16-3	VCC	+3.3 V		
J16-4	GND	GND		

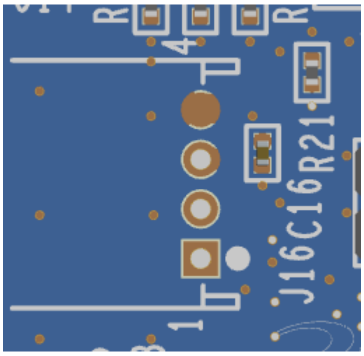

Figure 14. Seeed Grove Connector

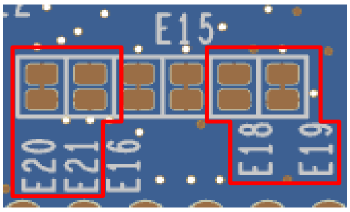

Figure 15. Seeed Grove Copper Jumpers (bottom side)

5.3.2 Digilent Pmod™ Connectors

5.3.2.1 Pmod 1

A 12-pin Pmod Type-2A (expanded SPI), Type-3A (expanded UART) and Type-6A (expanded I²C) connector is provided at connector J13 labelled PMOD1. At Type-2A, the MCU acts as the SPI master, and the connected module acts as a SPI slave device. At Type-6A, the MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave.

Table 16. Pmod 1 Connector

Pmod1 Connector			FPB-R9A02G021	Pmod 1 Configuration	
Pin	Description Type-2A, 3A	Option Type-6A	Signal / Bus	Close	Open
J13-1	CS / CTS / GPIO	INT	P109 (IRQ5_B)		
J13-2	MOSI / TXD	RESET	P103 (TXD2 / SO20) [*1]	E55	
J13-3	MISO / RXD		P102 (RXD2 / SI20) [*1]	E34	E37
		SCL	P011 (SCLA1) [*1]	E37	E34
J13-4	SCK / RTS / GPIO		P101 (SCK20) [*1]	E35	E36
		SDA	P010 (SDAA1) [*1]	E36	E35
J13-5	GND		GND		
J13-6	VCC		+3.3 V	E43	E45
			+5 V	E45	E43
J13-7	GPIO / INT (slave to master)		P201 (IRQ3_C)		
J13-8	GPIO / RESET (master to slave)		P204		
J13-9	GPIO / CS2		P205		
J13-10	GPIO / CS3		P206		
J13-11	GND		GND		
J13-12	VCC		+3.3 V	E43	E45
			+5 V	E45	E43

*1: The signals are shared with other ecosystem connectors. See Table 14 and FPB-R9A02G021 board schematic in detail.

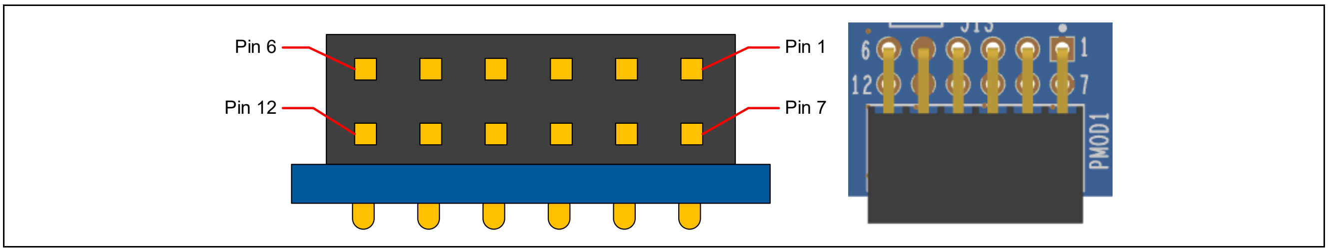

Figure 16. Pmod 1 Connector

The default setting of the Pmod 1 interface supports +3.3 V devices. Please ensure that any Pmod device installed is compatible with a +3.3 V supply.

Pmod Type-6A Operation

Pmod 1 can be configured to support Pmod Type-6A connector specification supporting I^2C connections. There is also an alternative +5 V power source option. In order to configure Pmod 1 for Type-6A operation, modify the copper jumpers as described in Table 16. The copper jumpers are shown in Figure 17.

Note: Exercise caution while modifying power source trace jumpers, E43 and E45. Permanent damage to the FPB-R9A02G021 board and/or connected modules may result.

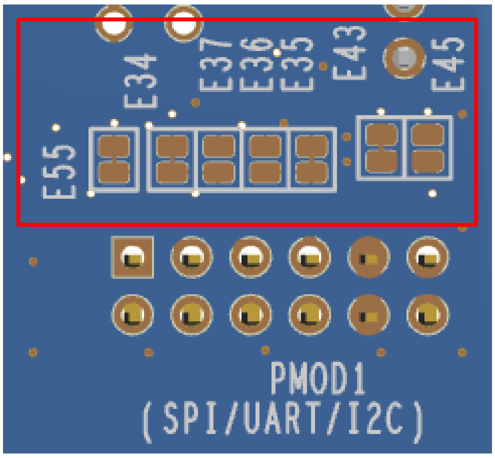

Figure 17. Pmod 1 Copper Jumpers (bottom side)

5.3.2.2 Pmod 2

A 12-pin Pmod Type-3A (expanded UART) and Type-6A (expanded I²C) connector is provided at connector J14 labelled PMOD2. At Type-6A, the MCU acts as a two-wire serial master, and a connected module acts as a two-wire serial slave.

Table 17. Pmod 2 Connector

Pmod2 Connector			FPB-R9A02G021	Pmod 2 Configuration	
Pin	**Description Type-3A**	**Option Type-6A**	**Signal / Bus**	**Close**	**Open**
J14-1	CTS / GPIO	INT	P108 (IRQ4_B) *1	E38	
J14-2	TXD	RESET	P001 (TXD1)		
J14-3	RXD		P000 (RXD1)	E39	E42
		SCL	P011 (SCLA1) *1	E42	E39
J14-4	RTS / GPIO		P207 *1	E40	E41
		SDA	P010 (SDAA1) *1	E41	E40
J14-5	GND		GND		
J14-6	VCC		+3.3 V	E44	E46
			+5 V	E46	E44
J14-7	GPIO / INT (slave to master)		P202 (IRQ2_C) *1	R52	R51
J14-8	GPIO / RESET (master to slave)		P111		
J14-9	GPIO		P307		
J14-10	GPIO		P306		
J14-11	GND		GND		
J14-12	VCC		+3.3 V	E44	E46
			+5 V	E46	E44

*1: The signals are shared with other ecosystem connectors, user switches and IR receiver module. See Table 14 and FPB-R9A02G021 board schematic in detail.

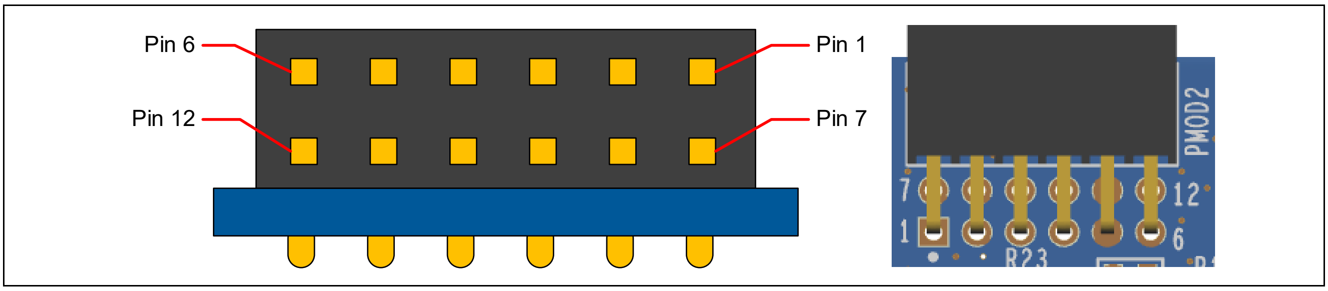

Figure 18. Pmod 2 Connector

The default setting of the Pmod 2 interface supports +3.3 V devices. Please ensure that any Pmod device installed is compatible with a +3.3 V supply.

Pmod Type-6A Operation

Pmod 2 can be configured to support Pmod Type-6A connector specification supporting I²C connections. There is also an alternative +5 V power source option. In order to configure Pmod 2 for Type-6A operation, modify the copper jumpers as described in Table 17. The copper jumpers are shown in Figure 19.

Note: Exercise caution while modifying power source trace jumpers, E44 and E46. Permanent damage to the FPB-R9A02G021 board and/or connected modules may result.

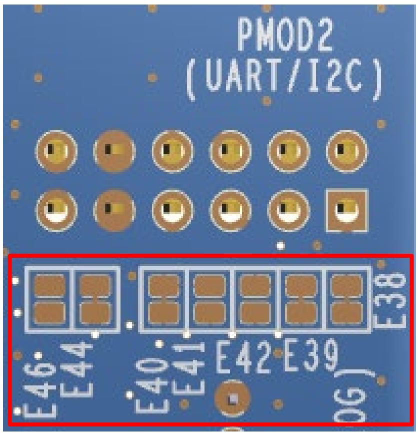

Figure 19. Pmod 2 Copper Jumpers (bottom side)

P202 (IRQ2_C / RIN0) of the MCU can be connected to OUT pin of the IR receiver module and Pmod 2 INT / GPIO (J14-Pin7). P202 (IRQ2_C / RIN0) is not connected to OUT pin of the IR receiver module but connected to Pmod 2 INT / GPIO (J14-Pin7) at shipping. It is needed to remove 0Ω resistor (SMD 0603) from R52 and fit 0Ω resistor (SMD 0603) to R51 for using the IR receiver module.

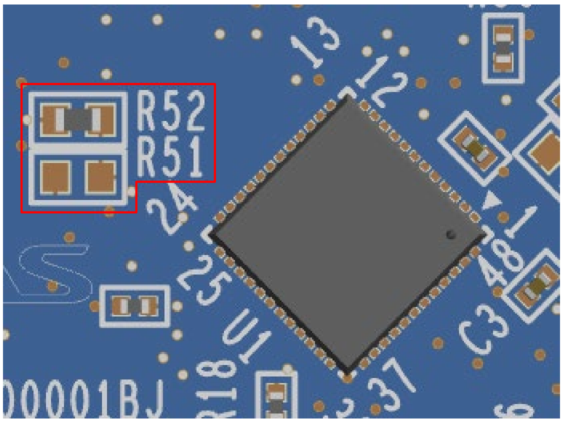

Figure 20. Pmod 2 INT / GPIO Selection Resistor (top side)

5.3.3 Arduino® Connector

Arduino Uno R3 compatible connector interface is provided at connector J9, J10, J11 and J12.

Table 18. Arduino Uno Connections

Arduino Compatible Connector		FPB-R9A02G021	Arduino Configuration	
Pin	**Description**	**Signal / Bus**	**Close**	**Open**
J9-1	NC	NC		
J9-2	IOREF	+3.3 V		
J9-3	RESET	RES#		
J9-4	3.3V	+3.3 V		
J9-5	5 V	+5 V	E17	
J9-6	GND	GND		
J9-7	GND	GND		
J9-8	VIN	NC		
J10-1	A0	P400 (ANI2)		
J10-2	A1	P401 (ANI3)		
J10-3	A2	P006 (ANI4)		
J10-4	A3	P007 (ANI5)		
J10-5	A4	P105 (ANI18) *1	E15	
J10-6	A5	P106 (ANI19) *1	E16	
J11-1	D0 / RX	P008 (RXDA1)		
J11-2	D1 / TX	P403 (TXDA1)		
J11-3	D2 / INT0	P110 (IRQ7_B)		
J11-4	D3 / INT1 / PWM	P100 (IRQ6_C / TO05) *1	E24 *3, E26	
J11-5	D4	P207 *1	E54	
J11-6	D5 / PWM	P402	E32	E33
		P102 (TO01) *1	E33	E32
J11-7	D6 / PWM	P104	E31	E30
		P011 (TO07_B) *1	E30	E31
J11-8	D7	P304		
J12-1	D8	P305		
J12-2	D9 / PWM	P107 (TO03_A) *1	E23	
J12-3	D10 / SS / PWM	P009	E29	E28
		P303 (TO04) *1 *2	E28	E29
J12-4	D11 / MOSI / PWM	P103 (SO20 / TO02_A) *1	E53	
J12-5	D12 / MISO	P102 (SI20) *1	E22	
J12-6	D13 / SCK	P101 (SCK20) *1	E52	
J12-7	GND	GND		
J12-8	AREF	AVREFP	E5	E3, E4, E6
J12-9	SDA	P010 (SDAA1) *1		
J12-10	SCL	P011 (SCLA1) *1	E51	

*1: The signals are shared with other ecosystem connectors, user switches and LEDs. See Table 14 and FPB-R9A02G021 board schematic in detail.

*2: The signal is shared with VCOM (RXD0_B).

*3: By shorting the copper jumper connects J11-Pin4 to +3.3 V through 10kΩ. The copper jumper may be shorted when P100 is assigned to IRQ6_C.

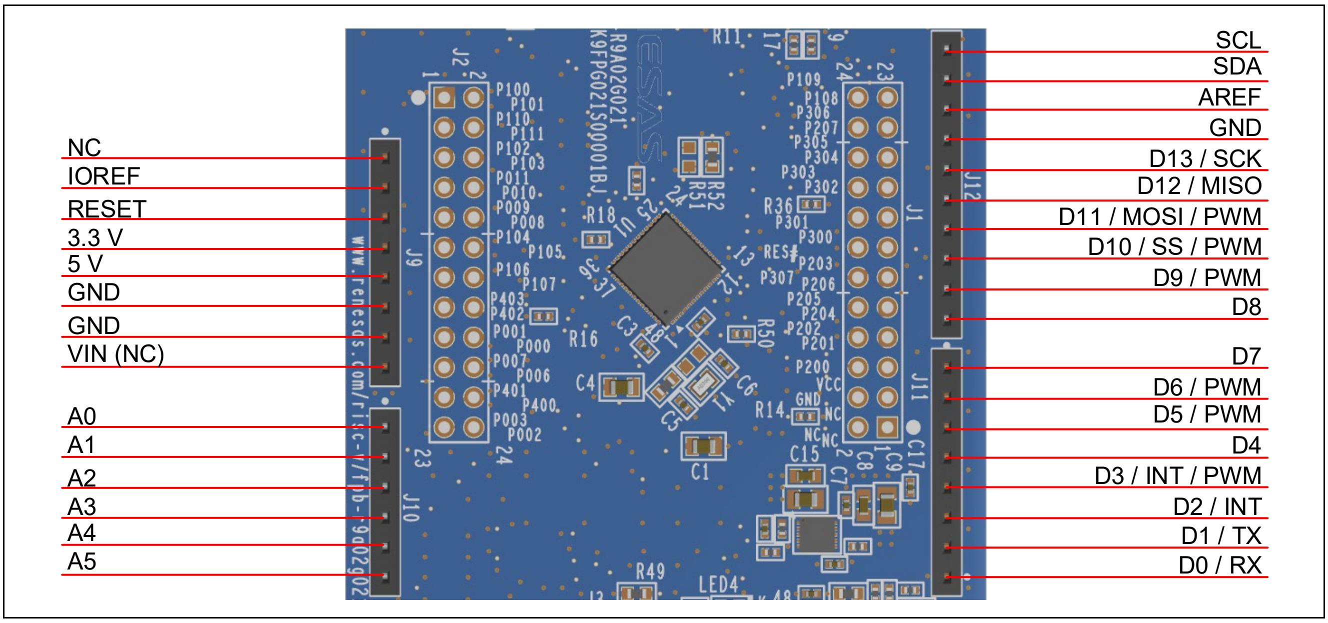

Figure 21. Arduino Uno Connectors

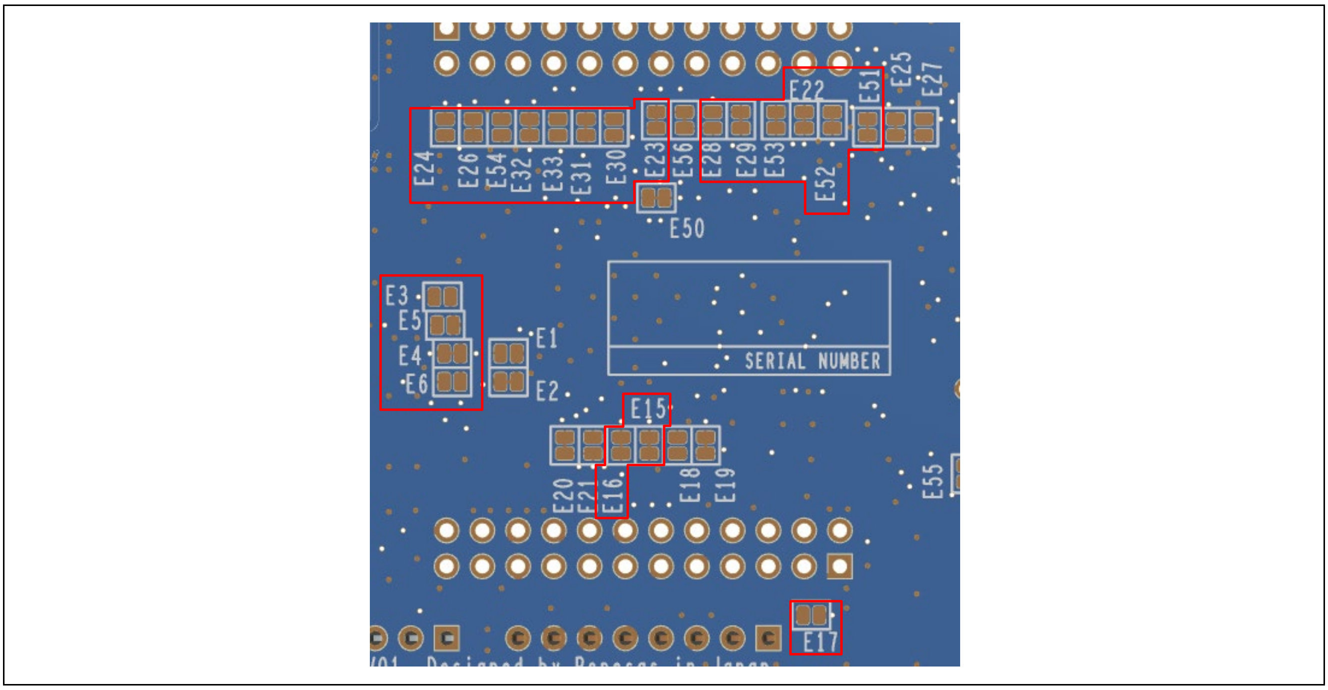

Figure 22. Arduino Uno Copper Jumpers (bottom side)

5.4 Miscellaneous

5.4.1 LED

Four LEDs are provided on the FPB-R9A02G021 board.

Functions of the LEDs on the FPB-R9A02G021 board is described in the following table.

Table 19. FPB-FPB-R9A02G021 Board LED Functions

Reference number	Color	Function	MCU Control Port
LED1	Green	User LED	P107 (TO03_A) *1
LED2	Green	User LED	P100 (TO05) *2
LED3	Green	Power on indicator	+3.3 V
LED4	Yellow	Debug LED	J-Link OB debug probe MCU

*1: The signal is shared with Arduino (D9 / PWM).
*2: The signal is shared with Arduino (D3 / INT / PWM).

The User LEDs may be disconnected from the MCU so that the associated ports can be used for other purposes. To disconnect LED1 from P107, copper jumper E11 must be open. To disconnect LED2 from P100, copper jumper E13 must be open.

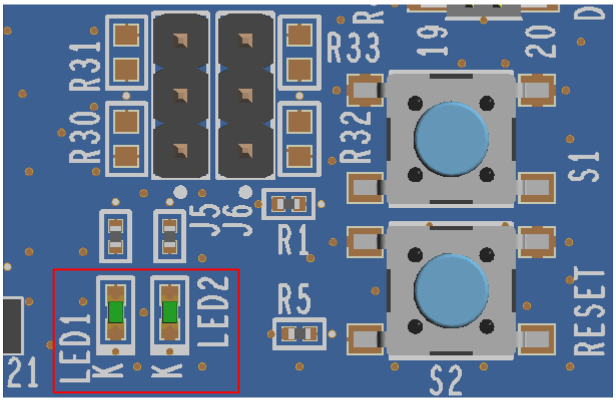

Figure 23. User LEDs

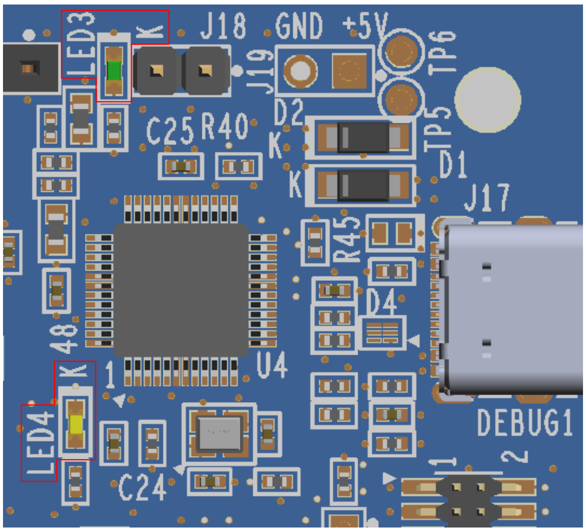

Figure 24. Power LED and Debug LED

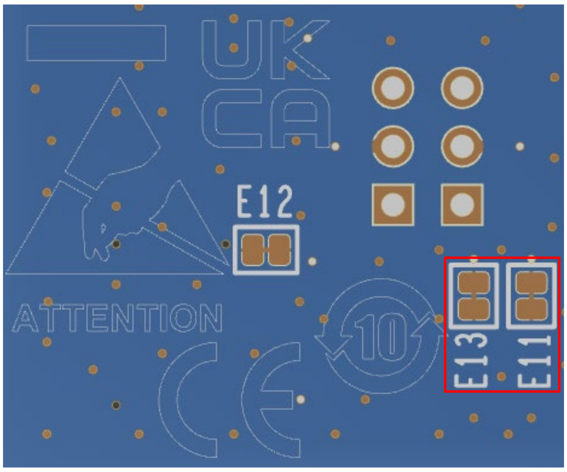

Figure 25. User LEDs Copper Jumpers (bottom side)

5.4.2 User and Reset Switches

Two miniature, momentary, mechanical push-button type SMD switches are mounted on the FPB-R9A02G021 board.

Pressing the reset switch (S2) generates a reset signal to restart the MCU.

Table 20. FPB-R9A02G021 Board Switches

Reference number	Function	MCU Control Port
S1	User Switch	P108 (IRQ4_B) *1
S2	MCU Reset Switch	RES#

*1: The signal is shared with Pmod 2 (CTS / INT).

The User Switch S1 may be isolated from the MCU, so that the associated port can be used for other purposes. To disconnect S1 from P108, trace cut jumper E12 must be open.

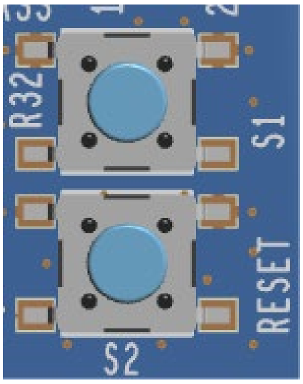

Figure 26. Reset (S2) and User Switch (S1)

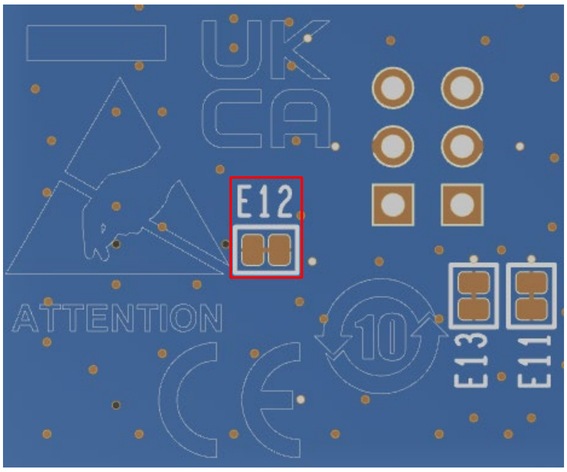

Figure 27. User Switch S1 Copper Jumper (bottom side)

5.4.3 MCU Boot Mode

A two-pin header (J8) can be fitted to select the boot mode (P203) of the MCU. For normal operation (single-chip mode), leave J8 open. To enable UART boot mode, place a shunt jumper on J8.

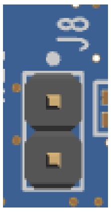

Figure 28. Boot Mode Jumper (J8)

6. Special Feature Access

6.1 Remote Control Signal Receiver

The FPB-R9A02G021 Board can be equipped with IR Receiver Module for remote control receive function. TSOP32438 (VISHAY) might be used for the FPB-R9A02G021 board. Refer to the manufacturer website for specification of the IR Receiver Module.

P202 (IRQ2_C / RIN0) of the MCU is connected to OUT pin of the IR receiver module and Pmod 2 INT / GPIO (J14-Pin7). It is needed to fit 0Ω resistor (SMD 0603) to R51 and remove 0Ω resistor (SMD 0603) from R52 when using the remote control receive function. Refer to Figure 20 regarding to location for R51 and R52.

Table 21. Remote Control Signal Receiver

IR Receiver Module		FPB-R9A02G021
Pin	**Description**	**Signal / Bus**
U3-1	OUT	P202 (IRQ2_C / RIN0)
U3-2	VS	+3.3 V
U3-3	GND	GND

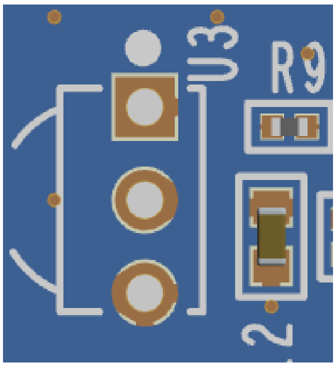

Figure 29. IR Receiver Module

7. MCU Native Pin Access

7.1 Breakout Pin Headers

The FPB-R9A02G021 board pin headers (not fitted), J1 and J2, provide access to all MCU interface signals, and to voltage of the MCU power port. Each header pin is labelled with the voltage or port connected to that pin. Refer to the R9A02G021 MCU User's Manual: Hardware for details of each port function, and the FPB-R9A02G021 board schematic for pin header port assignments.

The placement of the breakout pin headers allows for a standard 2.54 mm (0.100") breadboard to be placed on both pin headers simultaneously. This can be used for prototyping and testing of custom circuitry for use with the MCU.

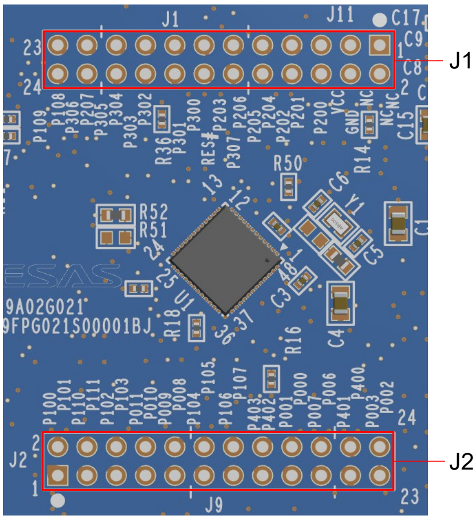

Figure 30. Breakout Pin Headers J1 and J2

7.2 MCU Current Measurement

Two pin header J3 (not fitted) is provided on the FPB-R9A02G021 board to measure the MCU current.

Resistor R49 is 0Ω (SMD 0603) as supplied. It should be removed in order to measure the current consumption using an ammeter connected between the pin header pins.

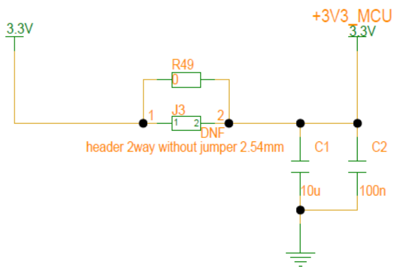

Figure 31. MCU +3.3 V Current Measurement Circuit

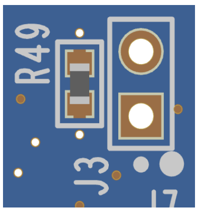

Figure 32. MCU +3.3 V Current Measurement Pin Header J3 and R49

8. Certifications

The FPB-R9A02G021 board meets the following certifications/standards. See page 4 of this user's manual for the disclaimer and precautions.

8.1 EMC/EMI Standards

- Innovation, Science and Economic Development Canada ICES-003 Compliance:
  CAN ICES-3 (A)/NMB-3(A)
- CE Class A (EMC)
  This product is herewith confirmed to comply with the requirements set out in the Council Directives on the Approximation of the laws of the Member States relating to Electromagnetic Compatibility Directive 2014/30/EU.
  Warning – This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures to correct this interference.
- UKCA Class A (EMC)
  This product is in conformity with the following relevant UK Statutory Instrument(s) (and its amendments): 2016 No. 1091 Electromagnetic Compatibility Regulations 2016.
  Warning – This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be requried to take adequate measures to correct this interference.
- Taiwan: Chinese National Standard 13438, C6357 compliance, Class A limits
- Australia/New Zealand AS/NZS CISPR 32:2015, Class A

8.2 Material Selection, Waste, Recycling and Disposal Standards

- EU RoHS
- China SJ/T 113642014, 10-year environmental protection use period.
- WEEE Directive (2012/19/EU) & The Waste Electrical and Electronic Equipment Regulations 2013

The WEEE (Waste Electrical and Electronic Equipment) regulations put responsibilities on producers for the collection and recycling or disposal of electrical and electronic waste. Return of WEEE under these regulations is applicable in the UK and European Union.

This equipment (including all accessories) is not intended for household use. After use the equipment cannot be disposed of as household waste, and the WEEE must be treated, recycled and disposed of in an environmentally sound manner.

Renesas Electronics Europe GmbH can take back end of life equipment. Register for this service at;
https://www.renesas.com/eu/en/support/regional-customer-support/weee

8.3 Safety Standards

- UL 94V-0

9. Design and Manufacturing Information

The design and manufacturing information for the FPB-R9A02G021 kit is available in the "FPB-R9A02G021 Design Package" available on renesas.com/risc-v/fpb-r9a02g021.

- Design package file name: fpb-r9a02g021-v1-designpackage.zip
- Design package contents

Table 22. FPB-R9A02G021 Board Design Package Contents

File Type	Content	File / Folder Name
File (PDF)	Schematics	fpb-r9a02g021-v1-schematics
File (PDF)	Mechanical Drawing	fpb-r9a02g021-v1-mechdwg
File (PDF)	3D Drawing	fpb-r9a02g021-v1-3d
File (PDF)	BoM	fpb-r9a02g021-v1-bom
Folder	Manufacturing Files	Manufacturing Files
Folder	Design Files	Design Files-Cadence Allegro

10. Website and Support

Visit the following URLs to learn about the kit and the RISC-V microcontrollers, download tools and documentation, and get support.

FPB-R9A02G021 Resources	renesas.com/risc-v/fpb-r9a02g021
RISC-V Product Information	renesas.com/risc-v
RISC-V Videos	renesas.com/risc-v/videos
Renesas Support	renesas.com/support

Revision History

Rev.	Date	Description	
		Page	**Summary**
1.00	Oct.31.23	—	Initial release
2.00	Apr.15.24	Disclaimer	Change the link to renesas.com/legal-notices
		4	Added a page for Glossary
		6, 7, 10, 35	Figure 1, 3, 7, 23 and 24 Modified to the figure, which is fitted J5, J6, J15 and J18, which is not fitted R31 and R33
		13	Table 4 Modified the description of J18
		13	Table 4 Deleted the description of R30, R31, R32 and R33
		13	Table 4 Added the description of J5 and J6
		21	Table 11 Modified to the table, which is deleted R30, R31, R32 and R33, which is added J5 and J6
		21	Figure 10 Modified to the figure which is fitted J15
		23	Section 5.2.2 Deleted the description that J15 is not fitted
		23	Section 5.2.2 Added notice for use about J15
		23	Figure 11 Newly added
		24	Table 13 Changed Pin Name of J15-7 to Not used
		35	Section 5.4.1 Modified typo of the port name of the LED1
		38	Table 21 Modified typo of the U3 pin assignment
		40	Section 8.1 Added UKCA
		40	Section 8.2 Added WEEE Directive (2012/19/EU) & The Waste Electrical and Electronic Equipment Regulations 2013

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