

RX231 Group

Target Board for RX231 User's Manual

RENESAS 32-Bit MCU

RX Family / RX200 Series

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

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
 2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
 3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
 4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
 5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.
"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.
Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.
 6. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
 7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
 8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
 9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
 10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
 11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
 12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.
- (Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.
- (Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

Precautions

The following precautions should be observed when operating Target Board for RX231 product:

The Target Board for RX231 is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this product and any sensitive equipment. Its use outside the laboratory, classroom, and study area or in area not conform to the protection requirements of the Electromagnetic Compatibility Directive could lead to prosecution.

This 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 any harmful interference to radio or television reception occurs by turning the equipment off or on, you are encouraged 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
- Contact the dealer or an experienced radio/TV technician for help

NOTE: It is recommended that wherever possible shielded interface cables are used.

This product is potentially susceptible to certain EMC phenomena. It is recommended to take following measures in order to migrate them;

- Do not use mobile phones within 10m of the product when in use.
- Take ESD precautions when handling the equipment.

The Target Board for RX231 neither represents an ideal reference design for an end product nor fulfils the regulatory standards for an end product.

How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the Target Board hardware functionality, and electrical characteristics, and not intend to be a guide to embedded programming or hardware design.

Particular attention should be paid to the precautionary notes when using the manual. These notes are attached at the end of each section and in the Usage Notes section, not within the body of the text.

The revision history only shows the summary of revised or added parts, and does not include all revisions. Refer to the text in this manual for details.

The following documents apply to the RX231 Group. Make sure to use the latest versions for reference, available on the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's Manual	Describes the technical details of the Target Board for RX231 hardware.	Target Board for RX231 User's Manual	R20UT4168EJ
Schematics	Describes circuit schematics of the Target Board for RX231 in full detail	Target Board for RX231 Schematics	R20UT4165EJ
BOM LIST	Describes Bill of Materials of the Target Board for RX231	Target Board for RX231 BOM LIST	R12TU0041EJ
Application Note	Sample code description.	Target Board for RX231 Application Note	R20AN0466EJ
User's Manual: Hardware	Provides technical details of the RX231 microcontroller.	RX231 Group User's Manual: Hardware	R01UH0496EJ

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
CPU	Central Processing Unit
DIP	Dual In-line Package
DNF	Do Not Fit
IDE	Integrated Development Environment
IRQ	Interrupt Request
HOCO	High-Speed On-Chip Oscillator
LOCO	Low-Speed On-Chip Oscillator
LED	Light Emitting Diode
MCU	Micro-controller Unit
n/a (NA)	Not Applicable
n/c (NC)	Not Connected
PC	Personal Computer
Pmod™	Digilent Pmod™ Compatible connector. Pmod™ is registered to Digilent Inc. Digilent-Pmod_Interface_Specification
RAM	Random Access Memory
RFP	Renesas Flash Programmer
ROM	Read Only Memory
SPI	Serial Peripheral Interface
USB	Universal Serial Bus

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

Table of Contents

1. Overview.....	7
1.1 Contents.....	7
1.2 Purpose.....	7
1.3 Features.....	7
1.4 Preparation.....	7
1.5 Board Specification Table.....	8
1.6 Block Diagram.....	8
2. Board Layout	9
3. Parts Layout.....	10
4. Operating Environment.....	11
5. User Circuit.....	12
5.1 Evaluation MCU	12
5.2 USB Connector	12
5.3 ACT LED	12
5.4 Power LED.....	12
5.5 User LED.....	12
5.6 Pmod™ Connector	13
5.7 External Power Supply Header.....	14
5.8 Current Consumption Measurement Header.....	15
5.9 MCU Header	15
5.10 RESET Switch.....	15
5.11 User Switch.....	15
5.12 Cut Pattern.....	15
5.13 Emulator Reset Header	16
5.14 Power Supply Selection Header	16
6. Configuration	17
6.1 Modifying the Target Board for RX231	17
6.2 Analog Power Supply.....	17
6.3 On-chip Oscillator	17
7. Handling Precautions.....	18
7.1 Board Thickness	18
7.2 Additional Load	18
7.3 Substrate Remodelling.....	18
7.4 Target Board connection limit	18
8. Code Development	19
9. Additional Information	20

1. Overview

1.1 Contents

Thank you for purchasing the Renesas evaluation tool "Target Board for RX231". This product consists of the following item.

Target Board for RX231

1.2 Purpose

The Target Board for RX231 is an evaluation tool for Renesas microcontrollers. This manual describes the technical details of the Target Board for RX231 hardware.

1.3 Features

The Target Board for RX231 includes the following features:

- Renesas microcontroller programming
- User code debugging
- Switch, LED user circuit
- Sample application^{*1}
- Sample peripheral function initialization code^{*1}

^{*1}: Available for download on the Renesas website.

1.4 Preparation

Install the integrated development environment (IDE) and necessary other software from the following URL on the host PC (before you get started).

<https://www.renesas.com/development-tools>

1.5 Board Specification Table

Table 1-1 shows the Target Board for RX231 specifications.

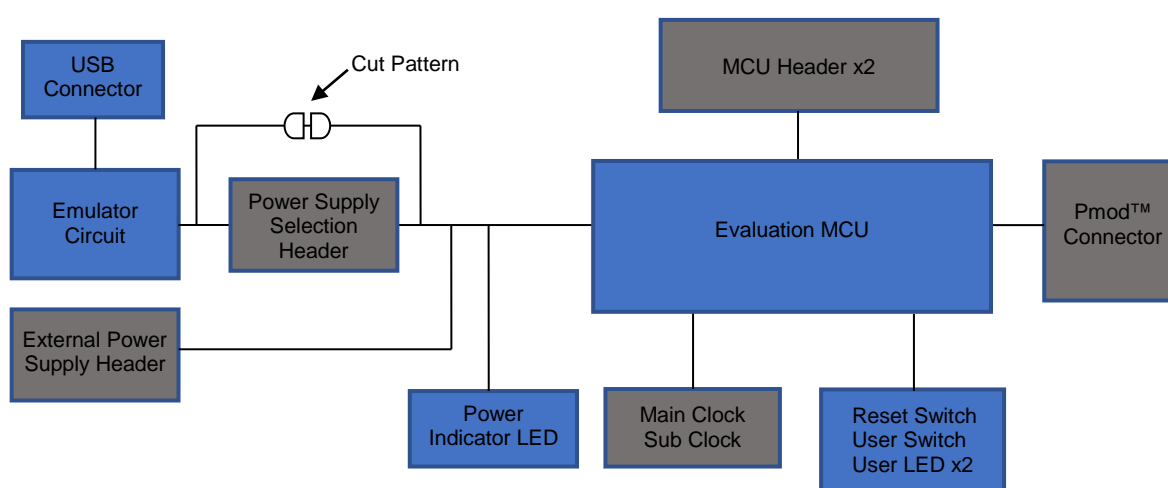
Table 1-1: Board Specification Table

Item	Specification
Evaluation MCU	Part No: R5F52318ADFP
	Package: 100-pin LFQFP
	On-chip memory: ROM 512KB+8KB, RAM 64KB
Board Size	Size: 53.34mm x 90.0mm
	Thickness: 0.8mm
Power Supply	USB connector: 5V Input
	Power supply IC: 5V Input, 3.3V Input
	For external power supply header *1: 3.3V Input, 2-pin, x 1
Current Consumption	Max. 200mA
Current Consumption Measurement Header *1	Header: 2-pin, x 1
Main Clock *1	Surface mount type: HC-49
	Lead type: 2.54mm Pitch Through Hole x 3
Sub Clock *1	Lead type: Through Hole x 2 (KYUSHU DENTSU CO., LTD.: NC-26 Equivalent)
Push Switch	Reset switch x 1
	User switch x 1
LED	Power indicator: green x 1
	User: green x 2
	ACT LED: green x 1
USB Connector	Connector: USB-mini B, 5-pin
Pmod™ Connector *1	Connector: Angle type, 12-pin
MCU Header *1	Header: 50-pin, x 2
Cut Pattern	8 places
Power Selection Header *1	Header: 3-pin, x 1
Emulator Reset Header *1	Header: 2-pin, x 1

*1: Parts are not mounted (DNF).

1.6 Block Diagram

Figure 1-1 shows the block diagram of the Target Board for RX231.



*Gray hatching parts is not mounted.

Figure 1-1: Block Diagram

2. Board Layout

Figure 2-1 shows the external appearance of the top side of Target Board for RX231.

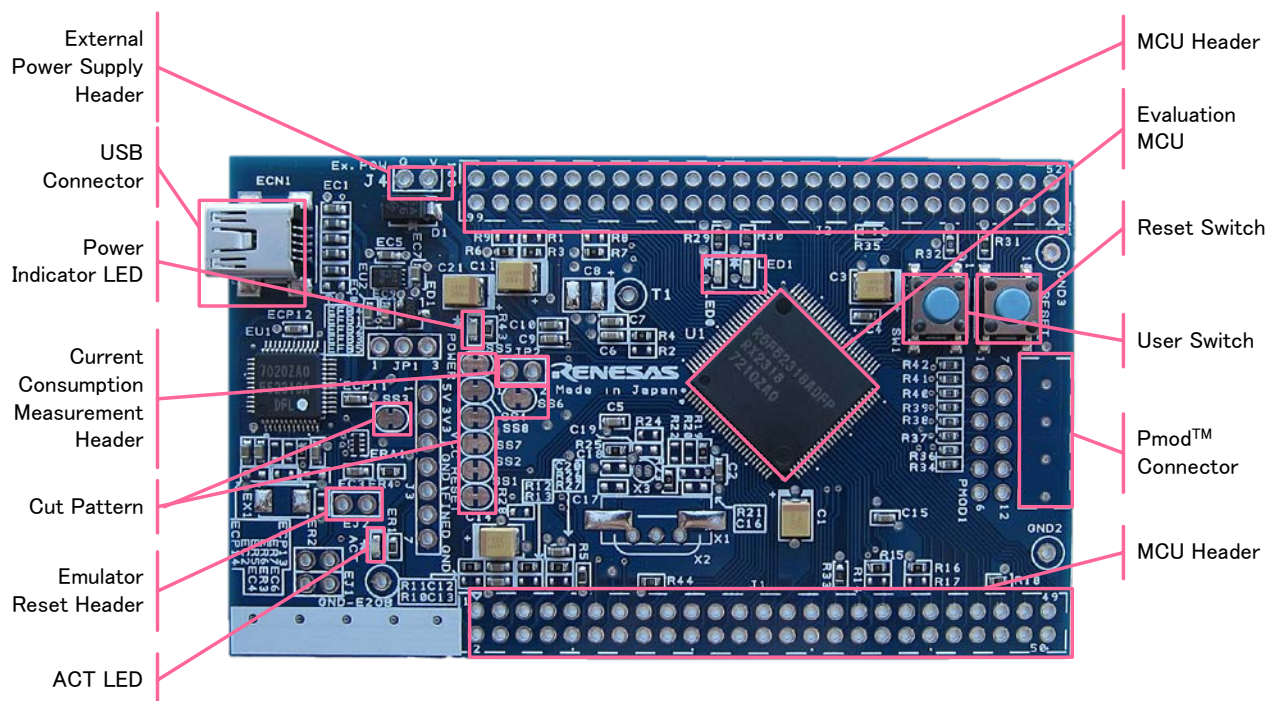


Figure 2-1: Board Layout (Top Side)

Figure 3-1 shows the parts layout of Target Board for RX231.

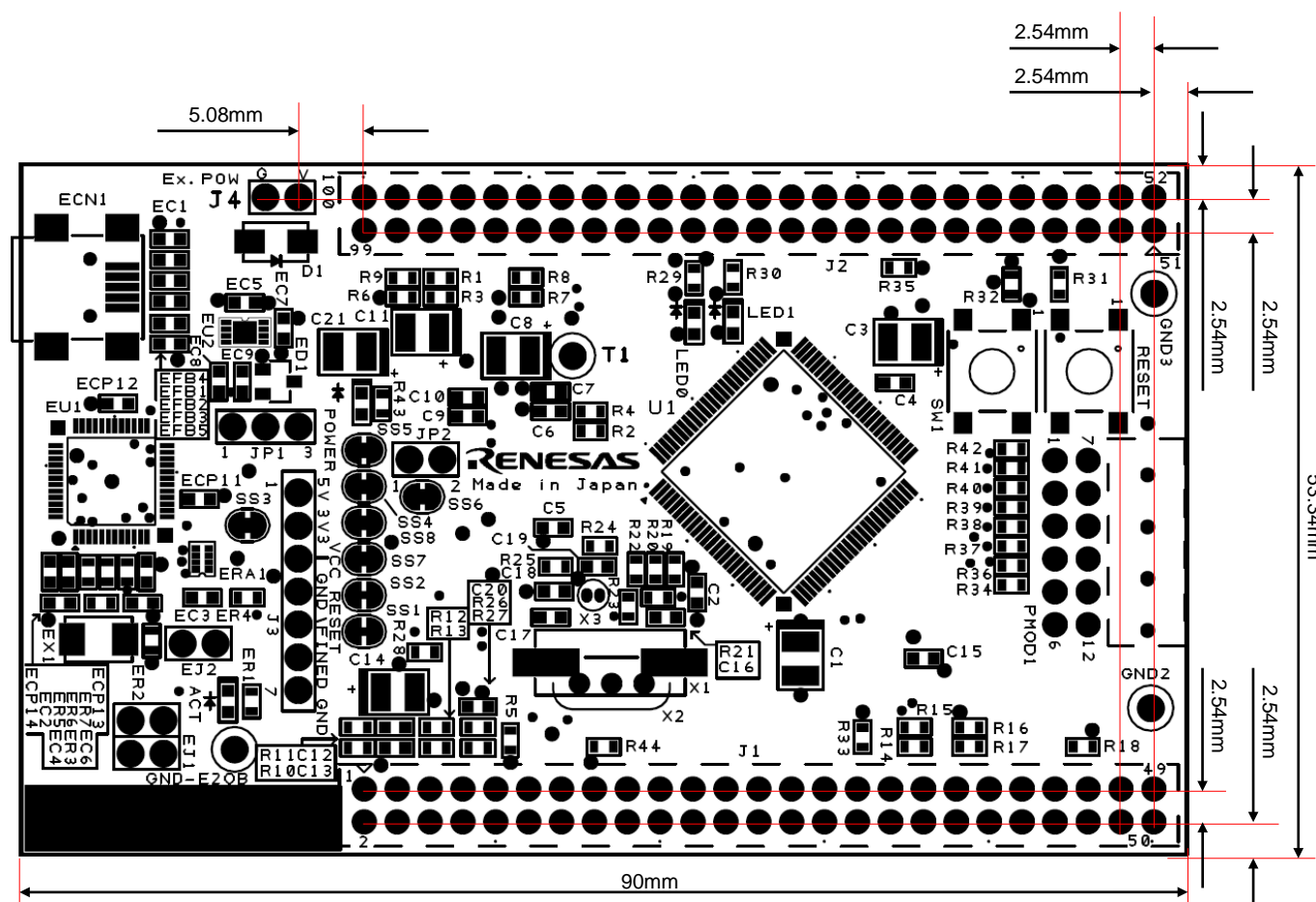


Figure 3-1: Parts Layout

4. Operating Environment

Figure 4-1 shows the operating environment of the Target Board for RX231. Install the integrated development environment (IDE) from the following URL on the host PC. All the other required drivers are will be automatically installed with the IDE.

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

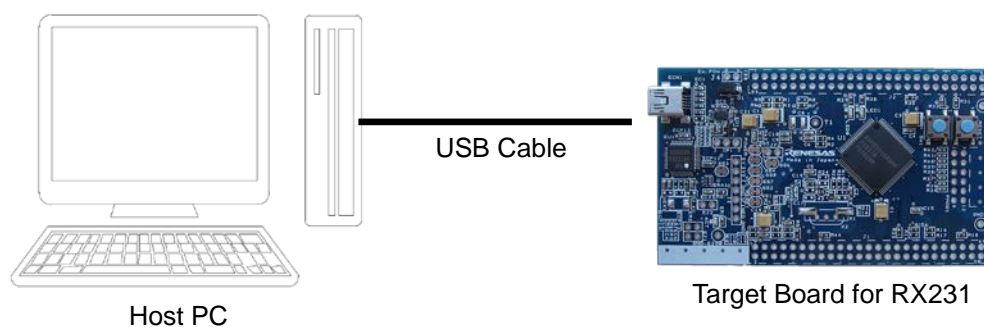


Figure 4-1: Operating Environment

5. User Circuit

5.1 Evaluation MCU

The MCU specification for the power supply, system clock, and reset at the time of shipment are as follows;

Power supply: 3.3 V fixed (including analog power supply)

System clock: Operated with on-chip oscillator

Reset: Reset switch, IDE reset instruction

5.2 USB Connector

The connector shape is USB mini -B for Integrated Development Environment (IDE) and for Renesas Flash Programmer (RFP). Connect to the computer via the USB cable. If the power supply on the host side is ON, the Target Board for RX231 will be automatically power-supplied with the cable connection.

Note: USB cable is not included in the package.

5.3 ACT LED

The ACT LED displays the operation status of the emulator control software. The lighting conditions are shown below. The lighting color is green.

Light On: Indicates that the emulator is connected to the target.

Flickering: Indicates that the host machine (PC) has recognized the emulator.

Light Off: Indicates that the emulator cannot be used for some reason. (Including power off)

5.4 Power LED

The power LED lights on, when the board is power- supplied. The lighting color is green.

5.5 User LED

The user LED is an optional LED to be used if necessary the board is mounted with LED 0 and LED 1, connected to the following ports respectively. The lighting color is green.

LED0: 80pin, Port PD6

LED1: 79pin, Port PD7

5.6 Pmod™ Connector

The Pmod™ connector (PMOD1) has a through hole at a pitch of 2.54 mm and is connected to the evaluation MCU according to Pmod™ Interface Type 2 A. Note that the Pmod™ connector has the pin assignment different from other headers. **Figure 5-1** shows the pin assignment of the Pmod™ connector and **Table 5-1** shows the signal assign of the Pmod™ connector. The channel for RSP is assigned to 0, and the channel for interrupts is assigned to IRQ5 respectively. (Connector parts are not mounted)

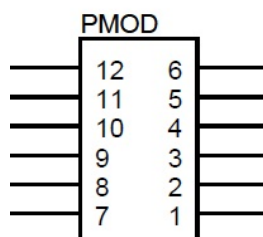


Figure 5-1: Pmod™ Connector Pin Assignment (Top View)

Table 5-1: Pmod™ Connector Signal Assignment

Pmod™ Connector							
Pin	Circuit Net Name	Evaluation MCU		Pin	Circuit Net Name	Evaluation MCU	
		Port	Pin			Port	Pin
1	PMOD1-CS	PA4	66	7	PMOD1-IRQ	P15	31
2	PMOD1-MOSI	PA6	64	8	PMOD1-RST	P17	29
3	PMOD1-MISO	PA7	63	9	PMOD1-IO0	PC3	49
4	PMOD1-SCK	PA5	65	10	PMOD1-IO1	PC2	50
5	GROUND	-	-	11	GROUND	-	-
6	TARGET_VCC	-	-	12	TARGET_VCC	-	-

5.7 External Power Supply Header

When operating the evaluation MCU at an arbitrary voltage, or requiring current more than the USB current capacity, use the external power supply header (J4) for power supply. The available voltage depends on the evaluation MCU. When using this header, cut SS1, SS2, SS4, SS5, SS7, SS8 and the bottom side cut pattern and separate the emulator and the target electrically. **Figure 5-2** and **Figure 5-4** show the position of the cut pattern, **Figure 5-3** shows the position of the external power supply header. (header parts are not mounted)

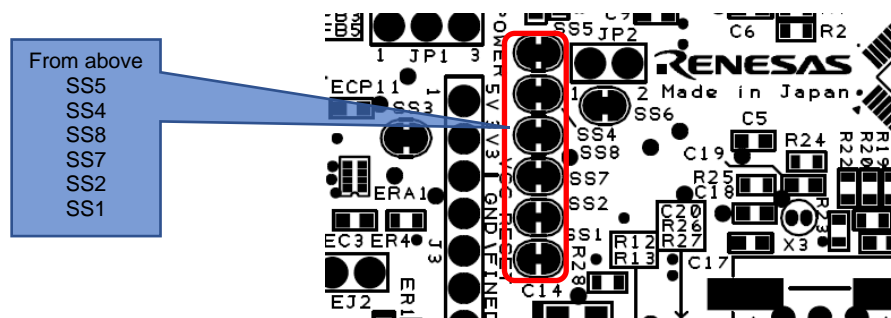


Figure 5-2: Position of Pattern SS1, SS2, SS4, SS5, SS7, SS8

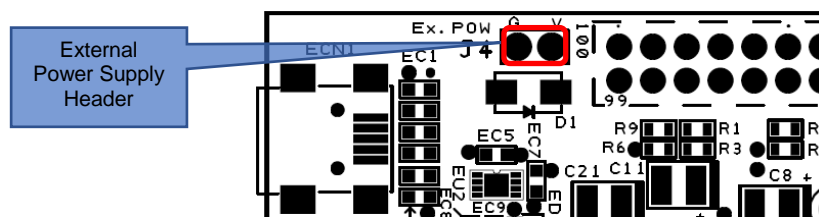


Figure 5-3: Position of External Power Supply

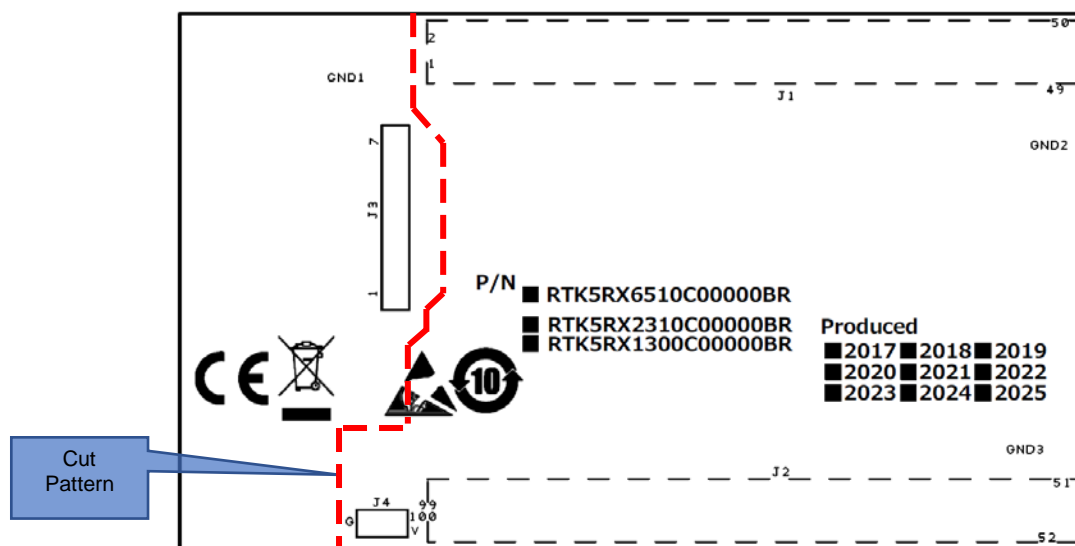


Figure 5-4: Position of Bottom Side Cut Pattern.

5.8 Current Consumption Measurement Header

The current consumption measurement header (JP2) is used for measuring current consumption of the evaluation MCU. The current consumption can be measured by connecting an ammeter to the evaluation MCU. Note that the cut pattern (SS6) should be cut when using this header. **Figure 5-5** shows the position of the header and cut pattern. (header parts are not mounted)

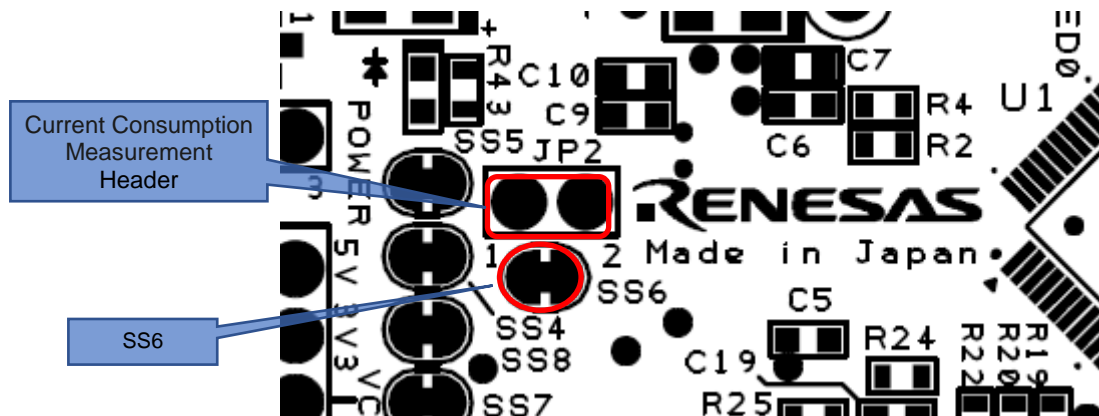


Figure 5-5: Position of Current Consumption Measurement Header and SS6 Cut Pattern

5.9 MCU Header

The MCU header is installed with two 50-pin headers (J1, J2). The headers are allocated with interval of 2.54 mm pitch. The evaluation MCU and the header are connected according to each pin number as 1pin to 1pin, and 2pin to 2pin in order until 100pin. (except 5, 8, 9 pins) (header parts are not mounted)

5.10 RESET Switch

Press the RESET switch to turn on the hard reset for the evaluation MCU.

5.11 User Switch

The user switch (SW 1) is an optional switch to be used if necessary. It is connected to 59pin and PB 1 port of the evaluation MCU. The interrupt is assigned to IRQ 4.

5.12 Cut Pattern

All cut patterns are set to the connected state at the time of factory shipment. Cut or repair soldering if necessary. **Figure 5-6** show the example of the cut patterns

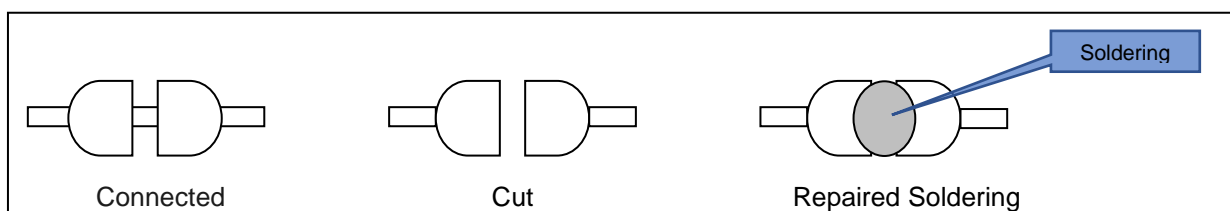


Figure 5-6: Cut Pattern Treatment Example

When repairing the cut pattern on the bottom side, repair soldering for SS7 and SS8 shown in **Figure 5-2**.

5.13 Emulator Reset Header

The emulator enters the forced reset state by short-circuiting the emulator reset header (EJ2). The evaluation MCU can be operated independently without controlling the IDE. **Figure 5-7** shows the emulator reset header position. (header parts are not mounted)

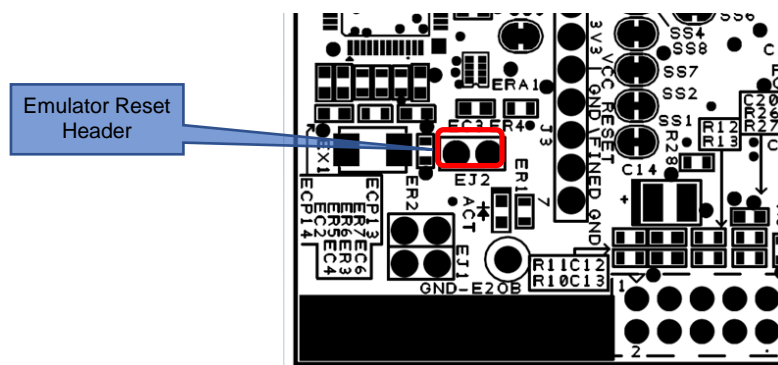


Figure 5-7: Position of Emulator Reset Header

5.14 Power Supply Selection Header

The operating voltage of the evaluation MCU can be changed. (5 V or 3.3 V) However, when using this header (JP 1), please remove the cut-pattern (SS3). **Figure 5-8** shows the header status of 5 V output, and **Figure 5-9** shows the header status of 3.3 V output. The location of the SS3 cut pattern is shown in **Figure 5-8**. (Header parts are not mounted)

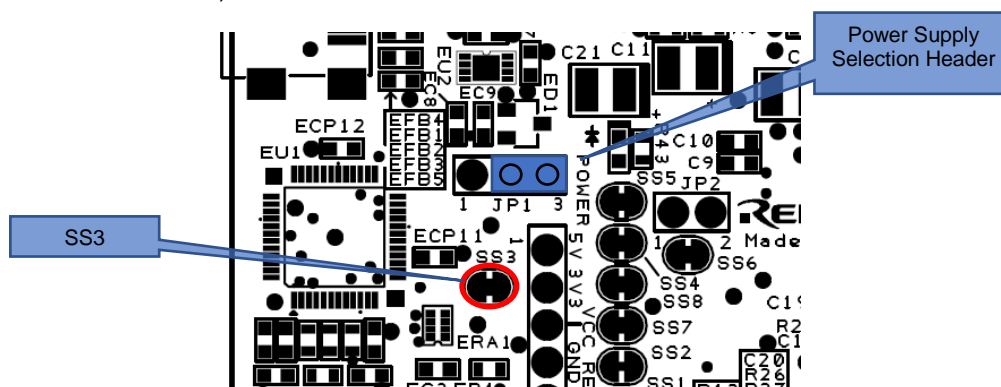


Figure 5-8: Header setting of 5V output, SS3 cut pattern position

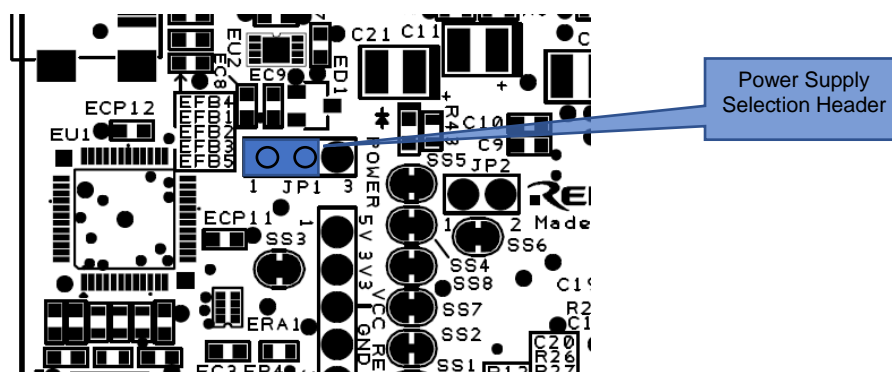


Figure 5-9: Header setting of 3.3V output

6. Configuration

6.1 Modifying the Target Board for RX231

This section describes how to change the Target Board for RX231 setting by using option link resistance.

An option link resistor is a 0Ω surface mount resistor, which is used to short or isolate a part of circuits. See the 6.2 below for the list of option links by function. Fit or remove the option link resistor to switch functions by referring to the list. **Bold fonts in blue** indicates the default configuration at the shipment. For the position of option links, see the chapter 3 “Part Layout”.

When removing soldered components, do not press a soldering iron on the Target Board for RX231 for more than 5 seconds to avoid any damage around the target area.

6.2 Analog Power Supply

The option links for analogue power supply are shown in **Table 6-1**, **Table 6-2**, and **Table 6-3**.

Table 6-1: 12bit A/D, 12bit D/A Analog Power Supply Option Link

12bit A/D, 12bit D/A Analog power supply source	Fit	DNF	Remarks
3.3V on the board	R3, R6	R1, R9	-
MCU Header	R1, R9	R3, R6	-

Table 6-2: 12bit A/D Reference Voltage Option Link

12bit A/D Reference voltage supply source	Fit	DNF	Remarks
3.3V on the board	R4, R7	R2, R8	-
MCU Header	R2, R8	R4, R7	The bypass capacitors of C6, C7, C8 are invalid.

Table 6-3: 12bit D/A Reference Voltage Option Link

12bit D/A Reference power supply source	Fit	DNF	Remarks
3.3V on the board	R11, R12	R10, R13	-
MCU Header	R10, R13	R11, R12	The bypass capacitors of C12, C13, C14 are invalid.

6.3 On-chip Oscillator

The option links for on-chip oscillator operation are shown in **Table 6-4**, **Table 6-5**.

Table 6-4: HOCO Option Link

HOCO setting	Fit	DNF	Remarks
Oscillation	R19, R23	R20, R22	-
Stop	R20, R22	R19, R23	Mount a crystal resonator on X1 or X2 and load capacitance on C16, C17.

Table 6-5: LOCO Option Link

LOCO setting	Fit	DNF	Remarks
Oscillation	R25	-	-
Stop	-	R25	Mount a crystal resonator on X3 and load capacitance on C18, C19.

7. Handling Precautions

7.1 Board Thickness

Please be extra careful when handling the Target Board for RX231 as the board is thin (0.8 mm).

7.2 Additional Load

When adding loads by USB power supply, the maximum operational current is 300 mA at 3.3 V, current is 100 mA at 5 V operation.

When adding loads by external power supply, the maximum operational current is 500 mA under any operating voltage.

7.3 Substrate Remodelling

Any modification of the board (including changing the cut pattern) shall be conducted on a user's own responsibility.

7.4 Target Board connection limit

It is not possible to connect to multiple Target Boards from the same host PC.

8. Code Development

Figure 8-1 shows the setting of e2 studio when creating a new project for the Target Board for RX231.

Debug hardware: Select [E2 Lite (RX)].

Power supply from the emulator: Select [No].

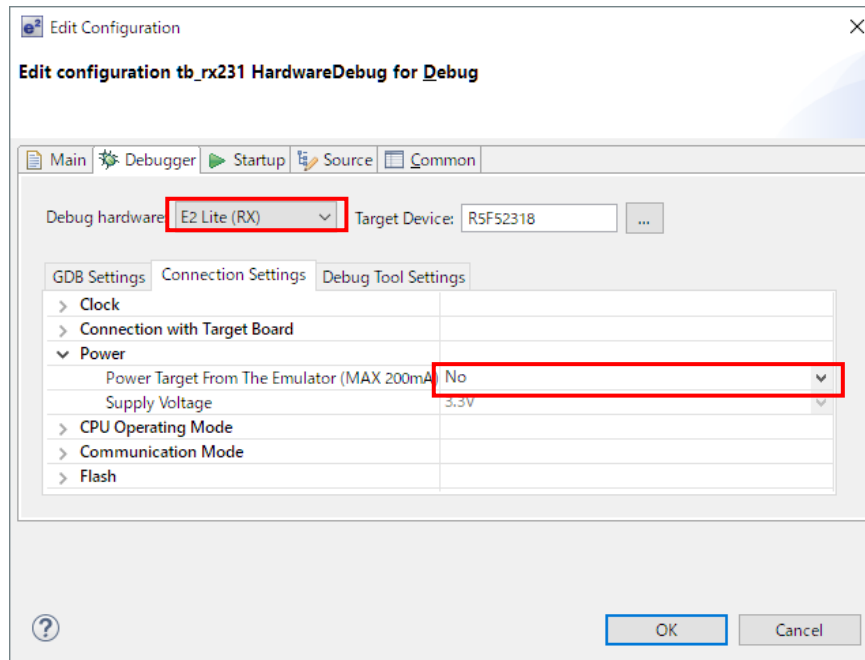


Figure 8-1: e2 studio settings

(Note) Do not connect another Target Board to your PC while connecting the Target Board for RX231.

9. Additional Information

Technical Support

For details on the RX231 Group microcontrollers, refer to the RX231 Group Hardware Manual.

For details on the RX assembly language, refer to the RX Family Software Manual.

The latest information is available from the WEB site <https://www.renesas.com/rxtb>.

Technical Contact Details

America: techsupport.america@renesas.com

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

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

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

Trademarks

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

Copyright

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

© 2017-2018 Renesas Electronics Corporation. All rights reserved.

REVISION HISTORY	Target Board for RX231 User's Manual
------------------	--------------------------------------

Rev.	Date	Description	
		Page	Summary
1.00	Oct 13, 2017	-	First Edition issued
1.01	Jul 20, 2018	7	Section 1.4 Changes URL. Changes the wording.
		8	Section 1.6 Adds Block Diagram.
		12	Section 5.2 Clarified the application.
		16	Section 5.14 Partly changed wording, added factory condition.
		18	Section 7.4 Removes Communication with RFP.
		18	Section 7.4 Adds Target Board connection limit.
		19	Section 8 Words of note unified in Target Board.

Target Board for RX231 User's Manual

Publication Date:	Rev. 1.00	Oct 13, 2017
	Rev. 1.01	Jul 20, 2018

Published by:	Renesas Electronics Corporation
---------------	---------------------------------



SALES OFFICES

Renesas Electronics Corporation

<http://www.renesas.com>

Refer to "<http://www.renesas.com/>" for the latest and detailed information.

Renesas Electronics America Inc.

1001 Murphy Ranch Road, Milpitas, CA 95035, U.S.A.
Tel: +1-408-432-8888, Fax: +1-408-434-5351

Renesas Electronics Canada Limited

9251 Yonge Street, Suite 8309 Richmond Hill, Ontario Canada L4C 9T3
Tel: +1-905-237-2004

Renesas Electronics Europe Limited

Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: +44-1628-651-700, Fax: +44-1628-651-804

Renesas Electronics Europe GmbH

Arcadiastrasse 10, 40472 Düsseldorf, Germany
Tel: +49-211-6503-0, Fax: +49-211-6503-1327

Renesas Electronics (China) Co., Ltd.

Room 1709 Quantum Plaza, No.27 ZhichunLu, Haidian District, Beijing, 100191 P. R. China
Tel: +86-10-8235-1155, Fax: +86-10-8235-7679

Renesas Electronics (Shanghai) Co., Ltd.

Unit 301, Tower A, Central Towers, 555 Langao Road, Putuo District, Shanghai, 200333 P. R. China
Tel: +86-21-2226-0888, Fax: +86-21-2226-0999

Renesas Electronics Hong Kong Limited

Unit 1601-1611, 16/F., Tower 2, Grand Century Place, 193 Prince Edward Road West, Mongkok, Kowloon, Hong Kong
Tel: +852-2265-6688, Fax: +852 2886-9022

Renesas Electronics Taiwan Co., Ltd.

13F, No. 363, Fu Shing North Road, Taipei 10543, Taiwan
Tel: +886-2-8175-9600, Fax: +886 2-8175-9670

Renesas Electronics Singapore Pte. Ltd.

80 Bendemeer Road, Unit #06-02 Hyflux Innovation Centre, Singapore 339949
Tel: +65-6213-0200, Fax: +65-6213-0300

Renesas Electronics Malaysia Sdn.Bhd.

Unit 1207, Block B, Menara Amcorp, Amcorp Trade Centre, No. 18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: +60-3-7955-9390, Fax: +60-3-7955-9510

Renesas Electronics India Pvt. Ltd.

No.777C, 100 Feet Road, HAL 2nd Stage, Indiranagar, Bangalore 560 038, India
Tel: +91-80-67208700, Fax: +91-80-67208777

Renesas Electronics Korea Co., Ltd.

17F, KAMCO Yangjae Tower, 262, Gangnam-daero, Gangnam-gu, Seoul, 06265 Korea
Tel: +82-2-558-3737, Fax: +82-2-558-5338

RX231 Group