User's Manual

32

RX23W Group

Target Board for RX23W module

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 Corp. without notice. Please review the latest information published by Renesas Electronics Corp. through various means, including the Renesas Electronics Corp. website (http://www.renesas.com).

Renesas Electronics
www.renesas.com

Rev.1.00 Jan 2021

Downloaded from Arrow.com.

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
6. Renesas Electronics products are classified according to the following two quality grades: “Standard” and “High Quality”. The intended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.
   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.
   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

   Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user’s manual or other Renesas Electronics document.
7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION (“Vulnerability Issues”). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
8. When using Renesas Electronics products, refer to the latest product information (data sheets, user’s manuals, application notes, “General Notes for Handling and Using Semiconductor Devices” in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

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

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

(Rev.5.0-1 October 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan

www.renesas.com

Contact information

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

Trademarks

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

© 2021 Renesas Electronics Corporation. All rights reserved.

Downloaded from Arrow.com.

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

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

1. Precaution against Electrostatic Discharge (ESD)
   A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.
2. Processing at power-on
   The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.
3. Input of signal during power-off state
   Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.
4. Handling of unused pins
   Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.
5. Clock signals
   After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.
6. Voltage application waveform at input pin
   Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).
7. Prohibition of access to reserved addresses
   Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.
8. Differences between products
   Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

Downloaded from Arrow.com.

How to Use This Manual

1. Purpose and Target Readers

This manual is designed to provide the user with an understanding of the basic specifications and correct usage of this product.

The target users are those who will be using it in evaluating MCUs and debugging programs.

The target readers of this manual require basic knowledge regarding the facilities of MCUs and debuggers.

> 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 Handling Precautions 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 Target Board for RX23W module. Be sure to refer to the latest versions of these documents. The newest versions of the listed documents are available on the Renesas Electronics Web site.

Document Type	Description	Document Title	Document No.
User's manual	Target Board for RX23W module hardware specifications	Target Board for RX23W module User's Manual	R20UT4890EJ (this manual)
Circuit schematics	Target Board for RX23W module circuit schematics	Target Board for RX23W module Circuit Schematics	R20UT4889EJ
Parts list	Target Board for RX23W module parts list	Target Board for RX23W module BOM LIST	R12TU0114EJ
Quick start guide	Procedure for checking the initial operation	Target Board for RX23W module Quick Start Guide	R20QS0022EJ
Application note	Description of sample code for use with the Target Board for RX23W module	RX23W Group BLE Module Firmware Integration Technology Application Note	R01AN4860
User's manual for the hardware*	Hardware specifications (pin assignments, memory maps, peripheral function specifications, electrical characteristics, timing charts) and descriptions of operation	RX23W Group User's Manual: Hardware	R01UH0823EJ

Note: Download the documents for the RX23W module from the product page for the RX23W module.

Downloaded from Arrow.com.

2. List of Abbreviations and Acronyms

Abbreviation	Full Form
Arduino™ UNO	Connectors compatible with the Arduino™ UNO R3 board are mounted on the Target Board.
—	Bluetooth® Low Energy The Bluetooth® word mark and logos are registered trademarks owned by Bluetooth SIG, Inc. and any use of such marks by Renesas Electronics Corporation is under license.
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™	Pmod™ is a trademark of Digilent Inc. The Pmod™ interface specification is the property of Digilent Inc. For the Pmod™ interface specification, refer to the Pmod™ License Agreement page at the Web site of Digilent Inc.
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.

Downloaded from Arrow.com.

Table of Contents

1. Overview 7
1.1 Package Components 7
1.2 Purpose 7
1.3 Features 7
1.4 Preparation 7
1.5 Target Board for RX23W module: Table of Specifications 8
1.6 Block Diagram 9

2. Board Layout 10

3. Parts Layout 11

4. Operating Environment 12

5. User Circuits 13
5.1 Evaluation MCU 13
5.2 Bluetooth® Low Energy 13
5.3 Emulator 14
5.4 USB-to-Serial Conversion 15
5.5 ACT LED 15
5.6 Power LED 15
5.7 User LEDs 15
5.8 External Power-Supply Header 16
5.9 Pmod™ Connector 17
5.10 Arduino™ UNO Headers 19
5.11 Current Measurement Header 21
5.12 MCU Headers 21
5.13 Reset Switch 21
5.14 User Switch 21
5.15 Patterns for Cutting 21

6. Configurations 22
6.1 Modifying the Target Board for RX23W module 22
6.2 Analog Power Supply 22
6.3 On-Chip Oscillator 23

7. Handling Precautions 24
7.1 Adding Load 24
7.2 Remodeling the Board 24
7.3 Limitation on the Number of Connected Target Board for RX23W modules 24

8. Developing Code 25
8.1 Using the e^2 studio 25
8.2 Using CS+ 26

9. Additional Information 27

10. Certification of Compliance 28
10.1 Radio-Related Laws 28

Downloaded from Arrow.com.

1. Overview

1.1 Package Components

Thank you for purchasing the Target Board for RX23W module evaluation tool from Renesas (hereinafter referred to as “this product”). This product consists of the Target Board for RX23W module (RTK5RX23W0C01000BJ).

1.2 Purpose

This product is an evaluation tool for a Renesas MCU. This user’s manual describes the hardware specifications, ways of setting switches, and the basic setup procedure.

1.3 Features

This product can handle the following tasks.

- Programming of the Renesas MCU
- Debugging of user code
- Evaluation of Bluetooth® Low Energy communications
- User circuits for switches and LEDs
- Sample applications*
- Samples of peripheral-function initialization code*

Note: These are available for downloading from the Renesas Web site.

https://www.renesas.com/rxtb

1.4 Preparation

Install the integrated development environment (IDE) and required software from the following URL on the host PC.

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

Downloaded from Arrow.com.

1.5 Target Board for RX23W module: Table of Specifications

Table 1-1 shows the specifications of this product.

Table 1-1 Target Board for RX23W module Specification Table

Item	Specification
Evaluation MCU	Part No.: R5F523W8CDLN (no TSIP)
	Package: 83-pin LGA
	On-chip memory: 512-KB ROM, 64-KB RAM, 8-KB E2 data flash memory
Board size	Size: 54.0 mm x 90.0 mm
	Thickness: 1.6 mm
Power-supply circuit	USB connector: 5-V input
	Power-supply IC: 5-V input, 3.3-V output
	External power-supply header*: 3.3-V input, 2 pins x 1
Current drawn	Max. 200 mA
Current measurement header*	Header: 2 pins x 1
Main clock*	Crystal oscillator (surface-mount technology (SMT)) for the main system clock
	Crystal oscillator or ceramic resonator (lead type) for the main system clock
Sub-clock*	Crystal oscillator (SMT) for the sub-clock
Bluetooth® Low Energy	Bluetooth® Low Energy circuit x 1
	Range of frequency: 2402 to 2480 MHz
	Maximum transmission output power: 4 dBm (in 4-dBm output mode)
	Output variation: +2 dB
Push switches	Reset switch x 1
	User switch x 1
LEDs	Power indicator: green x 1
	User: green x 2
	ACT LED: green x 1
USB	Connector for an on-board emulator: USB Micro-B
	Connector for a USB serial-conversion interface: USB Micro-B
Pmod™ connector	Connector: Angle type, 12 pins
Arduino™ UNO connectors*	A set of 2.54-mm pitch connectors for Arduino™ UNO
MCU headers*	Headers: 36 pins x 2
Patterns for cutting	27
Emulator reset switch	DIP switch x 1

Note: This part is not mounted.

Downloaded from Arrow.com.

1.6 Block Diagram

Figure 1-1 shows the block diagram of this product.

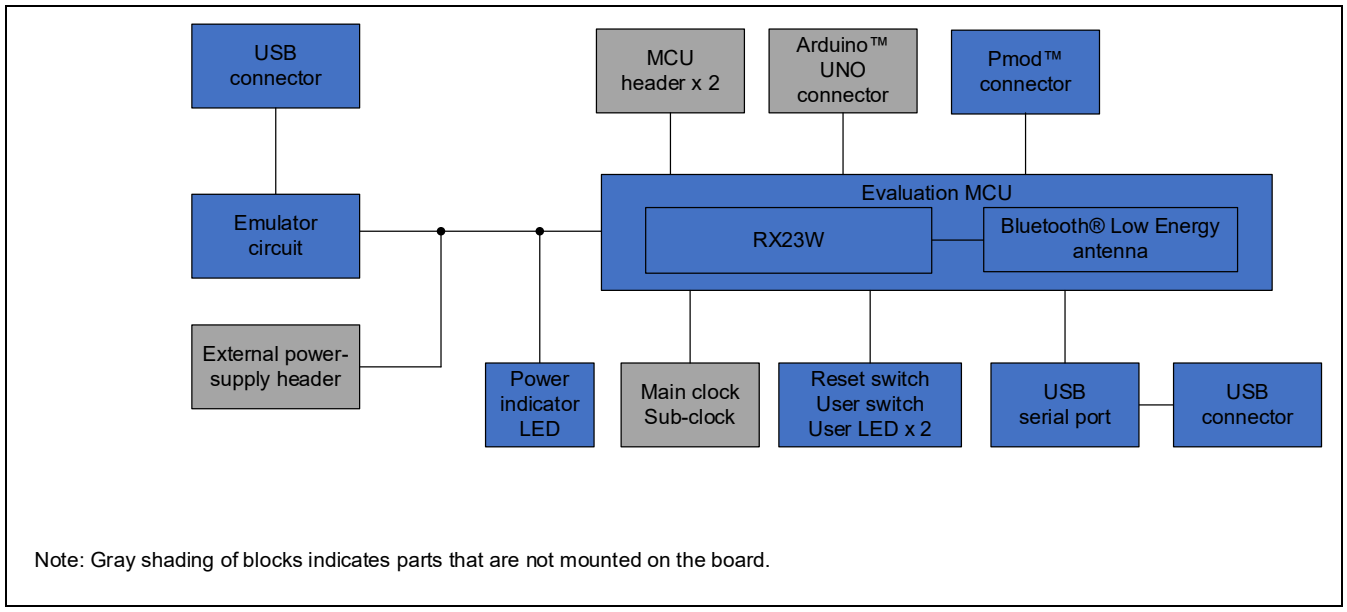


Figure 1-1 Block Diagram

Downloaded from Arrow.com.

2. Board Layout

Figure 2-1 shows the external appearance of the top side of this product.

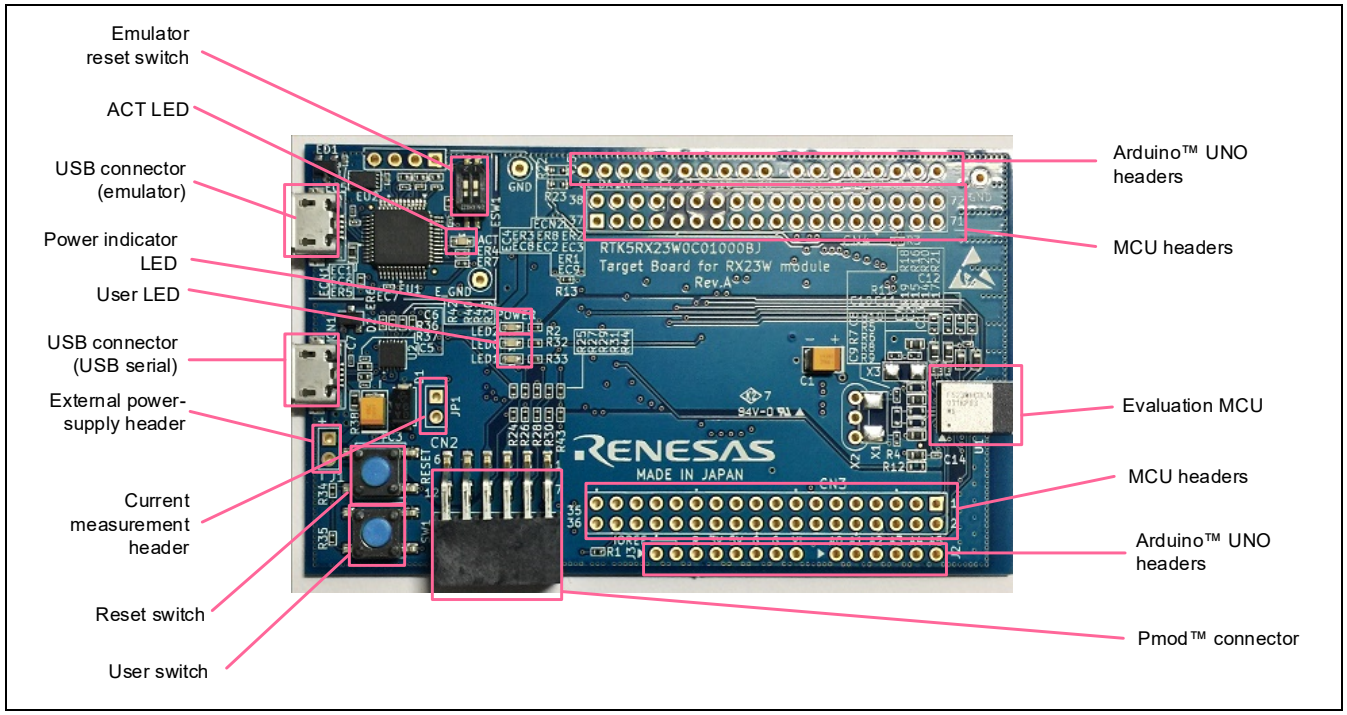


Figure 2-1 Board Layout (Top Side)

Downloaded from Arrow.com.

3. Parts Layout

Figure 3-1 shows the parts layout of this product.

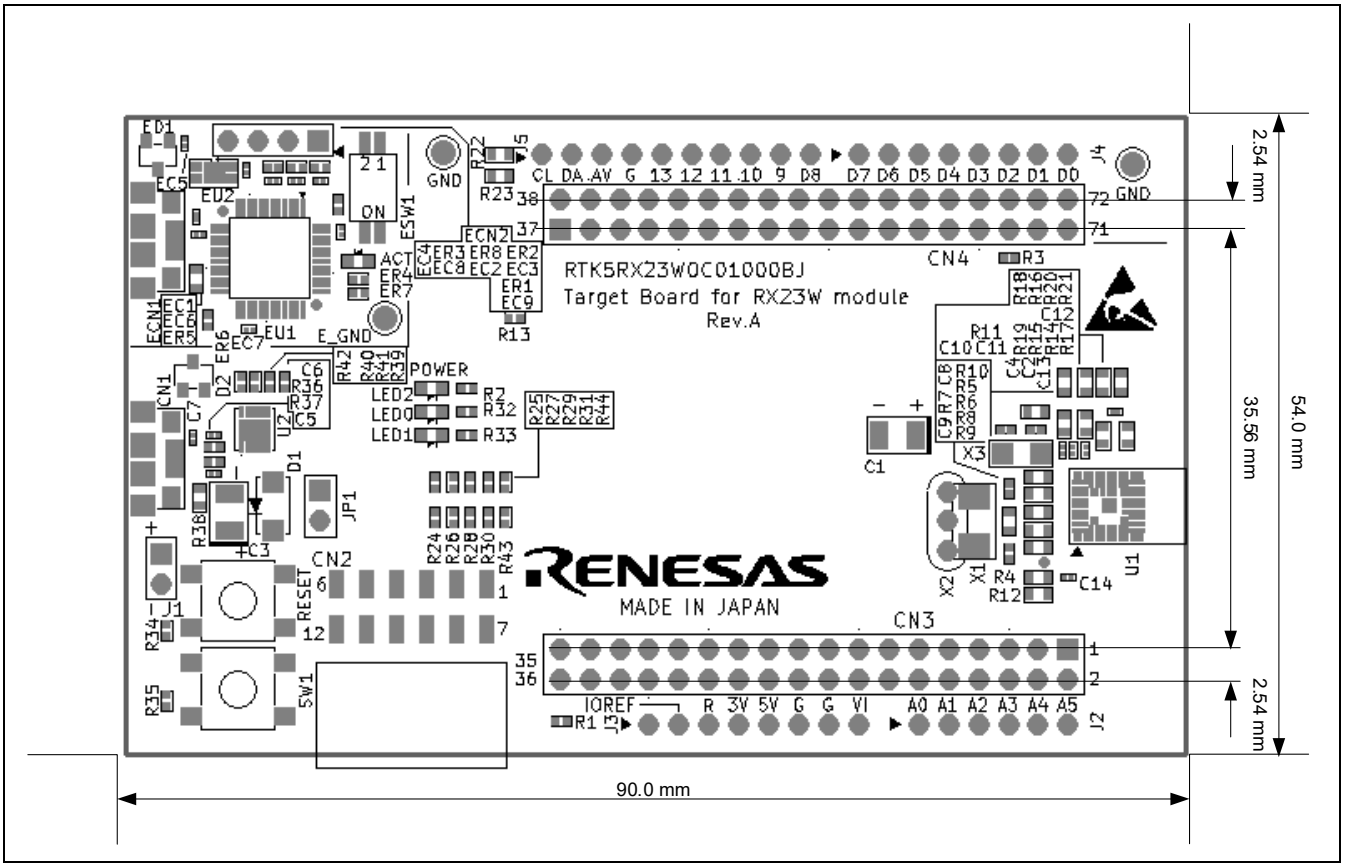


Figure 3-1 Parts Layout

Downloaded from Arrow.com.

4. Operating Environment

Figure 4-1 shows the operating environment of this product. Install the IDE from the following URL on the host PC. The installer automatically installs all required drivers along with the IDE.

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

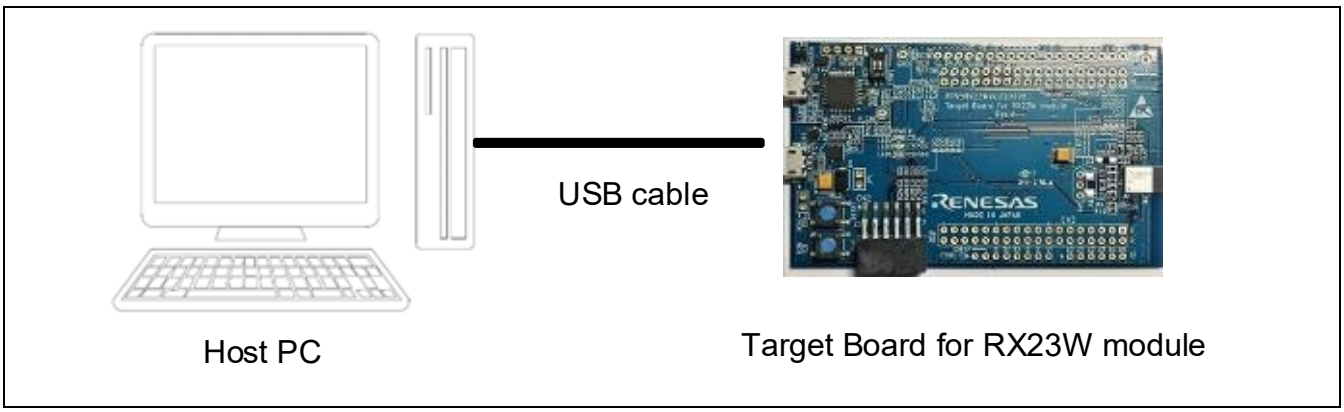


Figure 4-1 Operating Environment

Downloaded from Arrow.com.

5. User Circuits

5.1 Evaluation MCU

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

- Power supply: Fixed 3.3 V (including the analog power supply)
- System clock: Operation with an on-chip oscillator
- Reset: Directed by the reset switch or IDE

5.2 Bluetooth® Low Energy

A Bluetooth® Low Energy communications circuit is mounted on this board.

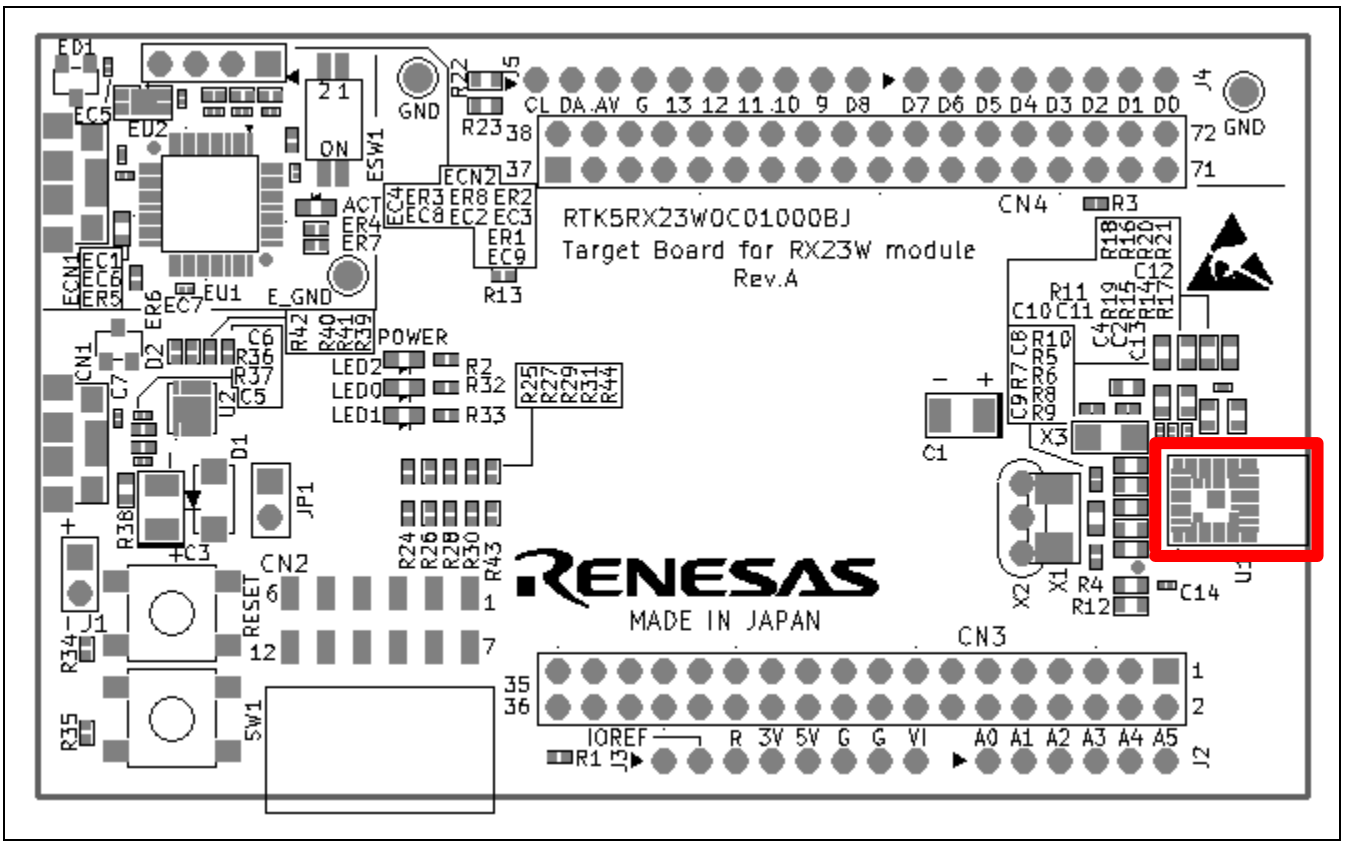


Figure 5-1 Bluetooth® Low Energy Circuit

Note:
Never remodel the Bluetooth® Low Energy circuit, as doing so will violate radio-related laws.

Downloaded from Arrow.com.

5.3 Emulator

An emulator is mounted on the board. With the settings as shipped, the switches shown in Figure 5-2 are turned off and the emulator is in reset state. To use the emulator, make the corresponding switch setting in Table 5-1.

The shape of the emulator connector (ECN1) is USB micro-B for the IDE and for the Renesas Flash Programmer (RFP). Connect the emulator connector to the computer by a USB cable. If the power supply on the host side is on, the power is supplied to this product at the same time as connection of the cable.

Note: The package does not include a USB cable.

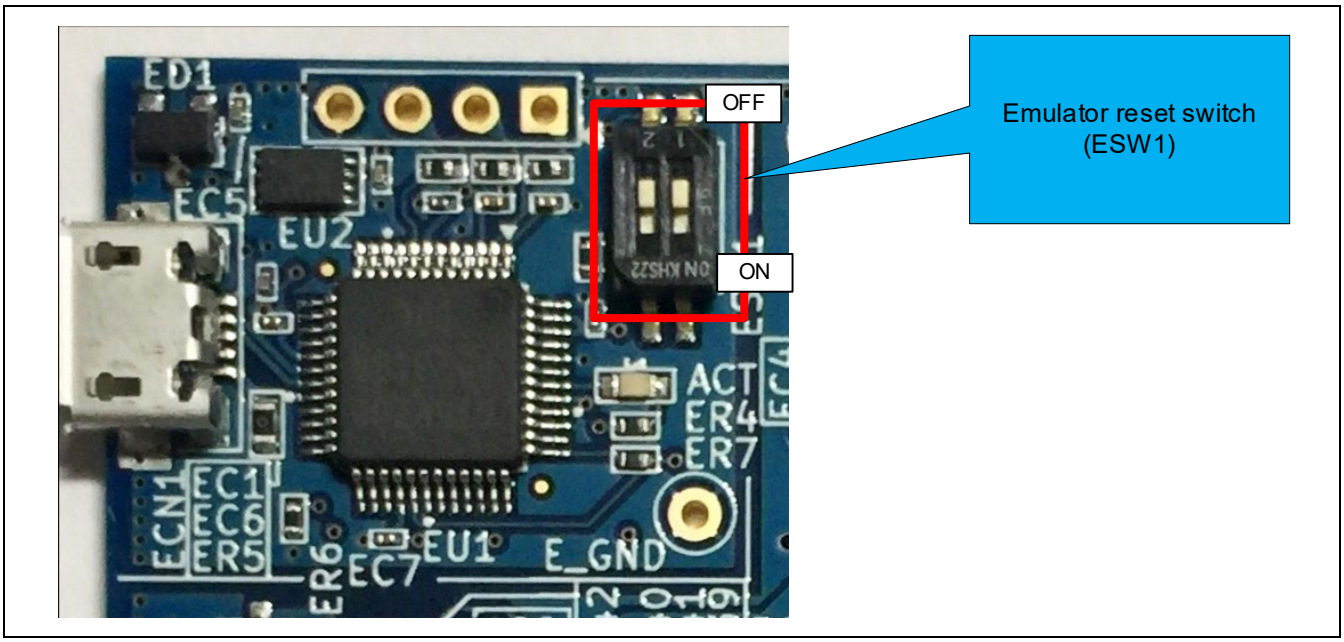


Figure 5-2 Emulator Reset Switch (ESW1)

Table 5-1 Setting of the Emulator Reset Switch (ESW1)

ESW1	Function	MCU	
Channel 1	Not used.	—	—
Channel 2	Resets the emulator.	Off	The emulator is reset. The emulator cannot be used.
		On	The emulator can be used.

Downloaded from Arrow.com.

5.4 USB-to-Serial Conversion

USB connector CN1 is connected to the USB-to-serial conversion module from FTDI and can be used as a virtual COM port. Table 5-2 shows the connection relationship of USB-to-serial signals.

Table 5-2 Names of the USB-to-Serial Signals

Signal Name	Function and Usage	MCU	
		Port	Pin
TXD	Signal for transmitting data	PC7	44
RXD	Signal for receiving data	PC6	45
CTS	Input signal for controlling the start of transmission and reception of data	*	(46)
RTS	Output signal for controlling the start of transmission and reception of data	*	(46)

Note: This port is not connected on the board as shipped.

The first time the CPU board is connected to the USB port of a PC, the monitor of the PC shows the message stating that installation of the driver is in progress as shown in Figure 5-3. After that, a message indicating completion of the driver installation is displayed. The content of the message will differ with the OS version on the host PC.

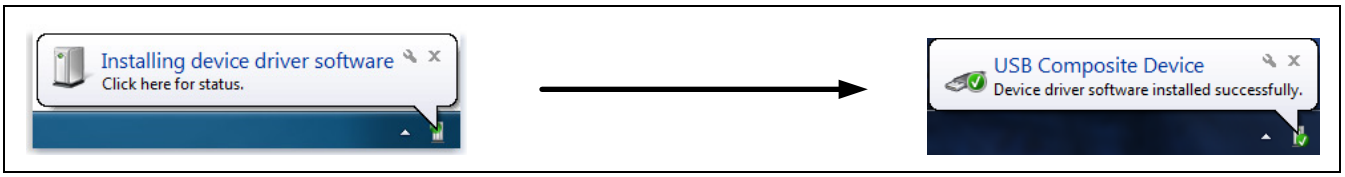


Figure 5-3 Displays Indicating Installation of the USB-to-Serial Driver

If you do not have a driver, download the installer for the driver from the Web site of FTDI.

5.5 ACT LED

The ACT LED displays the state of operation of the emulator control software. The illumination conditions are listed below. The LED is green.

- Illuminated: Indicates that the emulator is connected to the target.
- Blinking: Indicates that the host machine (PC) has recognized the emulator.
- Not illuminated: Indicates that the emulator cannot be used for some reason (including its power being off).

5.6 Power LED

While the power LED is illuminated, power is being supplied to the board. The LED is green.

5.7 User LEDs

The optional user LEDs can be used for any purpose. LED0 and LED1 are mounted on the board and are respectively connected to the following ports. The LEDs are green.

- LED0: Pin 47, connected to port PC0
- LED1: Pin 53, connected to port PB0

Downloaded from Arrow.com.

5.8 External Power-Supply Header

When more current is required than the USB is capable of supplying, use the external power-supply header (J1) to supply power. The usable voltage is 3.3 V. When this header is to be used, remove the pattern for cutting (SS19) on the soldered side, electrically separating the emulator from the target. Figure 5-4 shows the position of the pattern for cutting. Figure 5-5 shows the position of the external power-supply header (the actual header component is not mounted on the board as shipped).

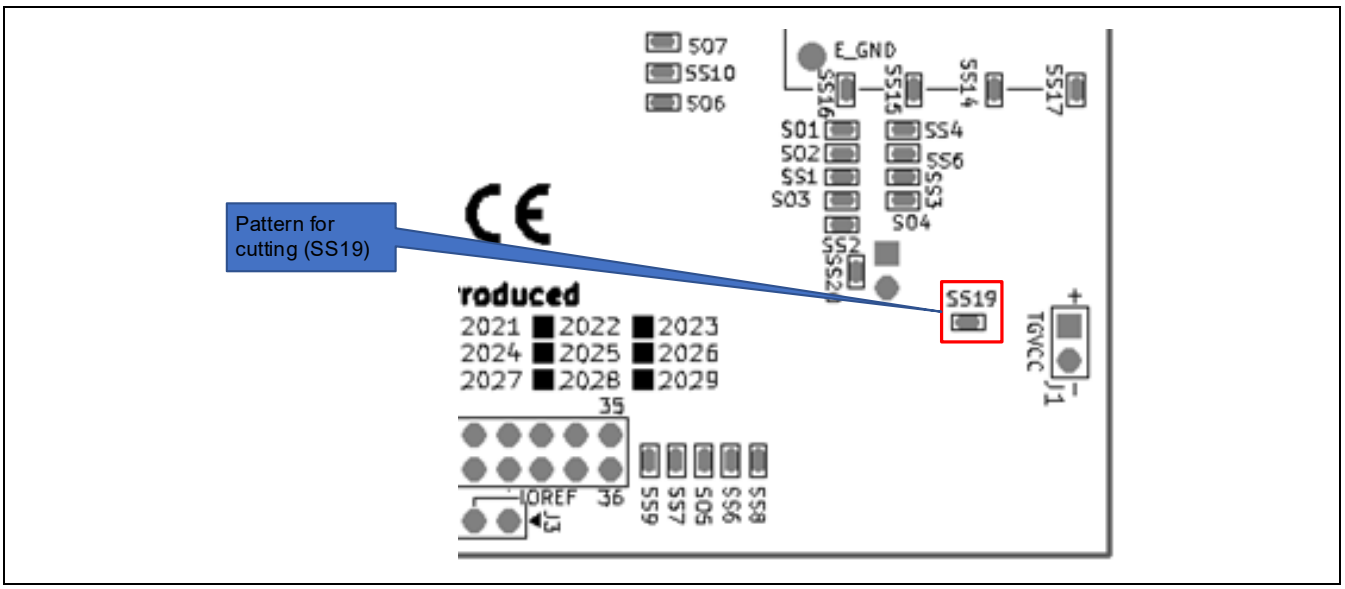


Figure 5-4 Position of the Pattern for Cutting (SS19) (Soldered Side)

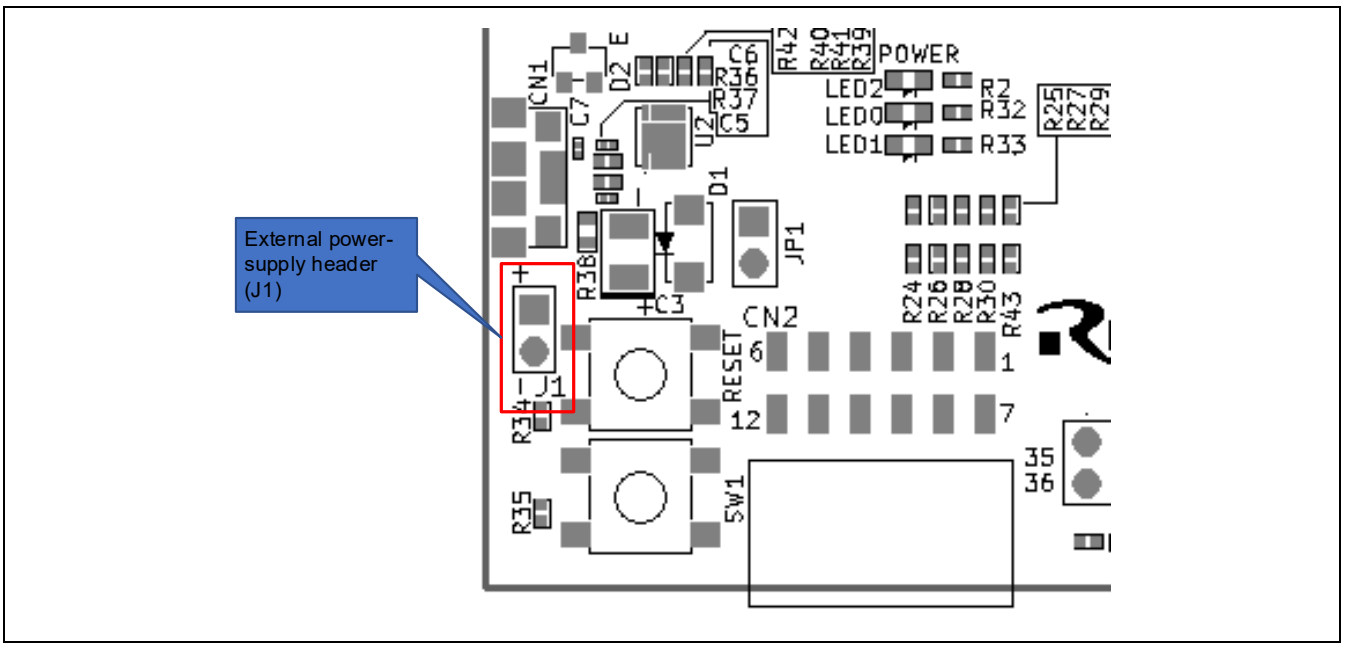


Figure 5-5 Position of the External Power-Supply Header (J1) (Top Side)

Downloaded from Arrow.com.

5.9 Pmod™ Connector

The specification of the Pmod™ connector (CN2) is on the assumption that Pmod™ modules are to be connectable.

CN2 is for connection to Pmod™ Interface Type 6A (Type 6 + Type 1) modules* in the product as shipped. Remodeling of the board by removing patterns for cutting enables the connection of CN2 to Type 2A or Type 3A modules. Use Pmod™ modules for operation at the same potential as that for the evaluation MCU.

However, we do not guarantee connection to all types of Pmod™ module. Confirm the specifications of this product against any Pmod™ module you intend to use.

Note: The specifications of Type 6A differ from those described in the Pmod™ interface specification of Digilent.

Table 5-3 Pin Assignments of the Pmod™ Connector

Pin No. (CN2)	Specifications of the Connector			Evaluation MCU	
	Type 6A (I2C)	Type 2A (SPI)	Type 3A (UART)	Port	Pin No.
1	INT	CS	CTS/GPIO	P31/CTS1#/IRQ1	68
2	RESET	MOSI	TXD	P17/SDA	72
				(P26/TXD1/SMOSI1/SSDA1)*1	71
3	SCL	MISO	RXD	P30/RXD1/SMISO1/SSCL1	69
4	SDA	SCK	RTS/GPIO	P16/TXD1/SMOSI1/SSDA1	41
				(P27/SCK1)*2	70
				(P14/RTS1#)*3	43
5	GND	GND	GND	—	—
6	VCC	VCC	VCC	—	—
7	GPIO	GPIO/INT	GPIO/INT	PB1/IRQ4	52
8	GPIO	GPIO/RESET	GPIO/RESET	PD3	57
9	GPIO	GPIO	GPIO	PC3/TXD5	8
10	GPIO	GPIO	GPIO	PC2/RXD5	48
11	GND	GND	GND	—	—
12	VCC	VCC	VCC	—	—

Notes: 1. If you wish to use Type 2A or 3A modules, change the connection of the pin to P26 (remove SS2 and short-circuit SO3).
2. If you wish to use Type 2A modules, change the connection of the pin to P27 (remove SS1 and SO2 and short-circuit SO1).
3. If you wish to use Type 3A modules, change the connection of the pin to P14 (remove SS1 and SO1 and short-circuit SO2).

Downloaded from Arrow.com.

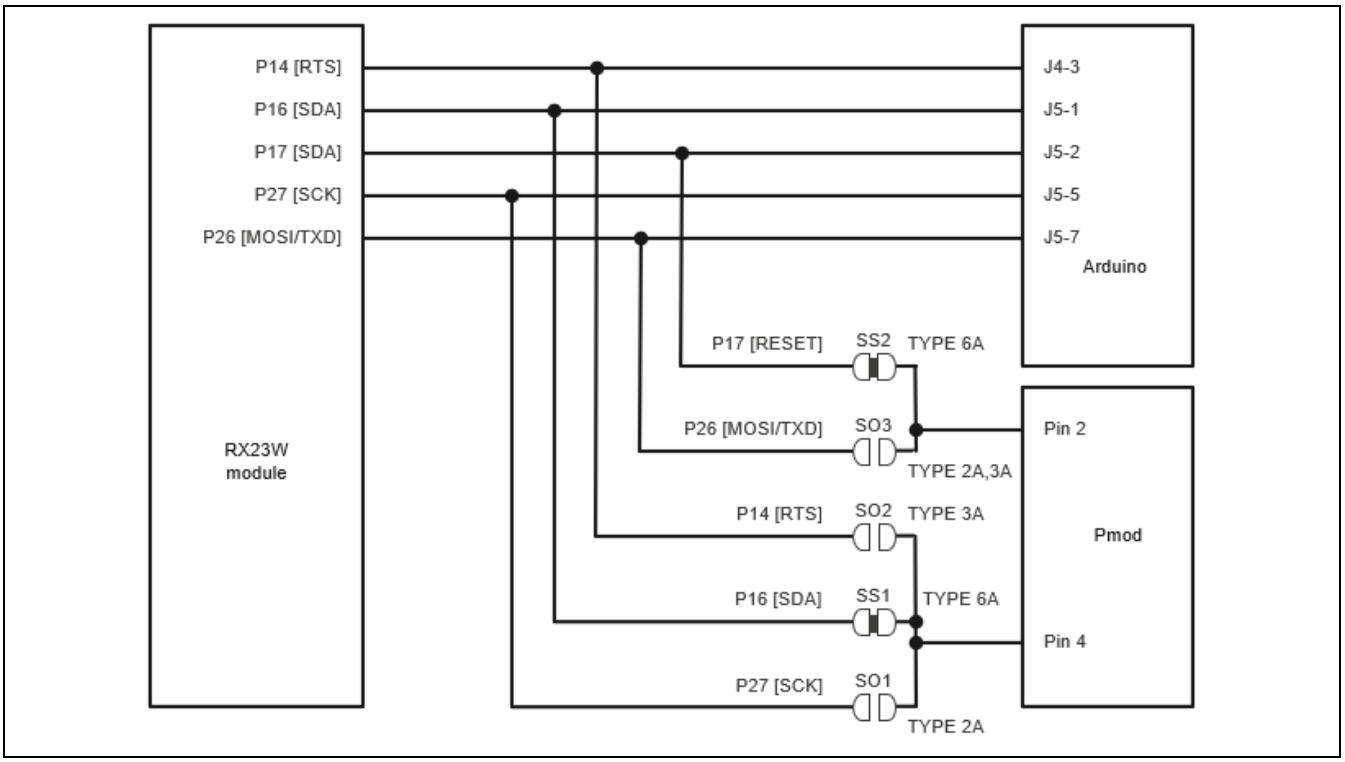


Figure 5-6 Pmod™ Multi-Function Pins

Downloaded from Arrow.com.

5.10 Arduino™ UNO Headers

For the J2, J3, J4, and J5 headers, through holes are assigned with a pitch of 2.54 mm and these headers are connected to the evaluation MCU according to the Arduino™ UNO R3 specification. Table 5-4, Table 5-5, Table 5-6, and Table 5-7 show the signal specifications of the Arduino™ UNO connectors (the actual connector components are not mounted on the board as shipped).

Table 5-4 Pin Assignments of J2 (6-Pin Analog Connector)

Pin No.	Signal Name	Specification	MCU	
			Signal Name	Pin No.
1	A0	AD input	AN001	61
2	A1		AN005	23
3	A2		AN006	58
4	A3		AN007	24
5	A4		AN018	56
6	A5		AN019	55

Table 5-5 Pin Assignments of J3 (8-Pin Power Connector)

Pin No.	Signal Name	Specification	MCU	
			Signal Name	Pin No.
1	Reserved	Reserved	—	—
2	IOREF	IOREF	VCC	—
3	RESET	RESET	RES#	66
4	3V3	Power supply	VCC	—
5	5V		—	—
6	GND		GND	—
7	GND		GND	—
8	VIN		VCC	—

Table 5-6 Pin Assignments of J4 (8-Pin Digital Connector)

Pin No.	Signal Name	Specification	MCU	
			Signal Name	Pin No.
8	D0/RX	GPIO/RxD	PC2/RxD5	48
7	D1/TX	GPIO/TxD	PC3/TxD5	8
6	D2	GPIO	PC0	47
5	D3/PWM/INT	GPIO/PWM/IRQ	PB7/MTIOC3B	49
4	D4/INT	GPIO/IRQ	PB1/IRQ4	52
3	D5/PWM/INT	GPIO/PWM/IRQ	P14/MTIOC3A/IRQ4	43
2	D6/PWM	GPIO/PWM	PE4/MTIOC4D	54
1	D7	GPIO	PB0	53

Downloaded from Arrow.com.

Table 5-7 Pin Assignments of J5 (10-Pin Digital Connector)

Pin No.	Signal Name	Specification	MCU	
			Signal Name	Pin No.
10	D8	GPIO	P31	68
9	D9/PWM	GPIO/PWM	PC6/MTIOC3C	45
8	D10/PWM	GPIO/PWM	PC5/MTIOC3B	7
7	D11/MOSI/PWM	GPIO/PWM	P26/SMOSI1/MTIOC2A	71
6	D12/MISO	GPIO	P30/SMISO1	69
5	D13/SCK	GPIO	P27/SCK1	70
4	GND	GND	—	—
3	ADREF	ADREF	(VREFH0)	(27)*
2	SDA	II2 data	SDA	72
1	SCK	II2 clock	SCL	41

Note: Connect pin J5-3 to TGVCC by removing the given pattern for cutting (disconnection pattern). Connect pin J5-3 to pin 27 of the RX23W module (U1) by removing the pattern for cutting (disconnection pattern).

Downloaded from Arrow.com.

5.11 Current Measurement Header

The current measurement header (JP1) is used to measure the current drawn by the evaluation MCU (an actual header component is not mounted on the board as shipped). The current drawn can be measured by connecting an ammeter to the evaluation MCU. When this header is to be used, remove the relevant pattern for cutting (SS20) on the soldered side. Figure 5-7 shows the positions of the header and pattern for cutting.

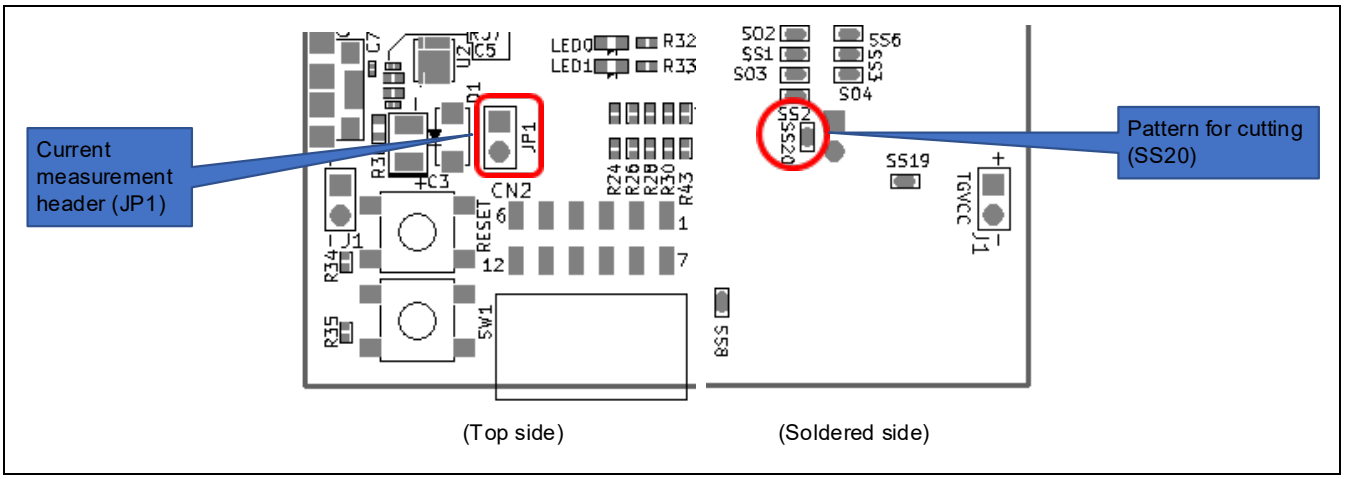


Figure 5-7 Positions of the Current Measurement Header (JP1) and Pattern for Cutting (SS20)

5.12 MCU Headers

MCU headers are provided for by two sets of through holes (CN3 and CN4) for 36-pin headers (actual header components are not mounted on the board as shipped). The pin headers have a pitch of 2.54 mm and are connected to the evaluation MCU. Pin numbers of the MCU headers correspond to those of the evaluation MCU, and most pins are connected (with pins 3, 6, 9 to 20, 33, 35, 36, and 73 to 83 as the exceptions).

5.13 Reset Switch

Pressing the RESET switch applies a hardware reset to the evaluation MCU.

5.14 User Switch

An optional user switch (SW1) is mounted. It is connected to pin 42 of the evaluation MCU, which operates as pin function P15. The IRQ5 interrupt is multiplexed on the same pin.

5.15 Patterns for Cutting

Patterns must be cut or repaired by soldering if necessary. Figure 5-8 shows examples of the states of patterns for cutting.

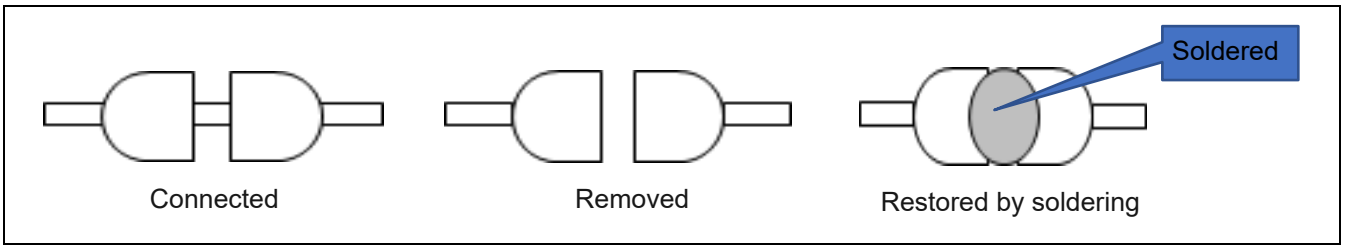


Figure 5-8 Examples of States of Patterns for Cutting

Downloaded from Arrow.com.

6. Configurations

6.1 Modifying the Target Board for RX23W module

This section describes how to change the setting of this product by using option-link resistors.

An option-link resistor is a 0-Ω surface-mount resistor, which is used to short-circuit or isolate a part of circuits. The subsequent sections contain lists of option-link resistors for individual functions. Fit or remove option-link resistors to switch functions with reference to the list. **Resistor numbers in bold blue type** indicate the initial state of the configuration on the Target Board for RX23W as shipped. For the positions of the option links, refer to chapter 3, Parts Layout.

When removing soldered components, do not apply a soldering iron to the Target Board for RX23W module for more than 5 seconds. This time restriction is to avoid any damage components mounted nearby on the board.

6.2 Analog Power Supply

Table 6-1 and Table 6-2 show the option-link resistors for the analog power supply.

Table 6-1 Option-Link Resistors for the Analog Power Supply of the 12-Bit A/D and 12-Bit D/A Converters

Analog Power-Supply Source of the 12-Bit A/D and 12-Bit D/A Converters	Mounted	Not Mounted	Remark
3.3 V on the board	**R15, R19**	**R16, R18**	—
MCU headers	R16, R18	R15, R19	—

Table 6-2 Option-Link Resistors for the Reference Power Supply of the 12-Bit A/D Converter

Reference Power-Supply Source of the 12-Bit A/D Converter	Mounted	Not Mounted	Remark
3.3 V on the board	**R14, R17**	**R20, R21**	—
MCU headers	R20, R21	R14, R17	—

Downloaded from Arrow.com.

6.3 On-Chip Oscillator

Table 6-3 and Table 6-4 show the option-link resistors for the operation of the on-chip oscillator.

Table 6-3 Option-Link Resistors for the HOCO

Setting of the HOCO	Mounted	Not Mounted	Remark
Oscillating	**R5, R9**	**R6, R8**	—
Halted	R6, R8	R5, R9	Mount a crystal oscillator on X1 or X2 and the load capacitance as C8 or C9.

Table 6-4 Option-Link Resistors for the LOCO

Setting of the LOCO	Mounted	Not Mounted	Remark
Oscillating	**R11**	**—**	—
Halted	—	R11	Mount a crystal oscillator on X3 and the load capacitance as C10 or C11.

Downloaded from Arrow.com.

7. Handling Precautions

7.1 Adding Load

When load is added while power is being supplied via the USB, the maximum current is 300 mA during operation at 3.3 V.

When load is added while power is being supplied externally, the maximum current is 500 mA regardless of the operating voltage.

7.2 Remodeling the Board

Any modification of the board (including removing the patterns for cutting) shall be conducted at the user's own responsibility.

7.3 Limitation on the Number of Connected Target Board for RX23W modules

Connecting the same host PC to multiple Target Board for RX23W modules is not possible.

Downloaded from Arrow.com.

8. Developing Code

8.1 Using the e² studio

Figure 8-1 shows the settings of the e² studio when creating a new project for the Target Board for RX23W module.

- [Debug hardware]: Select [E2 Lite (RX)].
- [Power Target From The Emulator]: Select [No].
- [Flash] – [ID Code]: Enter “45FFFFFFFFFFFFFFFFFFFFFFFFFFFF”.

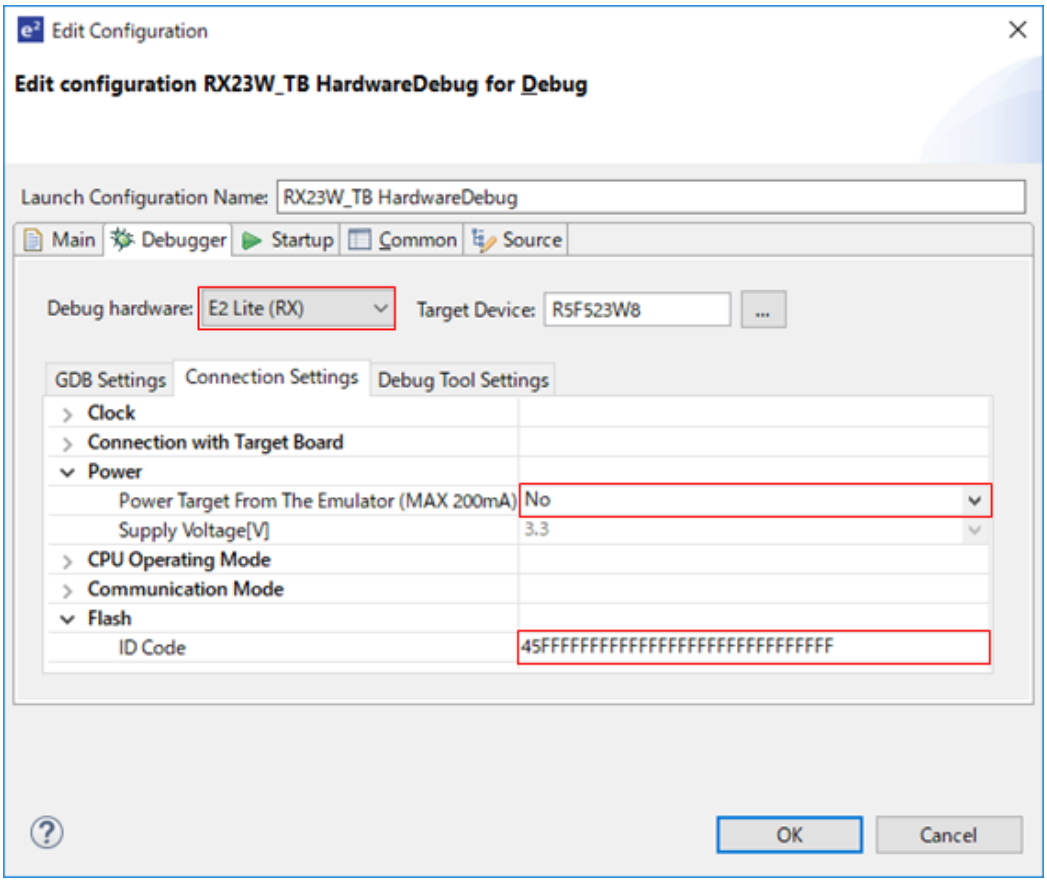


Figure 8-1 Settings of the e² studio

Note: Do not connect another Target Board for RX23W module to your PC while this product is already connected.

Downloaded from Arrow.com.

8.2 Using CS+

Figure 8-2 and Figure 8-3 show the settings of CS+ when creating a new project for the Target Board for RX23W module.

- [Using Debug Tool]:
  Select [RX E2 Lite] from [Using Debug Tool] in the [Debug] menu.

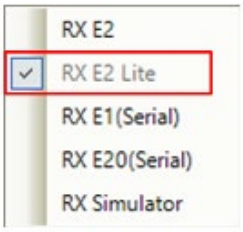


Figure 8-2 Panel for Selecting the Debug Tool

- [Power target from the emulator]: Select [No].
- [Flash] – [ID code]: Enter “45FFFFFFFFFFFFFFFFFFFFFFFFFFFF”.

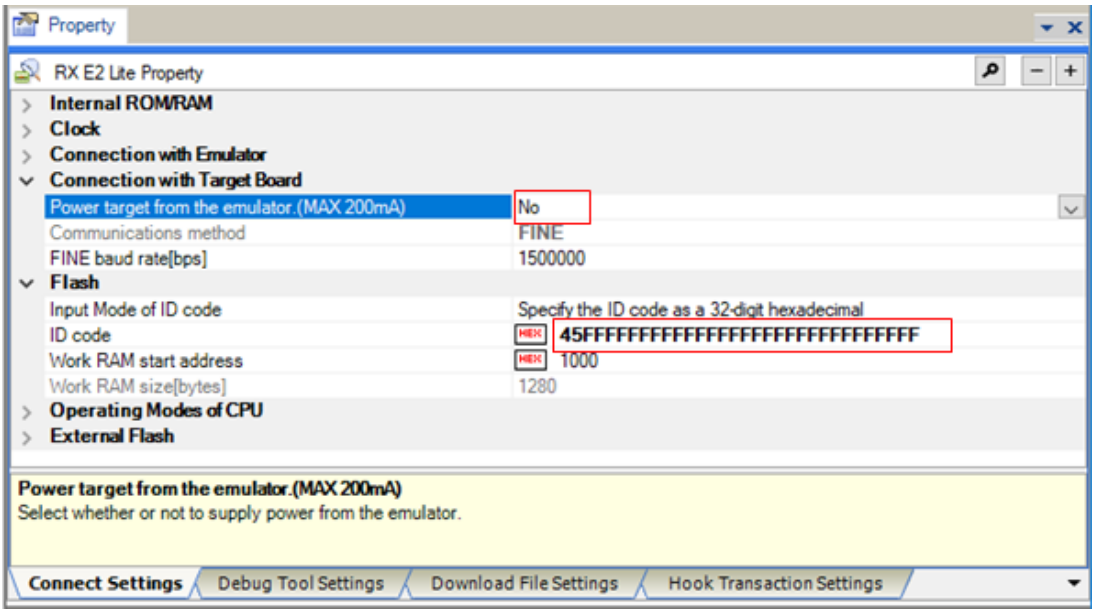


Figure 8-3 [Connect Settings] Tabbed Page of CS+

Downloaded from Arrow.com.

9. Additional Information

Technical Support

For details on the RX23W-group microcontrollers, refer to the RX23W Group User's Manual: Hardware.

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

The latest information is available from this Web page: 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/

Note

Do not install the Target Board for RX23W module or sample code into your product.

The operation of sample code is not guaranteed. Confirm the operation on your own responsibility.

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.

© 2021 Renesas Electronics Corporation. All rights reserved.

Downloaded from Arrow.com.

10. Certification of Compliance

The Target Board for RX23W module complies with the laws and regulations described below.

Since the use of this product in countries and regions that require compliance with other regulations may lead to the violation of the laws; confirm the regulations of such countries in which the product is to be used.

The use of this product in a Faraday-shielded chamber or box may be required.

10.1 Radio-Related Laws

The RX23W module (type number: R5F523W8CDLN) incorporated in this product has obtained the following certificates of technical compliance. If using the module overseas, you must do so in accord with the regulations of the country where the product is to be delivered.

Japan: Type certification (authentication number: 006-000937)

Europe: CE (RE)

United Kingdom: Radio Equipment Regulations 2017

North America: FCC (FCC ID: 2AEMXRX23W8DLN), ISED (20194-RX23W8DLN)

RE Directive

Hereby, Renesas Electronics Corporation declares that it is in compliance with Directive 2014/53/EU, Radio Equipment Regulations 2017.

Downloaded from Arrow.com.

FCC/ISED Regulatory

Contains FCC ID: 2AEMXRX23W8DLN

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

[for FCC]

FCC CAUTION

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment and meets the FCC radio frequency (RF) Exposure Guidelines. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person's body.

This device complies with FCC Part 15.203 because the antenna is not removable from this device.

Contains IC: 20194-RX23W8DLN

[for ISED]

This device complies with Industry Canada's license-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference; and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : 1) l'appareil ne doit pas produire de brouillage; 2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment and meets RSS-102 of the IC radio frequency (RF) Exposure rules. This equipment has very low levels of RF energy that it deemed to comply without maximum permissive exposure evaluation (MPE). But it is desirable that it should be installed and operated keeping the radiator at least 20cm or more away from person's body.

Cet équipement est conforme aux limites d'exposition aux rayonnements énoncées pour un environnement non contrôlé et respecte les règles d'exposition aux fréquences radioélectriques (RF) CNR-102 de l'IC. Cet équipement émet une énergie RF très faible qui est considérée conforme sans évaluation de l'exposition maximale autorisée. Cependant, il est souhaitable qu'il devrait être installé et utilisé en gardant une distance de 20 cm ou plus entre le radiateur et le corps humain.

The Hardware Version Identification Number (HVIN) and Product Marketing Name (PMN) will be R5F523W8CDLN or R5F523W8DDLN.

Downloaded from Arrow.com.

Revision History	Target Board for RX23W module User's Manual

Rev.	Date	Description	
		Page	Summary
1.00	Jan.15.21	—	First Edition issued

Downloaded from Arrow.com.

Target Board for RX23W module User's Manual

Publication Date: Rev.1.00 Jan.15.21

Published by: Renesas Electronics Corporation

Downloaded from Arrow.com.

RX23W Group

Renesas Electronics Corporation

R20UT4890EJ0100

Downloaded from Arrow.com.