Quick Start Guide

RX671 Group

Evaluation Kit for RX671 Microcontroller Group
EK-RX671
Quick Start Guide

Renesas RX Family
RX600 Series

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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.
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.

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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.

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Renesas RX Family

EK-RX671

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1. Introduction

This Quick Start Guide (QSG) provides:

- An overview of the Quick Start Example Project that the EK-RX671 board comes pre-programmed with.
- Instructions for running the Quick Start Example Project.
- Instructions for importing, modifying, and building the Quick Start Example Project using Firmware Integration Technology (FIT) and e^2 studio Integrated Development Environment (IDE).

1.1 Assumptions and Advisory Notes

1. Tool experience: It is assumed that the user has prior experience working with IDEs such as e^2 studio and terminal emulation programs such as TeraTerm.
2. Subject knowledge: It is assumed that the user has basic knowledge about microcontrollers, embedded systems, and FIT to modify the example project described in this document.
3. Prior to running the Quick Start Example Project or programming the EK-RX671 board, default jumper settings must be used. Refer to the EK-RX671 user's manual for the default jumper settings.
4. The screen shots provided throughout this document are for reference. The actual screen content may differ depending on the version of software and development tools used.

2. Kit Contents

The following components are included in the kit:

1. EK-RX671 board
2. Micro USB function cable (type-A male to micro-B male)
3. Micro USB host cable (type-A female to micro-B male)

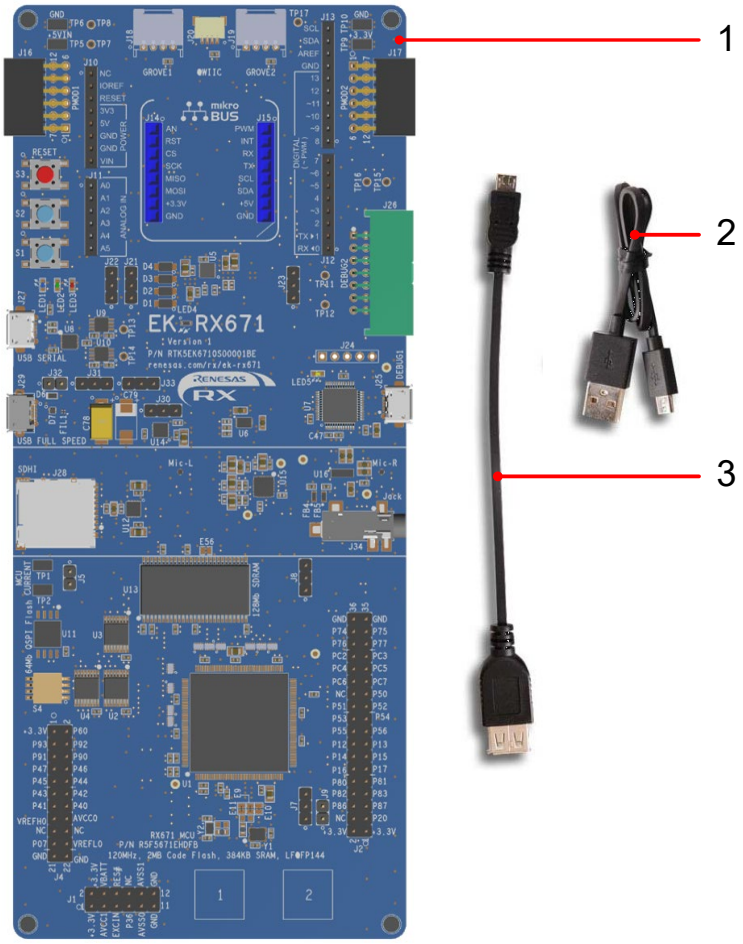

Figure 1. EK-RX671 Kit Contents

3. Overview of the Quick Start Example Project

The Quick Start Example Project allows the user to change the frequency and intensity of the on-board user LED1 (blue) using the user switches (S1 and S2). The supported frequencies are 1 Hz, 5 Hz, and 10 Hz and the supported intensities are 10%, 50%, and 90%.

When the EK-RX671 board running the Quick Start Example Project is connected to a host PC via USB connector (J27), the kit information, MCU die temperature, and user LED blinking frequency are displayed on a terminal console.

3.1 Quick Start Example Project Flow

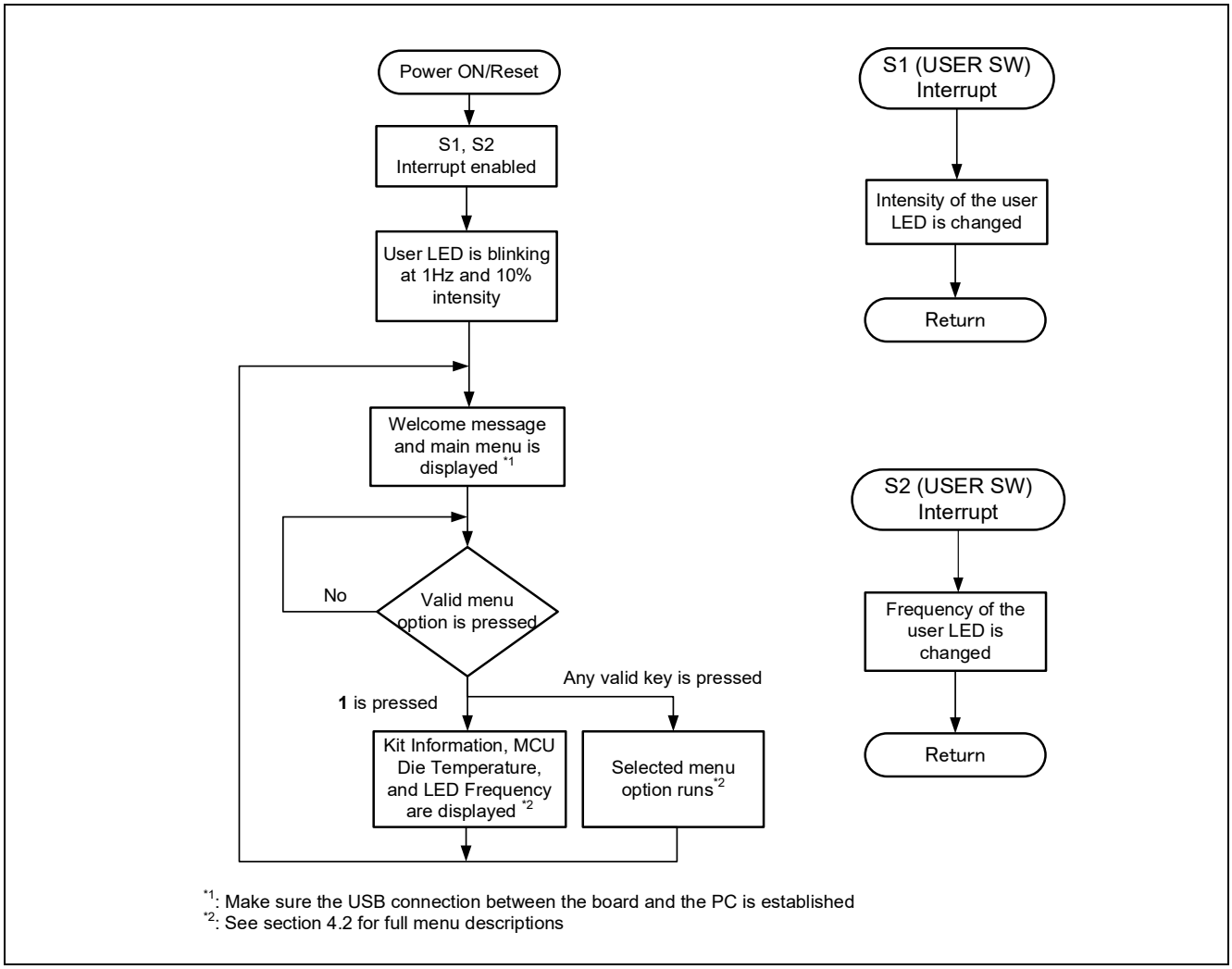

Figure 2. Operation overview of Quick Start Example Project

4. Running the Quick Start Example Project

This section lists the requirements and instructions to power up the EK-RX671 board and run the Quick Start Example Project.

Hardware Requirements

- EK-RX671 board
- Micro USB function cable
- A Host PC with at least 1 USB port

Software Requirements

- Microsoft® Windows® 10 operating system
- USB Serial Drivers
  The user must install the following drivers from the FTDI's web site.
  - VIRTUAL COM PORT (VCP) Drivers
  https://ftdichip.com/
- TeraTerm (or similar) terminal console application

4.1 Connecting and Powering Up the EK-RX671 Board

1. Check that DIP switch S4-2 is set to ON.
2. Connect the Micro USB end of the Micro USB function cable to USB connector (J27) of the EK-RX671 board.
3. Connect the other end of this cable to the USB port of the host PC. Power LED (LED4) on the EK-RX671 board lights up white, indicating that the EK-RX671 board is powered on.

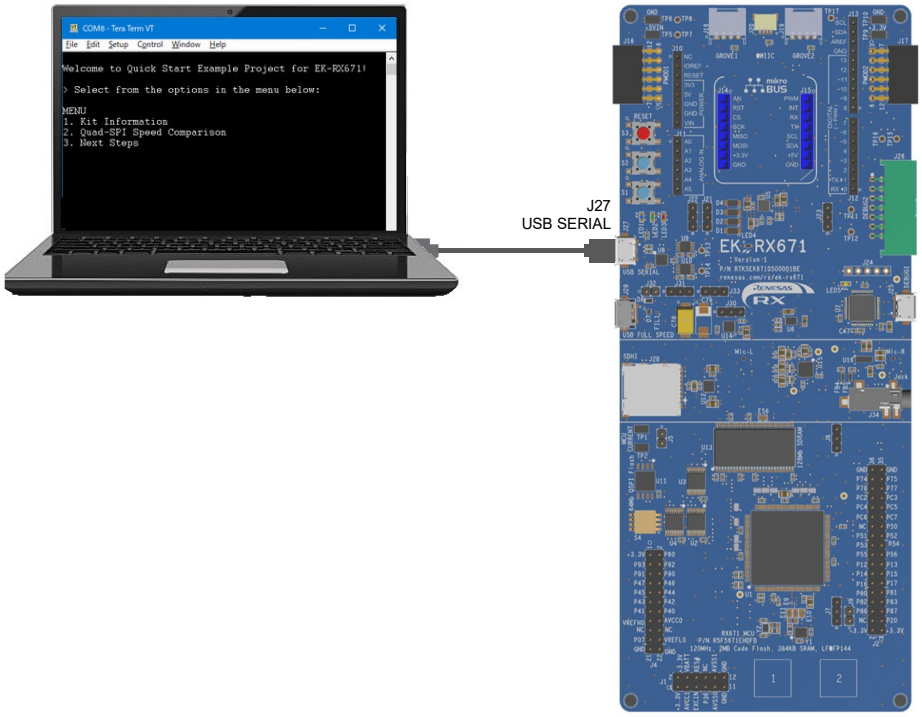

Figure 3. Connecting the EK-RX671 Board to the Host PC via USB Connector (J27)

4.2 Running the Quick Start Example Project

To run the Quick Start Example Project, use the following instructions:

1. On power up or RESET, the three user LEDs will take on the following states:
   — LED1 Blue - Blinking at 1 Hz frequency and at 10% intensity
   — LED2 Green – Steady, full intensity
   — LED3 Red – Off

2. Press the user switch (S1) on the EK-RX671 board to change the intensity of the user LED1. With every press of the user switch (S1), the intensity will switch from 10% to 50% to 90% and cycle back.
3. Press the user switch (S2) on the EK-RX671 board to change the blinking frequency of the user LED1 (blue). With every press of the first user switch (S2), the frequency will switch from 1 Hz to 5 Hz to 10 Hz and cycle back.
4. On the host PC, open Windows Device Manager. Expand **Ports (COM & LPT)**, locate **USB Serial Port (COMxx)** and note down the COM port number for reference in the next step.

   Note: USB Serial Device drivers (FTDI) are required to communicate between the EK-RX671 board and the terminal application on the host PC.

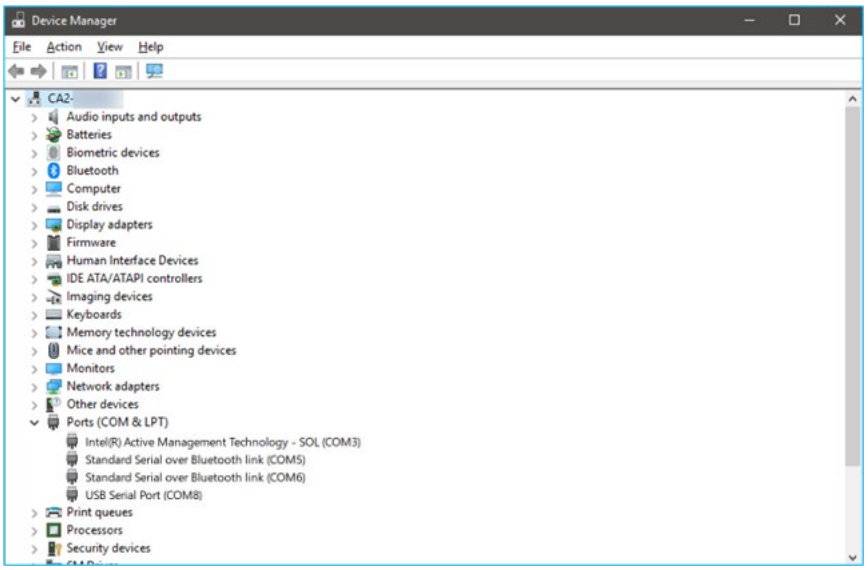

Figure 4. USB Serial Port in Windows Device Manager

5. Open Tera Term, select **Serial** and **COMxx: USB Serial Port (COMxx)** and click **OK**.

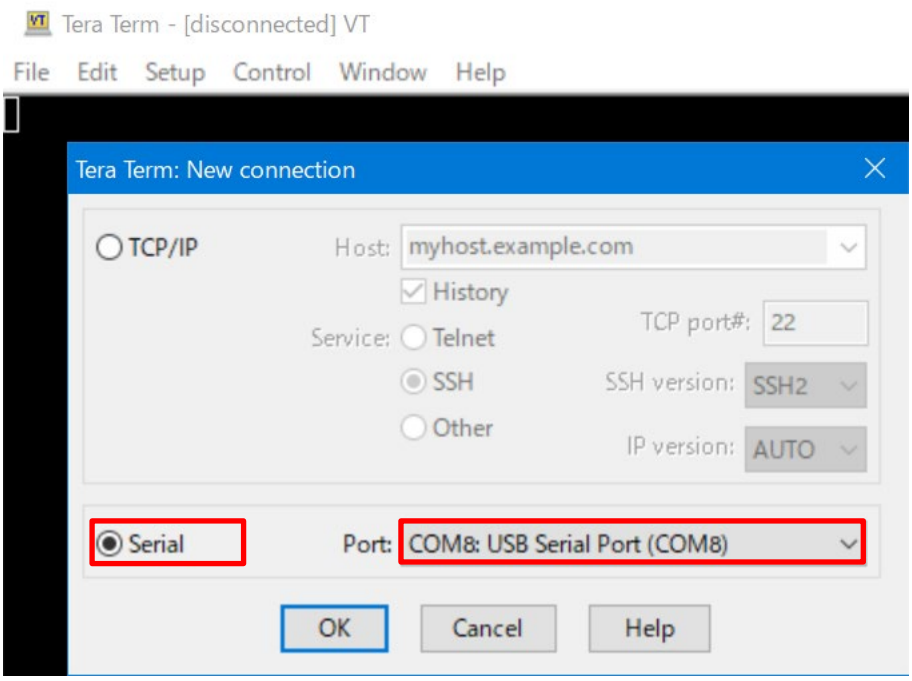

Figure 5. Selecting the Serial Port on Tera Term

6. Using the **Setup** menu pull-down, select **Serial port…** and ensure that the speed is set to 115200, as shown below.

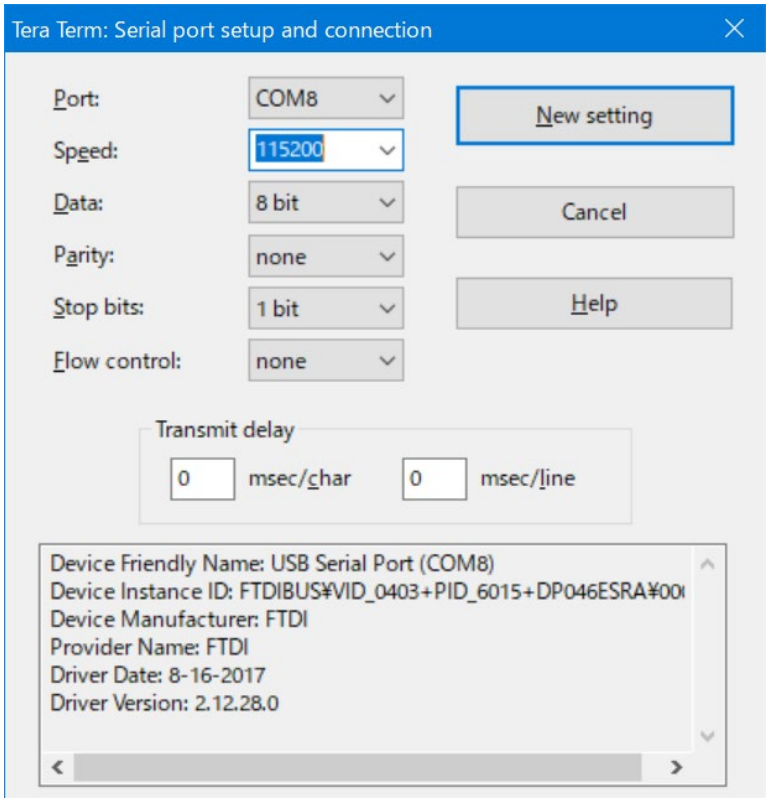

Figure 6. Select 115200 on the Speed Pulldown

7. After completing the connection, press switch S3(RESET) and the terminal window will show ‘welcome and main menu’.

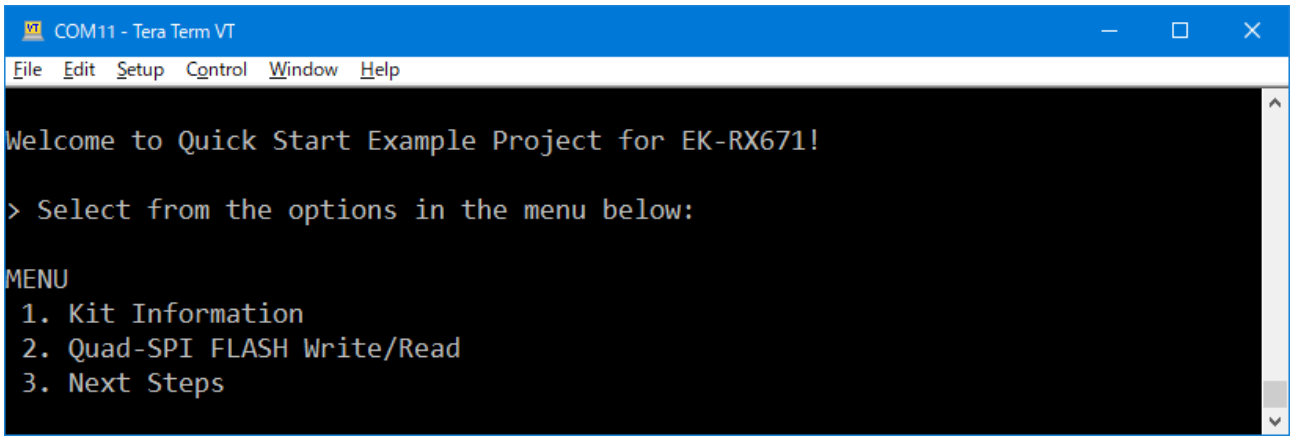

Figure 7. Welcome and Main Menu

8. Press **1** to display the **Kit Information** including the kit name, part number, MCU unique ID, MCU die temperature, and the user LED’s current blinking frequency.

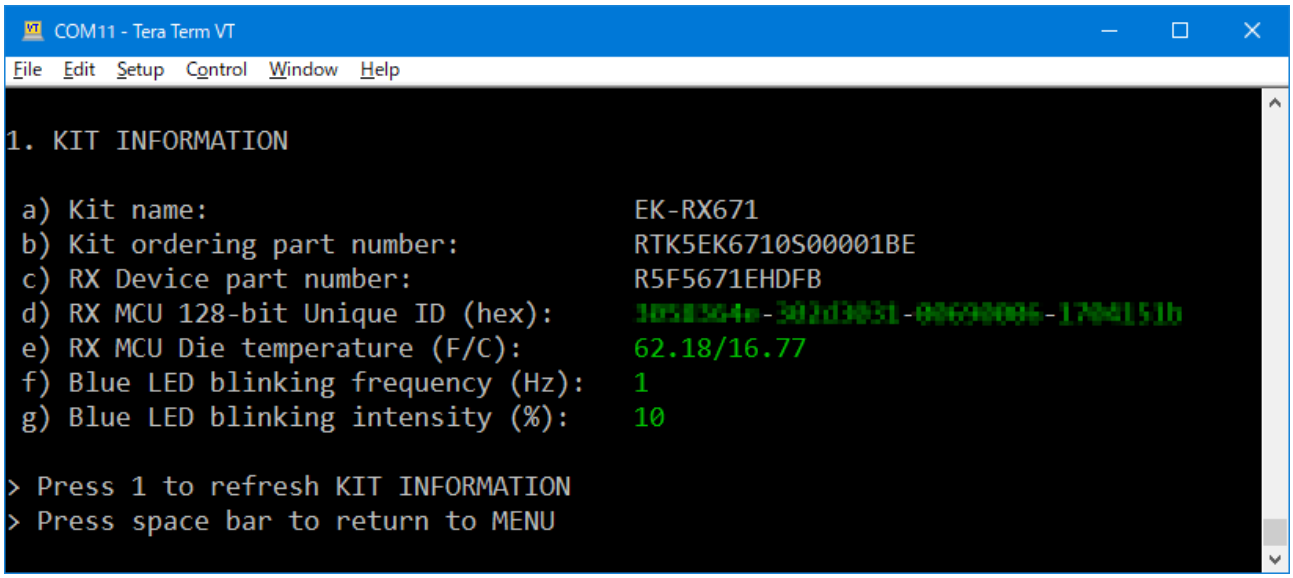

Figure 8. Kit Information

9. Press **1** to refresh KIT INFORMATION.
10. Press **Space** to return to the ‘welcome and main menu’ screen.

11. Press **2** to transition to the **Quad-SPI Flash Write/Read** menu. This menu executes writing and reading to the Quad-SPI memory of EK-RX671 and measure each processing time.

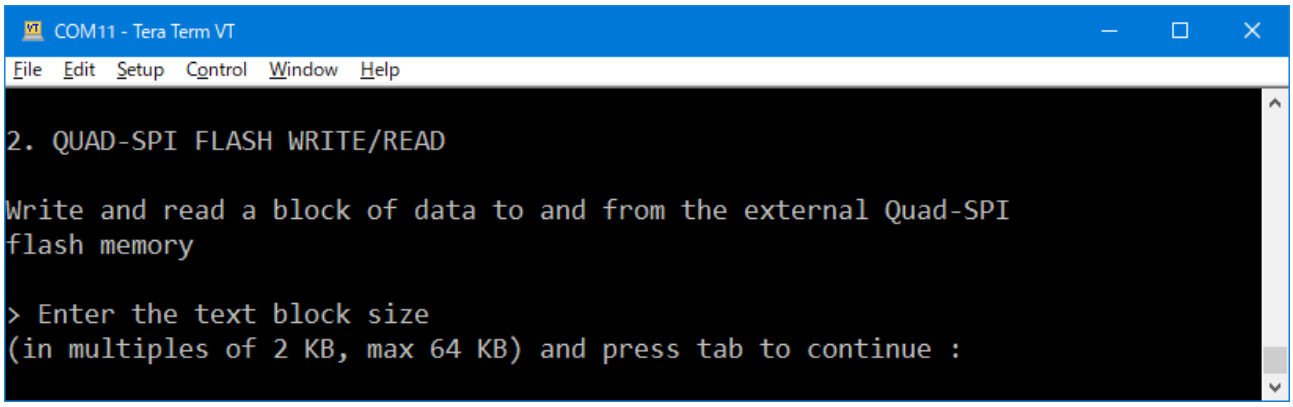

Figure 9. Quad-SPI Write/Read Block Size Entry Screen

12. Enter a read-write block size in the range of 2 KB to 64 KB (multiples of 2 KB) and press **Tab.**

    Note: If invalid input characters (i.e. keys other than 0 to 9, **Tab**, and **Space**) or out of range values are entered, the error messages will appear. Enter the correct inputs and press **Tab**. Pressing **Space** will bring the 'welcome and main menu' screen. **Enter** is an invalid character.

13. The EK-RX671 will write a block of memory, of the entered size, then read it back. On successful completion the cycle times will be displayed as follows:

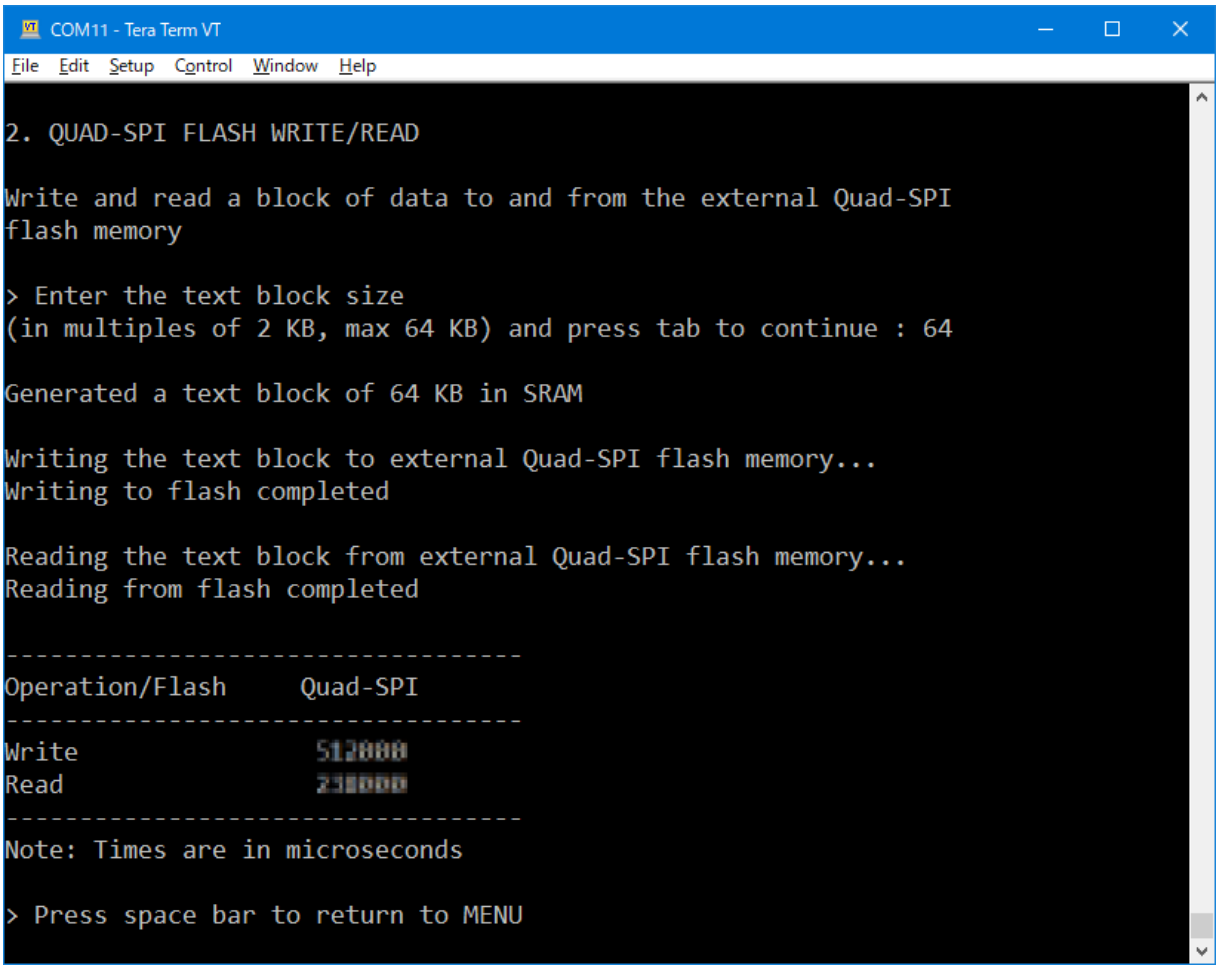

Figure 10. Quad-SPI Write/Read Processing Measurement Results

14. Press **Space** to return to the 'welcome and main menu' screen.

15. Press **3** to display **Next Steps**.

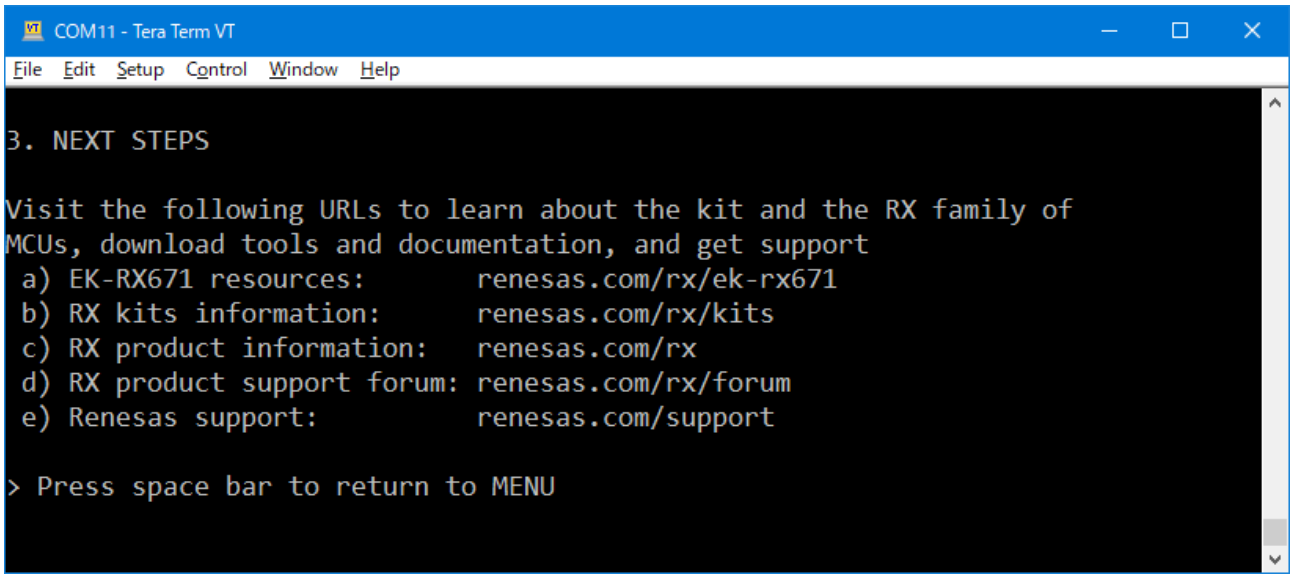

Figure 11. Next Steps

16. Press **Space** to return to the 'welcome and main menu' screen.

5. Customizing the Quick Start Example Project

This section lists the requirements and instructions for customizing the Quick Start Example Project.

Hardware Requirements

- EK-RX671 board
- Micro USB function cable x2
- A Host PC with at least 2 USB ports

Software Requirements

- Microsoft® Windows® 10 operating system
- USB Serial Drivers
  The user must install the following drivers from the FTDI's web site.
  - VIRTUAL COM PORT (VCP) Drivers
  https://ftdichip.com/
- TeraTerm (or similar) terminal console application
- e² studio IDE
- Quick Start Example Project
- C/C++ Compiler Package for RX Family [CC-RX]

5.1 Downloading and Installing Software

Before the Quick Start Example Project can be modified, it is necessary to download the Quick Start Example Project and install the e² studio and compiler package CC-RX on the host PC.

These can be downloaded from the website at renesas.com/rx/ek-rx671.

5.2 Importing the Quick Start Example Project

1. Place the Quick Start Example Project in a local directory on the host PC.
2. Launch e² studio.
3. Enter the name in the Workspace dialog box to create a new workspace.

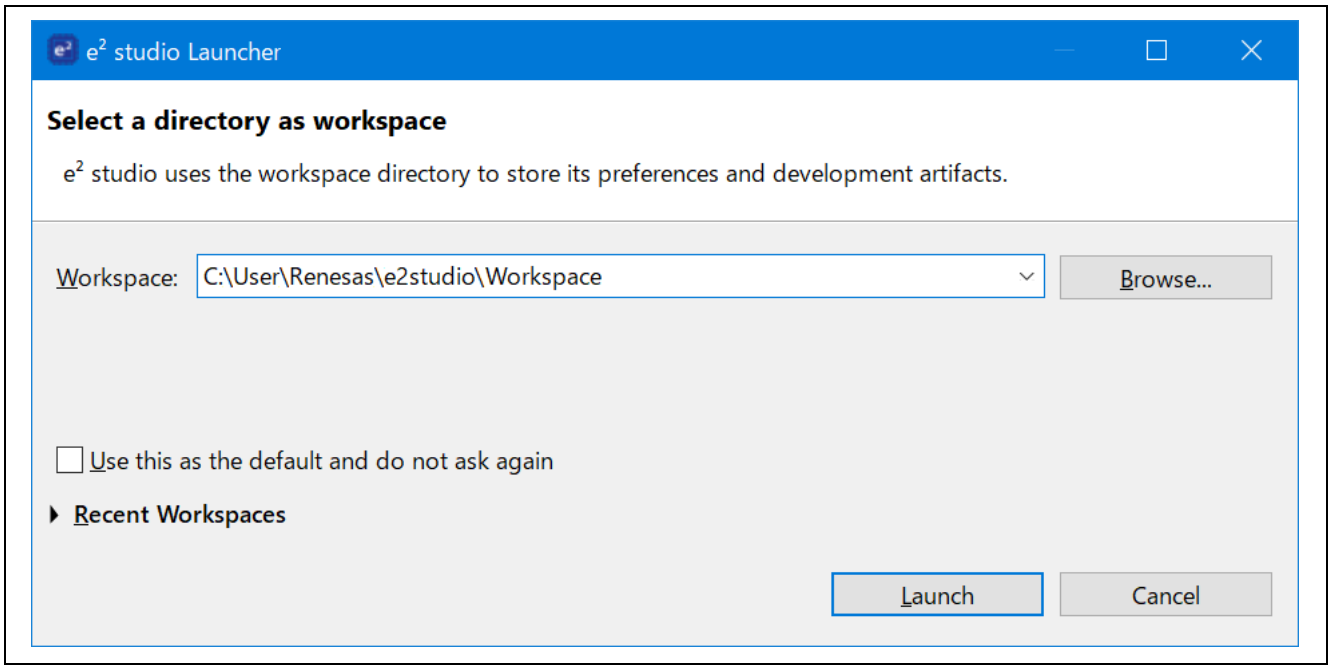

Figure 12. Creating a New Workspace

4. Click **Launch.**

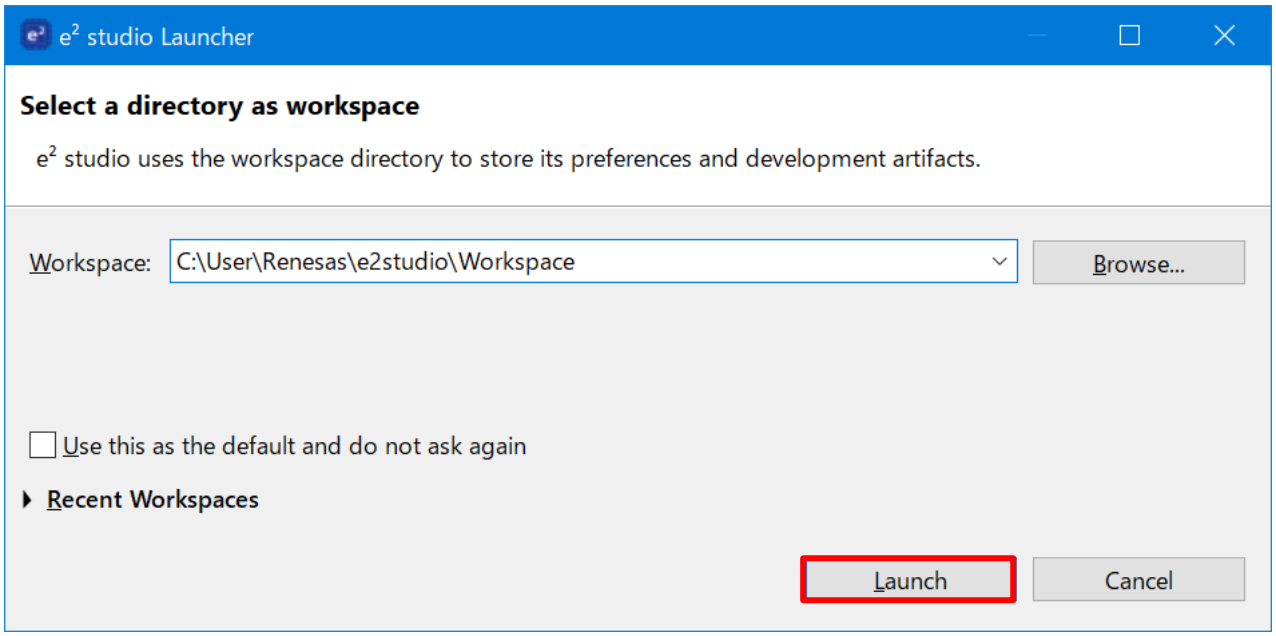

Figure 13. Launching the Workspace

5. Click **Import Project…** from the Project Explorer.

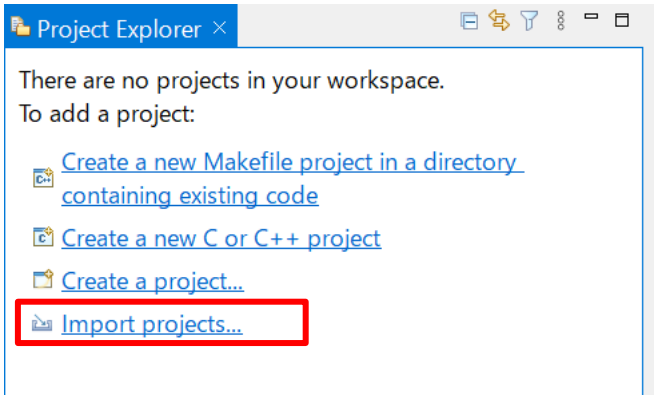

Figure 14. Importing the Project

6. In the **Import** dialog box, select **General**, and then select **Existing Projects into Workspace.**

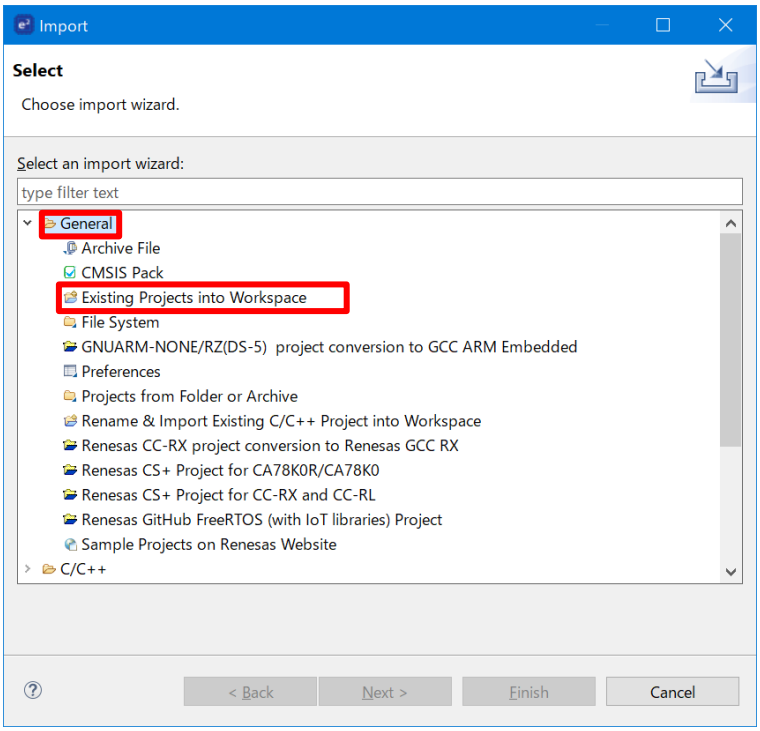

Figure 15. Importing Existing Projects into Workspace

7. Click **Next**.

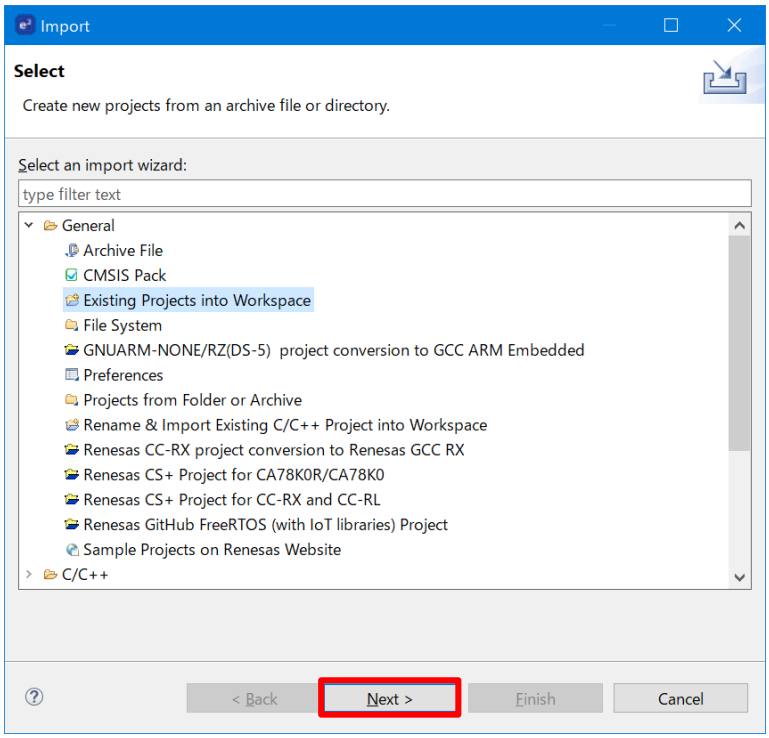

Figure 16. Clicking Next to Import Existing Projects into the Workspace

8. Click **Select root directory** and click **Browse** to go to the location of the Quick Start Example Project folder.

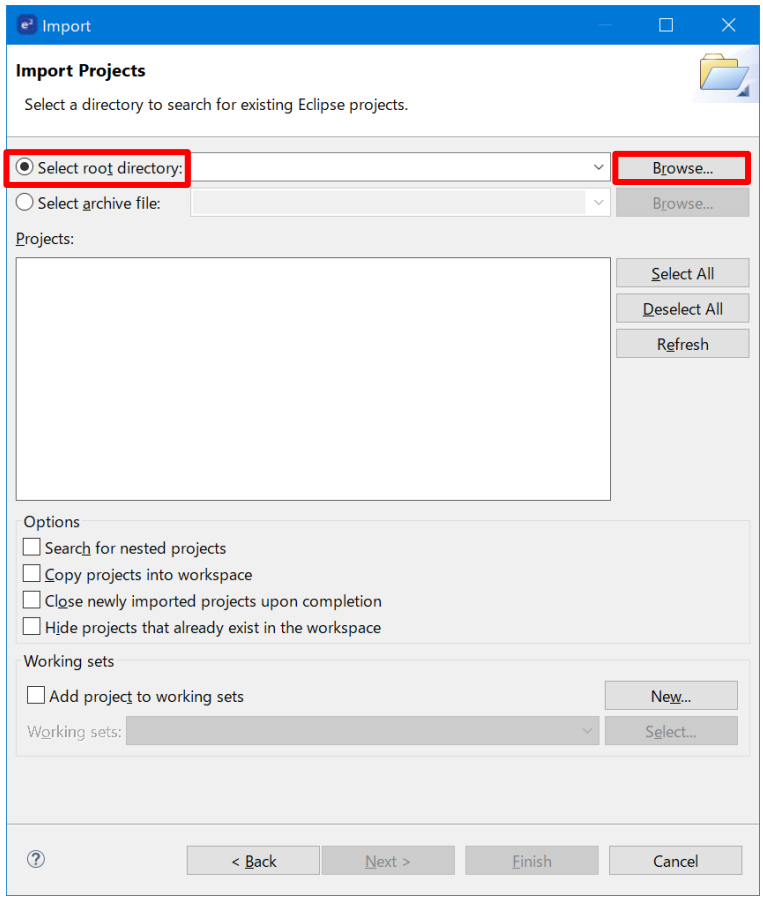

Figure 17. Selecting the Root Directory

9. Select the Quick Start Example Project and click **Finish.**

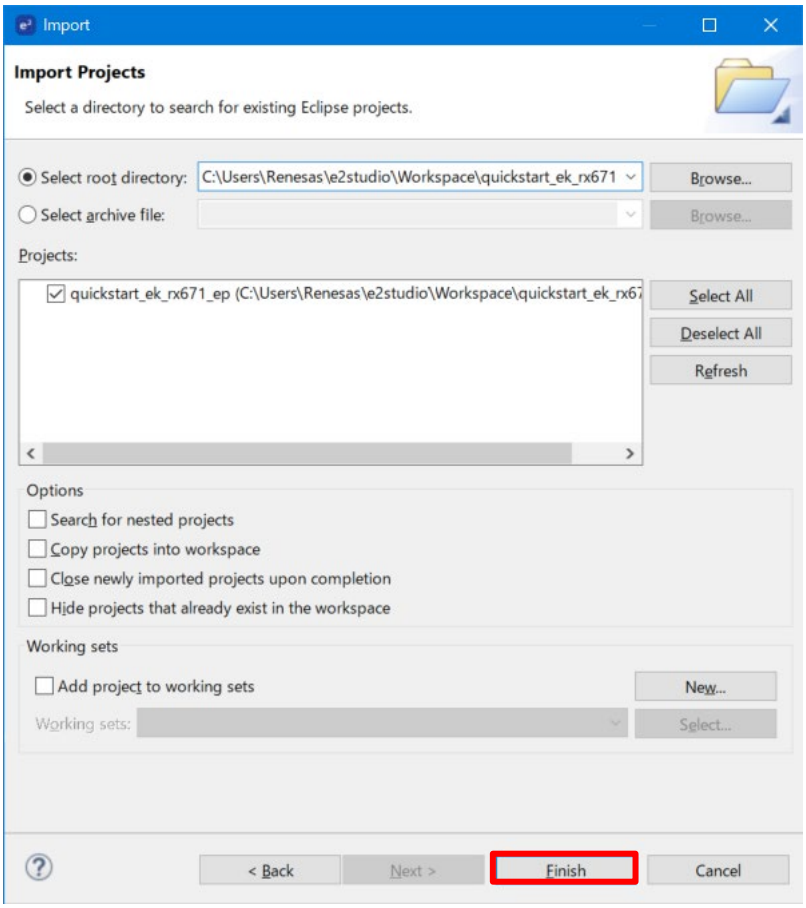

Figure 18. Finishing Importing the Quick Start Example Project

5.3 Modifying, Generating, and Building the Quick Start Example Project

This section provides instructions to modify the Quick Start Example Project. The Quick Start Example Project can be modified by editing the source code and reconfiguring the properties of the MCU peripherals, pins, clocks, interrupts, and so forth.

Note: The specific modifications that can be performed to the Quick Start Example Project are not prescribed in this QSG. User discretion is advised while modifying the Quick Start Example Project.

1. Once the Quick Start Example Project is imported, click the **quickstart_ek_rx671_ep.scfg** file to open the configurator. The configurator provides an easy to use interface to configure the properties of the MCU peripherals.

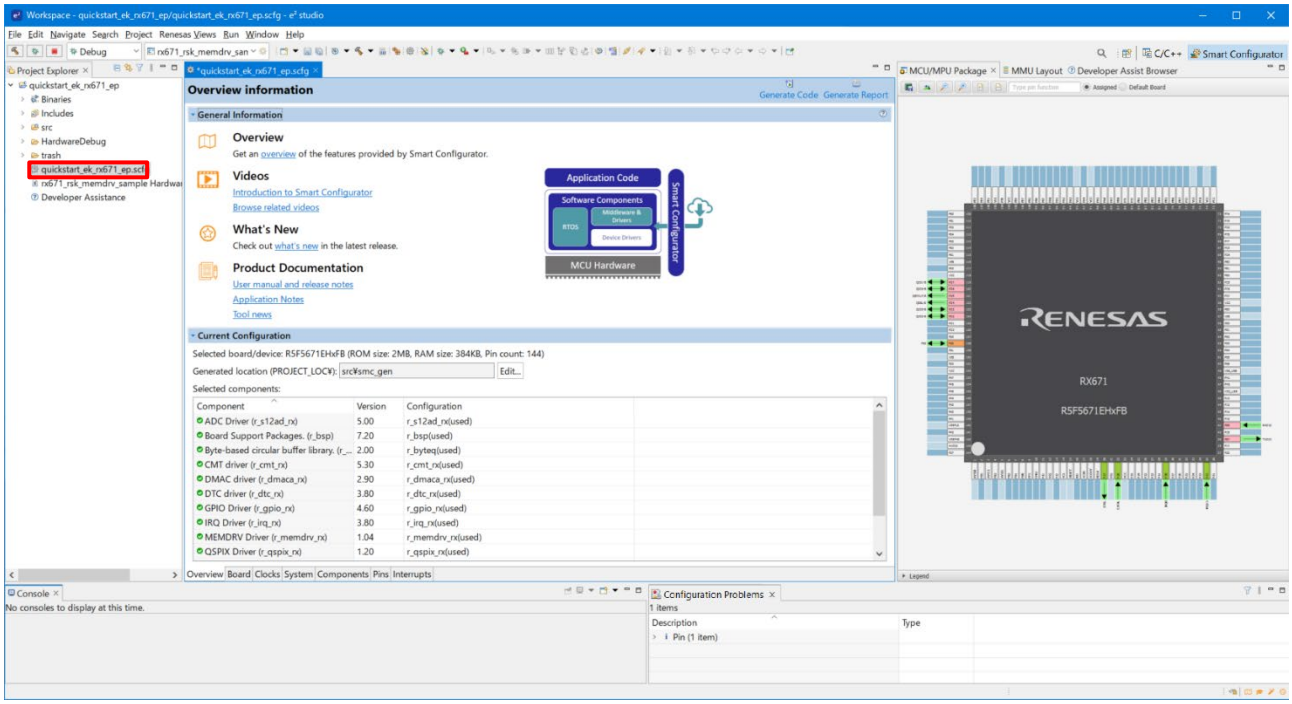

Figure 19. Opening the Configurator

When the Configurator is opened, the following dialog is displayed. Press **Open Perspective (O)** button.

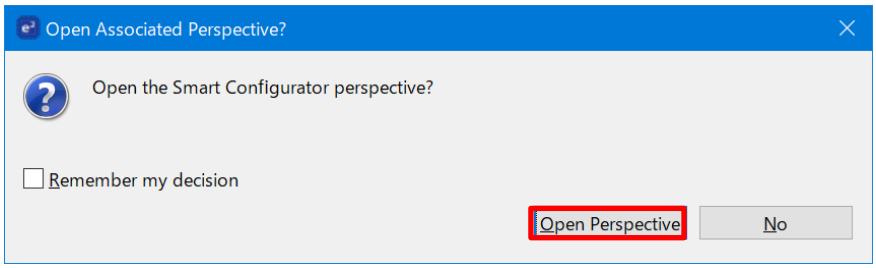

Figure 20. Switch to Configurator Perspective

2. For example, in the **Components** tab of the configurator, the user can click to select a module to modify its configuration settings, as required. **Figure 21** illustrates modifying the **IRQ** configuration.

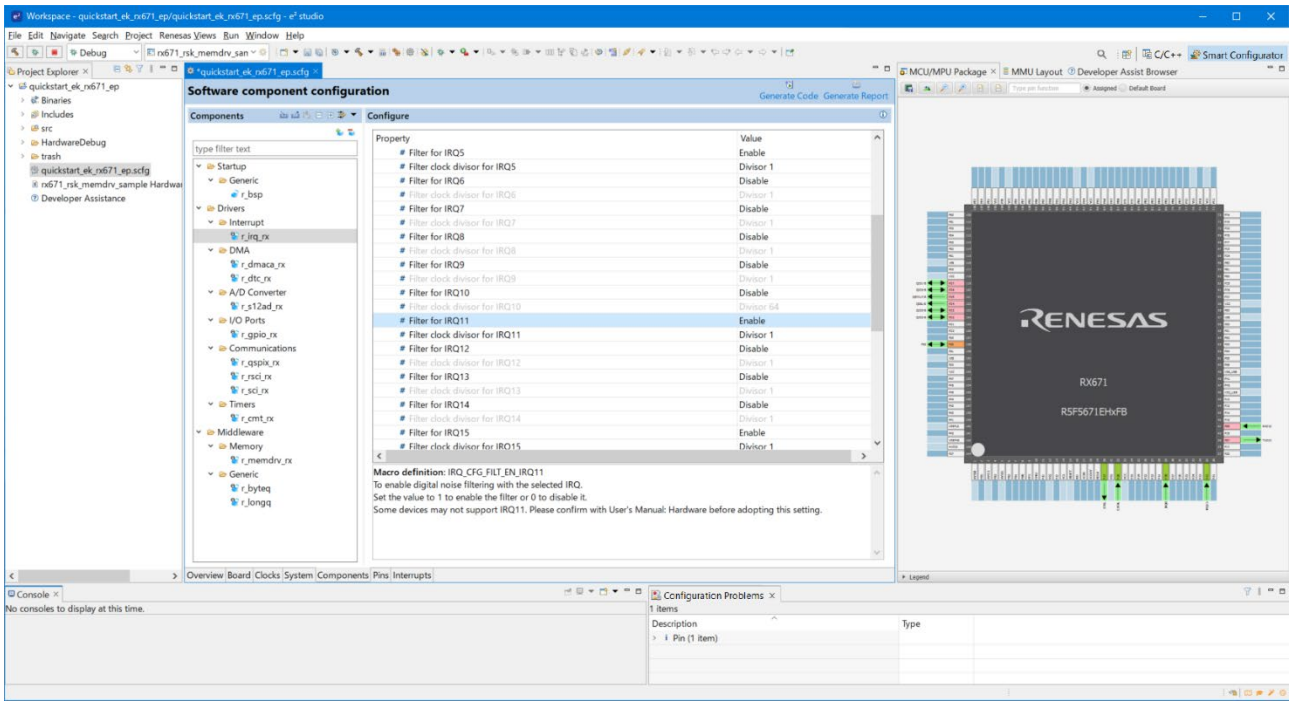

Figure 21. Modifying the Configuration Settings

3. After the desired modifications are made, click **Generate Code**.

Figure 22. Generate Code

4. Modify the source files in the **/src** folder as needed and save the changes.
5. Build the project by clicking the build icon.

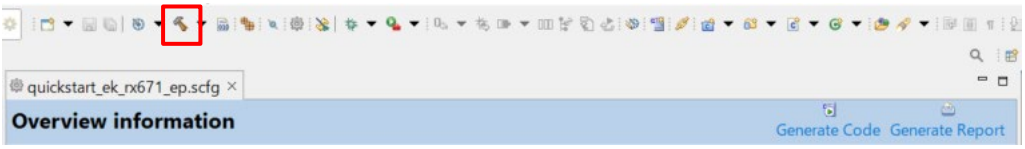

Figure 23. Building the Project

6. If the build finishes successfully, the following message will be output to the console.

Figure 24. Console screen when the build is successful

5.4 Setting Up Debug Connection between the EK-RX671 board and Host PC

To program the modified Quick Start Example Project on to the EK-RX671 board, a debug connection is necessary between the EK-RX671 board and host PC.

1. DIP switch S4-2 from ON to OFF.
2. Connect the Micro USB side of two Micro USB function cables, one to the EK-RX671 board's USB connector (J27) and the other to the DEBUG1 connector (J25) and connect the USB-A ends to the host PC.

Note: The EK-RX671 board supports 2 debugging modes. In this section and the following sections, default debugging mode, Debug On-Board, is used. More information on debugging modes is available in EK-RX671 user's manual.

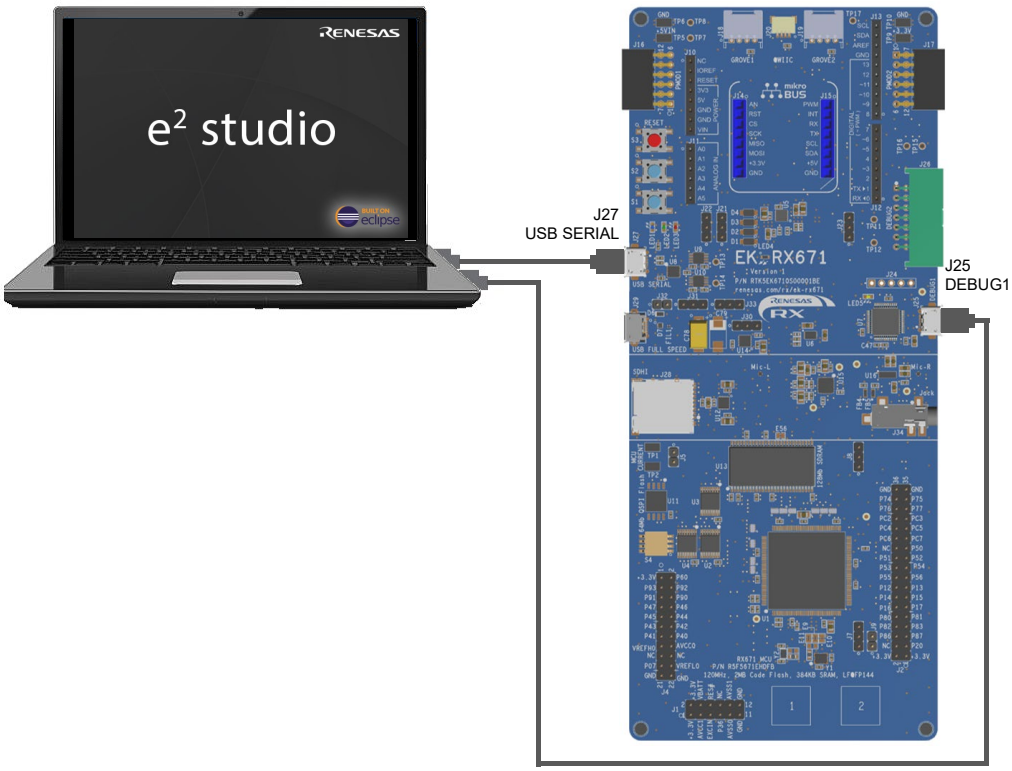

Figure 25. Connecting the EK-RX671 Board to the Host PC via USB Debug Port

3. The debug LED (LED5) flashes yellow to indicate that the E2OB driver has been detected by the EK-RX671 board.

5.5 Downloading and Running the Modified Quick Start Example Project

1. In e² studio, click the drop-down menu for the debug icon, select **Debug Configurations** option.

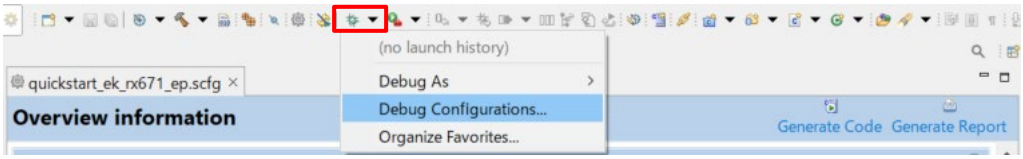

Figure 26. Selecting the Debug Option

2. In the dialogue, on the left-hand pane, expand the **Renesas GDB Hardware Debugger** and select the built image to debug. In this case, the **quickstart_ek_rx671_ep HardwareDebug**, and click on **Debug** button.

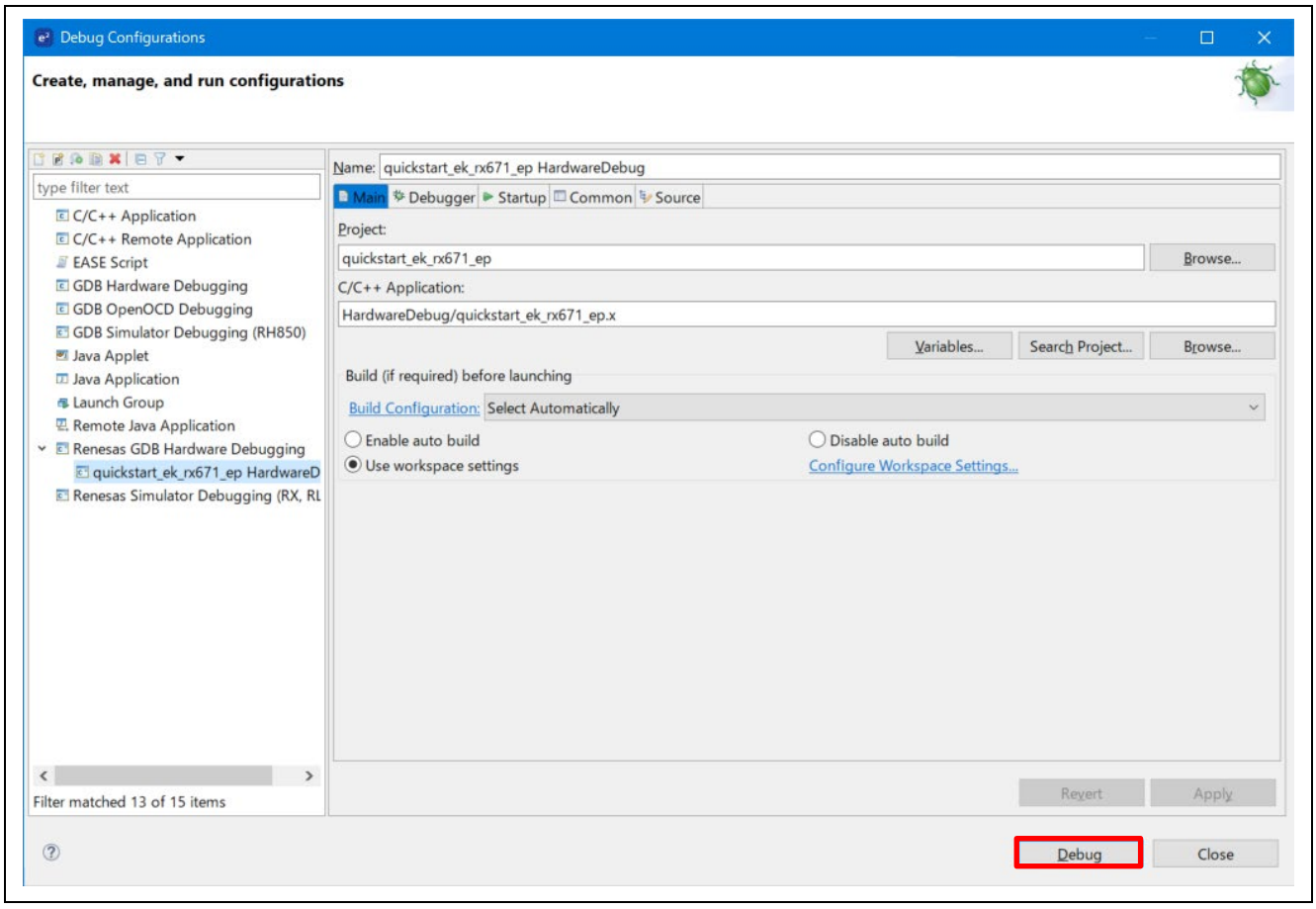

Figure 27. Selecting the Debug Image

3. If the firewall does not allow **'e2-server-gdb.exe'** to communicate, a confirmation dialog will be displayed. Check the '**Private networks, such as my home or work network**' box and click '**Allow access**'.
4. A user account control dialog may be displayed. Enter the administrator password and click **Yes**.
5. A dialog box may appear. Click **Switch**.

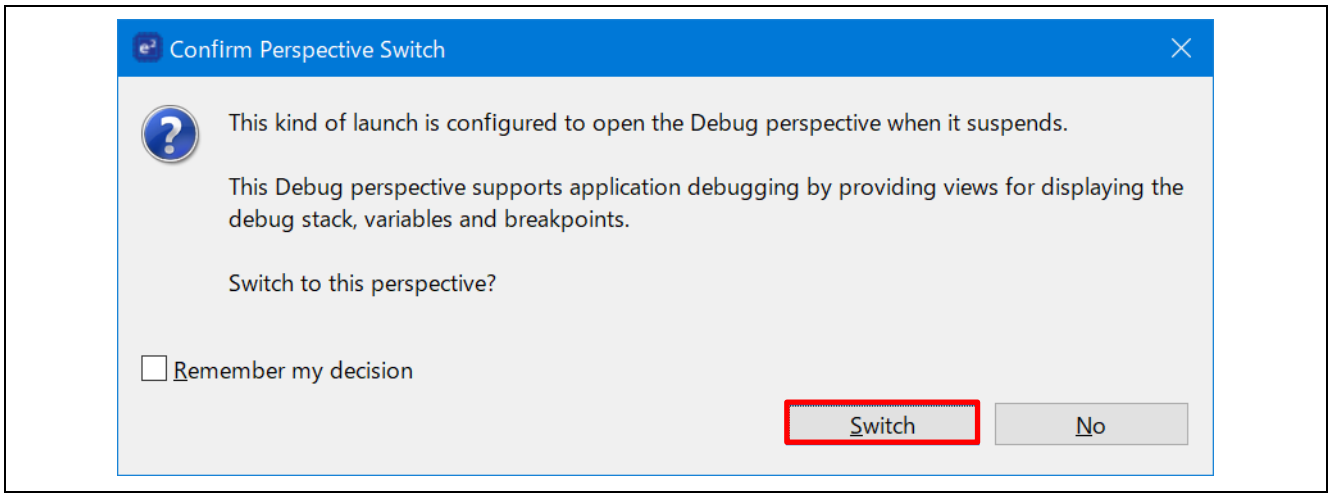

Figure 28. Opening the Debug Perspective

5.6 Running the Quick Start Example Project

1. Press **F8** or click **Resume** icon to begin executing the project.

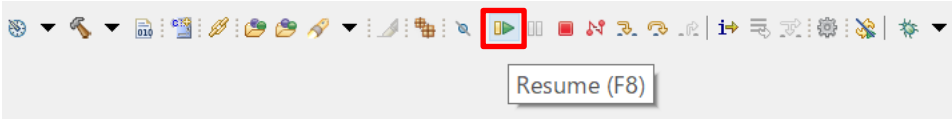

Figure 29. Executing the Project

2. The modified Quick Start Example Project is programmed into the EK-RX671 board and is running. The project can be paused, stopped, or resumed using the debug controls.

6. Next Steps

1. To learn more about the EK-RX671 kit, refer to the EK-RX671 user's manual and design package available in the Documents and Download tabs respectively of the EK-RX671 webpage at renesas.com/rx/ek-rx671
2. Renesas provides several example projects that demonstrate different capabilities of the RX MCUs. These example projects can serve as a good starting point for users to develop custom applications.

7. Website and Support

Visit the following URLs to learn about the kit and the RX family of microcontrollers, download tools and documentation, and get support.

EK-RX671 Resources	renesas.com/rx/ek-rx671
RX Kits Information	renesas.com/rx/kits
RX Product Information	renesas.com/rx
RX Product Support Forum	renesas.com/rx/forum
Renesas Support	renesas.com/support

Provide Feedback/Request a Feature

Renesas aims to provide the best microcontroller kit experience to help our customers jumpstart innovation and take products to market faster with the RX family of microcontrollers. The Renesas RX microcontroller kits have been designed with a lot of attention to detail and customer-centered thinking in every aspect of the design. Renesas aims to exceed customer expectation.

Renesas looks forward to hearing your feedback and learning how we can enhance your experience. Please share your feedback at renesas.com/rx/kitfeedback.

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		Page	Summary
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