RX Family

RX Driver Package Ver.1.14

R01AN4191EJ0114
Rev.1.14
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Introduction

This document is the RX Family RX Driver Package User's Manual, version 1.14.

This User's Manual describes basic structures, features and usage of RX Driver Package applications, and about the sample application program using the FIT modules included in this package.

Note that older versions of the RX Driver Package can be obtained by clicking the "Sample Code" link after accessing the following URL.

RX Driver Package webpage: https://www.renesas.com/rdp

Target Devices

RX110, RX111, RX113, RX130 Group

RX210, RX230, RX231, RX23T, RX24T, RX24U Group

RX63N, RX64M, RX65N, RX651 Group

RX71M Group

For Evaluation board, Renesas Starter Kit is used.

When using this application note with your product, careful evaluation is recommended.

And when using this application note with other Renesas MCUs, careful evaluation is recommended after making modifications to comply with the alternate MCU.

Version of e² studio Used for Operation Confirmation

Operation of the RX Driver Package has been confirmed on e^2 studio V. 6.2.0.

The RX Driver Package can be obtained from within e^2 studio. Instructions are provided in section 4, Usage.

Related Documents

- RX Family Board Support Package Module Using Firmware Integration Technology (R01AN1685EJ)
- Firmware Integration Technology User's Manual (R01AN1833EU)
- RX Family Adding Firmware Integration Technology Modules to Projects (R01AN1723EU)
- RX Family Adding Firmware Integration Technology Modules to CS+ Projects (R01AN1826EJ)
- The User's Manual provided with the RX Driver Package Application.

Contents

1. Overview

1.1 Applicability

This User's Manual applies to the RX Family RX Driver Package, version 1.14.

1.2 Operating Environment

This package runs under the operating environment described below.

Table 1-1 Operating Environment

Item	Contents
Integrated development environment	Renesas Electronics e^2 studio V6.2.0
C compiler	Renesas Electronics C/C++ compiler for RX Family V. 2.08.00
	Compiler options: The integrated development environment default settings are used, with the following option added. -lang = c99
Endian order	Big-endian/Little-endian
RDP version	Ver. 1.14
Board used	Renesas Starter Kit for RX64M (product No.: R0K50564MSxxxBE) Renesas Starter Kit for RX231 (product No.: R0K505231SxxxBE) Renesas Starter Kit for RX130-512KB (product No.: RTK5051308SxxxxxBE) Renesas Starter Kit for RX65N-2MB (product No.: RTK50565N2SxxxxxBE)

2. About RX Driver Package

The RX Driver Package is a software platform (framework) that combines the following modules to be required for development in a single package. Since the package contains multiple modules, you can start developing immediately without having to obtain each module separately.

Board Support Package (BSP) module

FIT peripheral function modules (free version)

FIT middleware modules (free version)

FIT interface modules

You can develop the user application layer with ease by using the Sample Application Program (RX Driver Package Application) which utilizes the RX Driver Package.

2.1 System Structure

The figure below shows the system structure of the RX Driver Package.

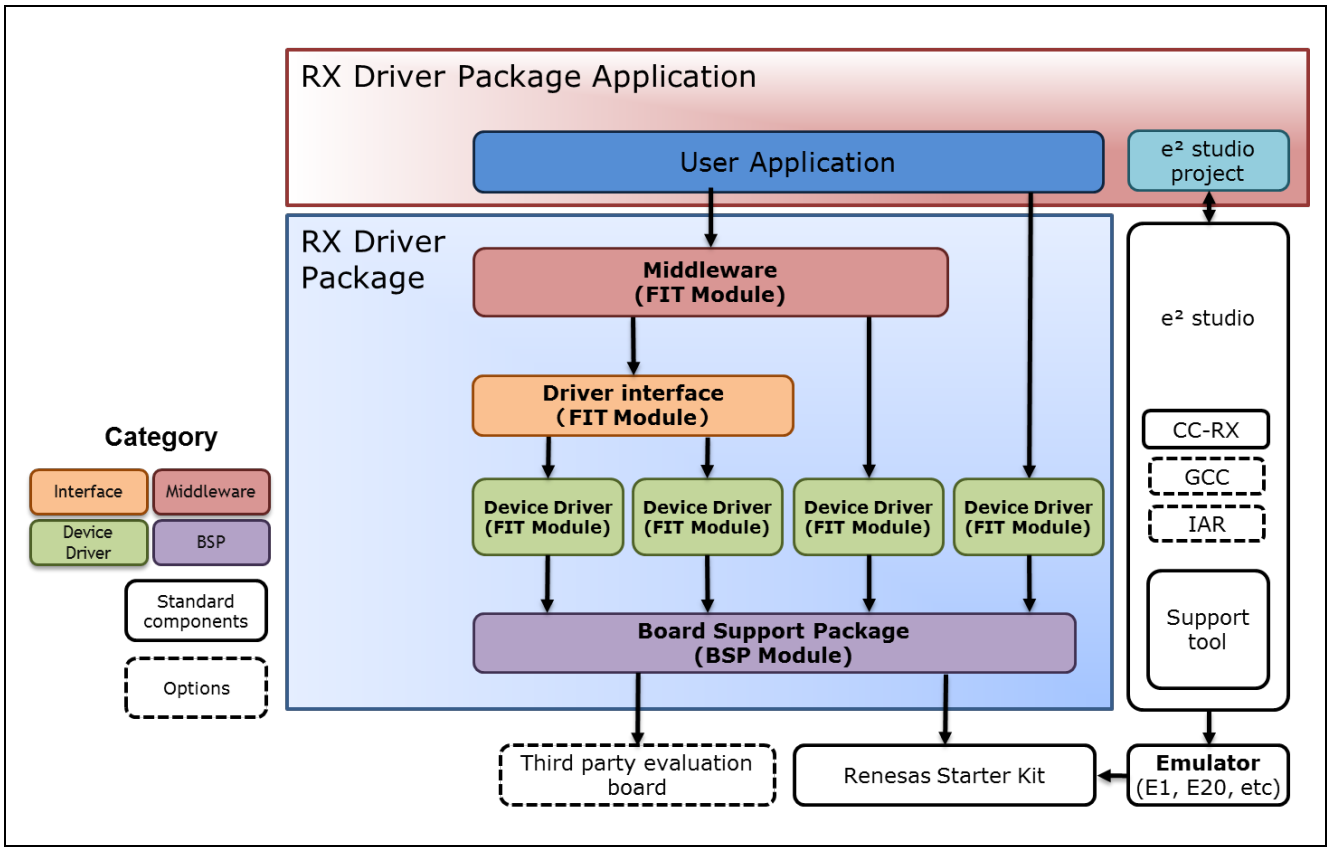

Figure 2-1 System Structure

2.2 RX Driver Package Features

The RX Driver Package has the following features.

(a) **Select Necessary Modules and Start Developing Immediately the Application Program**

You can easily build a system simply by selecting the modules you need from the package. After that, all you have to do is develop the application program.

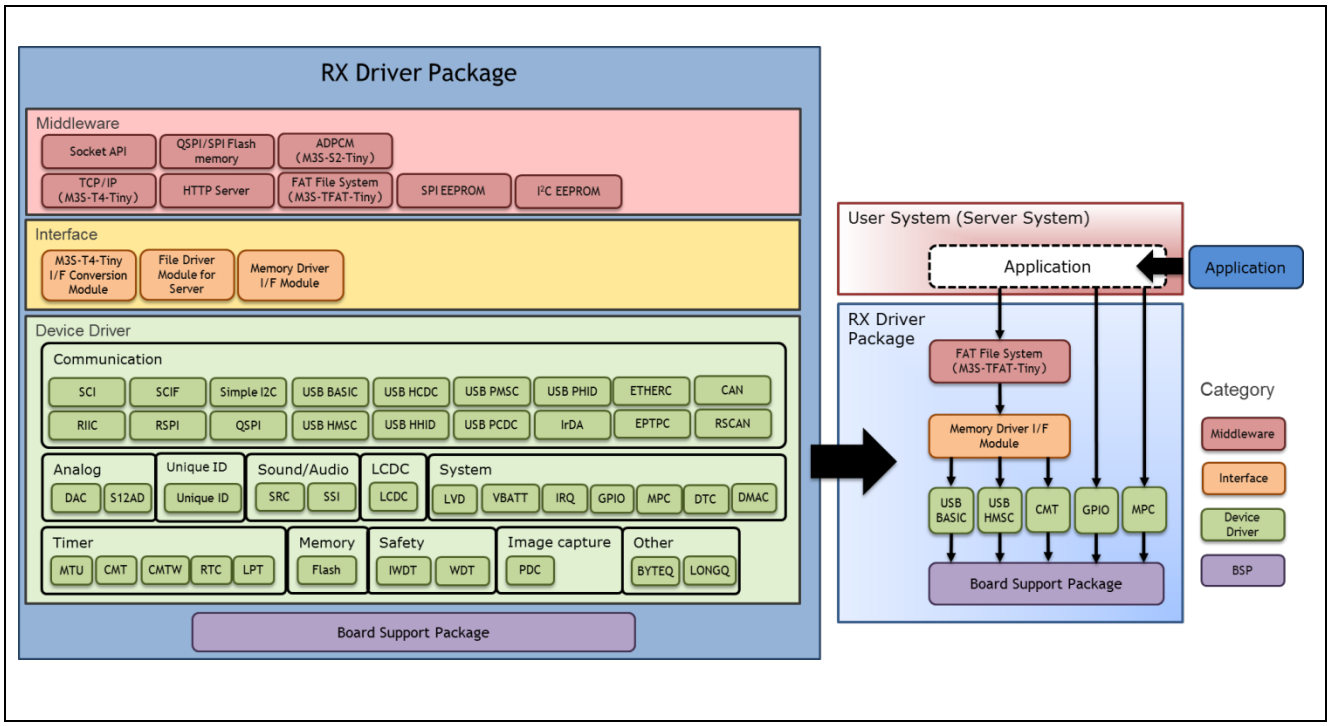

Figure 2-2 An Example of System Build

(b) **Free to Use**

All the modules included in the RX Driver Package can be used free of charge. Free versions of middleware modules such as TCP/IP and file system are included.

(c) **Can Upgrade to Paid Versions of Modules**

The free versions of modules in the RX Driver Package can be replaced with commercial (paid) versions. By using a commercial (paid) version, all the functionality of the module will be available, as well as support about a commercial version.

For commercial version (paid) modules, see 6.1 for separate purchase.

(d) **Check Operation Including User Application**

The RX Driver Package Application is provided as a sample user application that uses the RX Driver Package. The RX Driver Package Application consists of programs for operating each module in the RX Driver Package, and the project files for building the programs. It enables you to start checking the operation of your user application immediately.

3. Structure of the RX Family RX Driver Package

3.1 Folder Structure

The folder structure used in this package is shown below.

When the ZIP file for this package is downloaded from the Renesas web site and decompressed, a folder of the same name will be present and it will contain a **FITModules** folder, a **reference_documents** folder, and this document.

The **FITModules** folder contains the Firmware Integration Technology (FIT) modules shown in Table 3-1, Table 3-2, Table 3-3 (as ZIP files and XML files). For the FIT module supporting pin setting function, MDF file is contained.

The **reference_documents** folder contains the documentation for using this package in various development

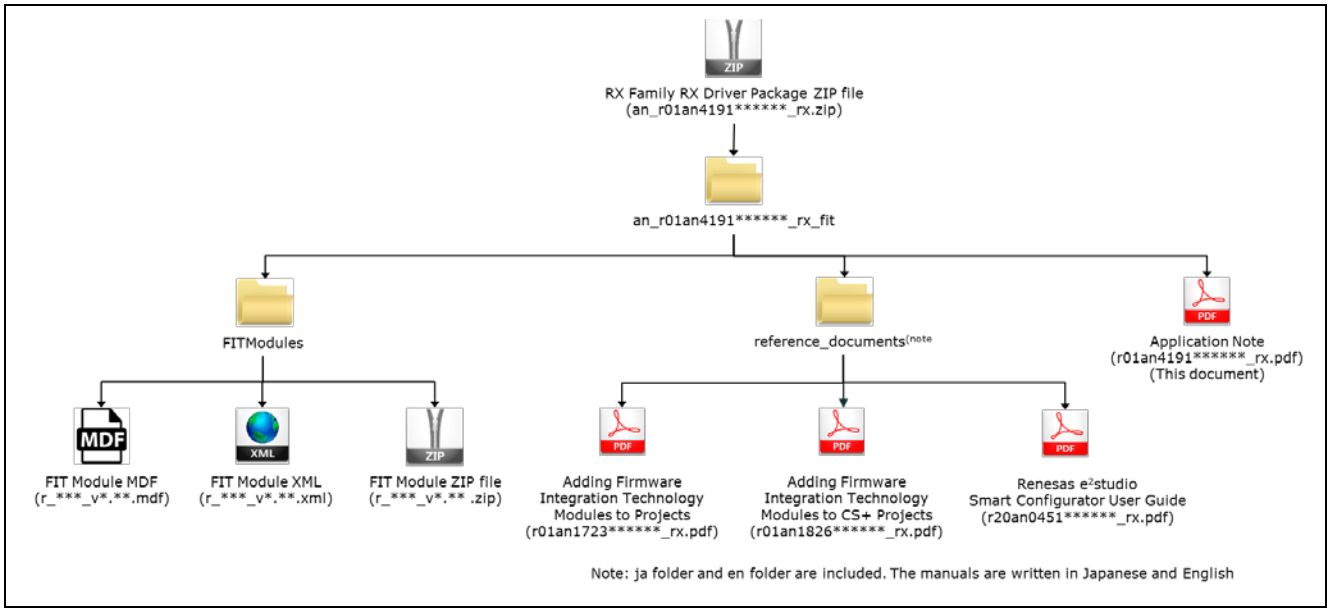

Figure 3-1 Folder Structure of the RX Family RX Driver Package

3.2 FIT Modules

The table below lists the FIT modules included in this package.

After the release of RX Family RX Driver Package Ver. 1.13 (R01AN3859), many Firmware Integration Technology (FIT) modules have been updated. Differences from Family RX Driver Package Ver. 1.13 are shown in Table 3-1, Table 3-2 and Table 3-3.

The meaning of the terms shown in differences columns are as follows:

“Same”	Includes the same module as previous.
“Updated”	Includes updated modules. Updated contents differ depending on the driver used. Check with the driver’s document.
“Added”	Includes the added modules this time.

(1) **Board Support Package (BSP)**

Table 3-1 Board Support Package (BSP)

Module	FIT Module Name	Rev	Update Information
Board Support Package (BSP)	r_bsp	3.71	Updated

(2) **Device Driver**

Table 3-2 Device Driver

Module	FIT Module Name	Rev	Update Information
Voltage Detection Circuit (LVD)	r_lvd_rx	2.31	Updated
Low Power Consumption (LPC)	r_lpc_rx	1.40	Same
Battery Backup (VBATT)	r_vbatt_rx	1.01	Same
Interrupt Controller (IRQ)	r_irq_rx	2.21	Updated
Data Transfer Controller (DTC)	r_dtc_rx	2.08	Same
DMA Controller (DMAC)	r_dmaca_rx	1.05	Same
I/O Ports (GPIO)	r_gpio_rx	2.31	Updated
Multi-Function Pin Controller (MPC)	r_mpc_rx	2.31	Updated
Compare Match Timer (CMT)	r_cmt_rx	3.21	Updated
Compare Match Timer W (CMTW)	r_cmtw_rx	1.31	Updated
Real-Time Clock (RTC)	r_rtc_rx	2.72	Updated
Low Power Timer (LPT)	r_lpt_rx	1.21	Updated
Independent Watchdog Timer (IWDT)	r_iwdt_rx	1.81	Updated
Watchdog Timer (WDT)	r_wdt_rx	1.20	Updated
Serial Communications Interface (SCI: Asynchronous/Clock Synchronous)	r_sci_rx	2.01	Updated
Serial Communications Interface with FIFO (SCI: Asynchronous/Clock Synchronous)	r_scif_rx	1.20	Same
Serial Communications Interface with FIFO (SCIF: Device Driver for Serial Memory Control)	r_scifa_smstr_rx	1.09	Same
Serial Communications Interface (SCI: Simple I^2C Bus)	r_sci_iic_rx	2.20	Same

I²C Bus Interface (RIIC)	r_riic_rx	2.20	Same
Serial Peripheral Interface	r_rspi_rx	1.70	Same
Serial Peripheral Interface (RSPI: Device Driver for Serial Memory Control)	r_rspi_smstr_rx	1.14	Same
Quad Serial Peripheral Interface (QSPI: Device Driver for Serial Memory Control)	r_qspi_smstr_rx	1.10	Same
USB Basic Firmware	r_usb_basic	1.23	Updated
USB Host Mass Storage Class	r_usb_hmsc	1.23	Updated
USB Host Communication Device Class	r_usb_hcdc	1.23	Updated
USB Host Human Interface Device Class	r_usb_hhid	1.23	Updated
USB Peripheral Mass Storage Class	r_usb_pmsc	1.23	Updated
USB Peripheral Communications Device Class	r_usb_pcdc	1.23	Updated
USB Peripheral Human Interface Device Class	r_usb_phid	1.23	Updated
USB Basic Firmware mini	r_usb_basic_mini	1.02	Same
USB Host Mass Storage Class mini	r_usb_hmsc_mini	1.02	Same
USB Host Communication Device Class mini	r_usb_hcdc_mini	1.02	Same
USB Host Human Interface Device Class mini	r_usb_hhid_mini	1.02	Same
USB Peripheral Mass Storage Class mini	r_usb_pmsc_mini	1.02	Same
USB Peripheral Communications Device Class mini	r_usb_pcdc_mini	1.02	Same
USB Peripheral Human Interface Device Class mini	r_usb_phid_mini	1.02	Same
PTP Module for the Ethernet Controller (EPTPC)	r_ptp_rx	1.14	Same
EPTPC Light Module	r_ptp_light_rx	1.11	Same
Ethernet controller (ETHERC)	r_ether_rx	1.14	Updated
CAN Module (CAN)	r_can_rx	2.12	Same
CAN Module (RSCAN)	r_rscan_rx	1.10	Same
IrDA Interface (IrDA)	r_irda_sci_rx	1.10	Same
Parallel Data Capture Unit (PDC)	r_pdc_rx	2.01	Same
SD Host Interface (SDHI)	r_sdhi_rx	2.01	Updated
SD Slave Interface (SDSI)	r_sdsi_rx	2.00	Same
12-Bit A/D Converter (S12AD)	r_s12ad_rx	2.30	Same
D/A Converter (DAC)	r_dac_rx	3.11	Updated
Flash Memory (On-chip flash memory Programing)	r_flash_rx	3.30	Updated
Sampling Rate Converter (SRC)	r_src_api_rx	1.11	Same
Serial Sound Interface (SSI)	r_ssi_api_rx	1.21	Same
LCD Controller/Driver (LCDC)	r_lcdc_rx	1.00	Same
Graphic LCD Controller (GLCDC)	r_glcdc_rx	1.00	Same
Unique ID Read	r_uid_rx	1.10	Updated
Byte Queue Buffer (Data Management)	r_byteq	1.60	Same
Long Queue Buffer (Data Management)	r_longq	1.60	Same
Event Link Controller (ELC)	r_elc_rx	1.20	Same

(3) **Middleware/Interface Module**

Table 3-3 Middleware/Interface Module

Module	FIT Module Name	Rev	Update Information
TCP/IP M3S-T4-Tiny for Embedding	r_t4_rx	2.07	Updated
Interface conversion module for Ethernet Driver and Embedded system M3S-T4-Tiny	r_t4_driver_rx	1.06	Same
System Timer Module	r_sys_time_rx	1.00	Same
SPI Serial EEPROM Module	r_eeprom_spi	2.34	Same
SPI Serial Flash memory Module	r_flash_spi	2.34	Same
I^2C Bus Interface (RIIC) Module for EEPROM Access	r_eeprom_riic_rx	1.40	Same
Simple I^2C Module for EEPROM Access	r_eeprom_sci_iic_rx	1.30	Same
JPEG Decoder Module	r_jpegd_rx	2.06	Same
JPEG Encoder Module	r_jpege_rx	1.01	Same
Sound playback system and compression system (original ADPCM codec)	r_s2_rx	3.04	Same
M3S-TFAT-Tiny (FAT file system)	r_tfat_rx	3.03	Same
M3S-TFAT-Tiny Memory Driver Interface Module	r_tfat_driver_rx	1.03	Same

Note: This package includes the M3S-T4-Tiny (TCP/IP protocol stack library) of evaluation version. For the commercial version, please go to the below URL.
https://www.renesas.com/mw/t4

4. Usage

You can easily construct application programs incorporating the RX Driver Package by using the Smart Configurator or FIT Configurator function of e^2 studio.

For instructions on using the RX Driver Package with CS+, refer to RX Family: Adding Firmware Integration Technology Modules to CS+ Projects (R01AN1826EJ), which is included in the RX Driver Package.

This section describes how to download the RX Driver Package and create a program for illuminating LEDs. You will need to log into My Renesas as part of the procedure.

4.1 Adding FIT Modules to Your Project

The procedure for using the functions of e^2 studio to download the RX Driver Package and develop an application program are described below.

Different procedures are used for downloading the RX Driver Package and adding it to an application program using the Smart Configurator and FIT Configurator functions, respectively. The description is therefore divided into two parts: 4.1.1 describes how to download the RX Driver Package with Smart Configurator, and 4.1.2 describes how to download the RX Driver Package with FIT Configurator.

4.1.1 Smart Configurator

How to create a new workspace and download the RX Driver Package is described below.

In this example, “RX65N” is used as the target MCU and “Renesas Starter Kit+ RX65N-2MB” as the target board. If the environment to be used for the download is different, adjust the relevant parts of the description that follows to match the actual environment.

(1) Creating a New Workspace and Project

In order to download the RX Driver Package, you must create a new workspace and project.

(a) Launching e^2 studio

From the Windows Start menu, launch e^2 studio.

e^2 studio V.6.1.0 and CC-RX V.2.07.00 are used in the e^2 studio’s screen in this application note.

(b) Designating the Workspace

The **Select a directory as workspace** dialog box appears.

1. Enter the name of the workspace folder of your choice in the **Workspace** field.
2. Click the **OK** button.

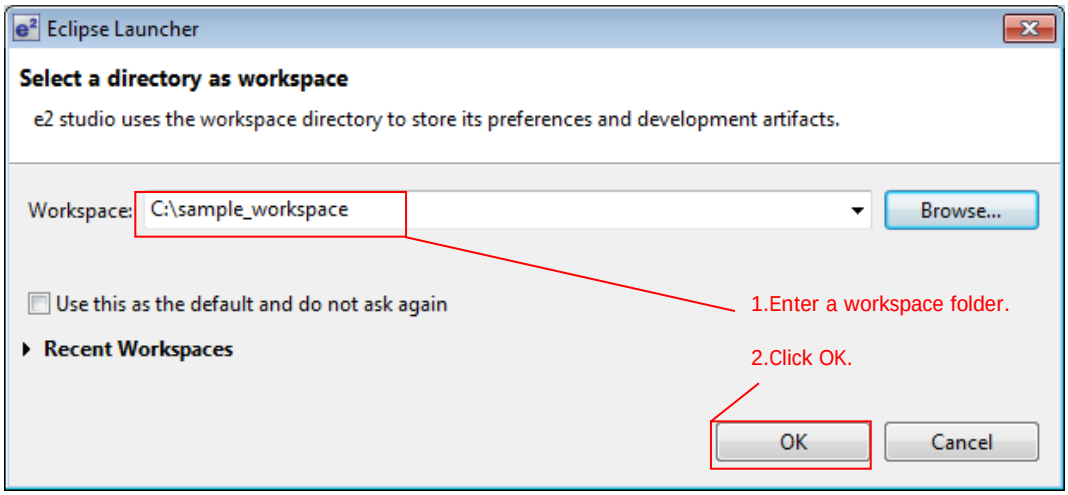

Figure 4-1 Designating the Workspace

(c) **Opening Workbench**

The **Welcome to e² studio** window appears.

Click the **Workbench** icon in the top right corner of the **Welcome** tab.

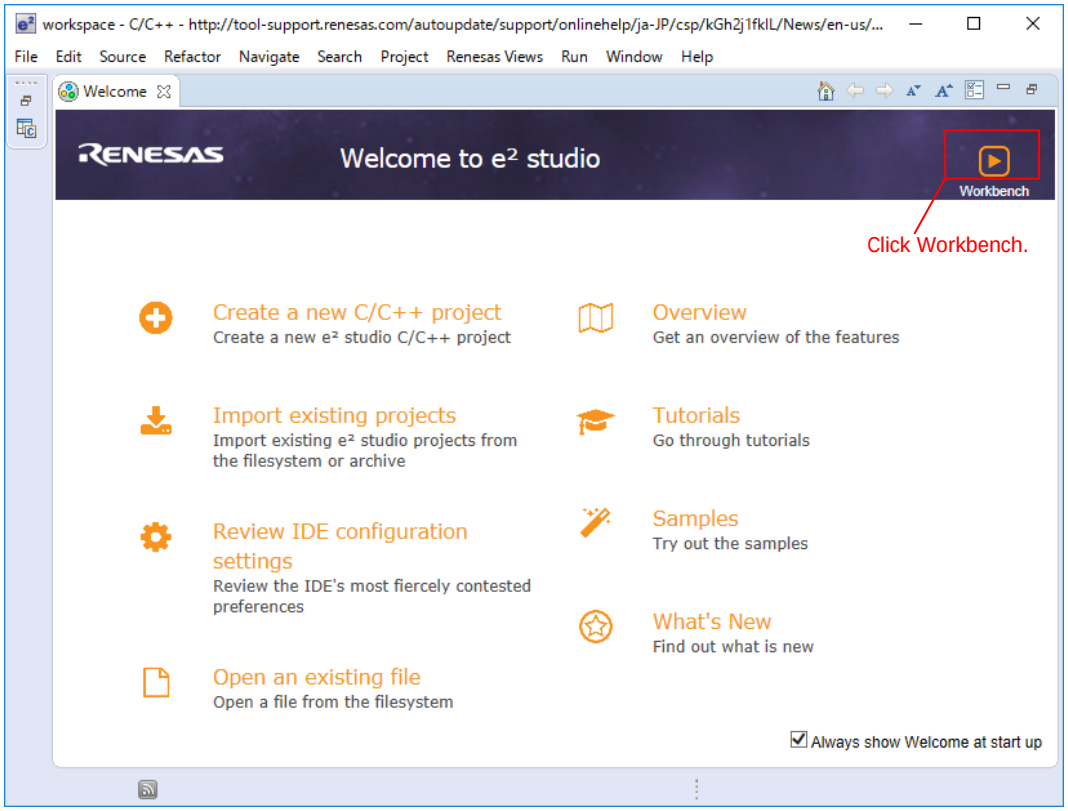

Figure 4-2 Opening Workbench

(d) **Creating a C/C++ Project**

Workbench starts.

From the menu bar, select **File** > **New** > **C/C++ Project**.

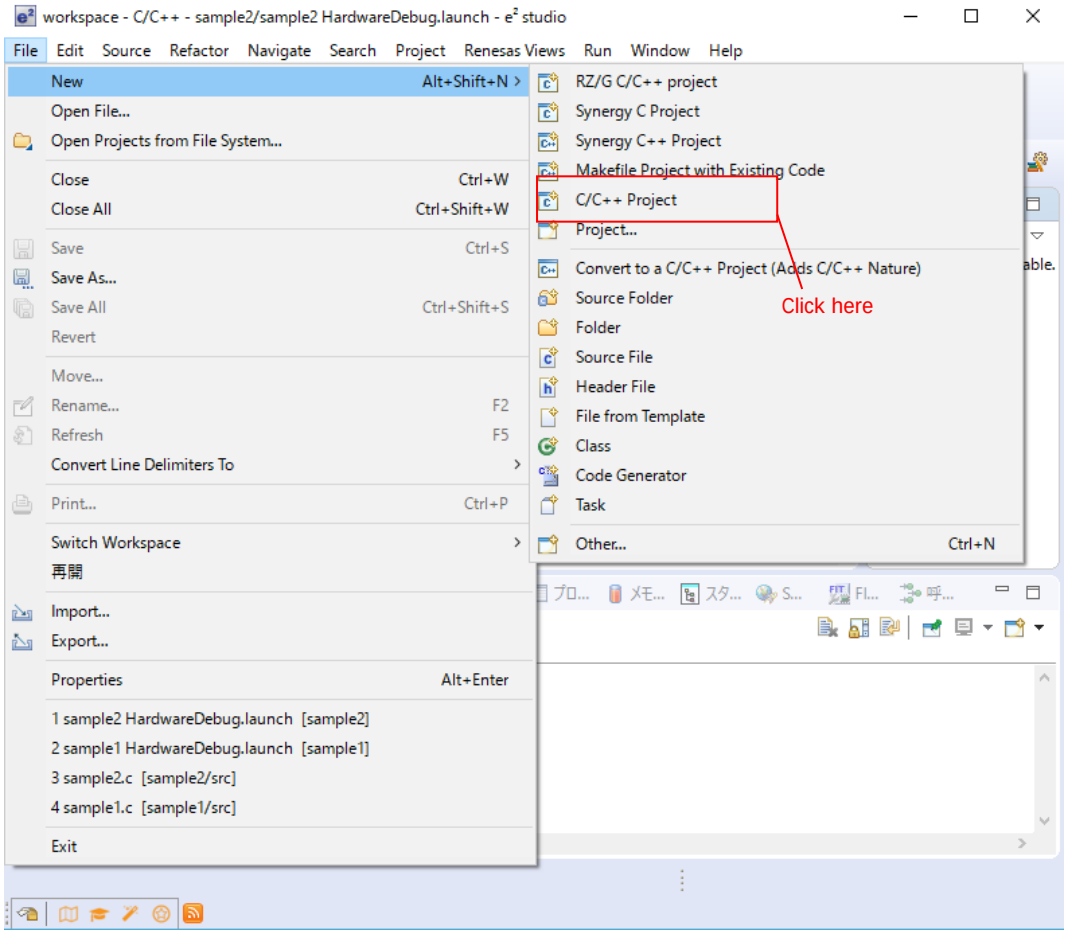

Figure 4-3 Creating a C/C++ Project

(e) **Selecting a Project Template**

The **Templates for New C/C++ Project** dialog box appears.

1. Select **Renesas RX** on the left side of the dialog box.
2. Select **Renesas CC-RX C/C++ Executable Project** on the right side of the dialog box.
3. Click the **Next** button.

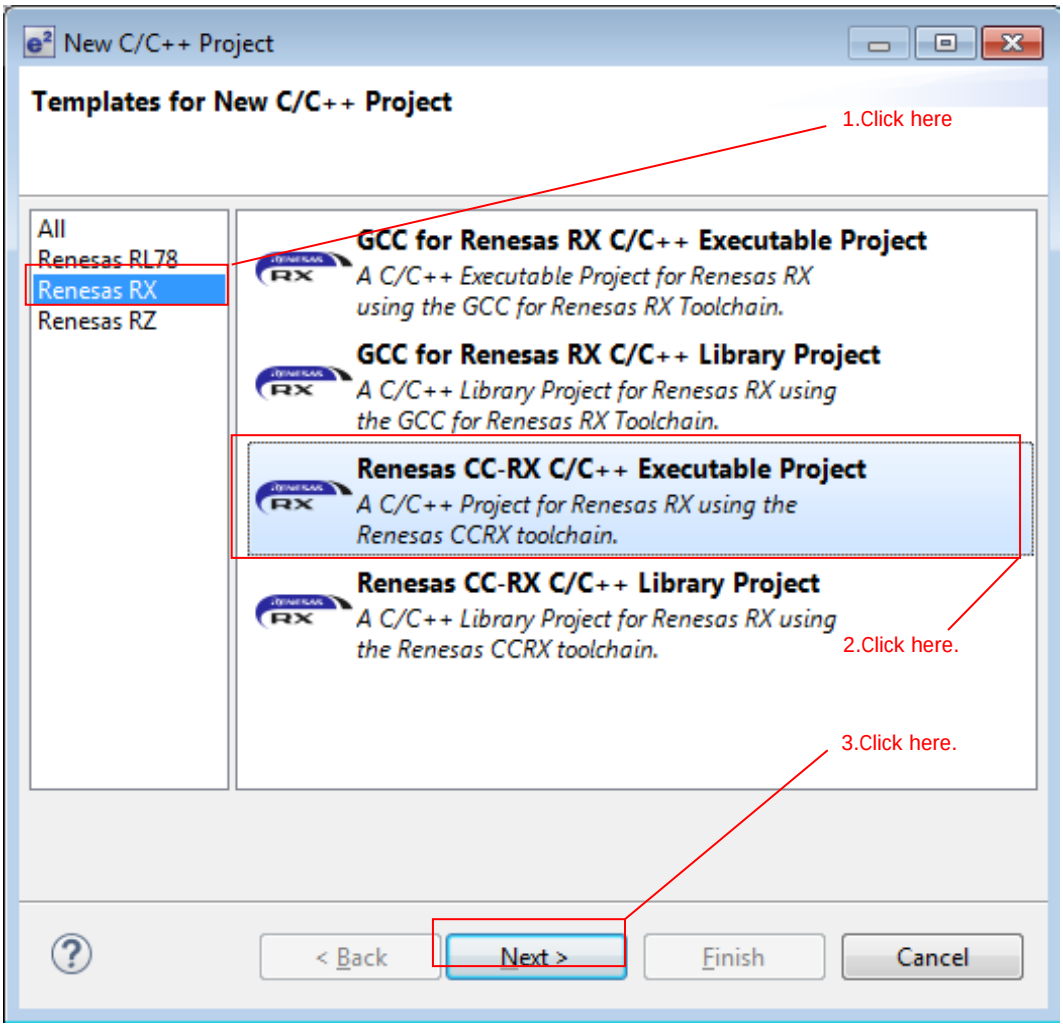

Figure 4-4 Selecting a Project Template

(f) **Entering a Project Name**

The **Renesas CC-RX Executable Project** dialog box appears.

1. Enter the name of the project into the **Project name:** field.

2. Click the **Next** button.

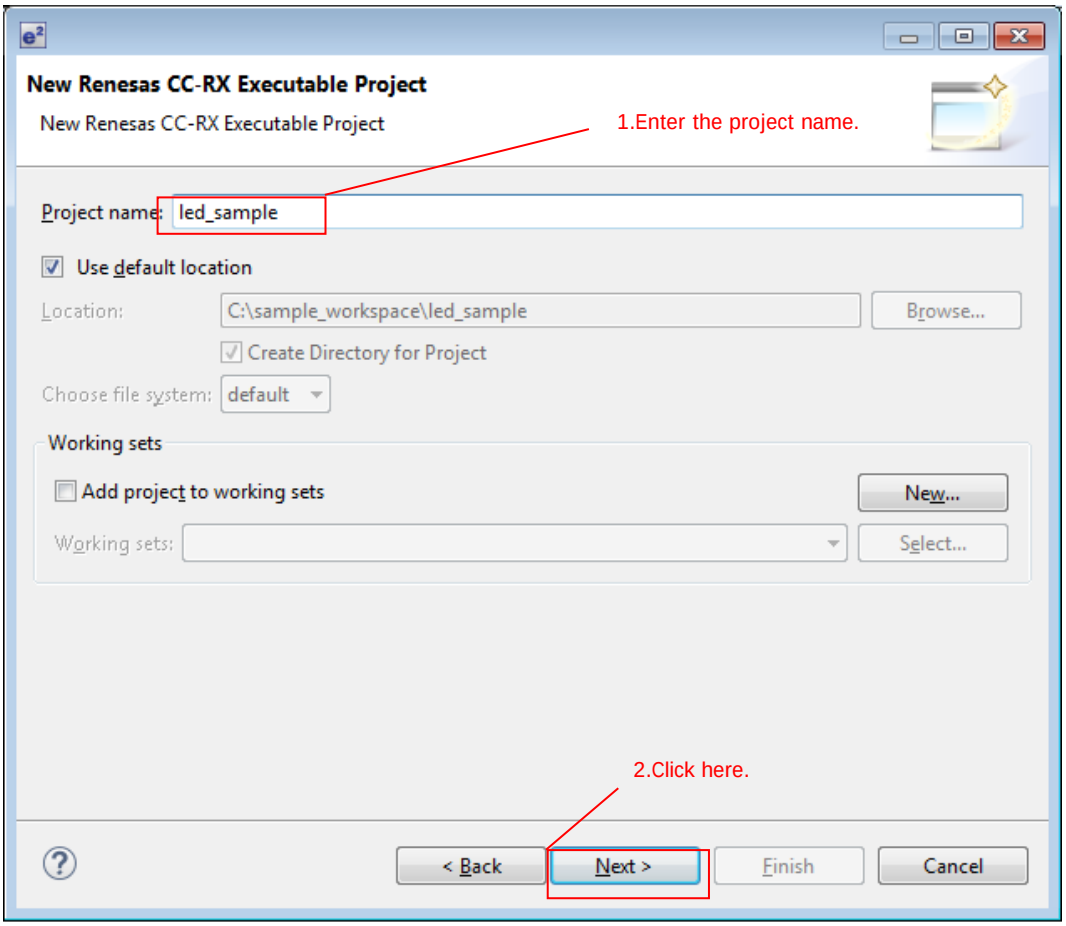

Figure 4-5 Entering a Project Name

(g) **Selecting a Toolchain and Device**

The **Select toolchain, device & debug settings** dialog box appears, allowing you to specify the toolchain, device, and debug settings.

1. From the **Toolchain:** dropdown list, select **Renesas CCRX**.*[1]
2. From the **Toolchain Version:** dropdown list, select **v2.08.00**.*[1]
3. Click the … button next to the **Target Device:** field, and select **R5F565NEDxFC**.*[1]
4. Click the **Next** button.

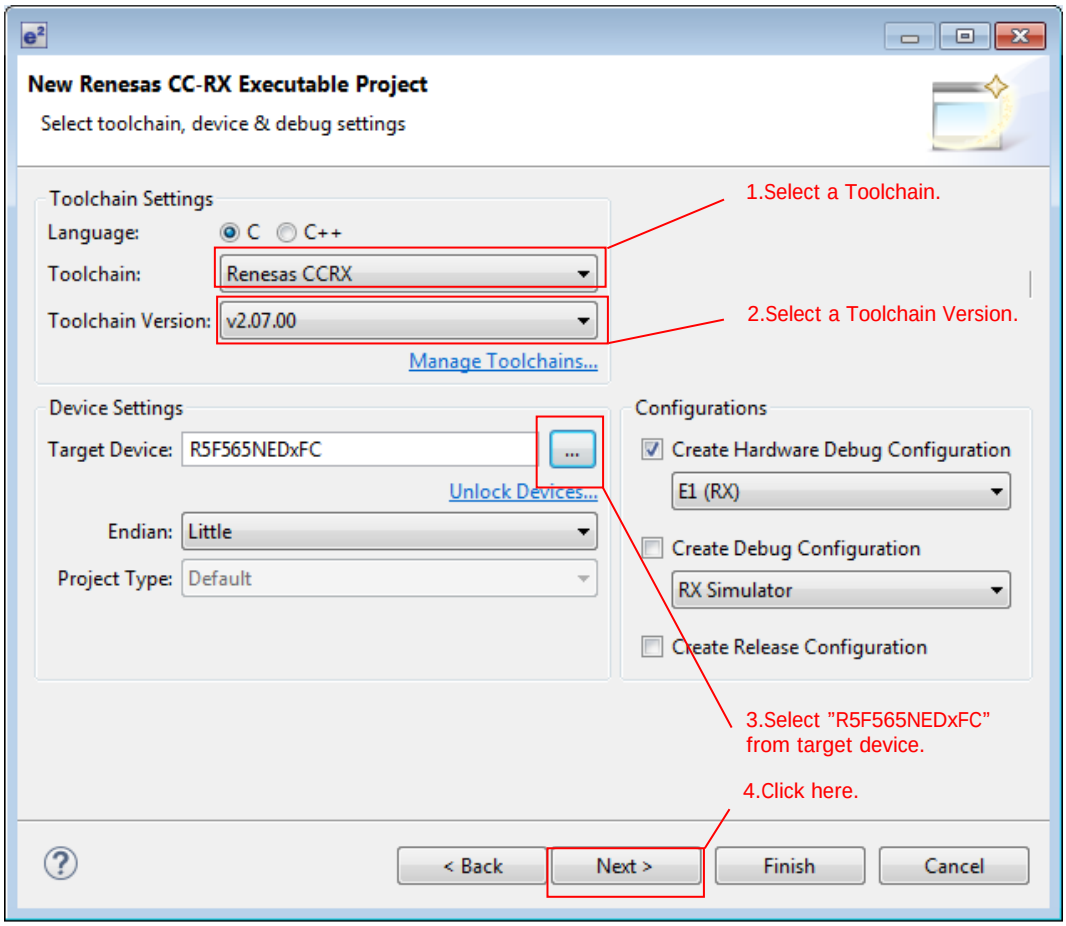

Figure 4-6 Selecting a Toolchain and Device

Note 1. If necessary, modify these settings to match your environment.

(h) **Finishing Creation of a Workspace and Project**

The **Select Coding Assistant settings** dialog box appears.

1. Check the box next to **Smart Configurator**.

2. Click the **Finish** button. The project is created.

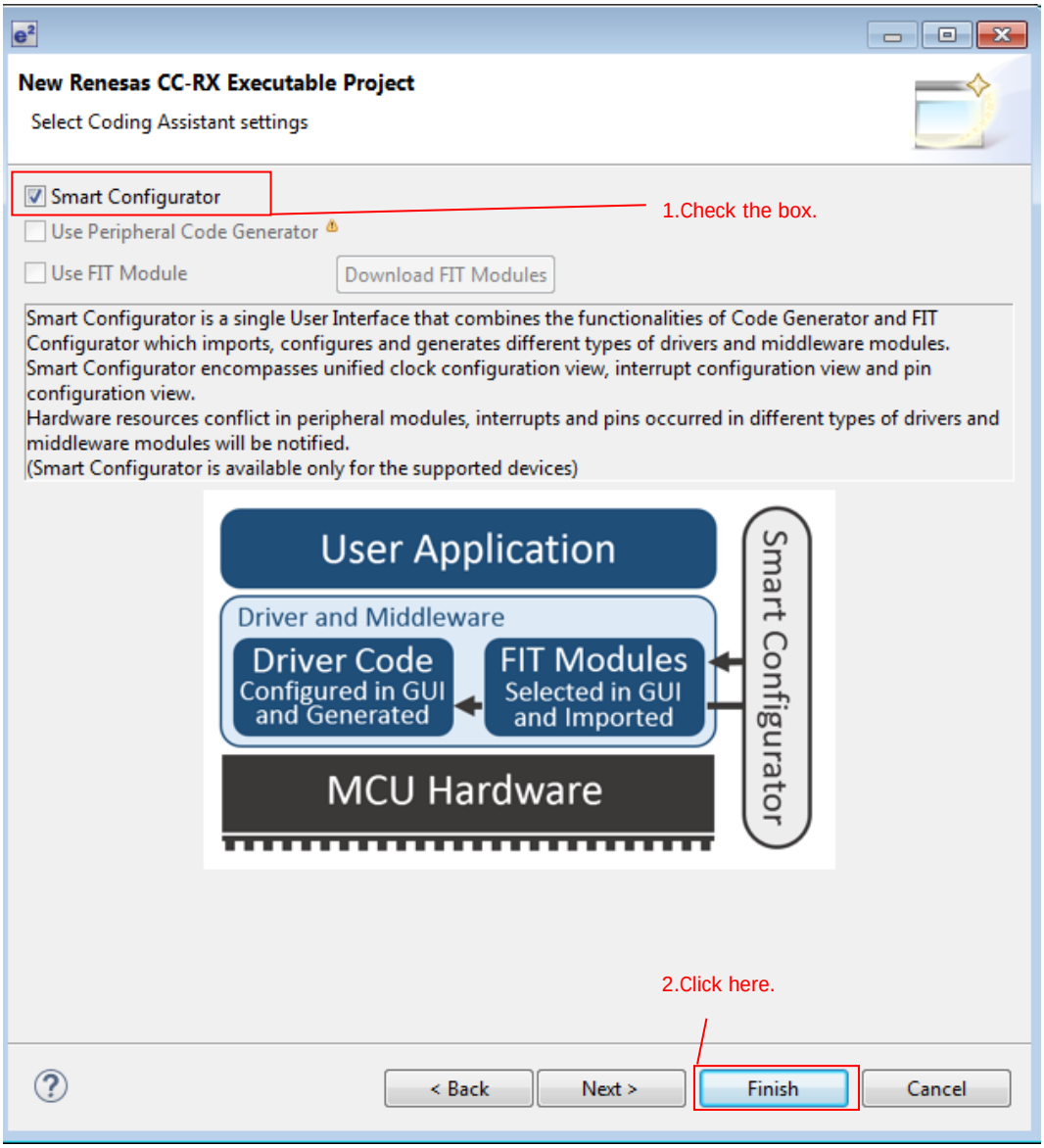

Figure 4-7 Finishing Creation of a Workspace and Project

(2) Downloading the RX Driver Package

Using the newly created workspace and project, you will download the RX Driver Package.

(a) Adding Components

The initial screen of Smart Configurator appears.

1. In the **led_sample.scfg** tab, select the **Components** tab.
2. The **Software component configuration** dialog box appears. Click the **Add component** button.

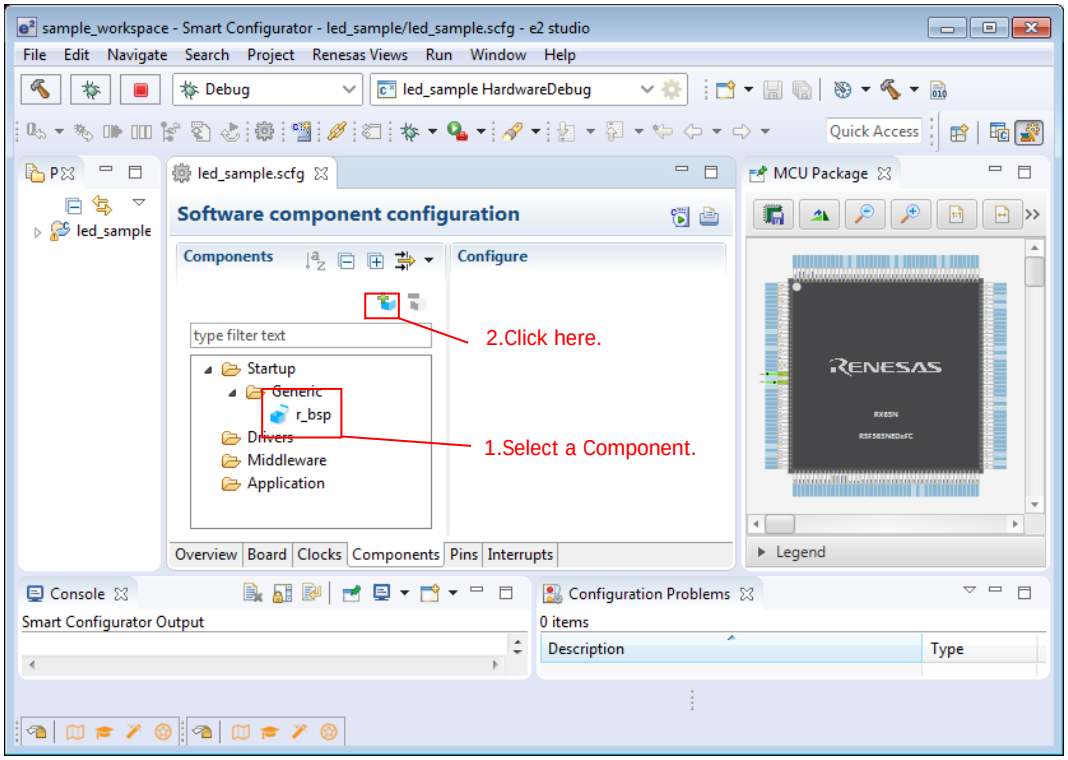

Figure 4-8 Adding Components

(b) **Selecting Components**

The **Software Component Selection** dialog box appears.

Click **Download more software components**.

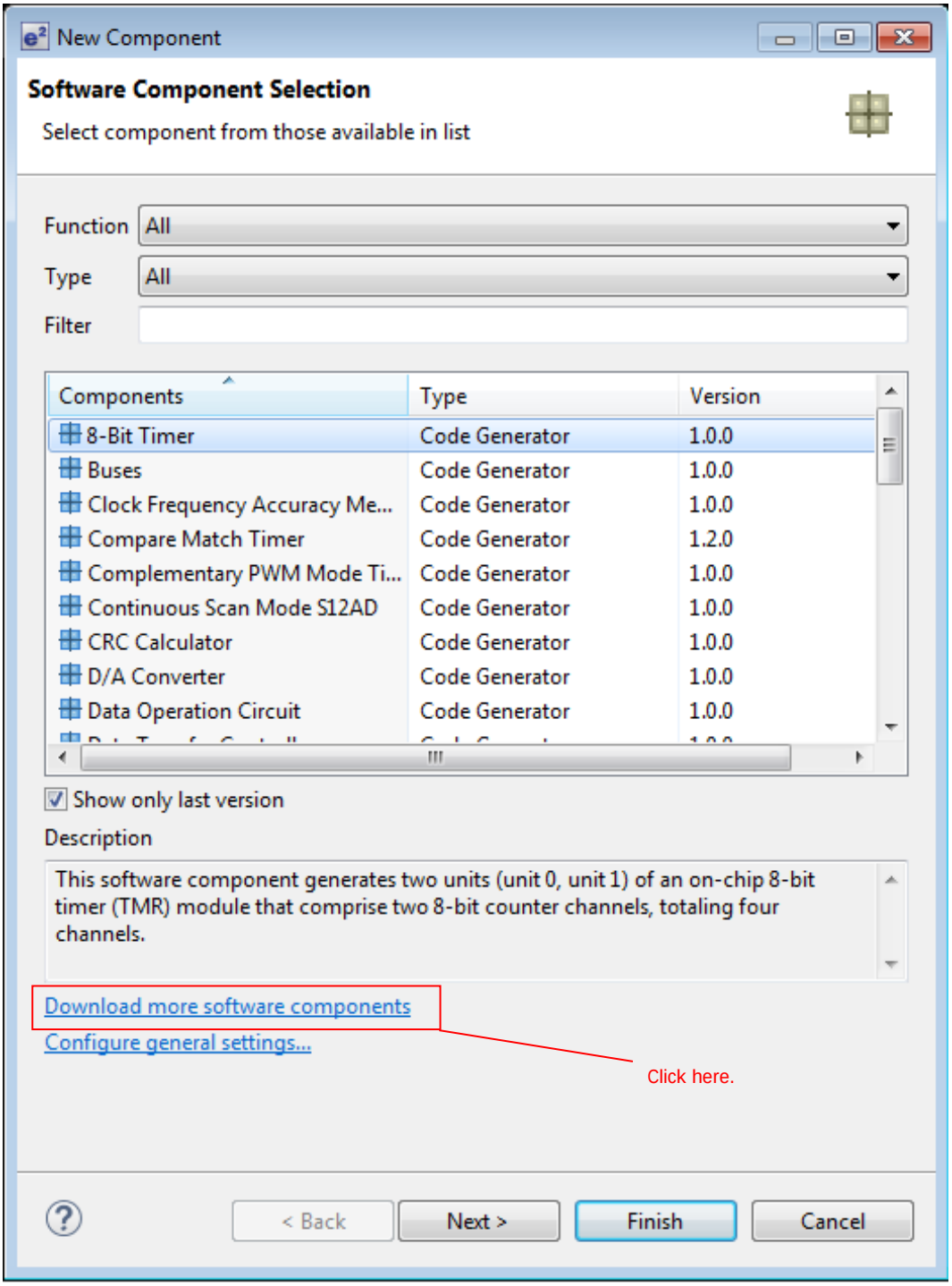

Figure 4-9 Selecting Components

(c) **Selecting a Module to Download**

The **FIT Module Download** dialog box appears.

1. Check the box next to the RX Driver Package in order to download it.
2. Specify the FIT module location in the **FIT Module Folder Path:** field.*[1]
3. Click the **Download** button.

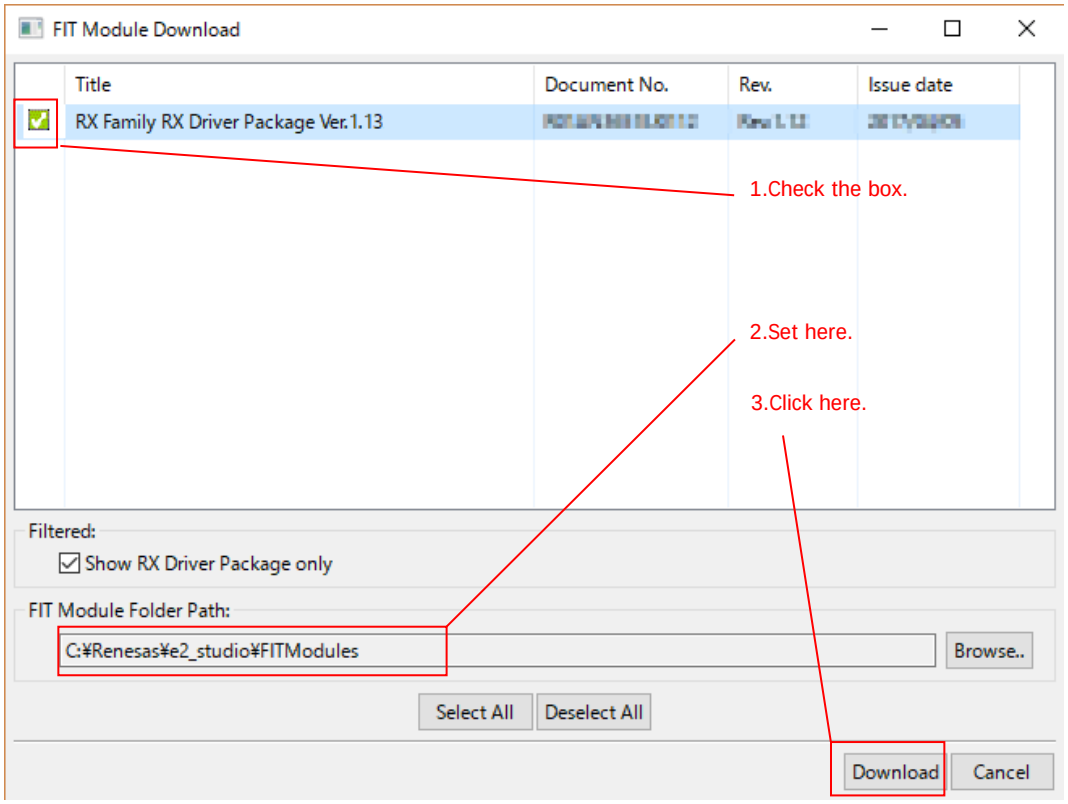

Figure 4-10 Selecting a Module to Download

Note 1. Specifying **FIT Module Folder Path:**
The downloaded RX Driver Package will be stored in the location specified in **FIT Module Folder Path:**. Any folder may be specified. The default setting is the **FITModules** folder (usually C:\Renesas\e2_studio\FITModules).

(d) **Logging into My Renesas**

The **My Renesas** dialog box appears.

1. Enter your My Renesas email address and password.*[1]*[2]

2. Click the **OK** button.

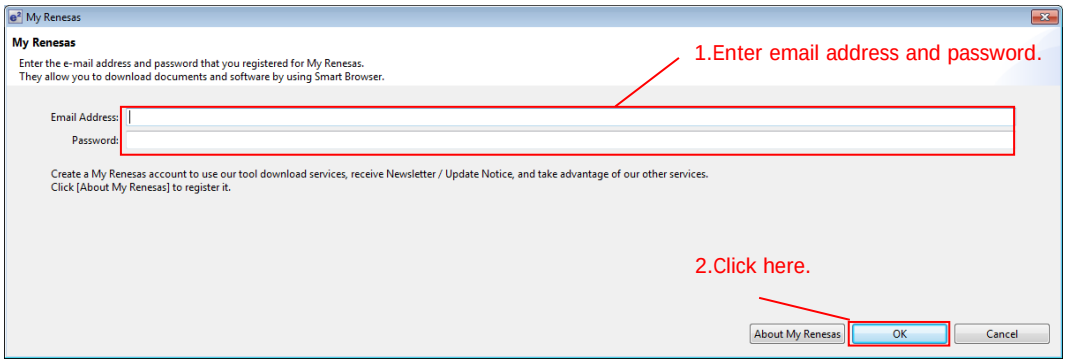

Figure 4-11 User authentication

Note 1. It is necessary to first register as a member of My Renesas on the official Renesas website. Refer to **Website and Support** for details.

Note 2. Once you have entered this information, the dialog box no longer appears.

(e) **License Agreement**

The **End User License Agreement** dialog box appears.

After reading and agreeing to the content of the agreement, click the **Agree** button.

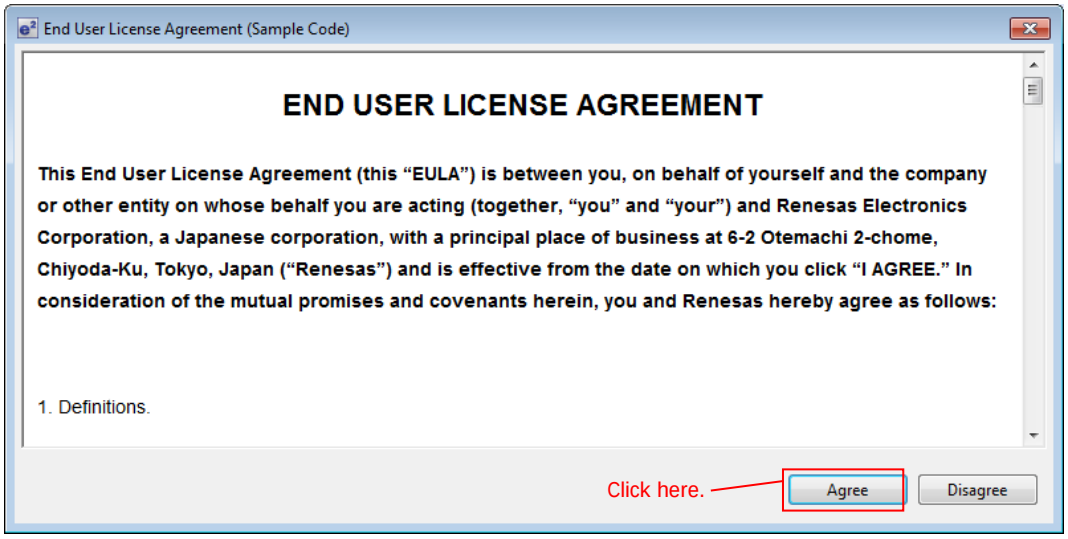

Figure 4-12 License Agreement

(f) **Finishing the Download**

The **Download FIT Module** dialog box appears.

Click the **OK** button.

(3) **Installing FIT Modules**

After creating a project, you can use Smart Configurator to install the necessary FIT modules.

In this example, we will install the CMT FIT module (r_cmt_rx).

(a) **Opening the Component Preferences Dialog Box**

The **Software Component Selection** dialog box appears.

Click **Configure general settings...** to open the component preferences dialog box.

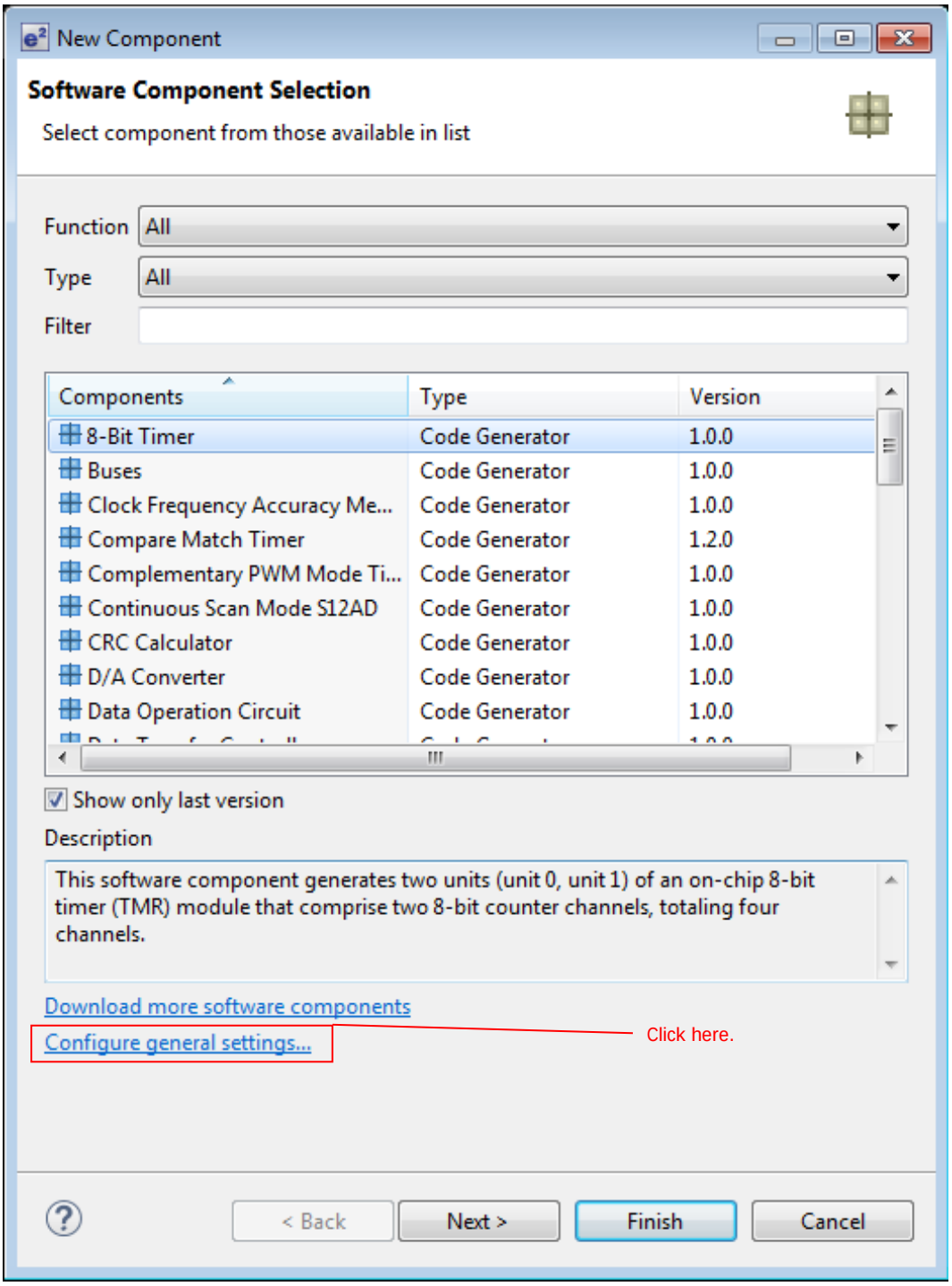

Figure 4-13 Opening the Component Preferences Dialog Box

(b) **Displaying All FIT Modules**

The component preferences dialog box appears.

1. Under **Blocked list settings**, check the box next to **Allow blocked FIT modules to be displayed**.

2. Click the **OK** button.

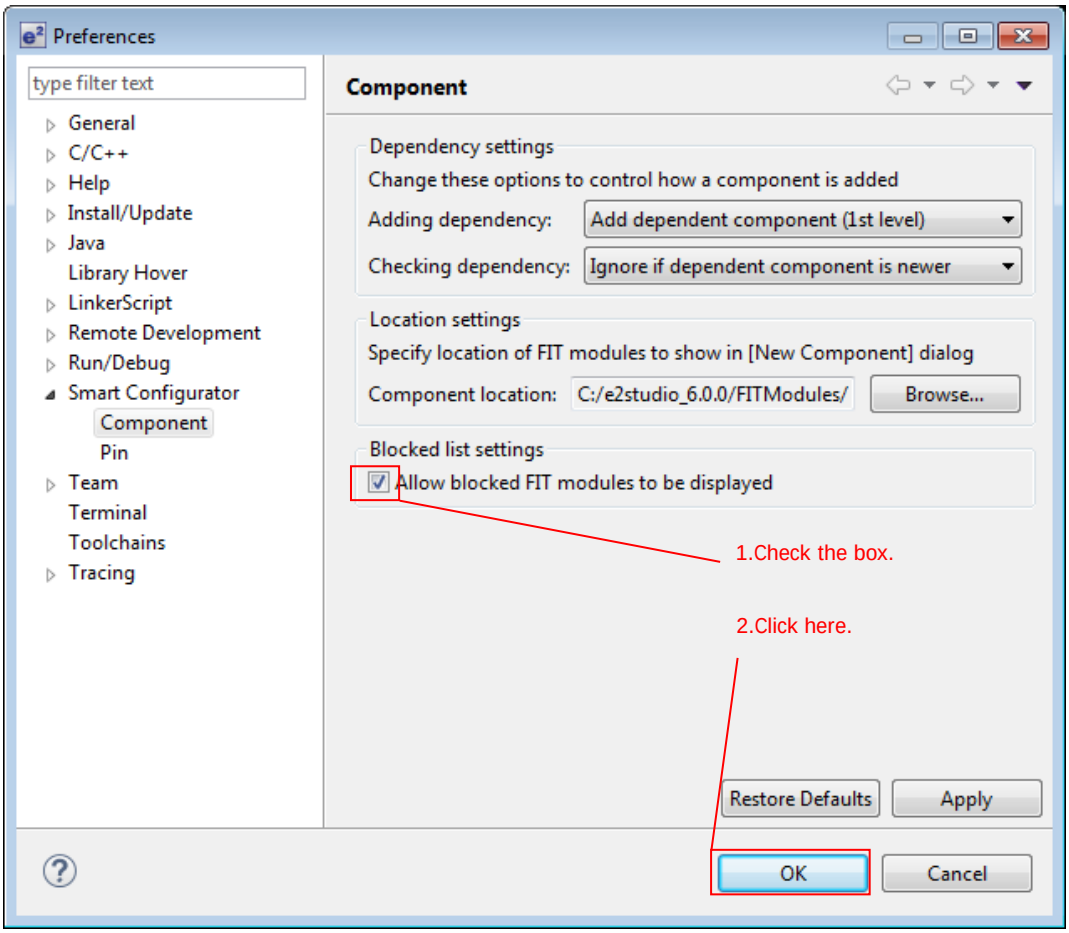

Figure 4-14 Displaying All FIT Modules

(c) **Select r_cmt_rx**

The **Software Component Selection** dialog box appears.

Components downloaded in the procedure of "4.1.1(2)" are displayed as "FIT" type.

Please select r_cmt_rx in the following procedure.

1. Select **r_cmt_rx** from the list of components.*[1]

2. Click the **Finish** button.

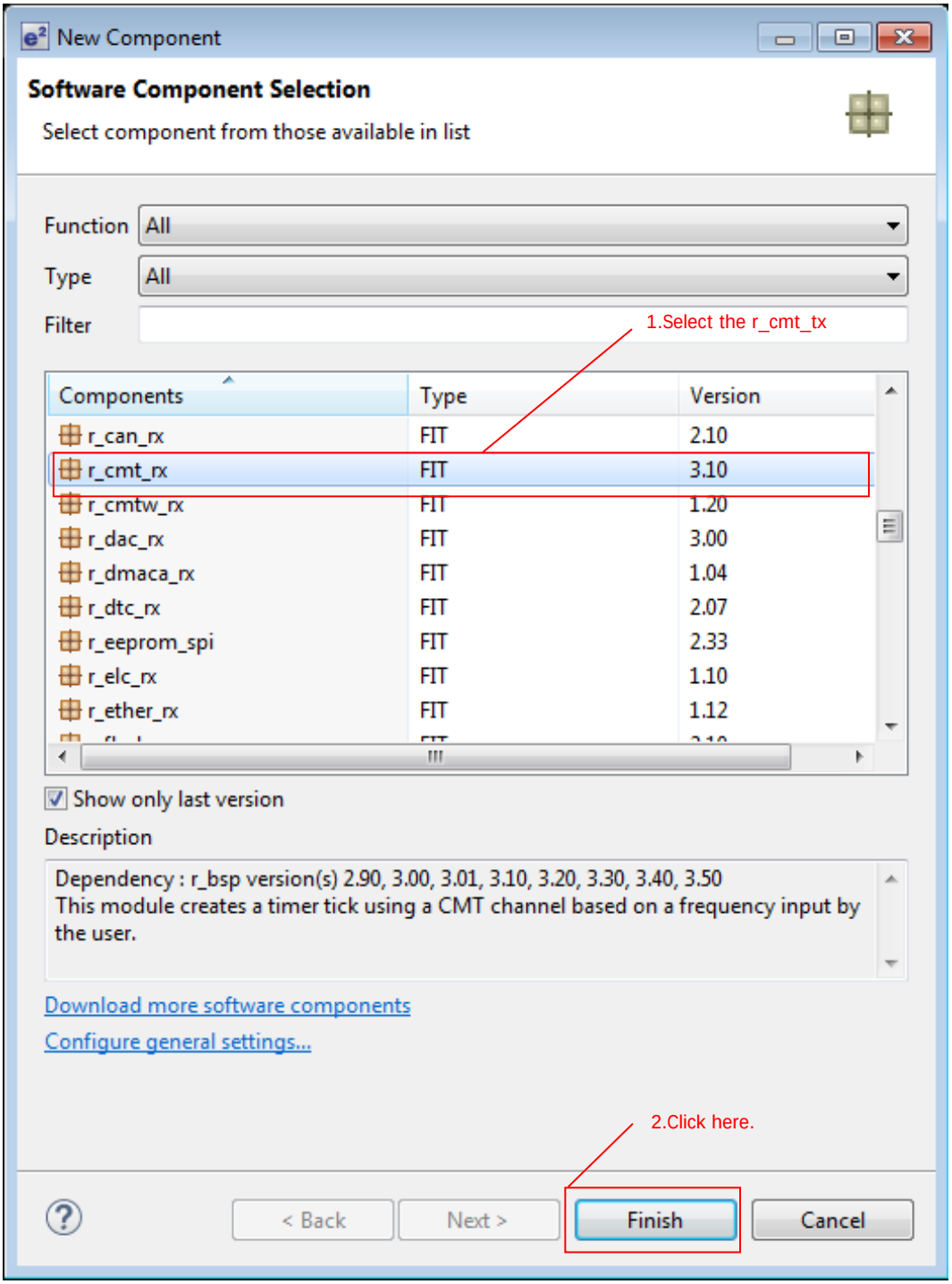

Figure 4-15 Adding r_cmt_rx to the Available Components

Note 1. Software component list items

a.Components

Multiple components are listed, such as “DMA controller” and “interrupt controller.”

b.Type

There are two types, “code generation” and “FIT.” Components can conform to any of the following three patterns:

- Code generation-only components
- FIT-only components
- Code generation and FIT components

When specifying components, select the type that matches your requirements.

c.Version

The component version numbers are listed. Make sure to select the version that matches your requirements.

(d) **Generating Code**

The **Software component configuration** dialog box reappears.

1. Confirm that **r_cmt_rx** has been added as a component.

2. Click the **Generate Code** button.

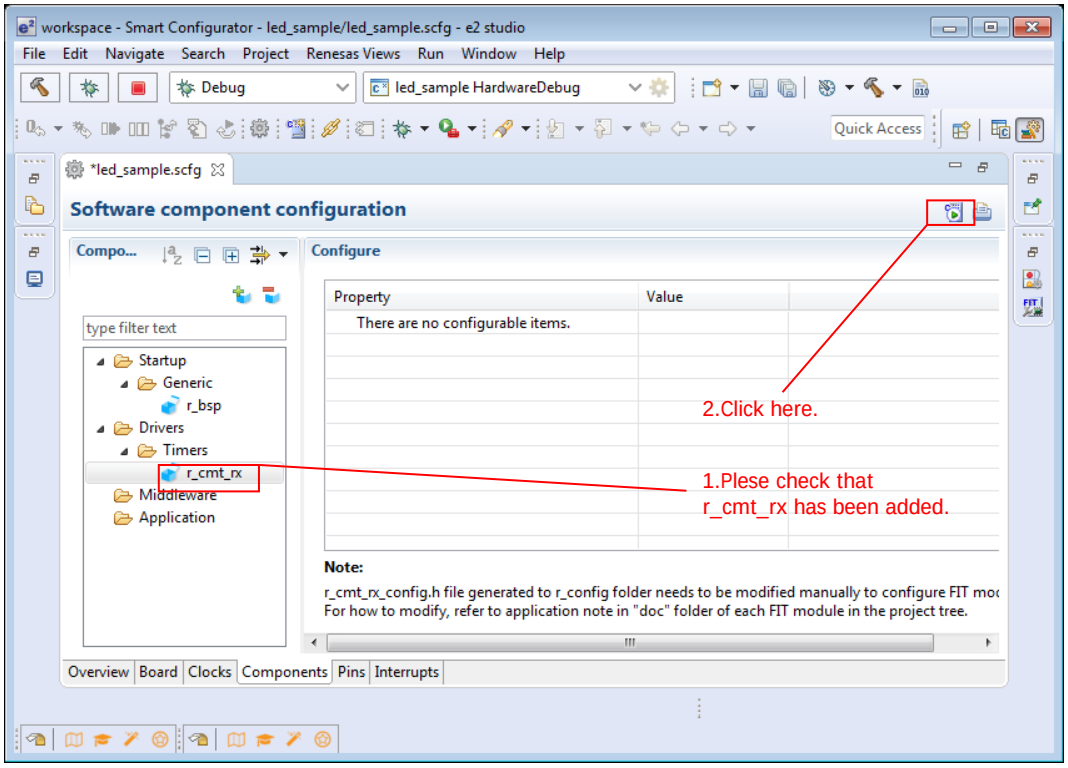

Figure 4-16 Generating Code

If you use the Smart Configurator to install the FIT module skip the “4.1.2 FIT Configurator”.

Proceed to “4.2 Create an LED Driving Program”.

4.1.2 FIT Configurator

How to create a new workspace and download the RX Driver Package is described below.

In this example, “RX111” is used as the target MCU and “Renesas Starter Kit+ RX111” as the target board. If the environment to be used for the download is different, adjust the relevant parts of the description that follows to match the actual environment.

(1) Creating a New Workspace and Project

In order to download the RX Driver Package, you must create a new workspace and project.

(a) Launching e^2 studio

From the Windows Start menu, launch e^2 studio.

(b) Designating the Workspace

The **Select a directory as workspace** dialog box appears.

1. Enter the name of the workspace folder of your choice in the **Workspace** field.

2. Click the **OK** button.

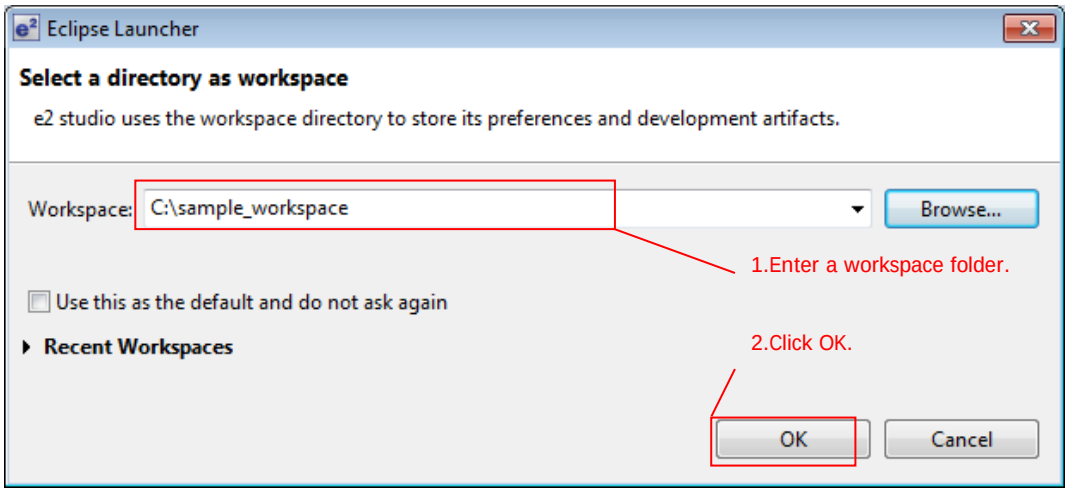

Figure 4-17 Designating the Workspace

(c) **Opening Workbench**

The **Welcome to e^2 studio** window appears.

Click the **Workbench** icon in the top right corner of the **Welcome** tab.

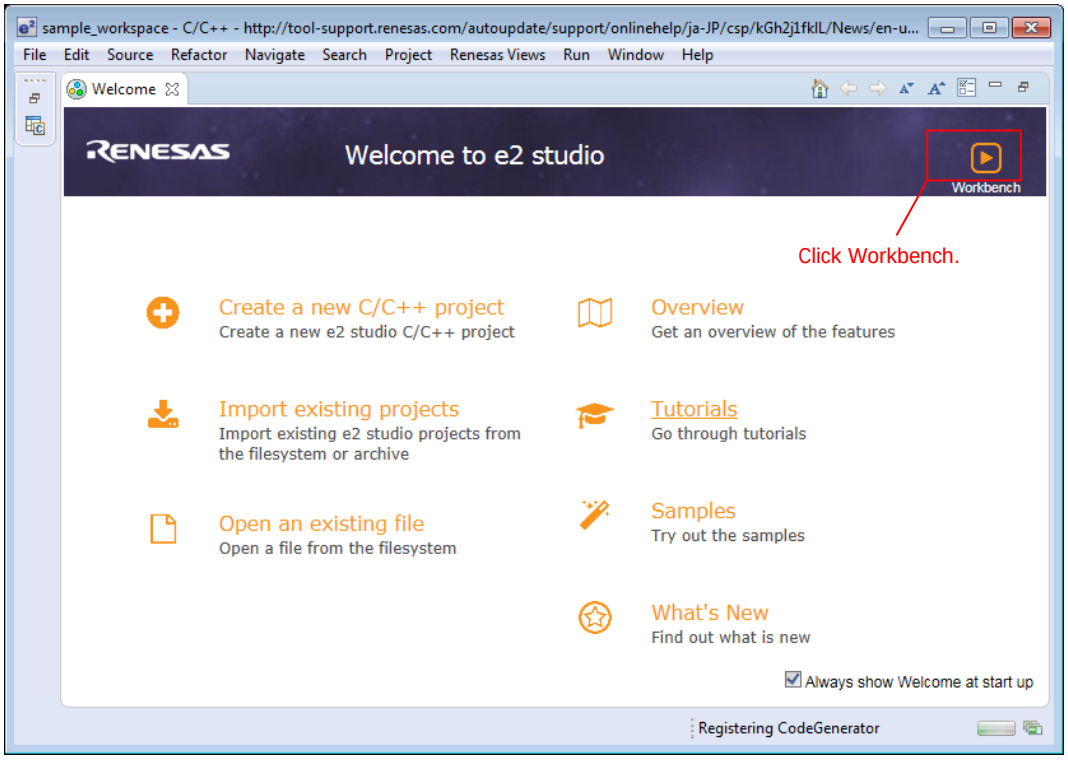

Figure 4-18 Start workbench

(d) **Creating a C/C++ Project**

Workbench starts.

From the menu bar, select **File** > **New** > **C/C++ Project**.

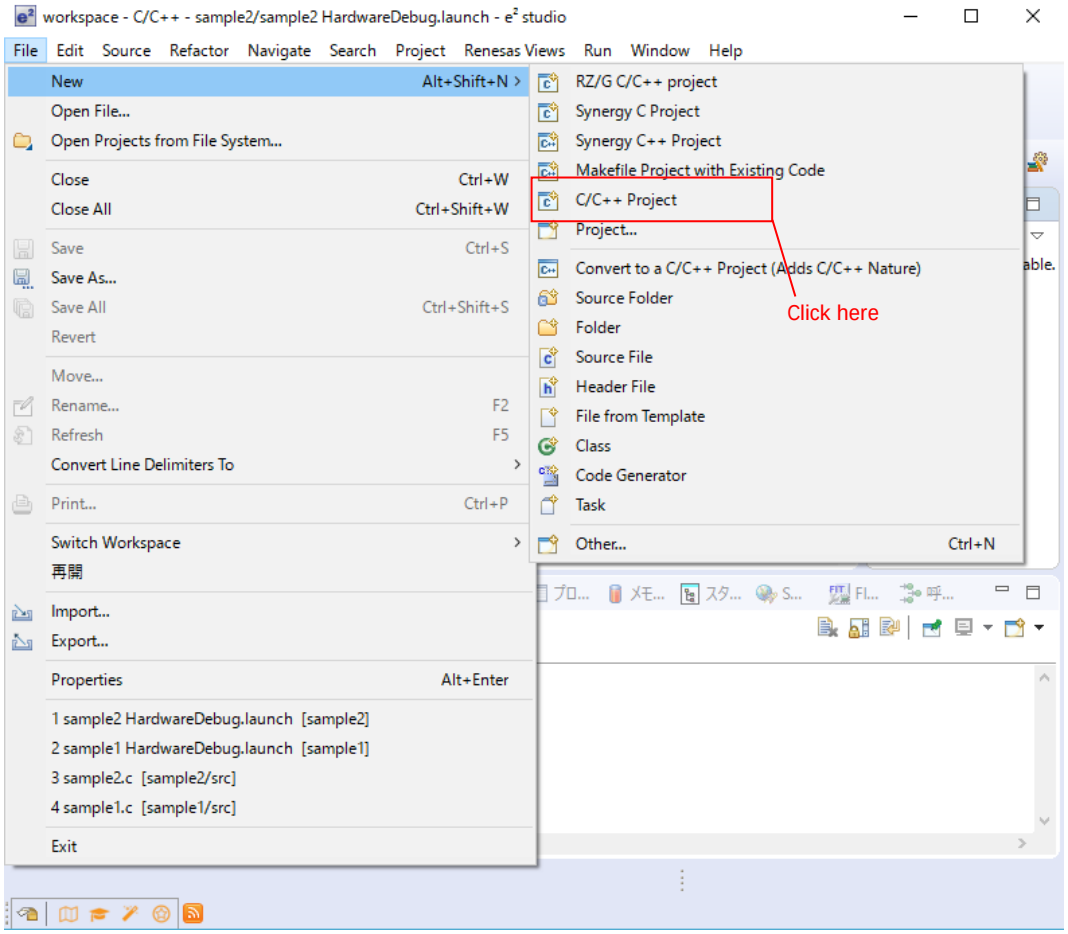

Figure 4-19 Creating a C/C++ Project

(e) **Selecting a Project Template**

The **Templates for New C/C++ Project** dialog box appears.

1. Select **Renesas RX** on the left side of the dialog box.
2. Select **Renesas CC-RX C/C++ Executable Project** on the right side of the dialog box.
3. Click the **Next** button.

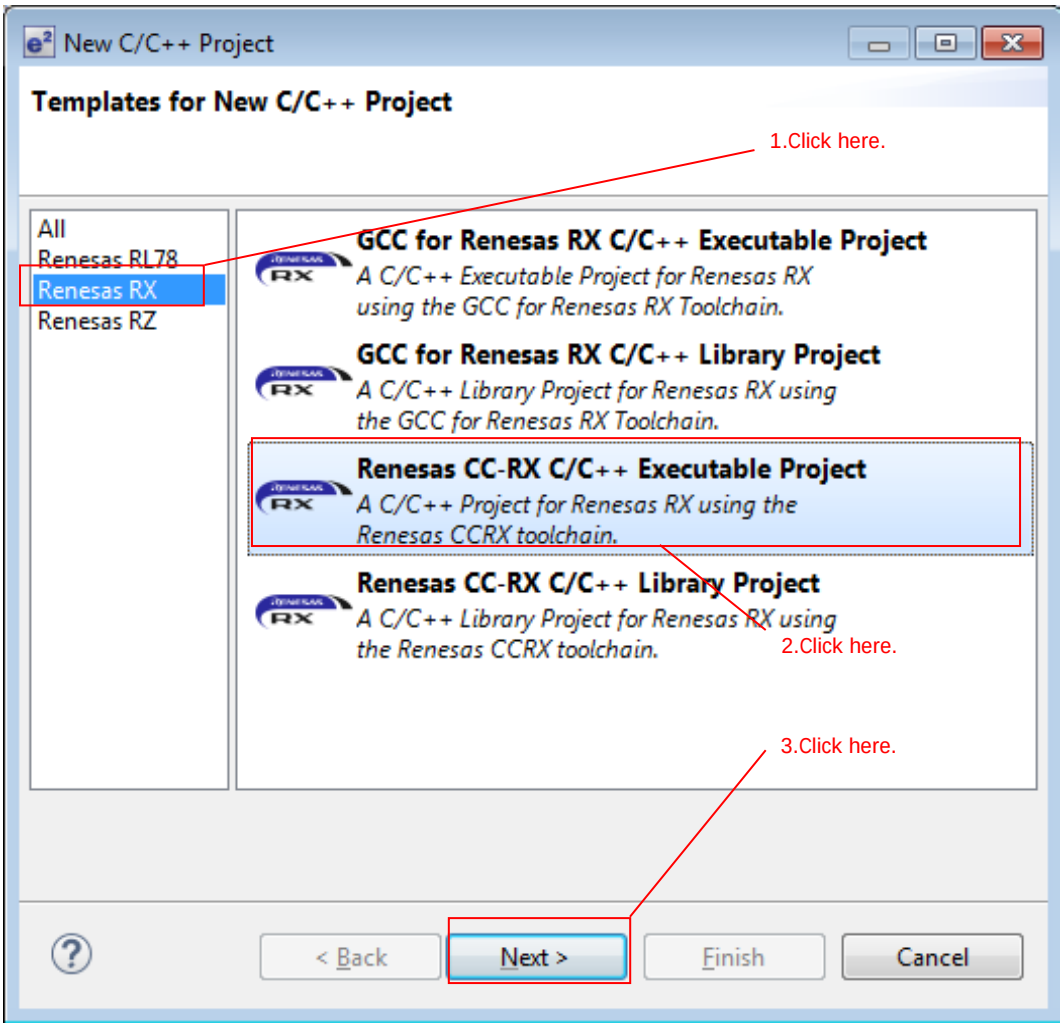

Figure 4-20 Selecting a Project Template

(f) **Entering a Project Name**

The **New Renesas CC-RX Executable Project** dialog box appears.

1. Enter the name of the project into the **Project name:** field.

2. Click the **Next** button.

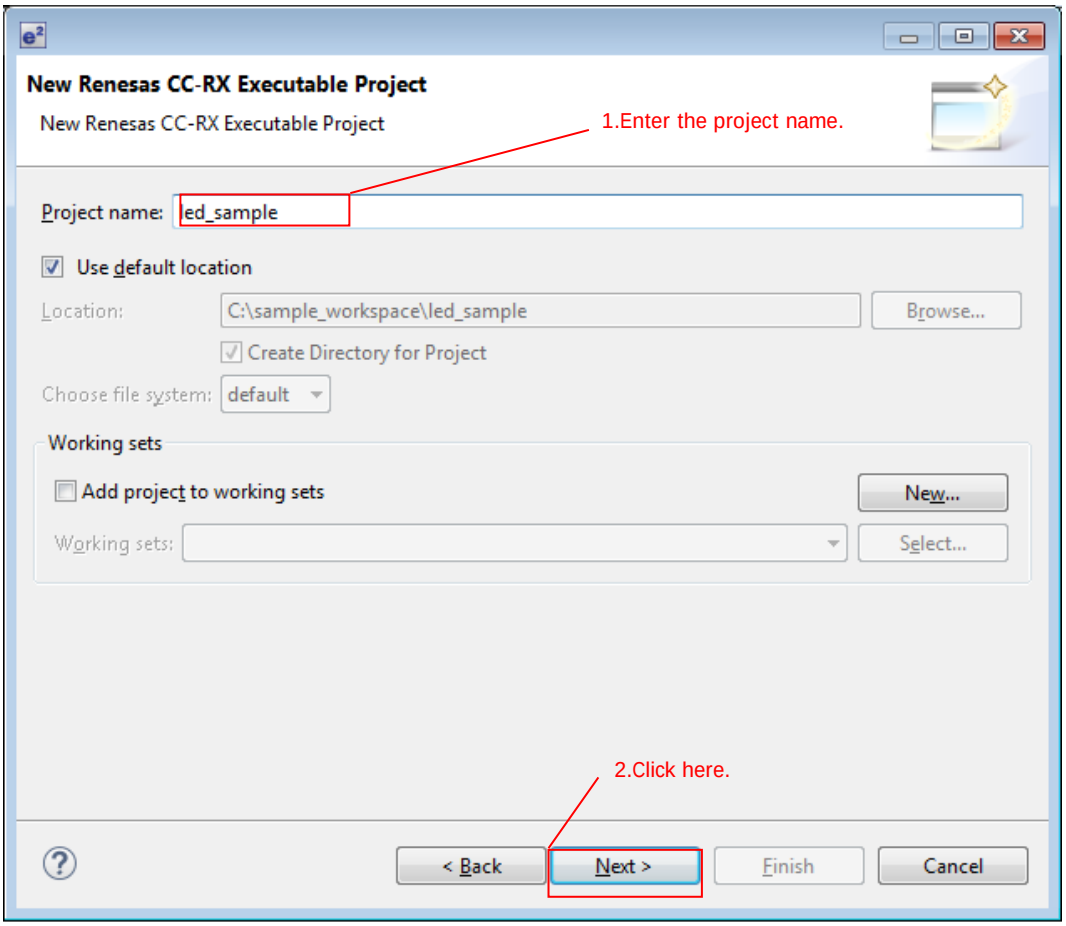

Figure 4-21 Entering a Project Name

(g) **Selecting a Toolchain and Device**

The **Select toolchain, device & debug settings** dialog box appears, allowing you to specify the toolchain, device, and debug settings.

1. From the **Toolchain:** dropdown list, select **Renesas CCRX**.*[1]
2. From the Toolchain Version: dropdown list, select **v2.08.00**.*[1]
3. Click the ... button next to the **Target Device:** field, and select **R5F51115AxFM**.*[1]
4. Click the **Next** button.

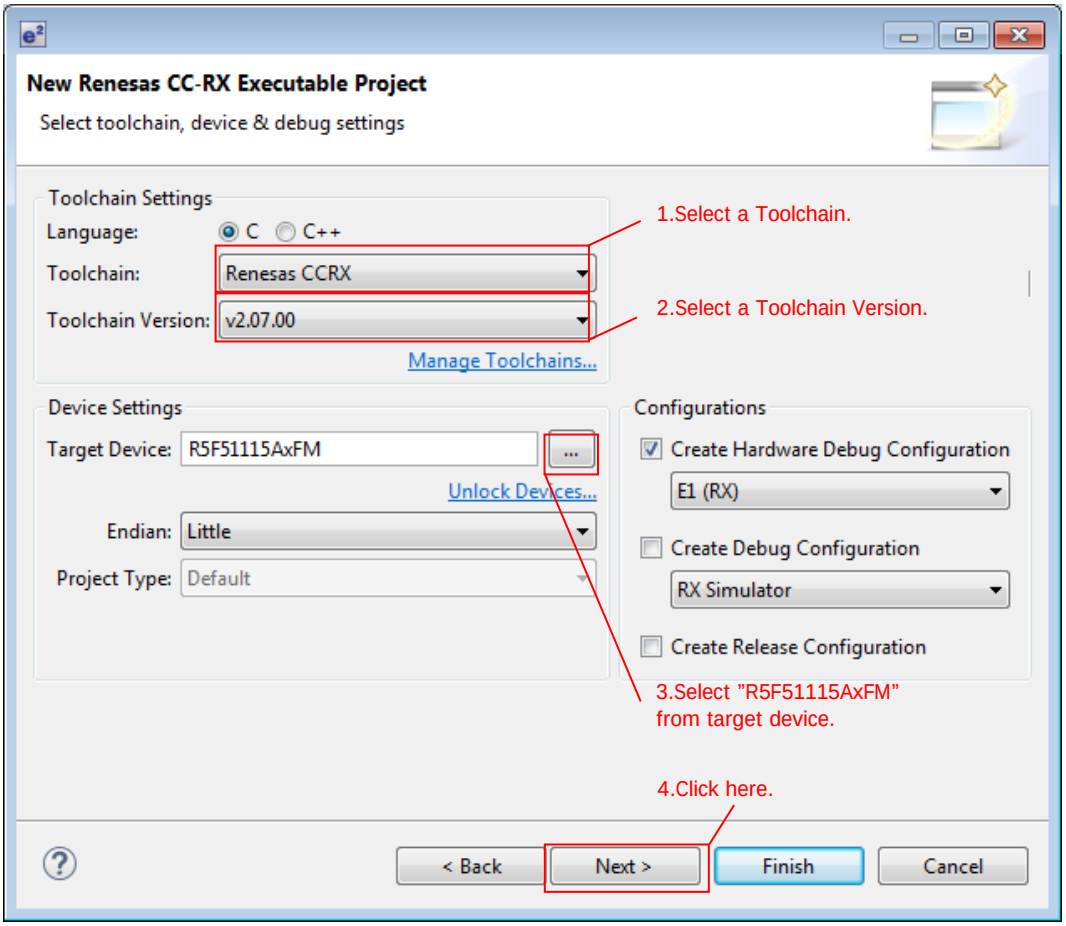

Figure 4-22 Selecting a Toolchain and Device

Note 1. If necessary, modify these settings to match your environment.

(h) **Selecting Coding Assistant Settings**

The **Select Coding Assistant settings** dialog box appears.

1. Check the box next to **Use FIT Module**.

2. Click the **Download FIT Modules** button. The **FIT Module Download** dialog box appears.

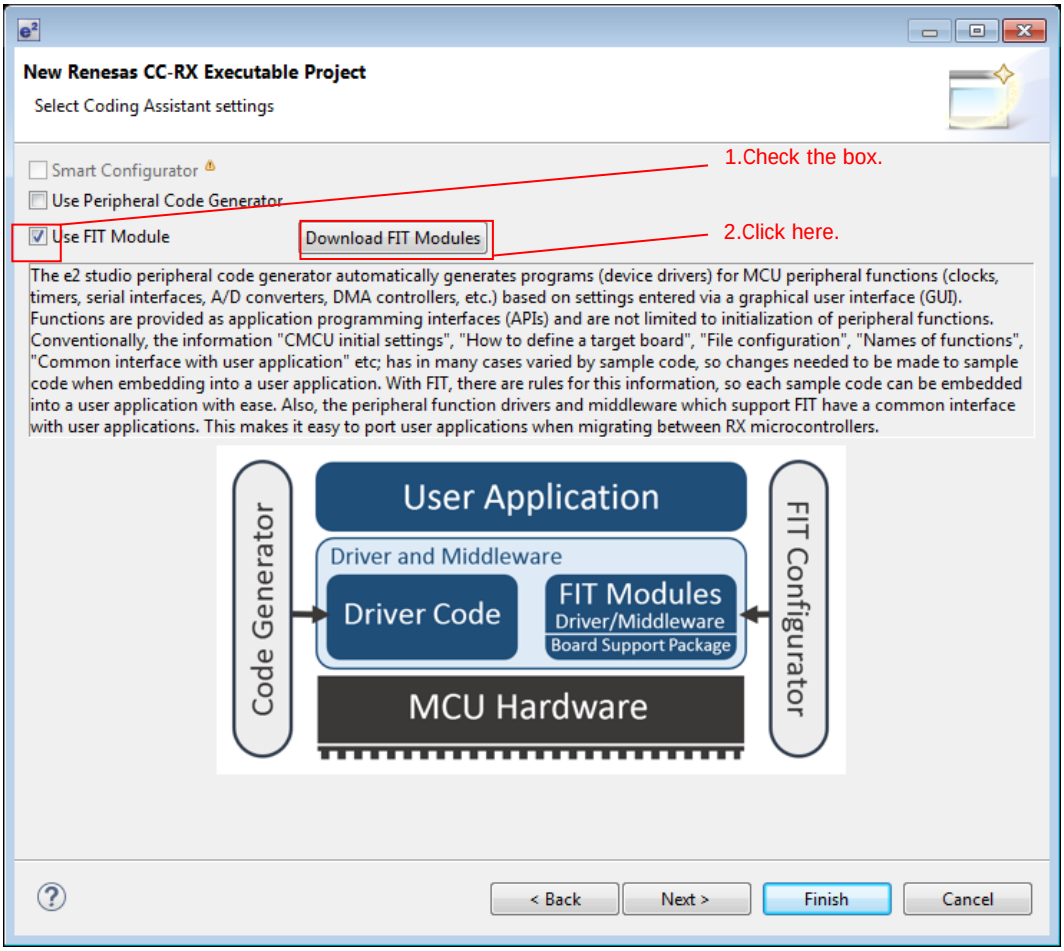

Figure 4-23 Selecting Coding Assistant Settings

(2) **Downloading the RX Driver Package**

Using the newly created workspace and project, you will download the RX Driver Package.

(a) **Selecting a Module to Download**

The **FIT Module Download** dialog box appears.

1. Under **Filtered:** check the box next to **Show RX Driver Package only**.
2. Check the box next to the RX Driver Package in order to download it.
3. Specify the FIT module location in the **FIT Module Folder Path:** field.*[1]
4. Click the **Download** button.

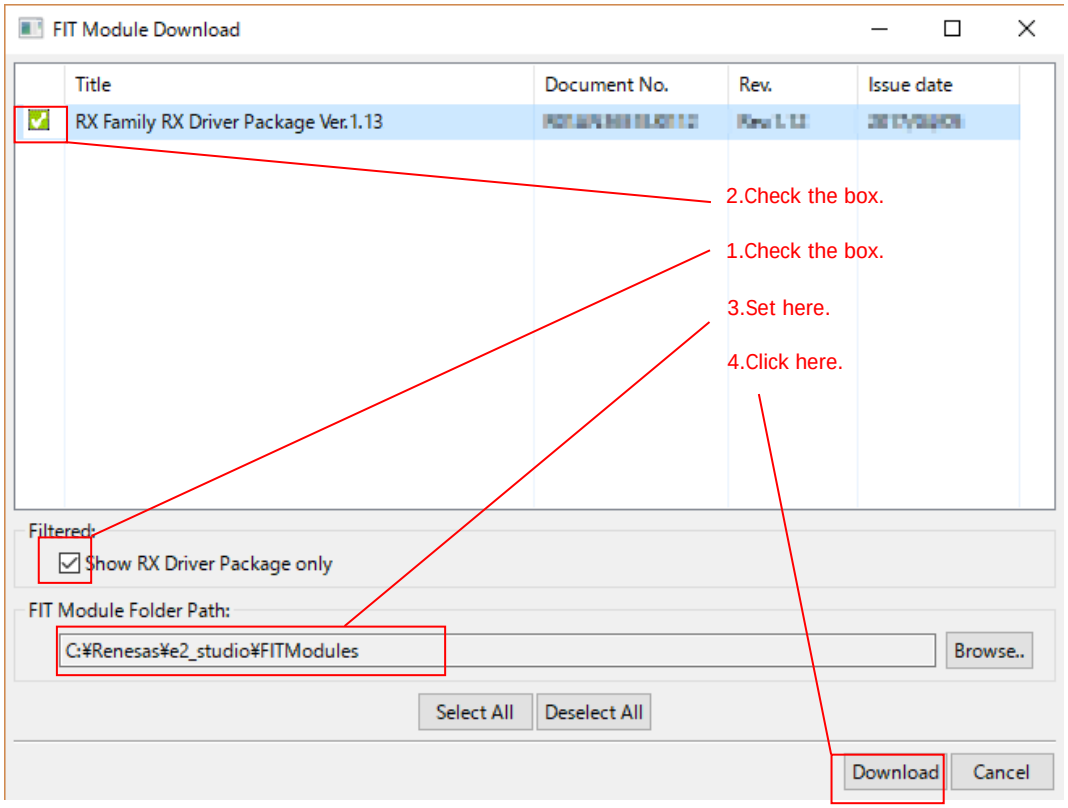

Figure 4-24 Selecting a Module to Download

Note 1. Specifying **FIT Module Folder Path:**
The downloaded RX Driver Package will be stored in the location specified in **FIT Module Folder Path:**. Any folder may be specified. The default setting is the **FITModules** folder (usually C:\Renesas\e2_studio\FITModules).
The **FITModules** folder is created automatically when you click the **Download FIT Modules** button as described in 4.1.2(1)(g).

(b) **Logging into My Renesas**

The **My Renesas** dialog box appears.

1. Enter your My Renesas email address and password.*[1]*[2]

2. Click the **OK** button.

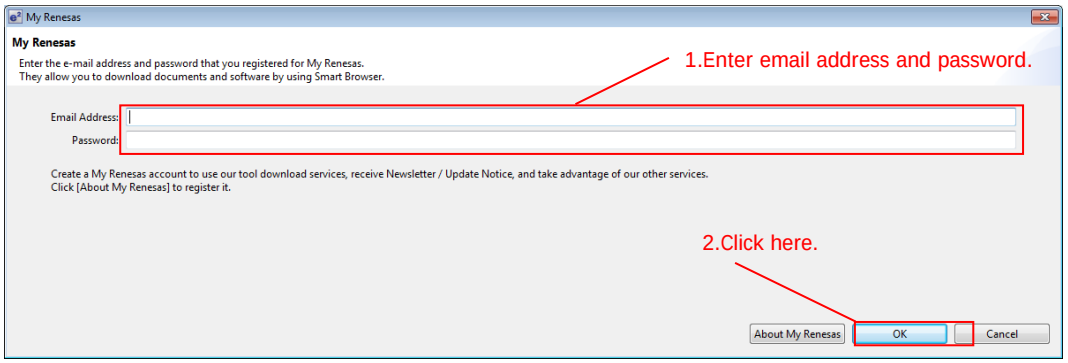

Figure 4-25 User Authentication

Note 1. It is necessary to first register as a member of My Renesas on the official Renesas website. Refer to **Website and Support** for details.

Note 2. Once you have entered this information, the dialog box no longer appears.

(c) **License Agreement**

The **End User License Agreement** dialog box appears.

After reading and agreeing to the content of the agreement, click the **Agree** button.

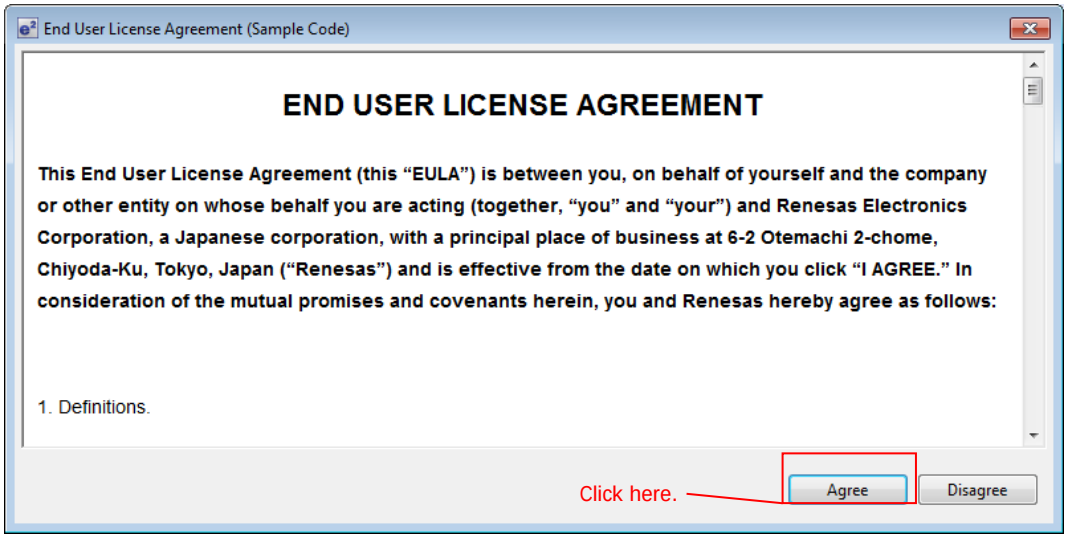

Figure 4-26 License Agreement

(d) **Finishing the Download**

The **Download FIT Module** dialog box appears.

Click the **OK** button.

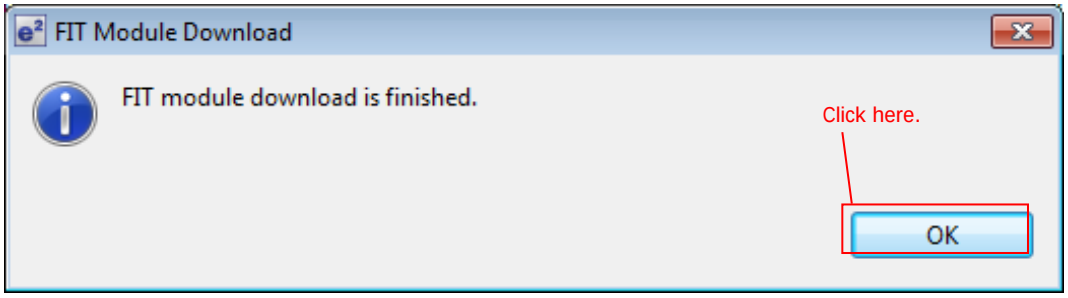

Figure 4-27 Finishing the Download

(e) **Finishing Creation of a Workspace and Project**

The **Select Coding Assistant settings** dialog box appears.

1. Confirm that the box next to **Use FIT Module** is checked.
2. Click the **Finish** button. The project is created.

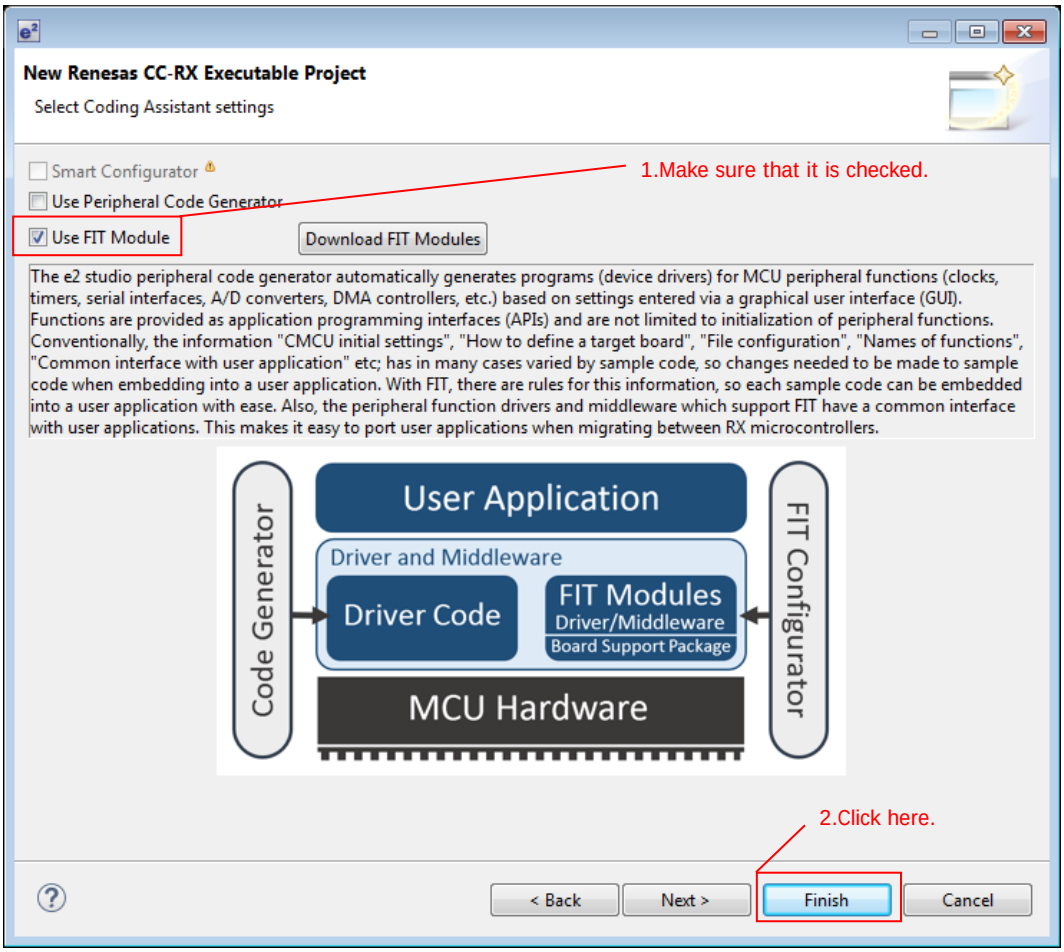

Figure 4-28 Finishing Creation of a Workspace and Project

(3) Installing FIT Modules

After creating a project, you can use FIT Configurator to install the necessary FIT modules.

In this example, we will install the CMT FIT module (r_cmt_rx).

(a) Opening FIT Configurator

From the e^2 studio menu, select **Renesas Views** > **e2 solution toolkit** > **FIT Configurator**.

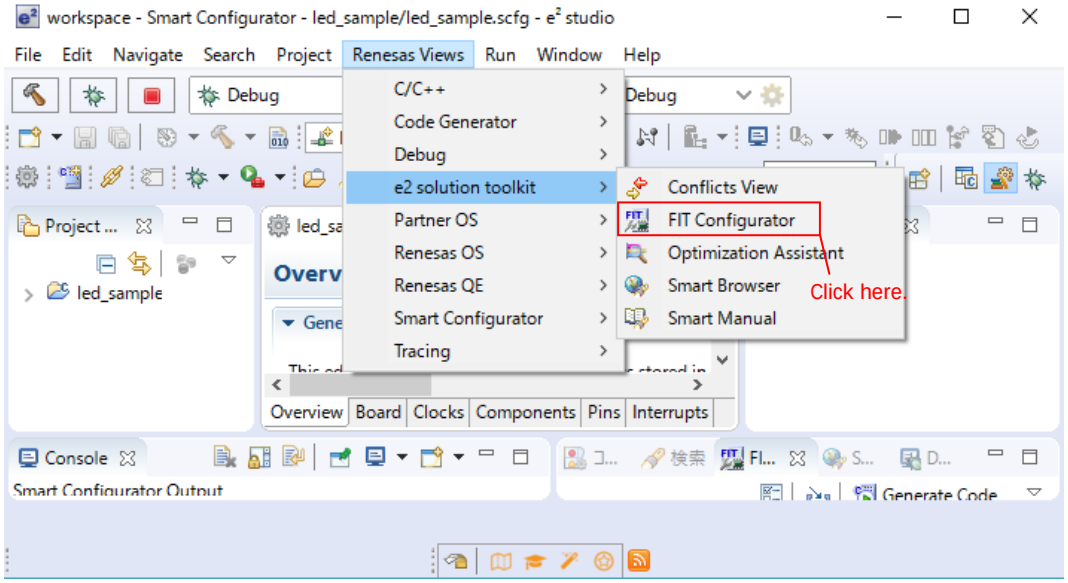

Figure 4-29 Opening FIT Configurator

(b) **Adding Modules**

FIT Configurator is displayed in the lower right of the workspace window.

1. Open the **FIT Configurator** tab.
2. From the **Name of the project to add FIT modules:** dropdown list, select the newly created project **led_sample**.
3. From the **Target Board:** dropdown list, select **RSKRX111**.
4. From the **Available Modules** list, select **r_cmt_rx**.
5. Click the **Add Module** >> button.

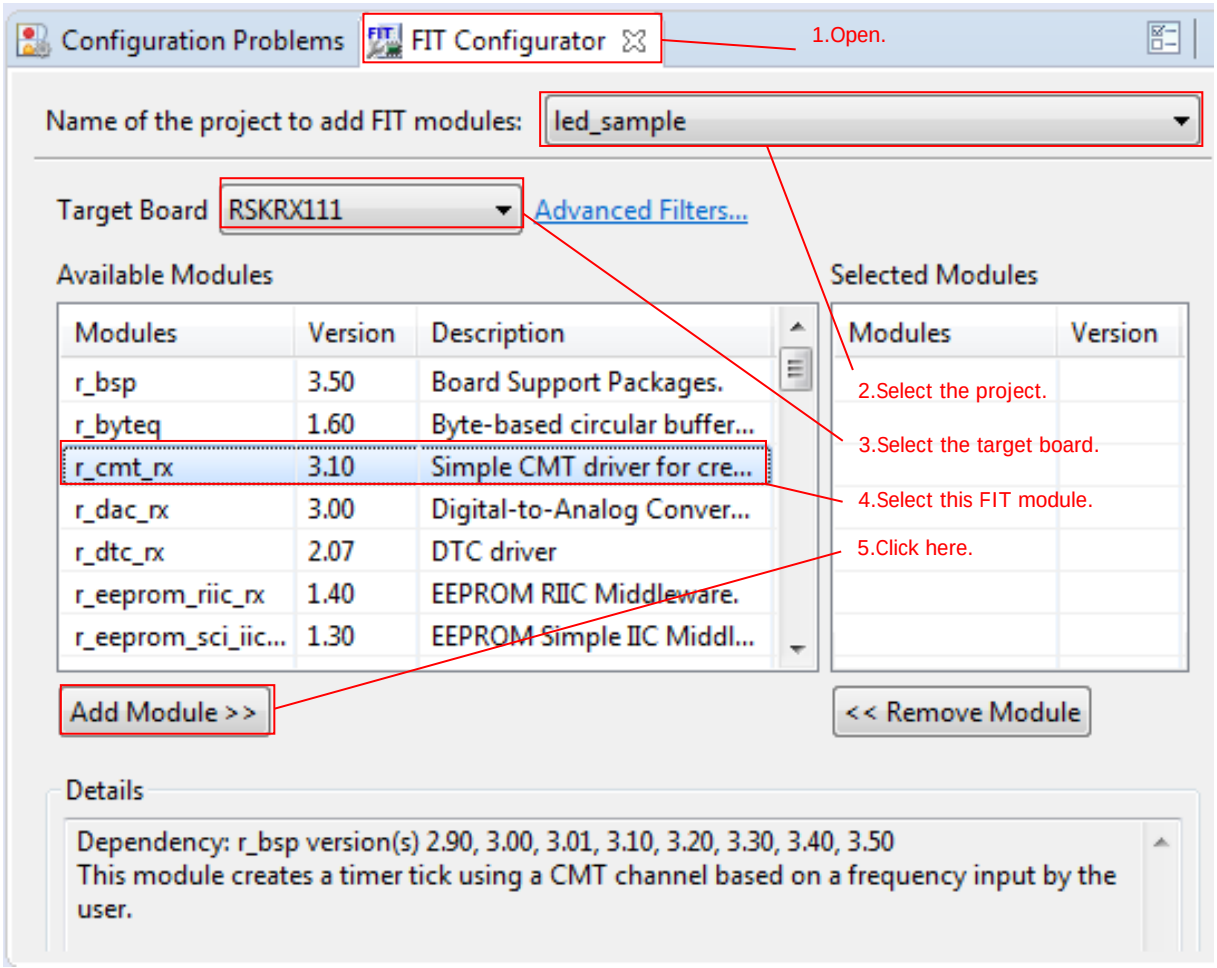

Figure 4-30 Adding Modules

(c) **Generating Code**

The module added by following the steps in **Adding Modules** appears in the **Selected Modules** list.

1. Confirm that both **r_bsp** and **r_cmt_rx** appear in the **Selected Modules***[1] list.

2. Click the **Generate Code** button.

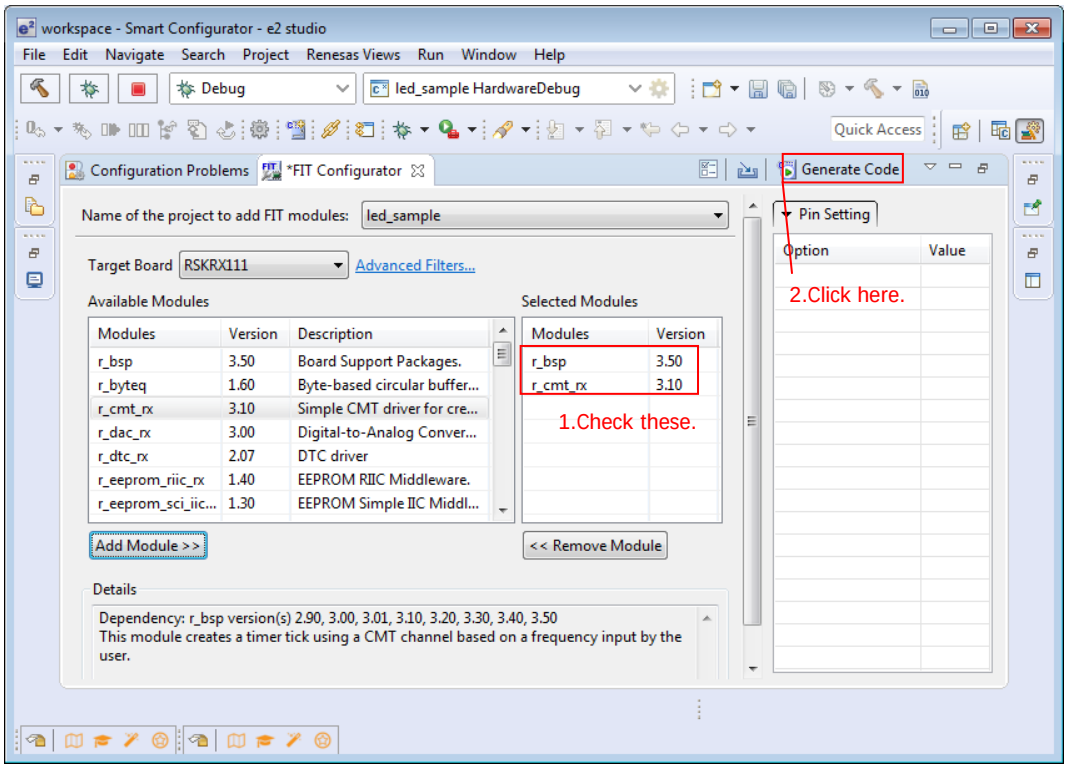

Figure 4-31 Generating Code

Note 1. Supplementary

The mark may appear in “Selected Modules”. It shows that the Warning has occurred in the added FIT module.

The contents of the Warning can be checked from “Console” tab. The occurrence of Warning is caused mainly by version mismatch of “r_bsp” that has dependencies with FIT module, and it occurs when the dependent information of the FIT module is not updated for the commonly updated “r_bsp”. The Warning can be ignored, as the updated “r_bsp” has backward compatibility.

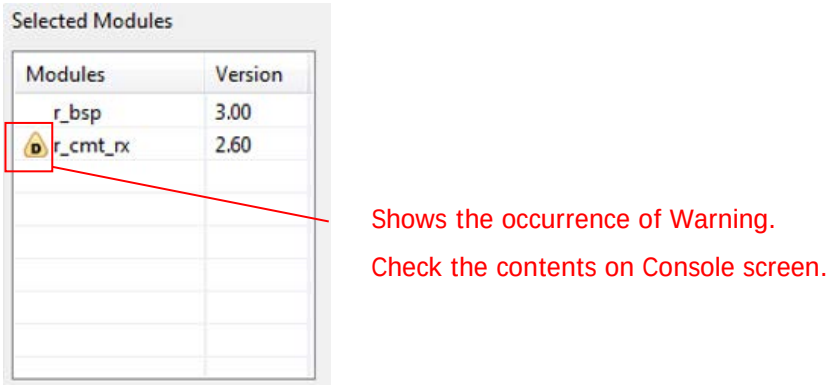

Figure 4-32 Supplementary: Selected Modules List

Example of CMT FIT module specifying the r_bsp ver.2.90

For the added r_bsp with ver.2.9 or later, the Warning can be ignored due to backward compatibility.

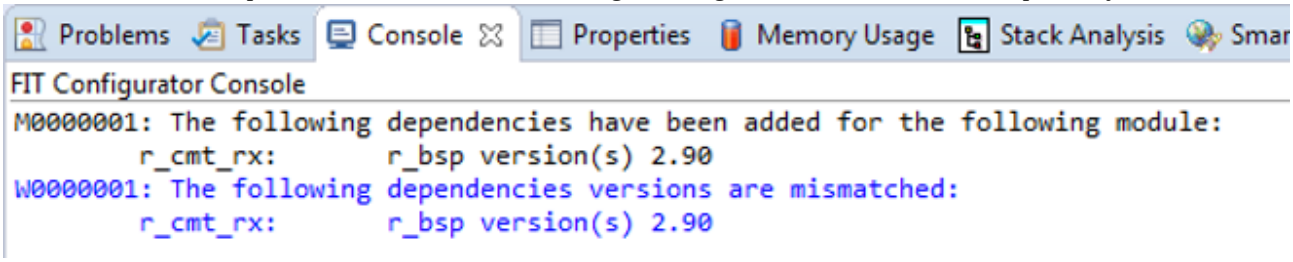

Figure 4-33 Supplementary: Console Tab

(d) **Code Generation - Summary Dialog Box**

In the **Code Generation - Summary** dialog box, click the **OK** button.

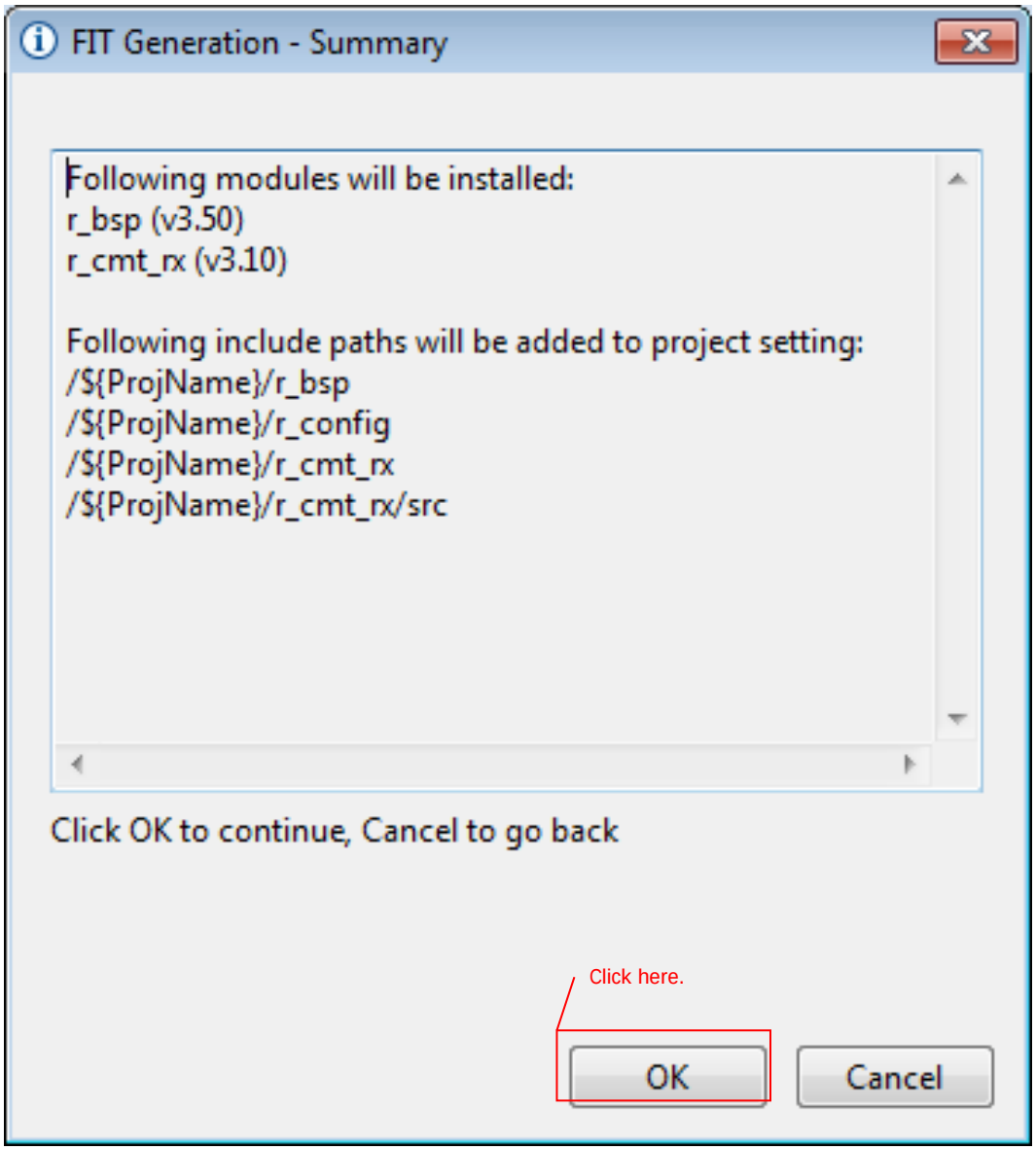

Figure 4-34 Code Generation - Summary Dialog Box

4.2 Create an LED Driving Program

Create a program that toggles the LED0 on/off state every 0.5 seconds using the compare match timer.

Open the file src/(the project name).c and modify it as shown below.*[1]

```
#include "platform.h"
#include "r_cmt_rx_if.h"

#define RDP_LED_OFF 1U
#define RDP_LED_ON 0U

/* Define PODR for LED0. In the case of RSKRX65N-2MB it will be as follows. */
/* #define LED0              PORT7.PODR.BIT.B3 */
#define RDP_LED0           LED0

/* Define PDR for LED0_PDR. In the case of RSKRX65N-2MB it will be as follows.
*/
/* #define LED0_PDR          PORT7.PDR.BIT.B3 */
#define RDP_LED_PDR        LED0_PDR

/* LED Currently status */
uint32_t ledstatus = RDP_LED_OFF;

void call_back(void *pdata)
{
      if (ledstatus == RDP_LED_OFF)
      {
            /* Turn ON the LED0 If the status is LED_OFF */
            RDP_LED0 = RDP_LED_ON;
            ledstatus = RDP_LED_ON;
      }
      else
      {
            /* Turn OFF the LED0 If the status is LED_ON */
            RDP_LED0 = RDP_LED_OFF;
            ledstatus = RDP_LED_OFF;
      }
}

void main(void)
{
      uint32_t cmt_ch;

      /* LED0 off */
      RDP_LED0 = RDP_LED_OFF;
      /* Create of 0.5 second(2Hz) cyclic timer. */
      R_CMT_CreatePeriodic(2, &call_back, &cmt_ch);

      while(1);
}
```

Figure 4-35 Sample program

Note 1. When using Smart Configurator it is necessary to enter a PODR setting in line 7 and a PDR setting in line 11 to match your environment. For details, refer to the user's manual: Hardware and Circuit diagram of your MCU.

4.3 Build and Try Running the Program

Build the program just created and verify that it runs.

1. Click **Build Project** on the **Project** menu.

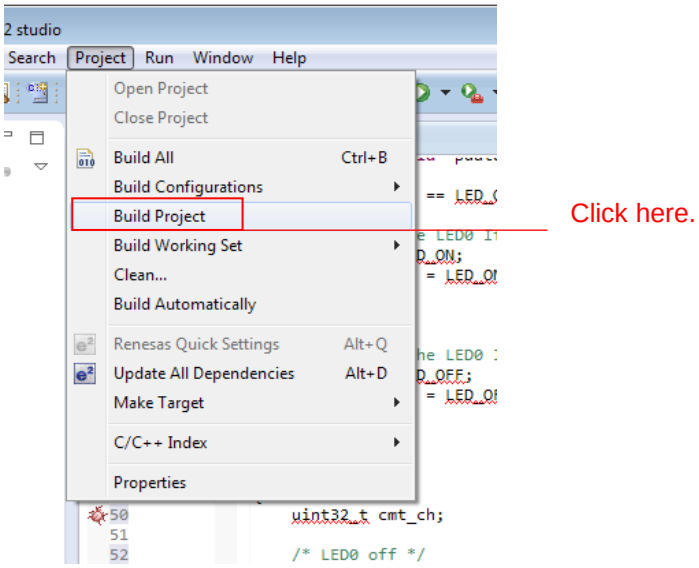

Figure 4-36 Build Project

2. When the build completes, the following will be displayed in **Console** view.

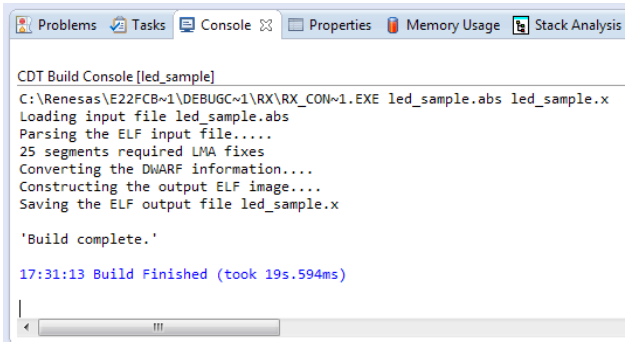

Figure 4-37 Console View

3. Click **Debug Build** on the **Run** menu.

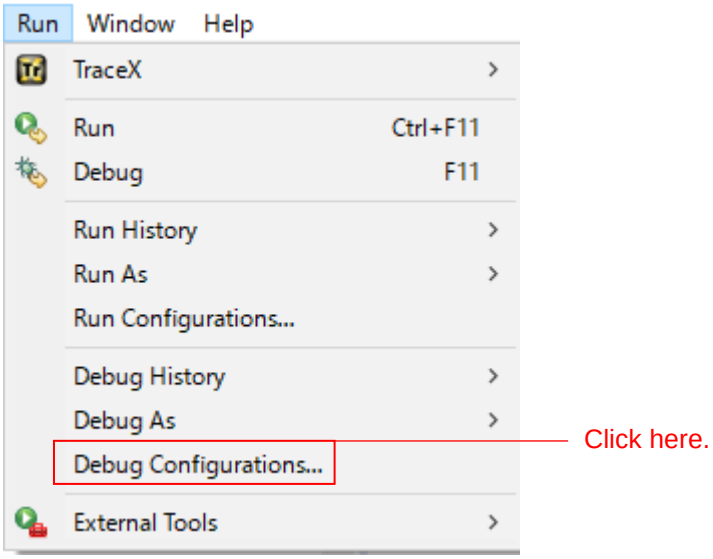

Figure 4-38 Debug Configuration

4. Click ◢ under the **Renesas GDB Hardware Debugging and c**lick **<project name> HardwareDebug**. Click the **Debugger** tab and click **Connection Settings**.
   Modify **EXTAL Frequency** to be **24.0000***[1] and change **Provide Power from Emulator** to **No***[2].
   When these changes have been made, click **Debug**.

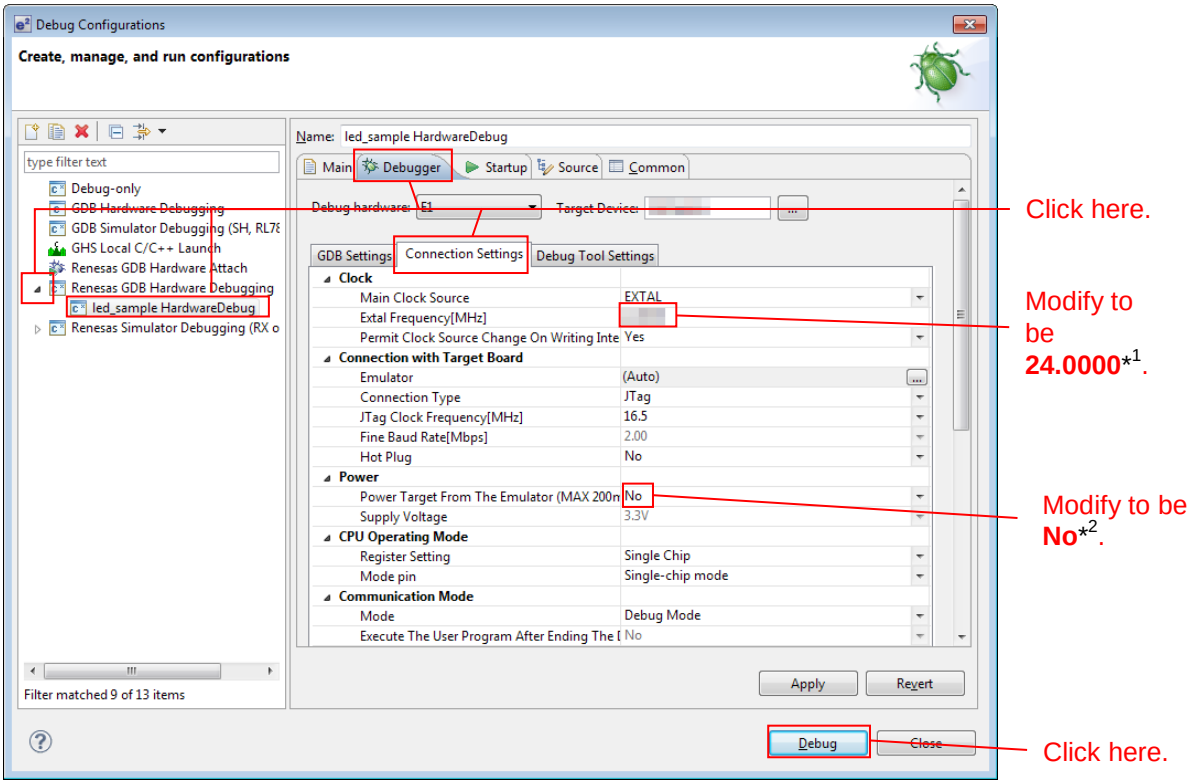

Figure 4-39 Debug Configuration

Note 1. Setting for Renesas Starter Kit+ for RX64M: review is required according to the environment you use.
Note 2. This is setting when using an external power supply. When supplying power from the emulator, select **Yes.**

5. When the following message is displayed, click **Yes**.

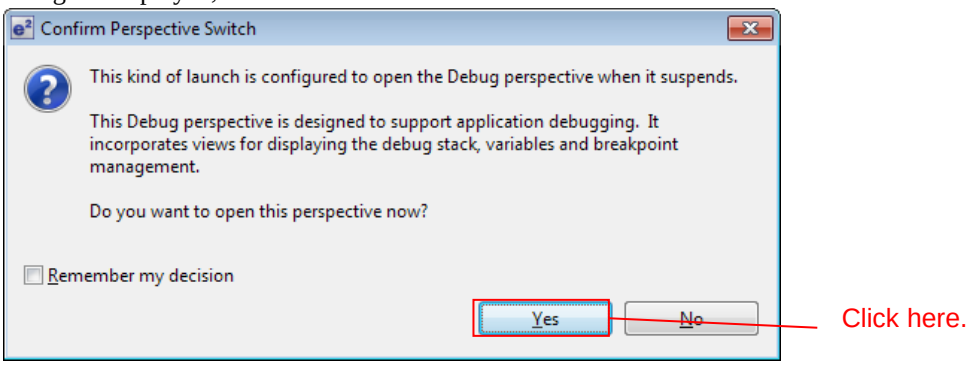

Figure 4-40 Confirm Perspective Switch

6. When the load module download completes, a **Debug** perspective opens.

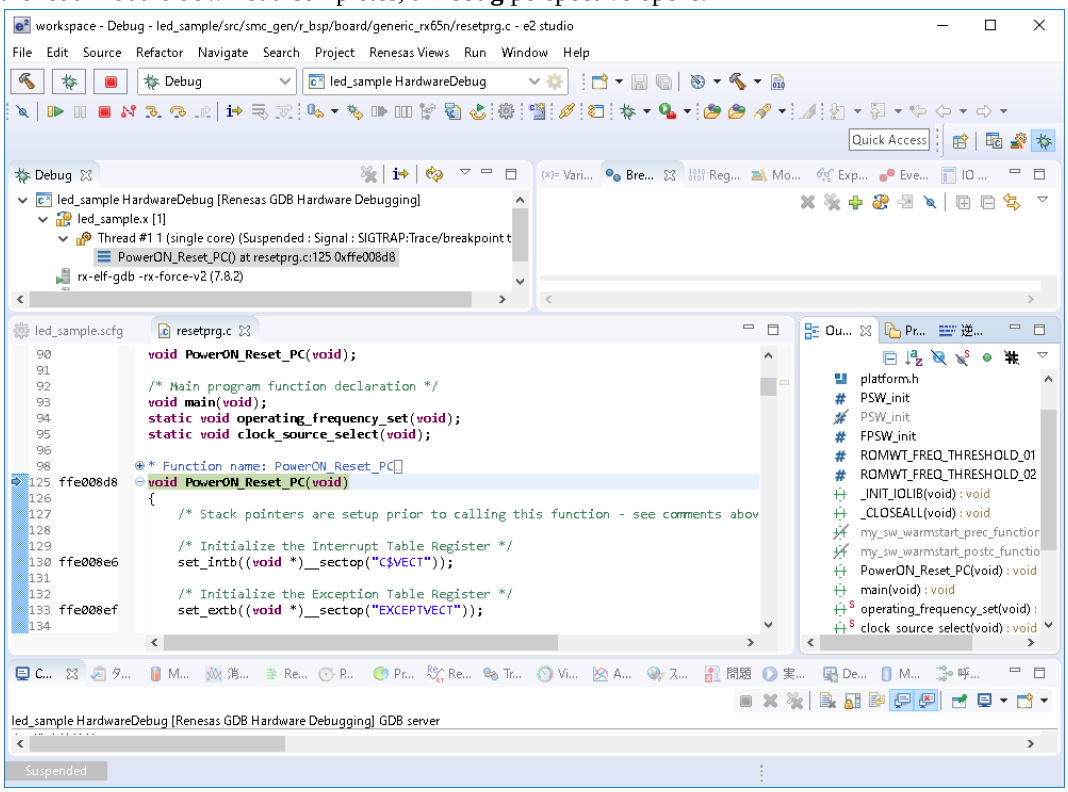

Figure 4-41 Debug

7. Click **Restart** on the toolbar. The program will be executed and a break will occur at the start of the main function.

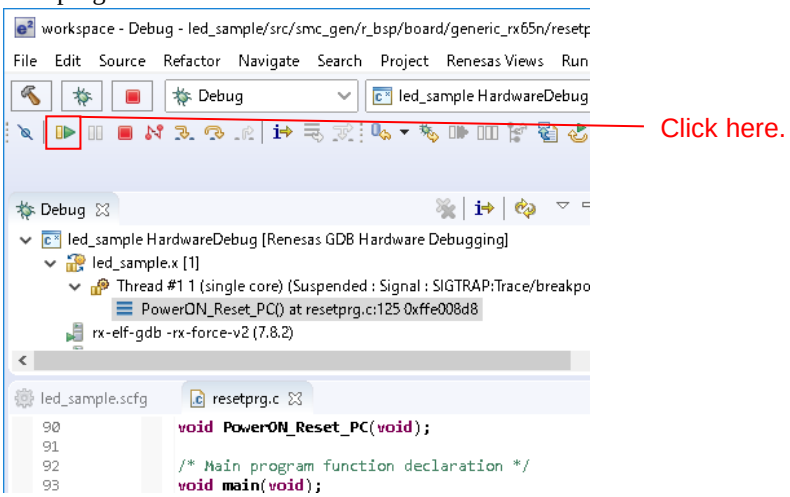

Figure 4-42 Restart Program

8. After the break at the start of the main function, click **Restart** on the tool bar again.
   The project will be run and the program will iterate toggling LED0 with a period of 0.5 seconds.

5. RX Driver Package Application

5.1 RX Driver Package Application Structure

The RX Driver Package Application is a sample application program provided so that users can use the RX Driver Package easily. The RX Driver Package Application consists of an application program that operates using device drivers and middleware included in the RX Driver Package and a project file for building that application. This allows users to start evaluation quickly.

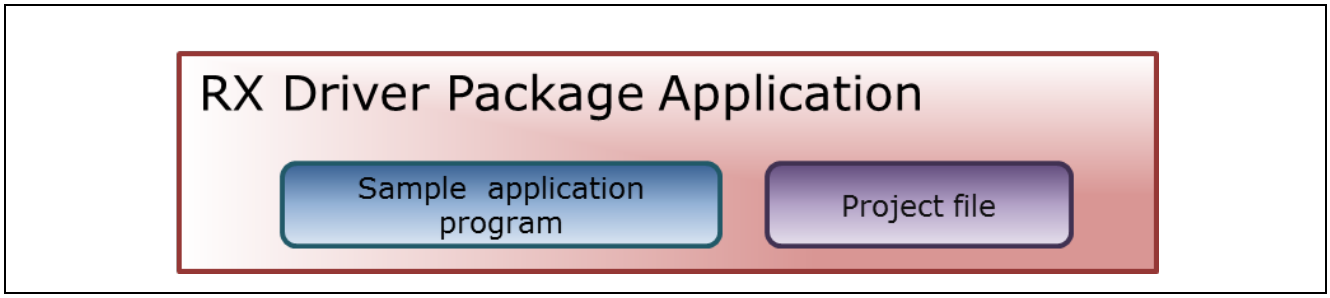

Figure 5-1 RX Driver Package Application Structure

Renesas plans to release a variety of types of this RX Driver Package Application in the future, such as system programs that operate using a combination of multiple drivers and middleware and evaluation programs for independent modules from the RX Driver Package.

For information of the latest RX Driver Package Application, refer to the “Products Supporting RX Driver Package Application” shown in the following URL.

https://www.renesas.com/rdp

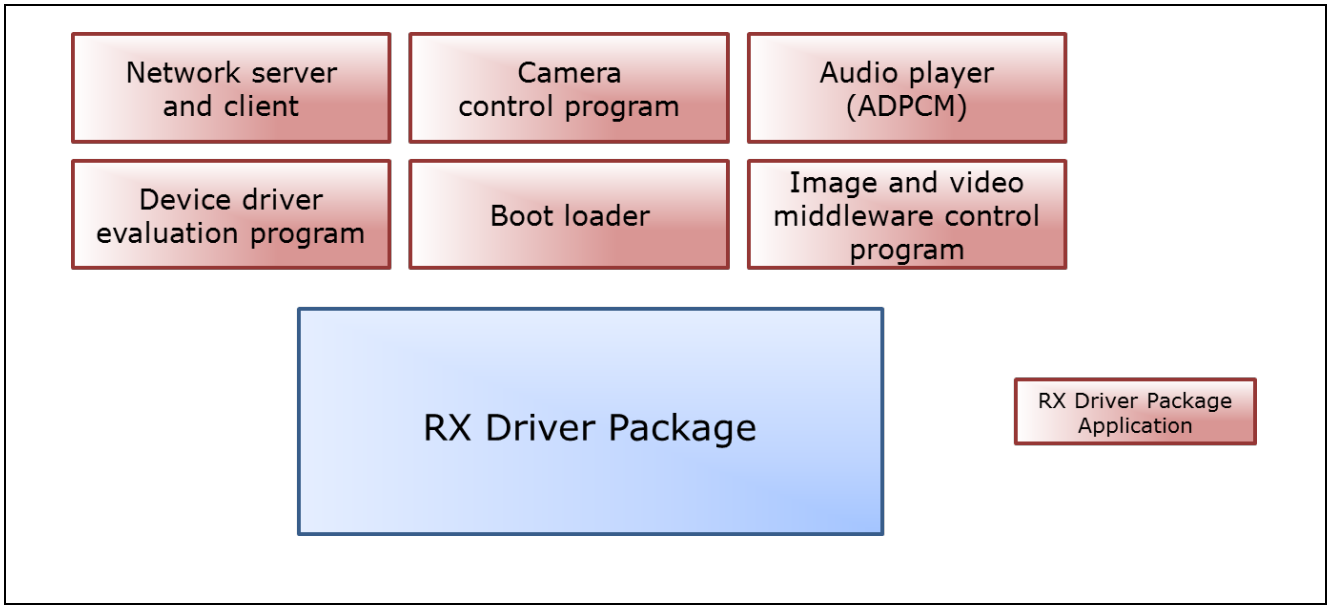

Figure 5-2 Types of RX Driver Package Application

6. Supplement

6.1 Commercial Version of Middleware and Drivers Supporting FIT

A list of the commercial version (paid) Middleware and Drivers for RX Family is shown below.

For the information of the latest commercial version (paid) Middleware and Drivers, refer to the page of the Middleware and Drivers. https://www.renesas.com/mw

Table 6-1 list of the commercial version (paid) Middleware and Drivers for RX Family

Commercial Version of Middleware and Drivers	URL	FIT Compliant
TCP/IP for Embedding M3S-T4-Tiny	https://www.renesas.com/mw/t4	Available

6.2 Sample Program

RX Driver Package is composed of FIT module group in a package, which does not include the sample program for operation confirmation. If the sample program is required, download the FIT module unit package separately*[1]. FIT module unit package has “FITDemos” folder an includes sample program or sample project.

Note 1. Note that some FIT modules may not provide sample program.

6.3 Location of the API Information for FIT Module

For the API information of FIT module embedded in the project, refer to the **doc** folder of each FIT module folder.

6.4 Check the RX Driver Package Downloaded

When successfully downloaded, FIT module is stored in the folder specified in ”FIT Module Folder Path:” described in “4.1.1(2)(c)”(Smart Configurator) “4.1.2(2)(a)”(FIT Configurator)(generally, C:\Renesas\e2_studio\ FITModules).

In “FITModules\Downloaded” folder, ZIP file of the package is stored.

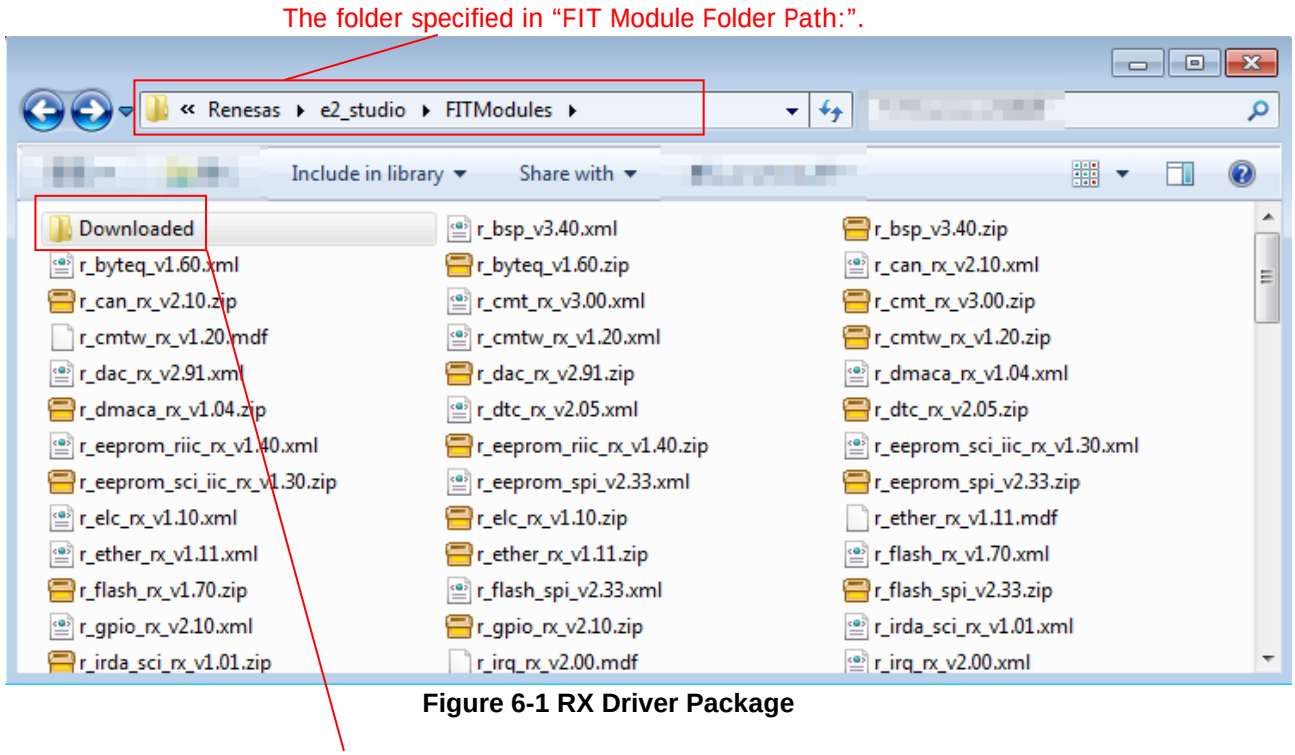

Figure 6-1 RX Driver Package

6.5 Update FIT Module

The following describes how to update the FIT module.

6.5.1 Environment Used for the Description

Upgraded IRQ FIT module Ver.9.99 (r_irq_rx_v9.99) is used as an example.

6.5.2 Add FIT Module

An intended FIT module is added to the folder specified in “FIT Module Folder Path:”.

For the file to be stored, ZIP file r_***_v*.**.zip and XML file r_***_v*.**.xml are mandatory, and MDF file r_***_v*.**.mdf are mandatory, if they exist.

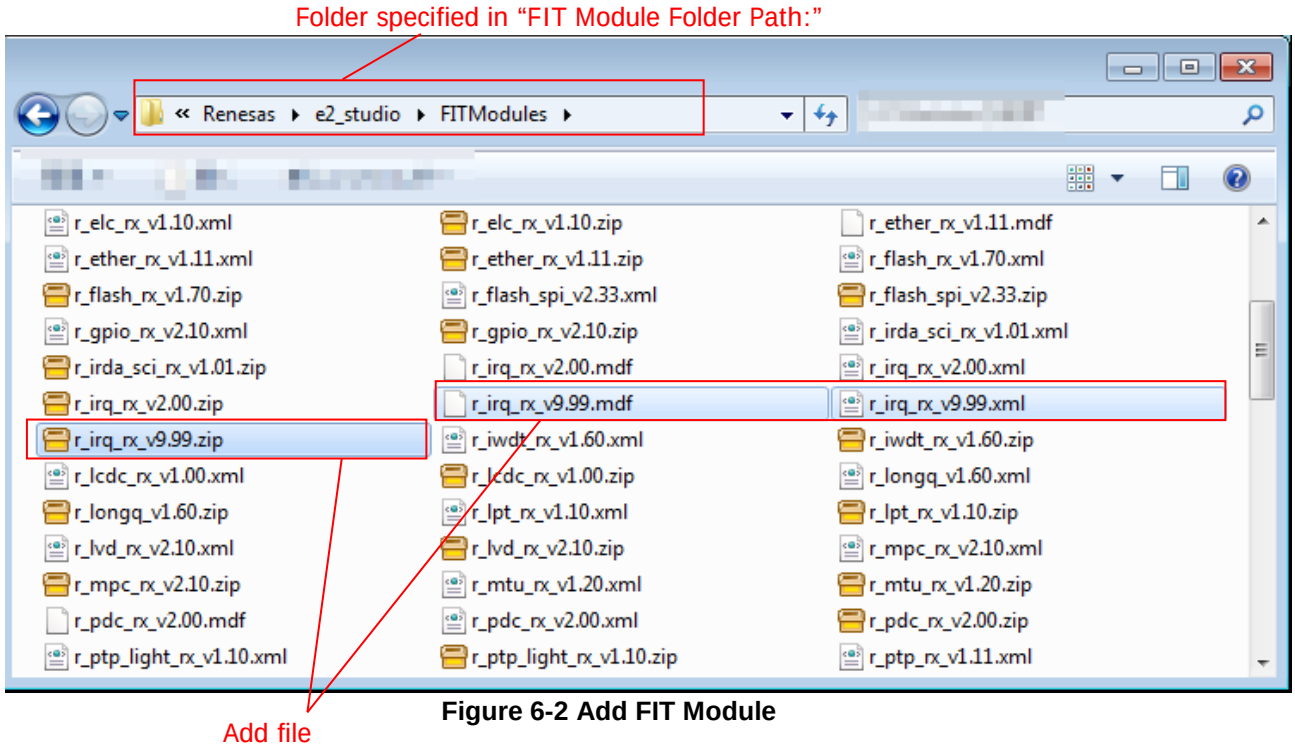

Figure 6-2 Add FIT Module

6.6 Confirm the FIT Module Added in FIT Configurator Screen

6.6.1 Smart Configurator

Please restart e2studio. The module is updated to the latest state.

(1) **Display additional screen of software component**

1. Select "Component" tab from "led_sample.scfg".
2. The "Software Component Settings" window will be displayed. Click the "Add Component" button.

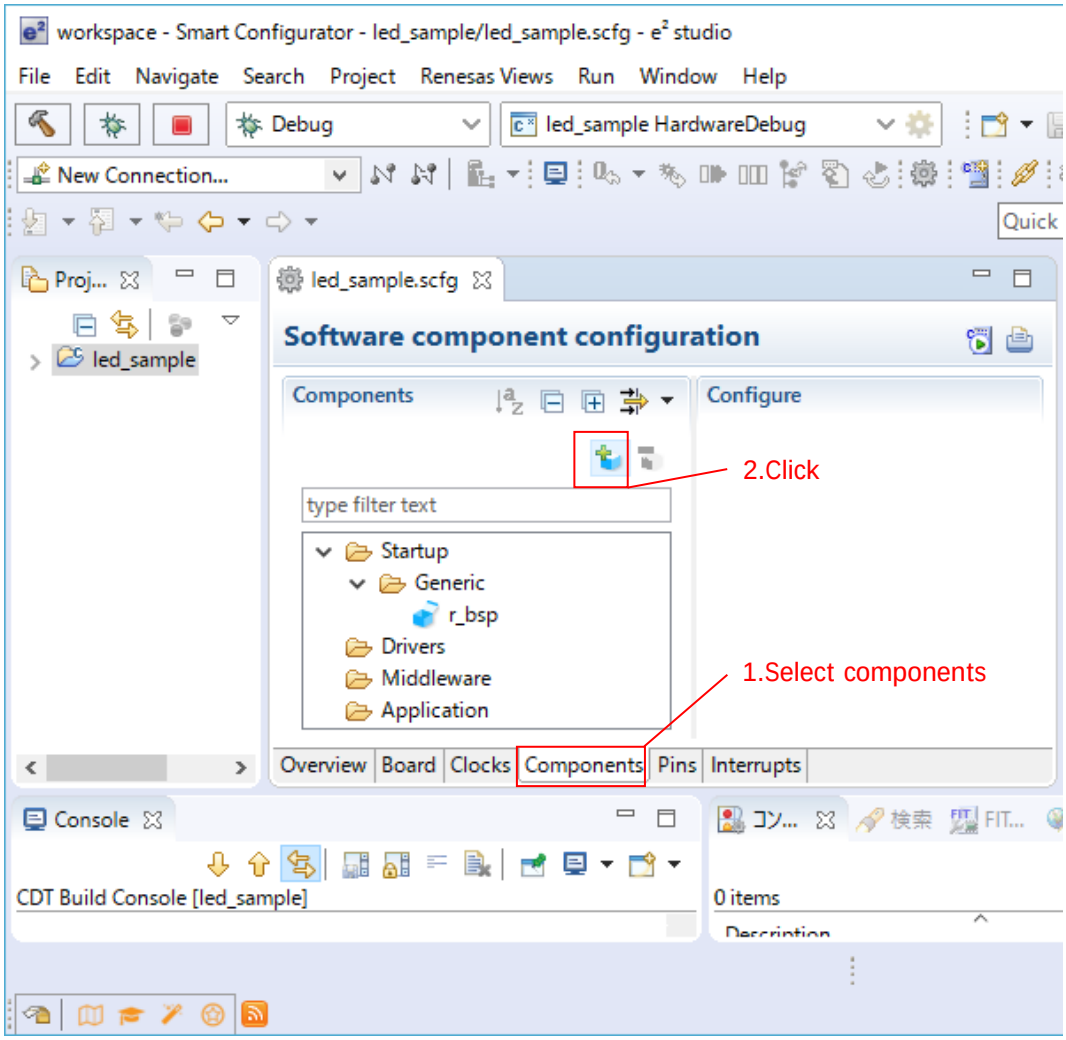

Figure 6-3 Display addtional screen of software component

(2) **Check the latest FIT module**

1. The latest version is displayed on the software component selection window.

See “4.1.1(3)” from then on to install the target FIT module.

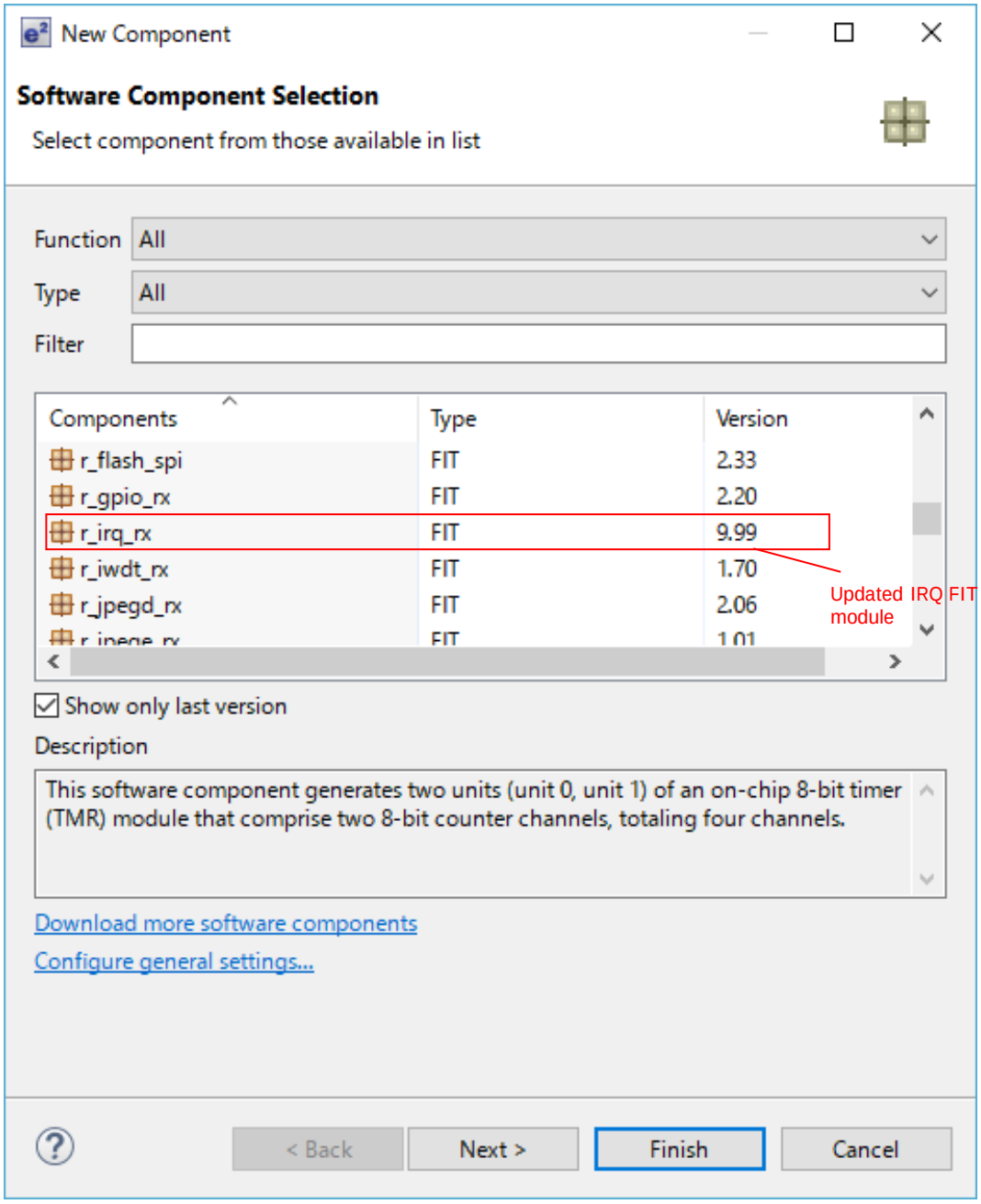

Figure 6-4 Check the latest FIT module

(3) **To select old Ver.**

1. If you clear the “Show only last version” check box, the old version will be displayed.
2. Select the desired version from the list.

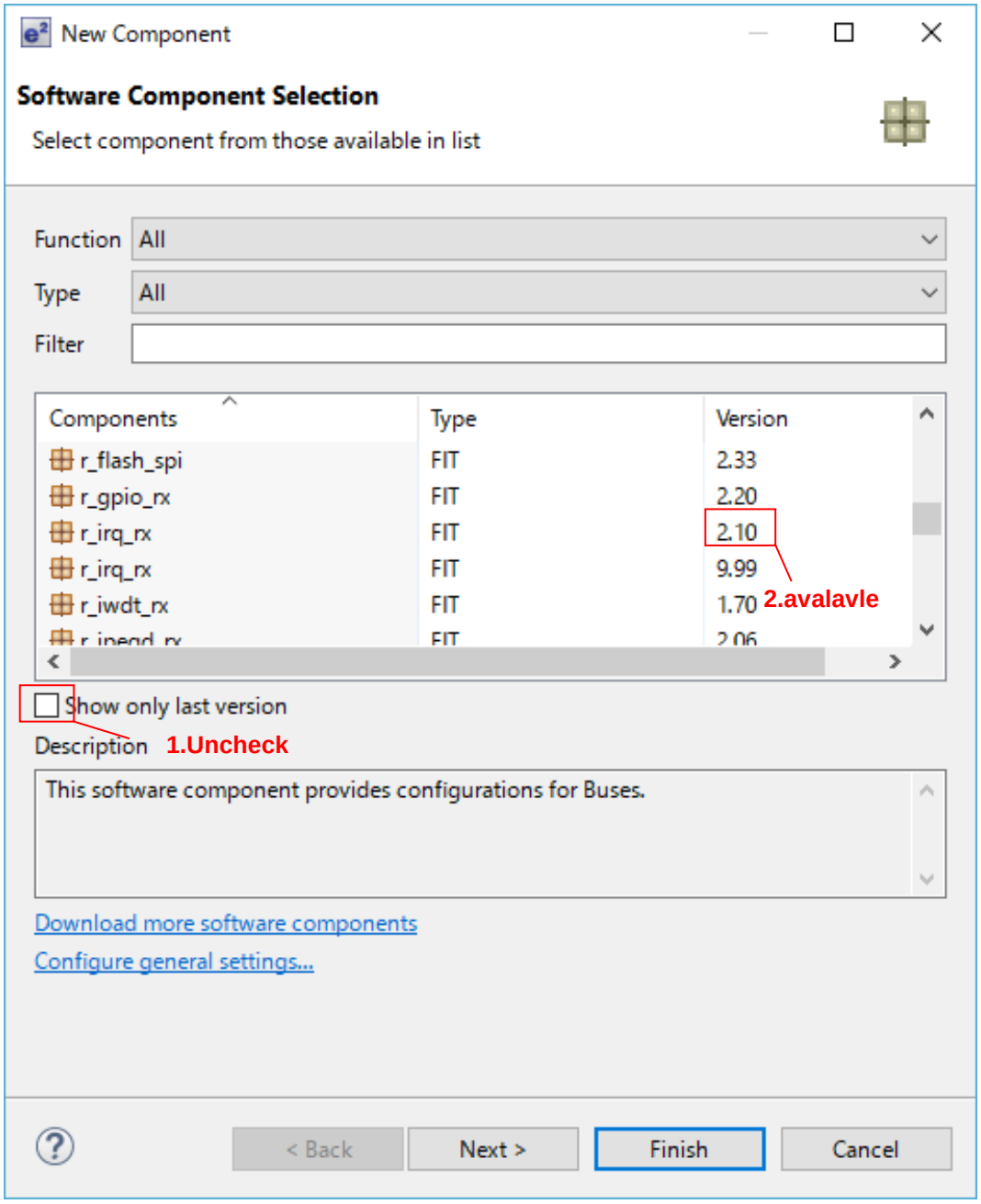

Figure 6-5 To select old Ver.

6.6.2 FIT Configurator

If FIT Configurator screen is displayed, clear this screen, then, reopen it. The screen information is not updated unless reopened.

(1) **Update the screen of FIT Configurator to the latest state**

1. Close the FIT Configurator tab.
2. Open FIT Configurator from Renesas view.

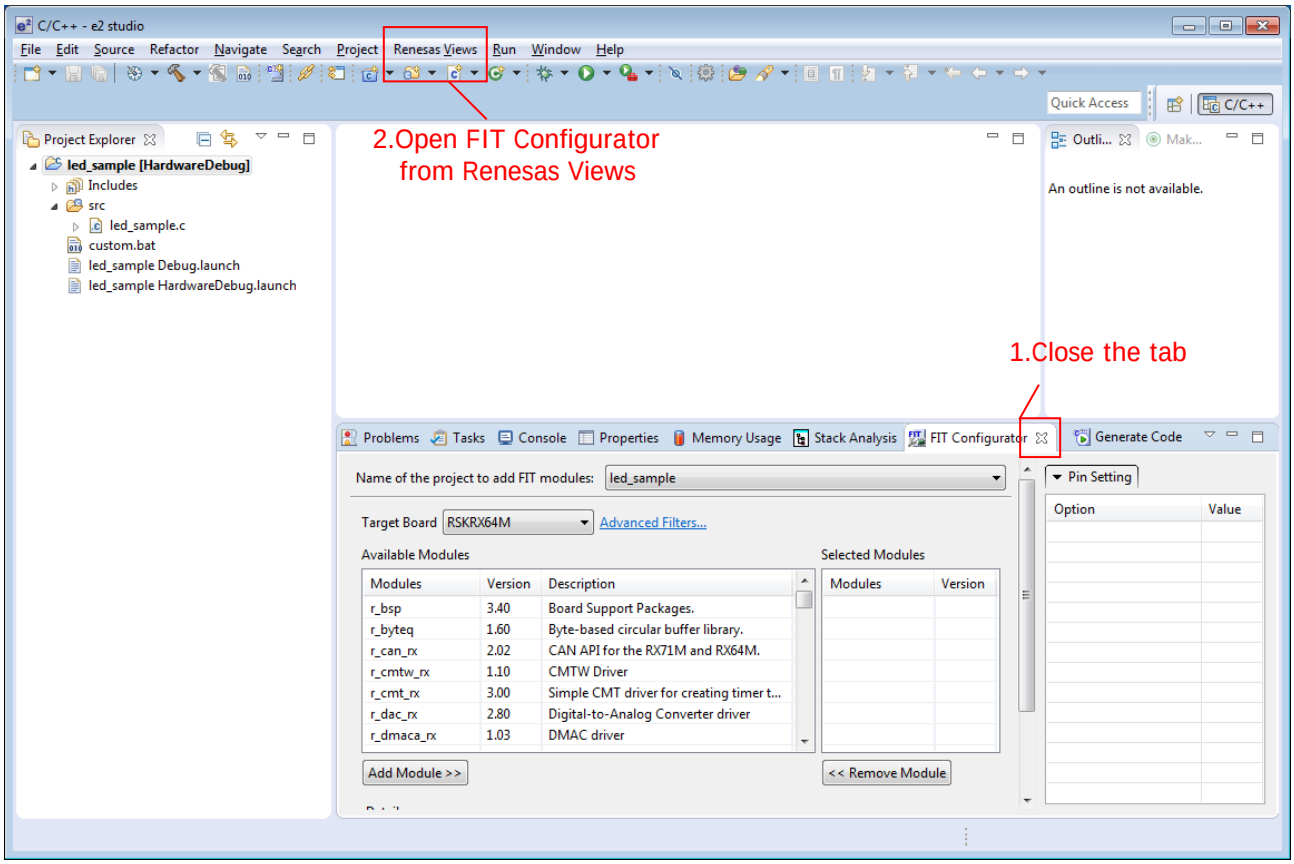

Figure 6-6 Update the screen of FIT Configurator to the latet state

(2) **Check the latest FIT module**

1. Confirm the FIT module added. Latest Ver. will appear on FIT Configurator screen (*).

See “4.1.2(3)” from then on to install the target FIT module.

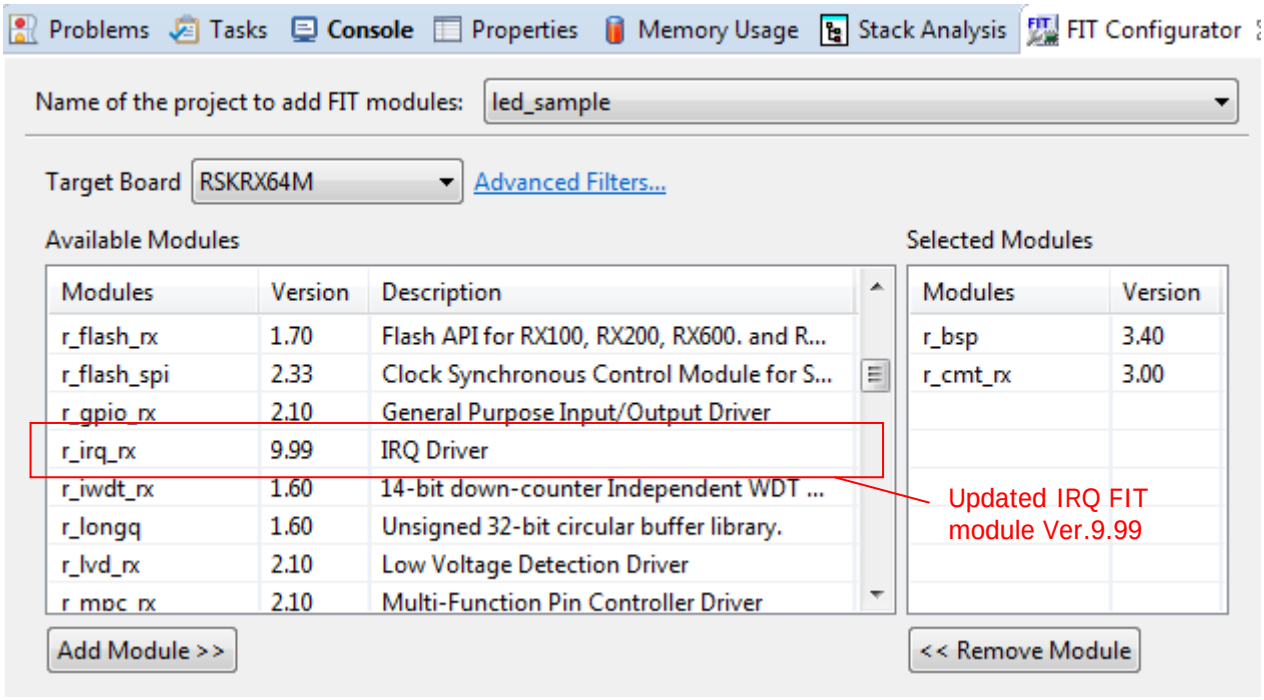

Figure 6-7 Check the latest FIT module

(3) **To select old Ver.**

1. Pulldown appears by clicking the FIT module Ver. Number.
2. Click pulldown to show old Ver.
3. Select the desired version from the pulldown.

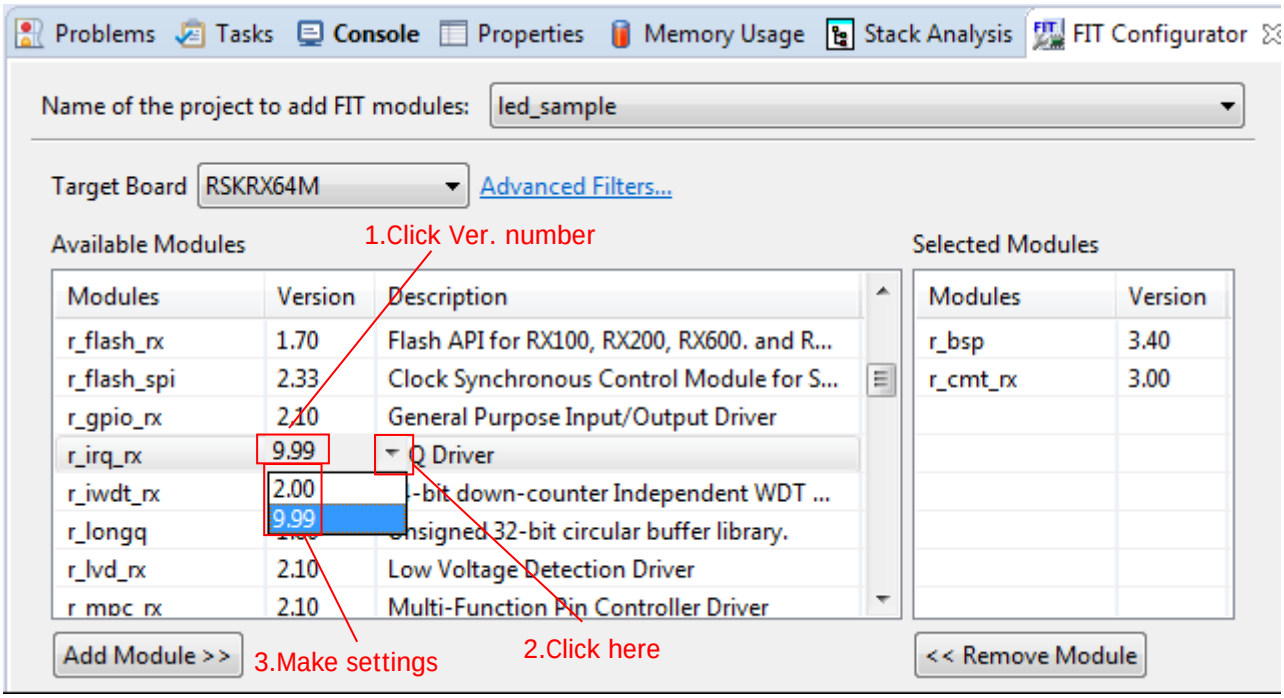

Figure 6-8 To select old Ver.

Website and Support

Renesas Electronics Website

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Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
1.14	Mar 31, 2018	-	First edition issued

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. 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 LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible. Unused pins should be handled as described under Handling of Unused Pins in the manual.

2. Processing at Power-on

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

   — The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the moment when power is supplied.
   In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the moment when power is supplied until the reset process is completed.
   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 moment when power is supplied until the power reaches the level at which resetting has been specified.

3. Prohibition of Access to Reserved Addresses

   Access to reserved addresses is prohibited.

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

4. Clock Signals

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

   — 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. Moreover, 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.

5. Differences between Products

   Before changing from one product to another, i.e. to a product with a different part number, confirm that the change will not lead to problems.

   — The characteristics of Microprocessing unit or Microcontroller unit products in the same group but having a different part number may differ in terms of the 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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