

RX Family

RX Driver Package Ver.1.12

APPLICATION NOTE

R01AN3651EJ0112 Rev.1.12 Apr 05, 2017

Introduction

This document is the RX Family RX Driver Package User's Manual, version 1.12.

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.

Target Device

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.

e² studio used for operation confirmation

V.5.2.0 or later version is used. The latest RX Driver Package is available on the current e² studio without access to the Web page.

The detail is described in 4.Usage Procedures explains.

Related Documents

- RX Family Board Support Package Module Using Firmware Integration Technology (R01AN1685EU)
- 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.



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1. Overview

1.1 Applicability

This User's Manual applies to the RX Family RX Driver Package, version 1.12.

1.2 Operating Environment

This package runs under the operating environment described below.

Table 1-1 Operating Environment (RX110)

Microcontroller	RX110 Group
Evaluation board	Renesas Starter Kit for RX110
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-2 Operating Environment (RX111)

Microcontroller	RX111 Group
Evaluation board	Renesas Starter Kit for RX111
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-3 Operating Environment (RX113)

Microcontroller	RX113 Group
Evaluation board	Renesas Starter Kit for RX113
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-4 Operating Environment (RX130)

Microcontroller	RX130 Group
Evaluation board	Renesas Starter Kit for RX130
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-5 Operating Environment (RX210)

Microcontroller	RX210 Group
Evaluation board	Renesas Starter Kit for RX210
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20



Table 1-6 Operating Environment (RX230)

Microcontroller	RX230 Group
Evaluation board	Renesas Starter Kit for RX230
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-7 Operating Environment (RX231)

Microcontroller	RX231 Group
Evaluation board	Renesas Starter Kit for RX231
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-8 Operating Environment (RX23T)

Microcontroller	RX23T Group
Evaluation board	Renesas Starter Kit for RX23T
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-9 Operating Environment (RX24T)

Microcontroller	RX24T Group
Evaluation board	Renesas Starter Kit for RX24T
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-10 Operating Environment (RX24U)

Microcontroller	RX24U Group
Evaluation board	Renesas Starter Kit for RX24U
Integrated development environment (IDE)	e ² studio, V5.3.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.06.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-11 Operating Environment (RX63N)

Microcontroller	RX63N Group
Evaluation board	Renesas Starter Kit for RX63N
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20



Table 1-12 Operating Environment (RX64M)

Microcontroller	RX64M Group
Evaluation board	Renesas Starter Kit+ for RX64M
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-13 Operating Environment (RX65N)

Microcontroller	RX65N Group
Evaluation board	Renesas Starter Kit+ for RX65N
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20

Table 1-14 Operating Environment (RX71M)

Microcontroller	RX71M Group
Evaluation board	Renesas Starter Kit+ for RX71M
Integrated development environment (IDE)	e ² studio, V5.2.0 or later
Cross tools	RX Family C/C++ Compiler Package V2.05.00 or later
Emulator	E1, E2 emulator Lite, E20



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.

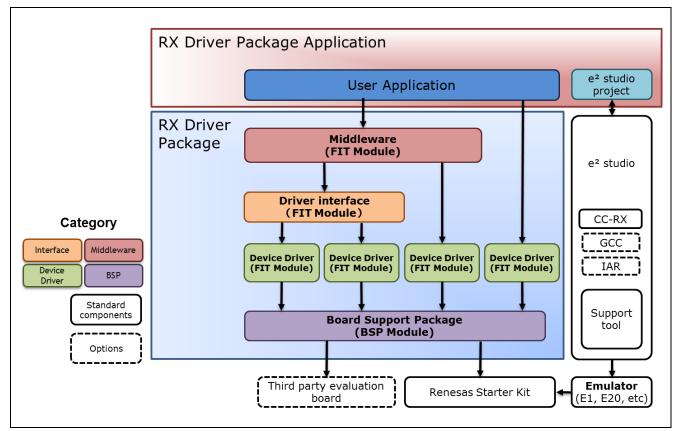


Figure 2-1 System Structure



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.

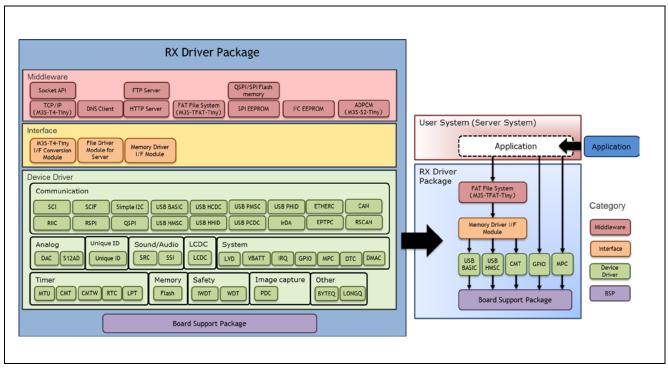


Figure 2-2 An example of system build

(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

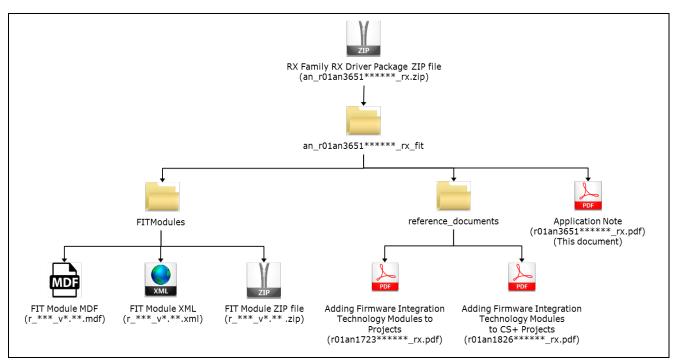


Figure 3-1 Folder Structure of the RX Family RX Driver Package



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.1.11 (R01AN3467EJ), many Firmware Integration Technology (FIT) modules have been updated. Differences from Family RX Driver Package Ver.1.11 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	3.50	Updated

(2) Device Driver

Table 3-2 Device Driver

Module	FIT Module Name	Rev	Update Information
Voltage Detection Circuit (LVD)	r_lvd_rx	2.20	Updated
Low Power Consumption (LPC)	r_lpc_rx	1.40	Added
Battery Backup (VBATT)	r_vbatt_rx	1.01	Same
Interrupt Controller (IRQ)	r_irq_rx	2.10	Updated
Data Transfer Controller (DTC)	r_dtc_rx	2.07	Updated
DMA Controller (DMAC)	r_dmaca_rx	1.04	Same
I/O Ports (GPIO)	r_gpio_rx	2.20	Updated
Multi-Function Pin Controller (MPC)	r_mpc_rx	2.20	Updated
Compare Match Timer (CMT)	r_cmt_rx	3.10	Updated
Compare Match Timer W (CMTW)	r_cmtw_rx	1.20	Same
Real-Time Clock (RTC)	r_rtc_rx	2.50	Same
Low Power Timer (LPT)	r_lpt_rx	1.11	Updated
Independent Watchdog Timer (IWDT)	r_iwdt_rx	1.70	Updated
Watchdog Timer (WDT)	r_wdt_rx	1.00	Same
Serial Communications Interface (SCI: Asynchronous/Clock Synchronous)	r_sci_rx	1.90	Updated
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 ² C Bus)	r_sci_iic_rx	2.00	Same



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5			0
I ² C Bus Interface (RIIC)	r_riic_rx	2.00	Same
Serial Peripheral Interface	r_rspi_rx	1.60	Updated
Serial Peripheral Interface (RSPI: Device Driver for Serial Memory Control)	r_rspi_smstr_rx	1.13	Updated
Quad Serial Peripheral Interface (QSPI: Device Driver for Serial Memory	r_qspi_smstr_rx	1.09	Same
Control)			
USB Basic Firmware	r_usb_basic	1.20	Same
USB Host Mass Storage Class	r_usb_hmsc	1.20	Same
USB Host Communication Device Class	r_usb_hcdc	1.20	Same
USB Host Human Interface Device Class	r_usb_hhid	1.20	Same
USB Peripheral Mass Storage Class	r_usb_pmsc	1.20	Same
USB Peripheral Communications Device Class	r_usb_pcdc	1.20	Same
USB Peripheral Human Interface Device Class	r_usb_phid	1.20	Same
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	1.12	Updated
EPTPC Light Module	r_ptp_light_rx	1.11	Updated
Ethernet controller (ETHERC)	r_ether_rx	1.12	Updated
CAN Module (CAN)	r_can_rx	2.10	Same
CAN Module (RSCAN)	r_rscan_rx	1.10	Updated
IrDA Interface (IrDA)	r_irda_sci_rx	1.01	Same
Parallel Data Capture Unit (PDC)	r_pdc_rx	2.00	Same
12-Bit A/D Converter (S12AD)	r_s12ad_rx	2.20	Updated
D/A Converter (DAC)	r_dac_rx	3.00	Updated
Flash Memory (On-chip flash memory Programing)	r_flash_rx	2.10	Updated
Sampling Rate Converter (SRC)	r_src_api_rx	1.11	Same
Serial Sound Interface (SSI)	r_ssi_api_rx	1.20	Same
LCD Controller/Driver (LCDC)	r_lcdc_rx	1.00	Same
Unique ID Read	r_uid_rx	1.00	Same
Byte Queue Buffer (Data Management)	r_byteq	1.60	Same
Long Queue Buffer (Data Management)	r_longq	1.60	Same
		4.46	_

Event Link Controller (ELC)

RX Family



1.10

Same

r_elc_rx

(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	2.06	Updated
Interface conversion module for Ethernet Driver and Embedded system M3S-T4-Tiny	r_t4_driver_rx	1.06	Updated
System Timer Module	r_sys_time_rx	1.00	Added
SPI Serial EEPROM Module	r_eeprom_spi	2.33	Same
SPI Serial Flash memory Module	r_flash_spi	2.33	Same
I2C Bus Interface (RIIC) Module for EEPROM Access	r_eeprom_riic_rx	1.40	Same
Simple I2C Module for EEPROM Access	r_eeprom_sci_iic_rx	1.30	Same
JPEG Decoder Module	r_jpegd_rx	2.06	Added
JPEG Encoder Module	r_jpege_rx	1.01	Added
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 librory version, please go to the below URL.	rary) of evaluation version	on. For	the commercial

https://www.renesas.com/en-us/products/software-tools/software-os-middleware-driver/communicationsoftware/m3s-t4-tiny.html (Americas)

<u>https://www.renesas.com/pt-br/products/software-tools/software-os-middleware-driver/communication-software/m3s-t4-tiny.html</u> (Brazil)

<u>https://www.renesas.com/en-eu/products/software-tools/software-os-middleware-driver/communication-software/m3s-t4-tiny.html</u> (Europe/Middle East/Africa)

https://www.renesas.com/ja-jp/products/software-tools/software-os-middleware-driver/communicationsoftware/m3s-t4-tiny.html (Japan)

https://www.renesas.com/zh-cn/products/software-tools/software-os-middleware-driver/communicationsoftware/m3s-t4-tiny.html (Mainland China/Hong Kong Region)

https://www.renesas.com/en-sg/products/software-tools/software-os-middleware-driver/communicationsoftware/m3s-t4-tiny.html (Singapore/South & Southeast Asia/Oceania)

https://www.renesas.com/en-in/products/software-tools/software-os-middleware-driver/communicationsoftware/m3s-t4-tiny.html (India)

<u>https://www.renesas.com/ko-kr/products/software-tools/software-os-middleware-driver/communication-software/m3s-t4-tiny.html</u> (South Korea)

https://www.renesas.com/zh-tw/products/software-tools/software-os-middleware-driver/communicationsoftware/m3s-t4-tiny.html (Taiwan Region)



4. Usage Procedures

The RX Driver Package allows programs to be easily constructed by using the FIT Configurator included in e^2 studio. The remainder of this section presents a simple usage example using e^2 studio. To use CS+, see the document "RX Family Adding Firmware Integration Technology Modules to CS+ Projects (R01AN1826EJ)" included in this package.

4.1 Application Creation

In this section, create a simple application that drives an LED.

4.1.1 Environment Used

The RX64M is used as the target microcontroller and the Renesas Starter Kit+ RX64M is used as the target board. If different environment is used, replace the descriptions used in the example according to the environment you use.

4.1.2 Create a Workspace and a Project

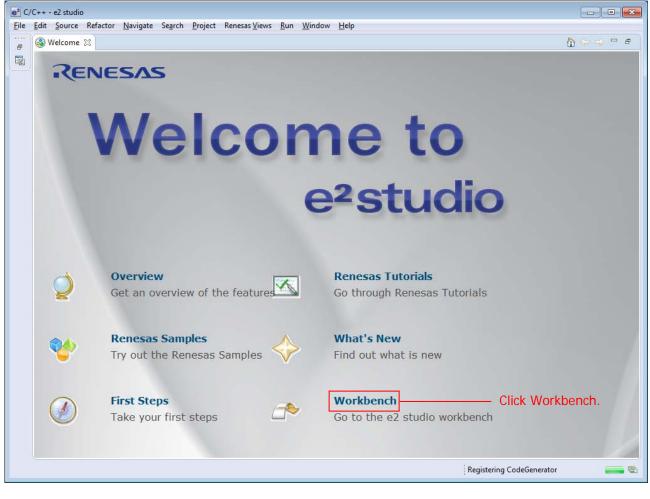
First, create a new workspace and a new project.

- 1. Start e² studio.
- 2. Enter an arbitrary workspace folder in the displayed dialog box and click OK.

e ² Workspace Launcher
Select a workspace
e2 studio stores your projects in a folder called a workspace. Choose a workspace folder to use for this session.
<u>W</u> orkspace: ▼ <u>B</u> rowse
1.Enter a workspace folder.
2.Click OK.
Use this as the default and do not ask again
OK Cancel



3. When the following window is displayed, click Workbench.





4.1.3 Create a Project and Download RX Driver Package

1. When the workbench has started, select **New** from the **File** menu and click **C Project**.

e ² C	/C++ - e2 studio					
File) Edit Source Refactor N	avigate Search I	roje	ct Renesas Views Run Window Help		
	New	Alt+Shift+N ►	C.	CProject Click here.		1 - 1
	Open File		C+	C++ Project		
	Close	Ctrl+W	Ċ	Synergy C Project		
	Close All	Ctrl+Shift+W	e e	Synergy C++ Project (Beta) Makefile Project with Existing Code		
	Save	Ctrl+S		Project		
	Save As		C++	Convert to a C/C++ Project (Adds C/C++ Nature)		
li i	Save All Revert	Ctrl+Shift+S	<u>6</u>	Source Folder		
			Ċ	Folder		
	Move Rename	F2	Ċ	Source File		
£	Refresh	F5	h [°]	Header File File from Template		
	Convert Line Delimiters To	•	G	Class		
Ð	Print	Ctrl+P		Other	Ctrl+N	
	Switch Workspace	•				1
	Restart					
2	Import					
2	Export					
	Properties	Alt+Enter				
	Exit					



2. Enter the project name. For the project type, click **Sample Project** under **Executable** (**Renesas**). For the tool chain, click **Renesas RXC Toolchain**. After making these settings, click **Next**.

C Project Create C project of selected type 1.Enter the project name. Project name: led_sample Image: Sample Project Image: Sample Project	
✓ Use default location ⊥ocation: C:\sample_workspace\led_sample ✓ Create Directory for Project Project type: Toolchains: ▲ Executable (Renesas)	
Executable (Renesas) KPIT GNUARM-NONE-EABI Toolchain	
 Static Library (Renesas) Sample Project Debug-Only Project Executable Shared Library Static Library Others Others Makefile project Makefile project Show project types and toolchains only if they are supported on the platform Show project types and toolchains only if they are supported on the platform 	Click here.



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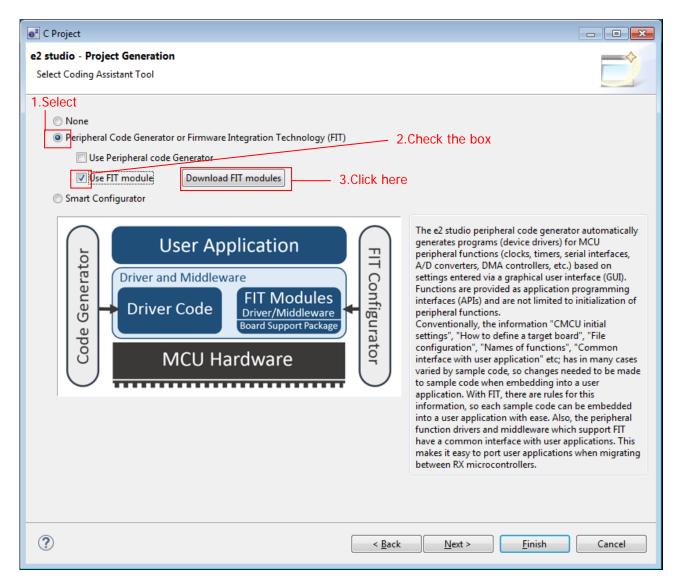
3. Select the target. Click the "..." button under **Target Selection** and select **R5F564MLCxFC** (*). After making these settings, click **Next**.

* Setting for Renesas Starter Kit+ for RX64M : review is required according to the environment you use.

Toolchain Version : Debug Hardware: Data endian : Select Target: Renesas RTOS suppo Select Configuration I Hardware Debug Debug using Sir Release (no deb	ns: g : Debug using hardware nulator : Debug using simulator	1.Click here and select R5F564MLCxFC for Renesas Starter Kit+ for F
Build configurations options, however by first configuration so (RX600) the debug h	will be created in the project only for the default the project will be built for the a elected from group. Based on the device ardware (E1 (RX)) and debug target (R5F automatically created for you.	e selected debug mode active configuration i.e., selection you made



4. Select "Peripheral Code Generator or Firmware Integration Technology (FIT)", and check the box of "Use FIT module" and click "Download **FIT modules"**.





5. Select RX Driver Package to be downloaded. Check the box of "Show RX Driver Package only" in "Filtered:". Then, check the box of the RX Driver Package you download. Set the "FIT Module Folder Path:" (*), and click **Download**.

FIT Module Download			_		×
Title	Document No.	Rev.	Issue da		
RX Family RX Driver Package Ver.1.12					
2.Check the box					
1.Select					
Filtered:					
FIT Module Folder Path: C:¥Renesas¥e2_studio¥FITModules				Brows	e
Select All	Deselect All				
			Download	d Can	cel
		4.	Click her	e	

* Setting of "FIT Module Folder Path:"

The RX Driver Package downloaded is stored in the folder specified in "FIT Module Folder Path:". Arbitrary folder can be specified.

In the default setting, "FITModules" folder is specified. (Generally, C:\Renesas\e2_studio\FITModules). "FITModules" folder is automatically created by clicking "Download **FIT modules**" described in "0 - 4".



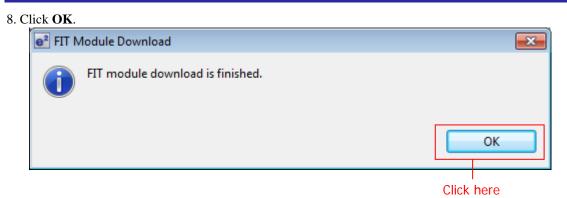
6. Enter My Renesas email address and password and click **OK**. This screen does not appear if you have already entered them.

My Renesas	
ly Renesas	
Enter the e-mail address and password that you registered for My Renesas. They allow you to download documents and software by using Smart Browser.	1.Enter email address and password
Email Address:	
Password:	
Create a My Renesas account to use our tool download services, receive l Click [About My Renesas] to register it.	Newsletter / Update Notice, and take advantage of our other services.
circle (Abball infy itericality to register ite	
	About My Renesas OK Cancel

7. Check the contents and click "Agree".

e ² End User License Agreement (Sample Code)	×
END USER LICENSE AGREEMENT	H
This End User License Agreement (this "EULA") is between you, on behalf of yourself and the company or other entity on whose behalf you are acting (together, "you" and "your") and Renesas Electronics Corporation, a Japanese corporation, with a principal place of business at 6-2 Otemachi 2-chome, Chiyoda-Ku, Tokyo, Japan ("Renesas") and is effective from the date on which you click "I AGREE." In consideration of the mutual promises and covenants herein, you and Renesas hereby agree as follows:	·
1. Definitions.	Ŧ
Agree Disagre	ee
 Click here	





9. Click Finish.

e ² C Project		
e2 studio - Project Generation Select Coding Assistant Tool		
 None Peripheral Code Generator or Firmware Integration Technology (FIT) Use Peripheral code Generator Use FIT module Townload FIT modules Smart Configurator 	FIT Configurator	The e2 studio peripheral code generator automatically generates programs (device drivers) for MCU peripheral functions (clocks, timers, serial interfaces, A/D converters, DMA controllers, etc.) based on settings entered via a graphical user interface (GUI). Functions are provided as application programming interfaces (APIs) and are not limited to initialization of peripheral functions. Conventionally, the information "CMCU initial settings", "How to define a target board", "File configuration", "Names of functions", "Common interface with user application" etc; has in many cases varied by sample code, so changes needed to be made to sample code when embedding into a user application. With FIT, there are rules for this information, so each sample code can be embedded into a user application with ease. Also, the peripheral function drivers and middleware which support FIT have a common interface with user applications. This makes it easy to port user applications when migrating between RX microcontrollers.
?	< <u>B</u> ack	<u>N</u> ext > <u>Finish</u> Cancel
		Click here

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10. Click **OK**. The project will be generated.

e ² Project generator summary	- • •						
Project summary for led_sample							
 The following target device settings and files will be generated. 							
PROJECT NAME : led_sample PROJECT DIRECTORY : C:\sample_workspace CPU SERIES : RX600 CPU TYPE : RX64M TOOLCHAIN NAME : Renesas_RXC TOOLCHAIN VERSION : v2.05.00 GENERATION FILES : Custom Batch file \custom.bat Main Program \src\led_sample.c							
? Ок	Cancel						
Click here							

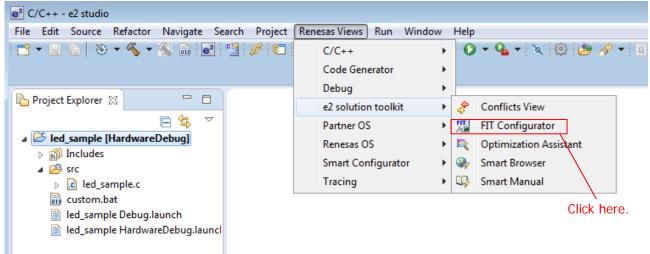


4.1.4 Install the FIT Modules with the FIT Configurator

Install the required modules with the FIT Configurator into the created project.

Here, install the CMT FIT module (r_cmt_rx).

1. In the Renesas Views menu, select e2 solution toolkit and click FIT Configurator.

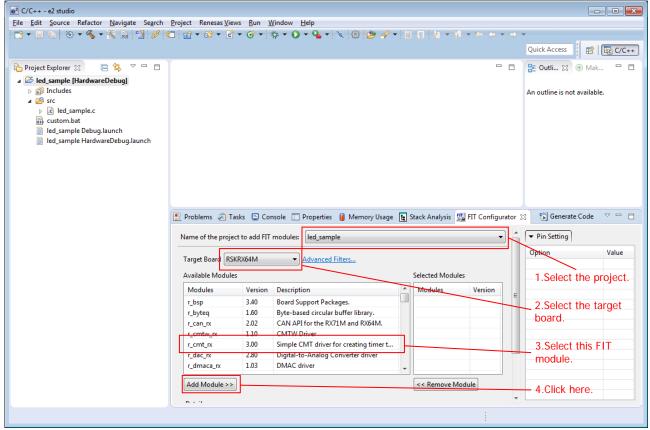


2. In the **FIT Configurator** tab,

Select the created project with **Project to Add FIT Module** to.

Next, select RSKRX64M from Target Board.

Next, click **r_cmt_rx** in the module list and click **Add Module** >>.





3. Check **r_bsp** and **r_cmt_rx** are added in **Selected Modules***.

Then, click Generate Code.

arget Board RSI		Advanced Filters		Selected Modul	les	2	2.Click h	ere.
Modules	Version	Description		Modules	Version			
_bsp	3.40	Board Support Packages.		r bsp	3.40			
_bsp _byteq	1.60	Byte-based circular buffer library.		r cmt rx	3.00			
_can_rx	2.02	CAN API for the RX71M and RX64M.		cix	5100			
cmtw rx	1.10	CMTW Driver						
_cmt_rx	3.00	Simple CMT driver for creating timer tick.		1.Checl	k here.			
_dac_rx	2.80	Digital-to-Analog Converter driver						
dmaca rx	1.03	DMAC driver						
dtc rx	2.04	DTC Module	-					
Add Module >>]			< Remove M	lodule			
iodefines, and N	ige provides ICU informa	a foundation for code to be built on top of. It tion for different boards. There are 2 folders tl es that are common to a MCU group. These fi	hat ma	ake up the r_bsp	package.			

* Supplementary note

The mark **(a)** 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.

Selected Modules

Modules	Version	Shows the occurrence of Warning.					
r_bsp	3.00						
r_cmt_rx	2.60	Check the contents on Console screen.					
		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.					
🖹 Problems	Tasks	🗐 Console 🙁 🔲 Properties 📲 Memory Usage 😭 Stack Analysis 🛶 Smar					
FIT Configurat	or Console						
M0000001: T	he follo	ing dependencies have been added for the following module:					

r	cmt	rx:	r bsp version(s) 2.90
W0000001:	The	following	dependencies versions are mismatched:
r.	cmt	rx:	r_bsp version(s) 2.90

4. Click **OK** with changing anything.

Following modules will be in	nstalled:	
r_bsp (v3.40)		
r_cmt_rx (v3.00)		
Following include paths will /\${ProjName}/r_bsp /\${ProjName}/r_config /\${ProjName}/r_cmt_rx /\${ProjName}/r_cmt_rx/src	be added to project setting:	
		-
<	F	



4.1.5 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.

src/(the project name).c

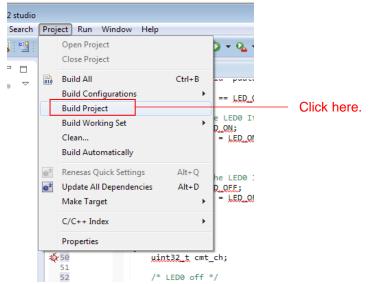
```
#include "platform.h"
#include "r_cmt_rx_if.h"
/* LED Currently status */
uint32_t ledstatus = LED_OFF;
void call_back(void *pdata)
{
      if (ledstatus == LED_OFF)
      {
             /* Turn ON the LED0 If the status is LED_OFF */
            LED0 = LED_ON;
             ledstatus = LED_ON;
      }
      else
      {
             /* Turn OFF the LED0 If the status is LED_ON */
            LED0 = LED_OFF;
            ledstatus = LED_OFF;
      }
}
void main(void)
{
      uint32_t cmt_ch;
      /* LED0 off */
      LED0 =LED_OFF;
      /* Create of 0.5 second(2Hz) cyclic timer. */
      R_CMT_CreatePeriodic(2, &call_back, &cmt_ch);
      while(1);
```



4.1.6 Build and Try Running the Program

Build the program just created and verify that it runs.

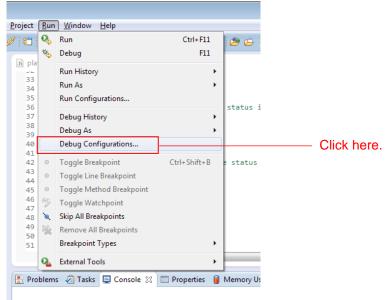
1. Click **Build Project** on the **Project** menu.



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

Problems Tasks Console Cons

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





RX Family

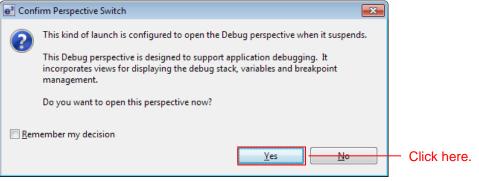
4. Click *d* under the **Renesas GDB Hardware Debugging and c**lick **< project name> HardwareDebug**. Click the **Debugger** tab and click **Connection Setting**.

Modify **EXTAL Frequency** to be **24.0000(Note1)** and change **Provide Power from Emulator** to **No (Note2)**. When these changes have been made, click **Debug**.

Note1 : Setting for Renesas Starter Kit+ for RX64M : review is required according to the environment you use. Note2 : This is setting when using an external power supply. When supplying power from the emulator, select **Yes.**

e ² Debug Configurations			×	
Create, manage, and run configurations	-			
Ype filter text © Debug-only © GDB Hardware Debugging © GDB Simulator Debugging (SH, RL7£ M GFL Local C/C++ Laundh Renesas GDB Hardware Attach © Ied_sample Hardware Debugging © Ied_sample Hardware Debugging (RX o	Name: led_sample HardwareDebug Main Debugger Startup Source Debug hardware GDB Settings Connection Settings Debug Tool Clock Main Clock Source Extal Frequency[MHz] Permit Clock Source Change On Writing In Connection With Target Board Emulator Connection Type JTag Clock Frequency[MHz] Fine Baud Rate[Mbps] Hot Plug A Power	Settings		 Click here. Modify to be 24.0000.
< ™ → Filter matched 9 of 13 items	Power Target From The Emulator (MAX 200 Supply Voltage CPU Operating Mode Register Setting Mode pin Communication Mode Mode Mode Execute The User Program After Ending The	3.3V Single Chip Single-chip mode Debug Mode	• • • • •	Modify to be No .
		Debug	Close	— Click here.

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





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

e ⁸ Debug - led_sample/r_bsp/board/rskn64m/resetprg.c - e2 studio					
Eile Edit Source Refactor Navigate Search Project Bun Window Help					
13 • 11 % A 8 • % • 8 % 1 8 A 8 • 0 • 9 • 1 • 1 • 1 • 1 • 1 • 1 • 1 • 1 • 1	= 😂 😂 🖋 - 1 J	18-8-00	0 = 38	Quick Access	C/C++ 🗱 Debug
Ibelung 153 Ref des < % 20 20 20 20 20 20 20 20 20 20 20 20 20	Name	Breakpoints IIII Registers 📷	Modules Value	δΩ δapressions 📲 Fventpaints 📄 10	
j,∬ GDB server					,-
<pre> platform.h @ led_sample.c @ resetpryc &</pre>			•	Dutline Image: State State Image: State State State Image: State State Image: State State Image: State Image: State State Image: State Image: State Image: State </td <td>en(vaid) : void han(vaid) : void</td>	en(vaid) : void han(vaid) : void
Console 22 Tasks PRenesas Coverage Memory Usage Profile % Performance Analysis Profile % Real time C Ind_sample HardwareDebug [Renesas GDB Hardware Debugging] gdb monitor set [a_access_width, Riv], 1,90366-90264, 902266-90234, 902266-90234, 90266-90240, 90226 monitor set [a_access_width, Riv], 1,90366-90364, 90376-90374, 90386-90384, 90396-90394, 90386-90384, 9039 monitor set [a_access_width, Riv], 1,90366-90304, 91316-91314, 91226-91224, 91236-91234, 91226-91234, 91236-913144, 91346-91344, 913	d6-902dd,902e6-902e b6-903bd,903c6-903c 76-9127d,91286-9120	d, 902f6-902fd, 90306-903 d, 903d6-903dd, 903e6-903 d, 91296-9129d, 912m6-912	0d,90316 ed,903f6 ad,912b6	■ ≭ ☆ in an construction and a second a	8858,91286-91 12e6-912ed,91

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

Pebug - led_sample/r_bsp/board/rskn/64m/resetprg.c - e2 studio	
<u>File Edit S</u> ource Refactor <u>N</u> avigate Se <u>a</u> rch <u>P</u> roject <u>R</u> un <u>W</u> indow <u>H</u> elp	
■ ▼ @ ▲ @ ▼ % ▼ ₪ % [™] Ø Ø % ▼ Ø ▼ Ø ▼ % ▼ × ▶ ■ #	—— Click here.
🏇 Debug 🛙 🦗 👻 🕷 🛔 🚵 💋 🚺	
a 📴 led_sample HardwareDebug [Renesas GDB Hardware Debugging]	
a 🎲 led_sample.x	
Thread [1] 1 (No thread info available) (Suspended : Signal : SIGTRAP:Trace/breakpoint trap	
PowerON_Reset_PC() at resetprg.c:122 0xffc017e8 gdb	
GDB server	
h platform.h 🖻 led_sample.c 📝 resetprg.c 🔀	

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.

4.1.7 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.

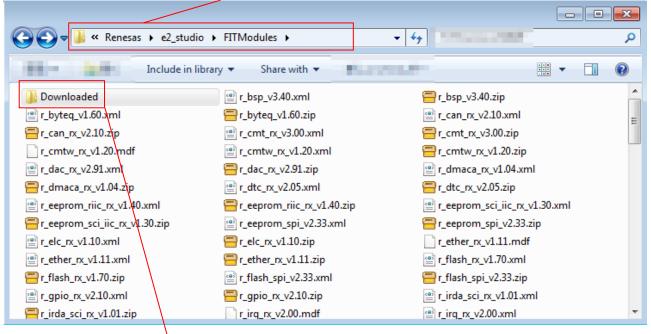


4.2 Check the RX Driver Package Downloaded

When successfully downloaded, FIT module is stored in the folder specified in "FIT Module Folder Path:" described in "0-5" (generally, C:\Renesas\e2_studio\ FITModules).

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





ZIP file of the package is stored. (an_r01an****ej****_rx_fit.zip)



4.3 Update FIT Module

The following describes how to update the FIT module.

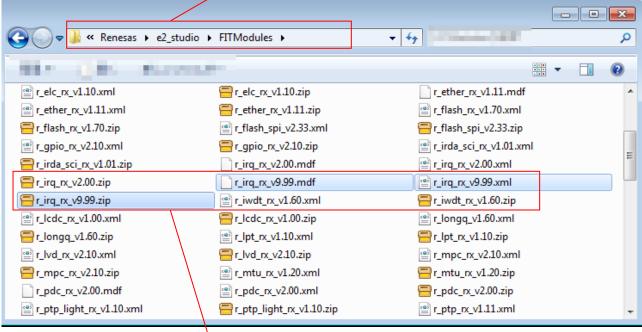
4.3.1 Environment Used for the Description

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

4.3.2 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 $r_***_v*.**$ and XML file $r_***_v*.**$ are mandatory, and MDF file $r_***_v*.**$. mdf are mandatory, if they exist.



Folder specified in "FIT Module Folder Path:"

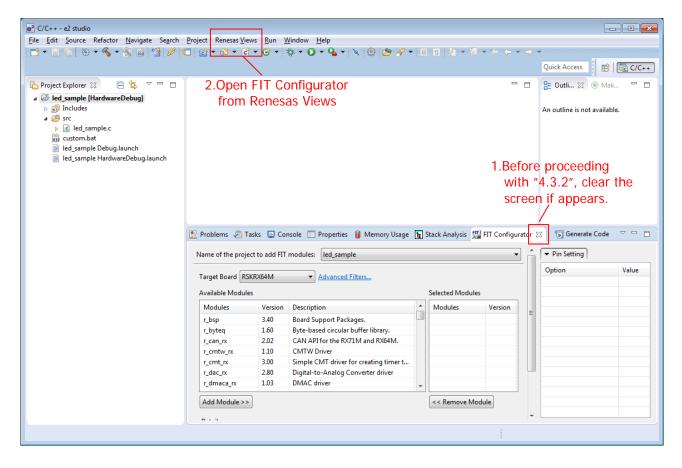
Add file



4.3.3 Confirm the FIT Module Added in FIT Configurator Screen

1. Open FIT Configurator

Before proceeding with "4.3.2", if FIT Configurator screen is displayed, clear this screen, then, reopen it. The screen information is not updated unless reopened.





2. Confirm the FIT module added. Latest Ver. will appear on FIT Configurator screen (*). See "4.1.4" from then on to install the target FIT module.

me of the proje	ect to add FIT	modules: led_sample			
arget Board RS	KRX64M	✓ Advanced Filters			
vailable Module	25			Selected Modules	
Modules	Version	Description		Modules	Version
_flash_rx	1.70	Flash API for RX100, RX200, RX600. and R		r_bsp	3.40
r_flash_spi	2.33	Clock Synchronous Control Module for S		r_cmt_rx	3.00
gpio rx	2.10	General Purpose Input/Output Driver			
r_irq_rx	9.99	IRQ Driver			
r_iwdt_rx	1.60	14-bit down-counter Independent WDT			FIT
r_longq	1.60	Updated IRQ FIT Unsigned 32-bit circular buffer library.			
_lvd_rx	2.10	Low Voltage Detection Driver			
mpc rx	2.10	Multi-Function Pin Controller Driver			

* To select old Ver. :

Pulldown appears by clicking the FIT module Ver. Number. Then, click pulldown to show old Ver.

ame of the project	to add FIT	modules: led_sample			
arget Board RSKR	X64M	Advanced Filters			
Available Modules		I.Click Ver. number		Selected Modu	es
Modules	Version	Description		Modules	Version
r_flash_rx	1.70	Flash API for RX100, RX200, RX600. and R		r_bsp	3.40
r_flash_spi	2.33	Clock Synchronous Control Module for S		r_cmt_rx	3.00
r_gpio_rx	2,10	General Purpose Input/Output Driver			
r_irq_rx	9.99	▼ Q Driver			
r_iwdt_rx	2.00	-bit down-counter Independent WDT			
r_longq	9.99	onsigned 32-bit circular buffer library.			
r_lvd_rx	2.10	Low Voltage Detection Driver			
r mpc rx	2.10	Multi-Function Pin Controller Driver			



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.

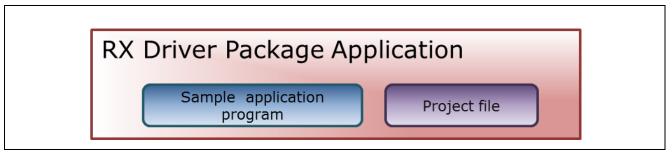


Figure 5-1 RX Driver Package Application Structure

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/en-us/solutions/rx-applications/fit.html (Americas)

https://www.renesas.com/pt-br/solutions/rx-applications/fit.html (Brazil)

https://www.renesas.com/en-eu/solutions/rx-applications/fit.html (Europe/Middle East/Africa)

https://www.renesas.com/ja-jp/solutions/rx-applications/fit.html (Japan)

https://www.renesas.com/zh-cn/solutions/rx-applications/fit.html (Mainland China/Hong Kong Region)

https://www.renesas.com/en-sg/solutions/rx-applications/fit.html (Singapore/South & Southeast Asia/Oceania)

https://www.renesas.com/en-in/solutions/rx-applications/fit.html (India)

https://www.renesas.com/ko-kr/solutions/rx-applications/fit.html (South Korea)

https://www.renesas.com/zh-tw/solutions/rx-applications/fit.html (Taiwan Region)



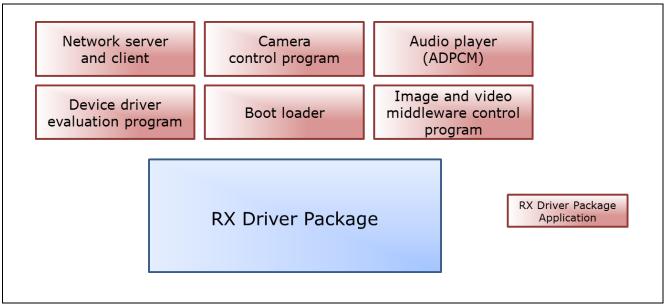


Figure 5-2 Types of RX Driver Package Application



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.

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

Commercial Version of	URL	FIT
Middleware and Drivers		Compliant
TCP/IP for Embedding	https://www.renesas.com/en-us/products/software-tools/software-os-	Available
M3S-T4-Tiny	middleware-driver/communication-software/m3s-t4-tiny.html	
	(Americas)	
	https://www.renesas.com/pt-br/products/software-tools/software-os-	
	middleware-driver/communication-software/m3s-t4-tiny.html (Brazil)	
	https://www.renesas.com/en-eu/products/software-tools/software-os-	
	middleware-driver/communication-software/m3s-t4-tiny.html	
	(Europe/Middle East/Africa)	
	https://www.renesas.com/ja-jp/products/software-tools/software-os-	
	middleware-driver/communication-software/m3s-t4-tiny.html (Japan)	
	https://www.renesas.com/zh-cn/products/software-tools/software-os-	
	middleware-driver/communication-software/m3s-t4-tiny.html (Mainland	
	China/Hong Kong Region)	
	https://www.renesas.com/en-sg/products/software-tools/software-os-	
	middleware-driver/communication-software/m3s-t4-tiny.html	
	(Singapore/South & Southeast Asia/Oceania)	
	https://www.renesas.com/en-in/products/software-tools/software-os-	
	middleware-driver/communication-software/m3s-t4-tiny.html (India)	
	https://www.renesas.com/ko-kr/products/software-tools/software-os-	
	middleware-driver/communication-software/m3s-t4-tiny.html (South	
	Korea)	
	https://www.renesas.com/zh-tw/products/software-tools/software-os-	
	middleware-driver/communication-software/m3s-t4-tiny.html (Taiwan	
	Region)	

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 (*). FIT module unit package has "FITDemos" folder and includes sample program or sample project.

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



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Inquiries

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Revision History

		Description			
Rev.	Date	Page	Summary		
1.12	Apr 05, 2017	-	First edition issued		

General Precautions in the Handling of MPU/MCU Products

The following usage notes are applicable to all MPU/MCU 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 accord 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 shootthrough 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 type number, confirm that the change will not lead to problems.

— The characteristics of an MPU or MCU 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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