

RX Family

RX Driver Package Ver.1.22

Introduction

This document is the RX Family RX Driver Package Application Note, version 1.22.

This application note 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

RX230, RX231, RX23T, RX23W, RX24T, RX24U Group

RX64M, RX65N, RX651 Group, RX66T Group

RX71M Group, RX72T Group, RX72M 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 Integrated development environments Used for Operation Confirmation

Operation of the RX Driver Package has been confirmed on e² studio V. 7.5.0 or IAR Embedded Workbench for Renesas RX 4.12.01.

Target Compilers

Renesas Electronics C/C++ Compiler Package for RX Family

GCC for Renesas RX

IAR C/C++ Compiler for Renesas RX

For details of the confirmed operation contents of each compiler, refer to "1.2 Operating Environment".

Related Documents

- RX Family Board Support Package Module Using Firmware Integration Technology (R01AN1685)
- The User's Manual provided with the RX Driver Package Application.

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1. Overview

1.1 Applicability

This application note applies to the RX Family RX Driver Package, version 1.22. The System Build of this package is described below.

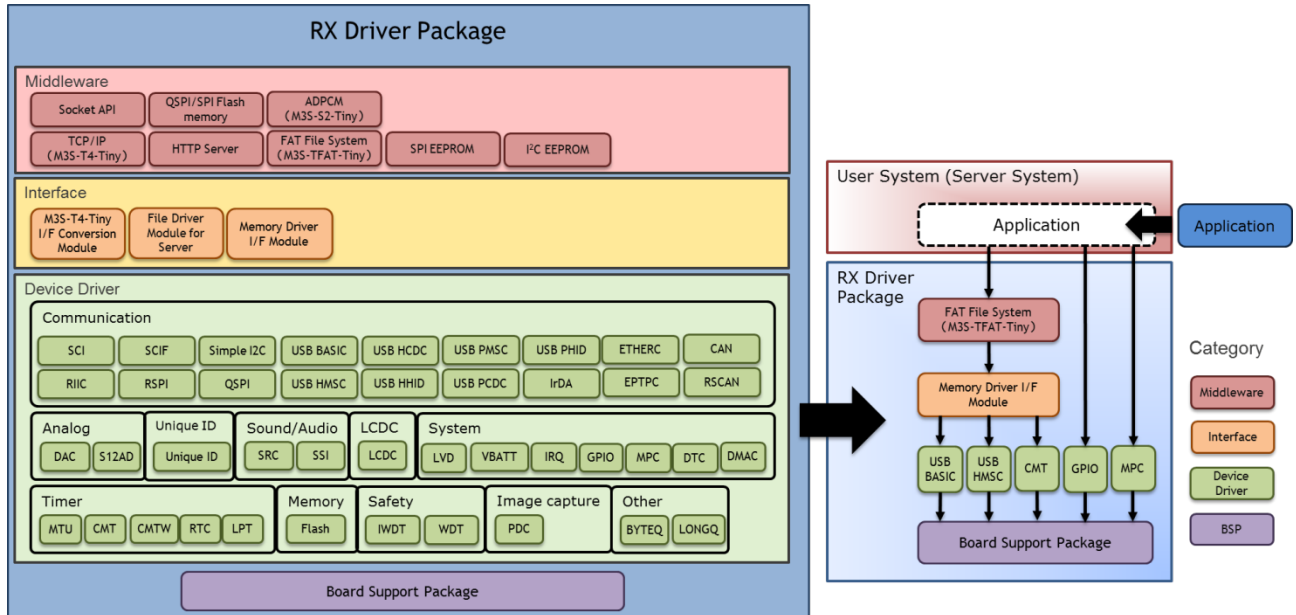


Figure 1-1 An Example of System Build

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 V7.5.0 IAR Embedded Workbench for Renesas RX 4.12.01 |
| C compiler | Renesas Electronics C/C++ compiler for RX Family V. 3.01.00 Compiler options: The integrated development environment default settings are used, with the following option added. -lang = c99 |
| | GCC for Renesas RX 4.08.04.201902 Compiler option: The following option is added to the default settings of the integrated development environment. -std=gnu99 |
| | IAR C/C++ Compiler for Renesas RX version 4.12.01 Compiler option: The default settings of the integrated development environment. |
| Endian order | Big-endian/Little-endian |
| RDP version | Ver. 1.22 |
| Board used | Renesas Starter Kit+ for RX64M (product No.: R0K50564Mxxxxxx) Renesas Starter Kit for RX231 (product No.: R0K505231xxxxxx) Renesas Starter Kit for RX113 (product No.: R0K505113xxxxxx) Renesas Starter Kit+ for RX65N-2MB (product No.: RTK50565N2Sxxxxxx) Renesas Starter Kit+ for RX72M (product No.: RTK5572Mxxxxxxxxxx) |

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.

3. FIT Modules

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

After the release of RX Family RX Driver Package Ver. 1.20 (R01AN4794), we updated Firmware Integration Technology (FIT) modules. Differences from Family RX Driver Package Ver. 1.20 are shown in Table 3-1, Table 3-2 and Table 3-3.

The meaning of the terms shown in “Update Information” column is 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. |

The meanings of the terms shown in “GCC/IAR status” column is as follows:

| | |
|-----------------|--|
| “Supported” | Supported. |
| “Restricted” | Limited support. Please check the documentation of each FIT module for details. |
| “Not supported” | Not supported. It will be supported in a future version. |

3.1 Board Support Package (BSP)

Table 3-1 Update Informations of Board Support Package (BSP)

| Module | FIT Module Name | Rev | Update Information | GCC/IAR status |
|-----------------------------|-----------------|------|--------------------|----------------|
| Board Support Package (BSP) | r_bsp | 5.20 | Same | Supported |

3.2 Device Driver

Table 3-2 Update Informations of Device Driver

| Module | FIT Module Name | Rev | Update Information | GCC/IAR status |
|--|------------------|------|--------------------|----------------|
| Voltage Detection Circuit (LVD) | r_lvd_rx | 3.20 | Updated | Supported |
| Low Power Consumption (LPC) | r_lpc_rx | 1.41 | Same | Not supported |
| Battery Backup (VBATT) | r_vbatt_rx | 1.04 | Updated | Supported |
| Interrupt Controller (IRQ) | r_irq_rx | 3.20 | Updated | Supported |
| Data Transfer Controller (DTC) | r_dtc_rx | 3.20 | Updated | Supported |
| DMA Controller (DMAC) | r_dmaca_rx | 2.20 | Updated | Supported |
| I/O Ports (GPIO) | r_gpio_rx | 3.20 | Updated | Supported |
| Multi-Function Pin Controller (MPC) | r_mpc_rx | 3.20 | Updated | Supported |
| Compare Match Timer (CMT) | r_cmt_rx | 4.20 | Updated | Supported |
| Compare Match Timer W (CMTW) | r_cmtw_rx | 2.10 | Updated | Supported |
| Real-Time Clock (RTC) | r_rtc_rx | 2.77 | Updated | Supported |
| Low Power Timer (LPT) | r_lpt_rx | 1.23 | Same | Not supported |
| Independent Watchdog Timer (IWDT) | r_iwdt_rx | 3.20 | Updated | Supported |
| Watchdog Timer (WDT) | r_wdt_rx | 2.20 | Updated | Supported |
| Serial Communications Interface (SCI: Asynchronous/Clock Synchronous) | r_sci_rx | 3.20 | Updated | Supported |
| Serial Communications Interface with FIFO (SCI: Asynchronous/Clock Synchronous) | r_scif_rx | 1.22 | Same | Not supported |
| Serial Communications Interface (SCI: Simple I ² C Bus) | r_sci_iic_rx | 2.43 | Updated | Supported |
| I ² C Bus Interface (RIIC) | r_riic_rx | 2.43 | Updated | Supported |
| Serial Peripheral Interface | r_rsipi_rx | 2.03 | Updated | Supported |
| Quad Serial Peripheral Interface (QSPI: Device Driver for Serial Memory Control) | r_qsipi_smstr_rx | 1.13 | Updated | Supported |
| USB Basic Firmware | r_usb_basic | 1.27 | Updated | Supported |
| USB Host Mass Storage Class | r_usb_hmsc | 1.27 | Updated | Supported |
| USB Host Communication Device Class | r_usb_hcdc | 1.27 | Updated | Supported |
| USB Host Human Interface Device Class | r_usb_hhid | 1.27 | Updated | Supported |
| USB Peripheral Mass Storage Class | r_usb_pmhc | 1.27 | Updated | Supported |
| USB Peripheral Communications Device Class | r_usb_pcdc | 1.27 | Updated | Supported |
| USB Peripheral Human Interface Device Class | r_usb_phid | 1.27 | Updated | Supported |
| USB Basic Firmware mini | r_usb_basic_mini | 1.12 | Updated | Supported |
| USB Host Mass Storage Class mini | r_usb_hmsc_mini | 1.12 | Updated | Supported |
| USB Host Communication Device Class mini | r_usb_hcdc_mini | 1.12 | Updated | Supported |
| USB Host Human Interface Device Class mini | r_usb_hhid_mini | 1.12 | Updated | Supported |
| USB Peripheral Mass Storage Class mini | r_usb_pmhc_mini | 1.12 | Updated | Supported |

| | | | | |
|--|-----------------|------|---------|---------------|
| USB Peripheral Communications Device Class mini | r_usb_pcdc_mini | 1.12 | Updated | Supported |
| USB Peripheral Human Interface Device Class mini | r_usb_phid_mini | 1.12 | Updated | Supported |
| PTP Module for the Ethernet Controller (EPTPC) | r_ptp_rx | 1.16 | Updated | Supported |
| EPTPC Light Module | r_ptp_light_rx | 1.13 | Updated | Supported |
| Ethernet controller (ETHERC) | r_ether_rx | 1.17 | Updated | Supported |
| CAN Module (CAN) | r_can_rx | 3.10 | Updated | Supported |
| CAN Module (RSCAN) | r_rscan_rx | 2.10 | Updated | Supported |
| IrDA Interface (IrDA) | r_irda_sci_rx | 1.01 | Same | Not supported |
| Parallel Data Capture Unit (PDC) | r_pdc_rx | 2.04 | Updated | Supported |
| SD Host Interface (SDHI) | r_sdhi_rx | 2.05 | Updated | Supported |
| SD Slave Interface (SDSI) | r_sdsi_rx | 2.02 | Same | Supported |
| MMC Mode MMCIF Driver (MMCIF) | r_mmcif_rx | 1.06 | Updated | Supported |
| 12-Bit A/D Converter (S12AD) | r_s12ad_rx | 4.20 | Updated | Supported |
| D/A Converter (DAC) | r_dac_rx | 4.20 | Updated | Supported |
| Delta-Sigma Modulator Interface (DSMIF) | r_dsmif_rx | 1.00 | Added | Restricted |
| Flash Memory (On-chip flash memory Programming) | r_flash_rx | 4.20 | Updated | Restricted |
| Sampling Rate Converter (SRC) | r_src_api_rx | 1.13 | Same | Supported |
| Serial Sound Interface (SSI) | r_ssi_api_rx | 1.24 | Updated | Supported |
| LCD Controller/Driver (LCDC) | r_lcdc_rx | 1.01 | Same | Supported |
| Graphic LCD Controller (GLCDC) | r_glcde_rx | 1.20 | Updated | Supported |
| Unique ID Read | r_uid_rx | 1.12 | Updated | Supported |
| Byte Queue Buffer (Data Management) | r_byteq | 1.80 | Same | Supported |
| Long Queue Buffer (Data Management) | r_longq | 1.80 | Same | Supported |
| Event Link Controller (ELC) | r_elc_rx | 1.21 | Same | Not supported |
| QE CTSU Module(CTSUS) | r_ctsu_qe | 1.00 | Same | Not supported |

3.3 Middleware/Interface Module

Table 3-3 Update Informations of Middleware/Interface Module

| Module | FIT Module Name | Rev | Update Information | GCC/IAR status |
|---|------------------|------|--------------------|----------------|
| TCP/IP M3S-T4-Tiny for Embedding | r_t4_rx | 2.09 | Updated | Supported |
| Interface conversion module for Ethernet Driver and Embedded system M3S-T4-Tiny | r_t4_driver_rx | 1.08 | Updated | Supported |
| System Timer Module | r_sys_time_rx | 1.01 | Updated | Supported |
| SD Mode SD Memory Card Driver | r_sdc_sdmem_rx | 2.03 | Same | Not supported |
| Flash Memory Data Management Module(DATFRX) | r_datfrx_rx | 2.01 | Same | Not supported |
| SPI Serial EEPROM Module | r_eeprom_spi | 3.01 | Same | Supported |
| SPI Serial Flash memory Module | r_flash_spi | 3.01 | Same | Supported |
| Memory Access Driver Interface Module | r_memdrv_rx | 1.01 | Same | Supported |
| JPEG Decoder Module | r_jpegd_rx | 2.06 | Same | Not supported |
| JPEG Encoder Module | r_jpege_rx | 1.01 | Same | Not supported |
| Sound playback system and compression system (original ADPCM codec) | r_s2_rx | 3.04 | Same | Not supported |
| M3S-TFAT-Tiny (FAT file system) | r_tfat_rx | 3.04 | Same | Not supported |
| M3S-TFAT-Tiny Memory Driver Interface Module | r_tfat_driver_rx | 1.05 | Same | Not supported |
| QE Touch Module | r_touch_qe | 1.00 | Same | Not supported |

4. Usage

You can easily construct application programs incorporating the RX Driver Package by using the Smart Configurator⁽¹⁾ or FIT Configurator⁽²⁾.

For details on usage, refer to one of the documents in Table 4-1 depending on the tool used.

Note1: Supported by e² studio, CS+ and IAREW.

Note2: Only devices not supported by Smart Configurator are supported by e² studio.

Table 4-1 related documents for instructions

| Item | Related Documents |
|---|---|
| e ² studio Smart Configurator | RX Smart Configurator User's Guide: e ² studio (R20AN0451) |
| CS+ Smart Configurator | RX Smart Configurator User's Guide: CS+ (R20AN0470) |
| IAREW Smart Configurator | RX Smart Configurator User's Guide: IAREW (R20AN0535) |
| e ² studio FIT Configurator | RX Family Adding Firmware Integration Technology Modules to Projects (R01AN1723) |

5. Supplement

5.1 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.

Or use supporting download and import sample project of FIT module with Smart Configurator. FIT module Guide function can easily import the sample program into e²studio Workspace. Please see for Renesas e²studio Smart Configurator V.2.0.0 Release Note (R20UT4475) for details.

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

5.2 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.

5.3 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 Usage" (Related Documents)(for example, C:\Renesas\e2_studio\FITModules).

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

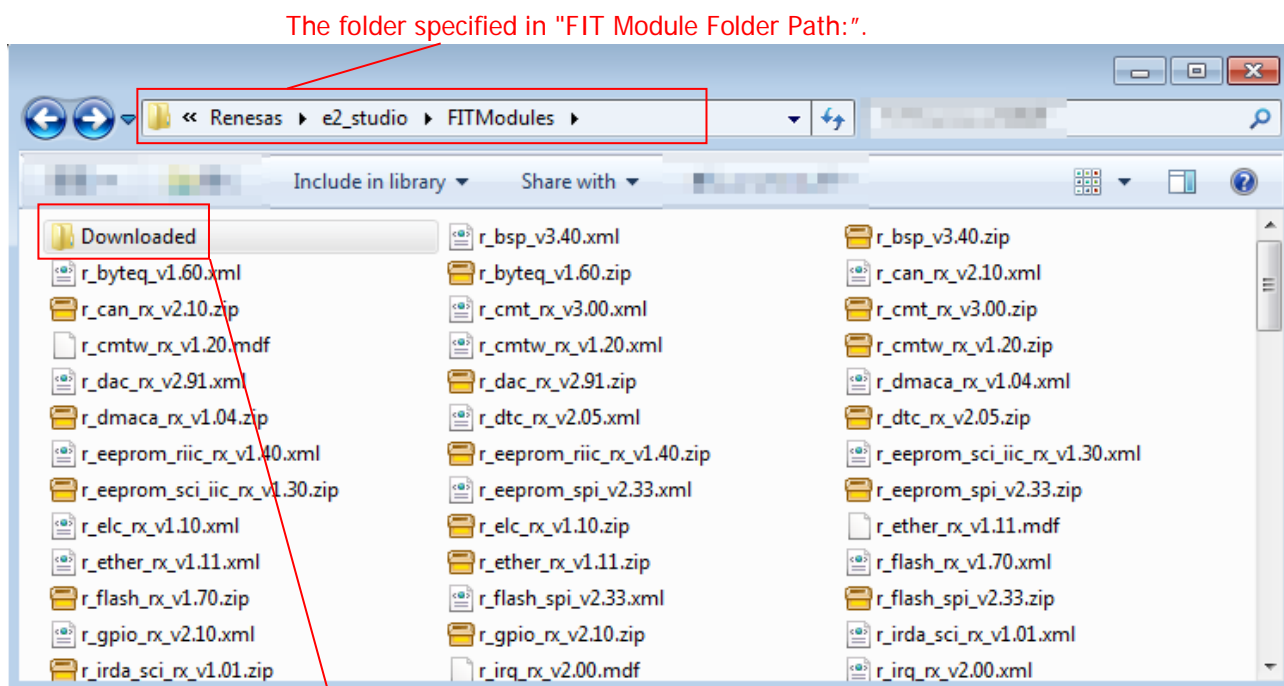


Figure 5-1 RX Driver Package

Revision History

| Rev. | Date | Description | |
|------|--------------|-------------|----------------------|
| | | Page | Summary |
| 1.22 | Sep 10, 2019 | - | 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. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity.

Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

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