RX Family

RX Driver Package Ver.1.26

Introduction

This document is the RX Family RX Driver Package Application Note, version 1.26.

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, RX13T Group

RX230, RX231, RX23E-A, RX23T, RX23W, RX24T, RX24U Group

RX64M, RX65N, RX651 Group, RX66N Group, RX66T Group

RX71M Group, RX72T Group, RX72M Group, RX72N 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 e^2 studio V. 7.7.0 or IAR Embedded Workbench for Renesas RX 4.14.01.

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.

Contents

1. Overview

1.1 Applicability

This application note applies to the RX Family RX Driver Package, version 1.26. The System Build of this package is described below.

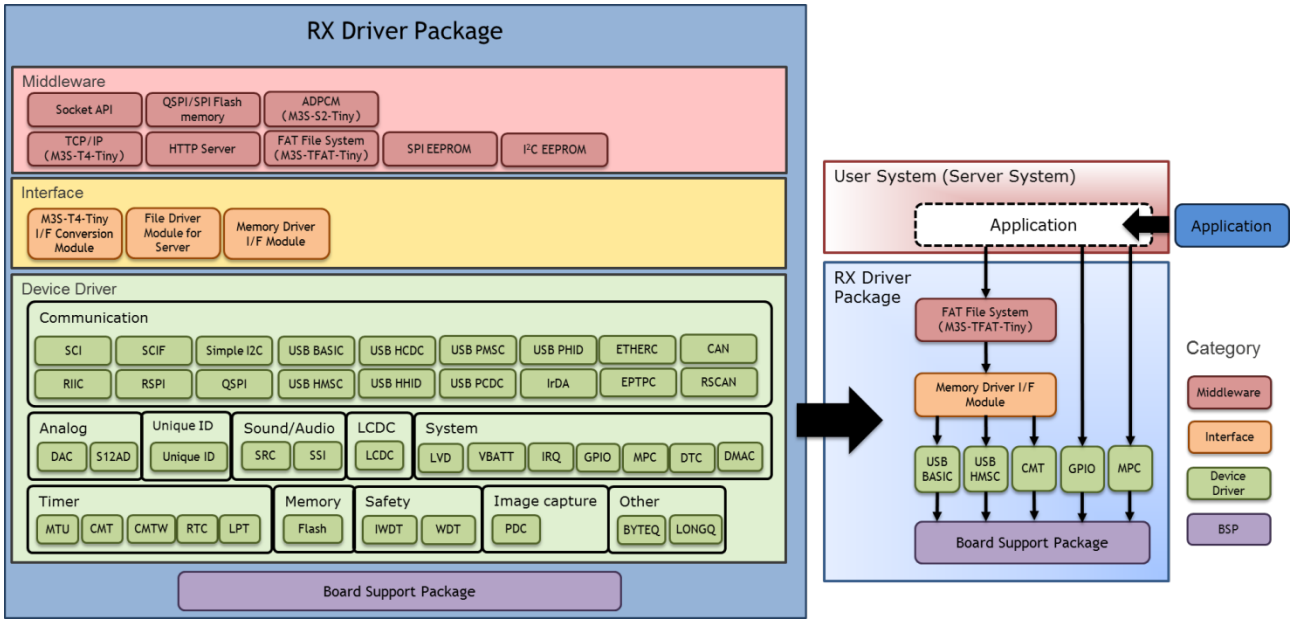

Figure 1-1 An Example of System Build

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 V7.7.0 IAR Embedded Workbench for Renesas RX 4.14.01
C compiler	Renesas Electronics C/C++ compiler for RX Family V. 3.02.00 Compiler options: The integrated development environment default settings are used, with the following option added. -lang = c99
	GCC for Renesas RX 8.3.0.201904 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 4.14.01 Compiler option: The default settings of the integrated development environment.
Endian order	Big-endian/Little-endian
RDP version	Ver. 1.26

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. 1.25 (R01AN5371), we updated Firmware Integration Technology (FIT) modules. Differences from Family RX Driver Package Ver. 1.25 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	5.52	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	3.50	Updated	Supported
Low Power Consumption (LPC)	r_lpc_rx	2.00	Same	Supported
Battery Backup (VBATT)	r_vbatt_rx	1.04	Same	Supported
Interrupt Controller (IRQ)	r_irq_rx	3.50	Updated	Supported
Data Transfer Controller (DTC)	r_dtc_rx	3.50	Updated	Supported
DMA Controller (DMAC)	r_dmaca_rx	2.40	Updated	Supported
I/O Ports (GPIO)	r_gpio_rx	3.50	Updated	Supported
Multi-Function Pin Controller (MPC)	r_mpc_rx	3.50	Updated	Supported
Compare Match Timer (CMT)	r_cmt_rx	4.40	Updated	Supported
Compare Match Timer W (CMTW)	r_cmtw_rx	2.20	Same	Supported
Real-Time Clock (RTC)	r_rtc_rx	2.78	Same	Supported
Low Power Timer (LPT)	r_lpt_rx	1.23	Same	Not supported
Independent Watchdog Timer (IWDT)	r_iwdt_rx	3.50	Updated	Supported
Watchdog Timer (WDT)	r_wdt_rx	2.30	Same	Supported
Serial Communications Interface (SCI: Asynchronous/Clock Synchronous)	r_sci_rx	3.50	Updated	Supported
Serial Communications Interface with FIFO (SCI: Asynchronous/Clock Synchronous)	r_scif_rx	2.00	Same	Supported
Serial Communications Interface (SCI: Simple I^2C Bus)	r_sci_iic_rx	2.46	Updated	Supported
I^2C Bus Interface (RIIC)	r_riic_rx	2.46	Updated	Supported
Serial Peripheral Interface	r_rspi_rx	2.05	Updated	Supported
Quad Serial Peripheral Interface (QSPI: Device Driver for Serial Memory Control)	r_qspi_smstr_rx	1.14	Same	Supported
USB Basic Firmware	r_usb_basic	1.30	Same	Supported
USB Host Mass Storage Class	r_usb_hmsc	1.30	Same	Supported
USB Host Communication Device Class	r_usb_hcdc	1.30	Same	Supported
USB Host Human Interface Device Class	r_usb_hhid	1.30	Same	Supported
USB Peripheral Mass Storage Class	r_usb_pmsc	1.30	Same	Supported
USB Peripheral Communications Device Class	r_usb_pcdc	1.30	Same	Supported
USB Peripheral Human Interface Device Class	r_usb_phid	1.30	Same	Supported
USB Basic Firmware mini	r_usb_basic_mini	1.12	Same	Supported
USB Host Mass Storage Class mini	r_usb_hmsc_mini	1.12	Same	Supported
USB Host Communication Device Class mini	r_usb_hcdc_mini	1.12	Same	Supported
USB Host Human Interface Device Class mini	r_usb_hhid_mini	1.12	Same	Supported
USB Peripheral Mass Storage Class mini	r_usb_pmsc_mini	1.12	Same	Supported

USB Peripheral Communications Device Class mini	r_usb_pcdc_mini	1.12	Same	Supported
USB Peripheral Human Interface Device Class mini	r_usb_phid_mini	1.12	Same	Supported
PTP Module for the Ethernet Controller (EPTPC)	r_ptp_rx	1.17	Updated	Supported
EPTPC Light Module	r_ptp_light_rx	1.14	Updated	Supported
Ethernet controller (ETHERC)	r_ether_rx	1.20	Same	Supported
CAN Module (CAN)	r_can_rx	3.20	Same	Supported
CAN Module (RSCAN)	r_rscan_rx	2.21	Updated	Supported
IrDA Interface (IrDA)	r_irda_sci_rx	1.01	Same	Not supported
Parallel Data Capture Unit (PDC)	r_pdc_rx	2.05	Same	Supported
SD Host Interface (SDHI)	r_sdhi_rx	2.06	Same	Supported
SD Slave Interface (SDSI)	r_sdsi_rx	2.02	Same	Supported
MMC Mode MMCIF Driver (MMCIF)	r_mmcif_rx	1.07	Same	Supported
12-Bit A/D Converter (S12AD)	r_s12ad_rx	4.50	Same	Supported
D/A Converter (DAC)	r_dac_rx	4.40	Same	Supported
BLE Module (BLE)	r_ble_rx23w	1.10	Same	Restricted
QE Utility Module (Profile)	r_ble_qe_utility	1.00	Same	Not supported
Mesh Module (Mesh)	r_mesh_rx23w	1.01	Same	Not supported
Delta-Sigma Modulator Interface (DSMIF)	r_dsmif_rx	1.00	Same	Restricted
Flash Memory (On-chip flash memory Programing)	r_flash_rx	4.50	Same	Supported
Sampling Rate Converter (SRC)	r_src_api_rx	1.13	Same	Supported
Serial Sound Interface (SSI)	r_ssi_api_rx	2.01	Same	Supported
LCD Controller/Driver (LCDC)	r_lcdc_rx	1.01	Same	Supported
Graphic LCD Controller (GLCDC)	r_glcdc_rx	1.30	Same	Supported
Unique ID Read	r_uid_rx	1.13	Same	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(CTSU)	r_ctsu_qe	1.11	Updated	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	Same	Supported
Interface conversion module for Ethernet Driver and Embedded system M3S-T4-Tiny	r_t4_driver_rx	1.08	Same	Supported
System Timer Module	r_sys_time_rx	1.01	Same	Supported
SD Mode SD Memory Card Driver	r_sdc_sdmem_rx	3.00	Same	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	1.02	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	4.00	Updated	Supported
M3S-TFAT-Tiny Memory Driver Interface Module	r_tfat_driver_rx	2.00	Updated	Supported
QE Touch Module	r_touch_qe	1.11	Updated	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
e2 studio Smart Configurator	RX Smart Configurator User's Guide: e² studio (R20AN0451)
CS+ Smart Configurator	RX Smart Configurator User's Guide: CS+ (R20AN0470)
IAREW Smart Configurator	RX Smart Configurator User's Guide: IAREW (R20AN0535)
e2 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 e^{2}studio Workspace. Please see for Renesas e^{2}studio 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.

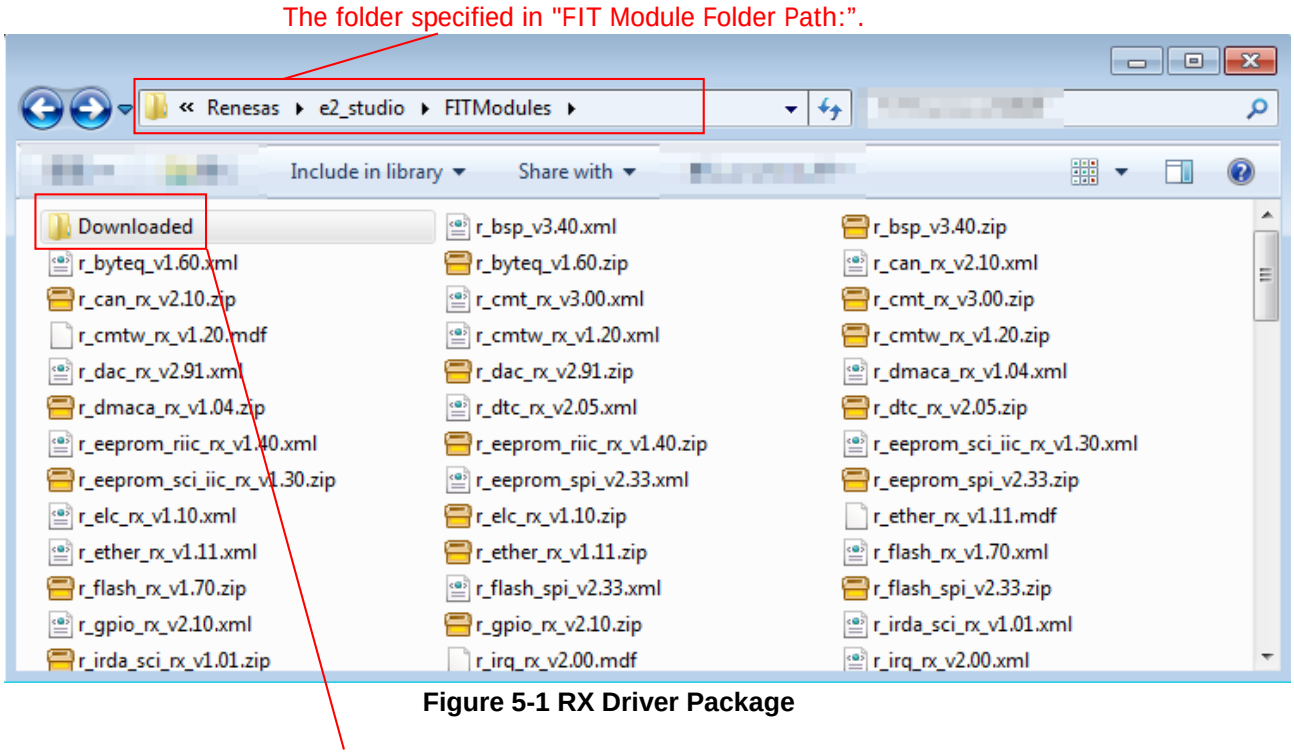

Figure 5-1 RX Driver Package

Revision History

Rev.	Date	Description	
		Page	Summary
1.26	May 29, 2020	-	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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