

# RZ/A2M Group

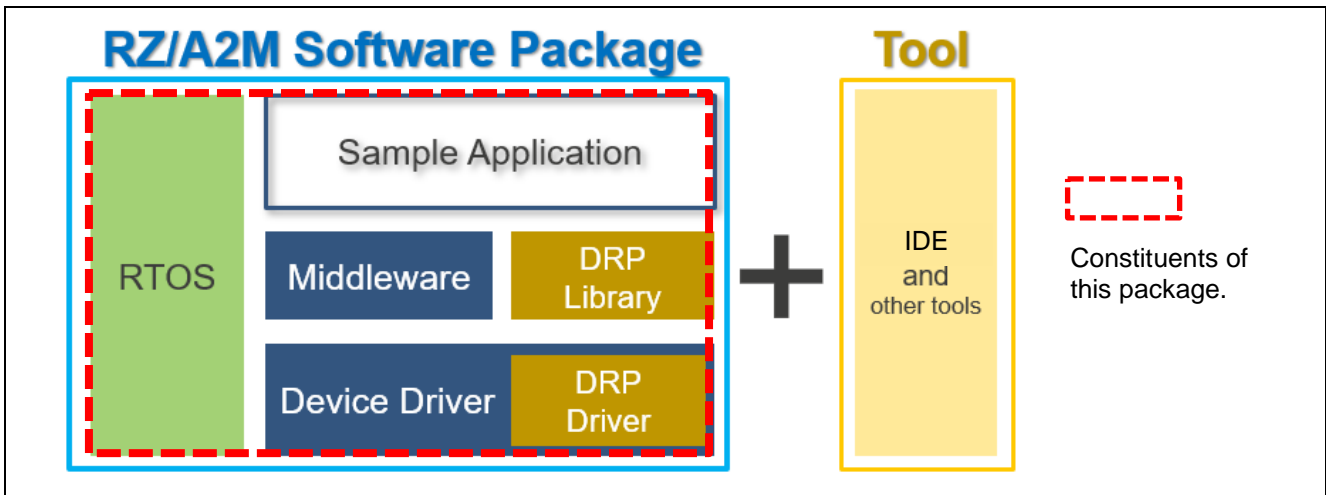
## RZ/A2M Simple Applications Package (Arm Development Studio) V2.00 Release Note

### Introduction

This Software Package has several simple applications for RZ/A2M.

The Software Package shows how easy it is to create a professional, user-friendly and platform-independent user interface for your product. The entire application source code is included in the workspace enabling the Software Package to be ported to the platform of your choice.

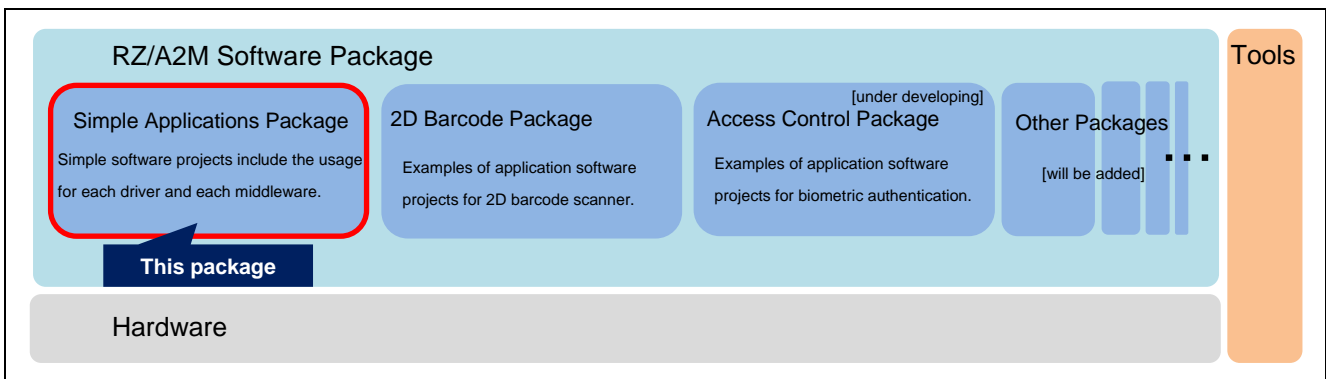
This package is one of RZ/A2M Software Package. RZ/A2M Software Package is a software development kit for the RZ/A2M that supports various RZ/A2M functions such as DRP (Dynamically Reconfigurable Processor), camera input, LCD output, and image adjustment. This package has the structure of the red frame in the following figure. However, device driver and middleware are only included what is necessary for the sample application.



RZ/A2M Software Package Configuration

Figure below shows the relation of RZ/A2M Software Package and this package. For details, refer following URL:

<https://www.renesas.com/products/software-tools/software-os-middleware-driver/software-package/rza2-software-development-kit-free-rtos/armcompiler.html>



The relation of RZ/A2M Software Packages and this package

Note that each software project includes only driver software and middleware used by each application. If you want to add software that is not included in the project, please use Smart Configurator. For more detail, please refer "RZ/A2M Software Package Quick Start Guide" (R01QS0040) bundled in this package.

Following sample applications are bundled in this package.

#### **Example of initialization:**

This sample is a simple sample program that blinks the LED on the RZ/A2M evaluation board. You can use this application as base project of your product and you can add various functions using Smart Configurator. Refer "RZ/A2M Software Package Quick Start Guide" (R01QS0040) bundled in this package.

#### **Example of FreeRTOS:**

This sample is a simple sample program that blinks the LED on the RZ / A2M evaluation board. In this sample, FreeRTOS is used. You can use this application as base project of your product and you can add various functions using Smart Configurator. Refer "RZ/A2M Software Package Quick Start Guide" (R01QS0040) bundled in this package.

#### **Camera and Display sample application:**

This program captures video from the MIPI CSI-2 interface camera module bundled in RZ/A2M Evaluation Board Kit and displays it on the display. In this sample, FreeRTOS is used.

#### **DRP basic sample program**

The DRP basic sample program provides the following sample. In this sample, FreeRTOS is used.

DRP Basic Operation Sample Program

Converts the input image from MIPI camera to grayscale image using DRP and outputs to display.

#### **Ethernet sample program**

This sample program connects the RZ / A2M evaluation board and the PC via Ethernet, outputs data to the Echo server of the PC, and confirms the response. In this sample, FreeRTOS is used.

#### **Example of Low power mode**

This sample program handles the stand-by mode process. (Stand-by in/out). In this sample, FreeRTOS is NOT used.

#### **Pmod ESP32 Wi-Fi Sample program**

This sample program transmits the JPEG data converted from captured image from MIPI camera using Digilent Pmod ESP32 module. In this sample, FreeRTOS is used.

### **Environment**

- Target Device: RZ/A2M
- Target Board: RZ/A2M Evaluation Board Kit (RTK7921053S00000BE)
- IDE: Arm® Development Studio (hereinafter called "Arm DS")
- Tool Chain: Arm Compiler 6
- Download Tool: SEGGER J-Links 6.48 or later

The IDE is available from the following site.

<https://developer.arm.com/tools-and-software/embedded/arm-development-studio/downloads>

The Download Tool is available from the following site.

<https://www.segger.com/downloads/jlink/#J-LinkSoftwareAndDocumentationPack>

## Contents

1. Package Contents .....	5
1.1 Software .....	5
1.2 Documents .....	5
2. Folder Structure.....	6
3. How to use the projects bundled in this package .....	8
4. Reference Application Notes .....	8
5. Restrictions.....	8
6. Precautions .....	9
7. Used open source software and licenses.....	10
Revision History.....	11

## 1. Package Contents

### 1.1 Software

This package contains the following software.

**Table 1-1 Software of this package**

No	Name	File
1	RZ/A2M Group Example of Initialization	rza2m_blinky_sample_osless_arm.zip
2	RZ/A2M Group Example of FreeRTOS	rza2m_blinky_sample_freertos_arm.zip
3	RZ/A2M Group Camera and Display sample application	rza2m_cam_and_disp_sample_freertos_arm.zip
4	RZ/A2M Group DRP Basic Operation sample program	rza2m_drp_library_sample_freertos_arm.zip
5	RZ/A2M Group Ethernet sample program	rza2m_ethernet_sample_freertos_arm.zip
6	RZ/A2M Group Example of Low power mode	rza2m_lpm_sample_osless_arm.zip
7	RZ/A2M Group Pmod ESP32 Wi-Fi Sample program	rza2m_wifi_pmod_esp32_sample_freertos_arm.zip
8	RZ/A2M Group Bootloader program	rza2m_sflash_boot_loader_arm.zip

### 1.2 Documents

This package contains the following documents.

**Table 1-2 Documents of this package**

No	Title	Document Number
1	RZ/A2M Group RZ/A2M Simple Applications Package (Arm Development Studio) V2.00 Release Note	R01AN5068 (This document)

Also, each project indicated in Table 1-1 includes the sample program's application notes.  
Each driver folder includes the document for the driver.

## 2. Folder Structure

Folder structure of this package and outline of contents are shown in Figure 2.1.

Figure 2.2 shows an example of the sample application's folder structure. The DRP basic sample application is used in the Figure 2.2.

TOP	: top folder
+---rza2m_blinky_sample_osless_arm.zip	: RZ/A2M Group Example of Initialization
+---rza2m_blinky_sample_freertos_arm.zip	: RZ/A2M Group Example of FreeRTOS
+---rza2m_cam_and_disp_sample_freertos_arm.zip	: RZ/A2M Group Camera and Display Sample
+---rza2m_drp_basic_sample_freertos_arm.zip	: RZ/A2M Group DRP Basic Operation sample program
+---rza2m_ethernet_sample_freertos_arm.zip	: RZ/A2M Group Ethernet sample program
+---rza2m_lpm_sample_osless_arm.zip	: RZ/A2M Group Example of Low power mode
+---rza2m_sflash_boot_loader_arm.zip	: RZ/A2M Group Bootloader program
+---rza2m_wifi_pmod_esp32_sample_freertos_arm.zip	: RZ/A2M Group Pmod ESP32 Wi-Fi Sample program
+---r01an5068ej0200-rza2m-simple-apl-swpkg-arm.pdf	: RZ/A2M Group Simple Applications Package (Arm Development Studio) V2.00 Release Note (this document)
+---r01an5068jj0200-rza2m-simple-apl-swpkg-arm.pdf	: RZ/A2M Group Simple Applications Package (Arm Development Studio) V2.00 Release Note (Japanese)
+---r01qs0040ej0100-rza2m-quick-guide-arm.pdf	: RZ/A2M Group RZ/A2M Software Package Quick Start Guide (English)
+---r01qs0040jj0100-rza2m-quick-guide-arm.pdf	: RZ/A2M Group RZ/A2M Software Package Quick Start Guide (Japanese)

Figure 2.1 Folder Structure

rza2m_drp_basic_sample_freertos_arm.zip	: Project Top Folder
+---demos	
+---renesas	
+---rza2m-ebk	
+---common	
+---application_code	: main.c
+---config_files	: Configurations
+---arnds	
+---bootloader	: QSPI boot loader
+---doc	: Document of this sample application.
+---FlashTools	: Download tool for bootloader and target program
+---generate	: Source files generated / configured by Smart Configurator
+---compiler	: Source files depended on the compiler
+---configuration	: Header files for project configuration
+---drivers	: Basic drivers
+---f_cache	: Cache driver
+---doc	: Document of Cache driver
+---inc	: Header files for Cache driver
+---src	: Source files for Cache driver
+---f_cpg	: Clock pulse generator driver (same folder structure as Cache driver)
+---f_gpio	: GPIO driver (same folder structure as Cache driver)
+---f_intc	: INTC driver (same folder structure as Cache driver)
+---f_mmu	: MMU driver (same folder structure as Cache driver)
+---f_stb	: STB driver (same folder structure as Cache driver)
+---os_abstraction	: OS abstraction layer (same folder structure as Cache driver)
+---doc	: Document of OS abstraction layer
+---inc	: Header files for OS abstraction layer
+---src	: Source files for OS abstraction layer
+---sc_drivers	: General drivers
+---f_cbuffer	: Ring buffer (same folder structure as DRP driver)
+---f_ceu	: CEU driver (same folder structure as DRP driver)
+---f_drp	: DRP driver (same folder structure as DRP driver)
+---doc	: Documents of DRP driver
+---r01us0355ej0101-rza2m-drp-driver-gcc.pdf	: RZ/A2M Group DRP Driver User's Manual (R01US0355) (English)
+---r01us0355jj0101-rza2m-drp-driver-gcc.pdf	: RZ/A2M グループ DRP Driver ユーザーズマニュアル (R01US0355) (Japanese)
+---r01us0367ej0104-rza2m-drp-library.pdf	: RZ/A2M Group DRP Library User's Manual (English)
+---r01us0367jj0104-rza2m-drp-library.pdf	: RZ/A2M グループ DRP Library ユーザーズマニュアル (R01US0367) (Japanese)
+---drp_lib	: Source files for DRP library
+---inc	: Header files for DRP driver
+---src	: Source files for DRP driver
+---f_mipi	: MIPI driver (same folder structure as DRP driver)
+---f_ostm	: OS timer driver (same folder structure as DRP driver)
+---f_riic	: I2C driver (same folder structure as DRP driver)
+---f_rvapi	: Video utility (same folder structure as DRP driver)
+---f_scifa	: SCIFA driver (same folder structure as DRP driver)
+---f_vdc	: VDC driver (same folder structure as DRP driver)
+---system	: System files for example, IO registers
+---src	: Source files for application
+---freertos	: FreeRTOS™
+---renesas	: Software developed by Renesas
+---application	: Application source files developed by Renesas
+---lib	
+---FreeRTOS	: FreeRTOS™
+---include	: FreeRTOS™ header files
+---third_party	
+---mcu_vendor	
+---renesas_rz	
+---amazon_freertos_common	: RZ/A2M Common Settings
+---LICENSE	
+---document_index.html	: links to bundled documents are described

Figure 2.2 Folder Structure of DRP basic sample programs

### 3. How to use the projects bundled in this package

Regarding how to use, refer to the documents in each folder in this package.

### 4. Reference Application Notes

Following is the list of application notes related to this software package.

RZ/A2M Group RZ/A2M Software Core Package (R01AN4801).

Drivers and middleware for RZ/A2M that can be added to the project bundled in this package.

### 5. Restrictions

The Restrictions of this package are shown as follow.

**Table 5-1 Restrictions**

No.	Type	Description
1	DRP Driver*	The following API Functions are not supported. - R_DK2_Uninitialize - R_DK2_Inactivate If these functions are called, these functions occur an error and return "R_DK2_ERR_INTERNAL".
2	DRP Driver *	The function that load the configuration data in background is not supported. This function validates when argument "pload" of R_DK2_Load Function is set to anything other than NULL. In the version in this package this function occurs an error and return "R_DK2_ERR_INTERNAL".
3	DRP Driver *	R_DK2_Load Function notifies the return value "R_DK2_ERR_DEVICE", when detects a transfer error of the configuration data. In the version in this package this function is not supported.
4	DRP Driver *	Processing Completion Callback Function notifies the argument "result" is "R_DK2_ERR_DEVICE", when detects a transfer error in DRP. In the version in this package this function is not supported.
5	DRP Driver *	Processing Completion Callback Function notifies the argument "result" is "R_DK2_ERR_STOPPED", when detects a transfer stopped by calling R_DK2_Unload Function of R_DK2_Inactivate Function. In the version in this package this function is not supported.

Note 1 Please refer to "RZ/A2M Group DRP Driver User's Manual(R01US0355)" for details of DRP Driver's function.



## 6. Precautions

The Precautions of this package are shown as follow.

**Table 6-1 Precautions**

No.	Type	Description
1	Environment	If it is happened a build error while building the project of this package as it is, the setting of environment may be incorrect. Check following items: <ul style="list-style-type: none"><li>• Follow section 3 of "RZ/A2M Software Package Quick Start Guide"(R01QS0040)</li><li>• Install Arm DS v2019.0 or later again.</li></ul>
2	Environment	To avoid build error, expand the project to the folder with short full-path.
3	Environment	To avoid build error, expand the project to the folder without multi-byte character.
4	Environment	To obtain the bootloader function specifications, download the following application note from the Renesas site. RZ/A1LU Group Example of Booting from Serial Flash Memory (R01AN4333)
5	Tool	To avoid download fail, use SEGGER J-Links version 6.48 or later.

## 7. Used open source software and licenses

Open source software used in this package and license of them are shown as following:

- FreeRTOS™ is a trade mark of Amazon Web Services, Inc.
- FreeRTOS is used under MIT license described in following site:  
<https://www.freertos.org/a00114.html>
- Amazon FreeRTOS is used under MIT license described in following site:  
<https://github.com/aws/amazon-freertos/blob/master/LICENSE>  
<https://aws.amazon.com/freertos/faqs/>
- mbedTLS is used under the Apache License, Version 2.0 described in following site:  
<http://www.apache.org/licenses/LICENSE-2.0>

## Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Nov. 29, 2019	-	First Edition issued
2.00	Feb. 28, 2020	P4-5	Added an application that is included in the package Example of Low power mode Pmod ESP32 Wi-Fi Sample program

# 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.

## Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
  2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
  3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
  4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
  5. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.
    - "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.
    - "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.
- Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.
6. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
  7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
  8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
  9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
  10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
  11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
  12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

## Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,  
Koto-ku, Tokyo 135-0061, Japan  
[www.renesas.com](http://www.renesas.com)

## Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

## Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:  
[www.renesas.com/contact/](http://www.renesas.com/contact/).