RZ/A2M Group

RZ/A2M Software Core Package V8.70 Release Note

Introduction

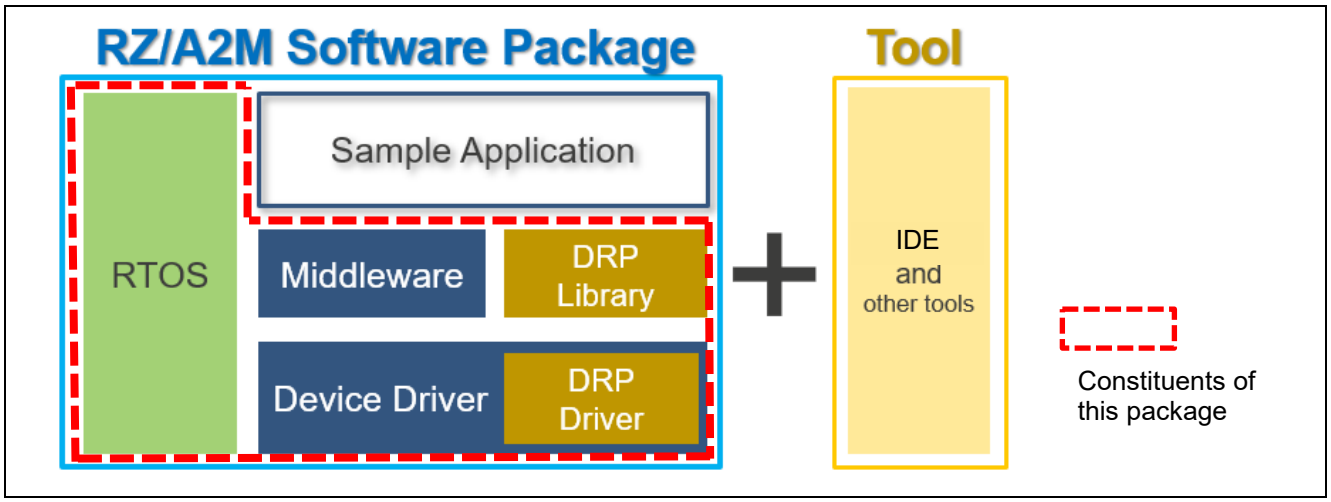
This software package for RZ/A2M is one of the RZ/A2M Software Package and consists of Renesas provided drivers, middleware, and RTOS. You can add new functions to your product of RZ/A2M using this package easily.

The executable sample program which is made based on this package is published on Renesas web site as RZ/A2M Group RZ/A2M Simple Applications Package (R01AN4494), RZ/A2M Group 2D Barcode Package (R01AN4487), and RZ/A2M Group IRIS Package (R01AN4584).

- RZ/A2M FreeRTOS Software Package site:
  https://www.renesas.com/software-tool/rza2m-freertos-software-package

RZ/A2M Group RZ/A2M Simple Applications Package (R01AN4494), RZ/A2M Group 2D Barcode Package (R01AN4487), and RZ/A2M Group IRIS Package(R01AN4584) include only required functions (drivers / middleware / RTOS) by each sample program, from this package's constituent.

User can add each function (drivers / middleware / RTOS) of this package to sample program. Please refer to section 3 for more detail.



Position of RZ/A2M Software Core Package

Target Device

RZ/A2M

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1. Overview

Table 1.1 lists software bundled in this package.

“RZ/A2M Group RZ/A2M Simple Application Package” (R01AN4494), “RZ/A2M Group 2D Barcode Package” (R01AN4487), and “RZ/A2M Group IRIS Package” (R01AN4584) include sample programs using these pieces of software. Note that this package includes no applications and no projects.

Table 1.1 Software bundled in this package

Directory	Peripheral device	Ver.	Description
generate\sc_drivers\r_cache	L1 / L2 cache	1.03	L1 and L2 cache
generate\sc_drivers\r_cpg	Clock Pulse Generator	1.05	Clock settings for LSI
generate\sc_drivers\r_gpio	GPIO	1.06	GPIO driver
generate\sc_drivers\r_intc	Interrupt Controller	1.05	Driver for controlling interrupt
generate\sc_drivers\r_mmu	Memory Management Unit	1.04	Driver to control memory attribute
generate\sc_drivers\r_stb	Power-Down Modes	1.04	Driver to control module stand-by
generate\sc_drivers\fatfs	-	0.13c	FatFS filesystem
generate\sc_drivers\r_adc	12-bit A/D Converter	1.03	Driver to control A/D converter
generate\sc_drivers\r_cbuffer	-	1.03	Ring buffer
generate\sc_drivers\r_ceu	Capture Engine Unit	1.12	Driver to capture the image from camera via parallel interface
generate\sc_drivers\r_dmac	Direct Memory Access Controller	2.04	Driver to control DMAC
generate\sc_drivers\r_drp	Dynamic Reconfigurable Processor	1.09	DRP driver
generate\sc_drivers\r_ether	Ethernet Controller	1.12	Driver to communicate with other board via LAN
generate\sc_drivers\r_gpt	General PWM Timer (GPT)	1.02	GPT driver
generate\sc_drivers\r_hyperbus	HyperBus™ Controller	1.02	Hyperbus driver
generate\sc_drivers\r_jcu	JPEG Codec Unit	1.13	Driver to control JPEG
generate\sc_drivers\r_lpm	Power-Down Modules	1.13	Driver to control low power mode
generate\sc_drivers\r_mipi	MIPI CSI-2 Interface Video Input Module	1.14	Driver to capture the image from camera via MIPI CSI-2 interface
generate\sc_drivers\r_ostm	OS Timer	1.07	OS Timer driver
generate\sc_drivers\r_riic	I2C Bus Interface	1.07	Driver to control other devices via I2C bus.
generate\sc_drivers\r_rspi	Renesas Serial Peripheral Interface	1.01	Driver to control other devices via RSPI bus.
generate\sc_drivers\r_rtc	Real Time Clock	1.04	RTC driver
generate\sc_drivers\r_rvapi	-	1.13	Video Application Interface
generate\sc_drivers\r_scifa	Serial Communications Interface with FIFO	2.05	Driver to control both asynchronous and clock synchronous serial communication.
generate\sc_drivers\r_sdhi_simplified	SD/MMC Host Interface	1.60	Driver to control SDHI
generate\sc_drivers\r_ssif	Serial Sound Interface	1.01	Driver to control SSIF
generate\sc_drivers\r_usbf_basic	USB Function Module	1.21	Driver to control USBF
generate\sc_drivers\r_usbf_cdc	USB Function Module	1.20	Communication Device Class Driver of USBF
generate\sc_drivers\r_usbh0_basic	USB Host Module	1.50	Driver to control USBH ch0
generate\sc_drivers\r_usbh0_msc	USB Host Module	1.51	Mass Storage Class driver of USBH ch0
generate\sc_drivers\r_usbh0_hid	USB Host Module	1.40	Human Interface Device Class driver of USBH ch0
generate\sc_drivers\r_usbh1_basic	USB Host Module	1.50	Driver to control USBH ch0
generate\sc_drivers\r_usbh1_msc	USB Host Module	1.51	Mass Storage Class driver of USBH ch0
generate\sc_drivers\r_usbh0_hid	USB Host Module	1.40	Human Interface Device Class driver of USBH ch1
generate\sc_drivers\r_vdc	Video Display Controller 6	1.13	Driver to capture the image from camera via parallel interface, and driver to display.
generate\os_abstraction	-	3.08	OS abstraction wrapper
generate\os_abstraction_freertos	-	3.10	OS abstraction wrapper (FreeRTOS)
r_hyperbus_middleware	HyperBus™ Controller	1.02	HyperBus configuration settings for RZ/A2M evaluation board.

Note: HyperBus™ is trademark of Cypress Semiconductor Corporation.

2. Operation Confirmation Conditions

The source code in this package is verified on following conditions.

Table 2.1 Peripheral device used(1/2)

Peripheral device	Usage
MCU used	RZ/A2M
Operating frequency[MHz] (Note)	CPU Clock (Iφ) : 528MHz Image processing clock (Gφ) : 264MHz Internal Bus Clock (Bφ) : 132MHz Peripheral Clock 1 (P1φ) : 66MHz Peripheral Clock 0 (P0φ) : 33MHz QSPI0_SPCLK : 66MHz CKIO : 132MHz
Operating voltage	Power supply voltage (I/O): 3.3 V Power supply voltage (either 1.8V or 3.3V I/O (PVcc_SPI)) : 3.3V Power supply voltage (internal): 1.2 V
Integrated development environment	e2 studio 2024-04 Windows 64-bit product version.
C compiler	“Arm GNU Toolchain 12.2.Rel1” compiler options(except directory path) Release: -mcpu=cortex-a9 -march=armv7-a -marm -mlittle-endian -mfloat-abi=hard -mfpu=neon -mno-unaligned-access -Os -ffunction-sections -fdata-sections -Wunused -Wuninitialized -Wall -Wextra -Wmissing-declarations -Wconversion -Wpointer-arith -Wpadded -Wshadow -Wlogical-op -Waggregate-return -Wfloat-equal -Wnull-dereference -Wmaybe-uninitialized -Wstack-usage=100 -fabi-version=0 Hardware Debug: -mcpu=cortex-a9 -march=armv7-a -marm -mlittle-endian -mfloat-abi=hard -mfpu=neon -mno-unaligned-access -Og -ffunction-sections -fdata-sections -Wunused -Wuninitialized -Wall -Wextra -Wmissing-declarations -Wconversion -Wpointer-arith -Wpadded -Wshadow -Wlogical-op -Waggregate-return -Wfloat-equal -Wnull-dereference -Wmaybe-uninitialized -g3 -Wstack-usage=100 -fabi-version=0

Note: The operating frequency used in clock mode 1 (Clock input of 24MHz from EXTAL pin)

Table 2.2 Peripheral device used(2/2)

Operation mode	Boot mode 3 (Serial Flash boot 3.3V)
Terminal software communication settings	Communication speed: 115200bps Data length: 8 bits Parity: None Stop bits: 1 bit Flow control: None
Board to be used	RZ/A2M CPU board RTK7921053C00000BE RZ/A2M SUB board RTK79210XXB00000BE
Device (functionality to be used on the board)	Serial flash memory allocated to SPI multi-I/O bus space (channel 0) Manufacturer : Macronix Inc. Model Name : MX25L51245GXD RL78/G1C (This device communications the host PC by convert USB Communication and Serial Communication.) LED1 EEPROM R1EX24128ASAS0A(Renesas) Ethernet PHY RTL8201FL-VB-CG(Realtek)

3. How to Use This Package

Drivers bundled in this package can be added/removed/configured by using Smart Configurator, a function of e2 studio 2024-04 or later.

Refer RZ/A2M Smart Configurator User's Guide: e² studio (R20AN0583) for the usage of Smart Configurator.
e.g.) how to install drivers and middleware to e2 studio.

4. Reference Application Notes

Following application notes are related to this package.

- Application Packages (needed downloading)
  - RZ/A2M Group RZ/A2M Simple Application Package(R01AN4494)
    includes simple executable projects using software bundled in this package.
  - RZ/A2M Group 2D Barcode Package(R01AN4487)
    includes 2D barcode sample projects using software bundled in this package.
  - RZ/A2M Group IRIS Package(R01AN4584)
    includes iris detection sample projects using software bundled in this package.
  - RZ/A2M Group SD Package(R01AN4680)
    includes SDHI sample projects using software bundled in this package.

- Documents for components (bundled in this package)
  - RZ/A2M Group RZ/A2M CACHE Driver Application Note (R01AN4501)
    includes driver software for Cache use.
  - RZ/A2M Group RZ/A2M CPG Driver Application Note (R01AN4499)
    includes driver software for CPG use.
  - RZ/A2M Group RZ/A2M GPIO Driver Application Note (R01AN4395)
    includes driver software for GPIO use.
  - RZ/A2M Group RZ/A2M INTC Driver Application Note (R01AN4500)
    includes driver software for INTC use.
  - RZ/A2M Group RZ/A2M MMU Driver Application Note (R01AN4498)
    includes driver software for MMU use.
  - RZ/A2M Group RZ/A2M STB Driver Application Note (R01AN4496)
    includes driver software for STB use.
  - RZ/A2M Group RZ/A2M OS Abstraction Driver Application Note (R11AN0309)
    includes driver software for OS abstraction use.
  - RZ/A2M Group ADC Driver Application Note (R11AN0368)
    includes driver software for ADC use.
  - RZ/A2M Group CEU Driver Application Note (R01AN4474)
    includes driver software for CEU use.
  - RZ/A2M Group RZ/A2M DMAC Driver Application Note (R01AN4467)
    includes driver software for DMAC use.

— RZ/A2M Group DRP Driver User's Manual (R01US0355)
includes driver software for DRP use.

— RZ/A2M Group DRP Library User's Manual (R01US0367)
includes libraries for DRP.

— RZ/A2M Group Ethernet Driver Application Note (R01AN4642)
includes driver software for Ethernet use.

— RZ/A2M Group GPT Driver Application Note (R11AN0443)
includes driver software for GPT use.

— RZ/A2M Group Example of booting from HyperFlash™ using HyperBus™ controller Application Note (R01AN4658)
includes driver software for Hyperbus use.

— RZ/A2M Group JCU Driver Application Note (R01AN4456)
includes driver software for JCU use.

— RZ/A2M Group Example of Low power mode Application Note (R01AN4644)
includes driver software for low power mode.

— RZ/A2M Group MIPI Driver Application Note (R01AN4481)
includes driver software for MIPI use.

— RZ/A2M Group OSTM Driver Application Note (R01AN4497)
includes driver software for OSTM use.

— RZ/A2M Group RZ/A2M RIIC Driver Application Note (R01AN4645)
includes driver software for RIIC use.

— RZ/A2M Group RZ/A2M RTC Driver Application Note (R01AN4958)
includes driver software for RTC use.

— RZ/A2M Group Video Utility Application Note (R01AN4476)
includes driver software for Video use.

— RZ/A2M Group RZ/A2M SCIFA Driver Application Note (R11AN0307)
includes driver software for SCIFA use.

— RZ/A2M Group Simplified SD Memory Card Driver Installation Guide Application Note (R20AN0532)
includes driver software for SDHI use.

— RZ/A2M Group USB Basic Peripheral Driver Application Note (R01AN4899)
includes driver software for USB Function basic use.

— RZ/A2M Group USB Peripheral Communication Device Class Driver (PCDC) Application Note (R01AN4900)
includes driver software for USB Function CDC use.

— RZ/A2M Group USB Basic Host Driver Application Note (R01AN4715)
includes driver software for USB Host basic use.

— RZ/A2M Group USB Host Mass Storage Class Driver (HMSC) Application Note (R01AN4714)
includes driver software for USB Host Mass Storage Class use.

— RZ/A2M Group USB Host Human Interface Device Class Driver (HHID) Application Note (R01AN4716)
includes driver software for USB Host HID Class use.

— RZ/A2M Group Video Display Controller and Sprite Engine Sample Driver Application Note (R01AN4475)
includes driver software for VDC use and SPE use.

- The Other Documents (needed downloading)
— RZ/A2M Group RZ/A2M Software Package Quick Start Guide (R01QS0027)
A guide for using RZ/A2M Software Package. This file is bundled in Application Packages.

— RZ/A2M Group Video Register Definition file iodefine.h (R01AN4585)
Describes I/O registers of RZ/A2M and how to use them.

— e2 studio Integrated Development Environment User's Manual: Getting Started (R20UT4535)
Installation guide for e2 studio.

— RZ/A2M Smart Configurator User's Guide: e² studio (R20AN0583)
Users Guide of Smart Configurator.

5. Restrictions

The Restrictions of this package are shown as follows.

Table 5-1 Restrictions

No.	Type	Description
1	Driver (RIIC)	Slave mode is not supported.
2	Driver (RIIC)	SMBus format is not supported.
3	Driver (USBH)	Full Speed Hub is not supported.
4	Driver (VDC)	A scaled-up graphics display of VDC can't be used. Even a scaled-up graphics display requires both an input Vsync signal and an output Vsync signal. The RZ/A2M evaluation board can't be used it because there is no input synchronization signal (DV0_VSYNC) on the board.
5	Driver (SCIFA)	In the case running on OS-less condition, the successful return value of write() function will be 0, not transmitted bytes.
6	Driver (USB Host HID)	These drivers don't work with OSless project.
7	Driver (USB Host)	Detachment of devices connected to a USB hub is prohibited. When you detach the device connected to the USB hub, detach the USB hub.

6. Precautions

The Precautions of this package are shown as follows.

Table 6-1 Precautions

No.	Type	Description
1	All	This package is incompatible with RZ/A2M Simple Application Package **V1.00** or RZ/A2M 2D Barcode Package **V1.00**. Please use RZ/A2M Simple Application Package **V2.00** or RZ/A2M 2D Barcode Package **V2.00** because of including the similar project.
2	File System	In the case that both USBH MSC and SD is used, File system is connected to USBH MSC.
3	e2 studio	There might be a revision difference between the drivers bundled in this package and the drivers included in the project generated by e2 studio new generating project function. In the case updating module stand-by (STB) driver to 1.04 in the project generated by e2 studio 2022-01 new generating project function, overwrite the following file from the projects in the packages described in the section 1. Overview: `generate\compiler\init\resetprg.c`

7. Used open source software and licenses

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

- newlib is used under the license described in following site:
  https://www.sourceware.org/newlib/COPYING.NEWLIB
- 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
- FatFs is used under the license described in following site:
  http://elm-chan.org/fsw/ff/doc/appnote.html#license
- HyperBus™/HyperFlash™/HyperRAM™ are trademarks of Cypress Semiconductor Corporation.

SD Host/Ancillary Product License Agreement (SD HALA) is required to develop SD host-related products.
Refer https://www.sdcard.org/developers/licensing/ for detail:

8. Reference Documents

User's Manual: Hardware

RZ/A2M Group User's Manual: Hardware
The latest version can be downloaded from the Renesas Electronics website.

RTK7921053C00000BE (RZ/A2M CPU board) User's Manual
The latest version can be downloaded from the Renesas Electronics website.

RTK79210XXB00000BE (RZ/A2M SUB board) User's Manual
The latest version can be downloaded from the Renesas Electronics website.

ARM Architecture Reference Manual ARMv7-A and ARMv7-R edition Issue C
The latest version can be downloaded from the ARM website.

ARM Cortex™-A9 (Revision: r4p1) Technical Reference Manual
The latest version can be downloaded from the ARM website.

ARM Generic Interrupt Controller Architecture Specification - Architecture version 2.0
The latest version can be downloaded from the ARM website.

ARM CoreLink™ Level 2 Cache Controller L2C-310 (Revision: r3p3) Technical Reference Manual
The latest version can be downloaded from the ARM website.

Technical Update/Technical News

The latest information can be downloaded from the Renesas Electronics website.

User's Manual: Development Tools

Integrated development environment e2studio User’s Manual can be downloaded from the Renesas Electronics website.
The latest version can be downloaded from the Renesas Electronics website.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Sep.14.18	-	First Edition Issued
2.00	Dec.28.18	3	Added following drivers: • r_drp, r_ether, r_riic
		3	Moved following drivers to “generate\sc_drivers”: • r_ceu, r_jcu, r_mipi, r_rvapi, r_vdc
		4,6	Changed supporting version of e2studio to v7.3
		5	Added EEPROM and Ethernet PHY to “device”.
		6	Supported Smart Configurator function of e2 studio.
		7	Added following documents to “Reference Documents”: • RZ/A2M Group IRIS Package • RZ/A2M Group CEU Driver Application Note • RZ/A2M Group DRP Driver User’s Manual • RZ/A2M Group DRP Library User’s Manual • RZ/A2M Group Ethernet Driver Application Note • RZ/A2M Group JCU Driver Application Note • RZ/A2M Group MIPI Driver Application Note • RZ/A2M Group Video Utility Application Note • RZ/A2M Group RZ/A2M Software Package Quick Start Guide • RZ/A2M Group Video Register Definition file iodefine.h
		9	Added the assembler include path issue to the restriction.
3.00	Apr.15.19	4, 8	Added following drivers: fatfs, r_adc, r_lpm, r_sd_simplified, r_usbh0_basic, r_usbh0_msc, r_usbh0_hidc, r_usbh1_basic, r_usbh1_msc, r_usbh1_hidc
		5, 7	Changed supporting version of e2studio to v7.4
		11	Fixed the following restriction about RIIC: • The DMAC driver supports only memory-to-memory transfers.
		11	Fixed the following restriction about RIIC: • When you add the component configuration with SmartConfigurator, do not register settings where different configurations refer to the same channel number.
		11	Fixed the following restriction about SCIFA: • When you add the component configuration with SmartConfigurator, do not register settings where different configurations refer to the same channel number.
		11	Added the following restriction about USBH: • Full Speed Hub is not supported.
		11	Added the following precaution about File System: • In the case that both USBH MSC and SD is used, File system is connected to USB MSC.
		12	Added section 7, “Used open source software and licenses”

Rev.	Date	Description	
		Page	Summary
4.00	Jun.07.19	4, 5	Deleted -mthumb-interwork option from compilation option. Updated some drivers by the modification of document to delete the option.
		4	Updated DRP component to add some libraries.
5.00	Sep.30.19	4	Moved following drivers to sc_drivers. • r_cache, r_cpg, r_gpio, r_intc, r_mmu
		4	Added following drivers. • r_usbf_basic, r_usbf_cdc
		4	Updated the revision of each driver
		5, 7	Changed supporting version of e2studio to v7.5
		9	Added the following relating documents: • e2 studio Integrated Development Environment User's Manual: Getting Started (R20UT4535) • RZ/A2M Smart Configurator User's Guide: e² studio (R20AN0583)
		11	Added the precaution about the e2 studio new generated project.
		11	Added the precaution about the return value of write() function of SCIFA driver.
		11	Added the precaution about OS of USB drivers.
6.00	Dec.17.19	4	Added following drivers. ● r_rtc
		4	Updated the revision of each driver
		5, 7	Changed supporting version of e2studio to v7.6
		9	Added the following relating documents: ● RZ/A2M Group RZ/A2M RTC Driver Application Note (R01AN4958)
		11	Removed the restriction about the assembler include path of DRP driver.
		11	Removed "USBF CDC" and "USBH MSC" drivers from the restriction about OS of USB drivers.
		11	Added the restriction about the USB hub connection of USB Host driver.
7.00	Mar.31.20	4	Added following drivers. • r_gpt • r_hyperbus
		4	Updated the revision of each driver
		5, 7	Changed supporting version of e2studio to v7.7
		9	Added the following relating documents: • RZ/A2M Group RZ/A2M GPT Driver Application Note (R11AN0443) • RZ/A2M Group Example of booting from HyperFlash™ using HyperBus™ controller Application Note (R01AN4658)
8.00	Jun.30.20	4	Added following drivers. • r_rspi • r_hyperbus_middleware
		4	Updated the revision of each driver
		5, 7	Changed supporting version of e2studio to v7.8

Rev.	Date	Description	
		Page	Summary
8.10	Sep.30.20	4	Added following drivers. • r_ssif
		4	Updated the revision of each driver
		5, 7	Changed supporting version of e2studio to 2020-07
8.20	Apr.20.21	4	Updated the revision of each driver.
		4	Deleted os_abstraction_amazon by merging with os_abstraction_freertos.
		7	Changed the version of e^2 studio to 2021-04 or later.
		11	Added the precaution about updating module stand-by (STB) driver to 1.04 in the project generated by e2 studio 2021-04 new generating project function.
8.30	Jan.20.22	5, 7	Changed supporting version of e2studio to 2022-01
		11	Changed supporting version of complier to 9-2020-q2-update Update the FreeRTOS version to V10.4.3-LTS-Patch-1
8.50	Jan.20.23	-	Modified Critical Section related functions in OS abstraction to support IRQ handler. Modified SCIFA files to change the return value when transferring 0 bytes. Modified GPIO macro value. Update some smart configurator component files.
8.70	Apr.22.24	–	Changed supporting version of complier to 12.2.Rel1. Updated the revision of each driver. SSIF and SCIFA driver support DMAC linkage on multiple channels.

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.
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