QE for OTA V2.2.0

Release Note

Thank you very much for your using the QE for OTA V2.2.0.

This release documentation, we have indicated this product installation, restrictions and so on.

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1. About QE for OTA

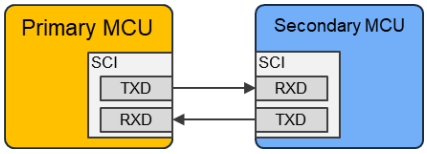
1.1 Summary

QE for OTA is one of the solution toolkits that operate on the e^2 studio integrated development environment.

This development assistance tool helps you easily try firmware update on your device. By performing operations according to the workflow diagram, you can set up a project to perform firmware updates on devices, embed security information into the MCU, create firmware, and perform OTA. In addition, in OTA using the cloud, you can obtain cloud-related information, register the information necessary for performing OTA to the cloud system, embed security information into the MCU, and then perform OTA.

1.2 New Functions

1. Firmware update for Secondary MCU (RL78/RX) connected to Primary MCU (RX65N) via UART is now supported. The 2nd OTA Project Creation Guide, which opens from the OTA Workflow (QE) view, makes it easy to create a project for a secondary MCU that supports firmware updates.



2. Firmware updates for the RX Family and RL78 Family that do not use the cloud are now supported. You can create, write, update firmware, and send firmware updates using serial communication from the "OTA Workflow (QE)" view.

1.3 Workflow Diagram

- Setup for Cloud

  Specify the settings to sign in to the cloud and set the cloud resources. If you do not want to use the cloud, select "None" for the connection destination.

- Prepare OTA projects

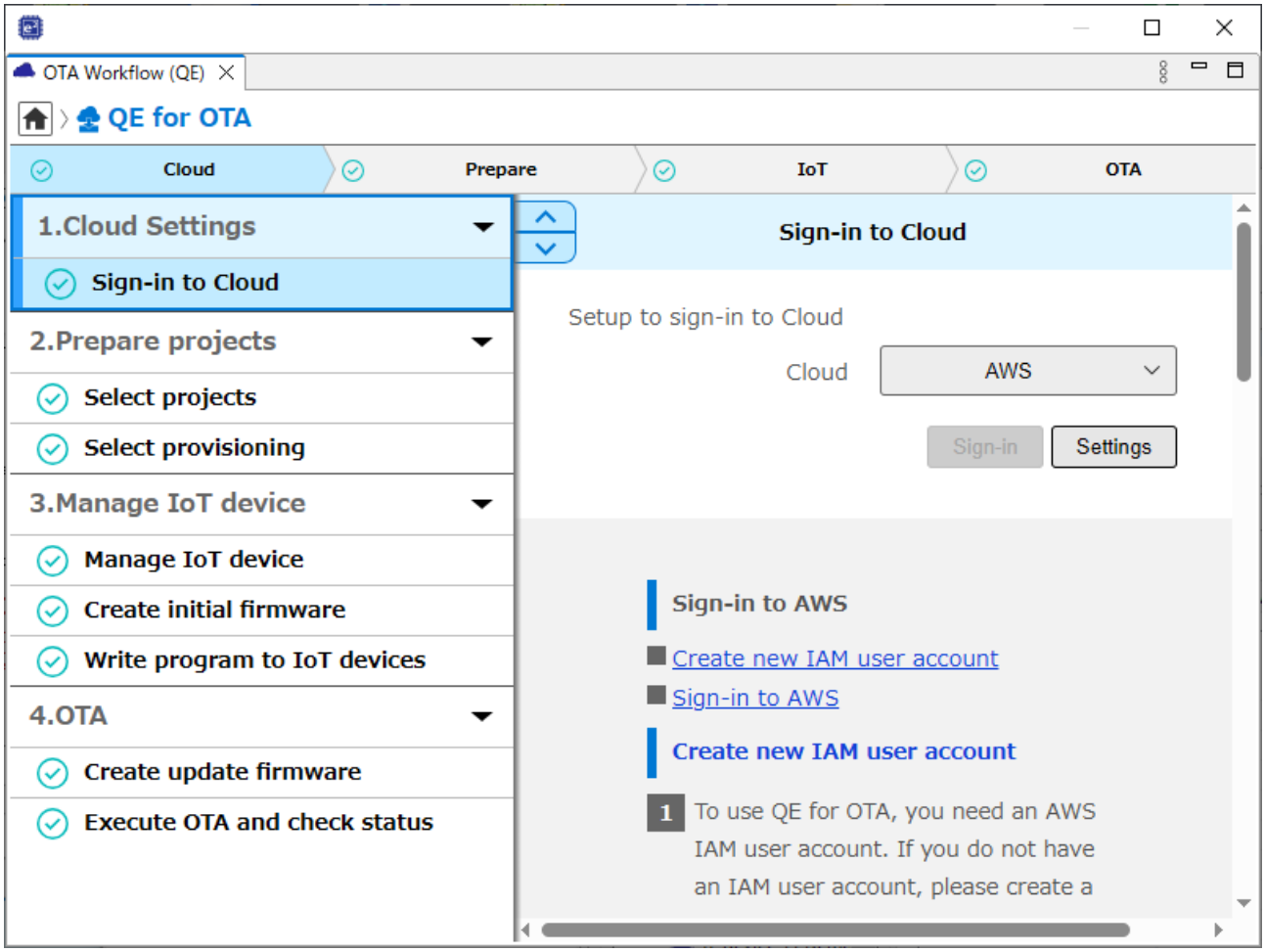
  Import or create OTA projects.

- Manage IoT devices

  You can add and delete IoT devices and view the IoT device information. You can also create initial firmware and write it into an IoT device.

- OTA

  Create update firmware and execute OTA.



1.4 OTA Manage IoT Device (QE) View

This view displays a list of IoT devices registered on the cloud. You can also add and delete IoT devices.

This view has five features: IoT Device, Initial Firmware, Update Firmware, OTA, and Firmware Log.

- IoT Device

  You can view IoT device information including the device certificate and security key set during creation of an IoT device.

- Initial Firmware

  You can create initial firmware by embedding information for each IoT device into the source code.

- Update firmware

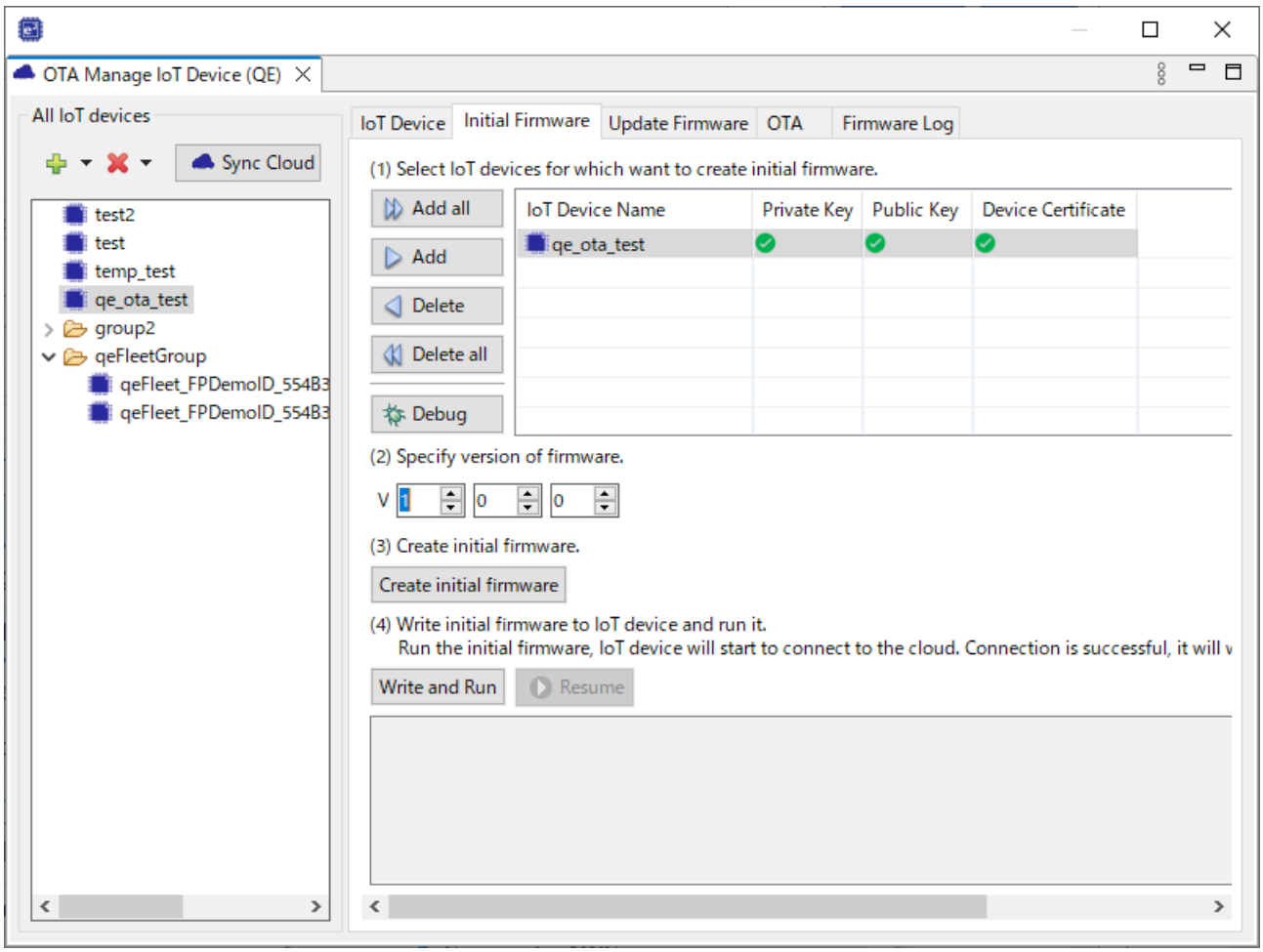
  You can create update firmware by embedding information for each IoT device into the source code.

- OTA

  Execute OTA.

- Firmware Log

  You can view the operation log of the target board.



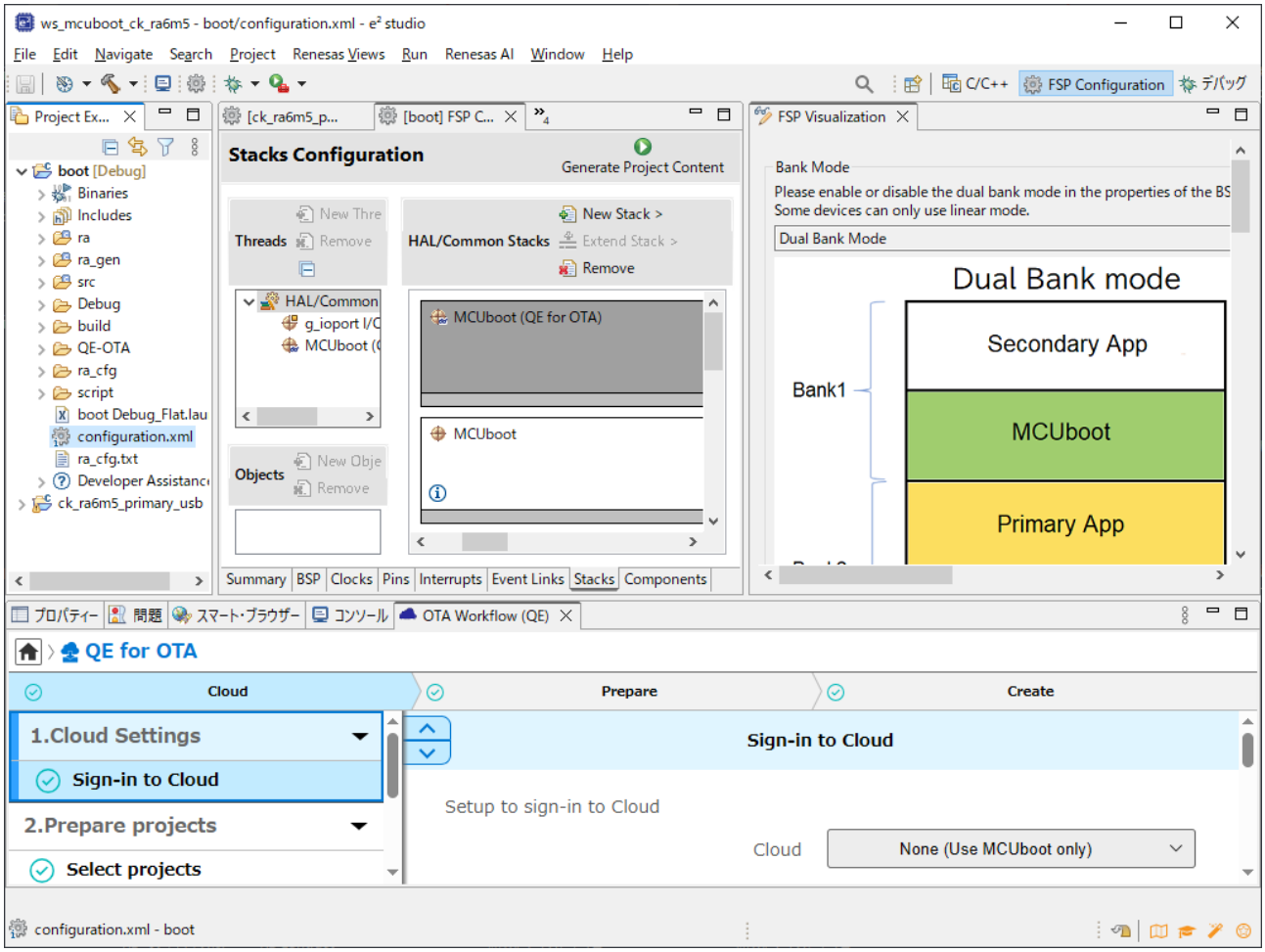
1.5 MCUboot (QE for OTA) module

This module adds the MCUboot (QE for OTA) module from the FSP Configuration Editor and allows you to create a boot loader by graphically configuring MCUboot in the FSP Visualization view.

For firmware with a firmware update function, please refer to the following application note.

RA6 MCU Advanced Secure Bootloader Design using MCUboot and Code Flash Dualbank Mode (R11AN0570)

- MCUboot (QE for OTA) module
  It can be configured in the FSP Visualization view with the FSP module that contains the MCUboot module.
- OTA Workflow view
  Initial firmware can be created, written, and debugged.
  Updated firmware can be created and debugged.



1.6 Supported Environment

- Windows 10, Windows 11
- Renesas e^2 studio 2024-10 (or later)
- Renesas Flash Programmer V3.16 (or later)
- OpenSSL: Win64 OpenSSL v3.0.4 Light (or later)

An AWS account or Azure account is required to use cloud with QE for OTA.

1.7 Supported Microcontroller

- OTA with cloud
  - RX65N
  - RL78/G23
  - RA6M5
- Firmware update with MCUboot
  - RA6M5
  - RA6M4
- Firmware update for secondary MCU
  - RX140
  - RX23E-B
  - RX261
  - RX660
  - RX66T
  - RL78/G23

Depending on the supported sample project and related software, the available functions and cloud services will differ.

1.8 Supported Board and RTOS

The combinations of the confirmed board and OTA sample program (including RTOS) are as follows.

Table 1. Sample projects that tested operation

Board or Kit	OTA sample projects(including RTOS)
CK-RX65N v1	• FreeRTOS v202107.00-rx-1.0.1 • FreeRTOS v202210.01-LTS-rx-1.1.3 (LTS #2) • FreeRTOS v202210.01-LTS-rx-1.2.1 (LTS #2) • FreeRTOS v202210.01-LTS-rx-1.3.1 (LTS #2) • AzureRTOS 6.4.0_rel-rx-1.0.0 • AzureRTOS 6.2.1_rel-rx-1.0.1 • AzureRTOS 6.2.1_rel-rx-1.0.0
CK-RX65N v2 (Wi-Fi) (Recommended)	• FreeRTOS v202210.01-LTS-rx-1.2.1 (LTS #2) • FreeRTOS v202210.01-LTS-rx-1.3.1 (LTS #2)
RX65N-Cloud-Kit	• FreeRTOS v202107.00-rx-1.0.1 • FreeRTOS v202107.00-rx-1.0.0
RX65N-2MB-Starter-Kit-Plus	• FreeRTOS v202107.00-rx-1.0.1 • FreeRTOS v202107.00-rx-1.0.0
RL78/G23-128p Fast Prototyping Board	• FreeRTOS v202210.01-LTS-rl78-1.0.0 • FreeRTOS v202210.01-LTS-rl78-1.1.0 (Only LTE, Not support Wi-Fi)
CK-RA6M5 v2	• Sample project included with Application Note “RA AWS Cloud Connectivity and Firmware Update OTA on CK-RA6M5 v2 with Ethernet (R11AN0915)”
EK-RA6M5	• MCUboot only
EK-RA6M4	• MCUboot only

The operation confirmed board for the firmware update of the secondary MCU is as follows.

Table 2. Boards that have been confirmed to work as secondary MCUs

Board or Kit	Reference Application Note
FPB-RX140	RX Family Firmware Updating Communications Module Using Firmware Integration Technology(R01AN7757)
RSSK-RX23E-B	Same as above
FPB-RX261	Same as above
RSK-RX66T	Same as above
TB-RX660	Same as above
RL78/G23-128p Fast Prototyping Board	RL78/G23 Firmware Updating Communications Module(R01AN7825)

2. Installation and Uninstallation

2.1 Installing This Product

Use either of the following procedure to install this product.

2.1.1 Install from the "Renesas Software Installer" menu of e² studio

1. Start e² studio.
2. Select the [Renesas Views] – [Renesas Software Installer] menu of e² studio to open the [Renesas Software Installer] dialog box.
3. Select the [Renesas QE] and click the [Next>] button
4. Select the [QE for OTA (v2.2.0)] check box, and click the [Finish] button.
5. Check that the [Renesas QE for OTA] check box is selected in the [Install] dialog box, and click the [Next>] button.
6. Check that the [Renesas QE for OTA] check box is selected as the target of installation, and click the [Finish] button.
7. If the dialog of the Security Warning is displayed, click the [Install anyway] button to continue installation.
8. When prompted to restart e² studio, restart it.
9. Start this product from the [Renesas Views] - [Renesas QE] menu of e² studio. For details about how to use this product, see the [Help] menu of e² studio.

2.1.2 Install using QE (zip file) downloaded from the Renesas website

1. Start e² studio.
2. From the [Help] menu, select [Install New Software...] to open the [Install] dialog box.
3. Click the [Add...] button to open the [Add Repository] dialog box.
4. Click the [Archive...] button, select the installation file (zip file) in the opened file selection dialog box, and then click the [Open] button.
5. Click the [OK] button in the [Add Repository] dialog box.
6. Expand the [Renesas QE] item shown in the [Install] dialog box, select the [Renesas QE common] check box and the [Renesas QE for OTA] check box, and then click the [Next>] button.
   * If you check off the [Contact all update sites during install to find required software] checkbox, you can shorten the installation time.
7. Check that the [Renesas QE common] and the [Renesas QE for OTA] are selected as the target of installation, and click the [Finish] button.
8. If the dialog of the trust certificate is displayed, check that “Unsigned” checkbox, and click the [Trust Selected] button to continue installation.
9. When prompted to restart e² studio, restart it.
10. Start this product from the [Renesas Views] - [Renesas QE] menu of e² studio. For details about how to use this product, see the [Help] menu of e² studio.

2.2 Uninstalling This Product

Use the following procedure to uninstall this product.

1. Start e^2 studio.
2. Select [Help -> About e^2 studio] to open the [About e^2 studio] dialog box.
3. Click the [Installation Details] button to open the [e^2 studio Installation Details] dialog box.
4. Select [Renesas QE for OTA] displayed on the [Installed Software] tabbed page and click the [Uninstall...] button to open the [Uninstall] dialog box.
5. Check the displayed information and click the [Finish] button.
6. When prompted to restart e^2 studio, restart it.

3. Notes / Restrictions

3.1 Usage Considerations

Please pay attention to the following items.

3.1.1 Notes of Azure CLI

1. If you use Azure as cloud, install Azure CLI v2.48.1. If you have installed the latest version (v2.63.0), you will not be able to add the permissions required for OTA to Azure resources. Azure CLI v2.48.1 can be downloaded from the following URL:
   https://azcliprod.blob.core.windows.net/msi/azure-cli-2.48.1.msi

3.1.2 Notes of initial firmware creation

1. Even if the settings of the firmware reset vector and exception vector are incorrect, an error may not be displayed during the initial firmware creation. In this case, you will not be able to boot the firmware from the bootloader.
   If the firmware does not boot properly, review the firmware section settings.

3.1.3 Notes of sample project of RL78 OTA

1. There is a compiler version note in the FreeRTOS v202210.01-LTS-rl78-1.0.0 and FreeRTOS v202210.01-LTS-rl78-1.1.0 sample projects.
   When using CC-RL V1.13.00 - V1.14.00 to build the initial firmware, an internal error (C0530001) may occur. In that case, take one of the following actions to avoid it.
   - Specify -Onothing in the optimization options.
   - Using CC-RL V1.15.00

3.1.4 Notes of firmware debugging

1. When using e^2 studio 2024-04 and e^2 studio 2024-07, if you start debugging the firmware from QE for OTA, you may be disconnected from the debugger immediately after starting. In that case, follow the steps below.
   1. Open the Debug Configuration of the firmware project
   2. In the Startup tab, uncheck Program Binary under Load Image and Symbols.
   3. Click the Apply button to save the settings, click the Debug button to start debugging, and then end debugging.
   4. Start debugging the firmware from QE for OTA again.

3.1.5 Notes of Installation

1. When installing QE for OTA, the "Trust Artifacts" dialog box displays the QE for OTA plug-in as unsigned.

   Workaround:
   Check "Unsigned" and click the "Trust Selected" button to continue the installation.

3.1.6 Notes on the sample code for secondary MCU

1. In the sample code for secondary MCU generated by QE for OTA, the MCU name displayed in the log may be different from the MCU name used.

   Workaround:
   Set the correct MCU name in the BL_MCU_NAME macro and DEMO_MCU_NAME macro in the output header file.

2. The sample code for the secondary MCU generated by QE for OTA is based on the sample code of the RX Family Firmware Update Module Firmware Integration Technology (R01AN6850). Although it is not used in the sample code output of QE for OTA, the port settings of RTS for UART and user switch are defined in boot_loader.h. These ports may prevent the bootloader from working properly, so please configure the ports appropriately or modify the sample code.

   The relevant definitions are as follows. Change the port appropriately to suit your board.
   #define BL_UART_RTS (PORTA.PODR.BIT.B1)
   #define BL_USER_SW_PORT (PORT3.PIDR.BIT.B0)
   #define BL_USER_SW_ON (0)

   Also, after setting up the components and sample code with QE for OTA, make sure that the settings for the board you are using are correct.

3.2 Functional Restrictions

QE for OTA V2.2.0 has the following functional restrictions.

3.2.1 Restrictions of OTA function using MCUboot

1. QE for OTA V2.2.0 does not support FSP 6.0.0 or later.

Workaround:

Instead of using QE for OTA, refer to the FSP documentation to create the initial firmware and update the firmware. If you are using QE for OTA, please use it in combination with FSP 5.9.0.

3.3 About Azure RTOS contributions to Open Source

Important Notice:
On November 21, 2023, Microsoft announced that they have decided to contribute Azure RTOS to Open Source
under the stewardship of the Eclipse foundation and Azure RTOS becomes Eclipse ThreadX.
For detailed information, please refer to the announcement titled at Microsoft Contributes Azure RTOS to Open Source.
The support strategy scheme for Eclipse ThreadX will be determined and communicated at a later date.
Microsoft will discontinue the Azure RTOS and Azure RTOS Middleware under the existing agreement LICENSED-HARDWARE.txt.
It’s important to note that updates for Azure RTOS on these hardware will no longer be provided.

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jul.4.25	-	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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