# Code Generator for RZ

e² studio Code Generator Plug-in V2.15.0,
AP4 for RZ V1.09.00
Release Note

R20UT4676EJ0101
Rev.1.01
Aug.01.20

## Introduction

Thank you for using the Code Generator for RZ. This document describes the restrictions and points for caution. Read this document before using the product. You can also check the latest release notes on the RENESAS website.

- Code Generator for RZ Release Note

## Contents

# 1. Introduction

The Code Generator for RZ is a software tool to generate control programs (device driver programs) for peripheral modules (timers, UART, A/D, etc.). It generates device driver codes using user settings through GUI. Initialize code and API (Application Programming Interface) functions are provided. The following products are provided as code generator for RL78.

- Code Generator Plug-in (e² studio)
- AP4 for RZ

## 1.1 Product version

| Code Generator for RL78 | Version |
|---|---|
| e² studio Code Generator Plug-in | 2.15.0 |
| AP4 for RZ | 1.09.00 |

## 1.2 Operating environments

### 1.2.1 PC

- IBM PC/AT compatible (Windows® 10, Windows® 8.1)
- Processor: At least 1 GHz (the product supports hyper-threading and multi-core CPUs)
- Memory capacity: 2 GB or more is recommended. At least 1 GB (or 2 GB for 64-bit versions of Windows®) is required.
- Hard disk capacity: At least 200 MB available
- Display resolution: 1024x768 or higher; at least 65536 colors
- Required elements of the software environment other than the Windows OS: .NET Framework 4.5 plus a language pack

### 1.2.2 Development tools

#### 1.2.2.1 e² studio and AP4 for RZ

- Integrated development environment e² studio from Renesas, V7.7 or later
- GCC ARM Embedded 6.3.1.20170620
- GNUARM-NONE-EABI V16.01
- IAR Embedded Workbench for ARM V8.30 or later
- ARM Development Suite (DS-5™) V5.29.1 or later

#### 1.2.2.2 iodefine file

Get iodefine file from below.

- iodefine file for RZ/T1 Group

## 2. Supported devices

The devices supported by the Code Generator for RZ are listed below.

Table 2-1. Supported devices

○: Support -: Not support

| Group (HW Manual number) | PIN | Device name | e² studio | AP4 |
|---|---|---|---|---|
| RZ/T1 Group (R01UH0483EJ0110) | 176pin | R7S910001CFP, R7S910101CFP | ○ | ○ |
| | 320pin | R7S910002CBG, R7S910102CBG, R7S910006CBG, R7S910106CBG, R7S910007CBG, R7S910107CBG, R7S910011CBG, R7S910111CBG, R7S910013CBG, R7S910113CBG, R7S910015CBG, R7S910115CBG, R7S910016CBG, R7S910116CBG, R7S910017CBG, R7S910117CBG, R7S910018CBG, R7S910118CBG, R7S910025CBG, R7S910125CBG, R7S910026CBG, R7S910126CBG, R7S910027CBG, R7S910127CBG, R7S910028CBG, R7S910128CBG, R7S910035CBG, R7S910135CBG, R7S910036CBG, R7S910136CBG | ○ | ○ |

# 3. Changes

Describes the changes in this release of the Code Generator for RL78.

## 3.1 List of Changes

Table 3-1. List of Points for Change

○: Applicable, /: Not applicable

| No | Description | Version *1 |
|---|---|---|
| | | RZ/T1 |
| | | V1.05.01.01 |
| 1 | Removal of point for caution regarding the write value of RSPI status register (SPSR) | ○ |
| 2 | Removal of point for caution when using link mode of DMAC | ○ |
| 3 | Update event signal selection menu in ELC settings | ○ |
| 4 | Modification of multiple interrupt processing (GCC only) | ○ |

Notes: 1. These version numbers are stated in the file headers of the source code which is generated by the code generator.

## 3.2 Details of Changes

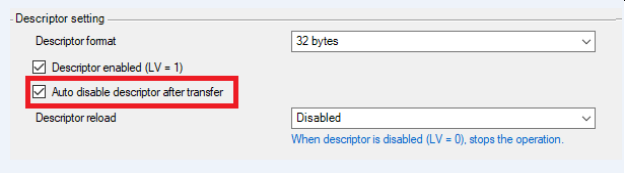
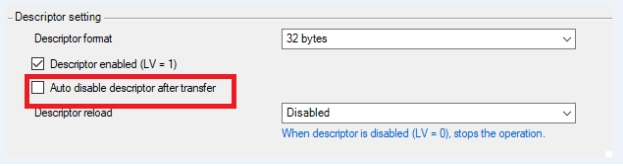
### 3.2.1 Removal of point for caution regarding the write value of RSPI status register (SPSR)

The SPSR initial value has been modified to adjust to RENESAS TECHICAL UPDATE TN-RZ*-A054A
TECHICAL UPDATE TN-RZ*-A054A.
TOOL NEWS R20TS0398EJ0100

### 3.2.2 Removal of point for caution when using link mode of DMAC

Corrected an error that the descriptor setting value at the completion of transfer and the WBD bit of the generated descriptor header are different.
TOOL NEWS R20TS0422EJ0100.

Example when DMAC0 ch0 is selected,

| Code generation settings | Example of code modification in r_cg_dmac.c |
|---|---|
|  <br>Check "Auto disable descriptor after transfer". | [Before]<br>void R_DMAC0_Create(void)<br>{<br>(Omitted)<br>dmac0_ch0_descriptor0.header = (Omitted)<br>_DMAC_DSC_HEADER_WBD_ENABLE<br>(*1)<br>[After]<br>_DMAC_DSC_HEADER_WBD_VAL_0 |
|  <br>Uncheck "Auto disable descriptor after transfer". | [Before]<br>void R_DMAC0_Create(void)<br>{<br>(Omitted)<br>dmac0_ch0_descriptor0.header = (Omitted)<br>_DMAC_DSC_HEADER_WBD_DISABLE<br>(*2)<br>[After]<br>_DMAC_DSC_HEADER_WBD_VAL_1 |

Notes *1, *2: The codes in e2 studio V4.0.1.007 (Code Generator Plug-in V2.0.0) or earlier and AP4 coding assistance tool for RZ V1.01.0 or earlier are displayed as follows.
*1 _DMAC_DSC_HEADER_WRITE_BACK_ENABLE
*2 _DMAC_DSC_HEADER_WRITE_BACK_DISABLE

### 3.2.3 Update event signal selection menu in ELC settings

With the update of the HW manual, the following selection item names of event signals have been updated.

[Before] EtherMAC/IEEE1588/SYNCOUT

[After] EtherMAC/SYNCOUT

### 3.2.4 Modification of multiple interrupt processing (GCC only)

The code of r_cg_nestintr_wrap.asm of GCC (e$^2$ studio) was corrected. There is no modification in ARM (DS-5) and IAR EWARM.

1. Description correction of __NESTED_INTERRUPT_PUSH_FPU

```
/***********************************************************************
* Function Name : __NESTED_INTERRUPT_PUSH_FPU
* Description   : Pre-process to push registers and switch to system mode
*                 for nested interrupt with VFP is enabled.
*                 The value of lr register before calling this function
*                 needed to be pushed so it is given by first argument.
*                 Second argument is to let compiler save r1 register
*                 at entry of interrupt.
* Limitation    : Must be used with __NESTED_INTERRUPT_POP_FPU() otherwise
*                 cause runaway
*                 FPU implementation (PUSH/POP) may need to modify to fit project
* Arguments     : r0: r1_irq r1:dummy
* Return Value  : none
***********************************************************************/
```

Modified red frame to “dummy”.

2. Code correction of _NESTED_INTERRUPT_POP

```
__NESTED_INTERRUPT_POP:
    POP     {r0, r1}      /* Pop LR_sys and SP adjusted value */
    MOV     r1, lr        /* Save LR_fnc */
    ADD     sp, sp, r0    /* Restore SP before aligned */

    CPS     #0x12         /* Change to IRQ mode */

    MOV     lr, r1        /* Set LR_fnc */
    POP     {r0, r1}      /* Pop LR_irq to r0 and SPSR to r1 */
    MSR     spsr_cxsf, r1     /* Restore SPSR */

    BX      lr            /* LR_fnc */
```

Modified red frame the following.

```
MOV     r1, lr          /* Save LR_fnc */
POP     {r0, lr}        /* Pop LR_sys and SP adjusted value */
```

3. Code correction of _NESTED_INTERRUPT_POP_FPU

```
__NESTED_INTERRUPT_POP_FPU:
    POP     {r0, r1}      /* Pop LR_sys and SP adjusted value */
    MOV     r1, lr        /* Save LR_fnc */
    ADD     sp, sp, r0    /* Restore SP before aligned */

    CPS     #0x12         /* Change to IRQ mode */

    MOV     lr, r1        /* Set LR_fnc */

    VPOP    {d0-d15}      /* Pop Extension registers from IRQ stack */
    POP     {r0, r1}      /* Pop FPSCR, FPEXC values from IRQ stack */
    VMSR    fpscr, r0     /* Set FPSCR register */
    VMSR    fpexc, r1     /* Set FPEXC register */

    POP     {r0, r1}      /* Pop LR_irq to r0 and SPSR to r1 */
    MSR     spsr_cxsf, r1     /* Restore SPSR */

    BX      lr            /* LR_fnc */


    .end
```

Modified red frame the following.

```
MOV     r1, lr          /* Save LR_fnc */
POP     {r0, lr}        /* Pop LR_sys and SP adjusted value */
```

## 4. History of Corrections Announced in Renesas Tool New

This section is a summary of corrections announced in Renesas Tool News.

| Issue Date | Document No. | Description | Device Concerned | Fixed version |
|---|---|---|---|---|
| May. 16, 2015 | 150516/tn2 | I2C Bus Interface (RIICa) | RZ/T1 | AP4 V1.01.00 |
| Nov. 10, 2015 | 151101/tn3 | Setting to permit or prohibit suspension of transfer in response to the reception of NACK over the I2C bus interface (RIIC) | RZ/T1 | e² studio V2.08.0<br>AP4 V1.02.00 |
| Mar.01. 2017 | R20TS0141EJ0100 | 1. Transfer-completed interrupt detection type for DMA controllers | RZ/T1 | e² studio V2.12.0<br>AP4 V1.06.00 |
| | | 2. Using DMA controllers with the serial communications interface with FIFO (SCIFA) | RZ/T1 | |
| Apr.16. 2017 | R20TS0162EJ0100 | 1. Prohibition of reading from and writing to registers protected from programming by mistake in multi-function timer pulse unit 3 (MTU3a) | RZ/T1 | e² studio V2.12.0<br>AP4 V1.06.00 |
| Feb. 02, 2019 | R20TS0398EJ0100 | Point for caution regarding the write value of RSPI status register (SPSR) | RZ/T1 | e² studio V2.15.0<br>AP4 V1.09.00 |
| Apr. 16, 2019 | R20TS0422EJ0100 | Using link mode of DMAC | RZ/T1 | e² studio V2.15.0<br>AP4 V1.09.00 |
| Dec. 16, 2019 | R20TS0525EJ0100 | Regarding writing 0 to the timer dead time enable register of the multi-function timer pulse unit 3 (TU3a) | RZ/T1 | - |

# 5. Cautions

This section describes points for caution regarding the Code Generator for RZ.

## 5.1 List for Cautions

Table 5-1. List of Points for Caution

○: Applicable, /: Not applicable

| No | Description | Version *1 |
|---|---|---|
| | | RZ/T1 |
| | | V1.05.01.01 |
| 1 | Online Help | ○ |
| 2 | Setting peripheral functions using pin view | ○ |

Notes: 1. These version numbers are stated in the file headers of the source code which is generated by the code generator.

## 5.2 Details for Cautions

### 5.2.1 Online Help

AP4 for RZ is not supporting online help.

### 5.2.2 Coding rule of MISRA-C

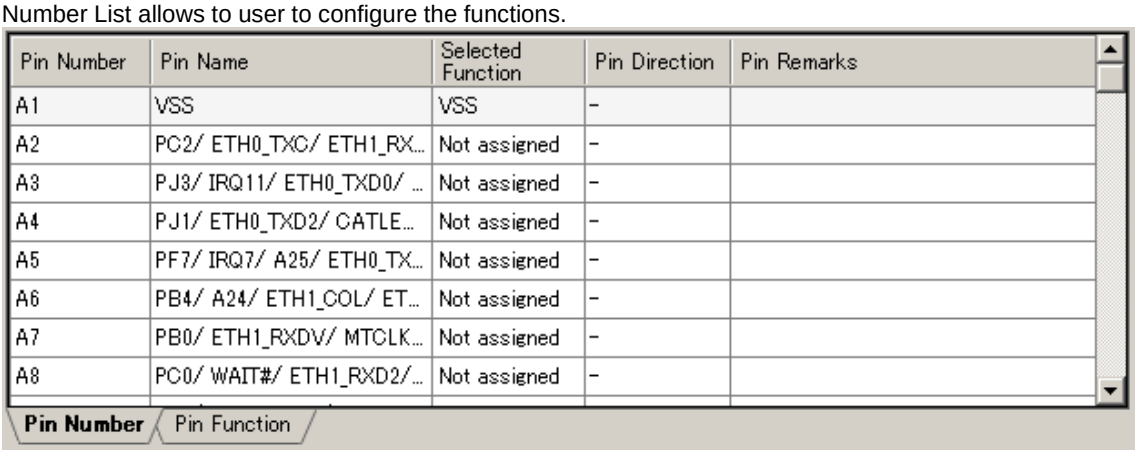
Pin View shows pin settings set by AP4 and allows user to configure pin settings.
Pin View has two view; Device List View and Device Top View and the two views are linked, so that settings can be made in either of them.

#### Device List View

Device list View shows the pin settings by the table style. Device list View has two lists; Pin Number and Pin Function.

#### Pin Number List

Pin Number List shows all assigned pins sorted by the pin number. If pins have multiple functions, Pin Number List allows to user to configure the functions.



| Pin Number | Pin Name | Selected Function | Pin Direction | Pin Remarks |
|---|---|---|---|---|
| A1 | VSS | VSS | - | |
| A2 | PC2/ ETH0_TXC/ ETH1_RX... | Not assigned | - | |
| A3 | PJ3/ IRQ11/ ETH0_TXD0/ ... | Not assigned | - | |
| A4 | PJ1/ ETH0_TXD2/ CATLE... | Not assigned | - | |
| A5 | PF7/ IRQ7/ A25/ ETH0_TX... | Not assigned | - | |
| A6 | PB4/ A24/ ETH1_COL/ ET... | Not assigned | - | |
| A7 | PB0/ ETH1_RXDV/ MTCLK... | Not assigned | - | |
| A8 | PC0/ WAIT#/ ETH1_RXD2/... | Not assigned | - | |

Pin Number | Pin Function

If pins have multiple functions, User can select pin functions by configuring the “Selected Function”. For example, when IRQ7 has not been set up in CG and user set A5 as IRQ7, the following warning is shown.

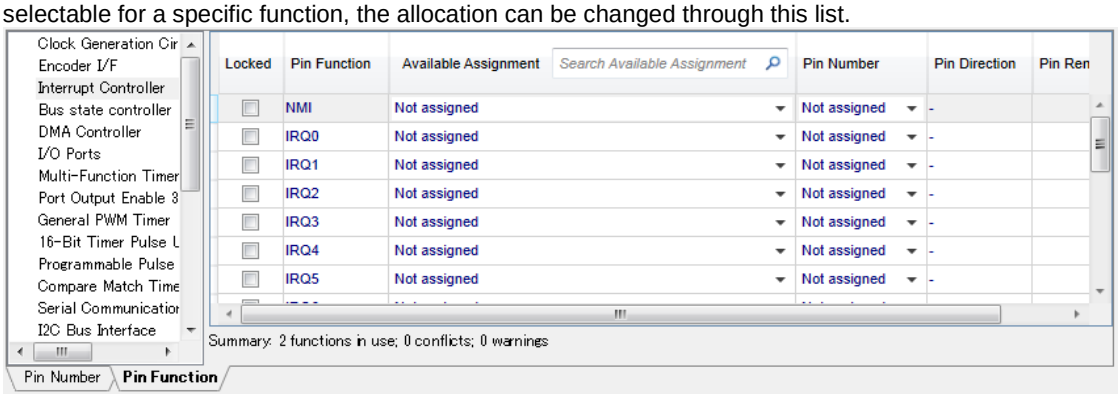
| | | | | |
|---|---|---|---|---|
| A5 | PF7/ IRQ7/ A25/ ETH0_TX... | IRQ7 | - | Function is not enabled in peripheral configuration. |

After that, IRQ7 has been set in Peripheral Functions (Interrupt Controller), this warning is disappeared and IRQ7 is shown in Selected Function.

| | | | | |
|---|---|---|---|---|
| A5 | PF7/ IRQ7/ A25/ ETH0_TX... | IRQ7 | In | |

### Pin Function List

Pin Function List shows which pins are used by corresponding peripheral module. If multiple pins are selectable for a specific function, the allocation can be changed through this list.




Pin Function List allows user to change a specific pin which has been to set by CG. For example, IRQ7 has been set by CG, an available pin are automatically set.

| | | | | |
|---|---|---|---|---|
| IRQ7 | PF7/ IRQ7/ A25/ ETH0_TXE… | A5 | In | |

User can change the pin to another available pins by selection “Pin Assignment” or “Pin Number”.

| | | | | |
|---|---|---|---|---|
| IRQ7 | P97/ AN107/ IRQ7/ A25/ AD… | E18 | In | |

If a pin which has been already set as other function is selected, the warning is shown and the selected pin is not assigned.

| | | | | |
|---|---|---|---|---|
| IRQ7 | Not assigned | Not assigned | In | Conflict detected in peripheral configuration. |

### Save Device List View

Clicking the icon above in Device List View, User can save the current pin settings as csv the format.

### Lock Pin Settings

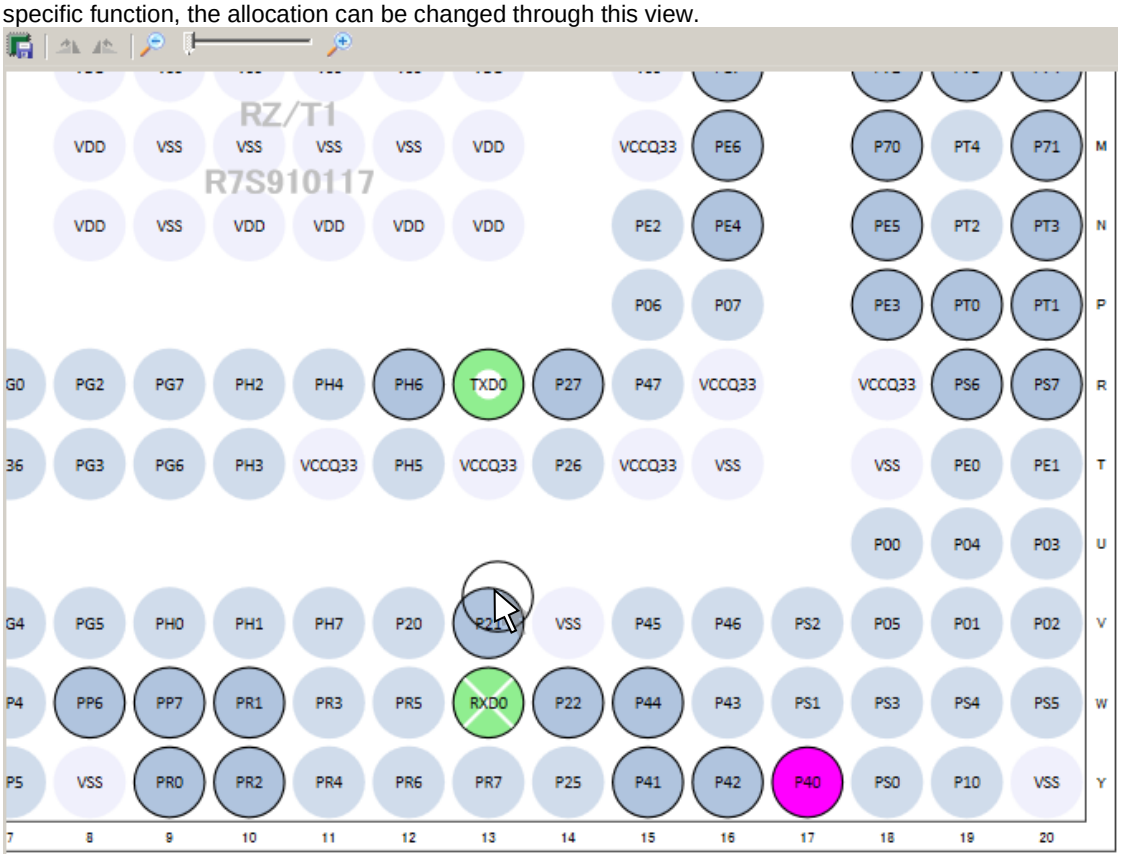
Clicking the icon above in Device List View, User can lock the current pin settings and be free of influence from other peripherals.

### Generate Code

Clicking the icon above in Device List View, code generation can be executed.

### Device Top View

Device Top View shows which pins are used by corresponding peripheral module in the package view. If pins have multiple functions, this view allows to user to configure the functions and if multiple pins selectable for a specific function, the allocation can be changed through this view.




### Highlight Pins by Peripheral


Device Top View highlights the group of pins that belongs to the active CG peripheral functions. The figure above shows Device Top View when Serial Communications Interface with FIFO is being selected by CG.

### Assigned Pin (Input)


Shows assigned pins (Input).

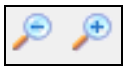
### Assigned pin (Output)


Shows assigned pins (Output).

### Alternative pin selection


If user holds down the “CTRL” key and use mouse “left click” on the pin in use, the other pins with this same function will change color. For example, R13 is assigned to the function “TXD0”, if user “CTRL + Click” to pin “TXD0”, the pin Y17 (P40) changes color, because it contains the same function “TXD0”. At the same time, while the “CTRL” key is hold down, if user drag and drops the pin to Y17 (P40). Y17 (P40) will be assigned to in use as “TXD0”.

### Zoom



Device Top View supports the zoom function by slider controls. After clicking the device top view, user can do this by mouse-wheel.

### Drag and Move

Device Top View supports mouse drags actions. Hold down mouse left button on the view and move will drag the view around.

### Save Device Top View

Clicking the icon above in Device Top View, User can save the view as PNG format.

### Configure Pin View Color

Pin View supports for user to change color, through the property window.
Right click on the Device Top View on project tree, the property window will pop up a right click menu.

## Revision History

| Rev. | Date | Description | |
|---|---|---|---|
| | | Page | Summary |
| 1.00 | Jan 20, 2020 | - | First edition issued |
| 1.01 | Aug.01.2020 | 3 | Correction for error of 'HW Manual number' in Table 2-1<br>Error: R01UH0483EJ0160<br>Correction: R01UH0483EJ0110 |

# 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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