RENESAS

Smart Configurator for RISC-V MCU Plug-in in e² studio 2024-07 Smart Configurator for RISC-V MCU V1.2.0

Release Note

Introduction

Thank you for using the Smart Configurator for RISC-V MCU. This document describes the restrictions and points for caution. Read this document before using the product.

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1. Introduction

Smart Configurator is a utility for combining software to meet your needs. It supports the following three functions related to the embedding of Renesas drivers in your systems: importing middleware, generating driver code, and setting pins.

Smart Configurator for RISC-V MCU V1.2.0 is equivalent to Smart Configurator for RISC-V MCU Plug-in in e² studio 2024-07 Smart Configurator for RISC-V MCU V1.2.0.

1.1 System Requirements

The operating environment is as follows.

1.1.1 Windows PC

- System: x64/x86 based processor
 - Windows® 11 Windows® 10 (64 hit versio

Windows® 10 (64-bit version)

- Windows® 8.1 (64-bit version)
- Memory capacity: We recommend 4 GB or more.
- Capacity of hard disk: At least 300 MB of free space.
- Display: Graphics resolution should be at least 1024 x 768, and the mode should display at least 65,536 colors.
- Processor: 1 GHz or higher (must support hyper-threading, multi-core CPUs)

1.1.2 Linux PC

Smart Configurator for RISC-V MCU plug-in in e² studio 2024-07 or later is supported on Linux OS.

• System: x64 based processor, 2 GHz or faster (with multicore CPUs)

Ubuntu 22.04 LTS Desktop (64-bit version) Ubuntu 20.04 LTS Desktop (64-bit version)

- Memory capacity: We recommend 2 GB or more.
- Capacity of hard disk: At least 2 GB of free space.

1.1.3 Development Environments

Windows

LLVM for Renesas RISC-V 17.0.2.202401 or later IAR Embedded Workbench for RISC-V 3.30.1 or later SEGGER Embedded Studio for RISC-V 8.10 or later

Linux

LLVM for Renesas RISC-V 17.0.2.202406 or later IAR bxriscv-3.30.1 or later SEGGER Embedded Studio 8for RISC-V 8.12a or later



2. Support List

2.1 Support Devices List

Below is a list of devices supported by the Smart Configurator for RISC-V MCU Plug-in in e² studio 2024-07 Smart Configurator for RISC-V MCU V1.2.0.

Table 2-1 Support Devices

| Group | PIN | Device name |
|--------------------|-------|---------------|
| (HW Manual number) | | |
| RISC-V/G021 Group | 16pin | R9A02G0214CBY |
| (R01UH1036EJ0110) | 24pin | R9A02G0214CNK |
| | 32pin | R9A02G0214CNH |
| | 48pin | R9A02G0214CNE |

2.2 Support Components List

Below is a list of Components supported by the Smart Configurator for RISC-V MCU Plug-in in e² studio 2024-07 Smart Configurator for RISC-V MCU V1.2.0.

Table 2-2 Support Components

G02` No Components Mode Remarks A/D Converter 1 2 Comparator 1 3 D/A Converter ./ Data Transfer Controller 4 5 Delay Counter / 6 Divider Function 1 Event Link Controller 7 External Event Counter 8 1 9 IIC Communication (Master mode) 1 IIC Communication (Slave mode) 10 / Input Pulse Interval/Period Measurement 11 ./ Input Signal High-/Low-Level Width Measurement 12 1 13 Interrupt Controller 14 Interval Timer 8 bit count mode / 16 bit count mode 16 bit capture mode / 32 bit count mode / Key Interrupt 15 ./ One-Shot Pulse Output 16 ./ Ports 17 / 18 PWM Output 1 19 Real-Time Clock / 20 Remote Control Signal Receiver 1 21 Simple SPI Communication Transmission Reception Transmission/reception / 22 Square Wave Output ./ 23 UART Communication Transmission ./ Reception ./ Transmission/reception / 24 Voltage Detector ./ 25 Watchdog Timer



✓: Support (*), -: Non-support

2.3 New support

2.3.1 BSP (Board Support Package) revision update

BSP rev1.20 is supported and will be added as default BSP when creating Smart Configurator project.

2.3.2 Linux host OS support

From this version, Linux host has been supported.

- For stand-alone version, user can start Smart Configurator for RISC-V as below steps.
- 1) Download stand-alone Smart Configurator for RISC-V package: SmartConfigurator_for_RISC-V_MCU_V1_2_0.tar.gz from Renesas web and extract to local folder.
- 2) Go to extracted folder .\$DIR/eclipse and run SmartConfigurator

| Name | | | \sim | Size |
|-------------------------|----------------------------|--------|--------|-----------|
| configuratio | n | | | 7 items |
| features | | | | 25 items |
| p2 | | | | 3 items |
| plugins | | | | 420 items |
| readme | | | | 1 item |
| <pre>artifacts.xm</pre> | nl | | | 105.5 kB |
| icon.xpm | | | | 66.7 kB |
| 🔅 SmartConfi | gurator | | | 88.3 kB |
| | Run | Return | | |
| SmartConfig | g Open With Other Applicat | ion | | 384 bytes |
| | Cut | Ctrl+X | | |
| .eclipseproo | du _{Copy} | Ctrl+C | | 85 bytes |
| | Move to | | | |
| | Copy to | | | |

Figure 2-1 Run SmartConfigurator

3) Create Smart Configurator project and start to use



Figure 2-2 Stand-alone SmartConfigurator started



- For e² studio Smart Configurator plugin version, user can start Smart Configurator for RISC-V as below steps.
- 1) Run e² studio under installation directory: /home/sc/.local/share/renesas/e2_studio

| Name | | | |
|----------------------|-------------------------|--------|--|
| configu | ration | | |
| | 5 | | |
| feature | 25 | | |
| p2 | | | |
| plugins | | | |
| readme | 2 | | |
| > artifact | ts.xml | | |
| 🔅 e2studi | io | | |
| 025 | Run | Return | |
| 6230 | Open With Other Applica | ation | |
| e ² icon. | Cut | Ctrl+X | |
| | Сору | Ctrl+C | |
| notic | Move to | | |
| | Copy to | | |
| .eclij | Move to Trash | Delete | |

Figure 2-3 Run e² studio

2) Create new project with Renesas RISC-V MCU and select Smart Configurator in project wizard, after project created, Smart Configurator will be started.

| | | workspa | ce202407_0701 - | test/test.sc | fg - e² studio | | | | | | | | × |
|---|---|--|-------------------|---------------------------|-------------------------|-----|------------|----------------------|----------|----------|----------|-------|----|
| File Edit Navigate | Search Project | t Renesas Views Run | Window Help | | | | | | | | | | |
| 8 ~ % ~ 1 | * ~ ⁰ ~ | | | | | Q | 1 | BC (| c/c++ 🚪 | 🖗 Smar | t Config | gurat | or |
| 눱 Pro 🗙 🗖 🗖 | ₿ test.scfg × | | | | - 0 | a M | си/м | PU P | × 💿 | Develop | er | - | ٥ |
| E S 7 8 ✓ E test | Overview in | nformation | Gene | 🗊 erate Code | 🚔 Generate Report | | i 4 | P |) | | | | »> |
| > 🔊 Includes > 😂 src | → General Info | ormation | | | 0 | | R | E | Ne | ES | | 5 | |
| 🗱 test.scfg 📄 test Hardware 🕜 Developer Ass | Ge pro Co | verview It an <u>overview</u> of the feature ovided by Smart onfigurator. ideos | es | | | 20 | 4 | A 21 A 2107 | (R9 B | A02 c | 2 G C |)2 | 14 |
| | | roduction to Smart nfigurator owse related videos | App | lication Co are Compor | ode Smart | | 3 | 2100 | P001 | P002 | vss | 3 | |
| | Chr lat Ser | nat's New eck out <u>what's new</u> in the est release. e all <u>Release Notes</u> . | RTOS | Drive Device D | rivers Configurato | | 1 | °302 °303 | тскс | RES | P203 | 1 | |
| | Pr an | roduct Documentatio 1d FAQ | MC MC | U Hardwa | ire | l | | A | В | с | D | | |
| | Overview Board | d Clocks System Compor | nents Pins Interr | upt | | ► L | egend | | | | | | |
| Console × | | 🗟 🚮 🐼 📑 🔍 🗸 | 🖻 v 🦳 🗖 | 🔝 Configu | ration Problems $	imes$ | | | | | চ | 78 | • | |
| Smart Configurator Out M00000001: Code gen M03000002: File gen M03000002: File gen | tput eration is stan erated: <u>src/smc</u> erated: <u>src/smc</u> | rted _gen/general/r_smc_cgc. _gen/general/r_smc_cgc. | .د ـh | 0 items Descriptio | n | | | | Туре | | | | |
| | | | | | | | | | | | | | |

Figure 2-4 Smart Configurator started



2.3.3 Access FAQ from Overview tab

From this version, FAQ can be accessed from Overview tab.



Figure 2-5 FAQ link at Overview tab

2.3.4 Simplify MCU/MPU Package view

From this version, when using QFP device, MCU/MPU Package view is simplified to remove outer pad by default for easy recognition of user changes.



Figure 2-6 MCU/MPU Package view with outer pad setting



2.3.5 Support My Renesas login within Smart Configurator standalone

From this version, users can login My Renesas within Smart Configurator and download SIS modules.

| 1 | Co New Co | omponent | | | | \times | |
|--|---|---|--|--|---|---------------------------------------|---|
| | Software | Component Selection | | | | | |
| | Select cor | nponent from those availab | le in list | | | | |
| | Category | All | | | | \sim | |
| | Function | All | | | | ~ | |
| | Filter | | | | | | |
| | Compon | ents | Short Name | Туре | Version | ^ | |
| | #A/D Co | nverter | | Code Generator | 1.0.0 | | |
| | Board S | Support Packages v1.10 | r_bsp | RISC-V MCU S | 1.10 | | |
| | #Compa | rator | | Code Generator | 1.0.0 | > ` | |
| | Show o | nly latest version | | | | | |
| | Descriptio | n | | | | | |
| | The analo | g to digital (A/D) converte | r is function for | converting analog | inputs to | ^ | |
| | digital sig | gnals. | | | | \sim | |
| | Download | RISC-V MCU Software Inte | gration System | modules | | | |
| | Configure | general settings | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | ? | < Back | Next > | Finish | Cance | 1 | |
| | | | | | | | |
| 101 10100 | | | | | | 14 | Pon |
| Renesas Login er the details use | d to register | your My Renesas account. | | | | Му | Ren |
| Renesas Login er the details use Email address: | d to register | your My Renesas account. | | | | Му | Ren |
| Renesas Login er the details use Email address: Password: | d to register | your My Renesas account. | | | | My | Ren |
| Renesas Login er the details use Email address: Password: | d to register | your My Renesas account. | | | | Eorga | Ren |
| Renesas Login er the details user Email address: Password: | d to register | your My Renesas account. | | | | Eorge | Ren ot passwor |
| Renesas Login er the details use Email address: Password: | d to register | your My Renesas account. | | | | My Eorge | Ren |
| Renesas Login er the details used Email address: Password: e ² studio can re well as to provi | d to register | your My Renesas account. | as. This data will I | se used to improve o | our produc | Eorge Pr | Ren ot passwor roxy Settin |
| Renesas Login er the details used Email address: Password: e ² studio can re well as to provo l consent to (linked belo | d to register | your My Renesas account. data and transmit it to Renes pipport and maintenance. being sent to Renesas & have | as. This data will I read and unders | be used to improve o | our produc | Forge Pr ts and se mation C | Ren ot passwor roxy Settir rvices as ollected |
| Renesas Login er the details used Email address: Password: e ^a studio can rr well as to provi (inked belo 0 1 do not con | d to register | your My Renesas account. data and transmit it to Renes pipport and maintenance. being sent to Renesas & have the data being recorded & sen | as. This data will I read and unders : to Renesas | pe used to improve o | our produc | Forge Pr ets and se mation C | Ren ot passwor roxy Settir rvices as ollected |
| Renesas Login er the details used Email address: Password: e ² studio can rr well as to provi consent to 1 do not con Privacy Policy | ecord usage dide better su usage data w) sent to usage | data and transmit it to Renes poport and maintenance. being sent to Renesas & have e data being recorded & sen Collected | as. This data will I read and unders : to Renesas | ce used to improve d | our produc cy & Infor | Forge Pr cts and se mation C | Ren ot passwor roxy Settir rvices as ollected |
| Renesas Login er the details used Email address: Password: e ^a studio can rr well as to provi consent to (linked belo 1 do not con Privacy Policy You can change | d to register | data and transmit it to Renes pipport and maintenance. being sent to Renesas & have te data being recorded & sen <u>Collected</u> g later in e ² studio's preferenc | as. This data will I read and unders : to Renesas es. | ce used to improve o | our produc | Forge Pr ets and se mation C | Ren et passwor roxy Settir rvices as ollected |
| Renesas Login er the details used Email address: Password: e ² studio can re well as to provi O l consent to (linked belo O l do not con Privacy Policy [You can change Don't have an a submit technic | d to register | your My Renesas account. data and transmit it to Renes ipport and maintenance. being sent to Renesas & have te data being recorded & sen <u>Collected</u> g later in e ² studio's preferenc <u>gistering at My Renesas</u> is eas equests and get access to trai | as. This data will I read and unders t to Renesas es. y, and allows you ning, tool downlo | be used to improve o tood the Privacy Poli to request free sam ads, document upda | our produc cy & Infor oles for sel te notifica | Forge Pr Cts and se mation C | Ren et passwor rvices as ollected |
| Renesas Login er the details user Email address: Password: e ² studio can rr well as to provi consent to I do not con Privacy Policy You can change Don't have an a submit technic | d to register ecord usage de better su usage data w) sent to usag Information e this setting account? <u>Re</u> | adata and transmit it to Reness poport and maintenance. being sent to Renesas & have to Collected Jater in e ³ studio's preferenc <u>collected</u> <u>collected</u> <u>atter in e³ studio's preferenc</u> <u>collected</u> | as. This data will I read and unders : to Renesas es. y, and allows you ning, tool downlo | ce used to improve o tood the Privacy Poli to request free sam ads, document upda | ur produc cy & Infor | Forge Pr | Ren at passwo roxy Settin rvices as ollected oducts, |

Figure 2-7 My Renesas log from Smart Configurator standalone

Note: Due to some SIS modules don't support IAR/SEGGER toolchain, so they will not be shown in components list when user selected IAR/SEGGER toolchain project.



3. Changes

This chapter describes changes to the Smart Configurator for RISC-V MCU V1.2.0.

3.1 Correction of issues/limitations

Table 3-1 List of Correction of issues/limitations

✓: Applicable, -: Not Applicable

| No | Description | G021 | Remarks |
|----|--|------|---------|
| 1 | Fixed the build error in mcu_mapped_interrupts.c | 1 | |
| 2 | Fixed the issue of developer assistance R_Config_IICA1_Master_Send has wrong parameters | ~ | |
| 3 | Fixed the issue of the core options in SEGGER Embedded Studio project | ~ | |
| 4 | Fixed the issue of the description of KEY_INTKR in interrupt page | 1 | |

3.2 Details of Changes

3.2.1 Fixed the build error in mcu_mapped_interrupts.c

When enabling the [Interrupt setting(bsp_mapped_interrupt_open)] in r_bsp, there will be build errors in mcu_mapped_interrupts.c:

This issue has been fixed in this version.

| Software component | t configuration | | |
|--|---------------------------------------|---|--|
| Components | · · · · · · · · · · · · · · · · · · · | Configure | |
| type filter text | 65 | Property # OCD/Serial Programmer ID Setting Register 1 value | Value 0xFFFFFFF |
| ✓ | | # OCD/Serial Programmer ID Setting Register 2 value # OCD/Serial Programmer ID Setting Register 3 value # Access Window Start Block Address (FAWS) # Access Window End Block Address (FAWE) | 0xFFFFFFF 0xFFFFFFF 0x7FF 0x7FF |
| ✓ Drivers ✓ U/O port Config_PORT | | UIDS0: User ID Setting Register 0 value UIDS1: User ID Setting Register 1 value UIDS1: User ID Setting Register 2 value UIDS2: User ID Setting Register 2 value | 0xFFFFFFF 0xFFFFFFF 0xFFFFFFFF |
| | | # Data flash memory area access control(DFLEN) # Initialization of peripheral functions by Code Generator/Smart Configurator | Disable Enable |
| | | # API functions(R_BSP_StartClock, R_BSP_StopClock) # API functions(R_BSP_ChangelCLXClockSetting) # Interrupt setting/bas managed interrupt open) | Disable Disable Fnable |
| | | # Enable user warm start callback (PRE) | Unused |

Figure 3-1 Enable the [Interrupt setting(bsp_mapped_interrupt_open)]

3.2.2 Fixed the issue of developer assistance R_Config_IICA1_Master_Send has wrong parameters

When using the developer assistance function, for IICA Master_Send and Master_Receive function, after drag, the parameters are wrong.

This issue has been fixed in this version.

3.2.3 Fixed the issue of the core options in SEGGER Embedded Studio project

When using SEGGER toolchain, the following options default vales have been changed: 1) RISC-V ISA Zba Extension: is "Yes".

2) RISC-V ISA Zbb Extension: is "Yes".



3) RISC-V ISA Zbs Extension: is "Yes".

| SEGGER Embedded Studio V8.10b - | Options | | × |
|--|---|--|--------------------------|
| Project 'segger' Optic | ons | | |
| ↑ ↓ 🕄 Debug 🔹 Se | earch Options | Sha | ow Modified Options Only |
| Code Assembler Build Code Analyzer Code Generation Compiler Compiler Warning External Build File Library Linker Preprocessor Printf/Scanf Runtime Memory Area Section Source Code User Build Step Debug Debuger GDB Server J-Link Loader Simulator [RISC-V] Target Script | Option • Omit Frame Pointer • Optimization Level • Relocation Model [segger-cc] • RISC-V ABI • RISC-V ISA • RISC-V ISA Extension • RISC-V ISA Extension • RISC-V ISA Zab Extension • RISC-V ISA Zbb Extension • RISC-V ISA Zmmul Extension • RISC-V ISA Zmmul Extension • RISC-V ISA Zba Extension • Unwind Tables • Use Builtins • Wide Character Size RISC-V ISA Zba Extension Add support for Zba extension | Value Yes None ilp32 inherits rv32imac inherits None No Yes Modified Yes No Yes No None None None | |
| | | [| OK Cancel |

Figure 3-2 Change the Zba/Zbb/Zbs Extension options

3.2.4 Fixed the issue of the description of KEY_INTKR in interrupt page

Add the description of KEY_INTKR interrupt in interrupt page.

| rrupt configu | ration | | 🖲 🤖 Generate Code 🛛 Generate Repo |
|------------------|-------------------|-----------------------|---------------------------------------|
| errupt vectors | | | X |
| Type filter text | | Vector | Number ~ |
| Vector Number | Vector Table Addr | Interrupt | Interrupt request source |
| 21 | 0x0A0 | IRQ21(SAU1_INTSRE2) | UART2 reception communication erro |
| 22 | 0x0A4 | IRQ22(REMC_OUTI) | REMC interrupt output |
| 23 | 0x0A8 | IRQ23(KEY_INTKR) | Key interrupt function |
| 24 | 0x0AC | IRQ24(UARTA_TX_ENDI0) | Transmit transfer complete, buffer er |
| 25 | 0x0B0 | IRQ25(UARTA_RX_ENDI0) | Receive transfer complete interrupt |
| 26 | 0x0B4 | IRQ26(UARTA RX ERI0) | Receive transfer complete communic ¥ |

Figure 3-3 KEY_INTKR interrupt description



3.3 Specification changes

Table 3-2 List of Correction of issues/limitations

✓: Applicable, -: Not Applicable

| No | Description | G021 | Remarks |
|----|---|------|---------|
| 1 | Improvement for changing blinky frequency for Blinky sample project | ~ | |
| 2 | Improvement for port initialization sequence for I2C to remove glitch on the I2C SDA/SCL line | 1 | |
| 3 | Improvement for adding common functions node for developer assistance function | 1 | |
| 4 | Improvement for adding a new interrupt vector routine for NMI interrupt | 1 | |
| 5 | Improvement for removing PMR setting for ICU pins | 1 | |

3.3.1 Improvement for changing blinky frequency for Blinky sample project

From this version, Blinky sample project is improved to detect if selected board has switch, users can use switch to change blinky frequency.



Figure 3-4 Create new project in Smart Configurator

3.3.2 Improvement for port initialization sequence for I2C to remove glitch on the I2C SDA/SCL line

From this version, port initialization sequence has been changed for I2C to remove glitch on the I2C SDA/SCL line.

Remove PODR setting, move NCODR, PMR, PSEL settings after IICE = 1.



Figure 3-5 Port initialization sequence for I2C



3.3.3 Improvement for adding common functions node for developer assistance function

From this version, the functions in general folder have been added in components node:



Figure 3-6 Common functions node for developer assistance

3.3.4 Improvement for adding a new interrupt vector routine for NMI interrupt

From this version, the NMI interrupt will be pointed to a new interrupt vector routine nmi_handler() function in r_cg_vect_table.c:



Figure 3-7 New interrupt vector routine for NMI interrupt

3.3.5 Improvement for removing PMR setting for ICU pins

From this version, the pin setting code of ICU will be removed PMR setting code in R_Config_ICU_Create().



Figure 3-8 Remove PMR setting for ICU pins



✓ : Applicable, -: Not Applicable

4. Points for Limitation

This section describes points for limitation regarding the Smart Configurator for RISC-V MCU V1.2.0.

4.1 List of Limitation

Table 4-1 List of Limitation

| No | Description | G021 | Remarks |
|----|--|------|---------|
| 1 | Note on extra help document issue | ~ | |
| 2 | Note on PORT functions in developer assistance function cannot be dragged issue | 1 | |
| 3 | Note on ITL function 16 bit capture mode with channel 0 and 1 can't be used together with 16 bit count mode with channel 2 and 3 issue | 1 | |
| 4 | Note on BSP machine timer does not support refresh operation issue | 1 | |

4.2 Details of Limitation

4.2.1 Note on extra help document issue

For Smart Configurator, there is an extra help "Smart Browser" under "[Help] > [Help Contents]". Please ignore it.

| Hel | р | | |
|-----|---------------|------------------------------|----------------|
| 0 | Help Contents | 😝 💽 Help - Smart Configurate | or |
| | Home Page | Search: | Go S |
| | Release Notes | Contents | • 🚀 🖻 🗟 🗖 |
| | Tool News | 🗷 伦 Smart Browser | |
| | API Manual | 🗷 🍩 Smart Configurator | for RISC-V MCU |
| 6 | About | | |

Figure 4-1 Extra help issue

4.2.2 Note on PORT functions in developer assistance function cannot be dragged issue

In e² studio version, when using Developer Assistance function, there are two PORT functions cannot be dragged to the file.

Please add these two functions manually.

This issue will be fixed in next release.



Figure 4-2 PORT functions cannot be dragged issue

4.2.3 Note on ITL function 16 bit capture mode with channel 0 and 1 can't be used together with 16 bit count mode with channel 2 and 3 issue

When using 16 bit capture mode with channel 0 and 1, if user wants to use 16 bit count mode with channel 2 and 3 at same time. Smart Configurator only support selecting "ITLCMP01 compare match interrupt" as "Capture trigger". If user wants to use the "Capture trigger" other than "ITLCMP01 compare match interrupt" for 16 bit count mode with channel 2 and 3, Smart Configurator can't support these settings now.



| Components | ù⊿!²₂ ⊟ ⊞ | Configure | | | |
|---|------------|--|---|---------------------------------|-------------------------------|
| ★ 日本 輸入筛选文本 ✓ Control Cont | 65 | Clock setting Operation clock (fITL0) Clock source | TML32LCLK/TML32SCLK ftTL0 | * | (Clock frequency: 32.768 kHz) |
| ✓ Seneric ✓ Seneric ✓ Tosp ✓ Drivers ✓ Timers ✓ Config_ITL00 | 000_ITL001 | Capture trigger setting Capture trigger Capture trigger operation clock Capture trigger interval value 16-bit counter (ITL000 + ITL001 | TML32LCLK/TML32SCLK (rising Software trigger ITLCMP01 compare match inter TML32LCLK/TML32SCLK (rising event input from ELC on prece | edge) v rupt edge) ge) | |
| | | Interrupt setting Detection of compare match/ca Priority | pture completion (TML32_OUTI) Level 15 (low) | ~ | |

Figure 4-3 "Capture trigger" other than "ITLCMP01 compare match interrupt" settings

As a workaround, please change the code in the following steps manually. If code generation is executed again after changing the code, the code will be conflicted. Please refer to chapter 11.3.2 Steps for Resolving the Merge Conflict of RISC-V MCU Smart Configurator User's Guide: e² studio.

Step1: Create a component - Interval Timer (ITL000, ITL001) as 16bit Capture Mode. Set "ITLCMP01 compare match interrupt" as "Capture trigger" and generate code.

| Components | èn 🛃 lª₂ 🖻 🕀 | Configure | | |
|---|-----------------|---|---|---|
| ◆ 合 Startup ◆ 合 Startup ◆ 合 Generic ● r_bsp ◆ P Drivers ◆ 合 Timers ● Config_I | tl000_ITL001 | Clock setting Operation clock (fITL0) Clock source Capture trigger setting Capture trigger Capture trigger operation clock Capture trigger interval value | TML32LCLK/TML32SCLK ~ ftTL0 ~ TTLCMP01 compare match interrupt ~ TML32HCLK ~ 100 μs ~ | (Clock frequency: 32.768 kHz) (ITL012_ITL013 is used) (Actual value: 100) |
| | Co Re: Op | mponent : Interval Timer source : ITL000_ITL001 beration : 16 bit capture mode ✓ Detection of compare match/capture Priority | lear after capture is complete ure completion (TML32_OUTI) Level 15 (low) | |

Figure 4-4 Set "ITLCMP01 compare match interrupt" as "Capture trigger"

Step2: Change driver code manually. Using TML32LCLK/TML32SCLK (rising edge) as example:

- 1) Chang code in Config_ITL000_ITL001.c file: The macro definition can be found
 - in ..\smc_gen\general\r_cg_itl.h.

| <pre>void R_Config_ITL000_ITL001_Create(void) {</pre> | <pre>void R_Config_ITL000_ITL001_Create(void) {</pre> |
|--|--|
| /* Capture setting */ | /* Capture setting */ |
| <pre>"" R_TML32->ITLCC0 = _00_ITL_CAPTURE_COUNTER_RETAIN; R_TML32->ITLCC0 &= FC ITL CAPTURE TRIGGER CLEAR; R_TML32->ITLCC0 = 01 TTL CAPTURE TRIGGER INTERNAL;</pre> | <pre>"" R_TML32->ITLCC0 = _00_ITL_CAPTURE_COUNTER_RETAIN; R_TML32->ITLCC0 &= _FC_ITL_CAPTURE_TRIGGER_CLEAR; /* Start user code */ R_TML32->ITLCC0 =</pre> |
| <pre>R_Config_ITL000_ITL001_Create_UserInit(); }</pre> | <pre>A_THESE = > THECCO T_ _02_ITL_CAPTURE_TRIGGER_TML32LCLK_TML32SCLK; /* End user code */ R_Config_ITL000_ITL001_Create_UserInit();}</pre> |



2) Change code in Config_ITL000_ITL001.c file:



3) Add code in ..\smc_gen\general\r_cg_itl_common_user.c file:

| <pre>void r_itl_interrupt(void)</pre> | <pre>void r_itl_interrupt(void)</pre> |
|---|---|
| <pre>{ R_ICU->IELSR20 &= 0xFFFEFFFU; /* clear TML32_OUTI interrupt flag */ if (_10_ITL_CAPTURE_COMPLETE_DETECTE == (R_TML32->ITLS0 & _10_ITL_CAPTURE_COMPLETE_DETECTE)) { R_TML32->ITLS0 &= (uint8_t)~_10_ITL_CAPTURE_COMPLETE_DETECT E; D. Gan Gia _ IIL000_ITL001_Gallback_Channed_In </pre> | <pre>{ R_ICU->IELSR20 &= 0xFFFEFFFU; /* clear TML32_OUTI interrupt flag */ if (_10_ITL_CAPTURE_COMPLETE_DETECTE == (R_TML32->ITLS0 & _10_ITL_CAPTURE_COMPLETE_DETECTE)) { R_TML32->ITLS0 &= (uint8_t)~_10_ITL_CAPTURE_COMPLETE_DETECTE; R_Config_ITL000_ITL001_Callback_Shared_Inter punt(); } }</pre> |
| R_Config_IIL000_IIL001_Callback_Shared_In terrupt(); | rupt(); |
| <pre>} } R_TML32->ITLS0 &= (uint8_t)~_01_ITL_CHANNEL0_COUNT_MATCH_DE TECTE; }</pre> | <pre>/* Start user code */ if (_04_ITL_CHANNEL2_COUNT_MATCH_DETECTE == (R_TML32->ITLS0 & _04_ITL_CHANNEL2_COUNT_MATCH_DETECTE)) { R_TML32->ITLS0 &= (uint8_t)~_04_ITL_CHANNEL2_COUNT_MATCH_DETEC TE;</pre> |
| | <pre>R_Config_ITL000_ITL001_Callback_Shared_Inter rupt(); } /* End user code */</pre> |
| | <pre>R_TML32->ITLS0 &= (uint8_t)~_01_ITL_CHANNEL0_COUNT_MATCH_DETEC TE; }</pre> |



4.2.4 Note on BSP machine timer does not support refresh operation issue

When using the machine timer in default r_bsp v1.20, if user wants to use refresh operation, Smart Configurator can't support refresh function. User needs to add code manually. As a workaround, in r_bsp v1.21 has supported refresh operation. Please use r_bsp v1.21 by following steps:

Step1: Download r_bsp v1.21 by [Download RISC-V MCU Software Integration System Modules]. ① Click [Download RISC-V MCU Software Integration System Modules] link → ② Click BSP Rev.1.21 →

③ Click [Download].

| | | | | 1 | | | | |
|---|-----------------------------|---|--|--------------------------------------|-----------------|----------|-----|----------------|
| New Component | | 8 | | | | _ | | × |
| Software Component Selection | | RISC | PISC V MCII Software Integration System Medules Download | | | | | |
| Select component from those available in list | | | | | and a set | | 1 | <u>ו ה א</u> נ |
| | | | ect the KISC-V WICO Softw | are integration system modules for d | ownioad | | | |
| Category All | | | Title | | Document No. | Rev. | Se | elect All |
| Eurotion All | | | RISC-V MCU Board Sup | port Package Module Using Softwa | R01AN7177EJ0121 | Rev.1.21 | De | coloct All |
| | | | RISC-V MCU Renesas Fl | ash Driver Application Note | R01AN7247EJ0100 | Rev.1.00 | De | Select All |
| Filter | | | | | | | | |
| Components | Short Name T | | | | | | | |
| Data Transfer Controller | c c | | | | | | | |
| Delay Counter | c | | | | | | | |
| Divider Function | c | | | | | | | |
| Show only latest version | | | | | | | | |
| Description | | | | | | | | |
| The apples to digital (A/D) convertes is for | action for converting analy | Madula Faldes Date | | | | | | |
| signals. | neuon for converting analo | Module Folder Path: | | | | | _ | |
| | | C:\Users\yang-xiaolin\.eclipse\com.renesas.platform_download\RISCV_Modules\GenericModules | | | | | Bro | owse |
| Developed BISC V MCU Sefference late and | a Custom madulas | | | | 8 | | | |
| Download RISC-V MCU Software Integration System modules | | | Developed | | | | | ncel |
| Conligure general settings | | | | | 200 | wilload | Cui | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| ? | ck Next > | Fini | sh Cancel | | | | | |
| | | | | | | | | |

Figure 4-5 Download r_bsp v1.21 by [Download RISC-V MCU Software Integration System Modules]

Step2: Change the [Code generation behavior] setting to "Re-generate all component files" by Click [Configure general setting...] in Step1 "New Component" window.

| ✓ Smart Configurator | FIT(RX) / SIS(RL78 / RISC-V | MCU) component settings |
|---------------------------------|-----------------------------|--|
| Component MCU/MPU Package Au | Code generation behavior: | Re-generate all component files \sim |
| | | |

Figure 4-6 [Code generation behavior] setting

Note: If the $\content \content \conte$

| ✓ → Startup | | | | 🗸 🏶 Machin |
|----------------|---|------------------|---------|-----------------|
| ✓ (⇒ Generic | | | | # Mac |
| 💣 r_bsp | | | | # Cloc |
| | | Change version | | |
| | * | Remove | | |
| | | Reset to default | | |
| | | Download and in | nport s | sample projects |
| P • • • | | 47 D | | a la su |

Figure 4-7 Remove r_bsp



Step 3: Change r_bsp version.

(1) Right-click [Change version] → (2) Confirm BSP version is Rev.1.21 → (3) Click [Next] →

④ Click [Finish] → ⑤ Click [Yes] →⑥ Click [Proceed] .

| Components 🔤 | | Configure | | | | | | | | |
|--|---------------------|----------------|-----------------------|--------|------------------|---------------------|--------------------------------|--------|---------|----|
| | | | | | | 🕲 Change Versio | on | | | × |
| 5 日 张 | ت 💕 | Property | | | | | | | | |
| type filter text | | 🗸 🕸 Config | Change Version | | | Setting Overview | | | | |
| V C Startun | | ✓ | Change Version | | | The following set | tings will be added or removed | | | |
| Y Generic | | # | Version Selection | | | | | | | |
| 9 r bsp | | # | Select available vers | sion | | Setting | | | Status | |
| Change v | ersion | | | | | X Configuration | - | | Status | |
| | | | | | | Timer mod | - | | Added | |
| Kemove | | | Component name: | r_bsp | | Interval val | | | Added | |
| Reset to | default | | Current version: | 1.20 | | Interval val | ue unit | | Added | |
| Downloa | d and import sam | ple projects | Available versions: | 1.21 | | Count value | e (higher 32 bits) | | Removed | |
| | | * | | 1.62.1 | | Count value | e (lower 32 bits) | | Removed | |
| | | # | | | | Compare v | alue (higher 32 bits) | | Removed | |
| | | # Sta | | | | Compare v | alue (lower 32 bits) | | Removed | |
| | | # Fla | | | | < | | | | > |
| | | # Fla | | | | | | | | |
| | | # Fia | | | | | | | | |
| | | # 00 | | | | | • | | | |
| | | # 00 | | | | _ | 4 | | | |
| | | | | | • | ? | < Back Next > | Finish | Cano | el |
| | | | | - | 3 | | | | | |
| | | | ? | < Back | Next > | Finish | Cancel | | | |
| | | | Ŭ | | | | | | | |
| Change Version | | r | > | < | Code Generat | tina | | × | | |
| | | | | | | | | | | |
| Component source file Current files will be los | es will be replaced | with the newer | r version. | | Configuration m | ust be saved before | generating code. | | | |
| Do you want to contin | ue? | | | | Proceed with sav | ve and generate? | | | | |
| | | 5 Yes | No | | Always save a | nd generate without | t asking? Proceed Ca | ancel | | |

Figure 4-8 Change r_bsp version

Step 4: When using "Periodic" of Timer mode, please add code in ..\smc_gen\general\ r_cg_inthandler.c manually. Detailed information of machine timer, please refer to ..\smc_gen\r_bsp\doc\en\r01an7177ej0121-risc-v-mcu-bsp.pdf chapter 3.2.4 Machine Timer Operation and chapter 5.3 API for Machine Timer.

| Property | Value |
|-------------------------------------|---------------------|
| ✓ | |
| ✓ | |
| # Machine timer | 🔽 Enable |
| # Clock source select | Machine timer clock |
| # Timer mode | Periodic |
| # Interval value | 100 |
| # Interval value unit | count |
| # mtip priority | Level 15 (low) |
| # Machine software interrupt (msip) | 🔽 Enable |
| # msip priority | Level 15 (low) |

Figure 4-9 "Periodic" of Timer mode





5. Points for Caution

This section describes points for caution regarding the Smart Configurator for RISC-V MCU V1.2.0.

5.1 List of Caution

Table 5-1 List of Caution

✓: Applicable, -: Not Applicable

| No | Description | | | | | |
|----|---|--------------|--|--|--|--|
| 1 | Note on the installation of the Smart Configurator | ~ | | | | |
| 2 | Note on the include path update issue when renaming the component's configuration name | | | | | |
| 3 | Note on TAU Input Signal High/Low level Measurement components. | | | | | |
| 4 | Note on using the user code protection feature | ~ | | | | |
| 5 | Note on the build error when an interrupt is not allocated to any interrupt vector | \checkmark | | | | |
| 6 | Note on SIS modules cannot be showed in New Component window | ✓ | | | | |
| 7 | Note on the start address 00000000 is not from start.s file function for Blinky CPP LLVM project | ~ | | | | |
| 8 | Note on the issue when opening the emProject file in SEGGER | ~ | | | | |

5.2 Details of Caution

5.2.1 Note on the installation of the Smart Configurator

Do not set more than 64 characters for the installation directory. The user might see an error message "The specified path is too long" and will not be able to install Smart Configurator.

5.2.2 Note on the include path update issue when renaming the component's configuration name

When renaming the added component's configuration in e² studio Smart Configurator project that has selfdefined include path setting for any folder or file, include path setting for that folder or file will keep the old name setting after code generation. This will cause build error when compiling the newly generated codes so please manually update the include path.

The folder or file which has self-defined include path setting can be recognized by checking the overlay icon

 $(\stackrel{6}{\leftarrow})$ on that folder or file. Below is an example on how to handle the include path update after renaming Compare Match Timer component configuration.

| Project Explorer × | ■\$7:-□ | ® test.scfg × | |
|---------------------------|-------------|---|---------------------------------------|
| 👻 🎏 test | | Overview inform | ation |
| > 🖑 Binaries | | | |
| > 🔊 Includes | | General Information | |
| 👻 🐸 src | | | |
| 🗠 🗁 smc_gen | | Overview | I |
| Config_ADC | | Get an <u>overvi</u> | iew of the features provided by Smart |
| > 🗁 Config_TAU0_1 | | Configurator. | |
| > 🗁 general 🛛 🖌 | | | |
| > 🗁 r_bsp | Folder with | overlay icon indi | icates |
| > 🗁 r_config | that "Confi | ADC" folder ha | as philgurator |
| > 🖻 test.c | self-define | include path se | tting |
| > 🗁 HardwareDebug | | | ew |
| > 🗁 trash | | Chack out wh | at's now in the latest release |
| 🗎 test.rcpc | | Check Out wi | Tat s new in the latest felease. |
| test.scfg | | Product I | Documentation |
| 🖹 test HardwareDebug.laun | ch | <u>User manual</u> | and release notes |





| 🖻 Project Explorer × 🗧 🗖 | ♥ *test.scfg × |
|--------------------------|-----------------------------------|
| 🖻 🕏 🍸 🕴 | Software component configurat |
| 👻 📂 test | Software component configura |
| > 🐰 Binaries | Components |
| Includes | |
| Y 🐸 src | - Ni 🗱 👘 🔪 |
| ✓ | type filter text |
| > 🗳 Config_ADC | 🗸 🗁 Startup |
| > Sconfig_TAU0_1 | 🗸 🗁 Generic |
| > 🗁 general | |
| > 🗁 r_bsp | ✓ ➢ Drivers |
| > 🗁 r_config | 👻 🗁 Timers |
| > 🖻 test.c | My_Config_TAU0_1 |
| > 🗁 HardwareDebug | ✓ ➢ A/D converter |
| > 🗁 trash | Penamed from "Config. TALIO 1" to |
| test.rcpc | "My_Config_TAU0_1" |

Figure 5-2 The Interval Timer component configuration after renaming

| Properties for Cor | nfig_ADC | | | |
|--|--|---|---|--|
| | Paths and Symbols | | | ⇔ ◄ ⇔ ▼ ៖ |
| > Resource > C/C++ Build > C/C++ General Paths and Sym Preprocessor I | Configuration: Hard | wareDebug [Active] | ✓ Manage 0 | Configurations |
| Run/Debug Settir | Includes # Symbol | ols 🤒 Source Location | | |
| | Languages | Include directories | ^ | Add |
| | GNU C++ | \$ {TCINSTALL}/inc { (\$/\$/ProiName}/src/smc.gen/r.hsp. } | | Edit |
| | Assembly | #/files/sic/sinc_gen/r_bsp /// // // // // // // // // // // // // | | Delete |
| | Assembly | ProjName}/src/smc_gen/Config_ADC | | Export |
| | | \${ProjName}/src/smc_gen/general \${ProjName}/src/smc_gen/Config_TAU0_1 | ~ | Move Up |
| | "Preprocessor Inc Show built-in value | lude Paths, Macros etc." property page may define ac ies | ditional entries | Move Down |
| < >> | Import Settings | Report Setting Include path for re updated after code To avoid build error "Config. TALIO. 1" | named con e re-genera or, please n to "My. Con | figuration is tion. nanually upd |

Figure 5-3 Include path setting for the "Config_ADC" configuration



5.2.3 Note on TAU Input Signal High/Low level Measurement component

When using TAU Input Signal High/Low level Measurement component, after used noise filter function for TImn input pulse, please make sure the High/Low level width min value needs to be greater than two times the minimum value prompted on the UI.

For example, the High/Low level width min value is 0.032us (min value), when use noise filter function, the width min value should be 0.064us.

| Clock setting | | | |
|--|--------------------|--|------|
| Operation clock | СКОО | ~ | |
| Clock source | PCLKB | ~ | |
| (Clock frequency: 32000 kHz, High-/low | -level width range | e: $0.032 \ (\mu s) \le TI00 \le 4.096 \ (r$ | ns)) |

Figure 5-4 High/Low level width min value

5.2.4 Note on using the user code protection feature

The user code protection feature will be supported for all Code Generation components. Please use the following specific tags to add user code when using the user code protection feature. If the specific tags do not match exactly, inserted user code will not be protected after the code generation.

| /* Start user code */ |
|--|
| User code can be added between the specific tags |
| /* End user code */ |
| |

5.2.5 Note on the build error when an interrupt is not allocated to any interrupt vector

Use IRQ0 as example, when IRQ0 is used in interrupt component, but an interrupt error is shown in "Configuration Problems" window. It means all interrupt vectors which can used by IRQ0 have been used.

| Components 🛛 🖓 🔁 🕀 | Configure | | | | | | | |
|---|--------------------------|--|---------|------------------------------|--|--|--|--|
| type filter text | NMI pin interrupt settir | Detection type Falling edge | ~ | Digital filter No filter 🗸 🗸 | | | | |
| ✓ → Startup ✓ → Generic → r bsp ✓ → Drivers | IRQ0 setting | Detection type Falling edge Priority Level 15 (low) | ~ | Digital filter No filter V | | | | |
| Config_ICU | IRQ1 setting | Detection type Falling edge Priority Level 15 (low) | ~ | Digital filter No filter V | | | | |
| Overview Board Clocks Components Pine | Interrupt | | | | | | | |
| Configuration Proble | ems × | | | | | | | |
| 1 error, 0 warnings, 0 ot | hers | | | | | | | |
| Description | | ~ | | | | | | |
| 🗸 🥝 Interrupt (1 item) | ✓ So Interrupt (1 item) | | | | | | | |
| 😣 E04010004: P0 | DRT_IRQ0 used by Con | fig_ICU is not allocated to ar | ny inte | errupt vector. | | | | |

Figure 5-5 An interrupt is not allocated to any interrupt vector

When you generate code, some build error will be shown:

| | 55 | ⊖ void R_Config_ICU_Create(void) | |
|---|----|----------------------------------|--|
| | 56 | { | |
| 4 | 57 | CLIC->clicintie_b.IE = 0U; | <pre>/* disable IRQ0 interrupt */</pre> |
| 0 | 58 | ICU->IELSR &= 0xFFFEFFFFU; | <pre>/* clear IRQ0 interrupt flag */</pre> |
| | 50 | | |

Figure 5-6 Build errors when an interrupt is not allocated to any interrupt vector

To solve these build errors, please refer to Smart Configurator User's Manual e² studio or IAREW, SEGGER Embedded Studio chapter 4.6.4 Resolving Interrupt error.



5.2.6 Note on the start address 00000000 is not from start.s file function for Blinky CPP LLVM project

When using a Blinky CPP LLVM project, the start addresse 00000000 is not from start.s file function.



Figure 5-7 Incorrect function of start address 00000000

| Correct start function address should in BSP start.s file a | and _Powe | erON_Reset(). |
|--|---|---|
| ▼ C iscv_cpp_llvm_blinky HardwareDebug [Renesas GDB Hardware Debugging] ▼ Rescv_cpp_llvm_blinky [1] [cores: 0] ▼ P Thread #1 1 (single core) [core: 0] (supended : Signal : SIGTRAP:Trace/breakpoint trap) E PowerON Reset() at start.sc41 0x0 # riscv32-unknown-elf-gdb (12.1) # Renesas GDB server (Host) | 29 30 31 32 33 34 35 36 37 38 39 | <pre>/*reset_program.asm[*]/ .extern initialize_vect .text .global_PowerON_Reset /*! global Start routine */ .type_PowerON_Reset, @function /* call to _PowerON_Reset */ _PowerON_Reset: # Initialize global pointer .option push .option norelax </pre> |
| | 41 0000000 42 00000004 43 44 45 46 00000008 47 00000010 48 | <pre>auipc gp, %pcrel_hi(_global_pointer\$) addi gp, gp, %pcrel_lo(1b) .option pop # initialize the stack and frame pointers la sp,stack add s0, sp, zero</pre> |

Figure 5-8 Start address 00000000 is from start.s file and _PowerON_Reset()

As a workaround, please changed the [Debug format] to dwarf-2 or dwarf-3:

| Properties for Blinky_CP | P_LLVM | | | | - | | × |
|---|---|---------------------------------|-------------|-----------|--------|------------------|----------|
| type filter text | Settings | | | | ¢ | • 🖒 | • 8 |
| > Resource Builders ~ C/C++ Build Build Variables Environment | Configuration: HardwareE | Debug [Active] | ~ | Manage | Confi | guratio | ns |
| Logging Settings Tool Chain Editor C/C++ General Project Natures Project References Refactoring History Renesas QE Run/Debug Settings | Tool Settings Toolch | nain 🚯 Device 🎤 Build Steps 🖤 B | uild Artifa | ict 🗊 Bin | ary Pa | arsers | × |
| | ➢ Warnings ✓ ℌ Library Generator ➢ Settings ✓ ℌ Compiler ➢ Source ➢ Includes | Other flags | | | | 1 1 1 1 | ^ |
| | < | | | | | | > |
| (?) | | l | Apply an | d Close | (| Cancel | |

Figure 5-9 Change the [Debug format] CPP LLVM project



5.2.7 Note on the issue when opening the emProject file in SEGGER

When opening the emProject file generated by SEGGER. The following prompt box will be pop up.



Figure 5-10 The issue when opening the emProject file

As a workaround, please "Ctrl + A" right-click change Line ending to "Unix".

| 9 | Toggle Breakpoint | F9 | ł | | | | | |
|---|----------------------|----------------|--------------|--|--------------|---|---------|---------|
| 1 | Check Syntax | Ctrl+Q, Ctrl+Y | 1 | | | | | |
| | Compare To Disk Copy | | ł. | | | | | |
| | Add File to Project | • | ł. | | | | | |
| × | Cut | Ctrl+X | | | | | | |
| Ē | Сору | Ctrl+C | | | | | | |
| ĥ | Paste | Ctrl+V | ł. | | | | | |
| _ | Tools | , | 1 | | | | | |
| | Folding | , | | | | | | |
| | Text Size | , | | | | | | |
| | Options | • | a-b | Visible Whitespace | Ctrl+Shift+8 | | | |
| | | | ~ | Display Code Completion Suggestions While Typing | currentee | | | |
| | | | ~ | Return or Enter | | | | |
| | | | | Tab | | | | |
| | | | | Code Completion Replaces Existing Word | | | | |
| | | | ~ | Include Preprocessor Definitions in Suggestions | | | | |
| | | | | Include Templates in Suggestions | | | | |
| | | | | Check Spelling | | | | |
| | | | | Column-mode Tab | | | | |
| | | | \checkmark | Show Inactive Code | | | | |
| | | | ~ | Show Symbol Declaration Tooltips | | | | |
| | | | ~ | Highlight All Selected Text | | | | |
| | | | * | Toggle Split Window | Ctrl+K, S | | | |
| | | | | Tab Size | • | | | |
| | | | | Syntax Highlighting | , | | | |
| | | | | Code Formatting | , | | | |
| | | | | Text Encoding | • | | | |
| | | | | Line Endings | • | | Windows | (CR+LF) |
| | | | P | Editor Properties | | ~ | Unix | (LF) |
| | | | | | | | OS-9 | (CR) |

Figure 5-11 Change Line ending to "Unix"



Revision History

| Rev. | Section | Description |
|------|-----------------------------|--|
| 1.00 | - | First edition issued |
| 1.01 | 4. Points for Limitation | Add 4.2.4 Note on BSP machine timer does not support refresh operation issue |



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 reset process 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 pullup 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 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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