

Smart Configurator

Guide on Sample Projects for RH850/U2A Devices

Introduction

This document describes how to use the sample project of Smart Configurator for RH850/U2A devices in CS+ integrated development environment.

Target Device

RH850/U2A16 (BGA516, BGA292) RH850/U2A8 (BGA292) RH850/U2A6 (BGA292, BGA156, LQFP176, LQFP144)

Contents

1.	Overview	2
1.1	Purpose	2
1.2	Operating Environment	2
2.	Outline of the Sample Projects	3
2.1	Introduction of Sample Project	3
2.2	Notes on the Sample Projects	3
3.	Basic Procedures for Operating the Smart Configurator	4
4.	Description of the Sample Project	5
4.1	Configuration of the Sample Project	5
4.2	Basic Operating Procedure	7
4.3	Procedure for Changing the Device	11
4.4	Settings in the Sample Project	18
5.	Operations in the Smart Configurator	23
5.1	Setting the Peripheral Modules (Software Components)	23
5.2	Generating Drivers	28
5.3	Adding the Code to the User Code Area	29
5.4	Adding the Code to main_pm0()	30



1. Overview

1.1 Purpose

This document describes how to use the sample project of Smart Configurator for RH850/U2A devices in CS+ integrated development environment.

When applying this application note to a microcontroller, change the contents according to the specifications of the microcontroller you are using and validate the correct operation of the sample projects.

1.2 Operating Environment

Install the Smart Configurator and tools to be used to create or build programs in CS+ based on the source files generated by the Smart Configurator with the use of the sample projects.

For details on how to use your integrated development environment, refer to the user's manual for the integrated development environment that you are using.

Table 1-1 Operating Environment

Type Name		Abbreviation in This Manual
IDE	CS+ for CC V8.09.00 or later	CS+
Toolchain C Compiler Package for RH850 Family		CCRH



2. Outline of the Sample Projects

The Smart Configurator for RH850/U2A devices outputs a main function and source files that initialize peripheral modules that are set by components of the Smart Configurator. But it does not output the initialization codes to be performed before the execution of the main function and the startup routine which starts the main function and handles some other processing after the microcontroller has been reset.

This sample project includes boot program and startup code as a reference so that the user application codes and the peripheral modules codes generated according to the configurations in the Smart Configurator can be built and downloaded to the debug tool immediately.

2.1 Introduction of Sample Project

RH850/U2A sample project is a multi-core project which includes a main project "u2a16_startup.mtpj" and four subprojects "PE0.mtsp", "PE1.mtsp", "PE2.mtsp" and "PE3.mtsp". In this sample project, only subproject "PE0.mtsp" includes the sample code of Interval Timer generated by Smart Configurator.

Each sub project has its own folder PEn(n=0-3) and independent interrupt vector table files sc_vecttble*n*.asm(*n*=0-3) and start files sc_cstart*n*.asm(*n*=0-3).

For details on the sample projects, see the descriptions in the relevant sections.

2.2 Notes on the Sample Projects

1. When using this sample project, please copy and use it in a directory that does not restrict access.

If you use it in a directory that restricts access, the generated codes and other files will not be saved and some errors may occur.

In general, the following directories require administrator permission:

- Program files folder (e.g. "C:\Program Files", "C:\Program Files (x86)")
- System root folder (e.g. "C:\Windows")

For your environment, please contact your system administrator(IT department).

- 2. The Smart Configurator outputs the register descriptors according to iodefine.h for the Renesas CCRH compiler. iodefine.h for the Renesas CCRH compiler has been included in sample project. This file is used for building files generated by the Smart Configurator.
- 3. The Smart Configurator uses interrupts with the table lookup method as the method for selecting the interrupt handler addresses. The address where the table starts is set as 0x00040000 in the sample projects.
- 4. This sample project assumes that only PE0 is used for code generation. After generating code, please be sure to rename "main()" in folder "<ProjectDir>\src\smc_gen \general\ r_cg_main.c" to main_pm0().
- 5. The definition of the interrupt vector table of peripheral modules that was set in the Smart Configurator is reflected in smc/general/r_cg_intvector_PE0.c, which is output by the Smart Configurator. The file sc_intprg-A16A8.c in the "intprg" folder defines the vector table of EI maskable interrupt sources, which is the default EI vector table, is not set by the Smart Configurator.
- 6. Settings of files and sections in the sample projects are examples. You should change or create the settings newly to match the specifications of the microcontroller used in your system.



3. Basic Procedures for Operating the Smart Configurator

This section describes the basic operating procedures when building a user application with the files output from the Smart Configurator for RH850/U2A devices.

The basic operating procedure in CS+ environment without using the sample projects is described here. For the operating procedure with using a sample project, see the relevant section 4 "Description of the Sample Project".

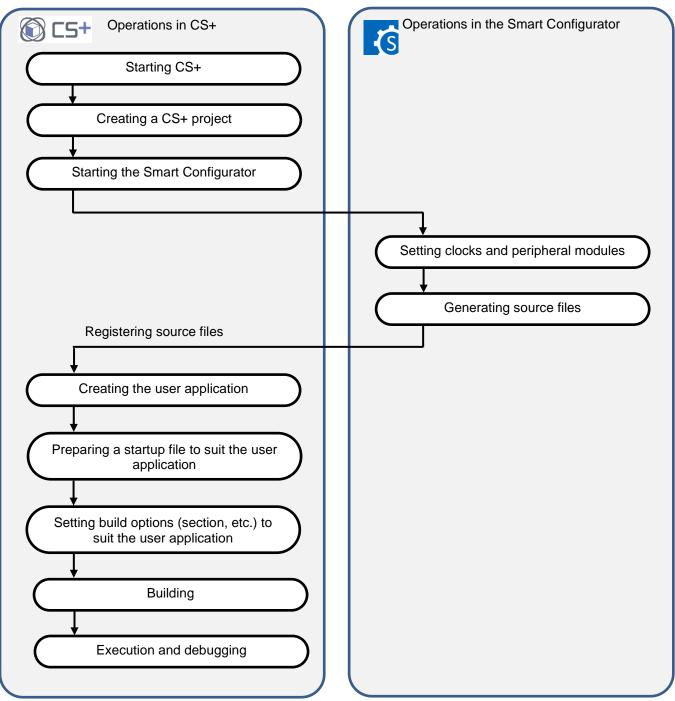


Figure 3-1. Basic Operating Procedure without using Sample Project



4. Description of the Sample Project

4.1 Configuration of the Sample Project

Figure 4-1 and Table 4-1 describes common folders and what files are included in the main project:

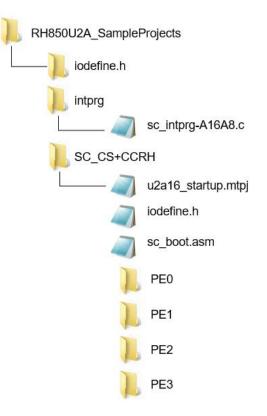


Figure 4-1. Common folder and Main project folder

Table 4-1.	File Configuration of the main	Project (corresponding to Figure 4-1)
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File Name	Outline of File	
iodefine.h folder	Folder which includes iodefine.h file	
intprg folder	Folder which includes sc_intprg-A16A8.c file. This file defines default interrupt functions that are used by the EI maskable interrupt vector table for RH850/U2A devices and should be included into SC project	
u2a16_startup.mtpj	Main project file for CS+	
iodefine.h	Renesas CCRH header file that defines the registers for RH850/U2A devices	
sc_boot.asm	Definition of root start routine and performs HW initialization for each PE, then branch to the corresponding $PEn(n=0 \sim 3)$ start routine in sc_cstart <i>n</i> .asm($n=0\sim3$)	
PE <i>n</i> folder(<i>n</i> =0~3)	Folder of subproject which is corresponding to the specific $PEn(n=0-3)$. The folder includes independent sc_start <i>n</i> .asm($n=0-3$), main.c and the files output from the Smart Configurator for RH850/U2A devices.	



Figure 4-2 and Table 4-2 describes what files are included in the subproject:

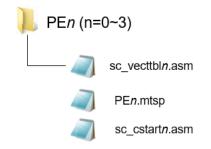


Figure 4-2. Subproject folder PEn(n=0~3)

Table 4-2. File Configuration of the subproject (corresponding to Figure 4-2)

File Name	Outline of File
sc_vecttbl <i>n</i> .asm(<i>n</i> =0~3)	Definition of $PEn(n=0-3)$ reset entry to branch to the root start routine which is defined in sc_boot.asm file and definition of the interrupt vector table for $PEn(n=0-3)$.
PE <i>n</i> .mtsp(<i>n</i> =0~3)	Subproject file for CS+
sc_cstart <i>n</i> .asm(<i>n</i> =0~3)	Definition of each $PEn(n=0~3)$ startup routine which is called by sc_boot.asm and is executed until branching to the main_pm0() function.

NOTE: The Smart Configurator does not output the above files except for "PEn.scfg(n=0~3)" and folder "src".



4.2 Basic Operating Procedure

Figure 4-3 shows the operating procedure in CS+ environment when using the sample project.

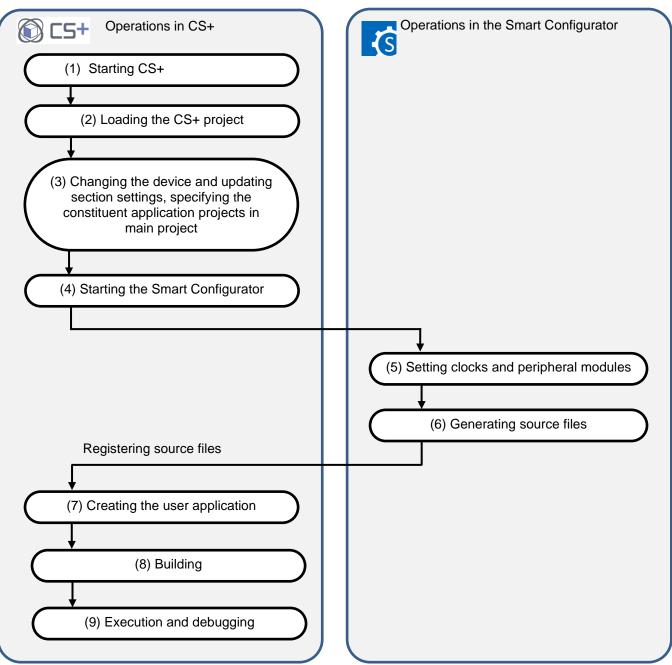


Figure 4-3. Operating Procedure for Sample Project



(1) Starting CS+

In the [Start] menu of Windows, select [Renesas Electronics CS+] \rightarrow [CS+ for CC (RL78, RX, RH850)].

(2) Loading the CS+ sample project

From the [Open...] item of the [File] menu or [Open Existing Project] of CS+, select "u2a16_startup.mtpj".

6	CS+ for CC - [Start]	- 0	×
File	e Edit View Project Build Debu	ua Tool Window Help	ž 🚔
	Open Ctrl+O		-
	Open with Encoding	Start	
	Add +		• ×
1	Close Project	We recommend reading the tutorial to find out what can be done in CS+.	^
J	1 1	GO The tutorial contains the information on how to effectively use CS+.	
	Save Project Ctrl+Shift+S	Create New Project	
AB,0	Save Project As	A new project can be created.	
	Save Object Ctrl+S	GO A new project can also be created by reusing the file configuration registered to an existing project.	
ABO	Save Object As		- 1
B	Object Save Settings	Create New Multi-core Project +	
ø	Save All Ctrl+Shift+A	Open Existing Project	
	Page Setup	Loads the project of CS+(formerly CubeSuite+). Can also be opened directly from the following link.	
2	Print Ctrl+P	Recent Projects Favorite Projects	
3	Print Preview	GO 1. u2a16_startup Nothing	
	Recent Files +	2. C1MA2multi-coreProject	
	Recent Projects +		~
	Exit	ut Messages	Р X
		Smart Browser 🔜 Output	•
F7		t F4 Replace. F5 Go F5 Build & D. F7 Build Pro. F8 Ignore Br. F9 Set/Delet. F18 Step Over F77 Step In F12 Jump	p to F
-	ens a file		

Figure 4-4. Loading the CS+ Sample Project

NOTE: Sample project has to be copied to a directory that does not restrict access before using. Please refer 2.2-1 for the detail.

(3) Changing the device

The R7F702300A (RH850/U2A) is selected as the target device in the sample project. If you are using another device, change the target device and file to be used with reference to section 4.3, "Procedure for Changing the Device". If the device does not require a change, proceed to step (4).

- (4) Starting the Smart Configurator
 - (a) Confirm the setting of the path for the Smart Configurator for RH850. In the Project Tree panel, select [Smart Configurator (Design Tool)] and open the [Property] panel. Confirm that the path in which the Smart Configurator for RH850 was installed is set in [Smart Configurator for RH850 executable file path].

6	u2a16_startup - CS+ for CC - [Project Tree]				_	\Box \times
File	Edit View Project Build Debug Tool Window	Help				🥹 🍘 🛊
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9	『 🖓 🖉 🧖 🖗 🗄 🗔 💭 🗔 🔍 🗗 🕴 🌽 Solu					
		Property r_cg_main.c				-
Smart	2 0 2 2	Smart Configurator Property				- م
3	🖶 📅 PE0 (Subproject) 🔷	 Product Information 				
Manual	R7F702300A (Microcontroller)	Version	V1.02.06.04 [16 No	v 2022]		
<u> </u>	🔤 Smart Configurator (Design Tool)	V-Cmart configurator extring				
	CC-RH (Build Tool)	Smart Configurator for RH850 ex	ecutable file path C:\Program Files (x86)\	Renesas Electronics\SmartConfigu	rator\RH850\eclipse\SmartCo	nfigurator.exe
	RH850 E2 (Debug Tool)					2
		Smart Configurator for RH850 exc				
	🚊 🗍 File	Specify the Smart Configurator for R	H850 executable file path.			
	🖃 📅 PE1 (Subproject)					
	R7F702300A (Microcontroller)	6				
	- Smart Configurator (Design Tool)	Smart Configurator Setting				
	5					-

Figure 4-5. Setting the path for Smart Configurator



- (b) Start the Smart Configurator for RH850 by double-clicking on [Smart Configurator (Design Tool)] in the Project Tree panel.
- (c) If [RH850/U2Axx Package Selection] pops up, please choose the package user wants to use: Such as choose R7F702300(BGA516pin) as following figure shows:

RH850/U2A16 Package Selection	×
Please select RH850/U2A16 package details for Smart Configurator.	
O R7F702300 (BGA292pin)	
O R7F702300 (BGA373pin)	
R7F702300 (BGA516pin)	
OK	

Figure 4-6. RH850/U2A16 Package Selection

- (5) Smart Configurator setting Clocks
- (6) Smart Configurator setting Components
- (7) Smart Configurator setting Generating driver

Above (5) \sim (7) are the procedures for setting clocks and components and generating driver in the Smart Configurator, please see section 5 "Operations in the Smart Configurator".

👩 Smart Configurator			-) ×
File Window Help					
					😢 📓
∰ PE0.scfg ≅				5 M	. 22 - 0
Overview information		Generate Code	Generate Report		<u>a</u> (3)
- General Information			0 ^		
This editor allows you to modify the settings stored in configuration file (.scfg)					
Board Allow board and device selection					
Clocks Allow clock configuration	Application under development Middleware	- Components			
Components Allow software component selection and configuration	Device RTOS				
Pins Allow general pin configuration and pin configuration for selected software component					
Interrupt Allow general interrupt configuration and interrupt configuration for selected software component			- 1		
- Current Configuration					
Selected board/device: R7F702300EBBG (ROM size: 16 MB , RAM size: 3584 KB, Pin count: 516)					
Generated location (PROJECT_LOC\): src\smc_gen Edit					
Selected components: Overview Board Clocks System Components Pins Interrupt			v		
Console 🐍 Configuration Problems 🛱					
0 items					
Description		Туре			
<			>	► Le	

Figure 4-7. Smart Configurator setting



(8) Building

Build the driver and application code. Select [Build Project] from the [Build] menu or click on the [Builds the project. (F7)] button in the toolbar of CS+.

(9) Execution and debugging

For program execution and debugging in the emulator, refer to CS+ Integrated Development Environment User's Manual: RH850 Debug Tool (Obtained the latest information from the website of Renesas Electronics).



4.3 Procedure for Changing the Device

When the target device of the sample project differs from the device that is to be used, the target device or file to be used must be changed according to the following procedure.

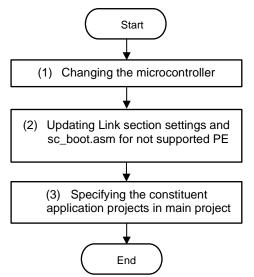


Figure 4-8. Changing the Target Device of the Sample Project

- (1) Changing the microcontroller
 - (a) Select "R7F702300A (Microcontroller)" of main project "u2a16_startup.mtpj" and then select [Change Microcontroller...] from the context menu.

Click on the [OK] button in the [Question] dialog box that appears.

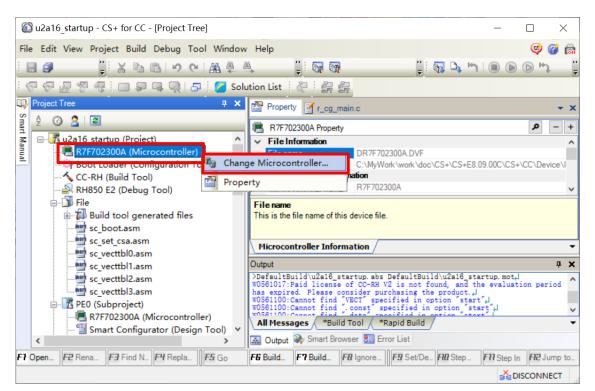


Figure 4-9. Change Microcontroller



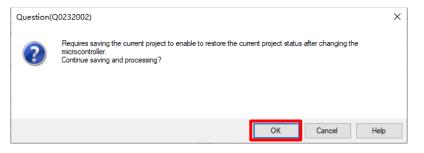


Figure 4-10. Save and continue

(b) In the [Change Microcontroller] dialog box, select the RH850/U2A16 or RH850/U2A8 device to be used.

Example: Changing from R7F702300A (RH850/U2A16 516pin) to R7F702301A (RH850/U2A8 292pin)

Change Microcontroller					\times
Change microcontroller to:					
(Search microcontroller)					
RH850/U2A16 R7F702300A(BGA292) R7F702300A(BGA292) R7F702300A(BGA292) R7F702300B(BGA292) R7F702300B(BGA373) R7F702300B(BGA373) R7F702300B(BGA516) RH850/U2A6 RH850/U2A8 R7F702301B(BGA292) R7F702301B(BGA292) R7F702301B(BGA373) R7F702301B(BGA373) R850/U2A-EVA RH850/U2A-EVA RH850/U2A-EVA	~	Internal R Code Fla Data Flas Internal R Local RA Cluster R		r of Cores: 2	< >
5. 	0	К	Cancel	Help	

Figure 4-11. Select device to be changed



(c) Change subprojects microcontroller.

Using the same method as (a) and (b), change the microcontroller of each PE to the same device with the main project, which means to change to R7F702301A(RH850/U2A8 292 pin). But RH850/U2A8 292 pin does not support PE2 and PE3, so remove subproject PE2 and PE3 and interrupt vector table sc_vecttbl2.asm and sc_vecttbl3.asm directly by following way:

Selecting [PE2(Subproject)] and [PE3(Subproject)] and then right-click it and then select [Remove from project]:

🚳 u2a16_startup - CS+ for CC - [Proje	ect Tree]		- 🗆 X
File Edit View Project Build Debu	ig Tool Window Help		🧔 😨
🕅 Start 🛃 🍟 🕷 🖪	v @ ₩ # #	Gran 🧊 🖬 🗅 M	
· · · · · · · · · · · · · · · · · · ·	🔍 🗗 💋 Solution List 🦧 🔮		
Project Tree	🕂 🗶 🌇 Property 📝 sc_intprg	-A16A8.c 🥤 r_cg_main.c 🧃 r_cg_intvector_F	PE0.c 🥑 u2a16_t 🖛 🖇 🕨 🗙
	d u2a16_startup	Columns -	
Reb	uild u2a16_startup		
Boot Loader (Coi 🔝 Clea	in u2a16_startup	E_MODULE_STANDBY_SET .set FLA	G_OFF ; enabl
CC-RH (Build Toc Ope	en Folder with Explorer	ple PEX by PEO E PE1 BY PEO .set FLA	G ON ; enabl
	dows Explorer Menu	E_PE2_BY_PE0 .set FLA	GOFF ; enak
Add	•	E_PE3_BY_PE0 .set FLA	G_OFF ; enabl
	PE2 as Active Project	pet dependence informations (spectrum)	ecify values suitak STER RAM2 ADDR ; c
Ben sc vecttbl1.as Rem	nove from Project Shift+Delete		JIEK_KANZ_ADDK , C
sc_vecttbl3.as	te Ctrl+V		>
⊕	ame F2		4 ×
Prop	perty	The device was changed. Update the heade The device was changed. Update the heade	r file by selecting [Gen A
🗄 📝 PE3 (Subproject)		لم The device was changed. Update the heade	
	erate I/O header file]. Information(M0291002) : erate I/O header file].	The device was changed. Update the heade	r file by selecting [Gen
	Information (M0291002) : erate I/O header file].	The device was changed. Update the heade	r file by selecting [Gen
	[EOF]		
			~
	All Messages	_	-
<	> 🖾 Output 🏶 Smart Brows	10	
F7 Open H F2 Rename F3 Find Ne F4	Replac F5 Go F6 Build & F7	Build Pr., FB Ignore F9 Set/Del FND Step (D F77 Step In F12 Jump to

Figure 4-12. Remove unsupported subprojects



Selecting [sc_vecttbl2.asm] and [sc_vecttbl3.asm] and then right-click it and then select [Remove from project]:

🚳 u2a16_startup - CS+ for CC	- [Project Tree]		- 🗆 X
File Edit View Project B	Assemble		🤤 🎯 🎰
🚳 Start 🔳 🍹 🔏 🕤	Open		
· େ େ ፼ · ፼ · @ · ■ 🚺	Open with Internal Editor		
Project Tree	Open with Selected Applicat	tion	🗹 sc_intprg-A16A8.c 🛛 r_cg_main.c 📓 r_cg_i ₹ 🔄 🕨 🗙
Smart Marting (Proje) R7F702301A (Micry	Open Folder with Explorer		⊂ i Columns •
Z 12a16 startup (Proje E R7F702301A (Micro	Windows Explorer Menu		
Boot Loader (Conf	Add	•	DISCLAIMER
CC-RH (Build Tool)	Remove from Project Sh	ift+Delete	This software is supplied by Renesas El
RH850 E2 (Debug	Сору	Ctrl+C	No other uses are authorized. This soft applicable laws, including copyright la
🚽 🗍 Build tool gene 🛍	Paste	Ctrl+V	THIS SOFTWARE IS PROVIDED "AS IS" AND R OR STATUTORY, INCLUDING BUT NOT LIMITED
	Rename	F2	NON-INFRINGEMENT. ALL SUCH WARRANTIES
sc_set_csa.asm	Change Extension		LAW, NEITHER RENESAS ELECTRONICS CORPOR INDIRECT, SPECIAL, INCIDENTAL OR CONSEC
est sc vecttbl1.asm	Property		ITS AFFILIATES HAVE BEEN ADVISED OF THE
sc_vecttbl2.asm sc_vecttbl3.asm		12 *	Renesas reserves the right, without not of this software. By using this softwar
⊕ 🕂 PE0 (Subproject)		14 *	following link:
⊕ B PE1 (Subproject)		15 *	http://www.renesas.com/disclaimer
		17 *	Copyright (C) 2018, 2022 Renesas Electr
		18	****************
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FI Open F2 Rena F3 Find	FURNIN FERMIN		Smart Browser 🕎 Error List
F7 Open F2 Rena F3 Find	F4 Repla F5 Go F6 Build	d F7 Build	F8 Ignore F9 Set/D FN Step F1 Step In F12 Jump t

Figure 4-13. Remove unsupported interrupt vector table



(d) Confirm that the microcontroller displayed in the Project Tree panel has become the device to be used after the change.

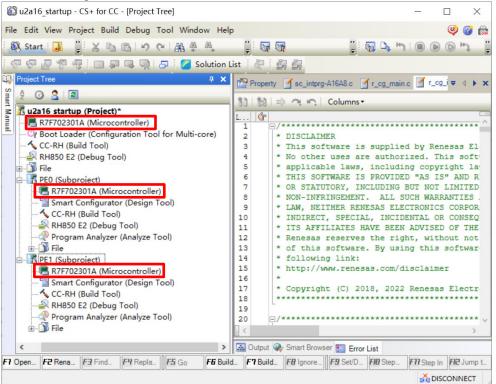


Figure 4-14. Confirm microcontrollers are changed

(e) Save the project by selecting [Save Project] from the [File] menu.



(2) Updating Link section settings, sc_boot.asm for not supported PE Because PE2 and PE3 are not supported by RH850/U2A8 292pin, the following update is needed:

(a) Section settings for PE2/PE3 that need to be deleted from main project Section Settings.
 [Property] panel from [CC-RH (Build Tool)] of main project "u2a16_startup.mtpj" → [Link Options] tab
 → [Section] → [Section start address]

Address	Section		Add
%ResetVectorPE0%	RESET_PE0		Modify
	EIINTTBL_PE0		Moully
%ResetVectorPE1%	RESET_PE1		New Overlay
	EIINTTBL_PE1		Remove
%ResetVectorPE2%	RESET_PE2		Lin Davis
	EIINTTBL_PE2		Up Down
%ResetVectorPE3%	RESET_PE3		
	EIINTTBL_PE3		
0×00002000	.text		Import
			Export
	ОК	Cancel	Help

Figure 4-15. Link Section Settings before changing microcontroller

Section Settings			×
Address	Section		Add
%ResetVectorPE0%	RESET_PE0		Modify
	EIINTTBL_PE0		mouly
%ResetVectorPE1%	RESET_PE1		New Overlay
	EIINTTBL_PE1	ſ	Remove
0×00002000	.text		Up Down
		[Import
		[Export
[ОК	Cancel	Help

Figure 4-16. Link Section Settings after changing microcontroller

(b) PE2 and PE3 should be disabled in sc_boot.asm.Line 101~Line102 in sc_boot.asm, FLAG_ON is changed into FLAG_OFF:

ENABLE_PE2_BY_PE0	.set FLAG_OFF	;	disable	PE2	by	PE0
ENABLE_PE3_BY_PE0	.set FLAG_OFF	;	disable	PE3	by	PE0



(3) Specifying the constituent application projects in main project
 [Property] panel from [Boot Loader (Configuration Tool for Multi-core)] → [Boot Loader] tab →
 [Constituent Projects] → [Constituent application projects]

8	🚳 u2a16_startup - CS+ for CC - [Property]				-	
Fil	File Edit View Project Build Debug Tool Window Help					👔 🖨
: 8	🚳 Start 🔒 🍟 🛪 🖻 🛍 🖉 언 🏔 🚇 🛝	21	a	💾 🐻 🖎 🛏 🔘 🛈		H) 🕢 📔
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			 ≦sc_intprg-A16A8.c	a mainic. 🗹 ricq intvecto	r PE0 (c ₹ 4 } x
Sma	S 2 3 2 3	() Boot Load				9 – +
Smart Manual	Z ⊡ I u2a16 startup (Project)*	 Constitue 				
inual	Boot Loader (Configuration Tool for Multi-core			onstituent application projects	[0]	
	CC-RH (Build Too RH850 E2 (Debug		9	×	re de	ebugging[0]
	File Select constituent application project By selecting these projects, you can stand-alone core debugging, debug	use the following	allel.	from boot loader, use		
	sc_set_csa.asm Project:		Association settings:		_	
	→ emiliar sc_vecttbl0.asi		 Project information Project file 			
	🗉 📲 🖪 PEO (Subproject)		Symbol address file			
	i≟ 👖 PE1 (Subproject)					
					plica	ation from bo
			Project file This is the project file of the	constituent application		-
	< <	>	project.			
F1	FT Open H F2 Rename F3 Find				In	FH2 Jump to
			ОК	Cancel Help	DIS	CONNECT

Figure 4-17. Specify the constituent of main project



4.4 Settings in the Sample Project

The main project in sample project is created in CS+ as a [Boot Loader for Multi-core (CC-RH)] project. The subproject is created as an [Application for Multi-core (CC-RH)] project. The include path is added and settings of the following options are changed.

(1) [Property] panel from [CC-RH (Build Tool)] \rightarrow [Link Options] tab \rightarrow [Section] \rightarrow [Section start address]

Settings in the main project u2a16_startup:

Address	Section		Add
%ResetVectorPE0%	RESET_PE0		Modify
	EIINTTBL_PE0		iniouily
%ResetVectorPE1%	RESET_PE1		New Overlay
	EIINTTBL_PE1		Remove
%ResetVectorPE2%	RESET_PE2		Up Down
	EIINTTBL_PE2		Up Down
%ResetVectorPE3%	RESET_PE3		
	EIINTTBL_PE3	_	
0x00002000	.text		Import
			Export
	ОК	Cancel	Export

Figure 4-18. Setting in the main project u2a16_startup

Settings in the subproject PE0:

Address	Section	Add
0x00004000	.const	Modify
	.INIT_DSEC.const	1100my
	.INIT_BSEC.const	New Overlay
	.text.cmn	Remove
	.text	Line David
	.data	Up Down
0×00040000	EIINTTBL_PE0.const	
0xFDC00000	.data.R	
	.bss	Import
	.stack.bss	import
	·	Export

Figure 4-19. Setting in the subproject PE0



Settings in the subproject PE1:

Address	Section	Add
0x00012000	.const	Modify
	.INIT_DSEC.const	1100my
	.INIT_BSEC.const	New Overlay
	.text.cmn	Remove
	.text	Line David
	data	Up Down
0xFDA00000	.data.R	
	.bss	
	.stack.bss	Import
		Export

Figure 4-20. Setting in the subproject PE1

Settings in the subproject PE2:

Address	Section	Add
0x00804000	.const	Modify
	.INIT_DSEC.const	
	.INIT_BSEC.const	New Overlay
	.text.cmn	Remove
	.text	Line Davie
	.data	Up Down
0xFD800000	.data.R	
	.bss	
	.stack.bss	Import
		Export

Figure 4-21. Setting in the subproject PE2



Settings in the subproject PE3:

Address	Section	Add
0x00806000	.const	Modify
	.INIT_DSEC.const	Moully
	.INIT_BSEC.const	New Overlay
	.text.cmn	Remove
	.text	Up Dowr
	.data	Up Dowr
0xFD600000	.data.R	
	.bss	
	.stack.bss	Import
		Export

Figure 4-22. Setting in the subproject PE3

(2) [Property] panel from [CC-RH (Build Tool)] → [Link Options] tab → [Section] → [(For multi-core) Section that outputs external defined symbols to the file]

Settings in the main project u2a16_startup:

Text Edit	×
Text:	
1	^
	\sim
<	>
OK Cancel	Help

Figure 4-23. Setting in the main project u2a16_startup



Settings in the subproject PE0:

×
^



Settings in the subproject PE1: Settings in the subproject PE3: Text Edit X Text:

Figure 4-25. Setting in the subproject PE1/PE2/PE3



(3) [Property] panel from [CC-RH (Build Tool)] → [I/O Header File Generation Options] tab → [I/O Header File] → [Update I/O header file on build]

Settings in all projects including main project and all subprojects:

	Property r_cg_main.c	+ x	
~	CC-RH Property	a 👂 – +	
v_I/O header file			
	Update I/O header file on build	Yes(Checking the device file)	
	Device file on generating I/O header file	DR7F702300A.DVF, V1.20	
	Current device file	DR7F702300A.DVF, V1.20	
	Select modules which are output in files	No	
	Output definitions regarding µITRON	No	
	Enable MISRA-C option	No	
	Enable module array option	No	
	Enable IOR array option	No	
	Share definition of structure	Yes	
	Output pragma directives for peripheral groups	No	
>	Others	¥	
Sel	date I/O header file on build ects whether to update the I/O header file on build. dates the I/O header file if the device file is newer	than the device file when the I/O header file was generated or the property related to I/O header file g	
0	common Options 🖌 Compile Options 🖌 Assen	ibleOptions \bigwedge Link Options \bigwedge Hex Output Options \bigwedge I/O Header File Generation Opti $/$ $ eq$	

Figure 4-26. Setting in the main project and subproject PE0/PE1/PE2/PE3



5. Operations in the Smart Configurator

This section gives an overview of setting the drivers of peripheral modules of the device and handling of the Smart Configurator for the generation of code.

For details, refer to Smart Configurator User's Guide: CS+ (R20AN0516).

5.1 Setting the Peripheral Modules (Software Components)

(1) Configure the clocks of the device on the [Clocks] tab page.

K Smart Configurator		- 0	×
File Window Help			
		12	£
∰ PE0.scfg ⊠			
Clocks configuration		1	
		Generate Code Generate Repo	ort
Prequency 200 (MHz)	×1/20	+	
Stop request in stand-by Mode Stop operation *		TAUJ Clock(CLKA_TAUJ) 10.0 NHz	
40			
		wDTRn Cleck(CLK_WDT) x1/22 * 312.5 kHz	
		LPS Clock(CLKA_LPS) 10.0 MHz	
LS IntOSC Preguency 240 (KHz)	_	wDTBA Clock(CLKA_WDT) x1/128 * 1.875 kHz	
MainOSC		RUN Clock/CLK_RUN)	
Oscillation source OSC mode *		RS-CANED(v4) Clock(CLK_RCANOSC)	
Frequency 40 v (MHz)	 • 	x1 * 40.0 MHz	
Stop request in stand-by Mode Stop operation *	CLK_UHSB	40.0 MHz	
Please set the option byte		MSPI Clock(CLK_MSPI)	
	CUCHSB	20.0 MHz	
		ADCIn Clock(CLK,ADC)	
PLL Stop request in stand-by Mode Stop negration	CLK_LSB	x1/2 * 5.0 MHz	
Stop request in stand-by Mode Stop operation	CLK_CPU	CPU Clock(CLK_CPU) 100.0 MHz	
I I I		SBUS Clock(CLK_SBUS)	
OPRT11.CKDIVMD 11	CLK_SBUS	50.0 MHz HBUS Clock(CLK, HBUS)	
	CIK,HBUS	25.0 MHz	
		N	Ψ
Overview Boa d Clocks S stem Components Pins Interrupt			
🕒 Console 🛛 🔝 Configuration Problems		r 🖸 🕶 📑 🕶 🖓	
No consoles to display at this time.			

Figure 5-1. Configure clock



(2) Add or set the peripheral modules of the device on the [Components] tab page. The peripheral modules are set as software components. Click on the [Add component] icon.

🐼 Smart Configurator		– 🗆 ×	(
File Window Help			
		📑 🖬	8
👼 *PE0.scfg 🛙		- [
Software component configuration	🛐 Generate Code	Generate Repor	t
Components 🎼 🚍 🖛 Configure			^
type filter text			~
		>	
Overview Board Clocks System Components Pins Interrupt			
📮 Console 🛱 🅵 Configuration Problems	🗟 🛃 🖻 📑 🖬	⊇ - 📬 - 🗆 (
Smart Configurator Output			

Figure 5-2. Add modules



(3) Select components on the [Software Component Selection] page of the [New Component] dialog box.
 Select each component to be used from the list and click on the [Next] button.
 Example [Interval Timer] is selected in this guide.

ategory	All			
unction	All			
ilter				
Compon	ents	Version		^
🖶 Input	Pulse Interval Measurement	1.2.0		
🖶 Input	Signal Width Judgment	1.2.0		
🖶 Input	Signal Width Measurement	1.2.0		
H Interr	upt Controller	1.1.0		
lnterv	al Timer	1.2.0		- 1
H MSPI	Master	1.0.1		
HSPI 🖶	Slave	1.0.2		
🖶 One-F	Pulse Output	1.2.0		
🖶 One-S	Shot Pulse Output	1.2.0		
😐 ос т:.		110		~
escriptio The Inter an interru	nly latest version on val Timer Function is timer that g upt is generated, resulting in a s general settings		ot at regular intervals.Whe	en A

Figure 5-3. Select components



(4) Select the configuration name and resource of the selected component. On the [Add new configuration for selected component] page of the [New Component] dialog box, enter an appropriate configuration name or use the default name. Select the resource or use the default resource. After you have made the selections, click on the [Finish] button.

🚺 New Component — 🗆 🔿				×
Add new configuration	for selected component			-
Interval Timer				^
Configuration name:	Config_TAUD0_0			
Resource:	TAUDO_0 V		~	
?	< Back Next > Finish		Cancel	

Figure 5-4. Input Configuration name and select Resource

(5) Set the configuration of the component. Click on the configuration icon in the Component Tree panel and make detailed settings in the right-hand panel.

🕼 Smart Configurator				- 0	×
File Window Help					
📑 🗁 🔡					😫 💰
∰ *PE0.scfg ⊠					
Software component configur	ation	G	enerate Code	Generate	Report
Components ↓ª □ 🕀 井 🕶	Configure				
type filter text ✓ ➢ Drivers ✓ ➢ Stand-By Controller ➢ Config_STBC ✓ ➢ Timers ✓ Config_TAUD0_0	Clock setting Operation clock Clock source Interval timer setting Interval time Generates INITAUD010 whe Interrupt setting ☑ Enable TAUD0 CH0 interrup Priority	Baud rate 1 µs V (Actual value		alue: 0.61()352kH :)
Overview Board Clocks System Comp Console 23 Configuration Proble			<u>.</u>	2 + <u>1</u>	>
Smart Configurator Output					

Figure 5-5. Set component configuration



(6) Repeat steps (2) to (5) for each component that you intend to use.

In this sample project, Stand-by Controller component must be added for providing the module standby mode cancelling function.

RH850/U2A supports Module Standby Mode. After the reset is released, all peripherals enter module standby modes. Register access to the module in module standby mode is prohibited. So before using any modules, module standby mode should be cancelled in advance.

For RH850/U2A Stand-by Controller component, all module standby mode set and cancel functions are always generated and there is no need to configure UI.

Smart Configurator							- 🗆 X
File Window Help							
							i 💼 i 📓
∰ *PE0.scfg ⊠							
Software component configuration	on					Gen	erate Code Generate Report
Components $\mu_2^a = \oplus \oplus \bullet$ Co	nfigure						^
type filter text	Deale setting						
V 🕞 Drivers 🔥	Chip standby mode set	ting					
· ·	STOP mode			O DeepSTOP mode			
Config_STBC	Wake-up factor 0 settin	ng .					
Config TAUD0 0	Port TNMI	INTP0	□ INTP1	INTP2	INTP3	□INTP4	
Comig_1A020_0	INTP6		INTP8	INTP2			
	INTP13	INTP14	INTP15	INTP16	INTP17	INTP18	INTP19
	INTP20	INTP21	INTP22	INTP23	INTP24	INTP25	INTP26
	INTP27	INTP28	INTP29	INTP30	INTP31	INTP32	INTP33
	INTP34	INTP35	INTP36	INTP37	INTP38	INTP39	
	INTWDTBA Low-Power Sample WUTRG0 JTAG INTDCUTDI		stand-by fued, can use				
	Timer Array Unit J2	INTTAUJ211	INTTAUJ212	INTTAUJ213			
	Timer Array Unit J3	INTTAUJ311	INTTAUJ312	INTTAUJ313			
	DINTRTCA01S AD Convertor(ADCJ2)	INTRTCA0AL	INTRTCAOR				
	CANFD Interface (RS-C	INTADCJ211	INTADCJ212	INTADCJ213	INTADCJ214		
	INTRCANGRECC0	INTRCANOREC	INTRCAN1REC	INTRCAN2REC	INTRCAN3REC	INTRCAN4REC	
	INTRCAN6REC	INTRCAN7REC					0
~ .	CANED Interface (RS-C)	ANFD1)					×
Overview Board Clocks System Compone	ents Pins Interrupt						
🔄 Console 🕴 🔝 Configuration Problems						🗟 🚮	🔊 🛃 🖸 🕶 📑 🗖
Smart Configurator Output							
M05000001: Pin AJ10 is assigned to TA	4UD000						0

Figure 5-6. Add Stand-by Controller component

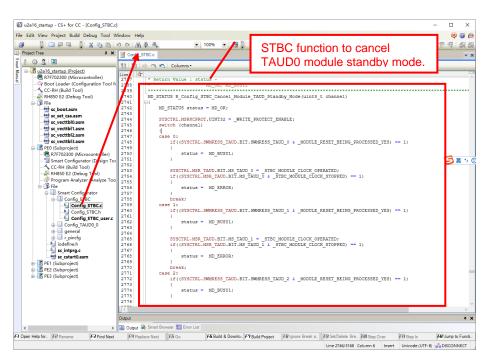


Figure 5-7. Cancel stand-by mode function for TAUD



5.2 Generating Drivers

Click on the [Code Generator] button to generate code. The source files generated by the Smart Configurator are stored in the <ProjectDir>\src\smc_gen folder.

<ProjectDir> is the folder containing the project files (.scfg) for the Smart Configurator.

🐼 Smart Configurator		- 🗆 X
File Window Help		
		🖻 📓
∰ *PE0.scfg ⊠		
Software component configuration		Generate Code Generate Report
Components	Configure	
 Drivers Stand-By Controller Config_STBC Timers Config_TAUD0_0 	Clock setting Operation clock Clock source PCLK/32768 Baud rate I Interval time I0000 µs v (Actual Generates INTTAUD010 when counting is started Interrupt setting Interrupt setting MEnable TAUD0 CH0 interrupt (INTTAUD010) Priority Lowest v	(Actual value: 0.610352kHz) value: 9830.4)
Overview Board Clocks System Components P	ns Interrupt	
E Console 🛛 🌇 Configuration Problems		▶ 🔐 🕅 🛃 🗉 ד 📑 ד
Smart Configurator Output		
HOLOGOOOD D' 1340 ' ' ' I TUDOOD		

Figure 5-8. Generating code



5.3 Adding the Code to the User Code Area

Some generated source files have a user code area for the writing of user code. Open such files in an editor from CS+ environment that you are using and add the code (e.g. code for interrupt processing) to the user code areas as necessary.

Example: File generated for the interval timer component

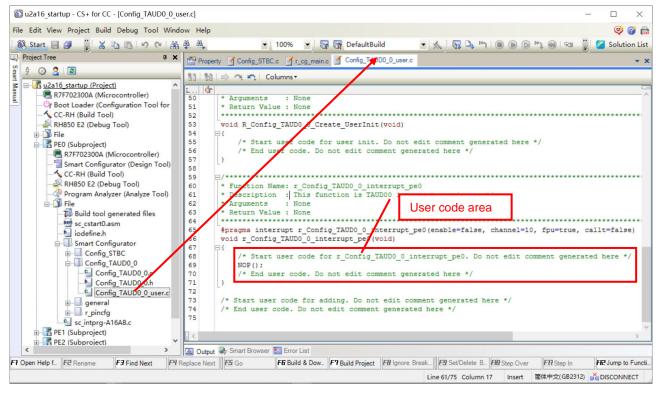


Figure 5-9. Add user code to the user code area of interrupt routine



5.4 Adding the Code to main_pm0()

The main function is in "<ProjectDir>\src\smc_gen\general\r_cg_main.c". Open the file in an editor from CS+ environment that you are using and add the code to the user code area.

NOTE: After re-generating code, please rename function main() to main_pm0(). Please refer 2.2-4 for the detail.

Example: Add code to the main_pm0() function for PE0 subproject.

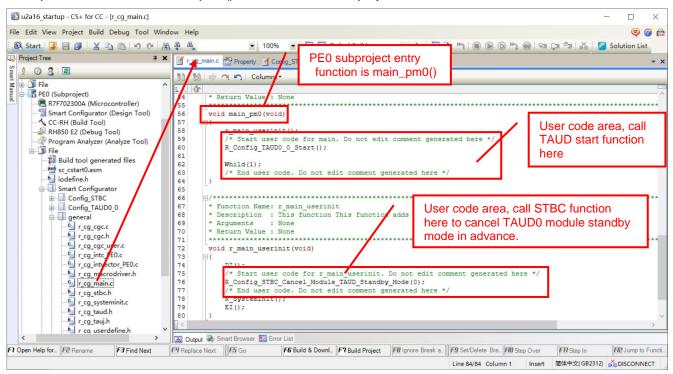


Figure 5-10. Add user code to main_pm0() function



Revision History

Rev.	Section	Description
1.00	All	New version
1.01	2. Outline of the Sample Projects	2.3 Notes on the Sample Projects: added two new notes: No.1 and No.4
1.02	Smart Configurator page	Target Device: add U2A6
	1. Overview	Table 1-1 Operating Environment:
		CS+V7.00.00 is updated to CS+ V8.08.00
	4. Description of the	4.1 Configuration of the Sample Project:
	Sample Project	Update figure:
		Figure 4-1. Common folder and Main project folder
		Figure 4-2. Subproject folder PEn(n=0~3)
		Update table:
		Table 4-2. File Configuration of the subproject (corresponding to Figure 4-2)
		4.2 Basic Operation Procedure:
		Update figure Figure 4-5. Setting the path for Smart Configurator
		Update CS+ Integrated Development Environment User's Manual version and document number in (9) Execution and debugging
		Update (4) Starting the Smart Configurator by adding c) content and relative figure Figure 4-6. RH850/U2A16 Package Selection
		4.3 Procedure for Changing the Device
		Update figure:
		Figure 4-9. Change Microcontroller
		Figure 4-11. Select device to be changed
		Figure 4-12. Remove unsupported subprojects
		Figure 4-14. Confirm microcontrollers are changed
		Figure 4-15. Link Section Settings before changing microcontroller
		Figure 4-16. Link Section Settings after changing microcontroller
		Figure 4-17. Specify the constituent of main project
		Add content about removing not supported interrupt vector table and relative figure Figure 4-13. Remove unsupported interrupt vector table in (1) Changing the
		microcontroller, c) Change subprojects microcontroller



Guide on Sample Projects for RH850/U2A devices

Rev.	Section	Description
1.02	4. Description of the	4.4 Settings in the Sample Project
	Sample Project	Update figure Figure 4-26. Setting in the main project and subproject PE0/PE1/PE2/PE3
	5. Operations in the	5.3 Adding the Code to the User Code Area
	Smart Configurator	Update figure:
		Figure 5-9. Add user code to the user code area of interrupt routine
		Figure 5-10. Add user code to main_pm0() function



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 is supplied until the 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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