

# RL78 Family

# Renesas Flash Driver RL78 Type 01 SC version (Extra Area)

## Introduction

This document explains Renesas Flash Driver RL78 Type 01 for the RL78/G2x group in the case of using Smart Configurator(SC). It is a process which builds into a user program the functions for "the extra area driver" included in RFD RL78 Type 01, and it is a method for programming extra area using the attached sample program.

In this document, "Renesas Flash Driver RL78 Type 01" is described to be "RFD RL78 Type 01" or "RFD".

This document includes the contents in comparison with conventional RFD RL78 Type 01 not using SC. This document distinguishes and expresses it.

Simple version : Conventional RFD RL78 Type 01 not using SC. SC version : RFD RL78 Type 01 using "SC" currently explained by this document.

### **Target Device**

The target device group by which the operation for RFD RL78 Type 01 was confirmed.

RL78/G22 group RL78/G23 group RL78/G24 group

If this application note is applied to other microcomputers, it is necessary to modify in accordance with the specification of the microcomputer. And, be sure to evaluate enough.



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### 1. Specification

The sample program included in RFD RL78 Type 01 reprograms 4 bytes (32 bits) of area which controls a flash shield window (FSW).

### 1.1 Operating Environment

- C Compiler Packages

#### Table 1-1 The target C Compiler Packages

Package	Manufacturer	Version
CC-RL(for CS+ or e <sup>2</sup> studio)	Renesas Electronics	V1.10 or later
IAR (Embedded Workbench)	IAR Systems	V4.21 or later
LLVM(e <sup>2</sup> studio)	Open source software	V10.0.0.202312 or later

# IAR Systems, IAR Embedded Workbench, IAR, and the logotype of IAR Systems are trademarks or registered trademarks owned by IAR Systems AB.

- Emulator

Table 1-2 shows the emulator on which the operation of RFD RL78 Type 01 was confirmed.Table 1-2 Emulator on which RFD RL78 Type 01 Operation was Confirmed

Emulator	Manufacturer
E2 emulator Lite	Renesas Electronics

Target MCU

RL78/G22

RL78/G23

RL78/G24



## 1.2 Structure of Sample Program Folders

Figure 1.1 shows the structure of sample program folders.

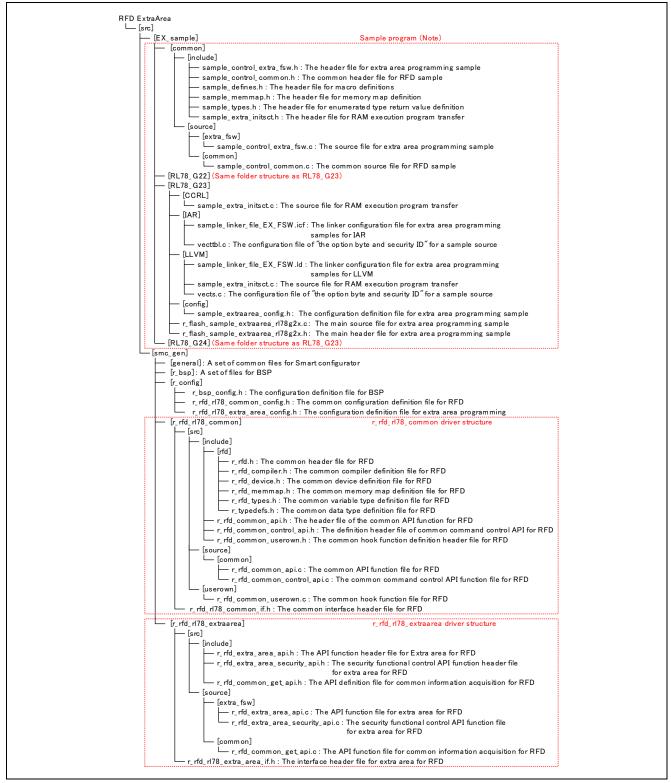


Figure 1.1 Structure of Sample Program Folders

Note: The sample program of a zip file format downloads by Smart configurator. Extract the compressed file (EX\_sample.zip) outputted to the "demo" folder, and move the [EX\_sample] folder under the [src] folder. Refer to "2.3 Project registration of sample program" for the details of project registration.



### **1.3 File Structure of RFD Driver**

#### 1.3.1 File Structure of RFD Common Driver (r\_rfd\_rl78\_common)

The difference of SC version RFD common driver and Simple version common driver is shown.Refer to the "RL78 Family Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830) " for the detail specification for the RFD common driver.

# Table 1-3 Difference of the files of the SC version RFD and the simple version RFD (Common API : r\_rfd\_rl78\_common\src\source\common)

File name	Simple version	SC version
r_rfd_common_api.c	No chang	je
r_rfd_common_control_api.c	No chang	ge

# Table 1-4 Difference of the files of the SC version RFD and the simple version RFD (Common API : r\_rfd\_rl78\_common\src\userown)

File name	Simple version	SC version
r_rfd_common_userown.c	No chang	je

# Table 1-5 Difference of the files of the SC version RFD and the simple version RFD (Common header : r\_rfd\_rl78\_common\src\include)

File name	Simple version	SC version
r_rfd_common_api.h	No chang	je
r_rfd_common_control_api.h	No chang	je
r_rfd_common_userown.h	No chang	je

# Table 1-6 Difference of the files of the SC version RFD and the simple version RFD (Common header : r\_rfd\_rl78\_common\src\include\rfd)

File name	Simple version	SC version
r_rfd.h	No chang	e
r_rfd_compiler.h	No chang	e
r_rfd_device.h	No change	
r_rfd_memmap.h	No change	
r_rfd_types.h	No change	
r_typedefs.h	No change	

# Table 1-7 Difference of the files of the SC version RFD and the simple version RFD (Common interface header : r\_rfd\_rl78\_common)

File name	Simple version	SC version
r_rfd_rl78_common_if.h	-	Newly created.
		Include the header file for common API.



#### **1.3.2** File Structure for RFD Extra Area Driver (r\_rfd\_rl78\_extraarea)

The difference of SC version RFD extra area driver and Simple version extra area driver is shown. Refer to the "RL78 Family Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830) " for the detail specification for the RFD extra area driver.

# Table 1-8 Difference of the files of the SC version RFD and the simple version RFD (Extra area API:r\_rfd\_rl78\_extraarea\src\source\extra\_fsw)

File name	Simple version	SC version
r_rfd_extra_area_api.c	No chang	je
r_rfd_extra_area_security_api.c	No chang	je

# Table 1-9 Difference of the files of the SC version RFD and the simple version RFD (Extra area API : r\_rfd\_rl78\_extraarea\src\source\common)

File name	Simple version	SC version
r_rfd_common_get_api.c	No chang	je

# Table 1-10 Difference of the files of the SC version RFD and the simple version RFD (Extra area API header : r\_rfd\_rl78\_extraarea\src\include)

File name	Simple version	SC version
r_rfd_extra_area_api.h	No chang	je
r_rfd_common_get_api.h	No chang	je
r_rfd_extra_area_security_api.h	No chang	je

# Table 1-11 Difference of the files of the SC version RFD and the simple version RFD (Extra area interface header : r\_rfd\_rl78\_extraarea)

File name	Simple version	SC version
r_rfd_rl78_extra_area_if.h	-	Newly created.
		Include the header file for extra area API.



### **1.4 Extra Area Programming Processing Using a Sample Program**

Figure 1.2 shows the flow chart of the sample program. The sample\_extraarea\_main function copies the "program executed on RAM" to RAM area from ROM area. And processing which reprograms extra area is executed on RAM.

Sample\_ExtraFSWControl function processing does not have change from Simple version. Refer to the item of "Sample\_ExtraFSWControl function" on Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830).

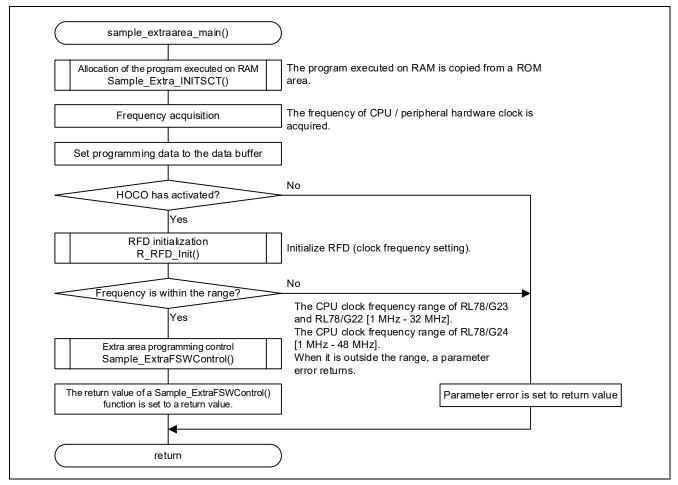


Figure 1.2 the flow chart of the sample program

- Notes: 1. In the code flash memory programming mode, the programs in the code flash memory cannot be executed. Copy the Sample\_ExtraFSWControl function and the processing to be executed and data to be referenced to inside the function to RAM in advance, and execute and reference them in RAM.
  - 2."Frequency acquisition" of CPU and peripheral hardware clock settings is using the function included in the "RL78 Family Board Support Package".



### 2. Creating a Sample Project for Extra area Reprogramming

### 2.1 Example of Creating a Sample Project

#### 2.1.1 In Case of CS+

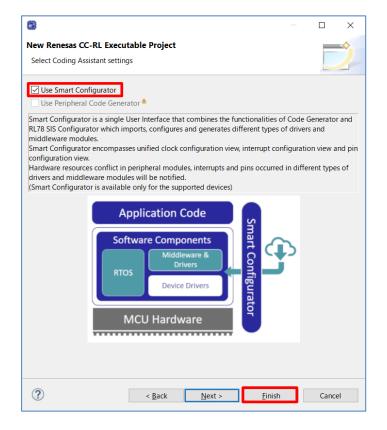
Refer to Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830) "Example of Creating a Sample Project" to create a project.

#### 2.1.2 In Case of e<sup>2</sup> studio(CC-RL)

Refer to Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830) "Example of Creating a Sample Project" to create a project.

In this application note, because smart Configurator is used, press a "Next" button after selecting a target device and a debugging tool. And perform the following processes.

Select "Use Smart Configurator" and press a "Finish" button.



#### 2.1.3 In Case of IAR EW for Renesas RL78

Refer to Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830) "Example of Creating a Sample Project" to create a project.



## 2.1.4 In Case of e<sup>2</sup> studio(LLVM)

Refer to Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830) "Example of Creating a Sample Project" to create a project.

In this application note, because smart Configurator is used, press a "Next" button after selecting a target device and a debugging tool. And perform the following processes.

Select "Use Smart Configurator" and press a "Finish" button.

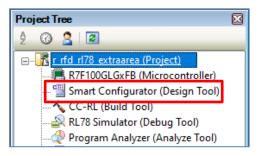
0 -		$\times$
LLVM for Renesas RL78	_	$\diamond$
Select Smart Configurator settings		4
Use Smart Configurator		
The e2 studio peripheral smart configurator automatically generates programs (device drivers) f peripheral functions (clocks, timers, serial interfaces, A/D converters, DMA controllers, etc.) base entered via a graphical user interface (GUI). Functions are provided as application programming (APIs) and are not limited to initialization of peripheral functions.	d on settir	-
Application Code		
Software Components Middleware & Drivers Device Drivers		
MCU Hardware		
< Back     Next >     Finish	Cancel	I



## 2.2 Example of Source Code Registration

#### 2.2.1 In Case of CS+

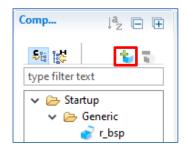
(1) Double-click "Smart Configurator" (design Tool) of "Project Tree", and start Smart Configurator.



(2) Select a "Components" tab.

Smart Configurator			]	×
File Window Help				
		1	🗈	<u>.</u>
∰ r_rfd_rl78_extraarea.scfg ⊠				æ
Overview information	Generate Code	Generate R	eport	<mark>و</mark>
- General Information		C	•	
This editor allows you to modify the settings stored in configuration file (.scfg)				
Board				
Allow board and device selection				
Clocks		ation under elopment	·	
Allow clock configuration			- 1	
Components	Device	Middlewa		
Allow software component selection and configuration	driver	RTC	s	
	1000		τ.	
Pins Allow general pin configuration and pin configuration for selected software component				
			~	
Overview Board Clocks System Components Pins Interrupt				
🖳 Console 🛛 🔄 📑 👻 🗖 🔛 🔝 Configuration Problems	s 🛛 🗌 👘	⊉ ▽		
	~		_	-
Description			Туре	
<			>	

(3)Press the "addition" button of "Components" and open the "addition" dialog of "Components".





(4) Select the following components and press a "Finish" button.

- Flash Driver[Renesas Flash Driver RL78 Type 01 Extra Area]( r\_rfd\_rl78\_t01\_extraarea)
- Flash Driver[Renesas Flash Driver RL78 Type 01 Flash Common]( r\_rfd\_rl78\_t01\_common)

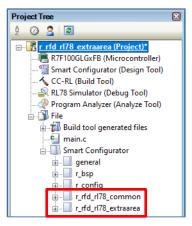
Kew Co	omponent				$\times$
Software	Component Selection			-	
Select cor	mponent from those available in list				-
Category	All				
					~
Function	All				~~
Filter					
Compon	ents	Short Name	Туре	Version	^
🖶 Flash 🛙	Driver[Renesas Flash Driver RL78 Type01 Code Flash]	r_rfd_rl78_t01_codeflash	Generic SW	1.20	
🖶 Flash [	Driver[Renesas Flash Driver RL78 Type01 Data Flash]	r_rfd_rl78_t01_dataflash	Generic SW	1.20	
🖶 Flash 🛛	Driver[Renesas Flash Driver RL78 Type01 Extra Area]	r_rfd_rl78_t01_extraarea	Generic SW	1.20	
🖶 Flash 🛛	Driver[Renesas Flash Driver RL78 Type01 Flash Commo	on] r_rfd_rl78_t01_common	Generic SW	1.20	~
Show o	only latest version				
Descriptio	on				
The anal	og to digital (A/D) converter is function for converting	g analog inputs to digital sig	inals.		^
					$\sim$
Download	RL78 Software Integration System modules				
Download	d ELCL modules				
Configure	general settings				
?	< <u>B</u> ack	<u>N</u> ext >	<u>F</u> inish	Cancel	

(5) Press a "Generate Code" button and close "Smart Configurator" after the completion of generation for the code.

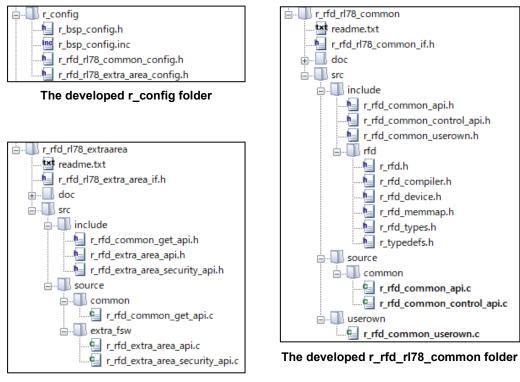
Software component configuratio	n Generate Code Generate R	eport
Components $\cong {}^{la} {}^{la}_{Z} = {}^{la}_{Z}$	Configure	i
Image: Startup       ✓ Error       ✓ Ero	Property Value There are no configurable items.	
✓ Generic	<	>
r_rfd_rl78_t01_common r_rfd_rl78_t01_extraarea	Note: r_rfd_rl78_t01_extraarea_config.h file generated to r_config folder needs to	Ŷ



(6) The "r\_rfd\_rl78\_common" folder and the "r\_rfd\_rl78\_extraarea" folder is added to the project tree.



Each folder is developed as follows



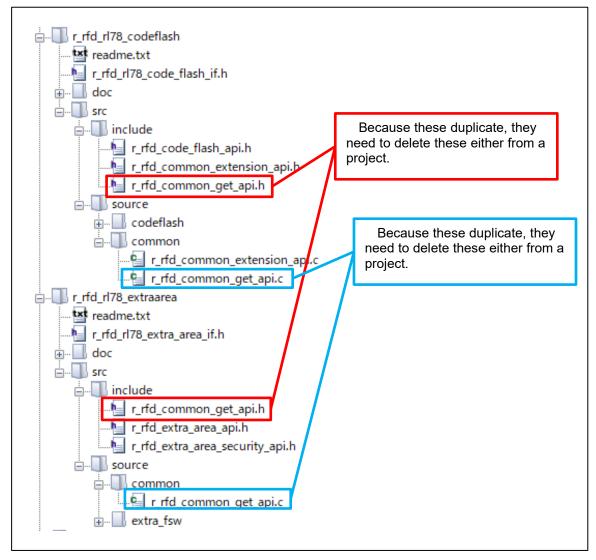
The developed r\_rfd\_rl78\_extraarea folder



2.2.1.1 Notes of case used at the same time in r\_rfd\_rl78\_codeflash and r\_rfd\_rl78\_extraarea

In the case which uses r\_rfd\_rl78\_codeflash and r\_rfd\_rl78\_extraarea at the same time, as shown in the following figure, "r\_rfd\_common\_get\_api.c" and "r\_rfd\_common\_get\_api.h" overlap.

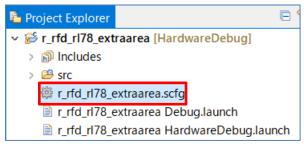
Each file needs to delete either from a project.



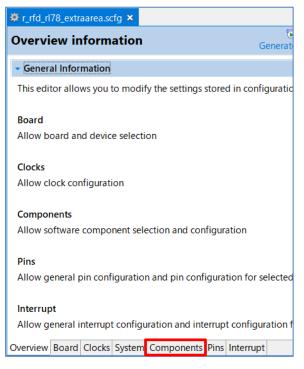


## 2.2.2 In Case of e<sup>2</sup> studio(CC-RL)

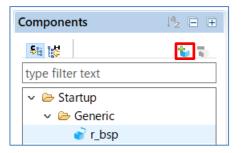
(1) Open the project file of "Smart Configurator" after starting e<sup>2</sup> studio.



(2) Select a "Components" tab.



(3) Press the "addition" button of "Components" and open the "addition" dialog of "Components".





- (4) Select the following components and press a "Finish" button.
  - Flash Driver[Renesas Flash Driver RL78 Type 01 Extra Area]( r\_rfd\_rl78\_t01\_extraarea)
  - Flash Driver[Renesas Flash Driver RL78 Type 01 Flash Common]( r\_rfd\_rl78\_t01\_common)

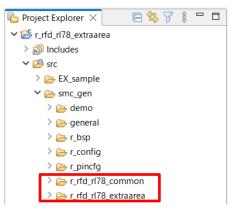
🛐 New Co	omponent					×
Software	Component Selection				4	
Select con	nponent from those available in list					
Category	All					~
Function	All					~
Filter						
Compon	ents ^	Short Name	Туре	N	ersion	^
	Driver[Renesas Flash Driver RL78 Type01 Code Flash]	r_rfd_rl78_t01_codeflash			.20	
	Driver[Renesas Flash Driver RL78 Type01 Data Flash]	r rfd rl78 t01 dataflash		1	.20	
🖶 Flash	Driver[Renesas Flash Driver RL78 Type01 Extra Area]	r_rfd_rl78_t01_extraarea	Generic SW	1	.20	
	Driver[Renesas Flash Driver RL78 Type01 Extra Area] Driver[Renesas Flash Driver RL78 Type01 Flash Common]		Generic SW Generic SW		.20 .20	~
H Flash	Driver[Renesas Flash Driver RL78 Type01 Flash Common]					~
H Flash	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version					~
Flash Show of Description	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on	r_rfd_r178_t01_common	Generic SW			~
Flash Show of Description	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version	r_rfd_r178_t01_common	Generic SW			~
Flash Show of Description	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on	r_rfd_r178_t01_common	Generic SW			•
H Flash	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an	r_rfd_r178_t01_common	Generic SW			<b>&gt;</b>
Flash  Flash  Show c  Descriptio  The analo  Download	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>4 ELCL modules</u>	r_rfd_r178_t01_common	Generic SW			<ul><li></li><li></li><li></li></ul>
Flash  Flash  Show c  Descriptio  The analo  Downloac  Downloac	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>d ELCL modules</u> <u>d RL78 Software Integration System modules</u>	r_rfd_r178_t01_common	Generic SW			▼
Flash  Flash  Show c  Descriptio  The analo  Downloac  Downloac	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>4 ELCL modules</u>	r_rfd_r178_t01_common	Generic SW			<ul> <li>✓</li> </ul>
Flash  Flash  Show c  Descriptio  The analo  Downloac  Downloac	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>d ELCL modules</u> <u>d RL78 Software Integration System modules</u>	r_rfd_r178_t01_common	Generic SW			▼ ~ ∨
Flash  Flash  Show c  Descriptio  The analo  Downloac  Downloac	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>d ELCL modules</u> <u>d RL78 Software Integration System modules</u>	r_rfd_r178_t01_common	Generic SW			×
Flash  Flash  Show c  Descriptio  The analo  Downloac  Downloac	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>d ELCL modules</u> <u>d RL78 Software Integration System modules</u>	r_rfd_r178_t01_common	Generic SW			> >

(5) Press a "Generate Code" button and generate the code.

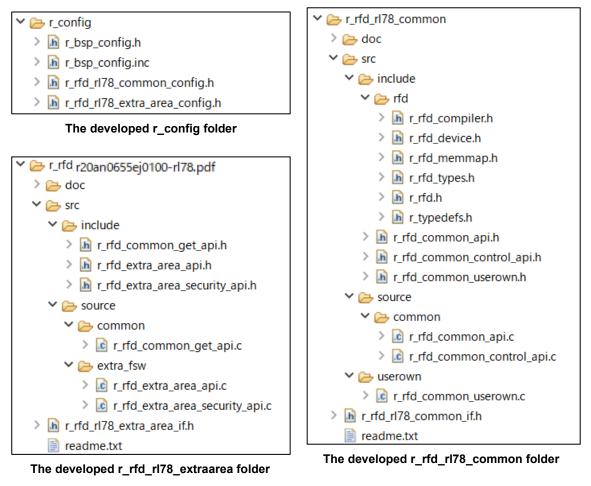
r_rfd_tl78_extraarea.scfg $ imes$			
Software component configur	ation	Generate Code	Report
Components 🛛 🚵 🛃 📮 🕀	Configure		i
Image: Startup         Image: Startup         Startup         Seneric         Image: Startup         Image: Startup	Property There are no configu	rable items.	
	r_config folder needs to configure FIT module.	config.h file generated to be modified manually to to application note in "doc"	>



(6) The "r\_rfd\_rl78\_common" folder and the "r\_rfd\_rl78\_extrarea" folder is added to the project tree.



Each folder is developed as follows.

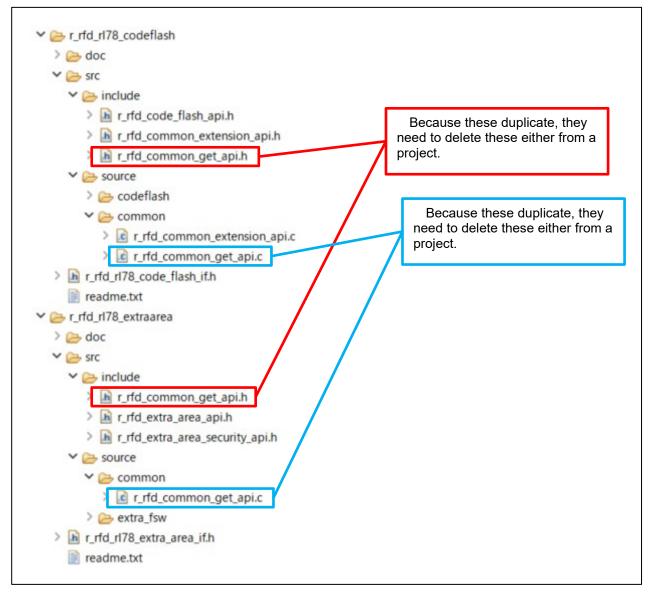




2.2.2.1 Notes of case used at the same time in r\_rfd\_rl78\_codeflash and r\_rfd\_rl78\_extraarea

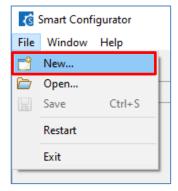
In the case which uses r\_rfd\_rl78\_codeflash and r\_rfd\_rl78\_extraarea at the same time, as shown in the following figure, "r\_rfd\_common\_get\_api.c" and "r\_rfd\_common\_get\_api.h" overlap.

Each file needs to delete either from a project.



#### 2.2.3 In Case of IAR EW for Renesas RL78

(1) Select "File" [New...] after starting Smart Configurator for RL78.



(2) Select the item of "Platform" and "Toolchain".

Select the same device as the device selected in "the project of IAR EW for Renesas RL78" by "Platform".

Select "IAR RL78 Toolchain" as "Toolchain".

Input arbitrary names into "File name".

Press the "Browse..." button and set the location of the project folder for IAR EW for Renesas RL78. And press "Finish" button.

The ".setting" folder and the "<file name>.scfg" file are created to the set location.

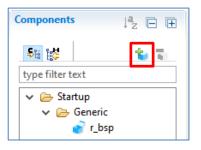
Kew Smart Configuration File		_		×
Smart Configuration Settings				
Select platform and toolchain settings	for the i	new configuration file		
Category: RL78				$\sim$
Platform:		Toolchain:		
type filter text		Renesas CCRL78 Toolchain		
✓ Device	~	🔮 IAR RL78 Toolchain		
✓ RL78/G23		e <sup>2</sup> LLVM for Renesas RL78		
<ul> <li>RL78/G23 - 30pin</li> </ul>				
R7F100GAFxSP				
R7F100GAGxSP				
R7F100GAHxSP				
R7F100GAJxSP				
<ul> <li>RL78/G23 - 32pin</li> </ul>				
R7F100GBFxFP				
R7F100GBFxNP	~			
ROM size: 96KB, RAM size: 12KB, Pin c	ount: 30			
File name: r_rfd_rl78_extraarea				
Location: C:\WorkSpace\r_rfd_rl78_e	xtraarea		Brow	
		<u> </u>	Cance	4



(3) Select a "Components" tab.

Overview information   General Information   General Information   This editor allows you to modify the settings stored in configuration file (.scfg)   Board   Allow board and device selection   Clocks   Allow clock configuration   Allow software component selection and configuration for selected software component   Pins   Allow general pin configuration and pin configuration for selected software component   Overview Board Clocks System Component Pins Interrupt						
Image: Second Secon	💰 Smart Configurator			-		х
r_rfd_rl78_extraarea.scfg %          Overview information       Generate Code Generate Report         General Information       Image: Code Generate Report         Image: Code Generate Code Generate Report       Image: Code Generate Report         Board       Allow board and device selection         Allow clock configuration       Image: Components         Allow software component selection and configuration for selected software component       Image: Code Generate Code Generate Report         Pins       Allow software component selection and configuration       Image: Code Generate Code Generate Report         Overview Board Clocks System Components       Image: Configuration Problems %       Image: Configuration Problems %         No consoles to display at this time.       Image: Configuration Problems %       Image: Configuration Problems %	File Window Help					
Overview information   General Information   General Information   This editor allows you to modify the settings stored in configuration file (scfg)   Board   Allow board and device selection   Clocks   Allow clock configuration   Components   Allow software component selection and configuration for selected software component   Pins   Allow general pin configuration and pin configuration for selected software component   Overview Board Clocks System Components Pins Interrupt   No consoles to display at this time.     O items   Description					B	
Generate Code       Generate Report         Generate Information       Image: Code Generate Report         This editor allows you to modify the settings stored in configuration file (.scfg)         Board         Allow board and device selection         Cocks         Allow clock configuration         Components         Allow software component selection and configuration for selected software component         Pins         Allow general pin configuration and pin configuration for selected software component         Overview Board Clocks System Components Pins Interrupt         No consoles to display at this time.	i r_rfd_rl78_extraarea.scfg ⋈				- 6	3 8
This editor allows you to modify the settings stored in configuration file (.scfg) Board Allow board and device selection Clocks Allow clock configuration Components Allow software component selection and configuration Pins Allow general pin configuration and pin configuration for selected software component Overview Board Clocks System Components Pins Interrupt Coverview Board Clocks Coverview Board Clocks Coverview Board Clocks System Components Pins Interrupt Coverview Board Clocks	Overview information			Generate	칠 e Report	
Board Allow board and device selection Clocks Allow clock configuration Components Allow software component selection and configuration Pins Allow general pin configuration and pin configuration for selected software component Overview Board Clocks System Components Pins Interrupt Console & Console & Configuration Problems & P C Configuration Problems & P C Configuration Problems & P C Configuration Type	- General Information				?	^
Allow board and device selection  Clocks  Allow clock configuration  Components  Allow software component selection and configuration  Pins  Allow general pin configuration and pin configuration for selected software component  Overview Board Clocks System Components Pins Interrupt  Coverview Board Clocks System Components  Coverview Board Clocks  Coverview Board Clocks	This editor allows you to modify the settings stored in configura	tion file (.scfg)				
Clocks       Application under development         Allow clock configuration       Middleware         Components       Middleware         Allow software component selection and configuration       Middleware         Pins       Allow general pin configuration and pin configuration for selected software component         Overview Board Clocks System Components Pins Interrupt       Configuration Problems S         © Console S       Image: Configuration Problems S         No consoles to display at this time.       0 items         Description       Type	Board					
Clocks   Allow clock configuration   Components   Allow software component selection and configuration     Pins   Allow general pin configuration and pin configuration for selected software component     Overview   Board   Clocks   System   Console %   Image: Selected software	Allow board and device selection					
Allow clock configuration Components Allow software component selection and configuration Pins Allow general pin configuration and pin configuration for selected software component Overview Board Clocks System Components Pins Interrupt Coverview Configuration Problems Coverview Covervi	Clocks					
Components       Middleware         Allow software component selection and configuration       Pervice         Pins       Allow general pin configuration and pin configuration for selected software component         Overview       Board       Clocks         System       Components       Pins         Overview       Board       Clocks       System         © Console       Console size       Configuration       Problems         © items       Description       Type	Allow clock configuration		dev	reiopmen	τ	
Components         Allow software component selection and configuration         Pins         Allow general pin configuration and pin configuration for selected software component         Overview Board Clocks System Components Pins Interrupt         © Console 🕸       Image: Configuration Problems 🕸         No consoles to display at this time.       Image: Configuration Type	,			Middle	ware	
Allow software component selection and configuration Pins Allow general pin configuration and pin configuration for selected software component Overview Board Clocks System Components Pins Interrupt Console & Console	Components		Device			
Allow general pin configuration and pin configuration for selected software component          Overview       Board       Clocks       System       Components       Pins       Interrupt         Image: Console to display at this time.				R	RTOS	
Allow general pin configuration and pin configuration for selected software component          Overview       Board       Clocks       System       Components       Pins       Interrupt         Image: Console to display at this time.			m	min	m	
Overview     Board     Clocks     System     Components     Pins     Interrupt       Image: Console to display at this time.     Image: Configuration Problems to display at this time.     Image: Configuration Problems to display at this time.     Image: Configuration Problems to display at this time.       Image: Console to display at this time.     Image: Configuration Problems to display at this time.     Image: Configuration Problems to display at this time.     Image: Configuration Problems to display at this time.	Pins					
Overview       Board       Clocks       System       Components       Pins       Interrupt         Image: Console to display at this time.       Image: Configuration Problems to display at this time.         Image: Console to display at this time.       Image: Configuration Problems to display at this time.       Image: Configuration Problems to display at this time.       Image: Configuration Problems to display at this time.         Image: Console to display at this time.       Image: Configuration Problems to display at this time.       Image: Configuration Problems to display at this time.       Image: Configuration Problems to display at this time.         Image: Console to display at this time.       Image: Configuration Problems to display at this time.       Image: Configuration Problems to display at this time.         Image: Console to display at this time.       Image: Configuration Problems to display at this time.       Image: Configuration Problems to display at this time.         Image: Console to display at this time.       Image: Configuration Problems to display at this time.       Image: Configuration Problems to display at this time.         Image: Console to display at this time.       Image: Configuration Problems to display at this time.       Image: Configuration Problems to display at this time.         Image: Console to display at this timage: Console to displ	Allow general pin configuration and pin configuration for select	ed software component				
No consoles to display at this time.  0 items Description Type	Overview Board Clocks System Components Pins Interrupt					<u> </u>
Description Type		Sconfiguration Problems	22		7 <sup>-</sup> E	3
Description Type	No consoles to display at this time.					
		Description			Туре	
< >>						
		<				>

(4) Press the "addition" button of "Components" and open the "addition" dialog of "Components".





(5) Select the following components and press a "Finish" button.

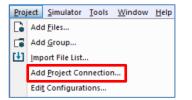
- Flash Driver[Renesas Flash Driver RL78 Type 01 Extra Area]( r\_rfd\_rl78\_t01\_extraarea)
- Flash Driver[Renesas Flash Driver RL78 Type 01 Flash Common]( r\_rfd\_rl78\_t01\_common)

Kew Co	omponent				×	
Software Component Selection						
Select cor	nponent from those available in list				-	
Category	All				$\sim$	
Function	All				$\sim$	
Filter						
Compon	ents	Short Name	Туре	Version	^	
H Flash [	Driver[Renesas Flash Driver RL78 Type01 Code Flash]	r_rfd_rl78_t01_codeflash	Generic SW	1.20		
🕀 Flash [	Driver[Renesas Flash Driver RL78 Type01 Data Flash]	r rfd rl78 t01 dataflash	Generic SW	1.20		
🖶 Flash [	Driver[Renesas Flash Driver RL78 Type01 Extra Area]	r_rfd_rl78_t01_extraarea	Generic SW	1.20		
🖶 Flash [	Driver[Renesas Flash Driver RL78 Type01 Flash Common]	r_rfd_rl78_t01_common	Generic SW	1.20	~	
Show o	only latest version					
Descriptio	n					
The anal	og to digital (A/D) converter is function for converting a	nalog inputs to digital sig	nals.		^	
Download	RL78 Software Integration System modules					
	I ELCL modules					
	general settings					
configure	general settings					
?	< <u>B</u> ack	<u>N</u> ext >	<u>F</u> inish	Cancel		

(6) Press a "Generate Code" button and close "Smart Configurator" after the completion of generation for the code.

Software component configura	tion	🔋 Generate Code	ienerate Report
Components $\ge {\bf u} \downarrow_2^a = {\bf t}$	Configure		(1)
Image: Startup       ✓ Startup       ✓ Seneric       ✓ Cosp	Property There are no configurable items.	Value	
<ul> <li>✓ Se Middleware</li> <li>✓ Se Generic</li> <li>Se r_rfd_r178_t01_common</li> <li>Se r_rfd_r178_t01_extraarea</li> </ul>	< Note: r_rfd_r178_t01_extraarea_config.h file generated t	o r_config folder nee	eds to be
Overview Board Clocks System Componen	ts Pins Interrupt		

(7) Start IAR EW for Renesas RL78. And select "Project" menu [Add Project Connection], and open the additional dialog of Project Connection.





(8)Select "IAR Project Connection", and press an "OK" button.

Add Project Con	nection	×
Connect using:	IAR Project Connection	~
	ОК	Cancel

(9) Select the icpf file created by Smart Configurator and press an "Open" button.

🔮 Select IAR Proje	ect Cor	nnection File					×
$\leftarrow \  \  \rightarrow \  \   \checkmark \  \   \uparrow$	~~	Windows (C:) > Work	Space > r_rfd_rl78_extraarea	· •	Ō	, ○ Search r	_rfd_rl78_extraarea
Organize 🔻	New fo	older					=
💻 This PC	^	Name	^	Date modified		Туре	Size
🧊 3D Objects	5	.settings		3/20/2023 5:37 PM	Л	File folder	
📃 Desktop		Debug		3/20/2023 5:36 PM	Л	File folder	
Document:	s	settings		3/20/2023 5:37 PM	N	File folder	
Downloads	<u>،</u>	src		3/20/2023 5:37 PM	Л	File folder	
Music		trash	-	3/20/2023 5:37 PM	Л	File folder	
_		📋 buildinfo.ipcf		3/20/2023 5:37 PM	Л	IPCF File	16 KB
Pictures							
📔 Videos							
🔛 Windows (	(C:) ~	<					>
	File	e <u>n</u> ame:			~	IAR Project Co	onnection File (*.ipe 🕤
						<u>O</u> pen	Cancel



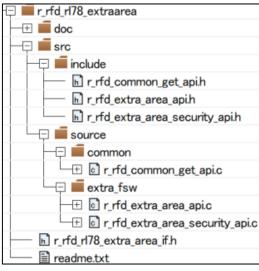
(10) "r\_rfd\_rl78\_common" and "r\_rfd\_rl78\_extraarea" are added to Workspace.

Workspace	
Debug	
Files	
🖻 🌒 r_rfd_rl78_extraarea - Debug	
🗕 🖵 🖬 Renesas_SC	
🔰 🖵 🗐 smc_gen	
🕀 🗐 general	
- 🕀 🛋 r_bsp	
⊞ 🖬 r_config	
- 🕀 🔳 r_rfd_rl78_common	

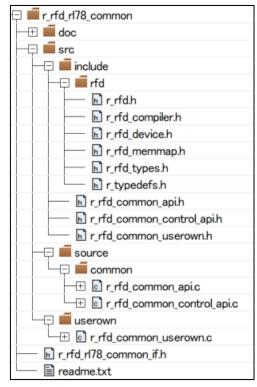
Each folder is developed as follows.

🗇 📕 r_config	
h r_bsp_config.h	
r_bsp_config.inc	
🖻 r_rfd_rl78_common_config.h	
└── ┣ r_rfd_rl78_extra_area_config.h	

The developed r\_config folder



The developed r\_rfd\_rl78\_extraarea folder



The developed r\_rfd\_rl78\_common folder



2.2.3.1 Notes of case used at the same time in r\_rfd\_rl78\_codeflash and r\_rfd\_rl78\_extraarea

In the case which uses r\_rfd\_rl78\_codeflash and r\_rfd\_rl78\_extraarea at the same time, as shown in the following figure, "r\_rfd\_common\_get\_api.c" and "r\_rfd\_common\_get\_api.h" overlap.

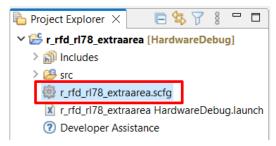
Each file needs to delete either from a project.

Image: Ind_common_get_api.nd       Image: Ind_common_get_api.nd         Image: Imag	Because these duplicate, they need to delete these either from a project. Because these duplicate, they need to delete these either from a project.

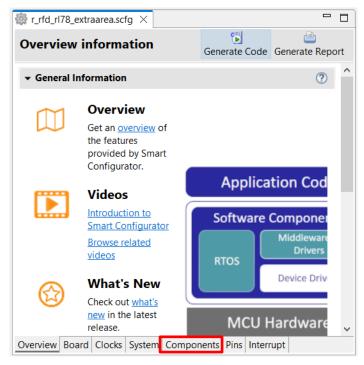


### 2.2.4 In Case of e<sup>2</sup> studio(LLVM)

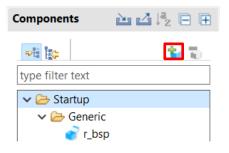
(1) Open the project file of "Smart Configurator" after starting e<sup>2</sup> studio.



(2) Select a "Components" tab.



(3) Press the "addition" button of "Components" and open the "addition" dialog of "Components".





- (4) Select the following components and press a "Finish" button.
  - Flash Driver[Renesas Flash Driver RL78 Type 01 Extra Area]( r\_rfd\_rl78\_t01\_extraarea)
  - Flash Driver[Renesas Flash Driver RL78 Type 01 Flash Common]( r\_rfd\_rl78\_t01\_common)

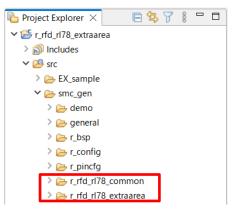
inew Co	omponent					×
Software	Component Selection					
Select cor	nponent from those available in list				T	
Category	All					~
Function	All					~
Filter						
Compon	ents	Short Name	Туре	Ve	ersion	^
H Flash	Driver[Renesas Flash Driver RL78 Type01 Code Flash]	r_rfd_rl78_t01_codeflash	Generic SW	1.	20	
H Flash	Driver[Renesas Elash Driver RL78 Type01 Data Elash]	r rfd rl78 t01 dataflash	Generic SW	1.	20	
I Flach	Driver[Renesas Flash Driver RL78 Type01 Extra Area]	r_rfd_rl78_t01_extraarea	Generic SW	1.	20	
	Driver[Renesas Flash Driver RL78 Type01 Flash Common]	r_rfd_rl78_t01_common	Generic SW	1.	20	~
🖶 Flash	Driver[Renesas Flash Driver RL78 Type01 Flash Common]	r_rfd_rl78_t01_common	Generic SW	1.	20	~
Flash	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version	r_rfd_rl78_t01_common	Generic SW	1.	20	~
Flash Show of Description	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on			1.	20	~
Flash Show of Description	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version			1.	20	<ul><li></li><li></li><li></li></ul>
Flash Show of Description	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on			1.	20	▼
Flash Show of Description	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on			1.	20	<ul><li></li><li></li><li></li><li></li><!--</td--></ul>
Flash Show of Description The anal	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on			1.	20	<ul><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li><li></li></ul>
Flash Flash Show o Descriptio The anal Download	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an			1.	20	<ul><li>✓</li></ul>
Flash Flash Show o Description The anal Download Download	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>4 ELCL modules</u>			1.	20	<ul><li>✓</li></ul>
Flash Flash Show o Description The anal Download Download	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>d ELCL modules</u> <u>d RL78 Software Integration System modules</u>			1.	20	▼
Flash Flash Show o Description The anal Download Download	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>d ELCL modules</u> <u>d RL78 Software Integration System modules</u>			1.	20	▼ < >
Flash Flash Show o Description The anal Download Download	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>d ELCL modules</u> <u>d RL78 Software Integration System modules</u>			1.	20	▼ ~ ~
Flash Flash Show o Description The anal Download Download	Driver[Renesas Flash Driver RL78 Type01 Flash Common] only latest version on og to digital (A/D) converter is function for converting an <u>d ELCL modules</u> <u>d RL78 Software Integration System modules</u>			1.	20	<ul> <li>✓</li> </ul>

(5) Press a "Generate Code" button and generate the code.

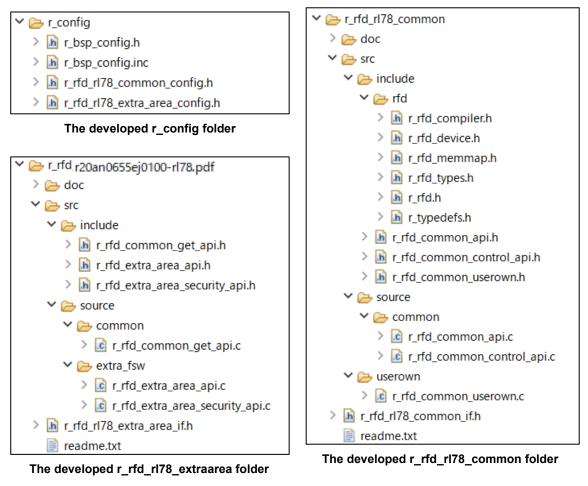
💮 r_rfd_rl78_extraarea.scfg 🗙	
Software component configuration	Generate Code Generate Report
Components 🛛 🚵 🛃 📮 🕀	Configure (1)
type filter text         Startup         Generic         r_bsp         Middleware         Generic         r_rfd_rl78_t01_common         r_rfd_rl78_t01_extraarea	Property There are no configurat
	There are no configurable items.
Overview Board Clocks System Component	ents Pins Interrupt



(6) The "r\_rfd\_rl78\_common" folder and the "r\_rfd\_rl78\_extrarea" folder is added to the project tree.



Each folder is developed as follows.

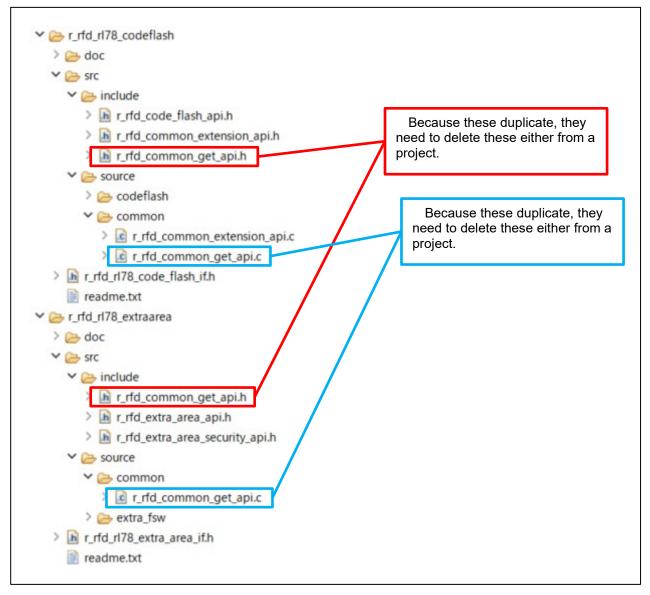




2.2.4.1 Notes of case used at the same time in r\_rfd\_rl78\_codeflash and r\_rfd\_rl78\_extraarea

In the case which uses r\_rfd\_rl78\_codeflash and r\_rfd\_rl78\_extraarea at the same time, as shown in the following figure, "r\_rfd\_common\_get\_api.c" and "r\_rfd\_common\_get\_api.h" overlap.

Each file needs to delete either from a project.



#### 2.3 Project registration of sample program

(1) Extract "EX\_sample.zip."

The folder of the device name generated after extracting leaves only the folder of a target device. Delete the folders of other device names. For example, when using the RL78/G23, leave only the "RL78\_G23" folder, and delete the untargeted "RL78\_G24" and other folders together.

The common file duplicates in the case which uses it at the same time with the sample program of a code flash or a data flash area. Extract to overwrite both as the same folder name.

(2) Register the folder of the sample program into the project of CS+, e<sup>2</sup> studio, or IAR.

\* Files included in the folder other than the compiler package used, do not need to be registered.

(3)Setting the section items

(3-1) Setting of the section items on CS+

Setting of the section Items on CS+ inputs in the "Link Options" tab. (Common in each area)

- Setting the [Section] items

Set "No" to [Layout sections automatically]. And sections come to be displayed on [Section start address]. Press the " .... " button of the right-hand side which sections are displaying, and a "Section Settings" screen is displayed.

$\geq$	Device	
>	Output Code	
>	List	
>	Variables/functions information	
~	Section	
	Layout sections automatically	No
	Section start address	const, text, RLIB, SLIB, textf, constf, dati
>	Section that outputs external defined symbols to the file	Section that outputs external defined symbols to the file
>	ROM to RAM mapped section	ROM to RAM mapped section[2]
>	Verify	
>	Message	

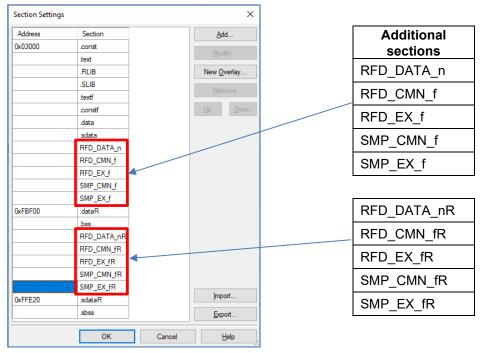
Note: Read the folder name ("RL78\_G23") of the sample for RL78/G23 as the folder name of a target device.

The folder name in the case of using RL78/G24: "RL78\_G24"



Add sections necessary for extra area(FSW) reprogramming on a "Section Settings" screen.

Add to the program area : RFD\_DATA\_n, RFD\_CMN\_f, RFD\_EX\_f, SMP\_CMN\_f, SMP\_EX\_f Add to the RAM area : RFD\_DATA\_nR, RFD\_CMN\_fR, RFD\_EX\_fR, SMP\_CMN\_fR, SMP\_EX\_fR



Note: About setting of the sample project in the case of using each device, refer to the "Setting related to changing devices" section of the "Creating a Sample Project for RFD RL78 Type 01" chapter after "RL78 Family Renesas Flash Driver RL78 Type 01 User's Manual(R20UT4830)" Rev.1.20 or later.

Be sure to return [Layout sections automatically] to "Yes", after pressing the "OK" button.



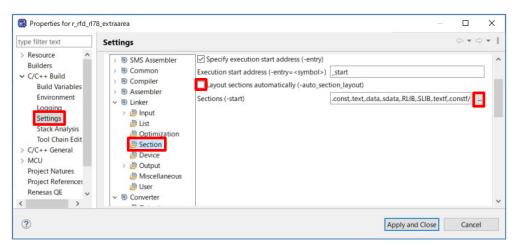
Press the right-hand side " .... " button by [ROM to RAM mapped section], display the "Text Edit" screen, and add the section for copying to RAM from ROM.

Text Edit			ROM to RAM mapped section
<u>T</u> ext:			.data=.dataR
.data=.dataR sdata=.sdataR			.sdata=.sdataR
RFD_DATA_n=RFD_DATA_nR RFD_CMN_f=RFD_CMN_fR RFD_EX_f=RFD_EX_fR			RFD_DATA_n=RFD_DATA_nR
			RFD_CMN_f=RFD_CMN_fR
SMP_CMN_f=SMP_CMN_fR SMP_EX_f=SMP_EX_fR			RFD_EX_f=RFD_EX_fR
			SMP_CMN_f=SMP_CMN_fR
		1	SMP_EX_f=SMP_EX_fR

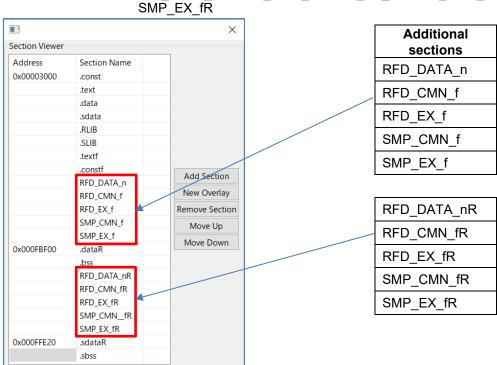


(3-2) Setting of the section items on  $e^2$  studio(CC-RL)

On e<sup>2</sup> studio(CC-RL), sections are set on a "Section Viewer" screen.



Add to the program area : RFD\_DATA\_n, RFD\_CMN\_f, RFD\_EX\_f, SMP\_CMN\_f, SMP\_EX\_f Add to the RAM area : RFD\_DATA\_nR, RFD\_CMN\_fR, RFD\_EX\_fR, SMP\_CMN\_fR,



Note: About setting of the sample project in the case of using each device, refer to the "Setting related to changing devices" section of the "Creating a Sample Project for RFD RL78 Type 01" chapter after "RL78 Family Renesas Flash Driver RL78 Type 01 User's Manual(R20UT4830)" Rev.1.20 or later.

Be sure to put a check mark to [Layout sections automatically (-auto\_section\_layout)], then press the "OK" button.

Specify execution start address (-entry)					
Execution start address (-entry= <symbol>)</symbol>	_start				
Layout sections automatically (-auto_section_layout)					
Sections (-start)	.const,.text,.data,.sdata,.RLIB,.SLIB,.textf,				

Select "C/C++ Build" [Setting] - "Linker" [Section], display the "ROM to RAM mapped section (-rom)" screen, and add the section for copying to RAM from ROM.

ROM to RAM mapped section (	-rom)	ROM to RAM mapped section
.data=.dataR .sdata=.sdataR RFD_DATA_n=RFD_DATA_nR RFD_CMN_f=RFD_CMN_fR RFD_EX_f=RFD_EX_fR		.data=.dataR
		.sdata=.sdataR
		RFD_DATA_n=RFD_DATA_nR
SMP_CMN_f=SMP_CMN_fR	SMP_CMN_fR	RFD_CMN_f=RFD_CMN_fR
SMP_EX_f=SMP_EX_fR	J	RFD_EX_f=RFD_EX_fR
		SMP_CMN_f=SMP_CMN_fR
		SMP_EX_f=SMP_EX_fR



(3-3) Setting of the section items on IAR EW for Renesas RL78

On IAR Embedded Workbench, Linker configuration file (\*. icf) describes link setting executed by building. Select "Options" by the click right mouse button of project with tree. Select [Linker] by "Category" in the displayed window, And put a check mark to "Override default" of the [Config] tab. Select Linker configuration file (\*. icf) in the "Open" window of " ... " button. Select the "sample\_linker\_file\_(area name).icf" file prepared for RFD RL78 Type 01. Linker configuration file (\*. icf) for every reprogramming area is as follows.

- For extra area reprogramming : sample\_linker\_file\_EX\_FSW.icf

RL78/G23:(\EX\_sample\RL78\_G23\IAR\)

Options for node "r_rfd_r178_	_extraarea"						×
Category: General Options Static Analysis C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger	Linker co	Diagnostic Library Inpu onfiguration fil ride default WorkSpace¥r_	it Op	hecksum timizations xtraarea¥src¥	Encodings Advanced ÆX_sample¥RL	Extra Output	y Settings Options List
COM Port						× /	
	RL78_G23 → IAR		ٽ ~	, Search	IAR		
Organize 🔻 New fol	lder					?	
<ul> <li>➡ Downloads ^</li> <li>Music</li> <li>➡ Pictures</li> <li>➡ Videos</li> </ul>	Name	r_file_EX_FSW.icf		Date modified 3/15/2021 2:14 P	Type M ICF File		
Windows (C:) V	< name: sample_link	er_file_EX_FSW.icf	~	Icf Files (*.icf) Open	Cancel	< <	

- \* On the case used at the same time with code flash area or data flash area, it is necessary to modify the icf file suitable for the sample program for the area used.
- Note: About setting of the sample project in the case of using each device, refer to the "Setting related to changing devices" section of the "Creating a Sample Project for RFD RL78 Type 01" chapter after "RL78 Family Renesas Flash Driver RL78 Type 01 User's Manual(R20UT4830)" Rev.1.20 or later.



Set the items of [General Options] - [Target] tab in the "Options" screen. Select the target device for [Device] and "Far" for [Code model].

Options for node "r_rfd_rl78_extra	aarea"				×
Category: General Options Static Analysis C/C++ Compiler Assembler Output Converter Custom Build Build Actions Linker Debugger COM Port E1 E2 E20 E2 Lite / E2 On-board EZ-CUBE EZ-CUBE Simulator TK	Library Options 2 Target Outpu Device RL78 - R7F100GLG Code model Far Data model Near Near constant locati Qverride default a Mirror ROM 0	e library calls		ouble':	×
			ОК	Cancel	



(3-4) Setting of the section items on e<sup>2</sup> studio(LLVM)

On e<sup>2</sup> studio (LLVM), Linker script (\*. ld) describes link setting executed by building. Select the [Property] in a project, and open a Properties window. Input the linker script directory path in the window displayed by selection of "C/C++" build [Setting] - "Linker" [Source].

That linker script path to add is shown below.

{workspace\_loc:/{ProjName}/src/EX\_sample/RL78\_G23/LLVM/sample\_linker\_file\_EX\_FSW.ld}

Properties for r_rfd_rl78_extra	aarea			— 🗆	×
type filter text	Settings			⇐>	<b>▼</b> 8
<ul> <li>&gt; Resource Builders</li> <li>&gt; C/C++ Build Build Variables Environment Logging Settings Tool Chain Editor</li> <li>&gt; C/C++ General Project Natures Project References Refactoring History Renesas QE Run/Debug Settings</li> </ul>	Configuration: HardwareDo Tool Settings Toolcha CPU CPU CPU CPU CPU CPU CPU CPU	ain 😵 Device 🎤 Build Steps 🥊 Entry point: -WI,-e_PowerON_Re Linker script	Build Artifact Build Artifact set set src/EX_sample/RL78_G23/LLVM/sample_	🗐 🗐 🗟 🖏 🖓	
?			Ар	ply and Close Cancel	

\* It is an example of the include path in the case which extracted EX\_sample.zip directly under the src folder.

Note: About setting of the sample project in the case of using each device, refer to the "Setting related to changing devices" section of the "Creating a Sample Project for RFD RL78 Type 01" chapter after "RL78 Family Renesas Flash Driver RL78 Type 01 User's Manual(R20UT4830)" Rev.1.20 or later.



(4) Include Path Settings

The figure shows the case of RL78/G23. This case also read the folder name ("RL78\_G23") of the sample for RL78/G23 as the folder name of a target device.

The folder name in the case of using RL78/G24: "RL78\_G24"

(4-1) Setting of the include path on CS+

Setting of the include path on CS+ inputs path in "Common Options" tab.

- Add the Include directory path in the "Path Edit" window displayed by selection of [Frequently Used Options(for Compile)] - [Additional include paths].

In the phase where code generation was performed by (5) of "2.1.1 In Case of CS+", the include path of files other than the sample program is registered. For a reason, it needs to register the include path of the sample program.

Those include path to add is shown below.

src\EX_sample\RL78_G23\config src\EX_sample\RL78_G23	
src\EX_sample\common\include	
	•
Path Edit	×
Path(One path per one line):	
src¥EX_sample¥RL78_G23¥config src¥EX_sample¥RL78_G23 src¥EX_sample¥common¥include src¥smc_gen¥r_rtd_r1/8_extraarea¥src¥include src¥smc_gen¥r_rtd_r1/8_extraarea	^
src¥smc_gen¥r_rfd_rf78_common¥src¥include¥rfd src¥smc_gen¥r_rfd_rf78_common¥src¥include	
src¥smc_gen¥r_fd_rl78_common <	>
Browse	
Permit non-existent path	
Include <u>s</u> ubfolders automatically	

\* It is an example of the include path in the case which extracted EX\_sample.zip directly under the src folder.

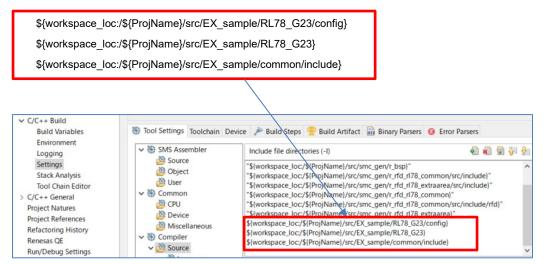


(4-2) Setting of the include path on e<sup>2</sup> studio(CC-RL)

Setting of the include path on e<sup>2</sup> studio(CC-RL) inputs path in "Properties" window.

- Input the Include directory path in the window displayed by selection of "C/C++" build [Setting] - "Compiler" [Source].

Those include path to add is shown below.



\* It is an example of the include path in the case which extracted EX\_sample.zip directly under the src folder.

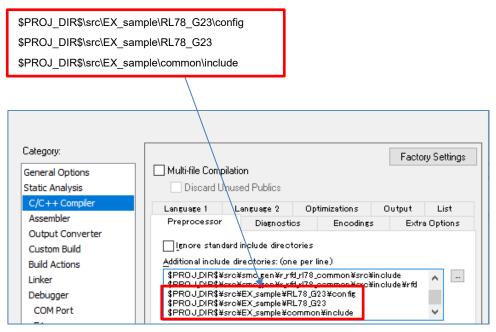


(4-3) Setting of the include path on IAR EW for Renesas RL78

Setting of the include path on IAR Embedded Workbench selects "C/C++ Compiler" of "Category", and inputs path in "Preprocessor" tab.

- Input the Include directory path in the "Edit include Directories" window displayed by selection of [Additional include directories: (one per line)].

Those include path to add is shown below.



\* It is an example of the include path in the case which extracted EX\_sample.zip directly under the src folder.



(4-4) Setting of the include path on e<sup>2</sup> studio(LLVM)

Setting of the include path on e<sup>2</sup> studio(LLVM) inputs path in "Properties" window.

- Input the Include directory path in the window displayed by selection of "C/C++" build [Setting] -

"Compiler" [Includes].

Those include path to add is shown below.

\${workspace_loc:/\${ProjName}/src/EX_sample/RL78_G23/config} \${workspace_loc:/\${ProjName}/src/EX_sample/RL78_G23} \${workspace_loc:/\${ProjName}/src/EX_sample/common/include}					
	Build Steps Build Artifact Binary Parsers Steps	rsers			
<ul> <li>CPU</li> <li>Optimization</li> <li>Debug</li> <li>Warnings</li> <li>SMS Assembler</li> <li>Source</li> <li>Object</li> <li>Stibrary Generator</li> <li>Settings</li> <li>Source</li> <li>Includes</li> <li>Sembler</li> </ul>	Include file directories (-1) "\$(workspace_loc:/\$(ProjName)/src/smc_gen/r_pincfg)" "\$(workspace_loc:/\$(ProjName)/src/smc_gen/r_config)" "\$(workspace_loc:/\$(ProjName)/src/smc_gen/r_fd_r178_common/src/inclu "\$(workspace_loc:/\$(ProjName)/src/smc_gen/r_fd_r178_common/src/inclu "\$(workspace_loc:/\$(ProjName)/src/smc_gen/r_fd_r178_extraarea/src/inclu "\$(workspace_loc:/\$(ProjName)/src/smc_gen/r_fd_r178_extraarea/src/inclu "\$(workspace_loc:/\$(ProjName)/src/smc_gen/r_fd_r178_extraarea/src/inclu \$(workspace_loc:/\$(ProjName)/src/smc_gen/r_fd_r178_common/src/inclu \$(workspace_loc:/\$(ProjName)/src/smc_gen/r_fd_r178_common/src/inclu \$(workspace_loc:/\$(ProjName)/src/smc_gen/r_fd_r178_common/src/inclu \$(workspace_loc:/\$(ProjName)/src/Ex_sample/RL78_G23) \$(workspace_loc:/\$(ProjName)/src/EX_sample/RL78_G23) \$(workspac	ude}"			

\* It is an example of the include path in the case which extracted EX\_sample.zip directly under the src folder.



- (5) The setting of user definition macro
- (5-1) Setting of the user definition macro on CS+

Refer to the chapter of "The setting of user definition macro" of Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830).

(5-2) Setting of the user definition macro on e<sup>2</sup> studio(CC-RL)

Refer to the chapter of "The setting of user definition macro" of Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830).

(5-3) Setting of the user definition macro on IAR EW for Renesas RL78

Refer to the chapter of "The setting of user definition macro" of Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830).

(5-4) Setting of the user definition macro on e<sup>2</sup> studio(LLVM)

Refer to the chapter of "The setting of user definition macro" of Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830).



- (6) Device Item Settings
- (6-1) Setting of the device Items on CS+

Refer to the chapter of "Device Item Settings" of Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830).

(6-2) Setting of the device Items on e<sup>2</sup> studio(CC-RL)

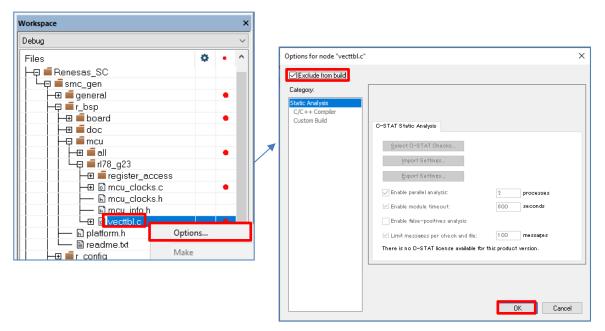
Refer to the chapter of "Device Item Settings" of Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830).

(6-3) Setting of the device Items on IAR EW for Renesas RL78

Build including vecttbl.c prepared as a sample program. A user option byte's value is set to 0x6EFFE8, and an on-chip debugging option byte's value is set to 0x85.

When the code is generated by Smart Configurator, vecttbl.c is generated to a "smc\_gen\r\_bsp\mcu\rl78\_g23\" folder. And because vecttbl.c duplicates, it is necessary to repeal this file.

Right-click a mouse by "Renesas\_SC\smc\_gen\r\_bsp\mcu\rl78\_g23\vecttbl.c" in the [project] on a tree. And select an "option" and set a "check" to [Exclude from build] in the displayed screen. And exclude vecttbl.c from build target.



(6-4) Setting of the device Items on e<sup>2</sup> studio(LLVM)

Build including vects.c prepared as a sample program. A user option byte's value is set to 0x6EFFE8, and an on-chip debugging option byte's value is set to 0x85.

When the code is generated by Smart Configurator, r\_cg\_vect\_table.c is generated to a "src\general\" folder. And because r\_cg\_vect\_table.c and vects.c duplicate the settings, it is necessary to repeal this file.

Right-click a mouse by "src\general\r\_cg\_vect\_table.c" in the [project] on a Project Explorer. And select [Resource Configuration] - [Exclude from build...] and use it to exclude r\_cg\_vect\_table.c from build target.



(7) Execute the sample program from a main function.

Describe the sample\_extraarea\_main function included in r\_flash\_sample\_extraarea\_rl78g2x.c like the "main function" for the project. And build, download and execute it.

\* The header file which described the prototype declaration for sample\_extraarea\_main function. Include prepared "r\_flash\_sample\_extraarea\_rl78g2x.h."



## 2.4 The Check of Operation for Sample Program

4 bytes (32 bits) of area which controls a flash shield window (FSW) is programmed. Confirm this operation by the following methods.

### 2.4.1 In Case of CS+

- (1) Select [Debug]menu [Download] and start debugging.
- (2) Select [View]menu [SFR] and display SFR window.
- (3) Display "FLFSWS" and "FLFSWE" on SFR window. Input "FLFSWS" into search area and it displays.

SFR	
🗾   🏶   🏹 🗙   Notation 🕶   🏨	
FLFSWS	

(4) Select [Debug]menu - [Go] and the program is executed. Check that the values of "FLFSWS and FLFSWE" displayed on the SFR window has changed after stopping the program.

SFR			X
🔳   🥮   🐫 🗙   Notat	tion ▼ 🖳		
FLFSWS			<ul> <li>&gt;&gt;</li> </ul>
SFR	Value	Type(Byte Size)	Address \land
# FLFSWS	0x0000	SFR[R 16](2)	0xf00b2
FLFSWE	0x0000	SFR[R 16](2)	0xf00b4 🗸

FLFSWS : 0x8000



# 2.4.2 In Case of e<sup>2</sup> studio(CC-RL)

- (1) Select [Run]menu [Debug] and start debugging.
- (2) Select [Window] [Show View] [Other...] [IO Registers], and display IO Registers view.
- (3) Display "FLFSWS" register and "FLFSWE" register on the IO Registers view.

The register name is inputted to the text box for search, and the register and its value are displayed by pressing the Enter key.

🔲 IO Re	gisters 🗙	FLFS	SWS ~	<mark>↓ î</mark> 🕀	🗆 🍣 🔕 🍲	0, 🚍 🛛	3 🖻 🖻 🗧	" 🗖
Name		Value (Hex)	Value (Bin)		Address	Access		^
	FLFSWS	0x0000	0000000	00000000	0x000f00b2	R		
	FLFSWE	0x0000	0000000	000000000	0x000f00b4	R		

(4) After the program is executed, check that the values of "FLFSWS" and "FLFSWE" displayed on the IO Registers window is changing.

FLFSWS : 0x8000



## 2.4.3 In Case of IAR EW for Renesas RL78

- (1) Select [Project] menu [Download and Debug] and start debugging.
- (2) After select [View]menu [Register], select either from "Registers 1" to "Registers 4", and the register window is displayed.
- (3) Display "FLFSWS" register and "FLFSWE" register on the registers window.

The register name is inputted to the text box for search, and the register and its value are displayed by pressing the Enter key.

Registers 1			×
Find: FLFSWS	~	Group: Others	~
Name	Value	Access	^
FLSEC	Oxffff	ReadOnly	
FLFSWS	0xffff	ReadOnly	
FLFSWE	Oxffff	ReadOnly	
FSSET	Oxff	ReadWrite	
FSSE	Oxff	ReadWrite	~

(4) After the program is executed, check that the values of "FLFSWS" and "FLFSWE" displayed on the registers window is changing.

FLFSWS : 0x8000



# 2.4.4 In Case of e<sup>2</sup> studio(LLVM)

- (1) Select [Run]menu [Debug] and start debugging.
- (2) Select [Window] [Show View] [Other...] [IO Registers], and display IO Registers view.
- (3) Display "FLFSWS" register and "FLFSWE" register on the IO Registers view.

The register name is inputted to the text box for search, and the register and its value are displayed by pressing the Enter key.

🔲 IO Re	gisters 🗙	FLFS	SWS ~	<mark>↓ î</mark> 🕀	🗆 🍣 🔕 🍲	0, 🚍 🛛	3 🖻 🖻 🗧	" 🗖
Name		Value (Hex)	Value (Bin)		Address	Access		^
	FLFSWS	0x0000	0000000	00000000	0x000f00b2	R		
	FLFSWE	0x0000	0000000	000000000	0x000f00b4	R		

(4) After the program is executed, check that the values of "FLFSWS" and "FLFSWE" displayed on the IO Registers window is changing.

FLFSWS : 0x8000



# 3. Precautions

- (1) Reprogramming of the code flash memory or extra area
- Place the reprogramming code in RAM when reprogramming the code flash memory or extra area.
- (2) Precondition for control of the data flash area Be sure to set the DFLEN bit (bit 0) of the data flash control register (DFLCTL) to 1 (enable access to the data flash area) before controlling the data flash area.
- (3) Program execution during reprogramming of the flash memory Self-programming in the RL78/G23 uses the flash memory sequencer to control the reprogramming of the flash memory. In the following flash memory control modes in which the flash memory can be reprogrammed, the CPU cannot read data from the target flash memory.
  - In the code flash memory programming mode, the CPU cannot read data from the code flash memory. The API functions of RFD RL78 Type 01 and the user program to be executed in the code flash memory programming mode should be copied from ROM to RAM in advance and executed and referenced in RAM.
  - In the data flash memory programming mode, the CPU cannot read data from the data flash memory. The data to be read in the data flash memory programming mode should be copied from the data flash memory to RAM in advance and referenced in RAM.
- (4) Clock setting under self-programming execution

The high-speed on-chip oscillator should be kept operating during self-programming. When selfprogramming is executed, it is necessary to use the main system clock and to select "X1 oscillator or the high-speed on-chip oscillator." Cannot execute self-programming, if the middle-speed on-chip oscillator or the subsystem clock is selected. Stop the middle-speed on-chip oscillator (MIOEN = 0) and select the high-speed on-chip oscillator (MCM1 = 0) as the main on-chip oscillator clock (fOCO).

- \* For the clock setting under self-programming execution, refer to the user's manual of the target RL78 microcontroller.
- (5) The precautions in the case of debugging self-programming with an on-chip debugger

In the case which debugs self-programming with an on-chip debugger, because 128 bytes of area is used from the top address of RAM when a debugger is executed, it is necessary to vacate this area. Additionally, in case CS+ or e<sup>2</sup> studio is used as the development environment, the debugger settings need to be configured to use flash self-programming

• Example settings for CS+:

On the project, select "Connect Settings" tab from "RL78 E2 [Lite] (Debug Tool)", and set "Yes" to "Flash" - "Using the flash self programming".

• Example settings for e<sup>2</sup> studio:

On the project, select "Property" - "Run/Debug Settings", and edit the target "HardwareDebug" setting. On the displayed screen, select "Debugger" tab - "Connection Settings" tab, and set "Yes" to "Flash" -"Program uses flash self programming".



# 4. Reference document

Please get the latest version of each document from the Renesas Electronics Corp. website (https://www.renesas.com).

No	Document Title	Document Number
1	RL78/G22 User's Manual Hardware	R01UH0978
2	RL78/G23 User's Manual Hardware R01UH0896	
3	RL78/G24 User's Manual Hardware R01UH0961	
4	RL78 Family Board Support Package Module R01AN5522	
5	RL78 Family Renesas Flash Driver RL78 Type 01 User's Manual R20UT4830	
6	E1/E20/E2 Emulator, E2 Emulator Lite Additional Document for User's Manual (Notes on Connection of RL78)	R20UT1994



# 5. Revision History

Davi	Dere D. (		Description		
Rev.	Rev. Date	Page	Summary		
1.00	Dec.20.21	—	Newly created.		
1.10	May.31.23		RL78/G22 and RL78/G24 were added.		
1.20	Mar.22.24	—	The LLVM compiler was supported.		



# 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  $V_{L}$  (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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(Rev.5.0-1 October 2020)

# **Corporate Headquarters**

#### TOYOSU FORESIA, 3-2-24 Toyosu, Koto-ku, Tokyo 135-0061, Japan www.renesas.com

## **Contact information**

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