

RL78 Family

Renesas Flash Driver RL78 Type 02 SC version (Extra Area)

Introduction

This document explains Renesas Flash Driver RL78 Type 02 for the RL78/F23, F24 groups 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 02, and it is a method for programming extra area using the attached sample program.

In this document, “Renesas Flash Driver RL78 Type 02” is described to be “RFD RL78 Type 02” or “RFD”.

This document includes the contents in comparison with conventional RFD RL78 Type 02 not using SC. This document distinguishes and expresses it.

Simple version : Conventional RFD RL78 Type 02 not using SC.

SC version : RFD RL78 Type 02 using “SC” currently explained by this document.

Target Device

The target device group by which the operation for RFD RL78 Type 02 was confirmed.

RL78/F23 group

RL78/F24 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.

Contents

1. Specification	3
1.2 Structure of Sample Program Folders.....	4
1.3.2 File Structure for RFD Extra Area Driver (r_rfd_rl78_extraarea)	6
1.4 Extra Area Programming Processing Using a Sample Program	7
2. Creating a Sample Project for Extra area Reprogramming	8
2.1 Example of Creating a Sample Project	8
2.1.1 In Case of CS+	8
2.1.2 In Case of e ² studio	8
2.1.3 In Case of IAR EW for Renesas RL78	8
2.2 Example of Source Code Registration	9
2.2.1 In Case of CS+	9
2.2.1.1 Notes of case used at the same time in r_rfd_rl78_codeflash and r_rfd_rl78_extraarea	12
2.2.2 In Case of e ² studio	13
2.2.2.1 Notes of case used at the same time in r_rfd_rl78_codeflash and r_rfd_rl78_extraarea	16
2.2.3 In Case of IAR EW for Renesas RL78	17
2.2.3.1 Notes of case used at the same time in r_rfd_rl78_codeflash and r_rfd_rl78_extraarea	22
2.3 Project registration of sample program	23
2.4 The Check of Operation for Sample Program.....	34
2.4.1 In Case of CS+	34
2.4.2 In Case of e ² studio	35
2.4.3 In Case of IAR EW for Renesas RL78	36
3. Precautions.....	37
4. Reference document	38
5. Revision History.....	39

1. Specification

The sample program included in RFD RL78 Type 02 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	IDE (Integrated Development Environment)	Manufacturer	Version
CC-RL	CS+ or e ² studio	Renesas Electronics	V1.11 or later
IAR	IAR Embedded Workbench® for Renesas RL78	IAR Systems®	V4.21 or later

Note. Integrated development environment and compiler must support the target device. IAR Systems, IAR Embedded Workbench, C-SPY, 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 Type 02 was confirmed.

Table 1-2 Emulator on which RFD RL78 Type 02 Operation was Confirmed

Emulator	Manufacturer
E2 emulator	Renesas Electronics
E2 emulator Lite	Renesas Electronics

- Target MCU

RL78/F23

RL78/F24

- Renesas Flash Driver (RFD) RL78 Type 02

Table 1-3 shows the Renesas Flash Driver (RFD) RL78 Type 02 supported by this manual.

Table 1-3 The RFD RL78 Type 02 Supported by This Manual

Package	Manufacturer	Package Version
RFD RL78 Type 02	Renesas Electronics	V1.01

1.2 Structure of Sample Program Folders

Figure 1.1 shows the structure of sample program folders.

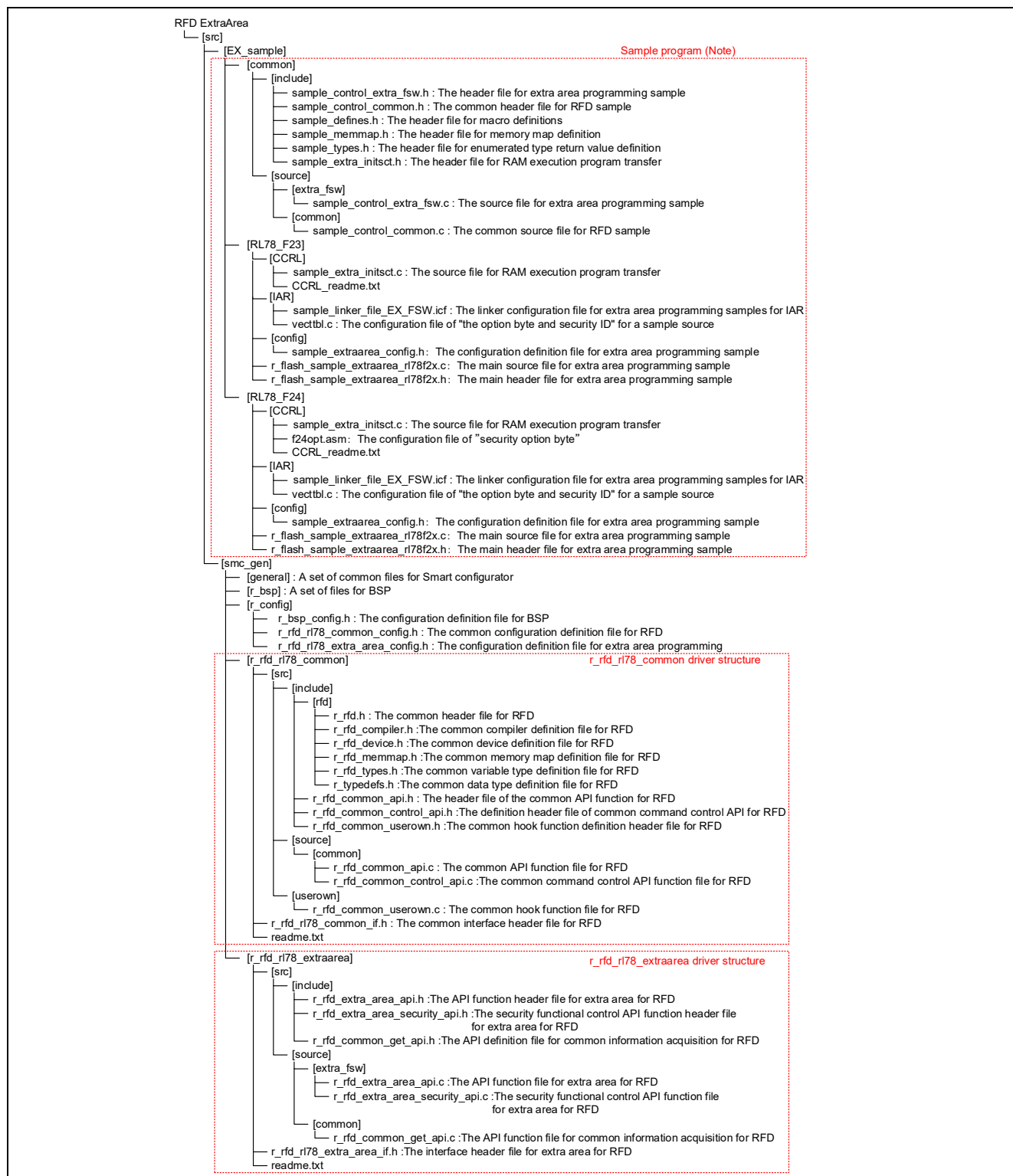


Figure 1.1 Structure of Sample Program Folders

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 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 02 user’s manual (R20UT5009)” for the detail specification for the RFD common driver.

**Table 1-4 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 change	
r_rfd_common_control_api.c	No change	

**Table 1-5 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 change	

**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)**

File name	Simple version	SC version
r_rfd_common_api.h	No change	
r_rfd_common_control_api.h	No change	
r_rfd_common_userown.h	No change	

**Table 1-7 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 change	
r_rfd_compiler.h	No change	
r_rfd_device.h	No change	
r_rfd_memmap.h	No change	
r_rfd_types.h	No change	
r_typedefs.h	No change	

**Table 1-8 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 02 user's manual (R20UT5009)" for the detail specification for the RFD extra area driver.

**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\extra_fsw)**

File name	Simple version	SC version
r_rfd_extra_area_api.c	No change	
r_rfd_extra_area_security_api.c	No change	

**Table 1-10 Difference of the file 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 change	

**Table 1-11 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 change	
r_rfd_common_get_api.h	No change	
r_rfd_extra_area_security_api.h	No change	

**Table 1-12 Difference of the file 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_CodeFlashControl function processing does not have change from Simple version. Refer to the item of “Sample_ExtraFSWControl function” on Renesas Flash Driver RL78 Type 02 user's manual (R20UT5009).

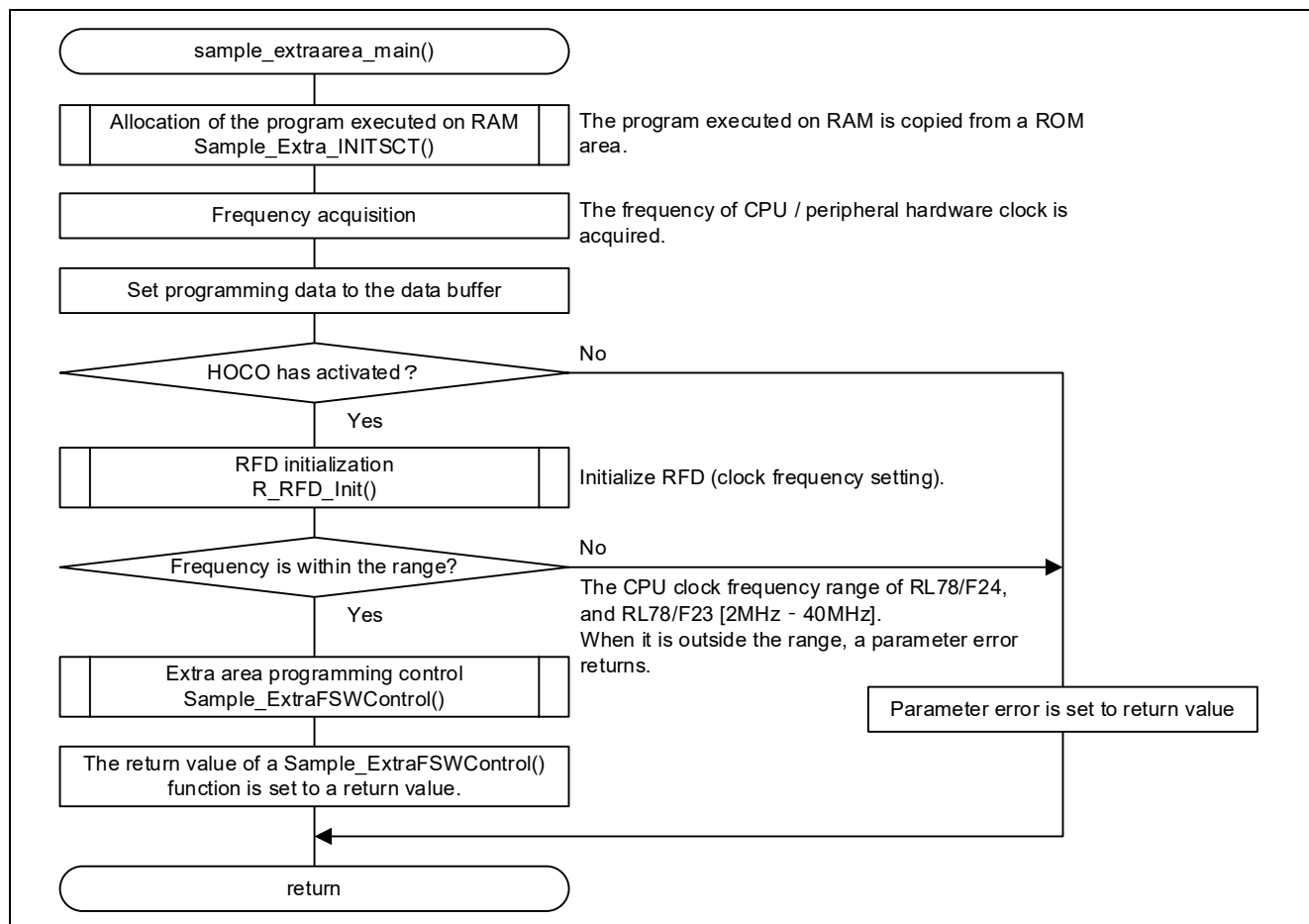


Figure 1.2 the flow chart of the sample program

- 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 02 user's manual (R20UT5009) "Example of Creating a Sample Project" to create a project.

2.1.2 In Case of e² studio

Refer to Renesas Flash Driver RL78 Type 02 user's manual (R20UT5009) "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.



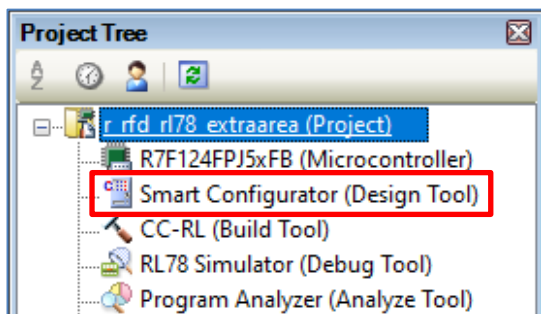
2.1.3 In Case of IAR EW for Renesas RL78

Refer to Renesas Flash Driver RL78 Type 02 user's manual (R20UT5009) "Example of Creating a Sample Project" to create a project.

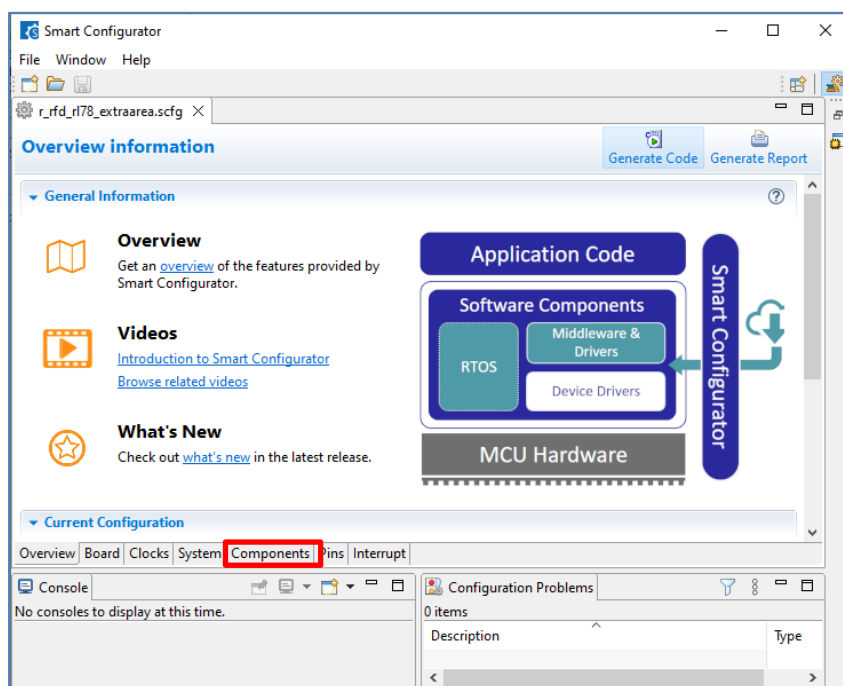
2.2 Example of Source Code Registration

2.2.1 In Case of CS+

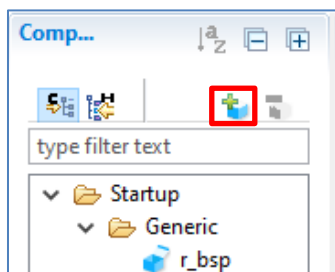
(1) Double-click “Smart Configurator (Design Tool)” of “Project Tree”, and start Smart Configurator.



(2) Select a “Components” tab.

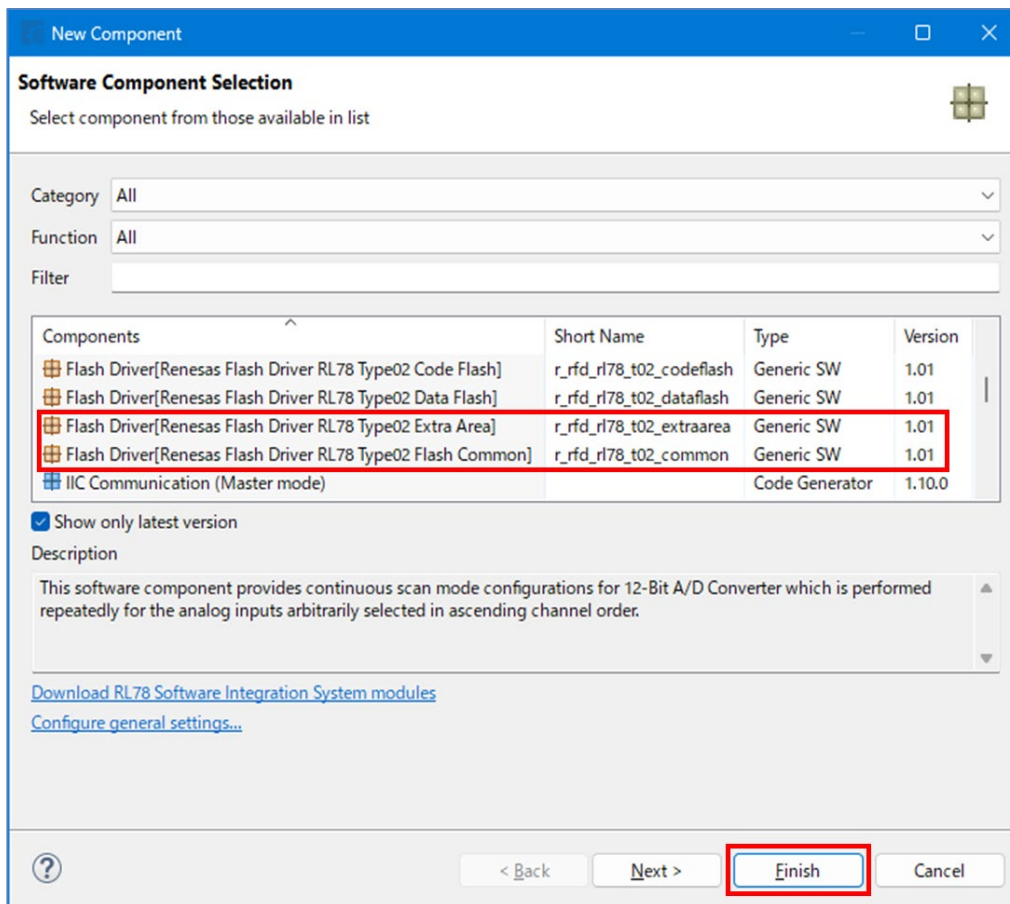


(3) Press the “Add component” button and open the “New Component” dialog.

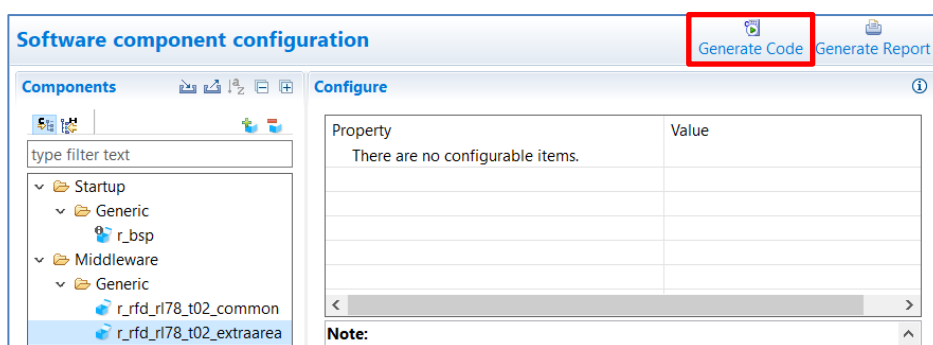


(4) Select the following components and press a “Finish” button.

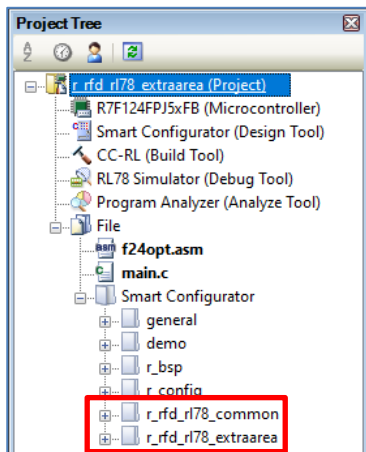
- Flash Driver[Renesas Flash Driver RL78 Type 02 Extra Area] (r_rfd_rl78_t02_extraarea)
- Flash Driver[Renesas Flash Driver RL78 Type 02 Flash Common] (r_rfd_rl78_t02_common)



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



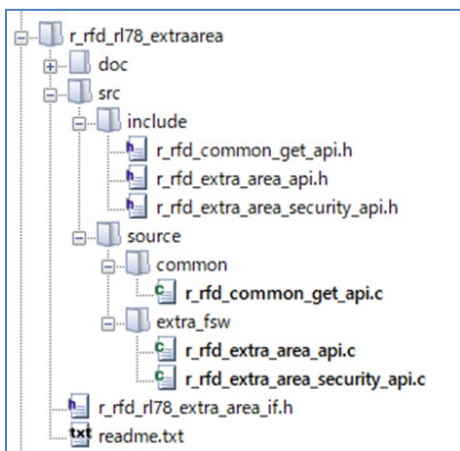
(6) The “r_rfd_rl78_common” folder and the “r_rfd_rl78_extraarea” folder is added to the project tree.



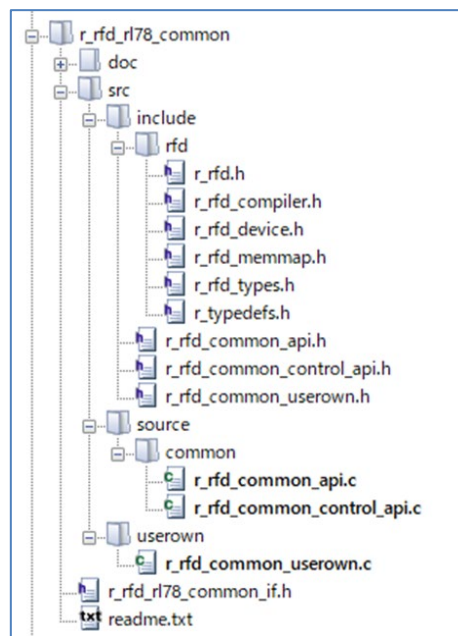
Each folder is developed as follows



The developed r_config folder



The developed r_rfd_rl78_extraarea folder

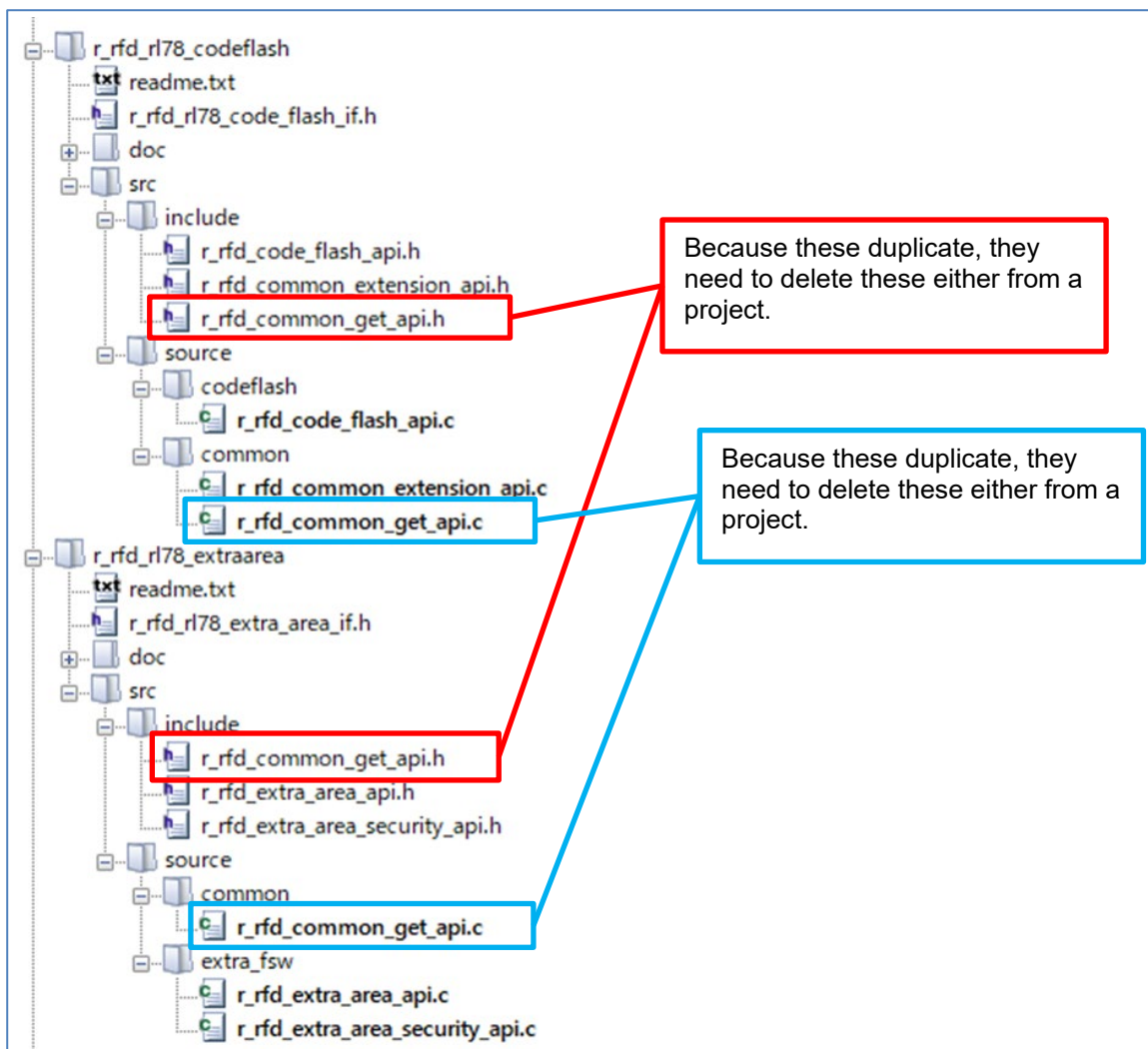


The developed r_rfd_rl78_common folder

2.2.1.1 Notes of case used at the same time in r_rfd_rl78_codeflash and r_rfd_rl78_extraarea

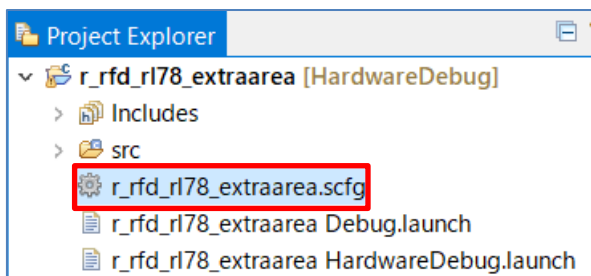
In the case which uses r_rfd_rl78_codeflash and r_rfd_rl78_extraarea at the same time, as shown in the following figure, “r_rfd_common_get_api.c” and “r_rfd_common_get_api.h” overlap.

Each file needs to delete either from a project.

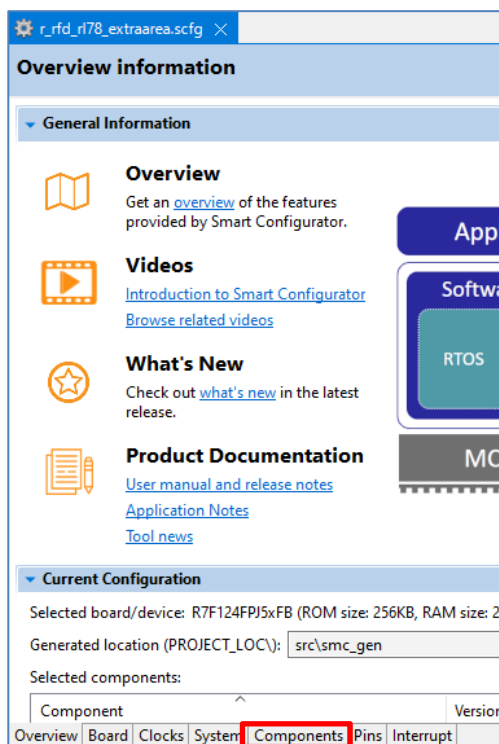


2.2.2 In Case of e² studio

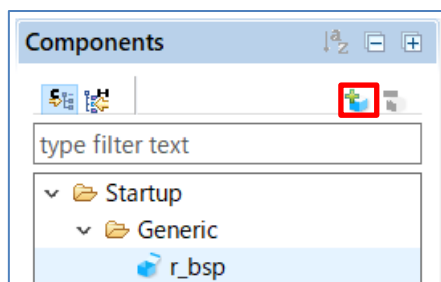
- (1) Open the project file of “Smart Configurator” after starting e² studio.



- (2) Select a “Components” tab.

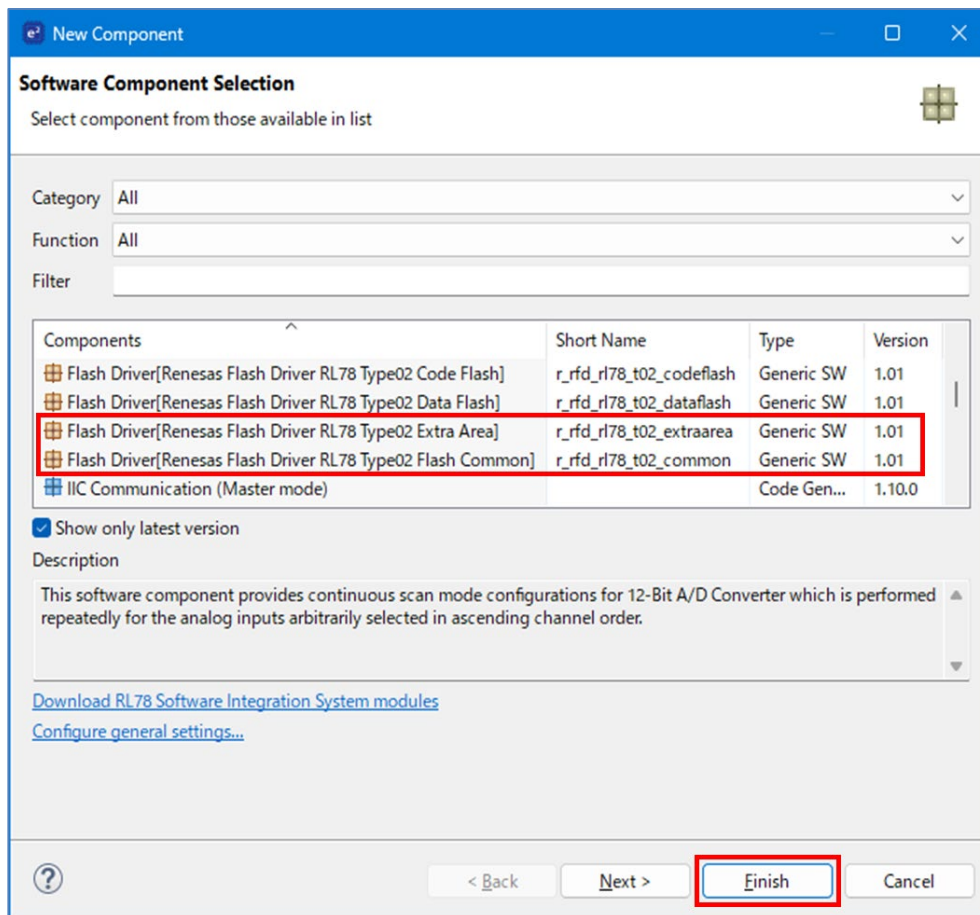


- (3) Press the “Add component” button and open the “New Component” dialog.

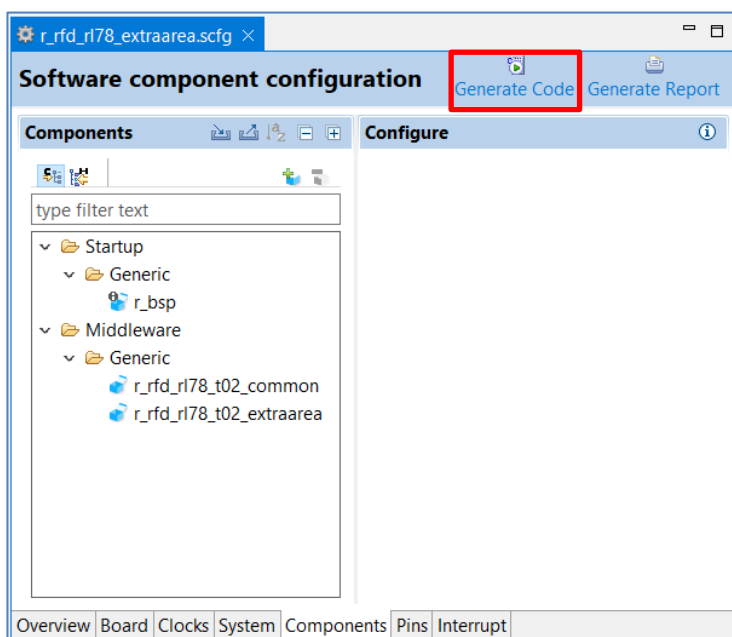


(4) Select the following components and press a “Finish” button.

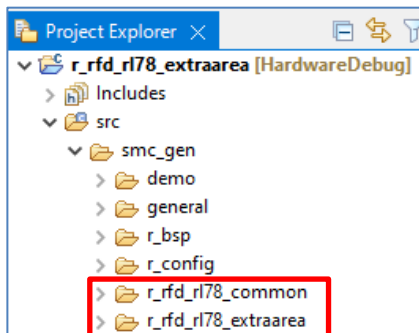
- Flash Driver[Renesas Flash Driver RL78 Type 02 Extra Area] (r_rfd_rl78_t02_extraarea)
- Flash Driver[Renesas Flash Driver RL78 Type 02 Flash Common] (r_rfd_rl78_t02_common)



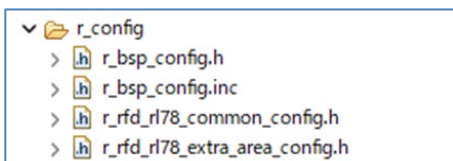
(5) Press a “Generate Code” button and generate the code.



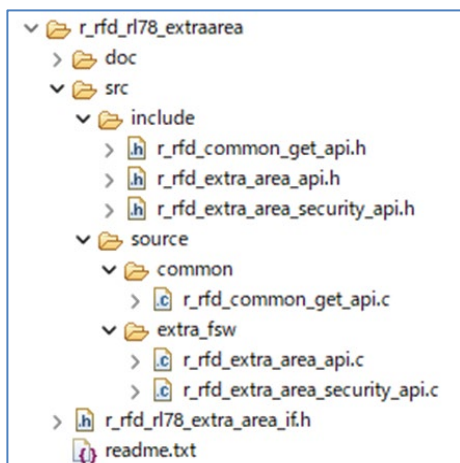
(6) The “r_rfd_rl78_common” folder and the “r_rfd_rl78_extrarea” folder is added to the project tree.



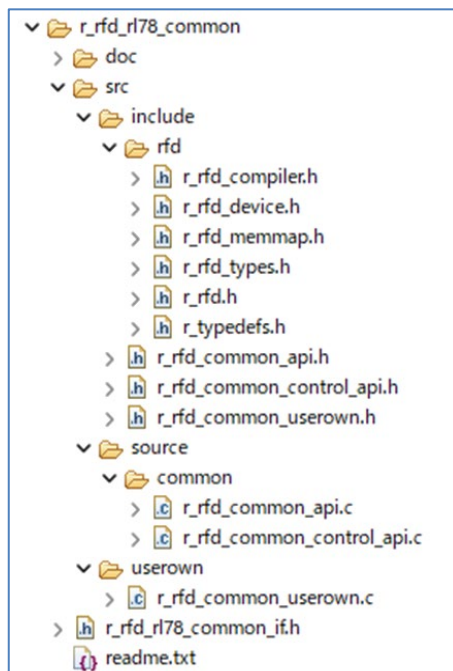
Each folder is developed as follows.



The developed r_config folder



The developed r_rfd_rl78_extrarea folder

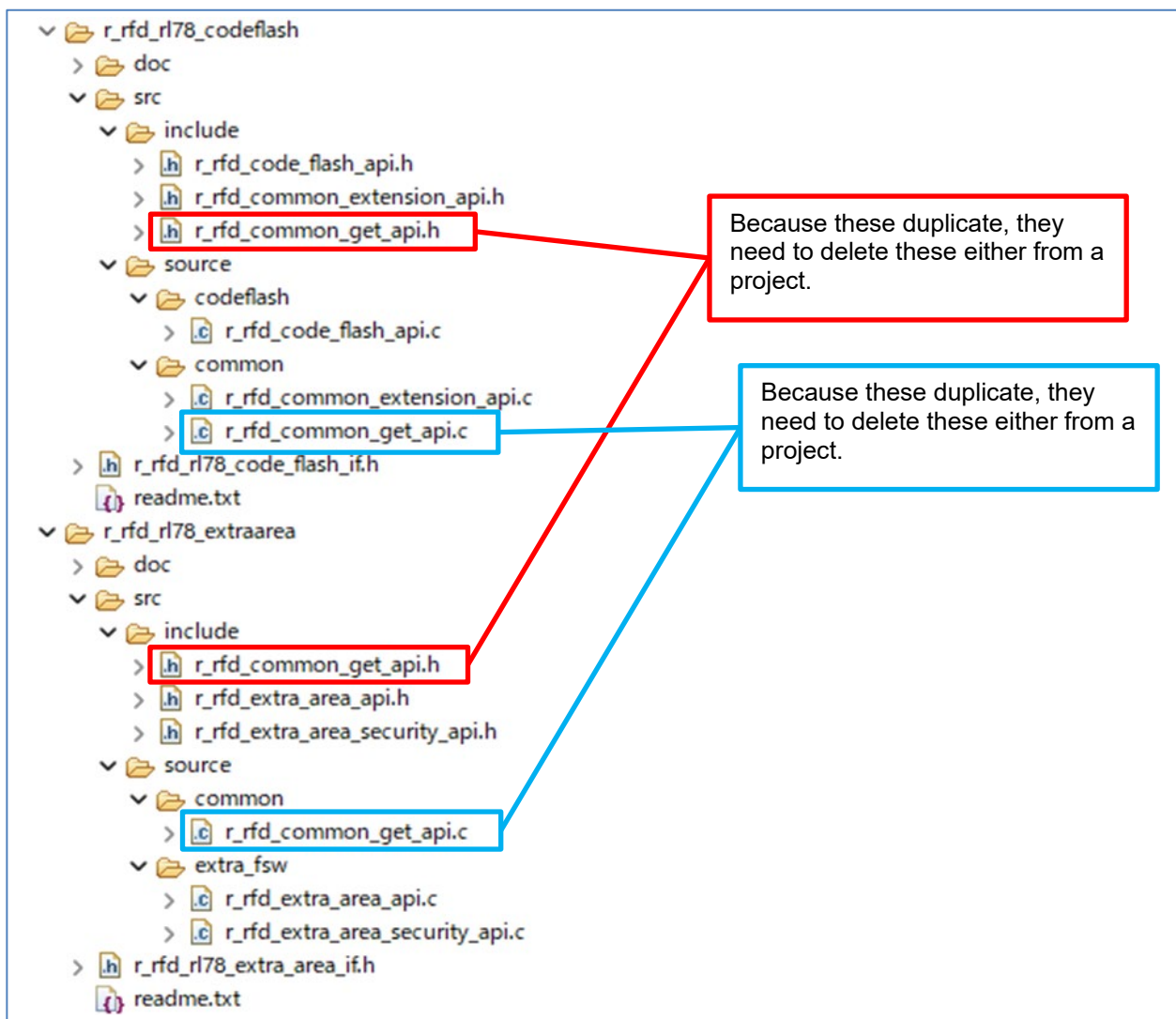


The developed r_rfd_rl78_common folder

2.2.2.1 Notes of case used at the same time in r_rfd_rl78_codeflash and r_rfd_rl78_extraarea

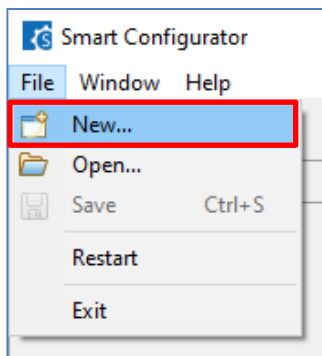
In the case which uses r_rfd_rl78_codeflash and r_rfd_rl78_extraarea at the same time, as shown in the following figure, “r_rfd_common_get_api.c” and “r_rfd_common_get_api.h” overlap.

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”.

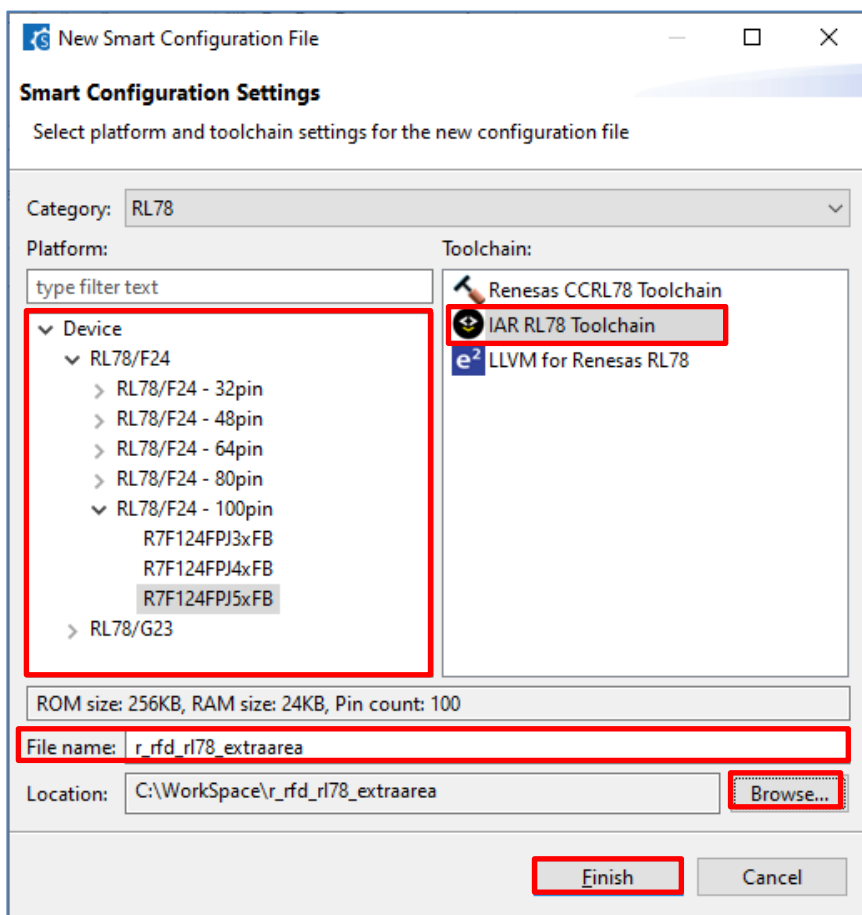
Select the same device as the device selected in the project of “IAR EW for Renesas RL78” by “Platform”.

Select “IAR RL78 Toolchain” as “Toolchain”.

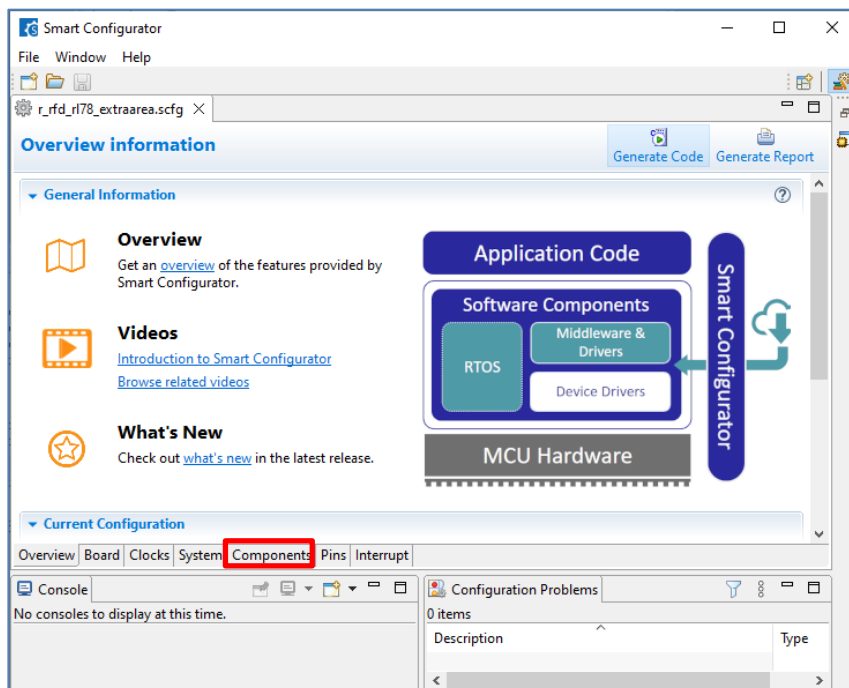
Input arbitrary names into “File name”.

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

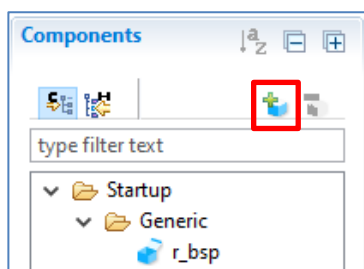
The “.setting” folder and the “<file name>.scfg” file are created to the set location.



(3) Select a “Components” tab.

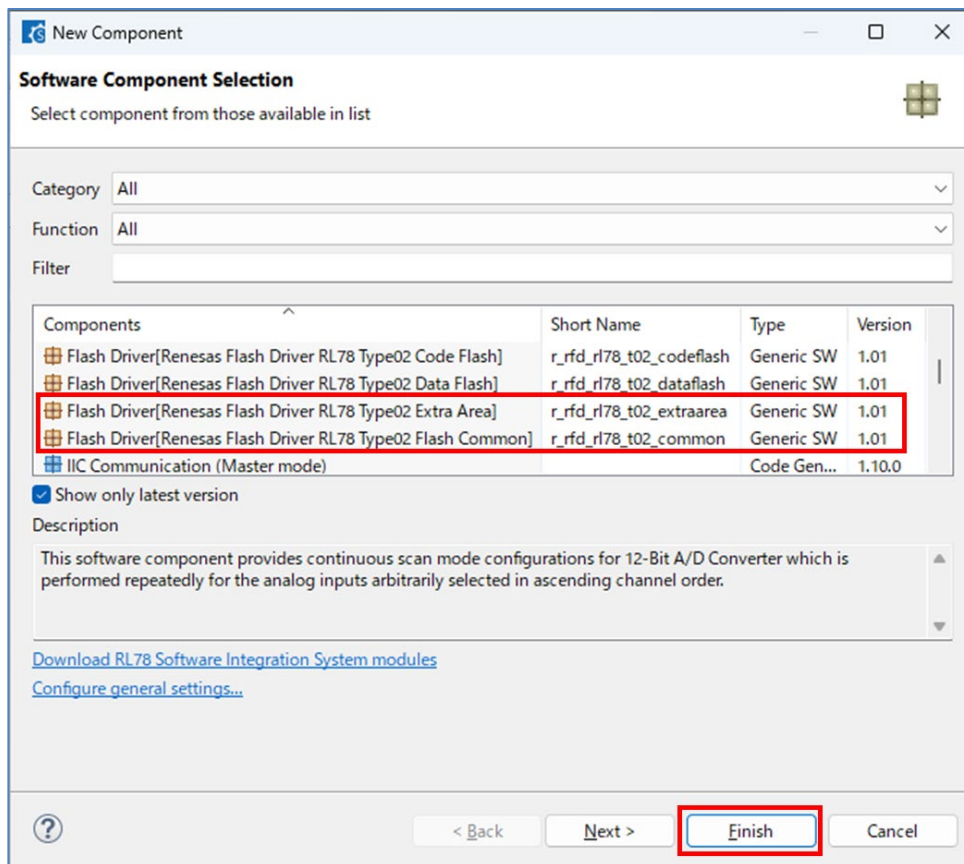


(4) Press the “Add component” button and open the “New Component” dialog.

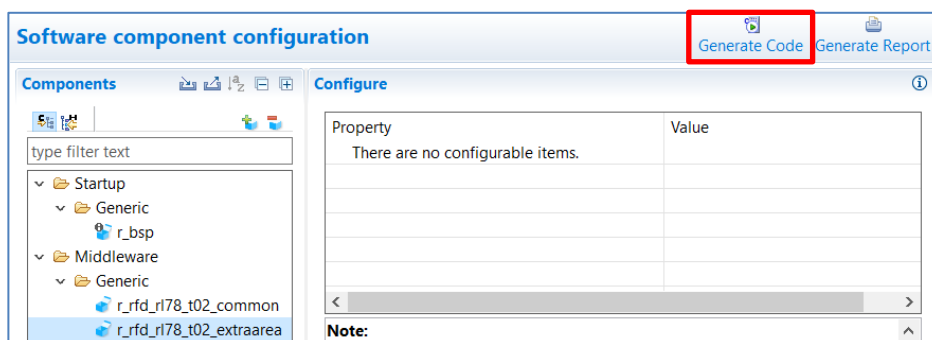


(5) Select the following components and press a “Finish” button.

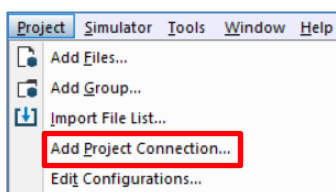
- Flash Driver[Renesas Flash Driver RL78 Type 02 Extra Area] (r_rfd_rl78_t02_extraarea)
- Flash Driver[Renesas Flash Driver RL78 Type 02 Flash Common] (r_rfd_rl78_t02_common)



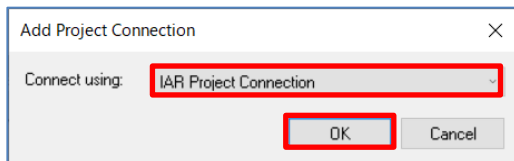
(6) Press a “Generate Code” button and close “Smart Configurator” after the completion of generation for the code.



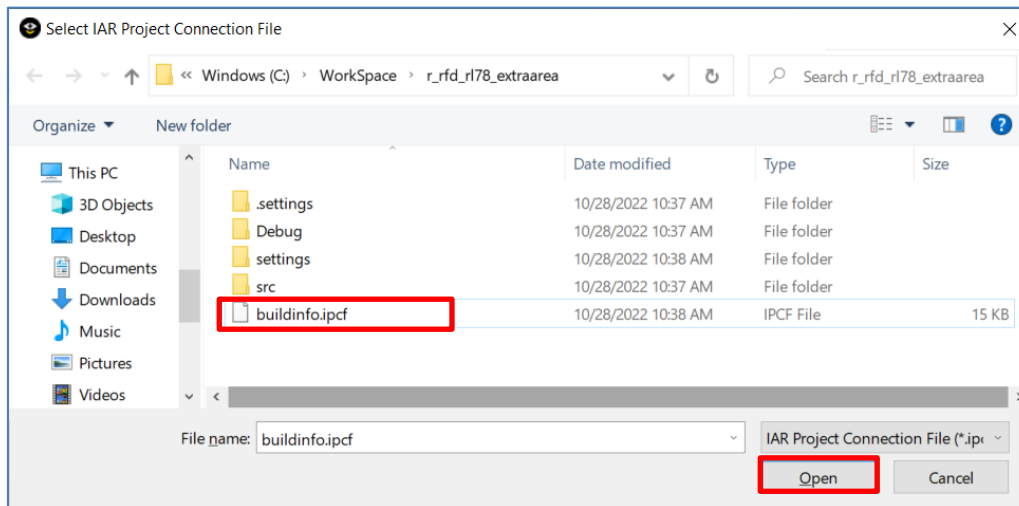
(7) Start IAR EW for Renesas RL78. And select “Project” menu [Add Project Connection], and open the additional dialog of Project Connection.



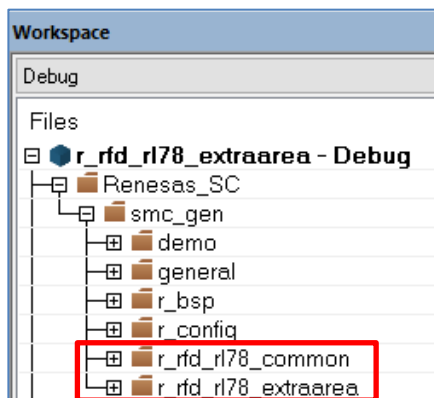
(8) Select “IAR Project Connection”, and press an “OK” button.



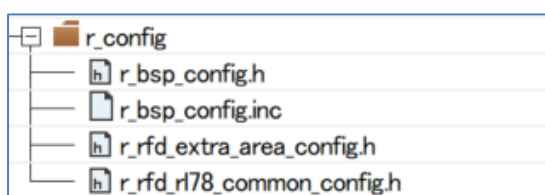
(9) Select the ipcf file created by Smart Configurator and press an “Open” button.



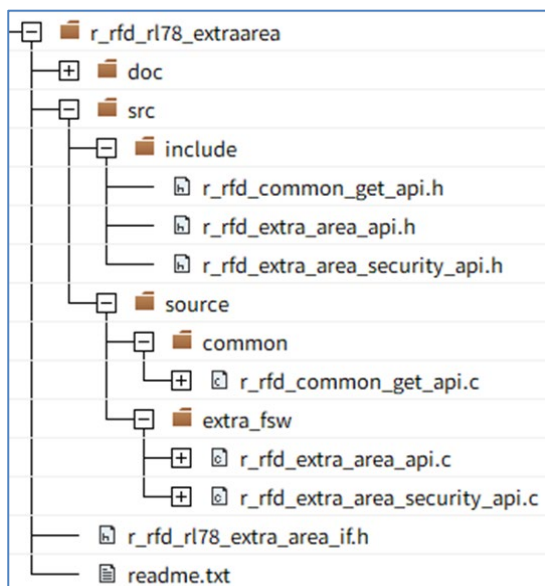
(10) “r_rfd_rl78_common” and “r_rfd_rl78_extraarea” are added to Workspace.



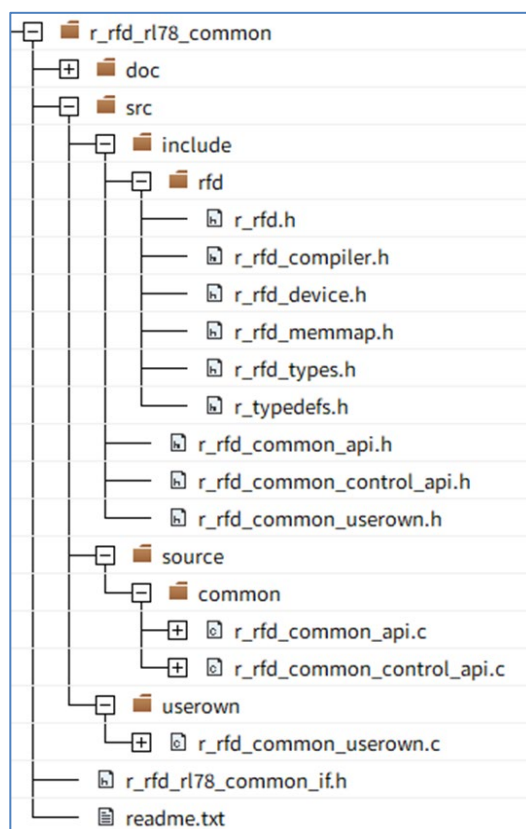
Each folder is developed as follows.



The developed r_config folder



The developed r_rfd_rl78_extraarea folder

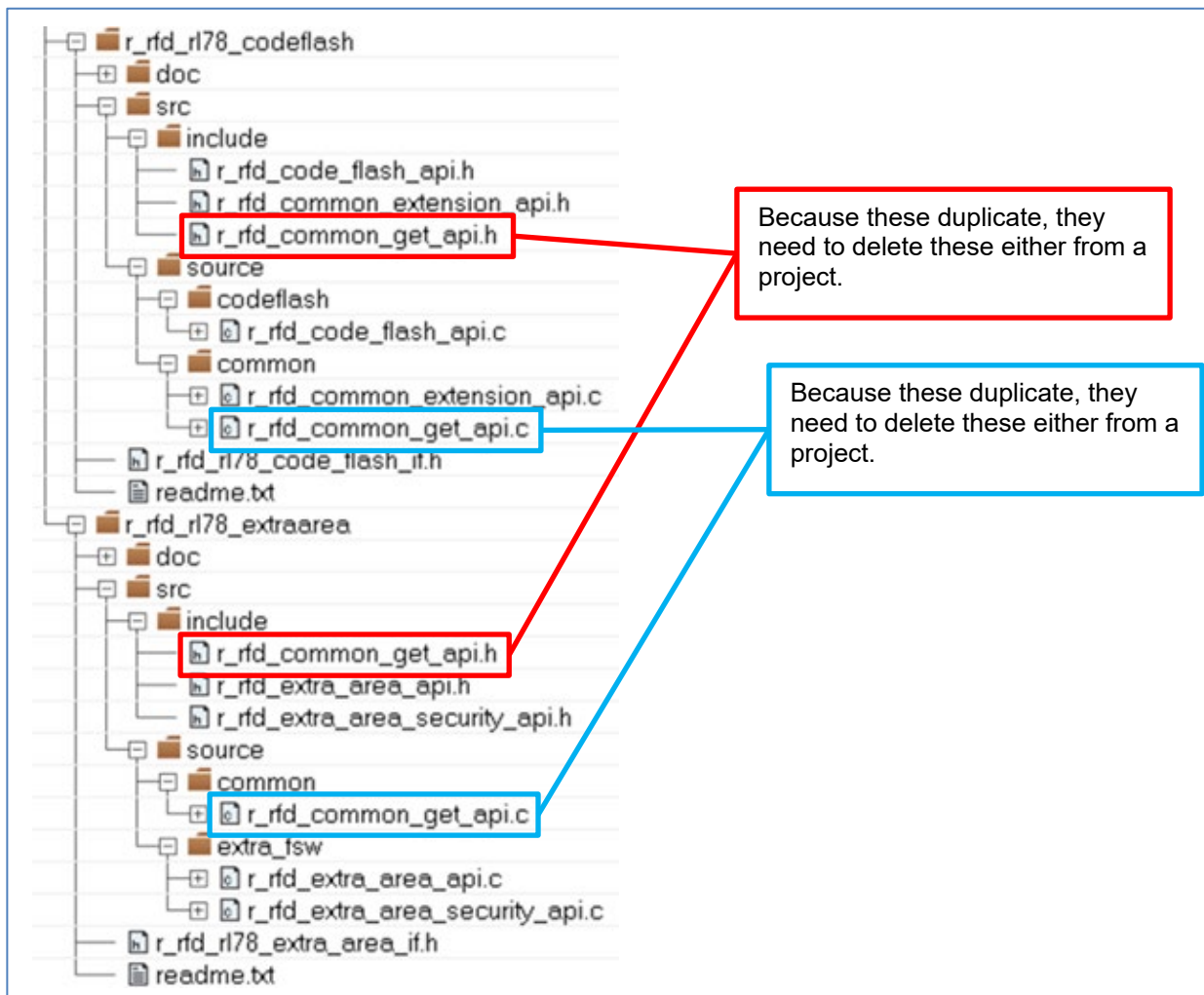


The developed r_rfd_rl78_common folder

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.



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. The folders of other device names delete. For example, when using the RL78/F23, leave only the "RL78_F23" folder, and delete the untargeted "RL78_F24" and other folders together.

A common file duplicates in the case used at the same time with the sample program for a data flash or a code flash. In order to prevent duplication, I set and extract the same folder name and the same files are made to be overwritten.

(2) Register the folder of the sample program into the project of CS+, e² studio, or IAR.

* In the case which uses RL78/F24 on CS+, f24opt.asm just under the "file" of the project tree duplicates with f24opt.asm included in the sample program. Click the right mouse button for the file of tree. And exclude f24opt.asm using "Remove from Project" function.

* In the case of CS+ and e² studio, because vecttbl.c included in the sample program is not used, it is not necessary to register it. Moreover, in the case which uses RL78/F24, if the sample programs of a code flash and a data flash are used at the same time, f24opt.asm will be duplicated. Exclude the other one with the right mouse click and "Remove from Project" function, leaving one.

* In the case of IAR EW for Renesas RL78, because sample_extra_initst.c/h and f24opt.asm(When using RL78/F24) are not used, it is not necessary to register them.

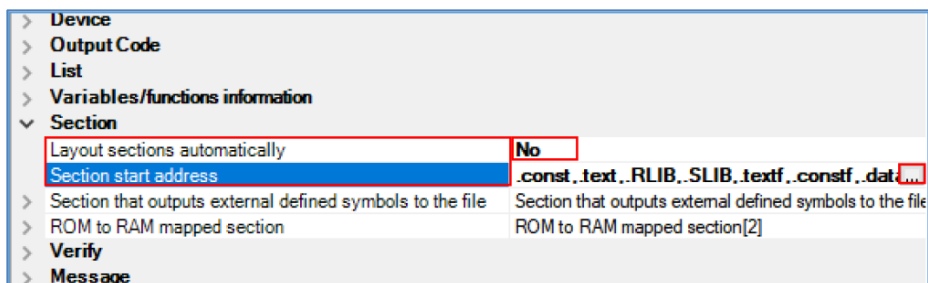
(3) Setting the section items

(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.

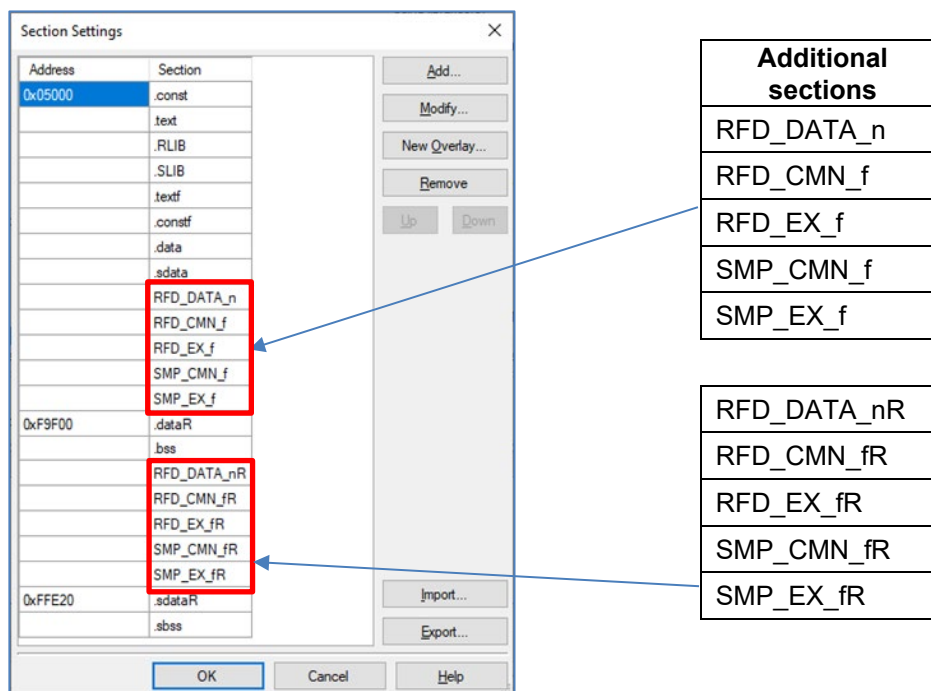


Note: Replace the folder name for the RL78/F24 sample ("RL78_F24") with the folder name for the target product. Replace the folder name in the case of using RL78/F23 to "RL78_F23"

Add sections necessary for extra area(FSW) reprogramming on a “section settings” screen.

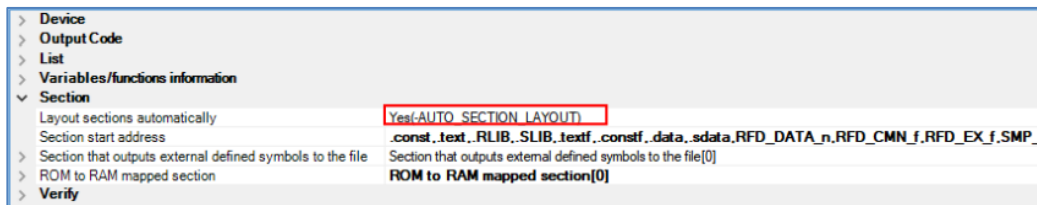
Add to the program area : RFD_DATA_n, RFD_CMN_f, RFD_EX_f, SMP_CMN_f, SMP_EX_f

Add to the RAM area : RFD_DATA_nR, RFD_CMN_fR, RFD_EX_fR, SMP_CMN_fR, SMP_EX_fR

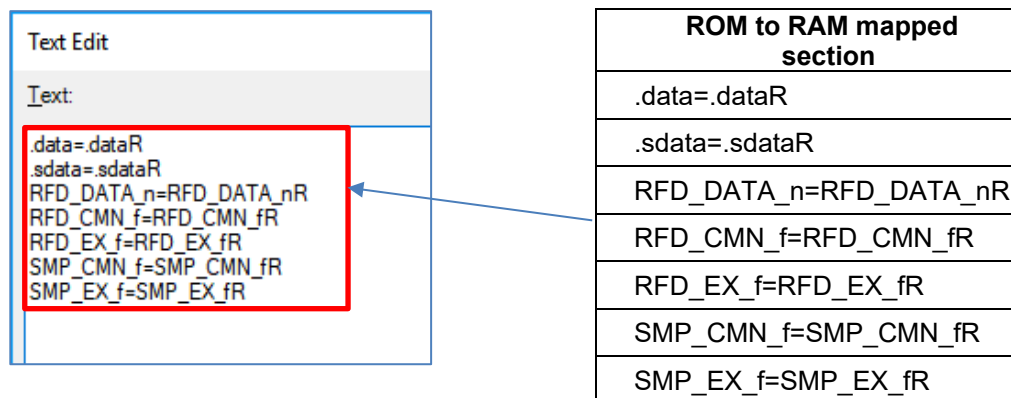


Note: About setting of the sample project in the case of using each device, refer to the “Setting related to changing devices” section of the “Creating a Sample Project for RFD RL78 Type 02” chapter after “RL78 Family Renesas Flash Driver RL78 Type 02 User’s Manual(R20UT5009)” Rev.1.11 or later.

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



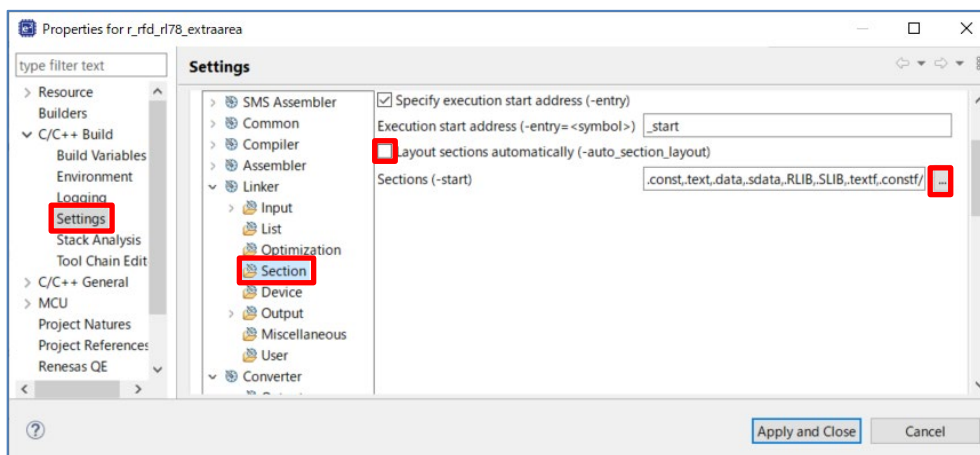
Press the right-hand side “...” button by [ROM to RAM mapped section], display the “Text Edit” screen, and add the section for copying to RAM from ROM.



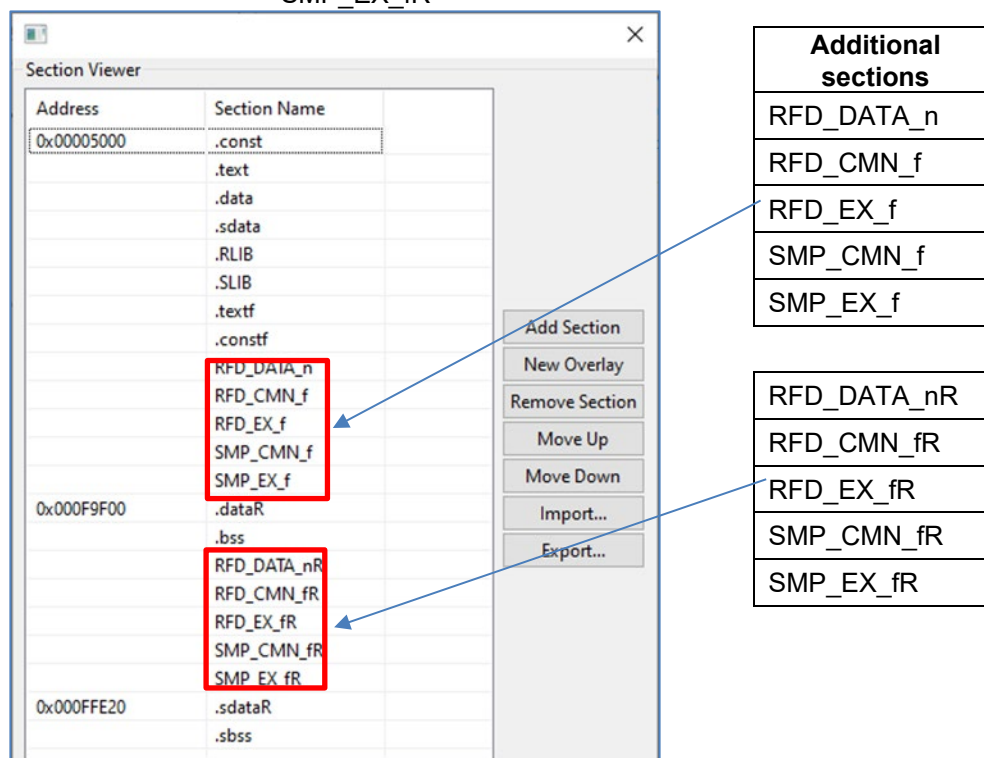
(3-2) Setting of the section items on e² studio

On e² studio, sections are set on a “Section Viewer” screen.

The process which displays a “Section Viewer” screen is shown. Select the [Properties] from the [Project] menu and open the window of the properties for a target project. And select “Linker” [Section] from [Settings] of “C/C++ Build”. Remove a check mark from [Layout sections automatically] (-auto_section_layout), and press the “...” button positioned in the rightmost of [Sections (-start)], and display Section Viewer.

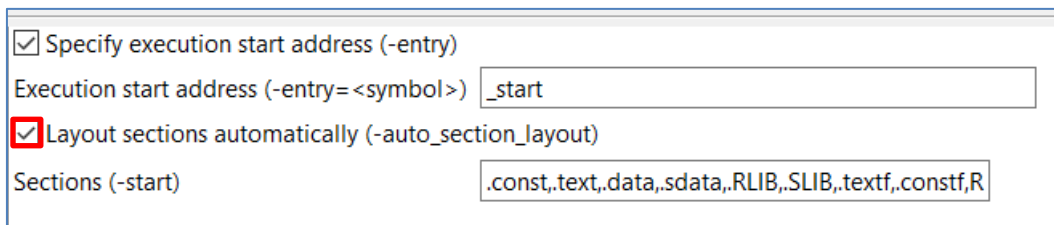


Add to the program area : RFD_DATA_n, RFD_CMN_f, RFD_EX_f, SMP_CMN_f, SMP_EX_f
 Add to the RAM area : RFD_DATA_nR, RFD_CMN_fR, RFD_EX_fR, SMP_CMN_fR, SMP_EX_fR

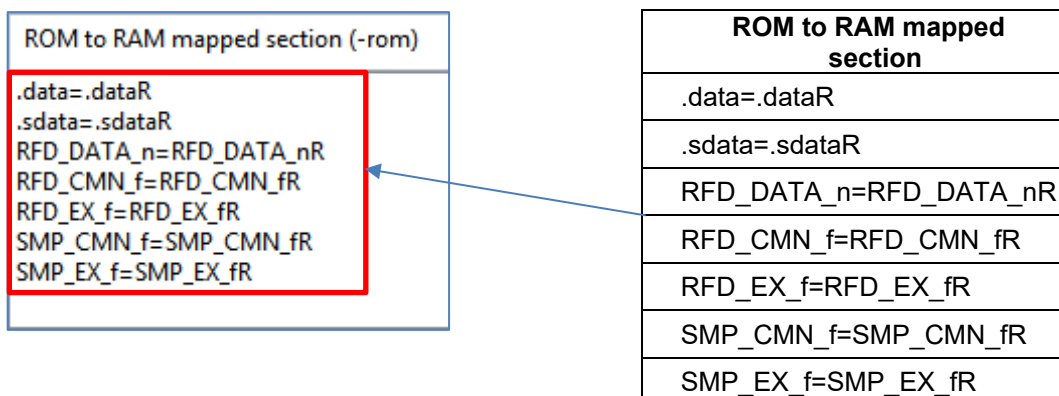


Note: About setting of the sample project in the case of using each device, refer to the “Setting related to changing devices” section of the “Creating a Sample Project for RFD RL78 Type 02” chapter after “RL78 Family Renesas Flash Driver RL78 Type 02 User’s Manual(R20UT5009)” Rev.1.11 or later.

Be sure to put a check mark to [Layout sections automatically (-auto_section_layout)], after pressing the “OK” button.



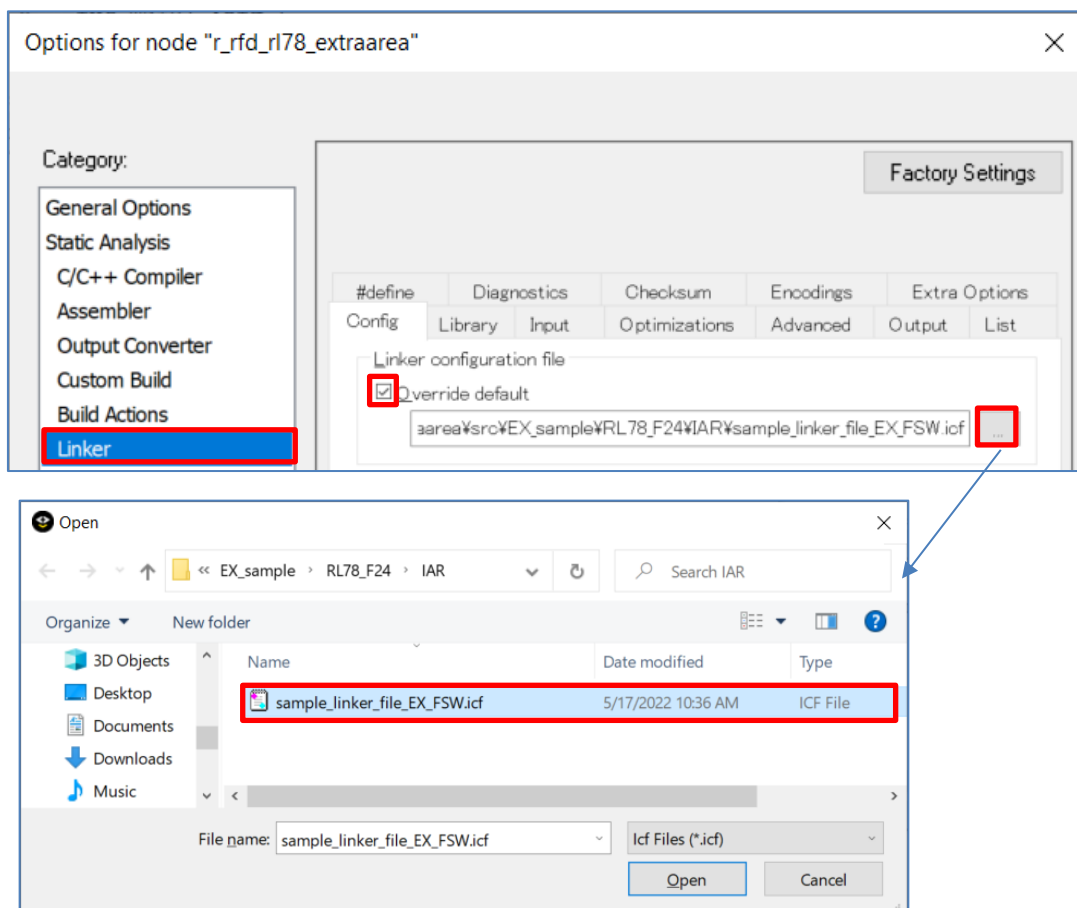
Select “C/C++ Build” [Settings] - “Linker” [Output], display the “ROM to RAM mapped section (-rom)” screen, and add the section for copying to RAM from ROM.



(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 02. Linker configuration file (*.icf) for every reprogramming area is as follows.

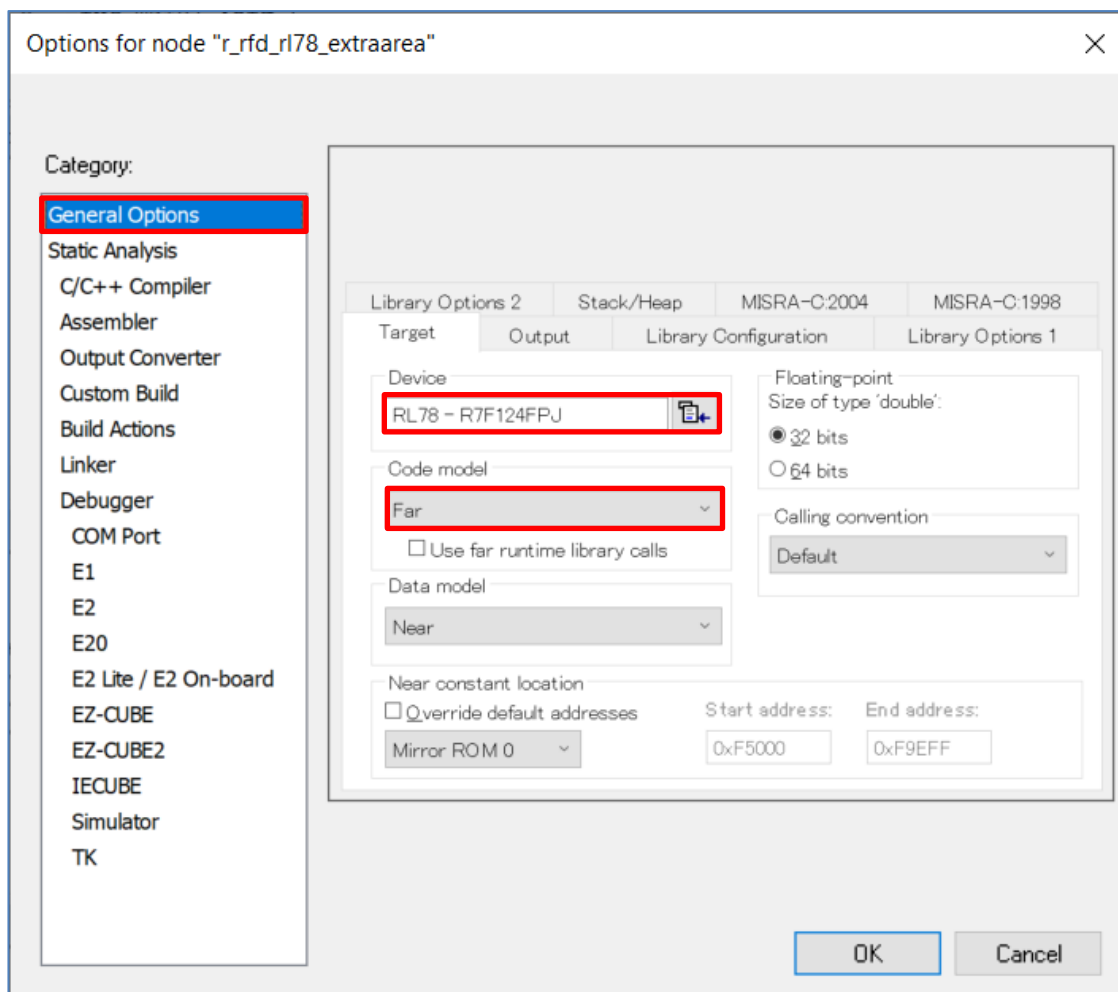
- For extra area reprogramming : sample_linker_file_EX_FSW.icf
(\EX_sample\RL78_F24\IAR\)



* 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 02" chapter after "RL78 Family Renesas Flash Driver RL78 Type 02 User's Manual(R20UT5009)" Rev.1.11 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].

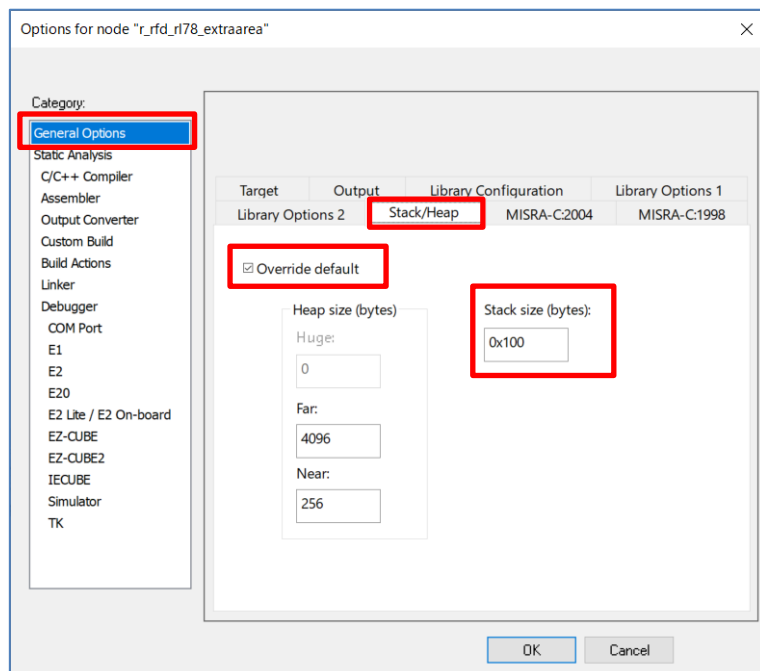
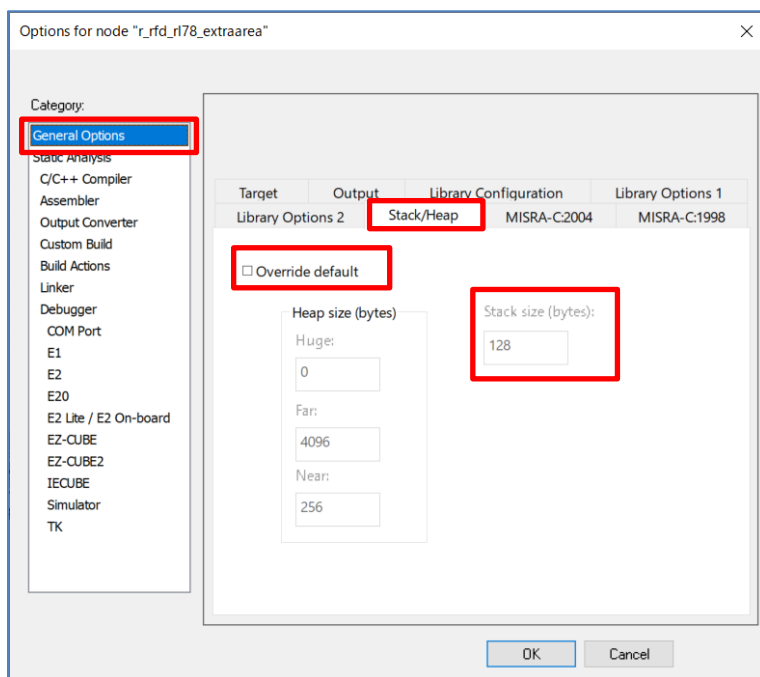


(3-3-1) Stack setting

The initial value of the stack size of IAR Embedded Workbench for RL78 is 128 bytes. When the stack used by a user program and RFD RL78 Type02 exceeds this size, it is necessary to modify use stack size.

When reprogramming an extra area, in consideration of adding user processing, obtaining the stack size about 0x100(256)byte is recommended.

<<The example of a stack setting>>



(4) Include Path Settings

The figure shows the case of RL78/F24. Replace the folder name for the RL78/F24 sample ("RL78_F24") with the folder name for the target product also on here. Replace the folder name in the case of using RL78/F23 to "RL78_F23"

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

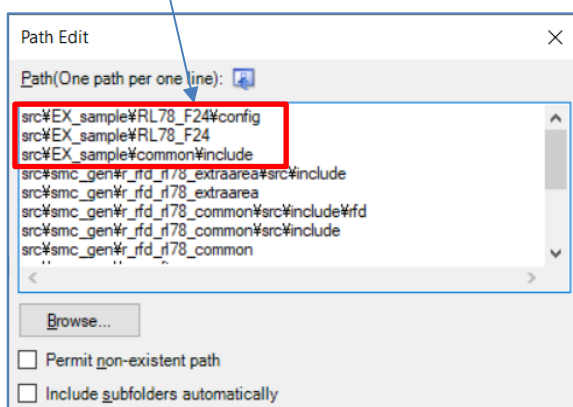
Setting of the include path on CS+ inputs path in "Common Options" tab.

- 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_F24\config  
src\EX_sample\RL78_F24  
src\EX_sample\common\include
```



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

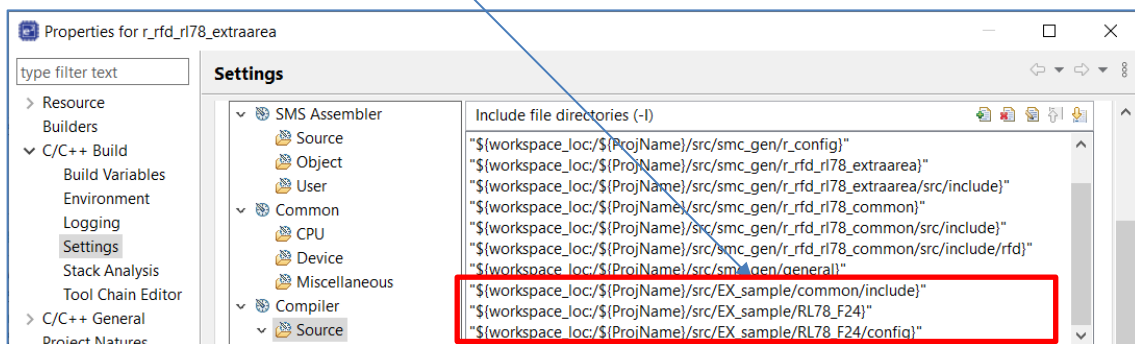
(4-2) Setting of the include path on e² studio

Setting of the include path on e² studio inputs path in “Properties” window.

- Input the Include directory path in the window displayed by selection of “C/C++ Build” [Settings] - “Compiler” [Source].

Those include path to add is shown below.

```
$(workspace_loc:${ProjName})/src/EX_sample/common/include}
$(workspace_loc:${ProjName})/src/EX_sample/RL78_F24}
$(workspace_loc:${ProjName})/src/EX_sample/RL78_F24/config}
```



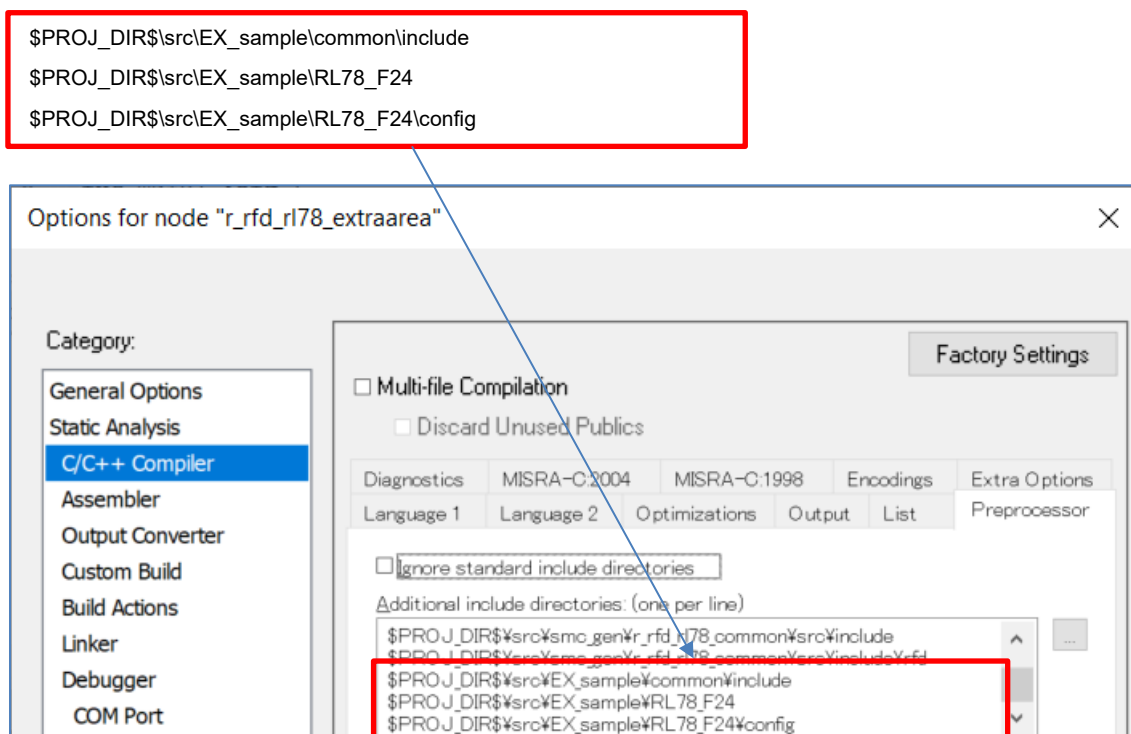
- * It is an example of the include path in the case which extracted EX_sample.zip directly under the src folder.

(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 DF_sample.zip directly under the src folder.

(5) Device Item Settings

(5-1) Setting of the device Items on CS+

Refer to the chapter of “Device Item Settings” of Renesas Flash Driver RL78 Type 02 user's manual (R20UT5009).

(5-2) Setting of the device Items on e² studio

Refer to the chapter of “Device Item Settings” of Renesas Flash Driver RL78 Type 02 user's manual (R20UT5009).

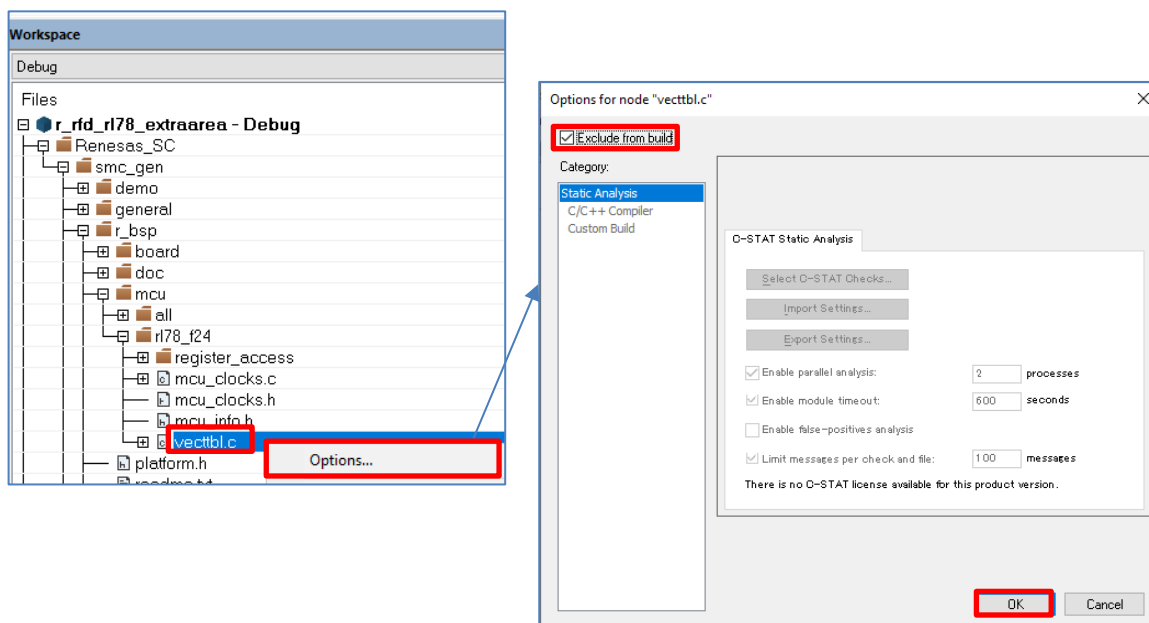
(5-3) Setting of the device Items on IAR EW for Renesas RL78

Option bytes will be set to the following values if it builds including vecttbl.c prepared as a sample program.

- User option byte: 0x6E6FE8
- On-chip debug option byte: 0xA5
- Security option byte: 0xFE

When the code is generated by Smart Configurator, vecttbl.c is generated to a “smc_gen\r_bsp\mcu\rl78_f24\” 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_f24\ vecttbl.c” in the [project] on a tree. And select an “option” and set a “check” to [Exclude from build] in the displayed screen.



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

Describe the sample_extraarea_main function included in r_flash_sample_extraarea_rl78f2x.c like the “main function” for the project. And build, download and execute it.

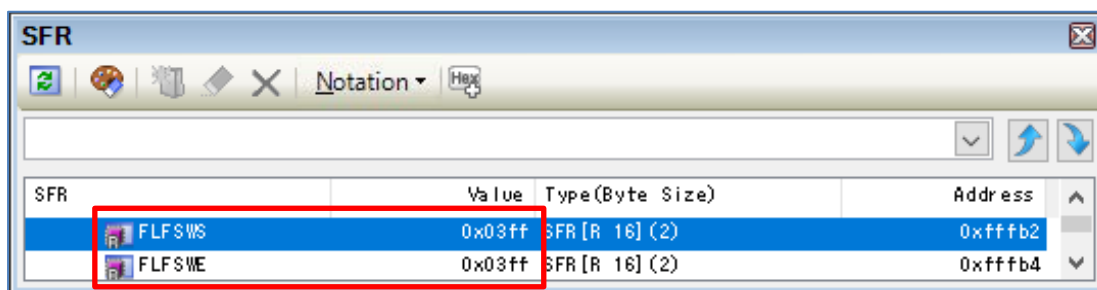
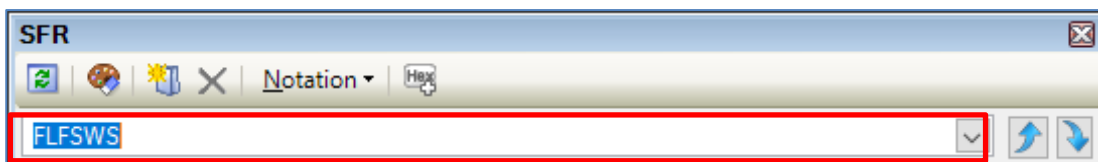
- * The header file which described the prototype declaration for sample_extraarea_main function. Include prepared “r_flash_sample_extraarea_rl78f2x.h”.

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.



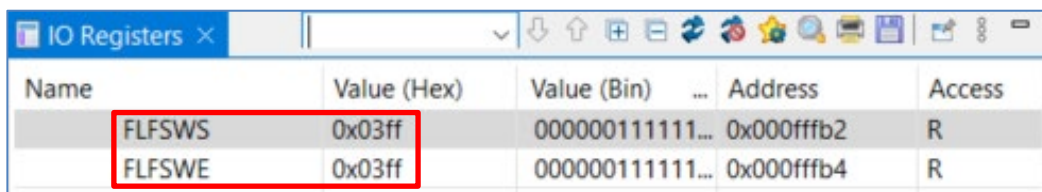
- (4) Select [Debug]menu - [Go] and the program is executed. Check that the values of “FLFSWS and FLFSWE” displayed on the SFR window has changed after stopping the program.

FLFSWS : 0x0000

FLFSWE : 0x0100

2.4.2 In Case of e² studio

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



Name	Value (Hex)	Value (Bin)	Address	Access
FLFSWS	0x03ff	000000111111...	0x000fffb2	R
FLFSWE	0x03ff	000000111111...	0x000fffb4	R

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

FLFSWS : 0x0000

FLFSWE : 0x0100

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:		Group: Others
Name	Value	Access
FLFSWS	0x03ff	ReadOnly
FLFSWE	0x03ff	ReadOnly
FSSET	0x00	ReadWrite

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

FLFSWS : 0x0000

FLFSWE : 0x0100

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/F23, F24 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 02 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) Points to note when using the Internal verify command
Execute the internal verify command only once for the target area immediately after writing.
- (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 e² 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 e² 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".
 - Example settings for IAR Embedded Workbench :
Put a check mark on "Hardware Setup" of the "Emulator" menu. Select "Download and Debug" from "Project" menu. And if "E2/E2Lite Hardware Setup" screen is displayed, check to "Use flash self programming" of the item of "Flash".
- (6) The precautions in the case of executing the data copy from ROM to RAM, when using CC-RL compiler.
When using CC-RL compiler, the Sample_Extra_INITSCT function is called from the main function of main.c file. This function copies the data and the program for RFD RL78 Type 02 to RAM from ROM. The area copied to RAM by this function cannot be allocated to extend across the 64K-byte boundary. Be sure to allocate this area so that it does not extend across the 64K-byte boundary.
However, the following setting will be necessary if this processing is executed by the start-up routine in the cstart.asm file which is a CC-RL compiler function.
(CC-RL compiler function : "Initialization of RAM area sections by using an initialization table [V1.12 or later]")
 - Set "-ram_init_table_section" by linker.
 - Set "__USE_RAM_INIT_TABLE" to the column which defines the macro of assemble options.
 - * For details, please refer to the user's manual of CC-RL compiler
 - Because "copy processing from ROM to RAM" of a Sample_Extra_INITSCT function duplicates in this case, it is necessary to set same [Macro definition] as "Compiler Option", and to cancel processing of a Sample_Extra_INITSCT function.
 - Set "__USE_RAM_INIT_TABLE" to the column which defines the macro of compiler options.

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/F23, F24 User's Manual Hardware	R01UH0944
2	RL78 Family Board Support Package Module	R01AN5522
3	RL78 Family Renesas Flash Driver RL78 Type 02 User's Manual	R20UT5009
4	E1/E20/E2 Emulator, E2 Emulator Lite Additional Document for User's Manual (Notes on Connection of RL78)	R20UT1994

5. Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Dec.29.22	—	Newly created.
1.01	May.29.26	—	Minor errors are corrected, and some descriptions have been improved.

General Precautions in the Handling of Microprocessing Unit and Microcontroller Unit Products

The following usage notes are applicable to all Microprocessing unit and Microcontroller unit products from Renesas. For detailed usage notes on the products covered by this document, refer to the relevant sections of the document as well as any technical updates that have been issued for the products.

1. Precaution against Electrostatic Discharge (ESD)

A strong electrical field, when exposed to a CMOS device, can cause destruction of the gate oxide and ultimately degrade the device operation. Steps must be taken to stop the generation of static electricity as much as possible, and quickly dissipate it when it occurs. Environmental control must be adequate. When it is dry, a humidifier should be used. This is recommended to avoid using insulators that can easily build up static electricity. Semiconductor devices must be stored and transported in an anti-static container, static shielding bag or conductive material. All test and measurement tools including work benches and floors must be grounded. The operator must also be grounded using a wrist strap. Semiconductor devices must not be touched with bare hands. Similar precautions must be taken for printed circuit boards with mounted semiconductor devices.

2. Processing at power-on

The state of the product is undefined at the time when power is supplied. The states of internal circuits in the LSI are indeterminate and the states of register settings and pins are undefined at the time when power is supplied. In a finished product where the reset signal is applied to the external reset pin, the states of pins are not guaranteed from the time when power is supplied until the reset process is completed. In a similar way, the states of pins in a product that is reset by an on-chip power-on reset function are not guaranteed from the time when power is supplied until the power reaches the level at which resetting is specified.

3. Input of signal during power-off state

Do not input signals or an I/O pull-up power supply while the device is powered off. The current injection that results from input of such a signal or I/O pull-up power supply may cause malfunction and the abnormal current that passes in the device at this time may cause degradation of internal elements. Follow the guideline for input signal during power-off state as described in your product documentation.

4. Handling of unused pins

Handle unused pins in accordance with the directions given under handling of unused pins in the manual. The input pins of CMOS products are generally in the high-impedance state. In operation with an unused pin in the open-circuit state, extra electromagnetic noise is induced in the vicinity of the LSI, an associated shoot-through current flows internally, and malfunctions occur due to the false recognition of the pin state as an input signal become possible.

5. Clock signals

After applying a reset, only release the reset line after the operating clock signal becomes stable. When switching the clock signal during program execution, wait until the target clock signal is stabilized. When the clock signal is generated with an external resonator or from an external oscillator during a reset, ensure that the reset line is only released after full stabilization of the clock signal. Additionally, when switching to a clock signal produced with an external resonator or by an external oscillator while program execution is in progress, wait until the target clock signal is stable.

6. Voltage application waveform at input pin

Waveform distortion due to input noise or a reflected wave may cause malfunction. If the input of the CMOS device stays in the area between V_{IL} (Max.) and V_{IH} (Min.) due to noise, for example, the device may malfunction. Take care to prevent chattering noise from entering the device when the input level is fixed, and also in the transition period when the input level passes through the area between V_{IL} (Max.) and V_{IH} (Min.).

7. Prohibition of access to reserved addresses

Access to reserved addresses is prohibited. The reserved addresses are provided for possible future expansion of functions. Do not access these addresses as the correct operation of the LSI is not guaranteed.

8. Differences between products

Before changing from one product to another, for example to a product with a different part number, confirm that the change will not lead to problems. The characteristics of a microprocessing unit or microcontroller unit products in the same group but having a different part number might differ in terms of internal memory capacity, layout pattern, and other factors, which can affect the ranges of electrical characteristics, such as characteristic values, operating margins, immunity to noise, and amount of radiated noise. When changing to a product with a different part number, implement a system-evaluation test for the given product.

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall be responsible for determining what licenses are required from any third parties, and obtaining such licenses for the lawful import, export, manufacture, sales, utilization, distribution or other disposal of any products incorporating Renesas Electronics products, if required.
5. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
6. Renesas Electronics products are classified according to the following two quality grades: "Standard" and "High Quality". The intended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below.

"Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.

"High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user's manual or other Renesas Electronics document.

7. No semiconductor product is absolutely secure. Notwithstanding any security measures or features that may be implemented in Renesas Electronics hardware or software products, Renesas Electronics shall have absolutely no liability arising out of any vulnerability or security breach, including but not limited to any unauthorized access to or use of a Renesas Electronics product or a system that uses a Renesas Electronics product. RENESAS ELECTRONICS DOES NOT WARRANT OR GUARANTEE THAT RENESAS ELECTRONICS PRODUCTS, OR ANY SYSTEMS CREATED USING RENESAS ELECTRONICS PRODUCTS WILL BE INVULNERABLE OR FREE FROM CORRUPTION, ATTACK, VIRUSES, INTERFERENCE, HACKING, DATA LOSS OR THEFT, OR OTHER SECURITY INTRUSION ("Vulnerability Issues"). RENESAS ELECTRONICS DISCLAIMS ANY AND ALL RESPONSIBILITY OR LIABILITY ARISING FROM OR RELATED TO ANY VULNERABILITY ISSUES. FURTHERMORE, TO THE EXTENT PERMITTED BY APPLICABLE LAW, RENESAS ELECTRONICS DISCLAIMS ANY AND ALL WARRANTIES, EXPRESS OR IMPLIED, WITH RESPECT TO THIS DOCUMENT AND ANY RELATED OR ACCOMPANYING SOFTWARE OR HARDWARE, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE.
8. When using Renesas Electronics products, refer to the latest product information (data sheets, user's manuals, application notes, "General Notes for Handling and Using Semiconductor Devices" in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
12. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
13. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
14. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.

(Note2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

(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

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.