RL78 Family

Renesas Flash Driver RL78 Type 01 SC version (Code Flash)

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 code flash memory driver" included in RFD RL78 Type 01, and it is a method for programming code flash memory 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.

Contents

1. Specification

The sample program included in RFD RL78 Type 01 erases the block 14 (0x00007000) of a code flash area, and programs 64 bytes of data from the top of the block 14.

1.1 Operating Environment

- C Compiler Packages

Table 1-1 The target C Compiler Packages

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

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- 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.

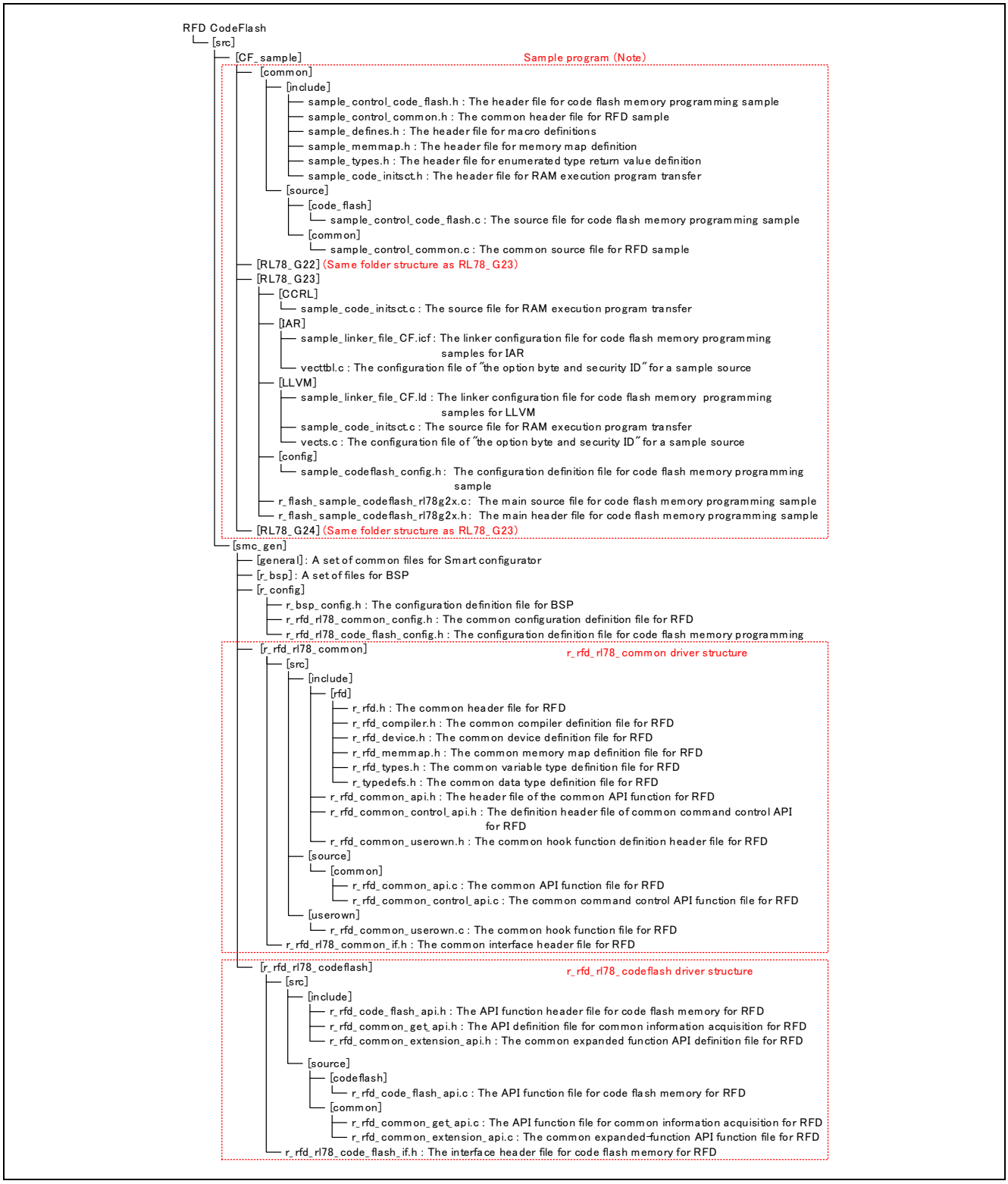


Figure 1.1 Structure of Sample Program Folders

Note: The sample program of a zip file format downloads by Smart configurator. Extract the compressed file (CF_sample.zip) outputted to the "demo" folder, and move the [CF_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 change	
r_rfd_common_control_api.c	No change	

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 change	

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 change	
r_rfd_common_control_api.h	No change	
r_rfd_common_userown.h	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\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 1-7 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 Code Flash Driver (r_rfd_rl78_codeflash)

The difference of SC version RFD code flash driver and Simple version code flash 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 code flash driver.

Table 1-8 Difference of the files of the SC version RFD and the simple version RFD (Code flash API : r_rfd_rl78_codeflash\src\source\codeflash)

File name	Simple version	SC version
r_rfd_code_flash_api.c	No change	

Table 1-9 Difference of the files of the SC version RFD and the simple version RFD (Code flash API : r_rfd_rl78_codeflash\src\source\common)

File name	Simple version	SC version
r_rfd_common_get_api.c	No change	
r_rfd_common_extension_api.c	No change	

Table 1-10 Difference of the files of the SC version RFD and the simple version RFD (Code flash API header : r_rfd_rl78_codeflash\src\include)

File name	Simple version	SC version
r_rfd_code_flash_api.h	No change	
r_rfd_common_get_api.h	No change	
r_rfd_common_extension_api.h	No change	

Table 1-11 Difference of the files of the SC version RFD and the simple version RFD (Code flash interface header : r_rfd_rl78_codeflash)

File name	Simple version	SC version
r_rfd_rl78_code_flash_if.h	-	Newly created. Include the header file for code flash API.

1.4 Code Flash Programming Processing Using a Sample Program

Figure 1.2 shows the flow chart of the sample program. The sample_codeflash_main function copies the "program executed on RAM" to RAM area from ROM area. And processing which reprograms code flash is executed on RAM.

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

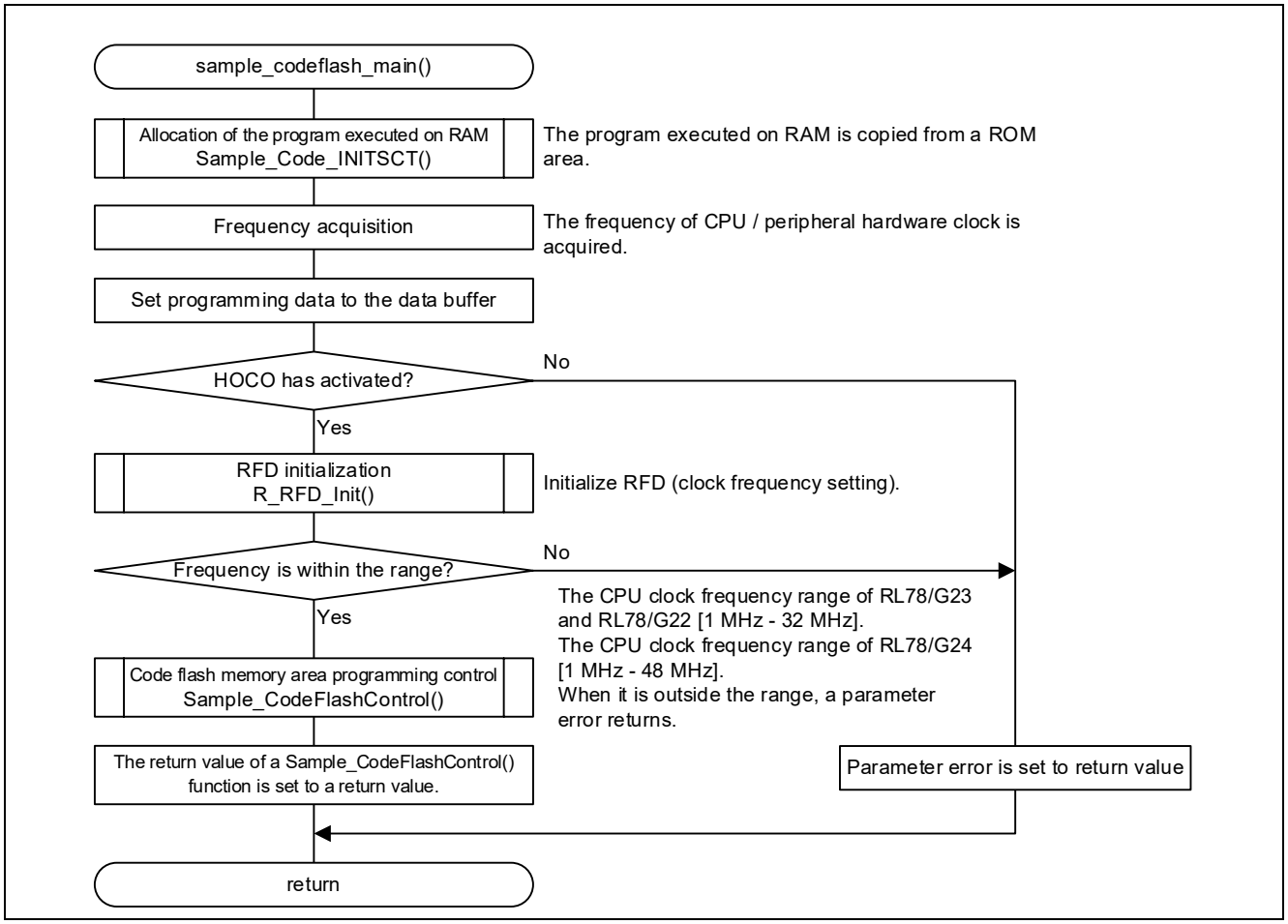


Figure 1.2 the flow chart of the sample program

Notes: 1. In the code flash memory programming mode, the programs in the code flash memory cannot be executed. Copy the Sample_CodeFlashControl 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 Code Flash Reprogramming

2.1 Example of Creating a Sample Project

2.1.1 In Case of CS+

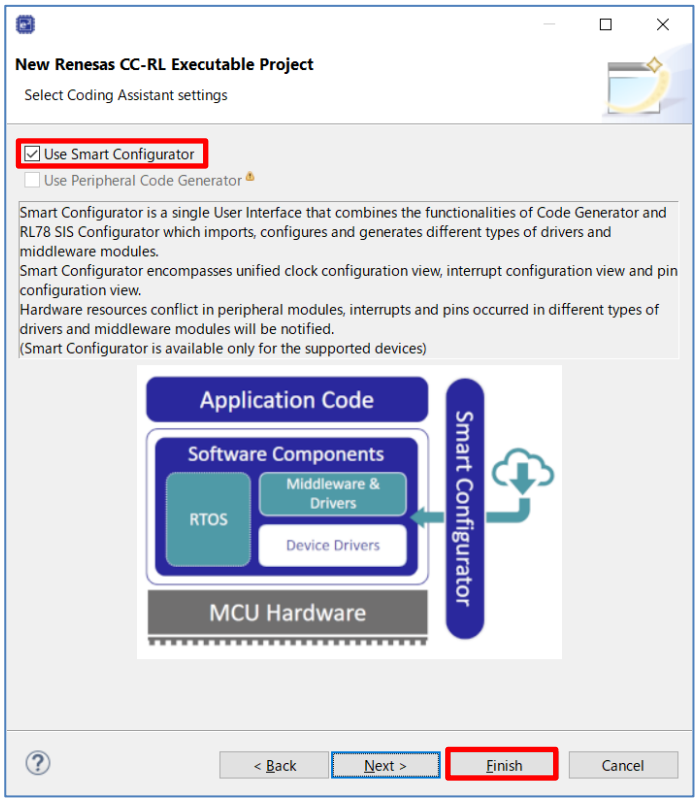
Refer to Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830) "Example of Creating a Sample Project" to create a project.

2.1.2 In Case of e^2 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

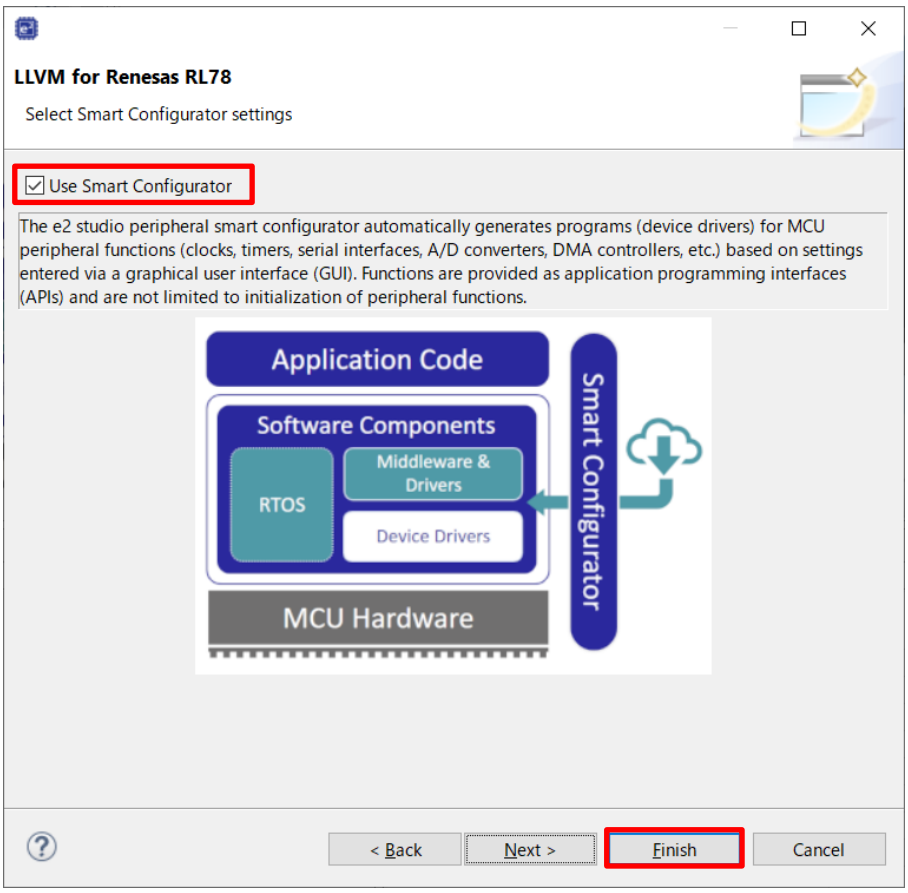
Refer to Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830) "Example of Creating a Sample Project" to create a project.

2.1.4 In Case of e^2 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.

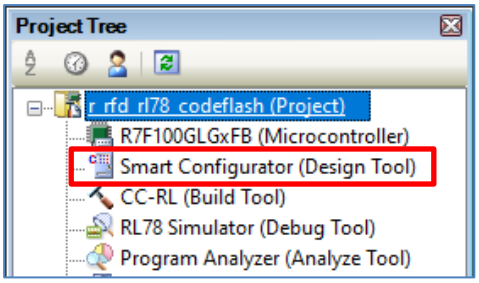
Select "Use Smart Configurator" and press a "Finish" button.



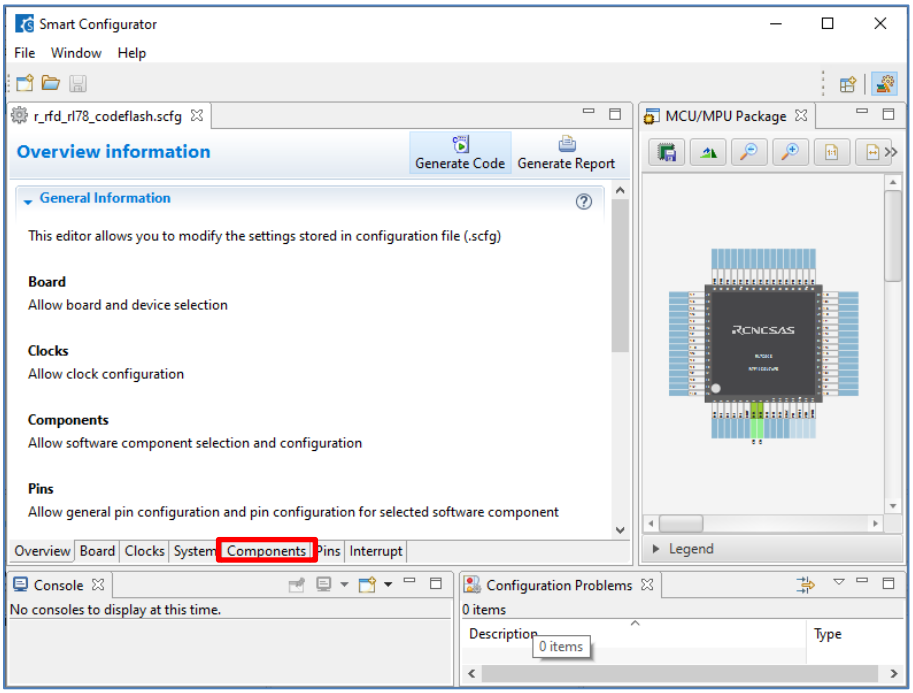
2.2 Example of Source Code Registration

2.2.1 In Case of CS+

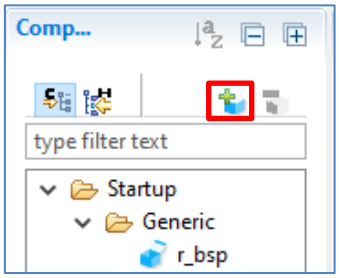
(1) Double-click "Smart Configurator" (design Tool) of "Project Tree", and start Smart Configurator.



(2) Select a "Components" tab.

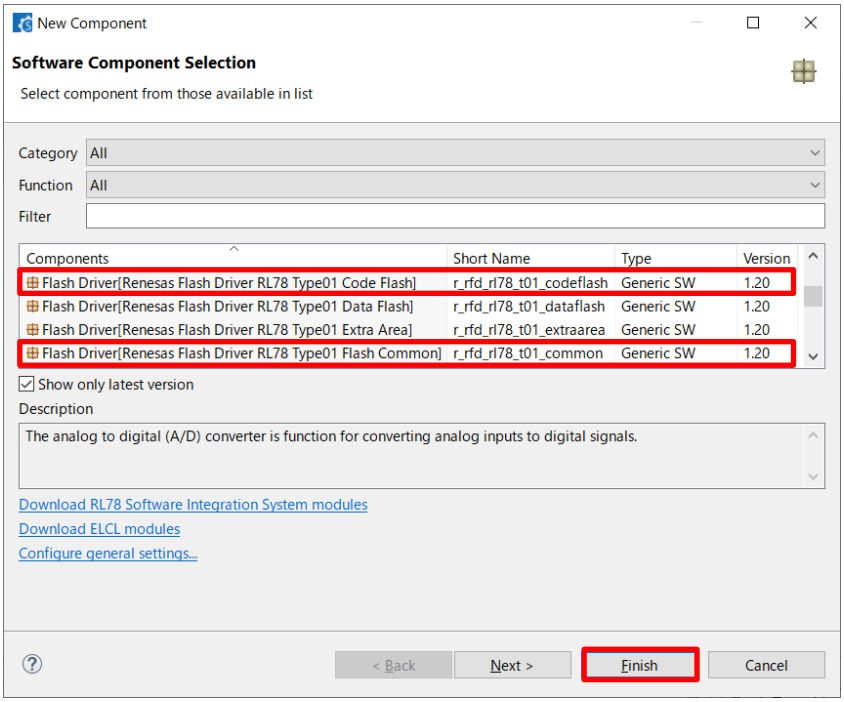


(3) Press the "addition" button of "Components" and open the "addition" dialog of "Components".

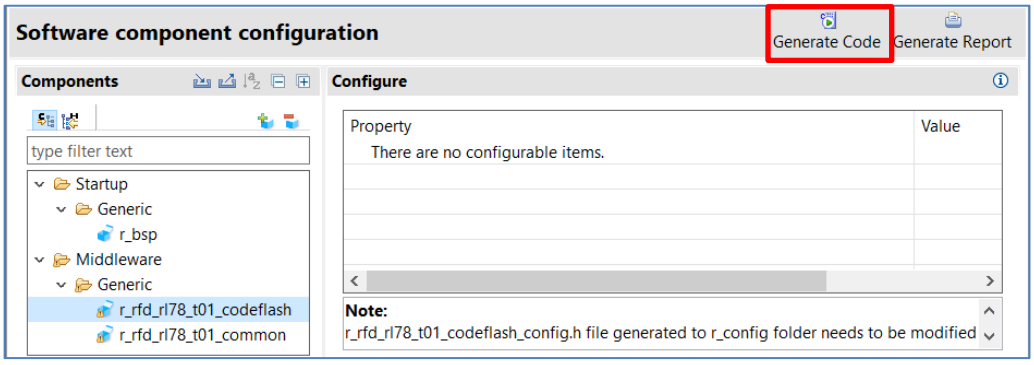


(4) Select the following components and press a "Finish" button.

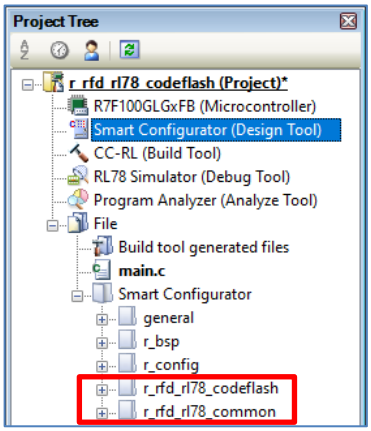
- Flash Driver[Renesas Flash Driver RL78 Type 01 Code Flash](r_rfd_rl78_t01_codeflash)
- Flash Driver[Renesas Flash Driver RL78 Type 01 Flash Common](r_rfd_rl78_t01_common)



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

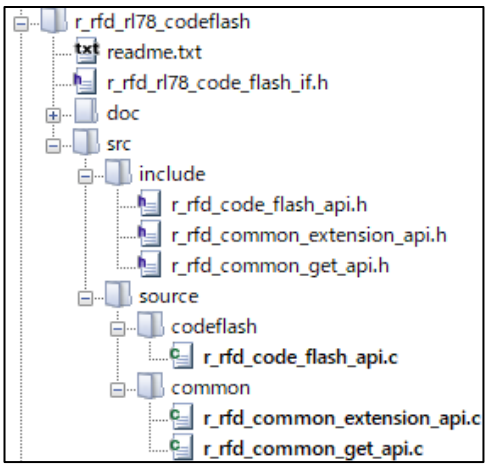


(6) The "r_rfd_rl78_common" folder and the "r_rfd_rl78_codeflash" folder is added to the project tree.

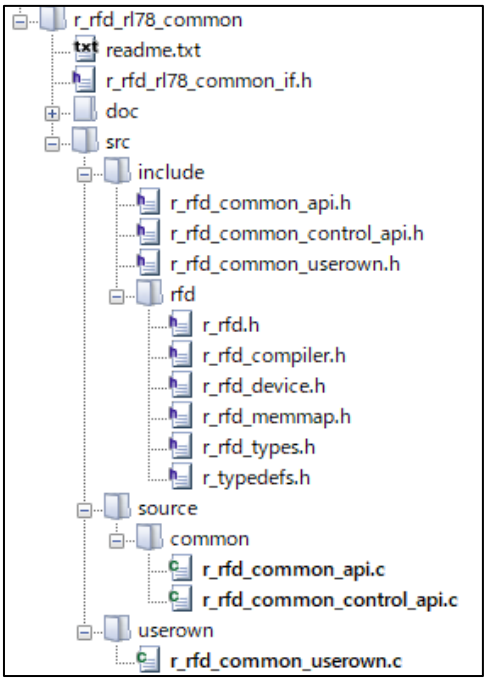


Each folder is developed as follows.

The developed r_config folder



The developed r_rfd_rl78_codeflash folder

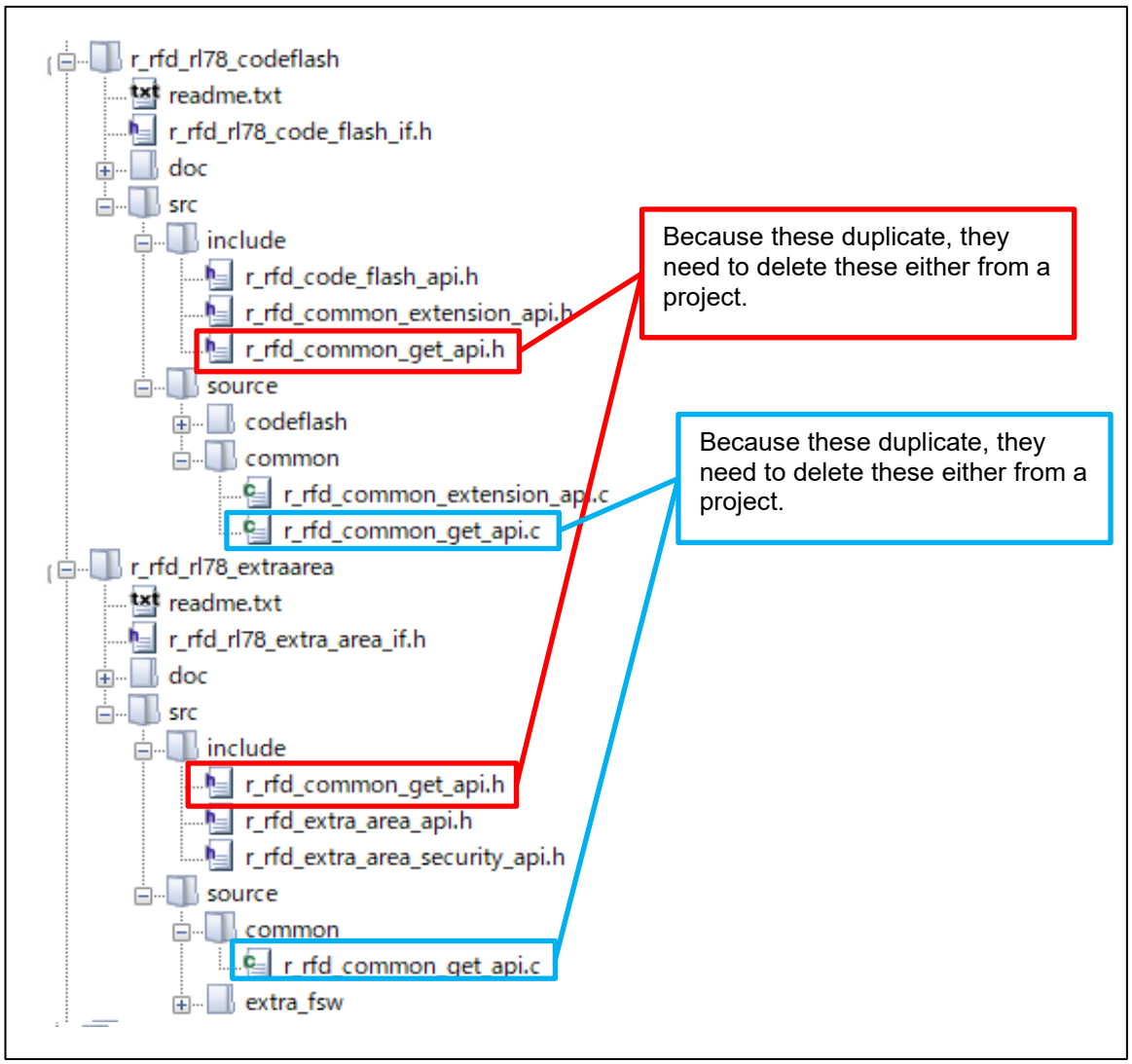


The developed r_rfd_rl78_common folder

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

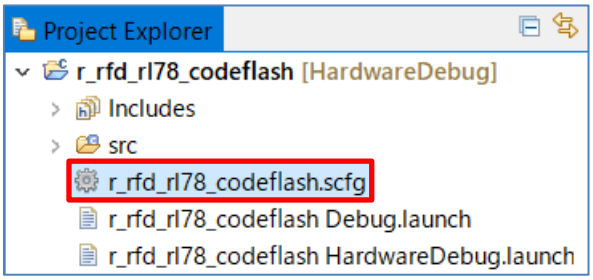
In the case which uses r_rfd_rl78_codeflash and r_rfd_rl78_extraarea at the same time, as shown in the following figure, "r_rfd_common_get_api.c" and "r_rfd_common_get_api.h" overlap.

Each file needs to delete either from a project.

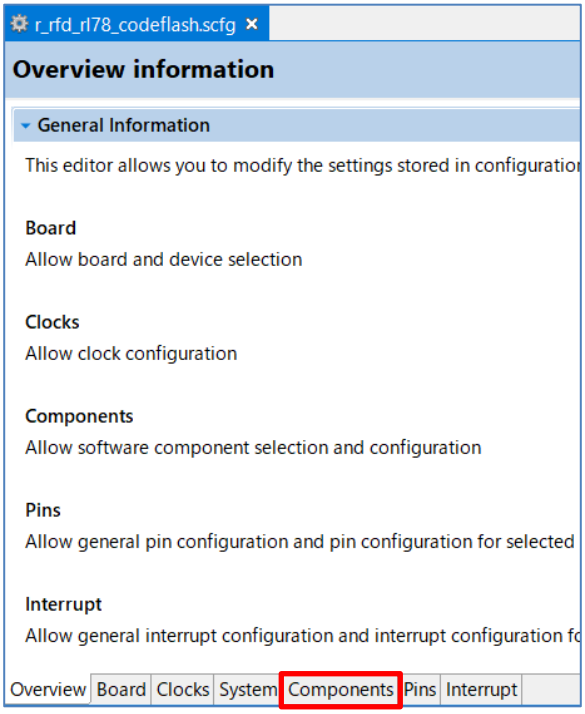


2.2.2 In Case of e² studio(CC-RL)

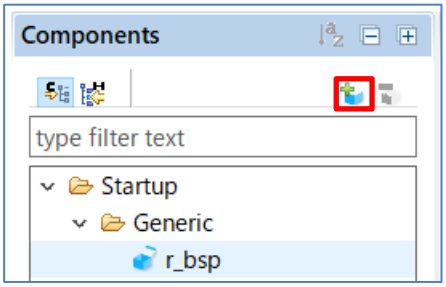
(1) Open the project file of "Smart Configurator" after starting e² studio.



(2) Select a "Components" tab.

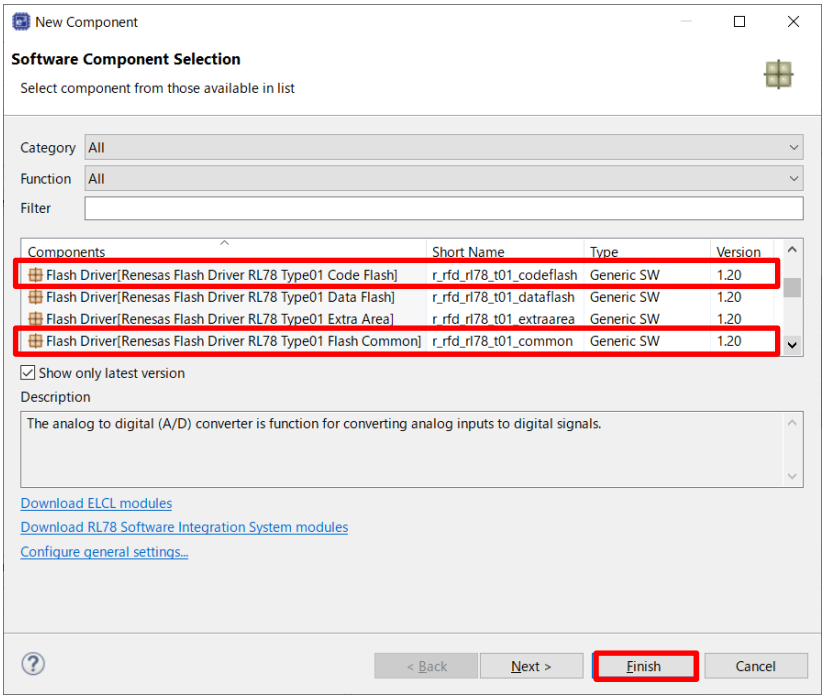


(3) Press the "addition" button of "Components" and open the "addition" dialog of "Components".

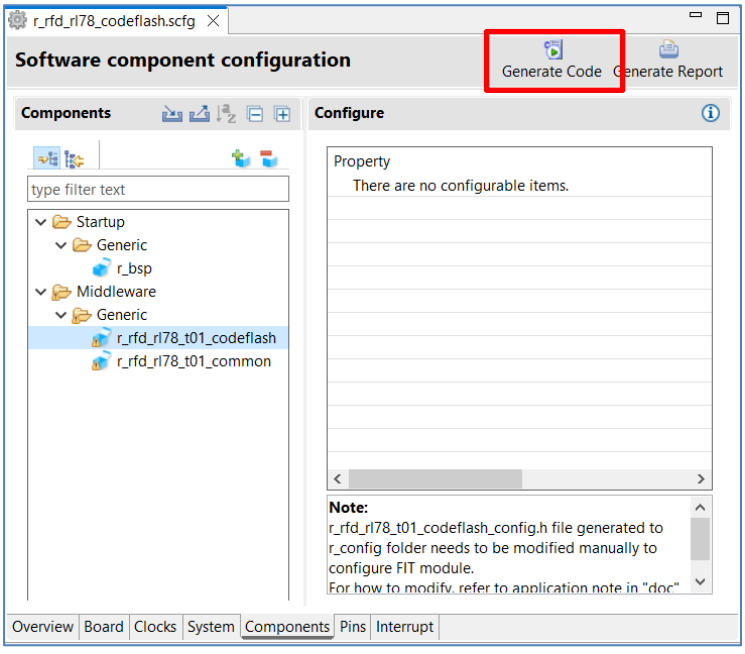


(4) Select the following components and press a "Finish" button.

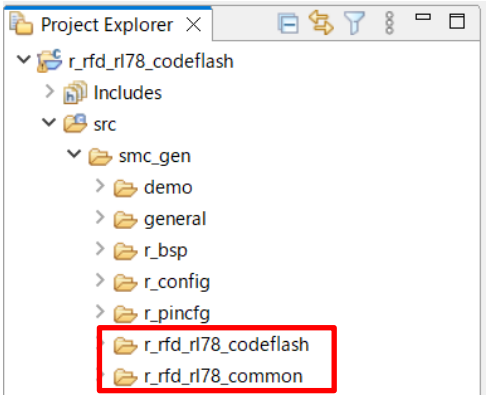
- Flash Driver[Renesas Flash Driver RL78 Type 01 Code Flash](r_rfd_rl78_t01_codeflash)
- Flash Driver[Renesas Flash Driver RL78 Type 01 Flash Common](r_rfd_rl78_t01_common)



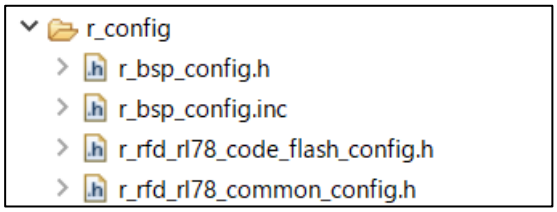
(5) Press a "Generate Code" button and generate the code.



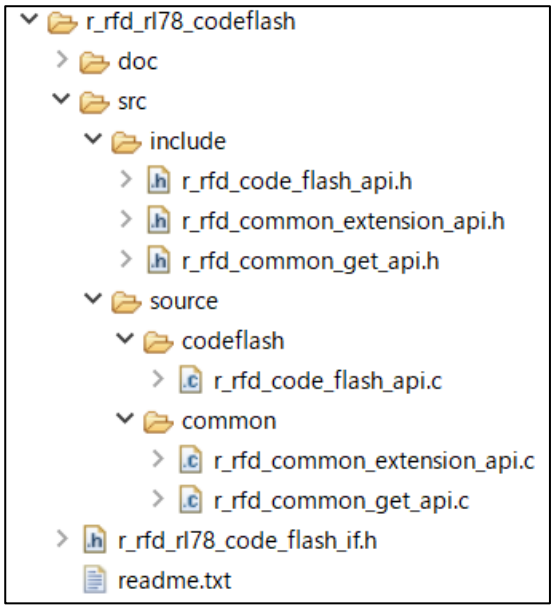
(6) The "r_rfd_rl78_common" folder and the "r_rfd_rl78_codeflash" folder is added to the project tree.



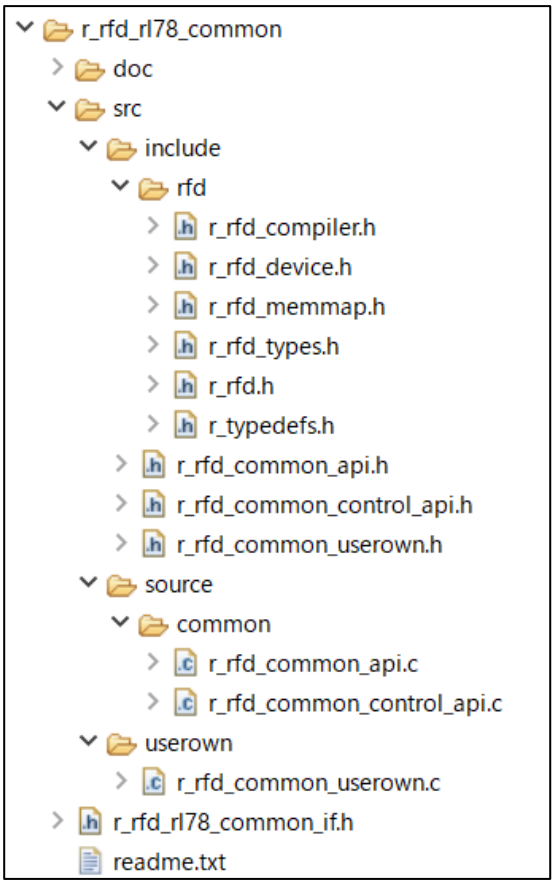
Each folder is developed as follows.



The developed r_config folder



The developed r_rfd_rl78_codeflash folder

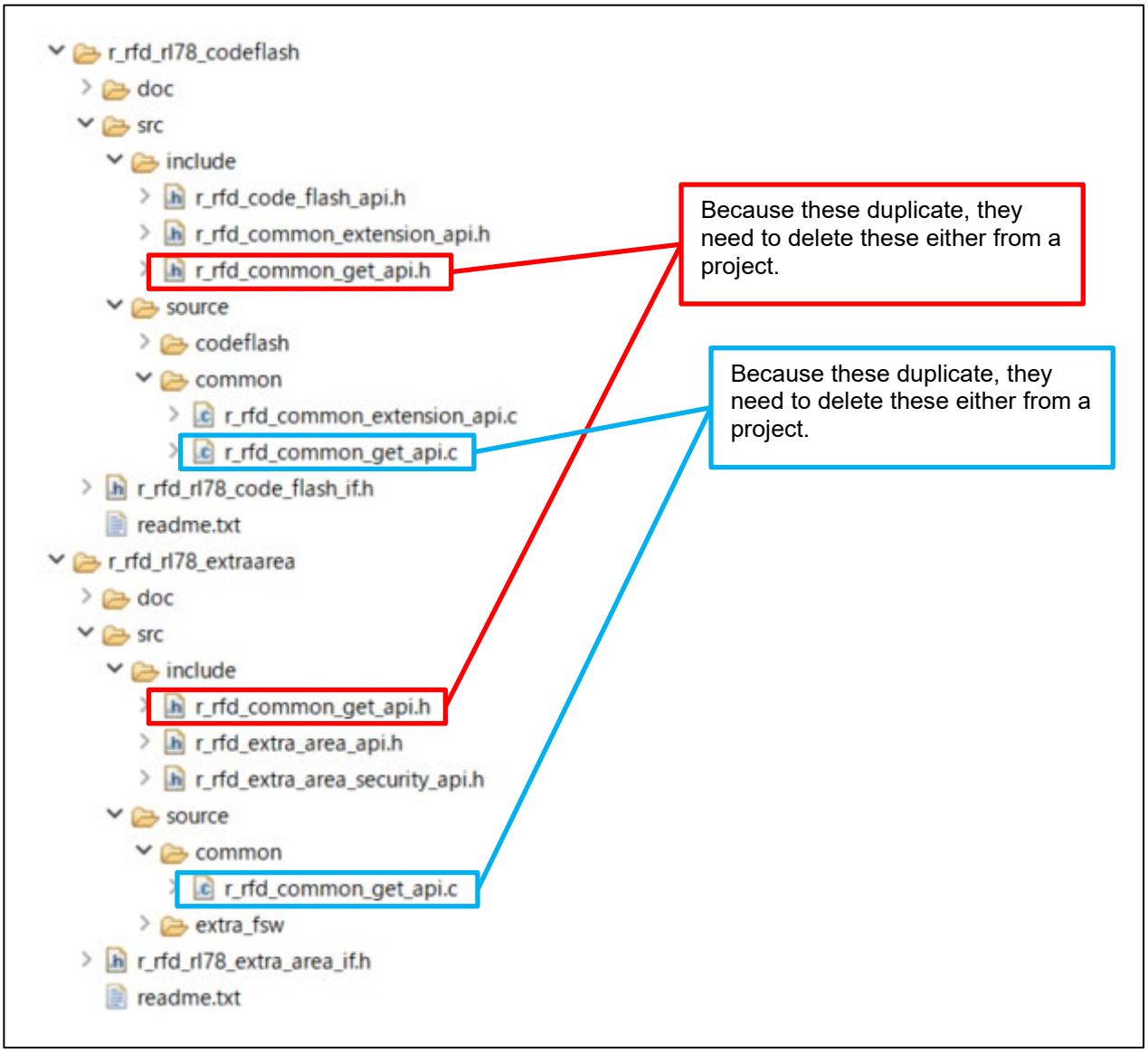


The developed r_rfd_rl78_common folder

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

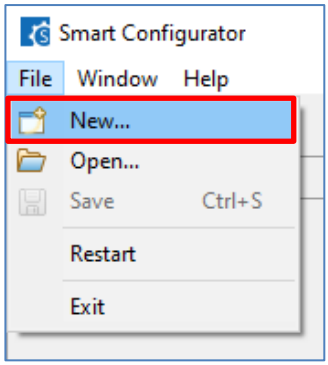
In the case which uses r_rfd_rl78_codeflash and r_rfd_rl78_extraarea at the same time, as shown in the following figure, "r_rfd_common_get_api.c" and "r_rfd_common_get_api.h" overlap.

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".

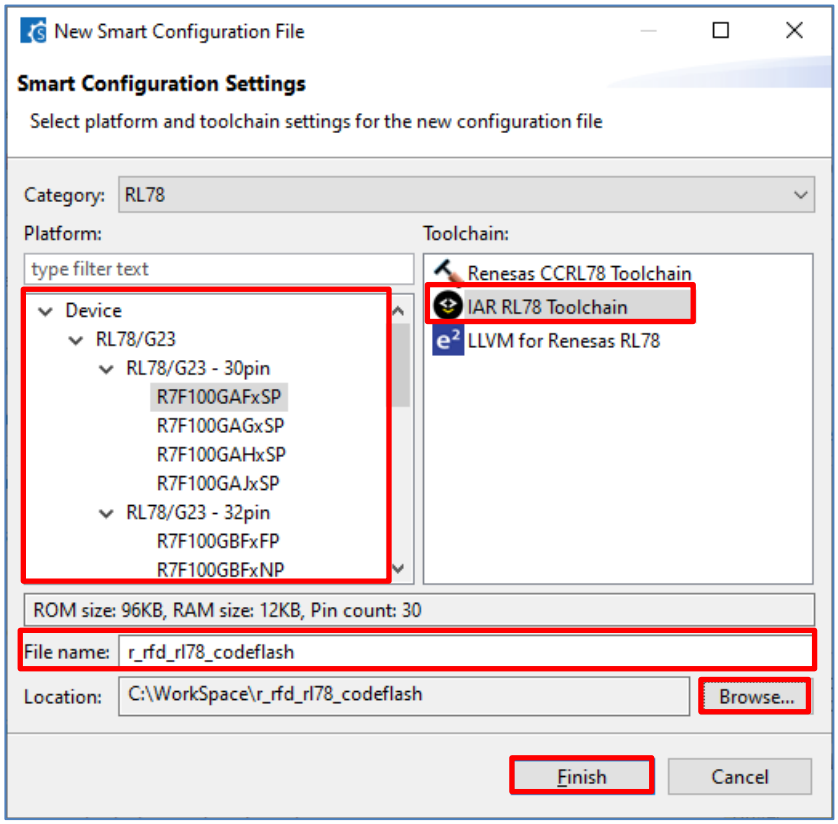
Select the same device as the device selected in "the project of IAR EW for Renesas RL78" by "Platform".

Select "IAR RL78 Toolchain" as "Toolchain".

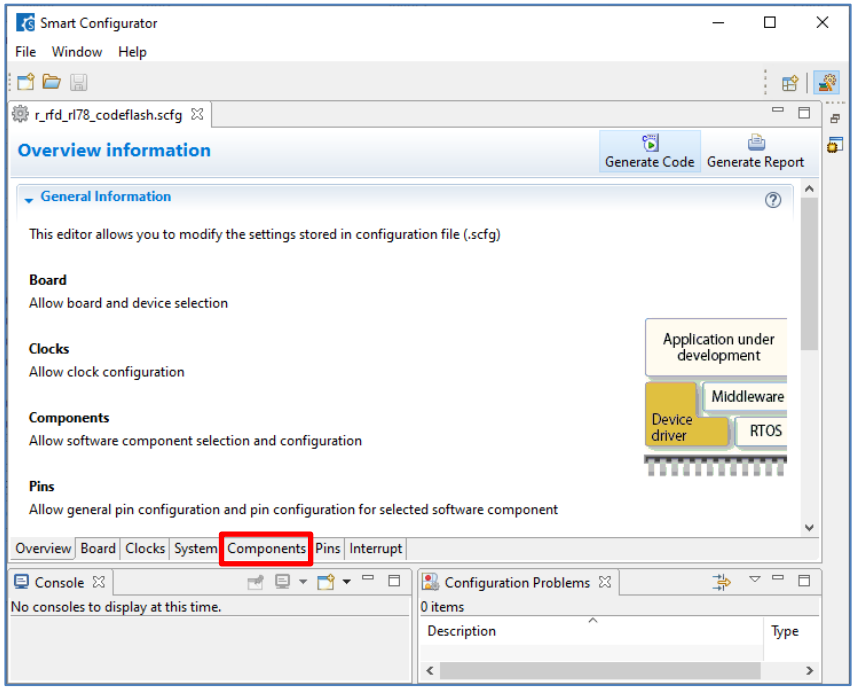
Input arbitrary names into "File name".

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

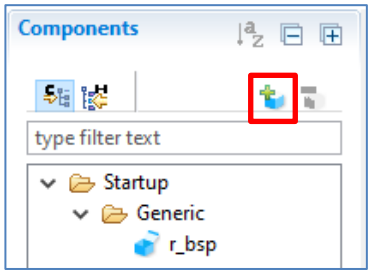
The ".setting" folder and the "<file name>.scfg" file are created to the set location.



(3) Select a "Components" tab.

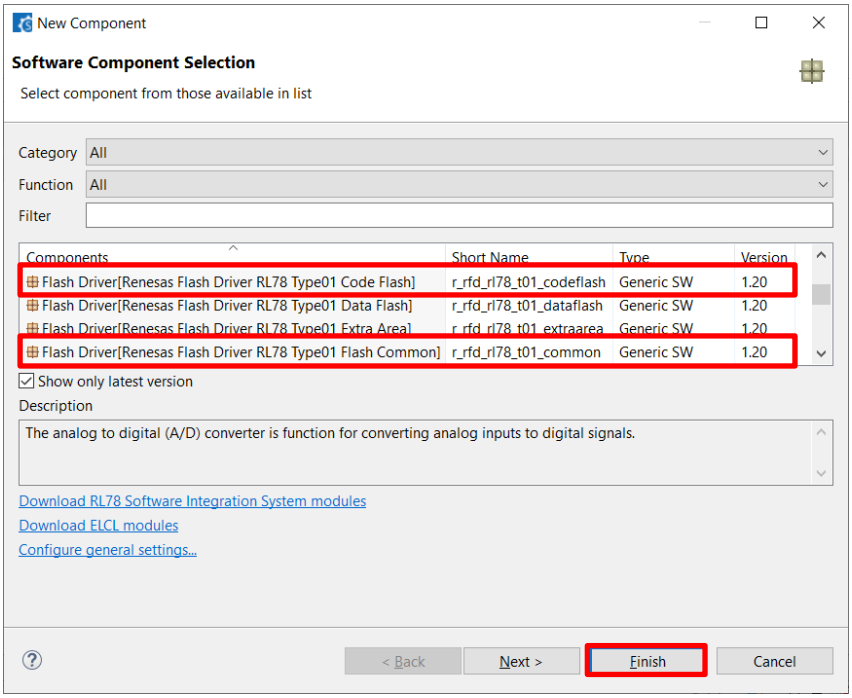


(4) Press the "addition" button of "Components" and open the "addition" dialog of "Components".

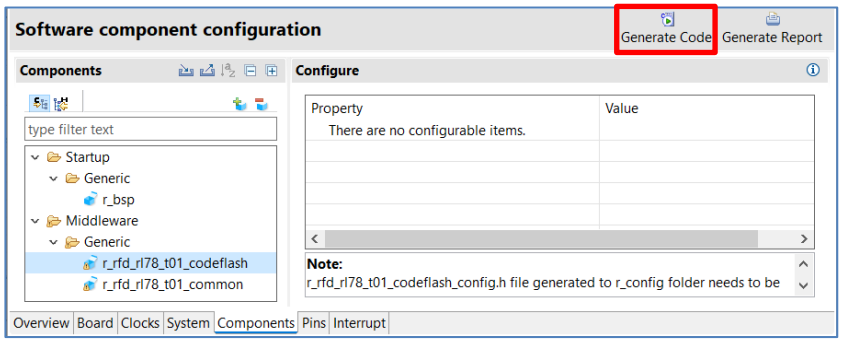


(5) Select the following components and press a "Finish" button.

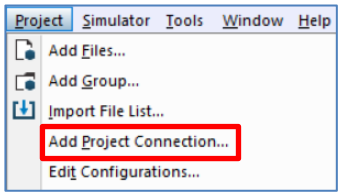
- Flash Driver[Renesas Flash Driver RL78 Type 01 Code Flash](r_rfd_rl78_t01_codeflash)
- Flash Driver[Renesas Flash Driver RL78 Type 01 Flash Common](r_rfd_rl78_t01_common)



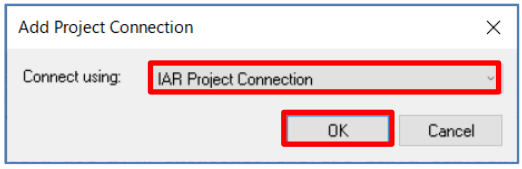
(6) Press a "Generate Code" button and close "Smart Configurator" after the completion of generation for the code.



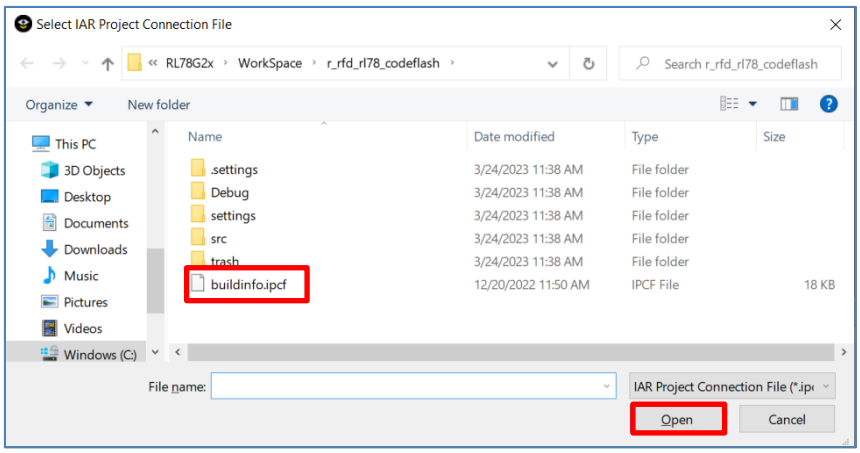
(7) Start IAR EW for Renesas RL78. And select "Project" menu [Add Project Connection], and open the additional dialog of Project Connection.



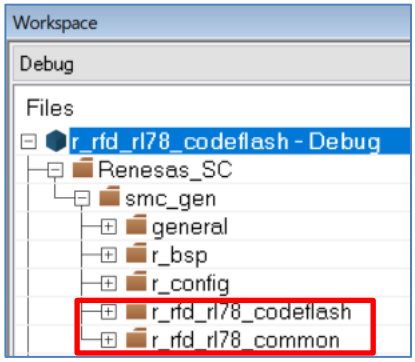
(8)Select "IAR Project Connection", and press an "OK" button.



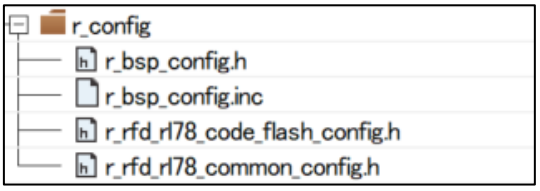
(9) Select the icpf file created by Smart Configurator and press an "Open" button.



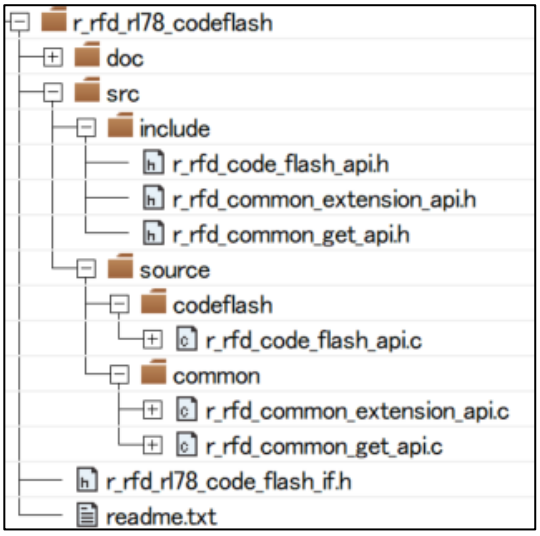
(10) "r_rfd_rl78_common" and "r_rfd_rl78_codeflash" are added to Workspace.



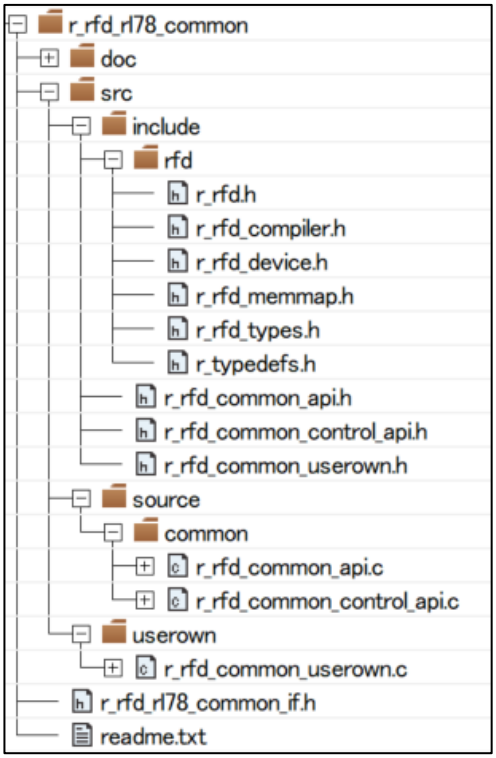
Each folder is developed as follows.



The developed r_config folder



The developed r_rfd_rl78_codeflash folder

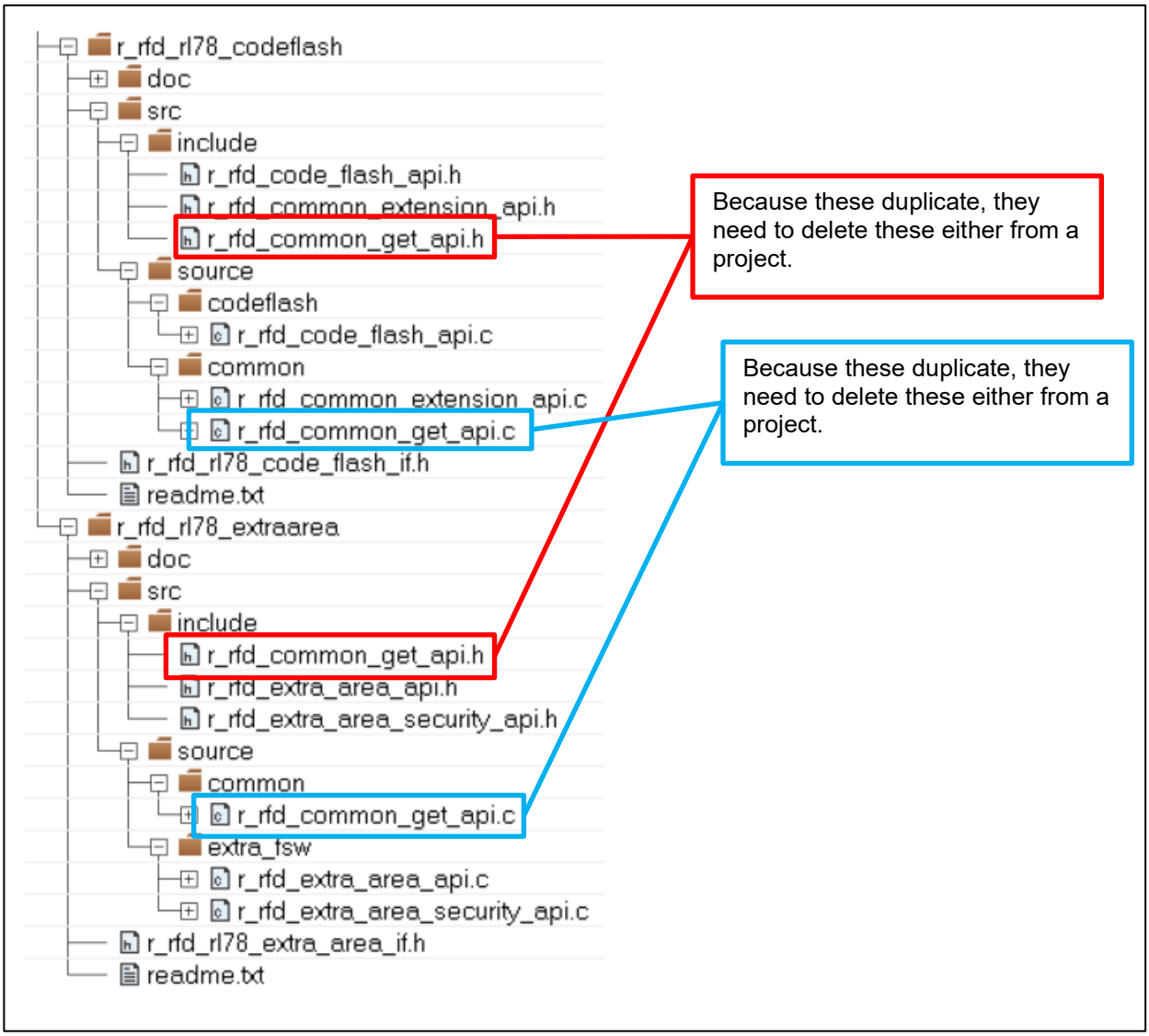


The developed r_rfd_rl78_common folder

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

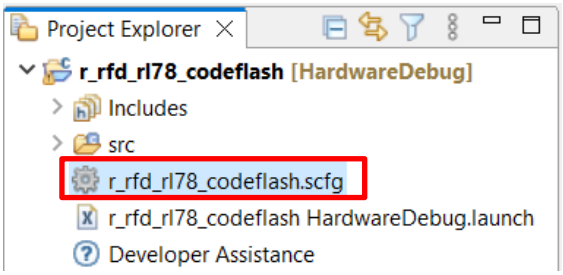
In the case which uses r_rfd_rl78_codeflash and r_rfd_rl78_extraarea at the same time, as shown in the following figure, "r_rfd_common_get_api.c" and "r_rfd_common_get_api.h" overlap.

Each file needs to delete either from a project.

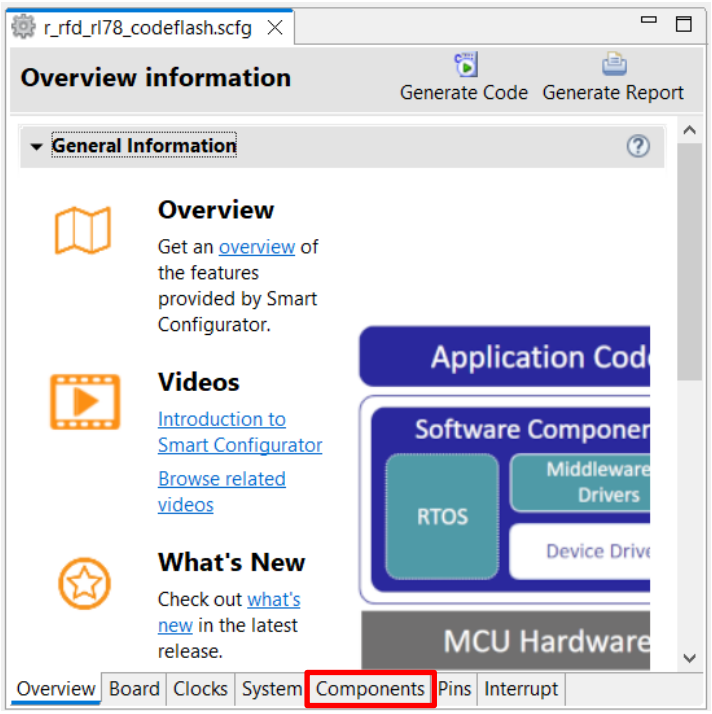


2.2.4 In Case of e² studio(LLVM)

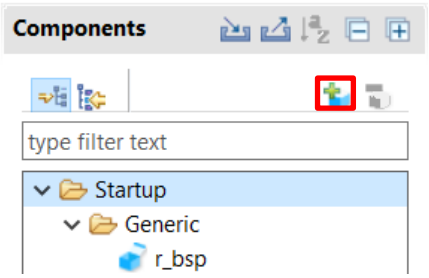
(1) Open the project file of "Smart Configurator" after starting e² studio.



(2) Select a "Components" tab.

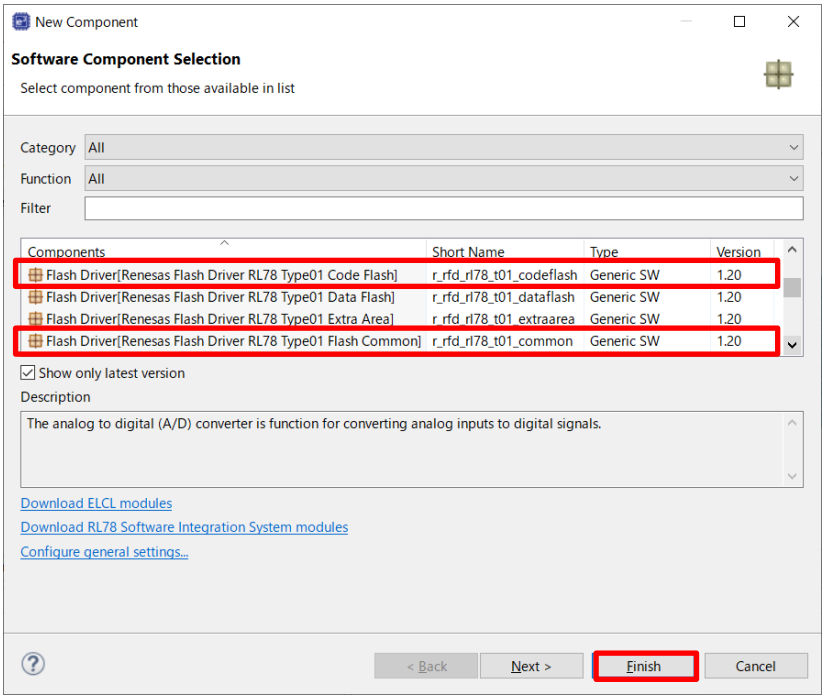


(3) Press the "addition" button of "Components" and open the "addition" dialog of "Components".

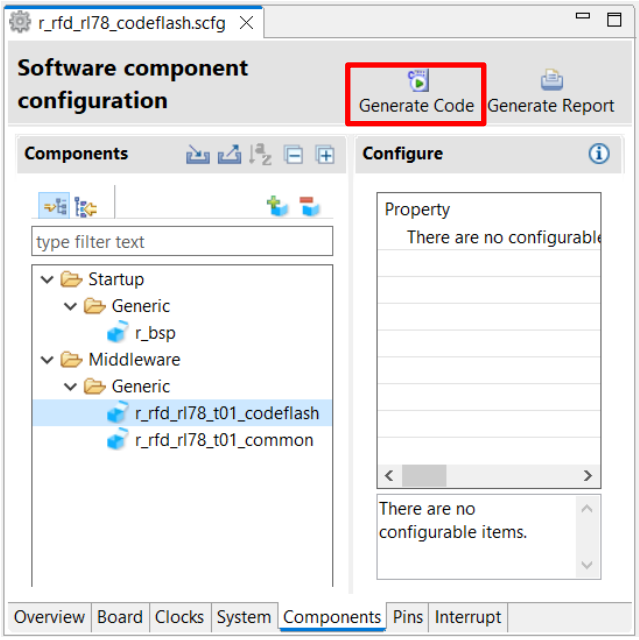


(4) Select the following components and press a "Finish" button.

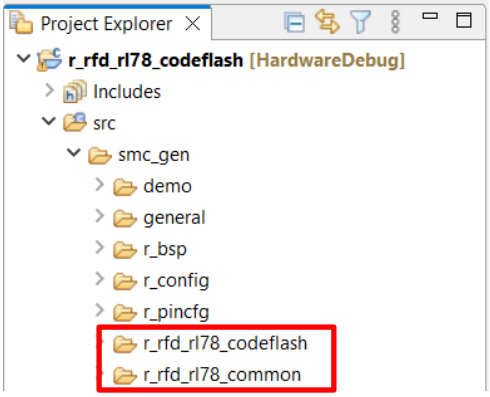
- Flash Driver[Renesas Flash Driver RL78 Type 01 Code Flash](r_rfd_rl78_t01_codeflash)
- Flash Driver[Renesas Flash Driver RL78 Type 01 Flash Common](r_rfd_rl78_t01_common)



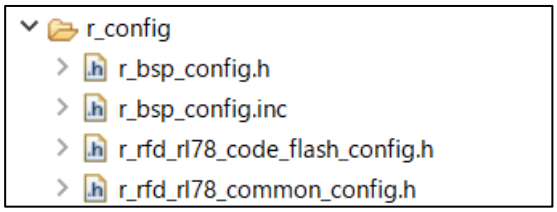
(5) Press a "Generate Code" button and generate the code.



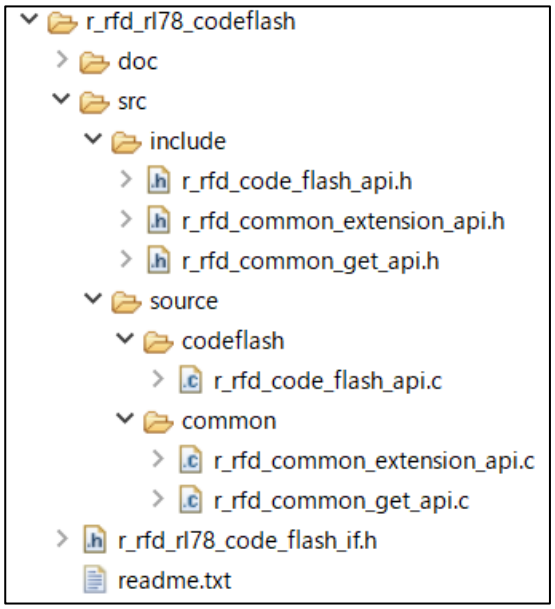
(6) The "r_rfd_rl78_common" folder and the "r_rfd_rl78_codeflash" folder is added to the project tree.



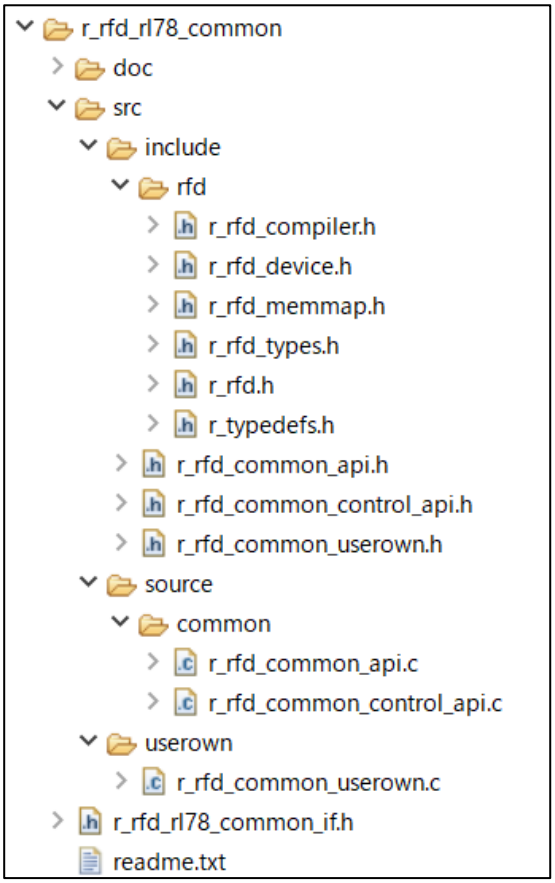
Each folder is developed as follows.



The developed r_config folder



The developed r_rfd_rl78_codeflash folder

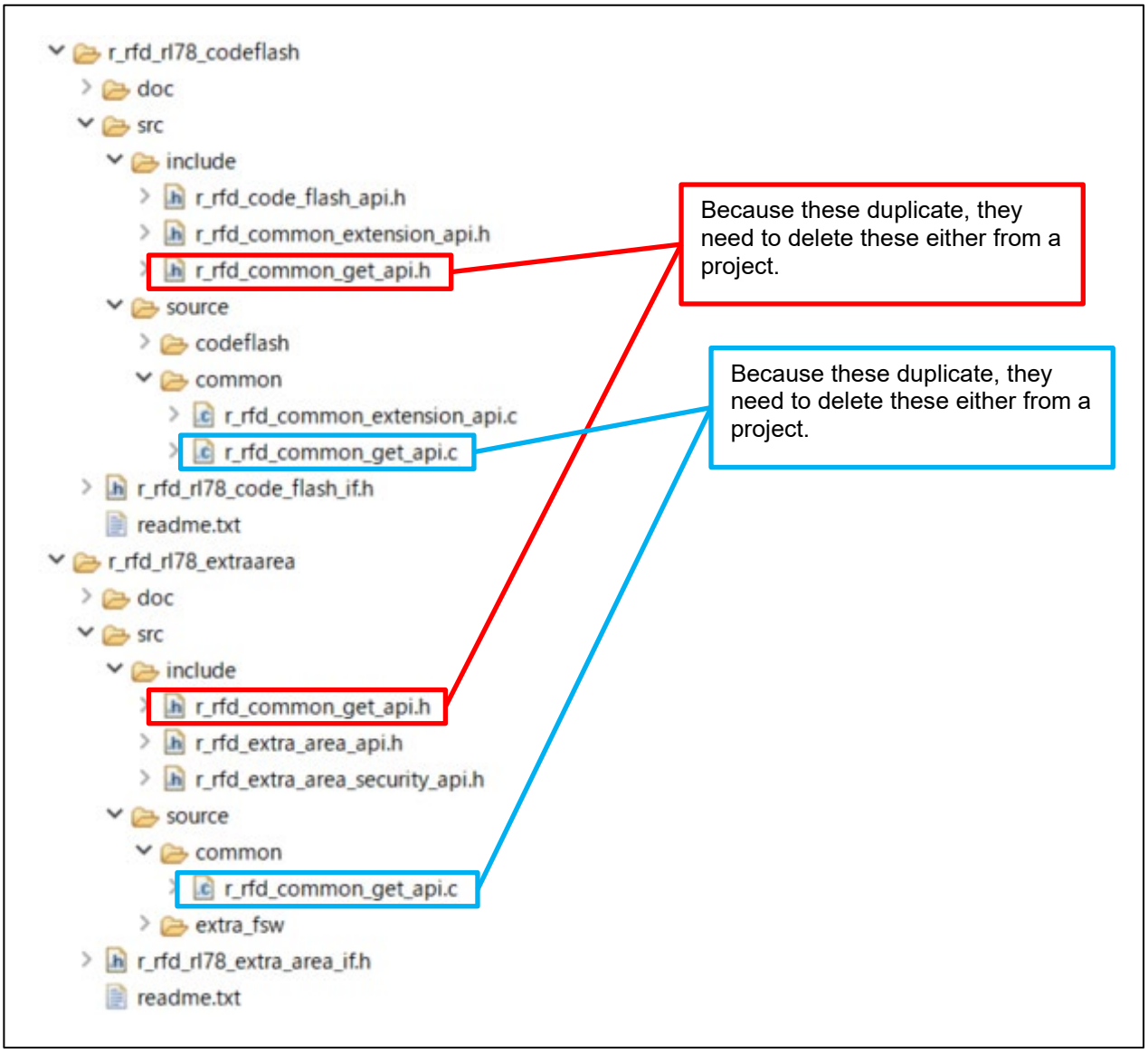


The developed r_rfd_rl78_common folder

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 "CF_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 data flash or an extra area. Extract to overwrite both as the same folder name.

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

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

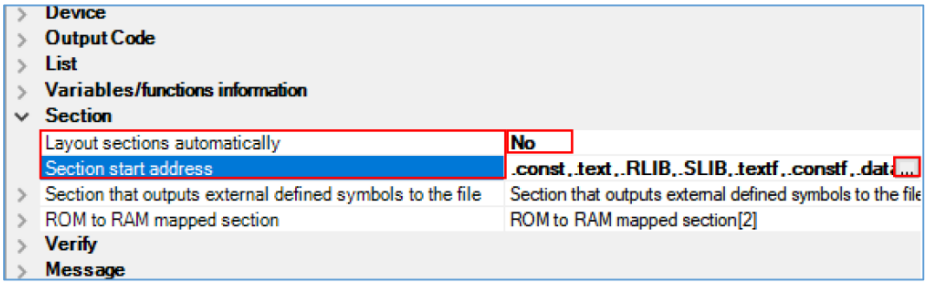
(3) Setting the section items

(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

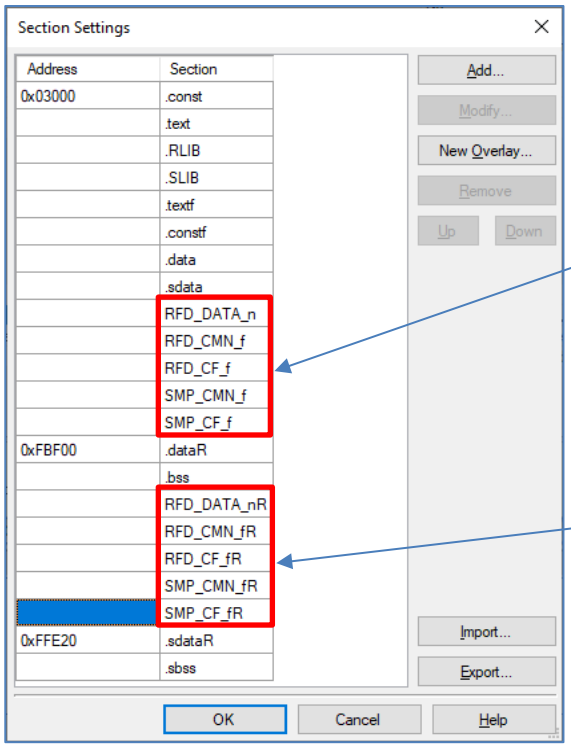
Set "No" to [Layout sections automatically]. And sections come to be displayed on [Section start address]. Press the " ... " button of the right-hand side which sections are displaying, and a "Section Settings" screen is displayed.



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 code flash memory reprogramming on a "Section Settings" screen.

Add to the program area : RFD_DATA_n, RFD_CMN_f, RFD_CF_f, SMP_CMN_f, SMP_CF_f
Add to the RAM area : RFD_DATA_nR, RFD_CMN_fR, RFD_CF_fR, SMP_CMN_fR, SMP_CF_fR

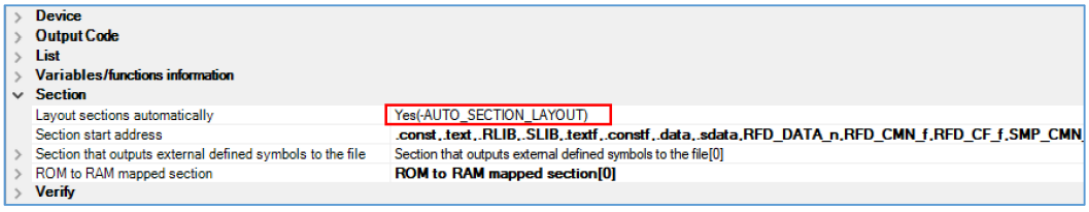


Additional sections
RFD_DATA_n
RFD_CMN_f
RFD_CF_f
SMP_CMN_f
SMP_CF_f

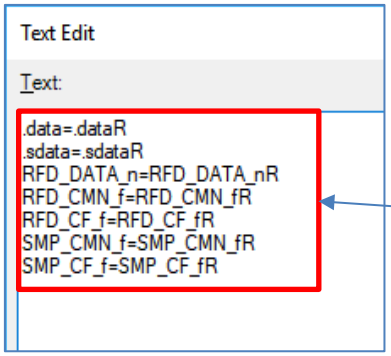
RFD_DATA_nR
RFD_CMN_fR
RFD_CF_fR
SMP_CMN_fR
SMP_CF_fR

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.

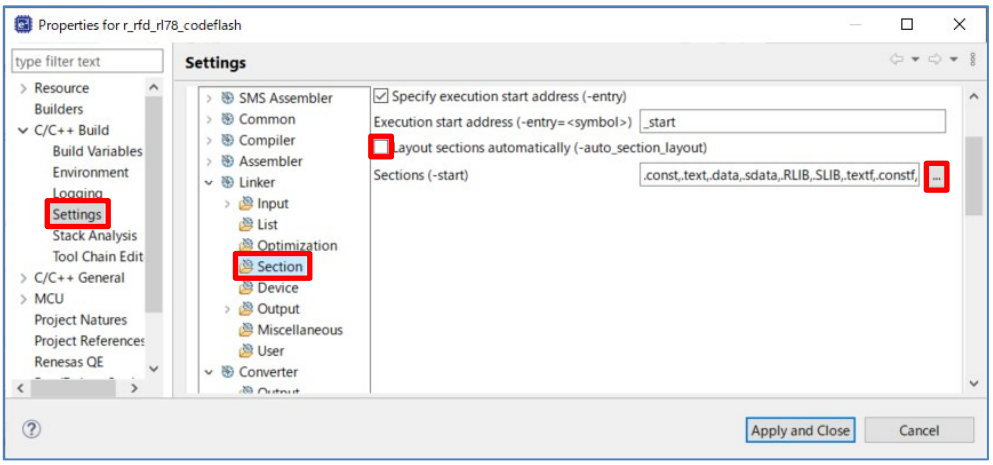


ROM to RAM mapped section
.data=.dataR
.sdata=.sdataR
RFD_DATA_n=RFD_DATA_nR
RFD_CMN_f=RFD_CMN_fR
RFD_CF_f=RFD_CF_fR
SMP_CMN_f=SMP_CMN_fR
SMP_CF_f=SMP_CF_fR

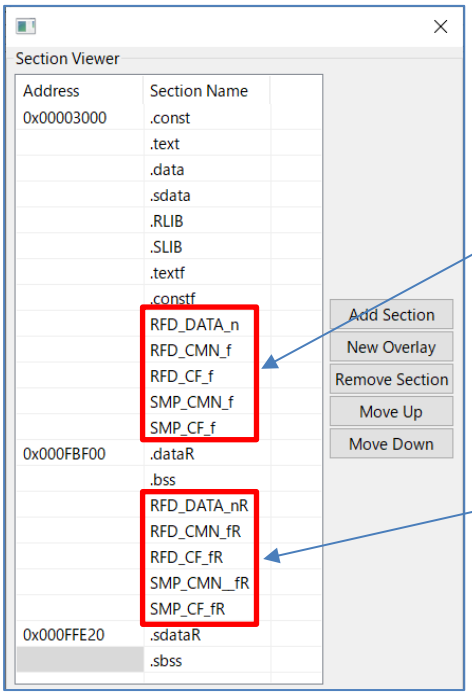
(3-2) Setting of the section items on e^2 studio(CC-RL)

On e^2 studio(CC-RL), 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_CF_f, SMP_CMN_f, SMP_CF_f
Add to the RAM area : RFD_DATA_nR, RFD_CMN_fR, RFD_CF_fR, SMP_CMN_fR, SMP_CF_fR

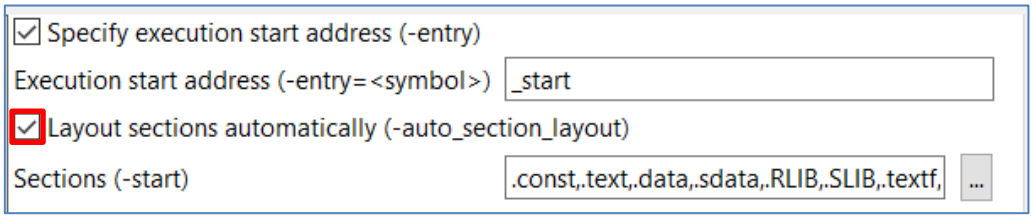


Additional sections
RFD_DATA_n
RFD_CMN_f
RFD_CF_f
SMP_CMN_f
SMP_CF_f

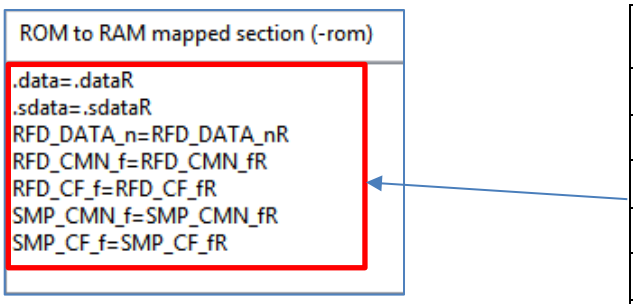
RFD_DATA_nR
RFD_CMN_fR
RFD_CF_fR
SMP_CMN_fR
SMP_CF_fR

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.



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.



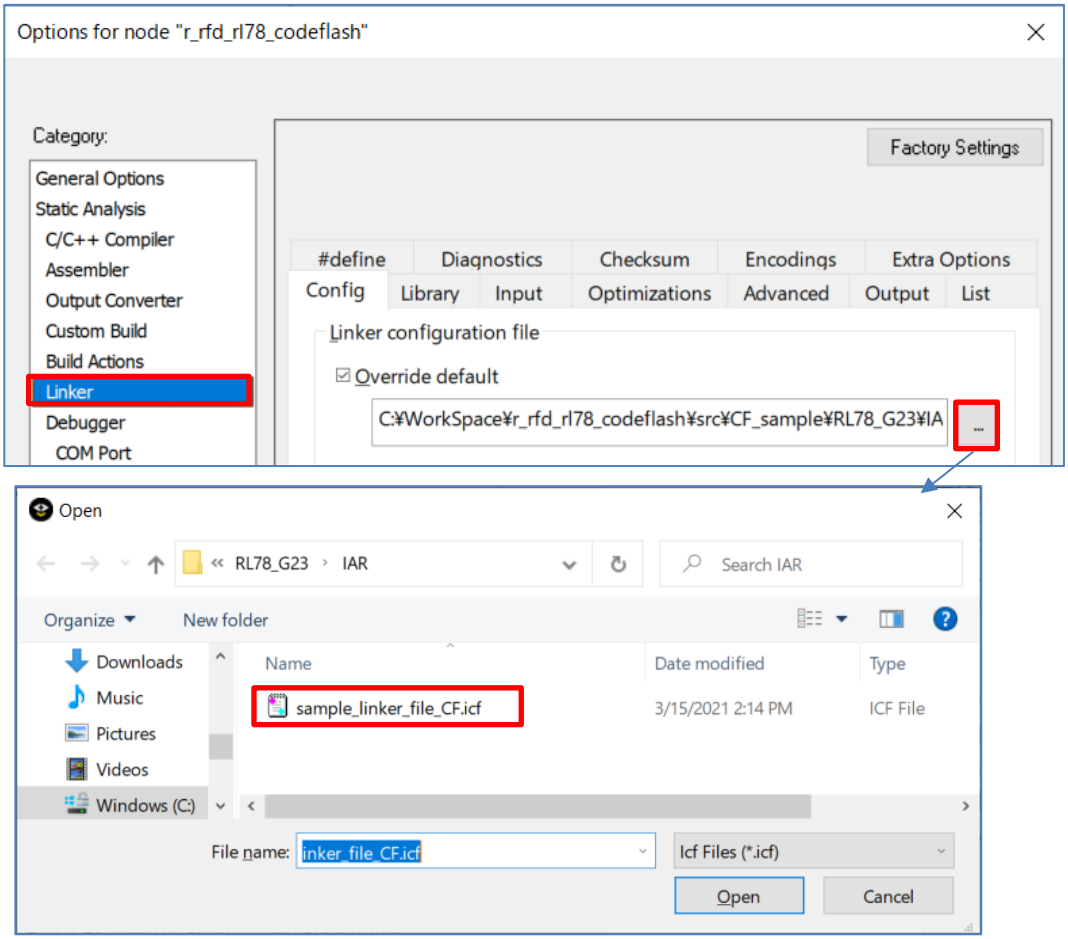
ROM to RAM mapped section
.data=.dataR
.sdata=.sdataR
RFD_DATA_n=RFD_DATA_nR
RFD_CMN_f=RFD_CMN_fR
RFD_CF_f=RFD_CF_fR
SMP_CMN_f=SMP_CMN_fR
SMP_CF_f=SMP_CF_fR

(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 code flash memory reprogramming : sample_linker_file_CF.icf

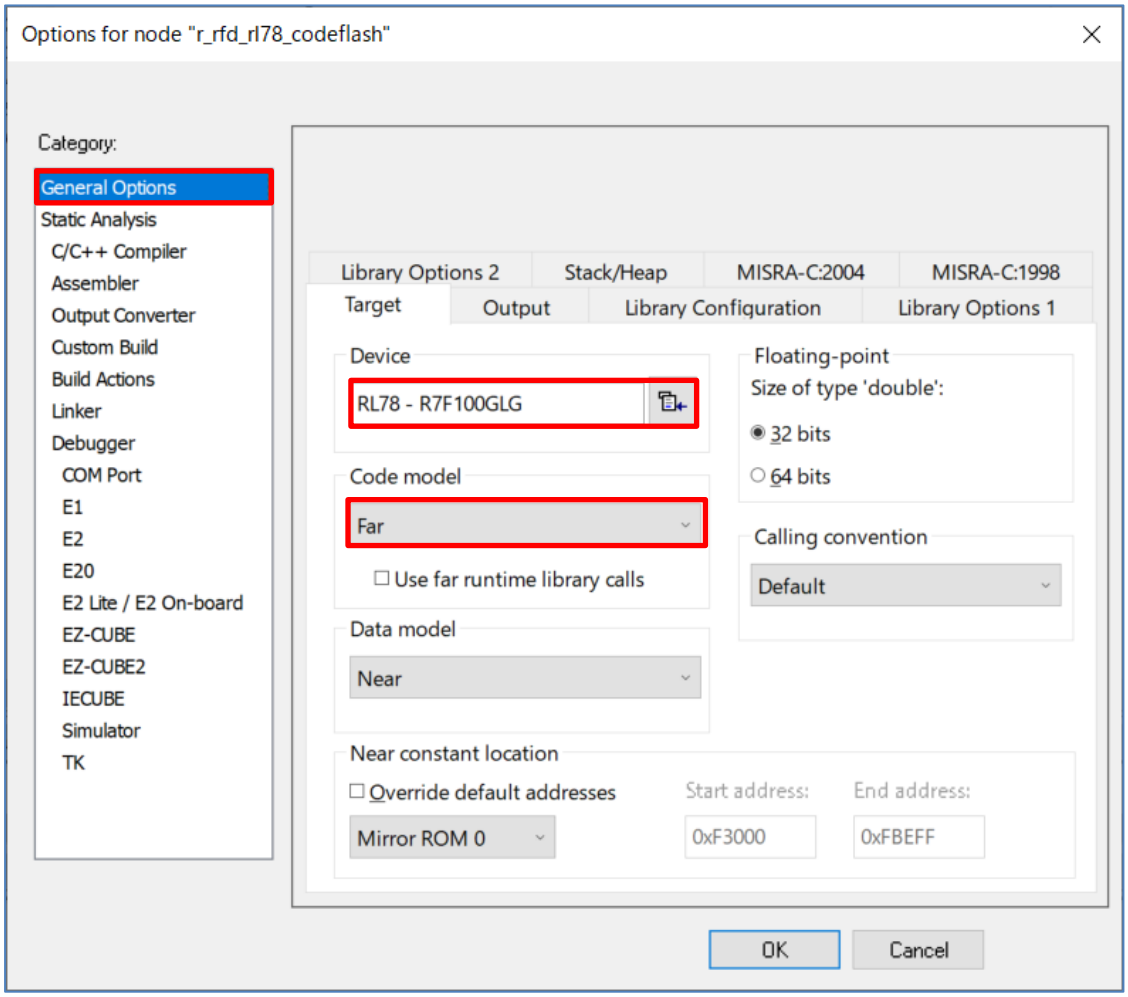
RL78/G23:(\CF_sample\RL78_G23\IAR\)



* On the case used at the same time with data flash area or extra 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].

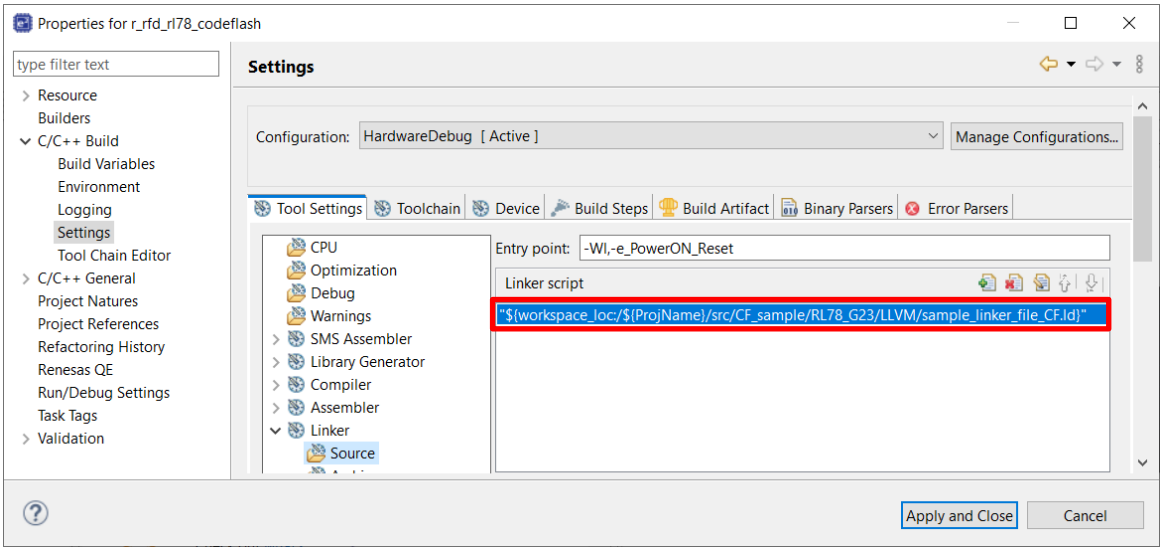


(3-4) Setting of the section items on e^2 studio(LLVM)

On e^2 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/CF_sample/RL78_G23/LLVM/sample_linker_file_CF.ld}



* It is an example of the include path in the case which extracted CF_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"

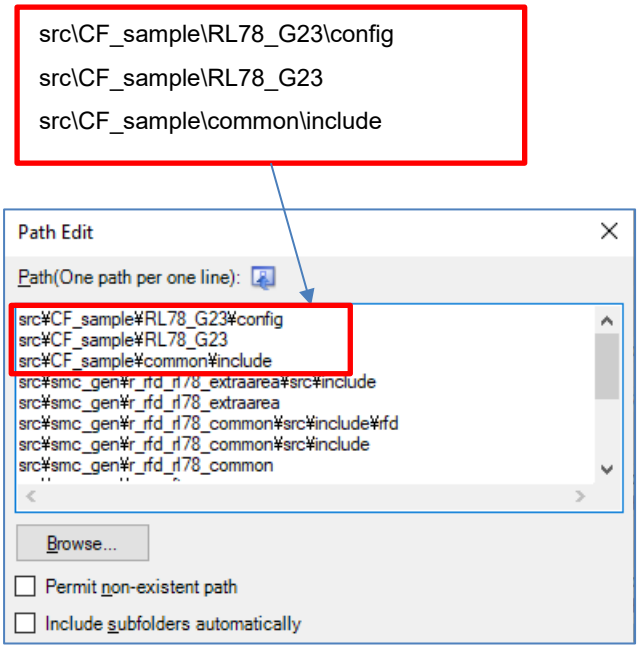
(4-1) Setting of the include path on CS+

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 "2.2.1 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.



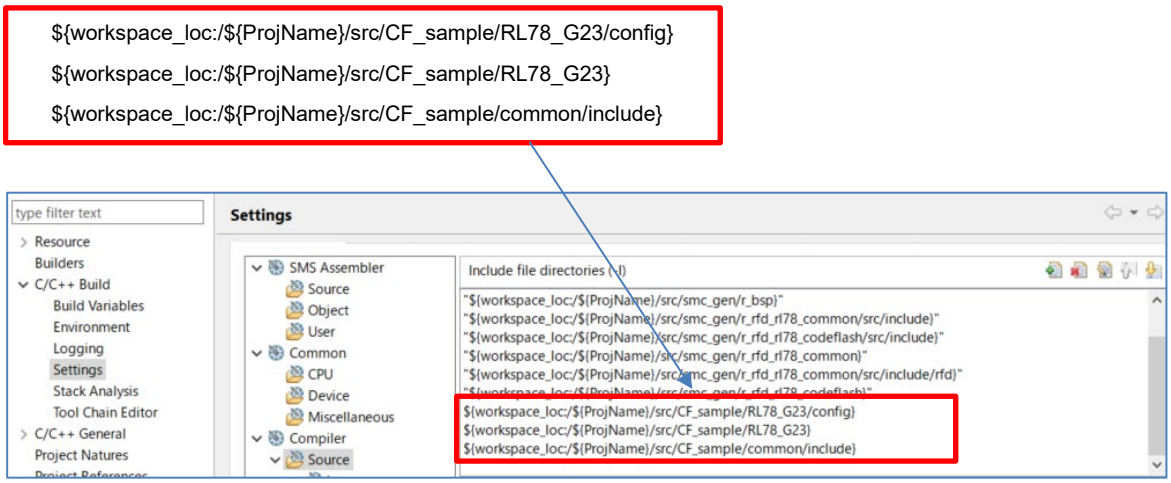
* It is an example of the include path in the case which extracted CF_sample.zip directly under the src folder.

(4-2) Setting of the include path on e^2 studio(CC-RL)

Setting of the include path on e^2 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.



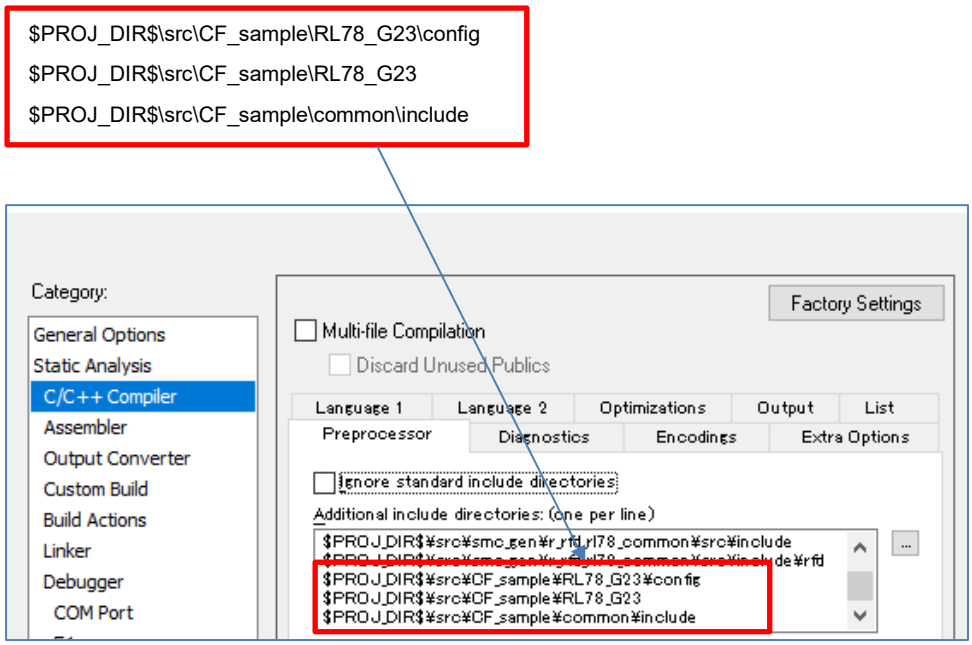
* It is an example of the include path in the case which extracted CF_sample.zip directly under the src folder.

(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.



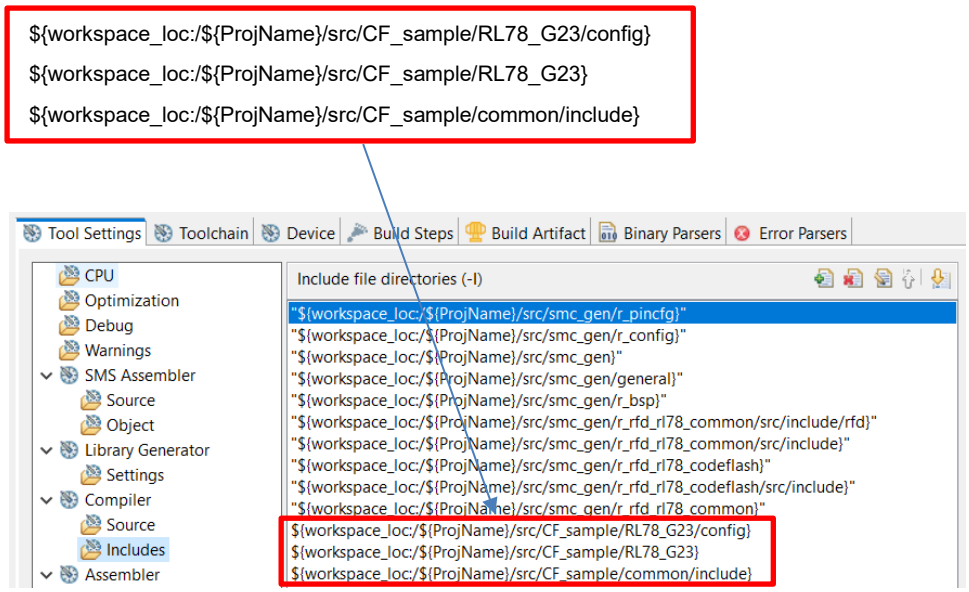
* It is an example of the include path in the case which extracted CF_sample.zip directly under the src folder.

(4-4) Setting of the include path on e^2 studio(LLVM)

Setting of the include path on e^2 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.



* It is an example of the include path in the case which extracted CF_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^2 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^2 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^2 studio(CC-RL)

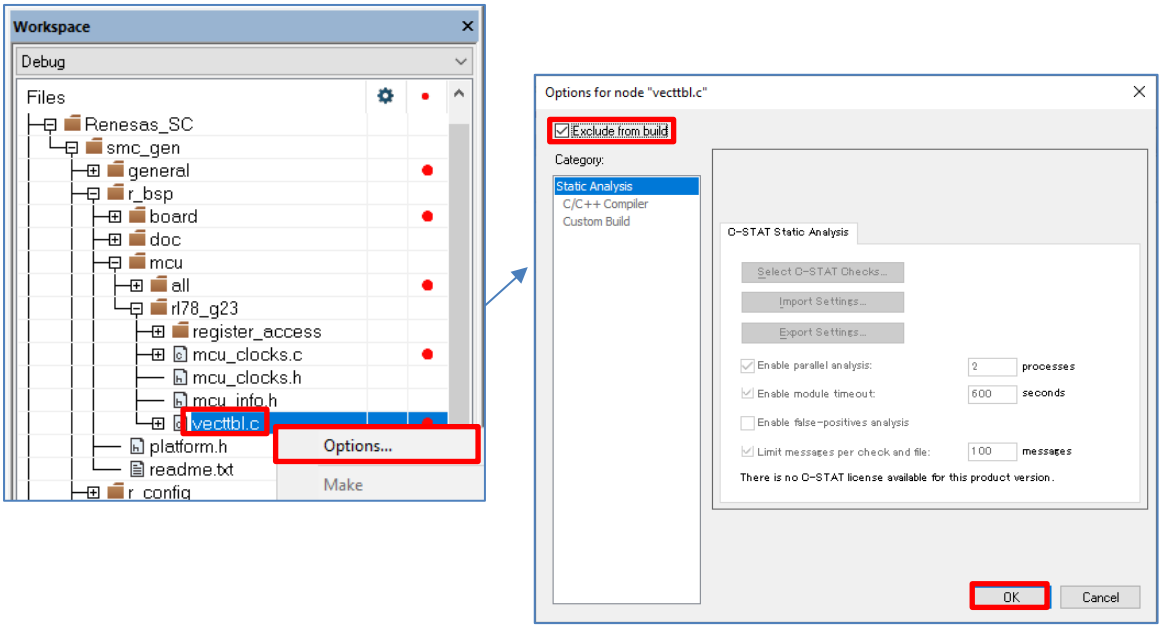
Refer to the chapter of "Device Item Settings" of Renesas Flash Driver RL78 Type 01 user's manual (R20UT4830).

(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^2 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_codeflash_main function included in r_flash_sample_codeflash_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_codeflash_main function. Include prepared "r_flash_sample_codeflash_rl78g2x.h."

2.4 The Check of Operation for Sample Program

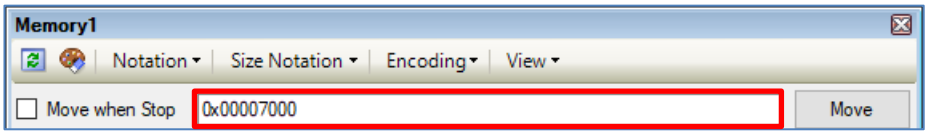
The block 14 (0x00007000) of a code flash area is erased. And 16 Words(64 bytes) of data is programmed from the top of the block 14. Confirm this operation by the following methods.

2.4.1 In Case of CS+

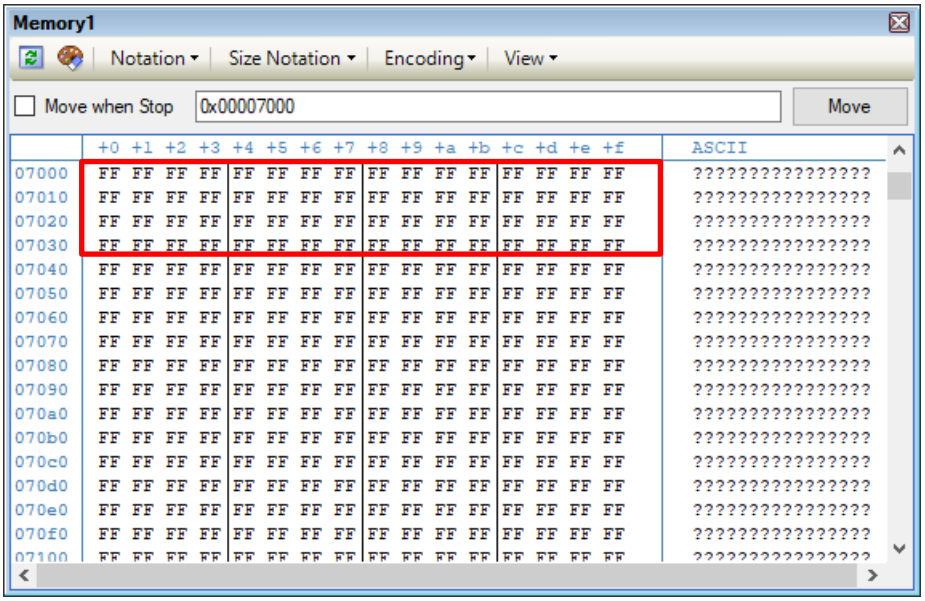
(1) Select [Debug]menu - [Download] and start debugging.

(2) After selecting [View]menu - [Memory], select "Memory1", "Memory2", "Memory3", or "Memory4", and display a memory window.

(3) Set "0x00007000" to the address of a memory window, and display the block 14 of a code flash area.



(4) Select [Debug]menu - [Go] and the program is executed. Check that the value of "0x00007000-0x0000703F" displayed on the memory window has changed after stopping the program.

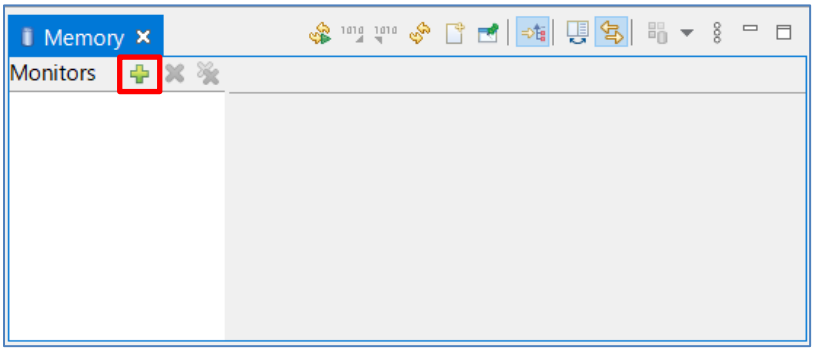


2.4.2 In Case of e² studio(CC-RL)

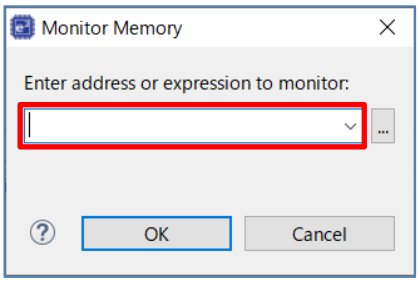
(1) Select [Run]menu - [Debug] and start debugging.

(2) Select [Window]menu - [Show View] - [Memory] and display Memory view.

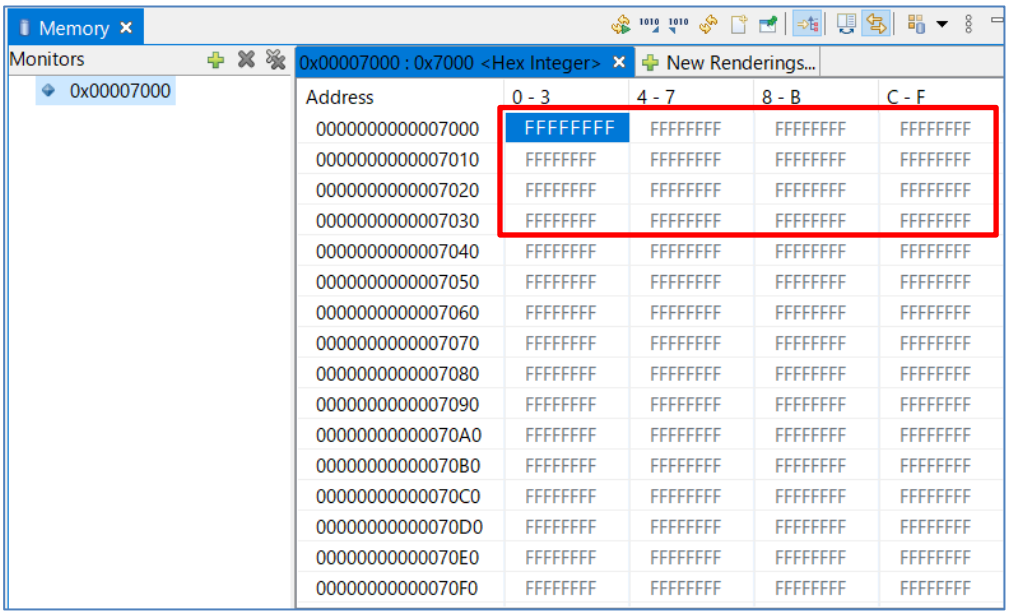
(3) Press " " button and display the Monitor Memory window.



(4) Input "0x00007000" into the address to monitor, and press the OK button. The block 14 of a code flash area is displayed on the memory view.



(5) After the program is executed, check that the value of "0x00007000-0x0000703F" displayed on the memory window is changing.



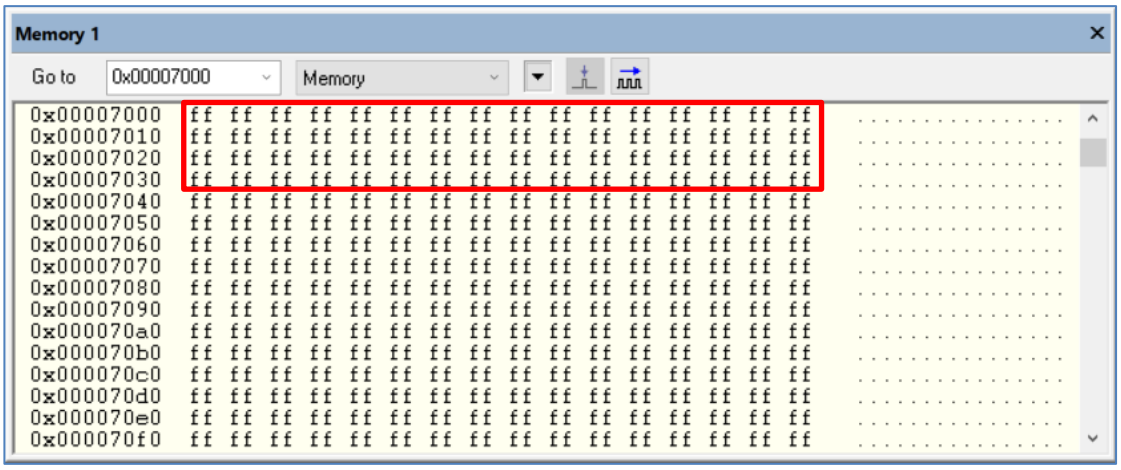
2.4.3 In Case of IAR EW for Renesas RL78

(1) Select [Project] menu - [Download and Debug] and start debugging.

(2) After select [View]menu - [Memory], select either from "Memory 1" to "Memory 4", and the memory window is displayed.

(3) Set "0x00007000" to the address of the memory window. And the block 14 of code flash area is displayed.

(4) After the program is executed, check that the value of "0x00007000-0x0000703F" displayed on the memory window is changing.

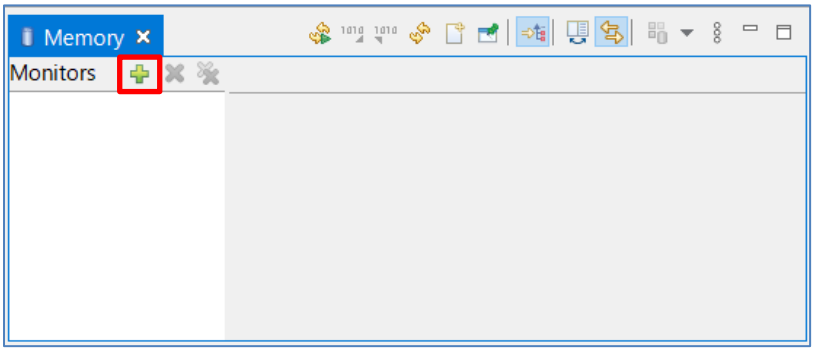


2.4.4 In Case of e² studio(LLVM)

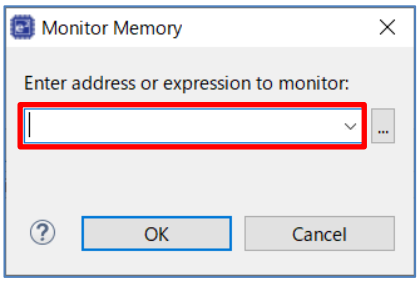
(1) Select [Run]menu - [Debug] and start debugging.

(2) Select [Window]menu - [Show View] - [Memory] and display Memory view.

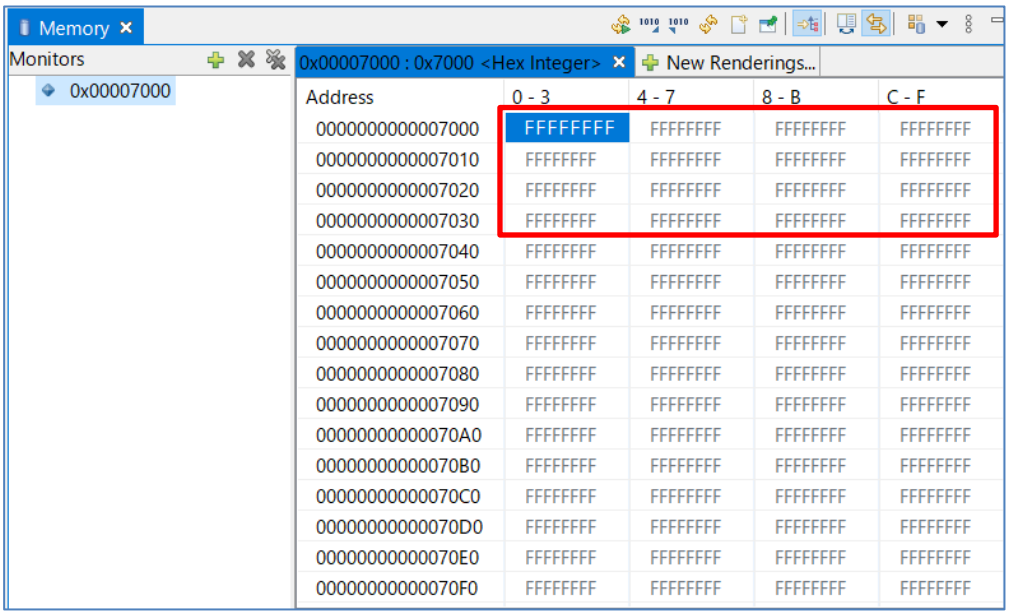
(3) Press " " button and display the Monitor Memory window.



(4) Input "0x00007000" into the address to monitor, and press the OK button. The block 14 of a code flash area is displayed on the memory view.



(5) After the program is executed, check that the value of "0x00007000-0x0000703F" displayed on the memory window is changing.



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 self-programming 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^2 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^2 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

Rev.	Date	Description	
		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 reaches the level at which resetting is specified.

3. Input of signal during power-off state

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

4. Handling of unused pins

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

5. Clock signals

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

6. Voltage application waveform at input pin

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

7. Prohibition of access to reserved addresses

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

8. Differences between products

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

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