

# RZ/V2L

Getting Started with Flexible Software Package

# Introduction

This manual describes how to use the Renesas Flexible Software Package (FSP) for writing applications for the RZ microprocessor series.

# **Target Device**

RZ/V2L



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### 1. Introduction

### 1.1 Overview

This application note describes how to use the Renesas Flexible Software Package (FSP) running on the Cortex®-M33 (hereinafter referred to as CM33) incorporated on RZ/V2L.

# **1.2 Introduction to FSP**

### 1.2.1 Purpose

The Renesas Flexible Software Package (FSP) is an optimized software package designed to provide easy to use, scalable, high quality software for embedded system design. The primary goal is to provide lightweight, efficient drivers that meet common use cases in embedded systems.

### 1.2.2 e<sup>2</sup> studio IDE

FSP provides a host of efficiency enhancing tools for developing projects targeting the Renesas RZ series of MPU devices. The e<sup>2</sup> studio IDE provides a familiar development cockpit from which the key steps of project creation, module selection and configuration, code development, code generation, and debugging are all managed.

### 1.3 Limitations

### 1.3.1 Peripherals and pins assignment

RZ/V2L has a multi-core configuration of Cortex-A55 (hereinafter referred to as CA55) and CM33. It is possible to use each peripheral and GPIO from each core. This package provides drivers for each peripheral for CM33, but each driver can operate on the assumption that it is not used in CA55.

### 1.3.2 RAM Initialization

In RZ/V2L FSP, there is no implementation for initializing internal RAM and external DDR SDRAM, and it is expected that the RAMs are initialized in the software that should run before CM33 is kicked. This is because CA55 is always the primary boot core because of RZ/V2L specification and initialization of RAMs should be carried out as a part of bootstrap.



# 2. Starting Development Introduction

### 2.1 e<sup>2</sup> studio setup

### 2.1.1 What is e<sup>2</sup> studio?

Renesas e<sup>2</sup> studio is a development tool encompassing code development, build, and debug. e<sup>2</sup> studio is based on the open-source Eclipse IDE and the associated C/C++ Development Tooling (CDT).

When developing for RZ MPUs, e<sup>2</sup> studio hosts the Renesas Flexible Software Package (FSP). FSP provides a wide range of time saving tools to simplify the selection, configuration, and management of modules and threads, to easily implement complex applications.

### 2.1.2 e<sup>2</sup> studio Prerequisites

### 2.1.2.1 Obtaining an RZ MPU Kit

To develop applications with RZ/V2L FSP, start with RZ/V2L Evaluation Board Kit.

Start-up guide of RZ/V2L Evaluation Board Kit is available at <u>RZ/V2L SMARC EVK Start-up Guide</u>.

### 2.1.2.2 PC Requirements

The following are the minimum PC requirements to use e<sup>2</sup> studio:

- Windows 10 with Intel i5 or i7, or AMD A10-7850K or FX
- Memory: 8-GB DDR3 or DDR4 DRAM (16-GB DDR4/2400-MHz RAM is preferred)
- Minimum 250-GB hard disk

### 2.1.2.3 Licensing

FSP licensing includes full source code, limited to Renesas hardware only.

### 2.1.3 e<sup>2</sup> studio installation for Windows PC

This chapter describes how to install the e<sup>2</sup> studio IDE on Windows PC.

### 2.1.3.1 Download

The latest e<sup>2</sup> studio IDE installer package can be downloaded from Renesas website for free. Please check detailed information from: <u>https://www.renesas.com/e2studio</u>. Note that user has to login to the Renesas account (in MyRenesas page) for the software download.



### 2.1.3.2 Installation of e<sup>2</sup> studio IDE

- 1. Double-click on e<sup>2</sup> studio installer to invoke the e<sup>2</sup> studio installation wizard page. Click [Install].
- **Note:** If e<sup>2</sup> studio was installed in your PC, the option to modify, remove the existing version or install e<sup>2</sup> studio to a different location will be displayed

| 🛃 Renesas e² studio 2023-01 Se          | tup                                                                                                                                                  | - 🗆 X          |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| Renesas e <sup>2</sup> studio 2023-01 S | Setup                                                                                                                                                |                |
| e2 studio version 22.10.0.R202210       | 013-1357 is already installed.                                                                                                                       |                |
|                                         | What do you want to do?<br>Upgrade<br>Upgrade to version 23.1.0.R20230106-1556.<br>Location (AReneasive2 studio)<br>Missall to a different location. |                |
| <u>v202301061733</u> Us                 | ser: All Users < <u>B</u> ack <u>N</u> ext >                                                                                                         | Install Cancel |

Figure 1: e<sup>2</sup> studio installation wizard

#### 2. Welcome page

User can change the install folder by clicking [Change...].Click [Next] to continue.

**Note1**: If you would like to have multiple versions of e<sup>2</sup> studio, please specify new folder here. **Note2**: Multi-byte characters cannot be used for e<sup>2</sup> studio installation folder name.

| Renesas e <sup>2</sup> studio 2023-01 Setup                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Families                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Cutor readies       Prerequisites oftware ready to install         Additional<br>Software       Initial:<br>• Microsoft Visual C++ 2015-2022 Runtime (x86)<br>• Microsoft Visual C++ 2015-2022 Runtime (x64)         Licenses       Change prerequisites to install.         Shortcuts       Internet connection available<br>Change Proxy Settings.         Installing<br>Results       Prerequisites oftware to install         Vicrosoft Visual C++ 2015-2022 Runtime (x86)<br>• Microsoft Visual C++ 201 |

Figure 2: Installation of e<sup>2</sup> studio – Welcome page



#### 3. Device Families

Select Devices Families to install. Click the [Next] button to continue.

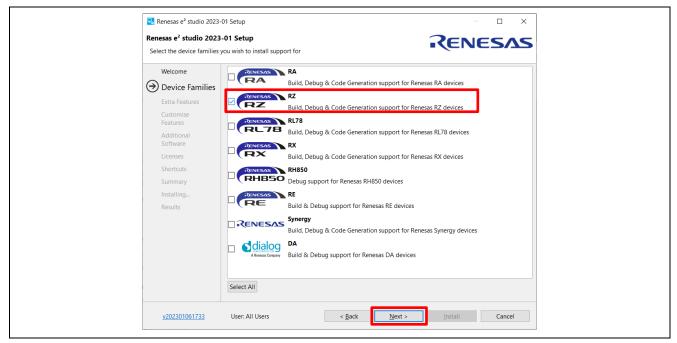


Figure 3: Installation of e<sup>2</sup> studio – Device Families

#### 4. Extra Features

Select Extra Features (i.e., Language packs, SVN & Git support, RTOS support...) to be installed. For non-English language users, please select Language packs at this step if needed. Click the [Next] button to continue.

| 🔜 Renesas e² studio 2023                                         | 3-01 Setup      | - <b>D</b> X                                                                   |
|------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------|
| Renesas e <sup>2</sup> studio 202<br>Select the extra features y | -               |                                                                                |
| Welcome<br>Device Families                                       |                 | Japanese Language Support                                                      |
| Extra Features                                                   |                 | Chinese (Simplified) Language Support                                          |
| Customise<br>Features<br>Additional                              |                 | Chinese (Traditional) Language Support                                         |
| Software                                                         |                 | Git Integration<br>Git SCM Support                                             |
| Shortcuts<br>Summary                                             |                 | Terminals<br>ANSI/vt102 compatible Terminal support for Serial, ssh and Telnet |
| Installing<br>Results                                            |                 |                                                                                |
|                                                                  |                 |                                                                                |
|                                                                  |                 |                                                                                |
|                                                                  | Select All      |                                                                                |
| <u>v202301061733</u>                                             | User: All Users | < <u>B</u> ack <u>Next</u> > Install Cancel                                    |

Figure 4: Installation of e<sup>2</sup> studio – Extra Features



#### 5. Customize Features

Select the components to install and click the [Next] button to continue.

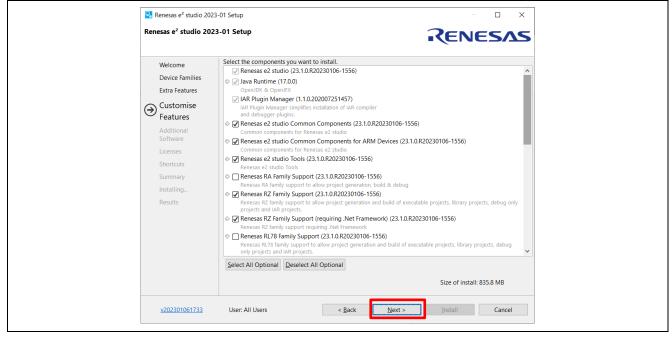


Figure 5: Installation of e<sup>2</sup> studio - Features

#### 6. Additional Software

Select additional software (i.e., compilers, utilities, QE...) to be installed. Be sure that you select the "GCC ToolChains & Utilities" tab, choose the following items and click [Next] to continue.

GNU ARM Embedded 9.2.1 2019q4 LibGen for GNU ARM Embedded

| Renesas e <sup>2</sup> studio 2         | 023-01 Setup                                                                                                                         |                           | Renesas e² studio 202                   | 23-01 Setup                                                                                               |                        |
|-----------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------|------------------------|
|                                         | oftware you wish to install                                                                                                          | RENESAS                   | Select the additional sol               |                                                                                                           | NESAS                  |
| Welcome                                 | Renesas Toolchains & Utilities ( GCC Toolchains & Utilities (1)                                                                      |                           | Welcome                                 | Renesas Toolchains & Utilities (0) GCC Toolchains & Utilities (3)                                         |                        |
| Device Families                         | 👼 Renesas CC-RH Compilers                                                                                                            | *                         | Device Families                         | 😺 GNU ARM Embedded                                                                                        | * ^                    |
| Extra Features<br>Customise<br>Features | Renesas CCRH v2.04.01 v2.04.01     Renesas C/C++ Compiler Package for RH850 Family v2.04.01     Download size: 19.3 MB     Reourises |                           | Extra Features<br>Customise<br>Features | GNU ARM Embedded 9.3.1 2020q2 9.3.1.2020q2<br>GNU ARM Embedded 9.3.1 2020q2<br>Download size: 111.2 MB    |                        |
| → Additional                            | Renesas Tool License Manager - 2.05.00                                                                                               |                           | Additional                              | GNU ARM Embedded 9.2.1 2019g4 9.2.1.2019g4                                                                |                        |
| Software                                | Renesas Utilities                                                                                                                    | *                         | → Software                              | GNU ARM Embedded 9.2.1 2019q4<br>Download size: 94.0 MB                                                   |                        |
| Licenses                                | Renesas E2 Self-Checking Program V1.02.00 v1.02.00<br>Self-checking program for the E2 emulators V1.02.00.                           |                           | Licenses                                | Download size: 94.0 MB                                                                                    |                        |
|                                         | Download size: 5.0 MB                                                                                                                |                           | Shortcuts                               | GNU ARM Embedded 6 2017q2 6.0.0.2017q3                                                                    |                        |
| Summary                                 | Renesas E2 Lite Self-Checking Program V1.00.00 v1.00.00                                                                              |                           | Summary                                 | GNU ARM Embedded 6 2017q2<br>Download size: 82.6 MB                                                       |                        |
| Installing                              | Self-checking program for the E2 Lite emulators V1.00.00.                                                                            |                           | Installing                              |                                                                                                           |                        |
| Results                                 | Download size: 5.5 MB                                                                                                                |                           | Results                                 | LibGen for GNU ARM Embedded 1.2020.9<br>LibGen for GNU ARM Embedded (requires GNU ARM Embedded toolchain) |                        |
|                                         | Renesas E1, E20 Self-Checking Program V1.01.00 v1.01.00                                                                              |                           |                                         | Download size: 51.7 MB                                                                                    |                        |
|                                         | Self-checking program for the E1 and E20 emulators V1.01.00.<br>Download size: 1.5 MB                                                |                           |                                         | GCC ARM A-Profile                                                                                         |                        |
|                                         | Download size: 1.3 Wb                                                                                                                |                           |                                         | GCC ARM A-Profile (AArch64 bare-metal) 10.3 2021.07 10.3.0.2021-07                                        |                        |
|                                         |                                                                                                                                      |                           |                                         | GCC ARM A-Profile (AArch64 bare-metal) 10.3 2021.07<br>Download size: 97.8 MB                             | <b>.</b>               |
|                                         |                                                                                                                                      | 97.8 MB download required |                                         | 243.                                                                                                      | 4 MB download required |
|                                         | User: All Users < Back Next >                                                                                                        | Install Cancel            | v202301061733                           | User: All Users < Back Next > Install                                                                     | Cancel                 |

Figure 6: Installation of e<sup>2</sup> studio – Additional Software

Be sure that LibGen for GNU ARM Embedded is essential for RZ/V2L FSP. If it's not installed, FSP won't be built successfully.

For more details on the installation of Additional Software, please see the section 2.1.4.



### 7. License Agreement

Read and accept the software license agreement. Click the [Next] button. Please note that user must accept the license agreement, otherwise installation cannot be continued.

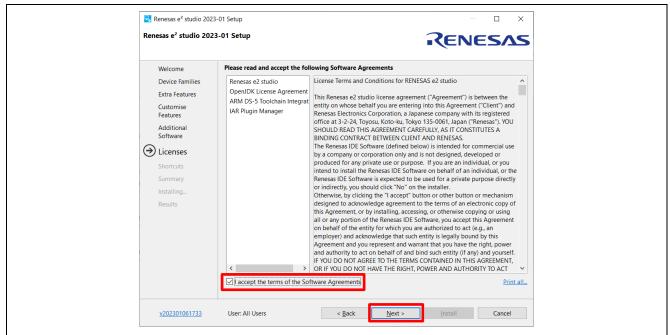


Figure 7: Installation of e<sup>2</sup> studio – Licenses

#### 8. Shortcuts

Select shortcut name for start menu and click [Next] button to continue.

**Note**: If e<sup>2</sup> studio was installed in another location, it is recommended to rename to distinguish from the other e<sup>2</sup> studio(s).

| Renesas e³ studio 2023-01 Setup <ul> <li>Renesas e² studio 2023-01 Setup</li> <li>Renesas e² studio 2023-01 Setup</li> </ul> Welcome       Device Families         Extra Features       Customise         Customise       Reatures         Additional       Software         Licenses |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Families         Extra Features         Customise         Features         Additional         Software         Licenses         Shortcuts         Summary         Installing                                                                                                   |
|                                                                                                                                                                                                                                                                                       |

Figure 8: Installation of e<sup>2</sup> studio – Shortcuts



### 9. Summary

Components list to be installed is shown. Please confirm the contents and click the [Install] button to install the Renesas e<sup>2</sup> studio IDE.

| udio 2023-01 Setup                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                                                              |                                                                                                                                                                     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                    | etup                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | * studio 2023-0                                                                              | lenesas e <sup>2</sup> st                                                                                                                                           |
| milies Pre-equisite software to install: Microsoft Visual C++ 2015-2022 Runtime (x86) Microsoft Visual C++ 2015-2022 Runtime (x64) Software to install: Renesas e2 studio v23.1.0.R20230106-1556 Java Runtime v17.0.0 IAR Plugin Manager v1.1.0.202007251457 Renesas e2 studio Common Components v23.1.0.R20230106-1556 Renesas e2 studio Common Components for ARM Devices v23.1.0.R20230106-1556 Renesas e2 studio Common Components for ARM Devices v23.1.0.R20230106-1556 Renesas e2 studio Common Components for ARM Devices v23.1.0.R20230106-1556 Renesas R2 Family Support (requiring ).Net Framework v23.1.0.R20230106-1556 Renesas R2 Family Support (requiring ).Net Framework v23.1.0.R20230106-1556 | C++<br>C++<br>C++<br>C++<br>C++<br>C++<br>C++<br>C++<br>C++<br>C++ | Prerequi<br>• Mici<br>• Mici<br>• Softwar<br>• Ren<br>• Java<br>• IAR<br>• Ren<br>• Ren | ce Families<br>Features<br>mise<br>rres<br>tional<br>ware<br>ses<br>tcuts<br>hmary<br>lling_ | Welcome<br>Device Fart<br>Extra Feat<br>Customise<br>Features<br>Additiona<br>Software<br>Licenses<br>Shortcuts<br>Shortcuts<br>Shortcuts<br>Shortcuts<br>Shortcuts |

Figure 9: Installation of e<sup>2</sup> studio – Summary

#### 10.Installing...

The installation is performed. Depending on selected items of additional software, new dialog prompts may appear during the installation process. Please see chapter 2.1.3.3 for more detailed information.

#### 11.Results

Click the **OK** button to complete the installation.

| Renesas e² studio 2023-01 Setup <ul> <li>Renesas e² studio 2023-01 Setup</li> </ul> Welcome              Installation of e2 studio is complete.           Device Families              Please click OK to close.           Extra Features              Launch e2 studio?           Additional              View Release Notes?          Additional              View What's New?          Software              Useful Links:             GCC ARM A-Profile (AArch64 bare-metal): C\Renesas\e2 studio\toolchains\gcc arm aarch64\10 2021 07          Installing                  Assults               Installing. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Families     Please click OK to close.       Extra Features <ul> <li>Launch e2 studio?</li> <li>Features</li> <li>View Release Notes?</li> <li>Additional</li> <li>View What's New?</li> <li>Software</li> <li>Licenses</li> <li>Useful Links:</li> <li>GCC ARM A-Profile (AArch64 bare-metal); C\Renesas\e2 studio\toolchains\gcc arm aarch64\10 2021 07.</li> </ul>                                                                                                                                                                                                                                       |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

Figure 10: Summary Page



#### 2.1.3.3 Installation of Additional Software

As mentioned in the section 2.1.3.2, the additional software listed below is essential for RZ/V2L FSP.

GNU ARM Embedded 9.2.1 2019q4 LibGen for GNU ARM Embedded

In this section, the detail procedure for installing these tools.

#### (1) GNU ARM Embedded Toolchain 9.2.1 2019q4

If it was selected in the Additional Software pane of e<sup>2</sup> studio, you will see the installation wizard for the GNU ARM Embedded Toolchain during the installation process.

| 💮 GNU Tools for Arm Embed                                                                           | ded Processors 9-2019-q4-major — 🗌 🗙                                                                                                                                                       | 🌍 GNU Tools for Arm Embedded Processors 9-2019-q4-major — 🗆 🗙                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                     | Welcome to the GNU Tools for Arm<br>Embedded Processors<br>9–2019–q4–major 9 2019 Setup<br>Wizard                                                                                          | License Agreement Please review the license terms before installing GNU Tools for Arm Embedded Processors 9-2019-q4-major 9 2019. Press Page Down to see the rest of the agreement.                                                            |
|                                                                                                     | This wizard will guide you through the installation of GNU<br>Tools for Arm Embedded Processors 9-2019-q4-major 9<br>2019.                                                                 | Contains code from project GNU Binutils ( <u>https://www.anu.org/software/binutils</u> ),<br>GNU Debugger ( <u>https://www.anu.org/software/adb/</u> ) under the following license(s).                                                         |
|                                                                                                     | It is recommended that you close all other applications<br>before starting Setup. This will make it possible to update<br>relevant system files without having to reboot your<br>computer. | GNU GENERAL PUBLIC LICENSE<br>Version 3, 29 June 2007                                                                                                                                                                                          |
|                                                                                                     | Click Next to continue.                                                                                                                                                                    | Copyright (C) 2007 Free Software Foundation, Inc. < <u>http://fsf.org/</u> ><br>Everyone is permitted to copy and distribute verbatim copies<br>of this license document, but changing it is not allowed.                                      |
|                                                                                                     |                                                                                                                                                                                            | If you accept the terms of the agreement, click I Agree to continue. You must accept the<br>agreement to install GNU Tools for Arm Embedded Processors 9-2019-q4-major 9 2019.                                                                 |
|                                                                                                     | Next > Cancel                                                                                                                                                                              | Nullsoft Install System v2.46-7                                                                                                                                                                                                                |
| 🌍 GNU Tools for Arm Embedo                                                                          | ded Processors 9-2019-q4-major — 🗆 🗙                                                                                                                                                       | 🕤 GNU Tools for Arm Embedded Processors 9-2019-q4-major — 🗆 🗙                                                                                                                                                                                  |
| 9-2019-q4-major 9 2019.<br>Setup will install GNU Tools for                                         | Arm Embedded Processors 9-2019-q4-major 9 2019 in the different folder, click Browse and select another folder. Click                                                                      | Completing the GNU Tools for Arm<br>Embedded Processors<br>9-2019-q4-major 9 2019 Setup<br>Wizard<br>GNU Tools for Arm Embedded Processors 9-2019-q4-major 9<br>2019 has been installed on your computer.<br>Click Finish to dose this wizard. |
| Destination Folder<br>Togram Files (x86)¥GNU T<br>Space required: 498.9MB<br>Space available: 1.2GB | Tools Arm Embedded¥9 2019-q4-major Browse                                                                                                                                                  | Show Readme<br>Launch gccvar.bat<br>Add path to environment variable<br>Add registry information                                                                                                                                               |
| Nullsoft Install System v2.46-7 —                                                                   | 3                                                                                                                                                                                          | < Back Finish Cancel                                                                                                                                                                                                                           |

Figure 11: Installation of GNU ARM Embedded Toolchain



#### (2) Libgen Update for GNU ARM Embedded Toolchains

If it was selected in the **Additional Software** pane of e<sup>2</sup> studio, you will see the installation wizard for the **Libgen Update for GNU ARM Embedded Toolchains** during the installation process.

- 1. Click Click here to select your GNU ARM Embedded Toolchain installation folder.
- 2. Select the folder where GNU ARM Embedded Toolchain 9.2019-q4-major is installed.

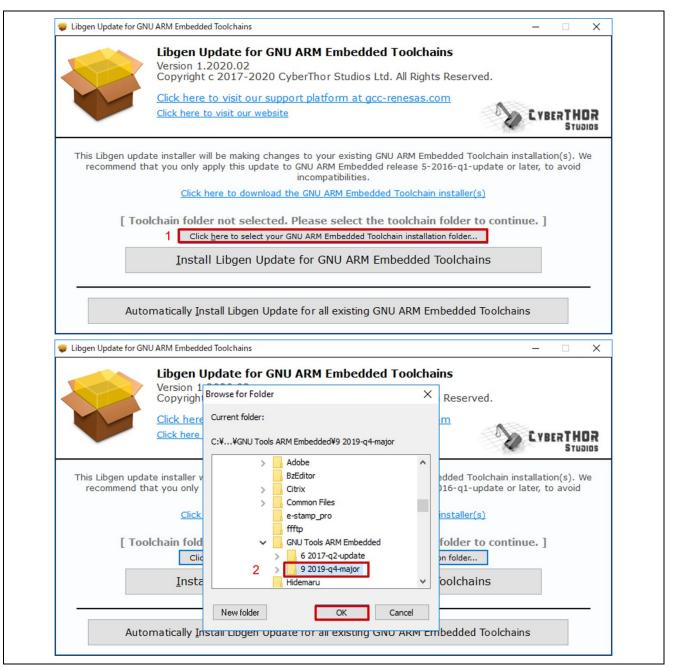


Figure 12: Libgen Update for GNU ARM Embedded: Select Toolchain Folder



3. Next, click Install Libgen Update for GNU ARM Embedded Toolchains.

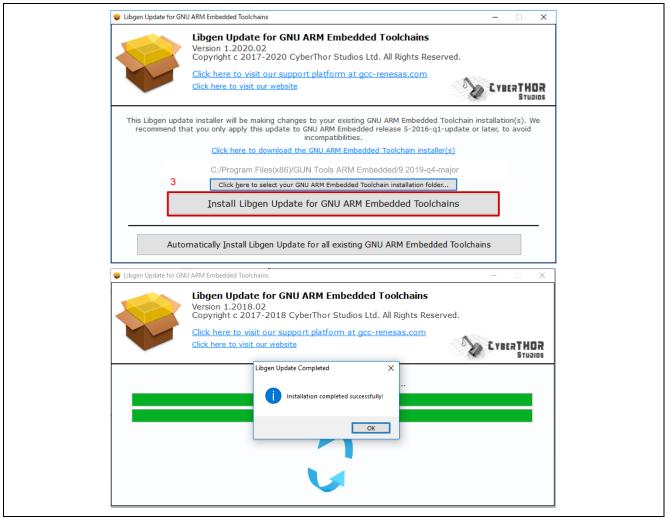


Figure 13: Libgen Update for GNU ARM Embedded: Update Toolchain



### 2.1.4 e<sup>2</sup> studio installation for Linux PC

This chapter describes how to install the e<sup>2</sup> studio IDE on Linux PC.

### 2.1.4.1 Download

Following files are required to download before installation.

SEGGER J-Link driver Please download the driver V7.84 or after from: <u>https://www.segger.com/downloads/jlink/JLink Linux x86 64.deb</u>

GNU ARM Embedded Toolchain

Please download gcc-arm-none-eabi-9-2019-q4-major-x86\_64-linux.tar.bz2 in the Arm Developer site: <a href="https://developer.arm.com/open-source/gnu-toolchain/gnu-rm/downloads">https://developer.arm.com/open-source/gnu-toolchain/gnu-rm/downloads</a>

Libgen Update for GNU ARM Embedded Toolchains

Please download the Libgen Update (Linux) for GCC ARM Embedded Toolchains v1.2020.02 or after from:

https://gcc-renesas.com/rz/rz-download-toolchains/

e<sup>2</sup> studio IDE installer

Please download the e<sup>2</sup> studio IDE installer package for Linux 2023-01 of after from: <u>https://www.renesas.com/e2studio</u>. Note that user has to login to the Renesas account (in MyRenesas page) for the software download.

### 2.1.4.2 Installation

This section describes the procedure of each software installation.

Filename, version number and the file path is provided for example purpose only.

#### (1) SEGGER J-Link driver

1. Open a terminal window and enter below commands.

sudo dpkg -i JLink\_Linux\_V784\_x86\_64.deb
(If the previous install fails with unmet dependencies, retry it as follows)
sudo apt-get -f install
sudo dpkg -i JLink\_Linux\_V784\_x86\_64.deb

#### (2) GNU ARM Embedded Toolchain

1. Enter below commands on terminal.

sudo mkdir -p /opt cd /opt sudo tar -xvf ~/Downloads/gcc-arm-none-eabi-9-2019-q4-major-x86\_64-linux.tar.bz2



### (3) Libgen Update for GNU ARM Embedded Toolchains

- 1. Run the Libgen Update Installer.
  - cd ~/Downloads

```
sudo chmod 755 LibgenUpdateInstall_v1.2020.02.run
sudo ./LibgenUpdateInstall_v1.2020.02.run
```

Enter the path where the GNU toolchain is installed.

```
Libgen Update for GNU ARM Embedded Toolchains Installer
Launch date: 21st of December, 2020
Copyright (c) 2015-2020 by CyberTHOR Studios Ltd. All Rights Reserved.
Get FREE worldwide support at https://gcc-renesas.com
Please specify a path where to install the Libgen update to: /opt/gcc-arm-none-e
abi-9-2019-q4-major
```

Figure 14: Installation – Libgen Update (1/2)

Ensure the input path and enter the 'y' to continue the installation. Then, the Libgen Update installation will complete.

```
The Libgen update will be installed in: /opt/gcc-arm-none-eabi-9-2019-q4-major

Please make sure that you have permissions to write to the "/opt/gcc-arm-none-ea

bi-9-2019-q4-major" folder

before continuing the installation process.

Are you sure you want to continue? [y/n] (default 'n') y

Attempting to install Libgen update in "/opt/gcc-arm-none-eabi-9-2019-q4-major".

..

Permissions have been verified.

Please wait, extracting files...

Detecting Libgen version... version 3.1.0 detected

Please wait, decompressing data...

Cleaning up leftover files...

Libgen Update for GNU ARM Embedded Toolchains has been installed successfully!

Installation complete!
```

Figure 15: Installation – Libgen Update (2/2)



#### (4) e<sup>2</sup> studio IDE

1. Run the e<sup>2</sup> studio IDE Installer. (Before running the installer, check the execution permission of the installer.)

— ./e2studio\_installer-2023-01\_linux\_host.run

2. Welcome page

User can change the install folder by clicking [Change...]. Click [Next] to continue.

**Note1**: If you would like to have multiple versions of  $e^2$  studio, please specify new folder here. **Note2**: Multi-byte characters cannot be used for  $e^2$  studio installation folder name.

| Renesas e² studio 2023-01 Setup    | RENESAS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ⊖ Welcome                          | Install directory ready<br>Install localion: /home/v-koanagi/.local/share/renesas/e2 studio 2023 01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Device Families                    | [Change]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Customise<br>Features              | Prerequisite software already installed                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Additional<br>Software<br>Licenses | Internet connection available<br>Change Proxy Settings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Shortcuts<br>Summary               | Ready to install                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Installing<br>Results              | Software to install:<br>• Renesas e2 studio v23.10.R20230106-1556<br>· Java Runtime v17.0.0<br>• IAR Plugim Manager v1.1.0.202007251457<br>• JustJ Adoptium OpenJDK Hotspot JEC Complete v17.0.4.v20220903-1038<br>• openjfx.standard.feature v17.0.2.202205100908<br>• openjfx.swing.feature v17.0.2.202205100908<br>• openjfx.swing.feature v17.0.2.202205100908<br>• openjfx.swi.feature v17.0.2.202205100908<br>• openjfx.web.feature v17.0.2.202205100908<br>Sopenjfx.swi.feature v17.0.2.202205100908<br>Sopenjfx.swi.feature v17.0.2.202205100908<br>Additional components can be selected on the next page<br>Size of install: S26.3 MB<br>Temporary space required: 912 MB<br>Available: 110 GB |

Figure 16: Installation of e<sup>2</sup> studio – Welcome page



#### 3. Device Families

Select Devices Families to install. Click the [Next] button to continue.

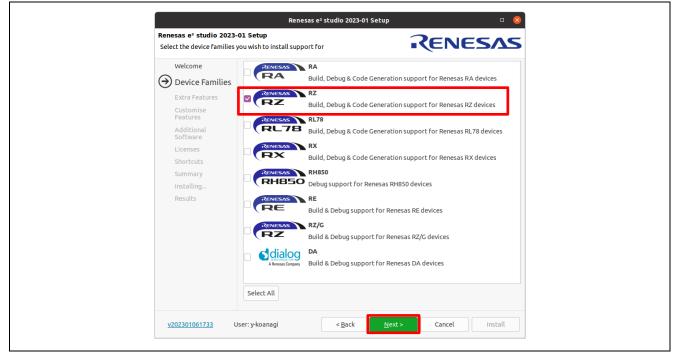


Figure 17: Installation of e<sup>2</sup> studio – Device Families

#### 4. Extra Features

Select Extra Features (i.e., Language packs, SVN & Git support, RTOS support...) to be installed. For non-English language users, please select Language packs at this step if needed. Click the [Next] button to continue.

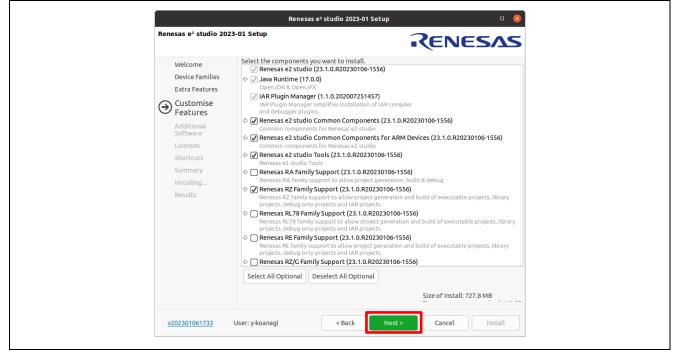
| RENESAS                                                                               | -          | Renesas e <sup>2</sup> studio 2023-0<br>Select the extra features yo |
|---------------------------------------------------------------------------------------|------------|----------------------------------------------------------------------|
| Japanese Language Support                                                             |            | Welcome<br>Device Families                                           |
| Chinese (Simplified) Language Support                                                 |            | Extra Features                                                       |
| Chinese (Traditional) Language Support                                                |            | Customise<br>Features<br>Additional<br>Software                      |
| Git Integration<br>Git SCM Support                                                    |            | Licenses<br>Shortcuts                                                |
| <b>Terminals</b><br>ANSI/vt102 compatible Terminal support for Serial, ssh and Telnet |            | Summary<br>Installing                                                |
|                                                                                       |            | Results                                                              |
|                                                                                       |            |                                                                      |
|                                                                                       | Select All |                                                                      |

Figure 18: Installation of e<sup>2</sup> studio – Extra Features



#### 5. Customize Features

Select the components to install and click the [Next] button to continue.



**Figure 19:** Installation of e<sup>2</sup> studio – Features

#### 6. Additional Software

Select additional software (i.e., compilers, utilities, QE...) to be installed. Click [Next] to continue.

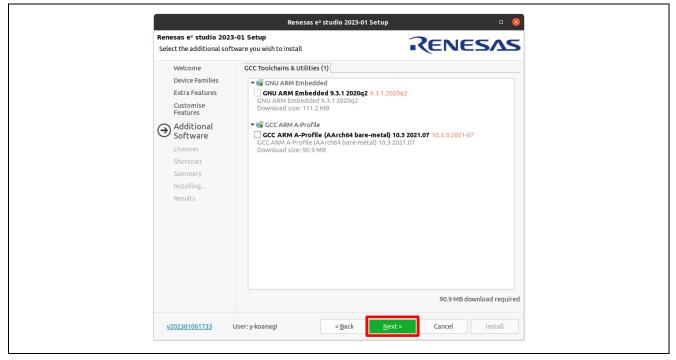


Figure 20: Installation of e<sup>2</sup> studio – Additional Software



### 7. License Agreement

Read and accept the software license agreement. Click the [Next] button. Please note that user must accept the license agreement, otherwise installation cannot be continued.

| Welcome                                                                                                                                           | Please read and accept t                                                                      | he following Software Agreements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Families<br>Extra Features<br>Customise<br>Features<br>Additional<br>Software<br>Licenses<br>Shortcuts<br>Summary<br>Installing<br>Results | Renesas e2 studio<br>OpenJDK License Agreen<br>ARM DS-5 Toolchain Integ<br>IAR Plugin Manager | License Terms and Conditions for RENESAS e2 studio<br>This Renesas e2 studio license agreement ("Agreement") is<br>between the entity on whose behalf you are entering into this<br>Agreement ("Client") and Renesas Electronics Corporation, a<br>Japanese company with its registered office at 3-2:4, Toyosu,<br>Koto-ku, Tokyo 135-0061, Japan ("Renesas"). YOU SHOULD READ<br>THIS AGREEMENT CAREFULLY, ASIT CONSTITUTES A BINDING<br>CONTRACT BETWEEN CLIENT AND RENESAS.<br>The Renesas IDE Software (defined below) is intended for<br>commercial use by a company or corporation only and is not<br>designed, developed or produced for any private use or purpose<br>If you are an individual, or you intend to install the Renesas IDE<br>Software on behalf of an individual, or the Renesas IDE Software<br>is expected to be used for a private purpose directly or indirectly<br>you should click "No" on the installer.<br>Otherwise, by clicking the "I accept" button or other button or<br>mechanism designed to acknowledge agreement to the terms of<br>an electronic copy of this Agreement, or by Installing, accessing,<br>or otherwise copying or using all or any portion of the Renesas IDE<br>Software, ou accept this Agreement, or behalf of the entity for<br>which you are authorized to act (e.g., an employer) and<br>acknowledge that such entity is legally bound by this Agreement<br>ad you represent and warrant that you have the right, power and<br>authority to act on behalf of an dind such entity (if any) and<br>yourself.<br>IF YOU DO NOT AGREE TO THE TERMS CONTAINED IN THIS<br>AGREEMENT, OR IF YOU DO NOT HAVE THE RICHT, POWER AND |
|                                                                                                                                                   | I accept the terms of t                                                                       | he Software Agreements Print all                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |

Figure 21: Installation of e<sup>2</sup> studio – Licenses

#### 8. Shortcuts

Select shortcut name for start menu and click [Next] button to continue.

**Note**: If e<sup>2</sup> studio was installed in another location, it is recommended to rename to distinguish from the other e<sup>2</sup> studio(s).

| Renesase * studio 2023-01 Setup         Welcome         Device Families         Extra Features         Customise         Features         Additional         Software         Licenses         Summary         Installing         Results |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Device Families<br>Extra Features<br>Customise<br>Features<br>Additional<br>Software<br>Licenses<br>Summary<br>Installing                                                                                                                 |
|                                                                                                                                                                                                                                           |

Figure 22: Installation of e<sup>2</sup> studio – Shortcuts



### RZ/V2L

### 9. Summary

Components list to be installed is shown. Please confirm the contents and click the [Install] button to install the Renesas  $e^2$  studio IDE.

| Renesas e² studio 202                                                                                                    | 3-01 Setup                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>CENESAS</b>                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Welcome<br>Device Families<br>Extra Features<br>Customise<br>Features<br>Additional<br>Software<br>Licenses<br>Shortcuts | Ready to Install<br>Software to install:<br>• Renesas e2 studio (v23.1.0.R20230106-1556<br>Java Runtime v17.0.0<br>• IAR Plugin Manager v1.1.0.202007251457<br>Renesas e2 studio Common Components V23.<br>• Renesas e2 studio Common Components V23.<br>• Renesas e2 studio Tools v23.1.0.R20230106-155<br>• Renesas e2 studio Tools v23.1.0.R20230106<br>• Renesas E75 PSmart Configurator ARV 99.0.0V<br>• Renesas F5P Smart Configurator ARV 99.0.0V<br>• Renesas F5P Smart Configurator ARV 99.0.0V<br>• Renesas F5P Smart Configurator ARV 99.0.0V<br>• ARM D5-5 Toolchain Integration v1.0.4.V20220<br>• Eclipse CDT Linker Script Ediltor and 05L v1.0.<br>• GCC for Renesas RZ Support V3.1.0.R20221031<br>• Renesas BUId Support Plies v23.1.0.V202<br>• Just J Adoptium OpenJDK Hotspot JLRE Compl<br>• Renesas BUId Support Files v3.1.0.V20221031<br>• Renesas RTOS Debug Views v9.0.0.V20221025-1029<br>• Renesas RTOS Debug Views v9.0.0.V20221031-10.V202<br>• Renesas Smart Kelp v9.0.0.V0202104062<br>• Renesas Smart Help v9.0.0.V020210400<br>• Renesas e2 studio ARM Common Debug v9.0.0.<br>• Renesas e2 studio ARM Common Debug v9.0.<br>• Renesas e2 studio ARM Common Build v9.0.0V2022<br>• Renesas e2 studio Common Build v9.0.0V2022<br>• Renesas e2 studio Common Build for RCC & LL<br>v9.0.0.V20221206-1637<br>• Renesas e2 studio Common Build for Renesas | ARM Devices<br>556<br>555<br>555<br>520230106-1254<br>1/20221202-2037<br>1/20221202-2037<br>1/20221203-1359<br>2/21212-1830<br>2/20922-1407<br>1/122<br>1/20221027-1512<br>-0612<br>-0612<br>-0612<br>-0828<br>2/229-2148<br>0/221214-1046<br>0.v20221202-1157<br>0.0.v20221102-1427<br>2103-1106<br>LIVM Toolchains |

Figure 23: Installation of e<sup>2</sup> studio – Summary

#### 10.Installing...

The installation is performed. Depending on selected items of additional software, new dialog prompts may appear during the installation process.

#### 11.Results

Click the **OK** button to complete the installation.

| R                                                                                                                                                                                                                                                                                                                                                                           | studio 2023-01 Setup                                                                                     | • 😣     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|---------|
| enesas e² studio 2023-01 Setup                                                                                                                                                                                                                                                                                                                                              | RENE                                                                                                     | SVZ     |
| Welcome       Installation of e2         Device Families       Please click OK to         Extra Features       Launch e2 st         Customise       View Releas         Features       View What's         Software       Useful Links:         Licenses       GCCARM A4         Shortcuts       GCCARM A4         Summary       Installing         → Results       Results | complete.<br>.rch64 bare-metal): /home/y-koanagi/.local/share/ren<br>olchains/gcc arm aarch64/10 2021 07 | nesas/- |

Figure 24: Summary Page



### 2.1.4.3 Add GNU ARM Embedded Toolchain on e<sup>2</sup> studio IDE

1. Launch e<sup>2</sup> studio

Specify the workspace path and launch the e<sup>2</sup> studio.

| Select a directory as workspace         e <sup>2</sup> studio uses the workspace directory to store its preferences and development artifacts.         Workspace:       //home/epsd1=ubuntu=nucs3/e2_studio/workspace         Use this as the default and do not ask again         Cancel       Launch |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Use this as the default and do not ask again                                                                                                                                                                                                                                                           |
|                                                                                                                                                                                                                                                                                                        |
|                                                                                                                                                                                                                                                                                                        |

#### 2. Preferences

Select [Help] -> [Add Renesas Toolchains] then you can see the [Preferences] window. Click [Add] button.

| type filter text     Renesas Toolchain Management              My Renesas<br>Renesas OF         Toolchain Type         Installation Path           Renesas Toolchain<br>Smart Browser         GNU ARM Embedded         Installation Path           Smart Browser         GCC ARM A-Profile (AArch64 bare-metal) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Renesas Colchain<br>Smart Browser                                                                                                                                                                                                                                                                               |
| Smart Demo     Smart Demo     Smart Manual     Support Folders     Tracealyzer     Trace     Fan/Debug     Scripting     Terminal     Toolchains     Tracing     Validation     Version Control (Tean     Scan     Add     Remove                                                                               |

### 3. Add New Toolchain

Specify the path of the GNU ARM Embedded Toolchain. Click [OK]

|           | Add New Toolchain                                                                      | 8      |
|-----------|----------------------------------------------------------------------------------------|--------|
| _         | e a new toolchain which is not already registered.<br>NU ARM Embedded - 9.2.1.20191025 |        |
| Location: | /opt/gcc-arm-none-eabi-9-2019-q4-major                                                 | Browse |
|           |                                                                                        |        |
|           | _                                                                                      |        |
| ?         | Cancel                                                                                 | ОК     |



### 4. Apply

Confirm that the GNU ARM Embedded is checked. Click [Apply and Close].

| type filter text                                                                                                                                                                                                                        | Renesas Toolchain Management                                                                                                                          | ↓ ↓ ↓ 8              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| My Renesas                                                                                                                                                                                                                              | Toolchain Type                                                                                                                                        | Installation Path    |
| Renesas QE<br>Renesas Toolchain<br>Smart Browser<br>> Smart Configuratol<br>Smart Demo<br>> Smart Manual<br>Support Folders<br>Tracealyzer<br>TraceX<br>> Run/Debug<br>> Scripting<br>Terminal<br>Toolchains<br>> Tracing<br>Validation | <ul> <li>GNU ARM Embedded</li> <li>9.2.1.20191025</li> <li>KPIT GNUARM-NONE-EABI Toolchain</li> <li>GCC ARM A-Profile (AArch64 bare-metal)</li> </ul> | /opt/gcc-arm-none-ea |
| <ul> <li>Version Control (Tean</li> <li>XML</li> </ul>                                                                                                                                                                                  | Scan Add                                                                                                                                              | Remove               |

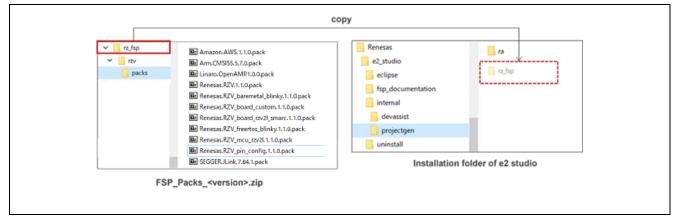


### 2.2 FSP setup

### 2.2.1 Installation of FSP Packs

FSP Packs can be downloaded from <u>here.</u> You can integrate FSP to e<sup>2</sup> studio by the procedure described below:

- 1. Exit e<sup>2</sup> studio.
- 2. Extract FSP Packs.
- 3. Copy the extracted FSP Packs (folders under \internal\projectgen\rz\_fsp) to the following folder:
  - <e<sup>2</sup> studio installation folder>\internal\projectgen



- 4. Launch e<sup>2</sup> studio.
- 5. Click Help > About e<sup>2</sup> studio.

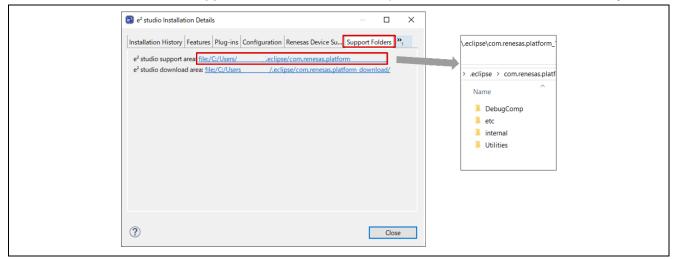
| 🖉 🍪 Welcome 🗙 |                                                                                             | Help<br>Welcome                                                               |                                                     |              | 1                 |
|---------------|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-----------------------------------------------------|--------------|-------------------|
| RENESAS       | Welcome to e <sup>2</sup> studio                                                            | <ul> <li>Help Conten</li> <li>Search</li> <li>Show Conten</li> </ul>          |                                                     |              |                   |
|               |                                                                                             | Show Active<br>Cheat Sheets                                                   | Keybindings                                         | Ctrl+Shift+L |                   |
| 0             | Create a new C/C++ project<br>Create a new e <sup>2</sup> studio C/C++ project              | RA Helpdesk<br>RenesasRulz<br>Add Renesas                                     | Community Forum<br>Toolchains                       | >            | rview<br>in over  |
| *             | Import existing projects<br>Import existing e <sup>2</sup> studio projects from the filesys | <ul> <li>Perform Setu</li> <li>Check for Up</li> <li>Install New S</li> </ul> | dates                                               |              | orials<br>prough  |
| <b>±</b>      | Import sample projects<br>Download and import sample projects from Renes                    |                                                                               | udio feedback<br>ed Workbench plugin manager<br>dio |              | uples<br>at the s |
| 8             | Review IDE configuration settings                                                           |                                                                               |                                                     | 🔿 Wh         | at's No           |

#### 6. Click Installation Details.

| About e <sup>2</sup> studio | lio                                                                                                                                                                                                                                    |           | × |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|
|                             | Renesas e <sup>z</sup> studio                                                                                                                                                                                                          |           |   |
| - 2                         | Version: 2022-01 (22.1.0)<br>Build Id: R20211118-2110                                                                                                                                                                                  |           |   |
| e-                          | Parts Copyright (C) 2010-2021 Renesas Electronics Corp.<br>All rights reserved.                                                                                                                                                        |           |   |
|                             | e <sup>2</sup> studio IDE is an extension of software developed for eclipse.org.                                                                                                                                                       |           |   |
|                             | e <sup>2</sup> studio IDE is based on Eclipse Platform 4.21 (2021-09)<br>and CDT version 10.4.1.                                                                                                                                       |           |   |
|                             | Source code for the Eclipse Foundation plug-ins is availa<br>from www.eclipse.org, under the Eclipse Public License "<br>see https://www.eclipse.org/org/documents/epi-z0/EPI<br>and https://www.eclipse.org/org/documents/epi-v10.htt | -2.0.html |   |
| 6                           | nz e² 🔹 🚯 🚥 🖋 🤤                                                                                                                                                                                                                        |           |   |
| (?) Installation            | tion Details                                                                                                                                                                                                                           | ⊊lose     | : |



7. Click the link to e<sup>2</sup> studio support area. At that time, the explorer should be launched automatically.



- 8. Check if the FSP Packs is copied to the following folder.
  - <e<sup>2</sup> studio support area>\internal\projectgen\rz\_fsp\rzv\packs

| <ul> <li>convenesas.platform</li> <li>DebugComp</li> <li>etc</li> <li>internal</li> <li>cmsis</li> <li>projectgen</li> <li>ra</li> <li>rzy</li> <li>rzy</li> <li>rzy</li> <li>packs</li> <li>packs</li> <li>Manzon.AWS.1.1.0.pack</li> <li>Amazon.AWS.1.1.0.pack</li> <li>Amazon.AWS.1.1.0.pack</li> <li>Amazon.AWS.1.1.0.pack</li> <li>Amazon.AWS.1.1.0.pack</li> <li>Amazon.AWS.1.1.0.pack</li> <li>Reness.RZV_board_rzv2[smarc.1.1.0.pack</li> <li>Reness.RZV_freetros_linky.1.1.0.pack</li> </ul> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

- 9. Check xml files is extracted to the following folder.
  - <e<sup>2</sup> studio support area>\internal\projectgen\rz\_fsp\rzv\modules

| com.renesas.pla 会約<br>DebugComp<br>etc<br>com.renal<br>com.renal<br>com.renesas.pla 会約<br>1.0<br>1.0<br>1.1<br>modules<br>projectgen<br>ra |
|--------------------------------------------------------------------------------------------------------------------------------------------|
| etc 1.1<br>internal modules<br>crusis packs                                                                                                |
| etc 1.1<br>internal modules<br>crusis packs                                                                                                |
| crisis packs projectgen                                                                                                                    |
| cmis packs projectgen                                                                                                                      |
|                                                                                                                                            |
|                                                                                                                                            |
|                                                                                                                                            |
| n_fsp                                                                                                                                      |
|                                                                                                                                            |



# 3. Set up an RZ/V2L SMARC EVK

Below is an example of a typical system configuration.

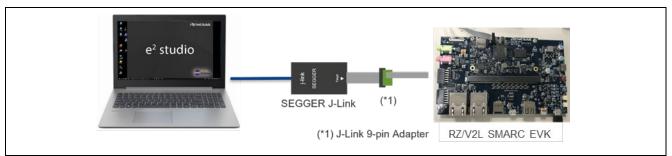


Figure 25: System Configuration Example – RZ/V2L SMARC EVK

### 3.1 Supported Emulator

• SEGGER J-Link

For details on SEGGER J-Link, please see <u>J-Link Debug Probes by SEGGER – the Embedded Experts</u>.

# 3.2 Board Setup

### 3.2.1 Boot MODE

To set the board to Boot mode 3(QSPI Boot(1.8V) Mode), set the SW11 as below.

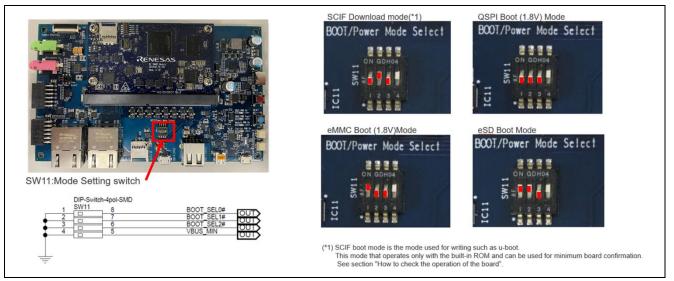


Figure 26: Boot MODE



# 3.2.2 JTAG connection

When connecting JTAG, you must set the DIP SW1 settings as follows:

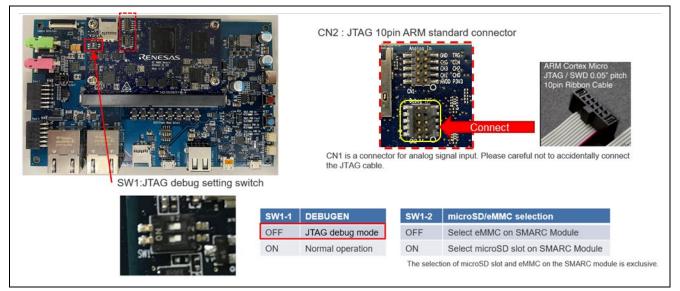


Figure 27: JTAG connection

Please note that RZ/V2L SMARC EVK has CoreSight 10 connector and therefore, the following adapter must be needed to connect Segger J-Link.

https://www.segger.com/products/debug-probes/j-link/accessories/adapters/9-pin-cortex-m-adapter/

# 3.2.3 Debug Serial (console output)

Debug serial uses CN14. The baud rate is 115200bps.

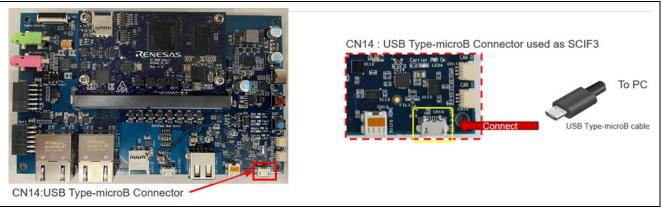


Figure 28: Debug Serial(console output)



### RZ/V2L

### 3.2.4 Power Supply

Here are the power supply related goods to be used in Renesas' development. Please prepare for the equivalent ones for your development.

- USB Type-C cable CB-CD23BK (manufactured by Aukey)
- USB PD Charger Anker PowerPort III 65W Pod (manufactured by Anker)

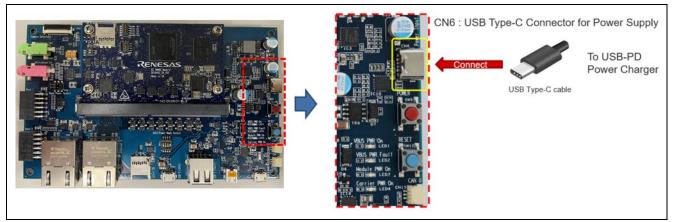


Figure 29: Power Supply

Connect USB-PD Power Charger to USB Type-C Connector. Then LED1(VBUS PWR On) and LED3 (Module PWR On) lights up. Press SW9 to turn on the power. Then LED4(Carrier PWR On) lights up.

**Note**: When turn on the power, press and hold the power button for 1 second. When turn off the power, press and hold the power button for 2 seconds

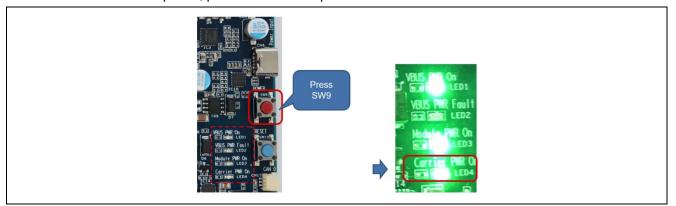


Figure 30: LED Status after Turning on EVK

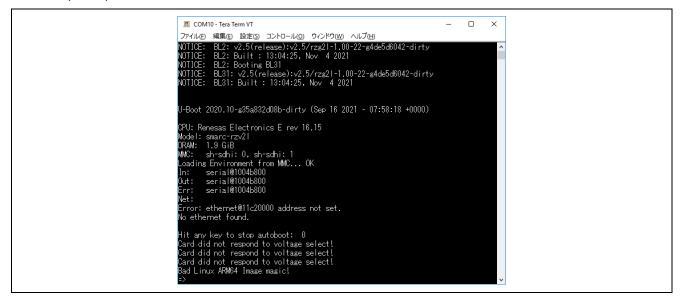


### 3.2.5 How to check the operation of the board

First, check the board for problems. There are two ways to do this. Please check with either.

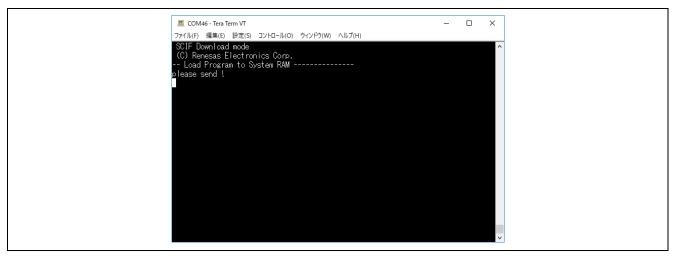
#### BOOT MODE: QSPI Boot(1.8V) Mode

If u-boot is written to the serial flash, when the power is turned on, the following will be output to the console(CN14).



BOOT MODE: SCIF Download Mode

When the power is turned on, the following will be output to the console (CN14).





# 4. Tutorial: Your First RZ MPU Project - Blinky

# 4.1 Tutorial Blinky

The goal of this tutorial is to quickly get acquainted with the Flexible Platform by moving through the steps of creating a simple application using e<sup>2</sup> studio and running that application on an RZ MPU board.

# 4.2 What Does Blinky Do?

The application used in this tutorial is Blinky, traditionally the first program run in a new embedded development environment.

Blinky is the "Hello World" of microprocessors. If the LED blinks you know that:

- The toolchain is setup correctly and builds a working executable image for your chip.
- The debugger has installed with working drivers and is properly connected to the board.
- The board is powered up and its jumper and switch settings are probably correct.
- The microprocessor is alive, the clocks are running, and the memory is initialized.
- Timer (GTM) interrupt is intentionally fired and GPIO is properly controlled.

Note: SRMAC EVK board does not have any LED.

Thus, Blinky sample application used in this tutorial is designed to use the Pmod module described below alternatively:

Pmod LED (Four High-brightness LEDs): <u>https://reference.digilentinc.com/pmod/pmodled/start</u>

This module is not included on the SRMAC EVK board and so, please prepare it beforehand.

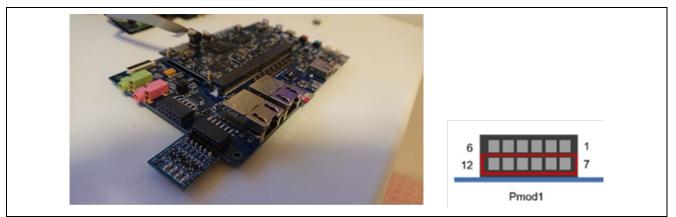


Figure 31: Connection Pmod LED module (410-076)

### 4.3 Create a New Project for Blinky

The creation and configuration of an RZ/V C/C++ FSP Project is the first step in the creation of an application.

The base RZ/V2L pack includes a pre-written Blinky example application.

Follow these steps to create an RZ MPU project:

1. In e<sup>2</sup> studio, click File > New > C/C++ Project.

| 6    | work - e² studio                             |    |                                     |   |      |
|------|----------------------------------------------|----|-------------------------------------|---|------|
| File | Edit Source Refactor Navigate Search Project | ct | Renesas Views Run Window Help       |   |      |
|      | New Alt+Shift+N >                            |    | Renesas C/C++ Project               | > | - 01 |
|      | Open File                                    | C  | Makefile Project with Existing Code |   |      |
|      | Open Projects from File System               | C  | ງ C/C++ Project                     |   | (÷ - |
|      | Recent Files >                               | C  | 9 Project                           |   |      |

Figure 32: New C/C++ Project



#### 2. Select [Renesas RZ] > [Renesas RZ/V C/C++ FSP Project] and Click Next.

Figure 33: Renesas RZ/V C/C++ FSP Project

- 3. Assign a name to this new project. Blinky is a good name to use for this tutorial.
- 4. Click Next. The Project Configuration window shows your selection.

| 🐻 Reness RZ/V C/C++ FSP Project — 🗆 🗙                              |  |
|--------------------------------------------------------------------|--|
| Renesas RZ/V C/C++ FSP Project                                     |  |
| Project Name and Location                                          |  |
| Driject name                                                       |  |
| givjet ame<br>Bioky                                                |  |
| Use gefault location                                               |  |
| Location Chuedek Billinky Bipmens.<br>Cheose file system default - |  |
| Choose his spirem: demain                                          |  |
| You zen deentiezd meer Rentza gaeka heen                           |  |
| ⑦ < ĝack <u>Bjest</u> ≻ Emilih Cancel                              |  |

Figure 34 : e<sup>2</sup> studio Project Configuration window (part 1)

5. Select the board support package by selecting the name of your board from the Device Selection dropdown list. Select **GNU ARM Embedded** in Toolchains and version is **9.2.1.20191025** and Click **Next**.

| Renesas RZ/V C/C++ FSP Project     Renesas RZ/V C/C++ FSP Project     Device and Tools Selection                                                                                                                       |                                           |        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------|
| Device Selection           FSP Version         10.0           Board:         EZZV23. Evaluation Kit (2)           Device         R8A070554.23066           Cone         Exercise           Language:         @ C ○ C++ | Device Details<br>TrutZone No<br>Pins 455 |        |
| Teolchains<br>CRU ABA Embedded                                                                                                                                                                                         | Processor Conter-M33 Debugger J-Link ARM  | ~      |
| ■2.1.20191025 ✓                                                                                                                                                                                                        | < Back Boot > Emails                      | Cencel |

Figure 35 : e<sup>2</sup> studio Project Configuration window (part 2)



6. Select the **build artifact** and **RTOS**. Be sure that on the current version, **Secure** should always be chosen at the **Sub-core start state**. Otherwise, the created project can't be built successfully.

| Renesas RZ/V C/C++ FSP Project                                                                          |                                          | - 0 X         | ] |
|---------------------------------------------------------------------------------------------------------|------------------------------------------|---------------|---|
| Renesas RZ/V C/C++ FSP Project<br>Build Artifact, RTOS Selection and Sub-Core Selection                 |                                          | $\rightarrow$ |   |
| Build Artifact Selection                • Executable             • Project builds to an executable file | RTOS Selection<br>No RTOS                |               |   |
| Static Library     Project builds to a static library file     Sub-core start state                     |                                          |               |   |
| Secure     Start sub-core in secure state     Non-secure     start sub-core in non-secure state         |                                          |               |   |
|                                                                                                         |                                          |               |   |
|                                                                                                         |                                          |               |   |
|                                                                                                         |                                          |               |   |
|                                                                                                         |                                          |               | - |
| ۲                                                                                                       | < <u>Back</u> <u>Next</u> > <u>Finis</u> | ish Cancel    |   |

Figure 36 : e<sup>2</sup> studio Project Configuration window (part 3)

7. Select the Blinky template for your board and click Finish.

| Renesas RZ/V C/C++ FSP Project                                                                                                                                                                                                                              |  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Renesas RZ/V C/C-+ 55P Project Project Template Selection                                                                                                                                                                                                   |  |
| Project Template Selection<br>Bare Metal - Blinky Bare metal - Blinky Bare metal FSP project that includes BSP and will blink LEDs if available. This project will initialize clocks, pins, stacks, and the C nutrine environment. (RenesseR2V2L1.0.0.prxk) |  |
| Bare Metal - Minimal     Bare metal FSP project that includes BSP. This project will initialize clocks, pins, stacks, and the C runtime environment.     [Renesas.RZV21.1.0.0 prck]                                                                         |  |
| Code Generation Settings<br>Use Renesus Code Formatter                                                                                                                                                                                                      |  |
| () Cancel                                                                                                                                                                                                                                                   |  |

Figure 37 : e<sup>2</sup> studio Project Configuration window (part 4)

Once the project has been created, the name of the project will show up in the **Project Explorer** window of e<sup>2</sup> studio. Now click the **Generate Project Content** button in the top right corner of the **Project Configuration** window to generate your board specific files.

| <ul> <li>Blinky] FSP Configuratio</li> <li>Summary</li> </ul> | on X                                             | Generate Proje | ct Content |
|---------------------------------------------------------------|--------------------------------------------------|----------------|------------|
| Project Summary                                               |                                                  | RENESAS        | ^          |
|                                                               | RZ/V2L Evaluation Kit (SMARC)<br>R9A07G054L23GBG |                |            |
| Toolchain: 0                                                  | GCC for Renesas RZ                               |                |            |
| Toolchain Version: 9                                          |                                                  |                |            |
|                                                               | 1.0.0<br>Flat                                    |                |            |
| Selected software con                                         | nponents                                         |                | ~          |

Figure 38 : e<sup>2</sup> studio Project Configuration tab

• Your new project is now created, configured, and ready to build.



### 4.3.1 Details about the Blinky Configuration

The Generate Project Content button creates configuration header files, copies source files from templates, and generally configures the project based on the state of the Project Configuration screen.

For example, if you check a box next to a module in the Components tab and click the Generate Project Content button, all the files necessary for the inclusion of that module into the project will be copied or created. If that same check box is then unchecked those files will be deleted.

#### 4.3.2 Configuring the Blinky Clocks

By selecting the Blinky template, the clocks are configured by e<sup>2</sup> studio for the Blinky application. The clock configuration tab (see 5.2.3. Configuring Clocks) shows the Blinky clock configuration. The Blinky clock configuration is stored in the BSP clock configuration file.

#### 4.3.3 Configuring the Blinky Pins

By selecting the Blinky template, the GPIO pins used to toggle the LED1 are configured by e<sup>2</sup> studio for the Blinky application. The pin configuration tab shows the pin configuration for the Blinky application (see 5.2.4.Configuring Pins). The Blinky pin configuration is stored in the BSP configuration file.

#### 4.3.4 Configuring the Parameters for Blinky Components

The Blinky project automatically selects the following HAL components in the Components tab:

- r\_gtm
- r\_ioport

To see the configuration parameters for any of the components, check the Properties tab in the HAL window for the respective driver (see 5.2.8.Adding and Configuring HAL Drivers).

#### 4.3.5 Where is main()?

The main function is located in < project >/rzv\_gen/main.c. It is one of the files that are generated during the project creation stage and only contains a call to hal\_entry(). For more information on generated files, see Adding and Configuring HAL Drivers.

#### 4.3.6 Blinky Example Code

The blinky application is stored in the hal\_entry.c file. This file is generated by e<sup>2</sup> studio when you select the Blinky Project template and is located in the project's src/ folder.

The application performs the following steps:

- 1. Get the LED information for the selected board by bsp\_leds\_t structure.
- 2. Set the configuration of Timer (GTM) and the callback function that is called when interrupt is fired.
- 3. Define the output level HIGH for the GPIO pins controlling the LEDs for the selected board.
- 4. Toggle the LEDs by writing to the GPIO pin with "R\_BSP\_PinWrite((bsp\_io\_port\_pin\_t) pin, pin\_level)" in callback function of GTM that is called with the specified interval.



### RZ/V2L

# 4.4 Build the Blinky Project

Highlight the new project in the Project Explorer window by clicking on it and build it.

There are three ways to build a project:

- 1. Click on Project in the menu bar and select Build Project.
- 2. Click on the hammer icon.
- 3. Right-click on the project and select Build Project.

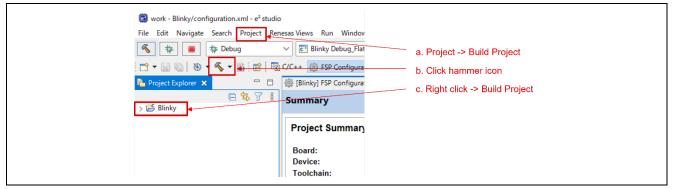


Figure 39 : e<sup>2</sup> studio Project Explorer window

Once the build is complete a message is displayed in the build Console window that displays the final image file name and section sizes in that image.

| 🎇 Pin Conflicts 📮 Console 🗙                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CDT Build Console [Blinky]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 'arm-none-eabi-gcc -mthumb -mcpu=cortex-m33+nodsp+notp -tdiagnostics-pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 'arm-none-eabi-gcc -mthumb -mcpu=cortex-m33+nodsp+nofp -fdiagnostics-pa                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| arm-none-eabi-gcc @"Blinky.elf.in"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| arm-none-eabi-objcopy -O srec "Blinky.elf" "Blinky.srec"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| arm-none-eabi-sizeformat=berkeley "Blinky.elf"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| text data bss dec hex filename                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 4812 2072 16784304 16791188 1003694 Blinky.elf                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 05:35:14 Build Finished. 0 errors, 0 warnings. (took 7s.823ms)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| L. Contraction of the second se |

Figure 40 : e<sup>2</sup> studio Project Build console



# 4.5 Debug the Blinky Project

### 4.5.1 Debug prerequisites

To debug the project on a board, you need

- The board to be connected to e<sup>2</sup> studio
- The debugger to be configured to talk to the board
- The application to be programmed to the microprocessor

Applications run from the internal ram or external ram of your microprocessor. To run or debug the application, the application must first be programmed to ram by JTAG debugger. SMARC EVK board has an JTAG header and requires an external JTAG debugger to the header.

#### 4.5.2 Debug steps

To debug the Blinky application, follow these steps:

1. Configure the debugger for your project by clicking Run > Debugger Configurations ...

| Rur      | Windo    | indow Help                  |          |
|----------|----------|-----------------------------|----------|
|          | Renesas  | esas Device Partition Manag | ger      |
| 1        | TraceX   | ceX                         | >        |
| Ð        | Tracealy | cealyzer                    | >        |
| <b>Q</b> | Run      |                             | Ctrl+F11 |
| *&       | Debug    | bug                         | F11      |
|          | Run Hist | History                     | >        |
| 0        |          |                             | >        |
|          | Run Cor  | Configurations              |          |
|          | Debug I  | oug History                 | >        |
| 柃        | Debug /  | -                           | >        |
|          | Debug    | oug Configurations          |          |
| 9        | External | ernal Tools                 | >        |

Figure 41 : e<sup>2</sup> studio Debug icon

or by selecting the drop-down menu next to the bug icon and selecting Debugger Configurations ...

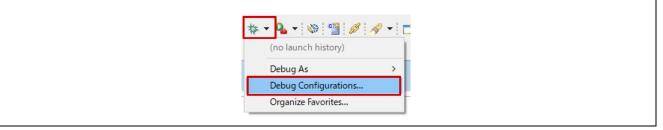


Figure 42 : e<sup>2</sup> studio Debugger Configurations selection option

2. Select your debugger configuration in the window. If it is not visible, then it must be created by clicking the New icon in the top left corner of the window. Once selected, the **Debug Configuration** window displays the **Debug configuration** for your **Blinky** project.



| Debug Configurations Create, manage, and run configurations                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                    |                      |        |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|----------------------|--------|------------------|
| Image: Second | Name: Blinky Debug | rce Common Variables |        | Browse<br>Browse |
| Filter matched 13 of 15 items                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                    |                      | Revert | Apply            |

Figure 43 : e<sup>2</sup> studio Debugger Configurations window with Blinky project (1)

- 3. Select the debug configuration for the generated project and select the **Debugger** tab.
- 4. Set the Secure and Non-secure Vector Address in the Connection Settings tab.

Click the "..." button in **Secure Vector Address** field and select "\_\_Secure\_Vectors" from the list in the **Select Symbol** window.

Also, click the "..." button in **Non-secure Vector Address** field and select "\_\_\_Vectors" from the list in the **Select Symbol** window.

These commands are for setting the address of Secure and Non-secure Vector Offset mapped in Blinky project. Please note that these addresses vary in accordance with linker settings.

| Debug Configurations                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                 |                                                          | – 🗆 X |                                                                                                                                        |                                                                                                                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-------|----------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| eate, manage, and run config                                                                                                                                                                                        | irations                                                                                                                                                                                                                                                                                                        |                                                          | Ť.    | Filter:<br>Symbol  SystemInit_S                                                                                                        | Address<br>0x72eff549                                                                                                                    |
| Perfilter text<br>C /C++ Application<br>C /C++ Remote Application<br>C /C++ Remote Application<br>E ASE Script<br>C OBB Hardware Debugging (<br>D Bb Ardware Debugging ()<br>D Bb Application<br>D Java Application | Name: Blinky Debug, Flat                                                                                                                                                                                                                                                                                        | evice: R9A07G044L23GBG_(                                 | ×     | Systemint, S     UsageFault, Handler, NS     UsageFault, Handler, S     UsageFault, Handler, S     Worm, Pasel, S     Excerte, Vectors | 0x/2eff549<br>0x6001084d<br>0x72eff535<br>0x73eff581<br>0x1001ff80<br>0x70010000<br>0x72eff5b9<br>0x600107b1<br>0x60010835<br>0x600108d9 |
| A Launch Group                                                                                                                                                                                                      | ✓ Connection                                                                                                                                                                                                                                                                                                    |                                                          |       | ОК                                                                                                                                     | Cancel                                                                                                                                   |
|                                                                                                                                                                                                                     | Connection     Register initialization     Reset on connection     Reset before run     ID Code (8ytes)     Hold reset during connect     Reset before download     Prevent Releasing the Reget of the CM3     Secure Vector Address     Non-secure Vector Address     SWV     Core clock (MHz)     V TrustZone | No<br>No<br>No<br>FFFFFFFFFFFFFFFFFFFFFFFFFF<br>No<br>No |       | OK                                                                                                                                     | Address<br>0x6001084d<br>0x72eff585<br>0x72eff585                                                                                        |

Figure 44: e<sup>2</sup> studio Debugger Configurations window with Blinky project(2)



- 5. Click **Debug** to begin debugging the application.
- 6. Extracting **RZ Debug**.

| Progress Information      |        |         | ×  |
|---------------------------|--------|---------|----|
| Preparing launch delegate |        |         |    |
| Configuring GDB           |        |         |    |
|                           | Cancel | Details | >> |

#### 7. When get the warning message, click Yes.

| 6 |
|---|
|   |

### 4.5.3 Details about the Debug Process

In debug mode, e<sup>2</sup> studio executes the following tasks:

- 1. Downloading the application image to the microprocessor and programming the image to the internal and/or external memory.
- 2. Setting a breakpoint at main().
- 3. Setting the stack pointer register to the stack.
- 4. Loading the program counter register with the address of the reset vector.
- 5. Displaying the startup code where the program counter points to.

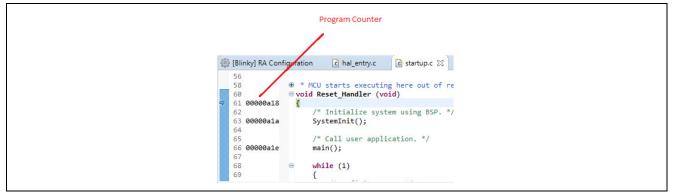


Figure 45 : e<sup>2</sup> studio Debugger memory window

#### 4.5.4 Run the Blinky Project

While in Debug mode, click Run > Resume or click on the Play icon twice.



Figure 46 : e<sup>2</sup> studio Debugger Play icon

The LEDs on the Pmod LED marked LD0, LD1, LD2 and LD3 should now be blinking.



## 5. FSP application launch with e<sup>2</sup> studio

#### 5.1 Create a Project

#### 5.1.1 What is a Project?

In e<sup>2</sup> studio, all FSP applications are organized in RZ MPU projects. Setting up an RZ MPU project involves:

- 1. Create a Project
- 2. Configuring a Project

These steps are described in detail in the next two sections. When you have existing projects already, after you launch e<sup>2</sup> studio and select a workspace, all projects previously saved in the selected workspace are loaded and displayed in the **Project Explorer** window. Each project has an associated configuration file named configuration.xml, which is located in the project's root directory.

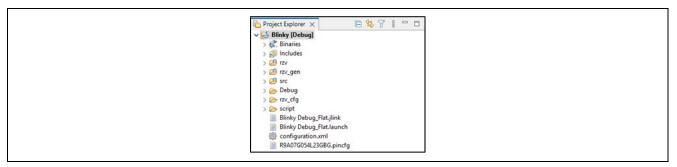


Figure 47 : e<sup>2</sup> studio Project Configuration file

Double-click on the configuration.xml file to open the RZ MPU Project Editor. To edit the project configuration, make sure that the **FSP Configuration** perspective is selected in the upper right-hand corner of the e<sup>2</sup> studio window. Once selected, you can use the editor to view or modify the configuration settings associated with this project.

# 😰 🔤 C/C++ 🏟 FSP Configuration

#### Figure 48 : e<sup>2</sup> studio FSP Configuration Perspective

**Note**: Whenever the RZ project configuration (that is, the configuration.xml file) is saved, a verbose RZ Project Report file (rzv\_cfg.txt) with all the project settings is generated. The format allows differences to be easily viewed using a text comparison tool. The generated file is located in the project root directory.

|                          | □ 🖹 rzv_cfg.txt × |                                           | - 1 |
|--------------------------|-------------------|-------------------------------------------|-----|
| Blinky [Debug]           | 1                 | FSP Configuration                         | ^   |
| > 🖏 Binaries             | 2                 | Board "RZ/V2L Evaluation Kit (SMARC)"     |     |
| > 🔊 Includes             | 3                 | R9A07G054L23GBG                           |     |
| > 🥝 rzv                  | 4                 | part_number: R9A07G054L23GBG              |     |
|                          | 5                 | rom_size_bytes: 0                         |     |
| > 🥴 rzv_gen              | 6                 | ram_size_bytes: 131072                    |     |
| > 😂 src                  | 7                 | package_style: LFBGA                      |     |
| > 🦢 Debug                | 8                 | package_pins: 456                         |     |
| > 🗁 rzv_cfg              | 9                 |                                           |     |
| > 😂 script               | 10                | RZV2L                                     |     |
| Blinky Debug_Flat.launch | 11                | series: 2                                 |     |
|                          | 12                |                                           |     |
| configuration.xml        | 13                | RZV2L Family                              |     |
| R9A07G054L23GBG.pincfg   | N 14              | RZ/V2L Common                             |     |
| rzv_cfg.txt              | 15                | Secure stack size (bytes): 0x200          |     |
|                          | 16                | Main stack size (bytes): 0x200            |     |
|                          | 17                | Heap size (bytes): 0                      |     |
|                          | 18                | MCU Vcc (mV): 3300                        |     |
|                          | 19                | Parameter checking: Disabled              |     |
|                          | 20                | Assert Failures: Return FSP_ERR_ASSERTION |     |
|                          | 21                | Error Log: No Error Log                   |     |
|                          | 22                | PFS Protect: Enabled                      |     |
|                          | 23                | C Runtime Initialization : Enabled        | ~   |

Figure 49 : RZ Project Report



The RZ Project Editor has several tabs. The configuration steps and options for individual tabs are discussed in the following sections.

**Note**: The tabs available in the RZ Project Editor depend on the e<sup>2</sup> studio version and the layout may vary slightly, however the functionality should be easy to follow.

|                                                                                                                                                                  |                                                          | - 0                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|--------------------------|
| Summary                                                                                                                                                          |                                                          | Generate Project Content |
| Project Summary Board: RZ/V2L Evaluation Kit (SMARC) Device: R3A07G054L23GBG Toolchain: GCC for Renesas RZ Toolchain Version: 9.2.120191025 FSP Version: 1.0.0   | Renesa                                                   | • ^                      |
| Project Type: Flat                                                                                                                                               |                                                          |                          |
| Selected software components<br>Simple application that blinks an LED. No RTOS included.<br>Arm CMSIS Version 5 - Core (M)<br>Board Support Package Common Files | v1.0.0<br>v5.7.0<br>v1.0.0                               |                          |
| General Timer<br>I/O Port<br>Board support package for R9A07G054L23GBG<br>Board support package for RZV2L<br>Board support package for RZV2L (RZV2L) - FSP Data  | v1.0.0<br>v1.0.0<br>v1.0.0<br>v1.0.0<br>v1.0.0<br>v1.0.0 |                          |
| Evaluation Kit RZ/V2L Support Files (RZ/V2L) - FSP Data                                                                                                          | v1.0.0                                                   | ~                        |
|                                                                                                                                                                  |                                                          |                          |
| Summary BSP Clocks Pins Interrupts Event Links Stacks Compor                                                                                                     | hents                                                    |                          |

Figure 50 : RZ Project Editor tabs



## 5.1.2 Creating a New Project

For RZ MPU applications, generate a new project using the following steps:

1. Click on **File > New > C/C++ Project**.

| 6    | work - e² studio               |                |      |                                     |   |      |
|------|--------------------------------|----------------|------|-------------------------------------|---|------|
| File | Edit Source Refactor Navigate  | Search Project | t Re | enesas Views Run Window Help        |   |      |
|      | New                            | Alt+Shift+N >  |      | Renesas C/C++ Project               | > | - 61 |
|      | Open File                      |                | C+   | Makefile Project with Existing Code |   | I –  |
|      | Open Projects from File System |                | C    | C/C++ Project                       |   | (÷ • |
|      | Recent Files                   | >              |      | Project                             |   |      |

Figure 51 : New RZ MPU Project

2. Then click on the Renesas RZ/V C/C++ FSP Project template for the type of project you are creating.

| New C/C++ P                                                       | C/C++ Project                     | 0 X    |  |
|-------------------------------------------------------------------|-----------------------------------|--------|--|
| All<br>CMake<br>Make<br>Renesas Debug<br>Renesas RA<br>Renesas R2 | RA Renesas RZ/T C/C++ FSP Project | ,<br>, |  |
| ?                                                                 | < Back Next > Einish              | Cancel |  |

Figure 52 : New Project Templates

3. Select a project name and location.

| Renesse RZ/Y C/C - + FSP Project         Project Name and Location         Project Name         Image: Churche RZ/Network Mindy         Churche RZ/Network Mindy         Churche Rie System:         Oncoder Rie System:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Г | Renesas RZ/V C/C++ FSP Project             | ×       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|--------------------------------------------|---------|
| Project Name and Location                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |   |                                            |         |
| Project name Use gefault location Location Channels, RZVwardt Slinky Channel RZvardt Slinky Van can download more Renease packs here                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |   |                                            |         |
| Binky       Urs getaut location       Location       Choose for system       default   You can download more Remeas pack here                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |   | Project Name and Location                  | <u></u> |
| Binky         Use datable location         Location:       Chooses & R2/NeweRX Binky         Chooses file system:       default                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   | Project name                               |         |
| Lotation Chaotic Register Sense parks herp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |   |                                            |         |
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Figure 53 : RZ MPU Project Generator (Screen 1)

4. Click Next.



## 5.1.2.1 Selecting a Board and Toolchain

In the Project Configuration window select the hardware and software environment:

- 1. Select the **FSP version**.
- 2. Select the **Board** for your application. You can select an existing RZ MPU Evaluation Kit or select **Custom User Board** for any of the RZ MPU devices with your own BSP definition.
- 3. Select the **Device**. The **Device** is automatically populated based on the **Board** selection. Only change the **Device** when using the **Custom User Board (Any Device)** board selection.
- 4. To add threads, select **RTOS**, or **No RTOS** if an RTOS is not being used.
- 5. The Toolchain selection defaults to GNU Arm Embedded.
- 6. Select the Toolchain version. This should default to the installed toolchain version.
- 7. Select the **Debugger**. The J-Link Arm Debugger is preselected.
- 8. Click Next.

|                  | ///C/C++ FSP Project<br>/ C/C++ FSP Project<br>Jols Selection |                                                           |                      |   |  |
|------------------|---------------------------------------------------------------|-----------------------------------------------------------|----------------------|---|--|
| Device:<br>Core: |                                                               | Board Description Device Details TrustZone Pins Processor | No<br>436<br>Cote-M3 |   |  |
| Toolchains       |                                                               | Debugger                                                  |                      |   |  |
| GNU ARM E        | mbedded                                                       | J-Link ARM                                                |                      | ~ |  |
| 9.2.1.2019102    | \$ v                                                          |                                                           |                      |   |  |
| ?                |                                                               | < Back                                                    | yest > Emish         |   |  |

Figure 54 : RZ MPU Project Generator (Screen 2)

#### 5.1.2.2 Selecting a Project Template

In the next window, select the build artifact, **Sub-core start state** and **RTOS**. Be sure that you select **Secure** as **Sub-core start state** in the current version.

| Renesas RZ/V C/C++ FSP Project                                                                     | - 🗆 X                       |   |
|----------------------------------------------------------------------------------------------------|-----------------------------|---|
| Renesas RZ/V C/C++ FSP Project                                                                     |                             |   |
| Build Artifact, RTOS Selection and Sub-Core Selection                                              |                             |   |
| Build Artifact Selection                                                                           | RTOS Selection              |   |
| Executable     Project builds to an executable file                                                | No RTOS V                   |   |
| Project ounds to an executable file     Static Library     Project builds to a static library file |                             |   |
| Sub-core start state                                                                               |                             |   |
| Secure     Start sub-core in secure state                                                          |                             |   |
| Non-secure     Start sub-core in non-secure state                                                  |                             |   |
|                                                                                                    |                             |   |
|                                                                                                    |                             |   |
|                                                                                                    |                             |   |
|                                                                                                    |                             |   |
|                                                                                                    |                             |   |
|                                                                                                    |                             |   |
|                                                                                                    |                             | - |
| 0                                                                                                  | < Back Next > Einish Cancel |   |
|                                                                                                    |                             |   |

Figure 55 : RZ MPU Project Generator (Screen 3)



In the next window, select a project template from the list of available templates. By default, this screen shows the templates that are included in your current RZ/V MPU Pack. Once you have selected the appropriate template, click **Finish**.

Note: If you want to develop your own application, select the basic template for your board, **Bare Metal -Minimal** or **FreeRTOS - Blinky**.

| Renesas RZ/V C/C++ FSP Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Renesas RZ/V C/C++ FSP Project                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |   |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| Project Template Selection         Project Template Selection         Image: | Project Template Selection  FreeRTOS - Blinky - Dynamic Allocation  FreeRTOS - Blinky - Static Alloc | 8 |
| Code Generation Settings                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Code Generation Settings<br>⊡Use Renesas Code Formatter                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |   |
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Figure 56 : RZ MPU Project Generator (Screen 4)



When the project is created, e<sup>2</sup> studio displays a summary of the current project configuration in the RZ MPU Project Editor.

| [Blinky] FSP Configuration ×                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                           | - 0                      |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|--------------------------|
| Summary                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | G                                         | ienerate Project Content |
| Project Summary           Board:         RZ/V2L Evaluation Kit (SMARC)           Device:         R9A076054123686           Toolchain:         GCC for Renesas RZ           Toolchain: Version:         9.2.1.2.0191025           FSP Version:         1.0.0           Project Type:         Flat           Selected software components           Simple application that blinks an LED. No RTOS included.           Arm CMSIS Version 5 - Cre (M)           Board Support Package Common Files           General Timer | V10.0<br>V5.7.0<br>V10.0                  | ^                        |
| General Timer<br>I/O Port<br>Board support package for R9A070054L23GBG<br>Board support package for R2V2L<br>Board support package for R2/V2L (R2/V2L) - FSP Data<br>Evaluation Kit R2/V2L Support Files (R2/V2L)                                                                                                                                                                                                                                                                                                       | V1.00<br>V1.00<br>V1.00<br>V1.00<br>V1.00 | v                        |
| Support                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                           |                          |

Figure 57 : RZ MPU Project Editor and available editor tabs

On the bottom of the RZ MPU Project Editor view, you can find the tabs for configuring multiple aspects of your project:

- With the **Summary** tab, you can see all they key characteristics of the project: board, device, toolchain, and more.
- With the **BSP** tab, you can change board specific parameters from the initial project selection.
- With the Clocks tab, you can configure the MPU clock settings for your project.
- With the Interrupts tab, you can add new user events/interrupts.
- With the **Stacks** tab, you can add and configure FSP modules. For each module selected in this tab, the **Properties** window provides access to the configuration parameters, interrupt selections.
- The **Components** tab provides an overview of the selected modules. Although you can also add drivers for specific FSP releases and application sample code here, this tab is normally only used for reference.

The functions and use of each of supported tabs is explained in detail in the next section. Please note that RZ/V MPU Pack doesn't support **Pins** and **Event Links** tab and so, those tabs are grayed out as shown above.



#### 5.2 Configuring a Project

Each of the configurable elements in an FSP project can be edited using the appropriate tab in the RZ Configuration editor window. Importantly, the initial configuration of the MPU after reset and before any user code is executed is set by the configuration settings in the **BSP** tab. When you select a project template during project creation, e<sup>2</sup> studio configures default values that are appropriate for the associated board. You can change those default values as needed. The following sections detail the process of configuring each of the project elements for each of the associated tabs.

#### 5.2.1 Summary Tab

| [Blinky] FSP Configuration ×                                                                                                                                                                                                                                                                                                                                                          |                                                             | - 0                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|--------------------------|
| Summary                                                                                                                                                                                                                                                                                                                                                                               |                                                             | Generate Project Content |
| Project Summary Board: R2/V2L Evaluation Kit (SMARC) Device: R3A070654L236BG Tootchain: GCC for Renesas R2 Tootchain Version: 9.2.1.2011025                                                                                                                                                                                                                                           | Renesas                                                     | ^                        |
| FSP Version: 1.0.0<br>Project Type: Flat<br>Selected software components                                                                                                                                                                                                                                                                                                              |                                                             |                          |
| Simple application that blinks an LED. No RTOS included.<br>Arm CMSIS Version 5 - Core (M)<br>Board Support Package Common Files<br>General Time<br>I/O Port<br>Board support package for R9A07G054L23GBG<br>Board support package for R2V2L<br>Board support package for R2V2L<br>Board support package for R2V2L (R2VV2L) - FSP Data<br>Evaluation KR R2VV2L Support Files (R2VV2L) | 100<br>570<br>100<br>100<br>100<br>100<br>100<br>100<br>100 | Ţ                        |
| Support                                                                                                                                                                                                                                                                                                                                                                               | 9                                                           |                          |

Figure 58 : Configuration Summary tab

The **Summary** tab, seen in the above figure, identifies all the key elements and components of a project. It shows the target board, the device, toolchain and FSP version. Additionally, it provides a list of all the selected software components and modules used by the project. This is a more convenient summary view when compared to the **Components** tab.

#### 5.2.2 Configuring the BSP

The **BSP** tab shows the currently selected board (if any) and device. The Properties view is located in the lower left of the Project Configurations view as shown below.

Note: If the Properties view is not visible, click Window > Show View > Properties in the top menu bar.

| Summary                                       | Summary BSP Clocks Pins Interrupts Event Links Stacks Components |                          |  |  |  |
|-----------------------------------------------|------------------------------------------------------------------|--------------------------|--|--|--|
| Properties × Problems @ Smart Browser Console |                                                                  |                          |  |  |  |
| RZ/V2L                                        | Evaluation Kit (SMARC)                                           |                          |  |  |  |
| Settings                                      | Property                                                         | Value                    |  |  |  |
|                                               | ✓ R9A07G054L23GBG                                                |                          |  |  |  |
|                                               | part_number                                                      | R9A07G054L23GBG          |  |  |  |
|                                               | rom_size_bytes                                                   | 0                        |  |  |  |
|                                               | ram_size_bytes                                                   | 131072                   |  |  |  |
|                                               | package_style                                                    | LFBGA                    |  |  |  |
|                                               | package_pins                                                     | 456                      |  |  |  |
|                                               | <ul> <li>RZ/V2L Common</li> </ul>                                |                          |  |  |  |
|                                               | Secure stack size (bytes)                                        | 0x200                    |  |  |  |
|                                               | Main stack size (bytes)                                          | 0x200                    |  |  |  |
|                                               | Heap size (bytes)                                                | 0                        |  |  |  |
|                                               | MCU Vcc (mV)                                                     | 3300                     |  |  |  |
|                                               | Parameter checking                                               | Disabled                 |  |  |  |
|                                               | Assert Failures                                                  | Return FSP_ERR_ASSERTION |  |  |  |
|                                               | Error Log                                                        | No Error Log             |  |  |  |
|                                               | PFS Protect                                                      | Enabled                  |  |  |  |
|                                               | C Runtime Initialization                                         | Enabled                  |  |  |  |
|                                               | ✓ RZV2L                                                          |                          |  |  |  |
|                                               | series                                                           | 2                        |  |  |  |

Figure 59 : Configuration BSP tab



The **Properties** view shows the configurable options available for the BSP. These can be changed as required. The BSP is the FSP layer above the MPU hardware. e<sup>2</sup> studio checks the entry fields to flag invalid entries. For example, only valid numeric values can be entered for the stack size.

When you click the **Generate Project Content** button, the BSP configuration contents are written to rzv\_cfg/fsp\_cfg/bsp/cfg.h This file is created if it does not already exist.

Warning

Do not edit this file as it is overwritten whenever the Generate Project Content button is clicked.

## 5.2.3 Configuring Clocks

The **Clocks** tab presents a graphical view of the MPU's clock tree, and each HAL driver uses the settings for dedicated numerical calculation. For example, scif\_uart driver calculates the communication rate from the settings in Clocks tab. Please note that the clock configuration is carried out on the main core (CA55) in advance. Thus, clocks configuration here must align with the settings on CA55.

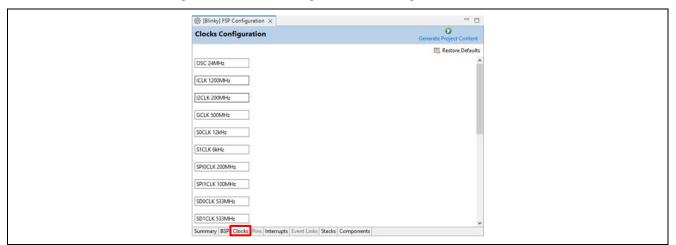


Figure 60 : Configuration Clocks tab

When you click the **Generate Project Content** button, the clock configuration contents are written to: rzv\_gen/bsp\_clock\_cfg.h

This file will be created if it does not already exist.

Warning

Do not edit this file as it is overwritten whenever the Generate Project Content button is clicked.



#### 5.2.4 Configuring Pins

RZ/V2L FSP doesn't support **Pins** tab, and it is grayed out.

If you would lite to use I/O port, I/O Port setting should be modified "pin\_data.c" manually. For details on I/O Port setting, please refer to <u>RZ/V2L Setting GPIO with Flexible Software Package.</u>

#### 5.2.5 Configuring Interrupts from the Stacks Tab

You can use the **Properties** view in the **Stacks** tab to enable interrupts by setting the interrupt priority. Select the driver in the **Stacks** pane to view and edit its properties.

|          | FSP Configuration ×                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                   | Ga                     | Concerts Reside Content |  |  |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------------------------|-------------------------|--|--|
| Threads  | Movember of the second se | HAL/Common Stacks | 🔊 New Stack > 🚊 Entend | nerate Project Content  |  |  |
| Properti | New Object > Remove  SP_Clocks Pins Interrupts Event Links St  ss X Problems @ Smart Brower @  Timer Driver on r.gtm  Property  v Commo                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                   | Value                  |                         |  |  |
|          | Parameter Checking<br>V Module g_timer2 Timer Driver on r_gtm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   | Default (BSP)          |                         |  |  |
|          | > General<br>> Interrupts<br>> Extra Features                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                   |                        |                         |  |  |

Figure 61 : Configuring Interrupts in the Stacks tab

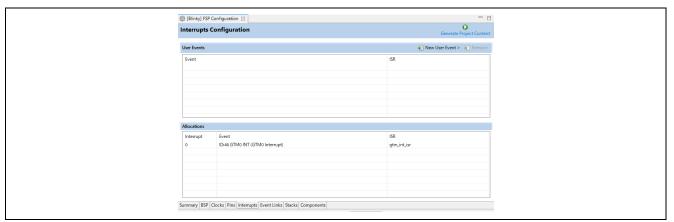
| *[Blinky] FSP Configu                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | uration ×                |                                           | Q、三部一覧 CyC++ ® FSP Configuratio                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| itacks Configura                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | New Thread Remove        | HAL/Common Stacks                         | Generate Project Content     Silinary     Set Binaries     Set Bina |
| ✓ Statute of the second se | Port Driver on r_joport  | ♥ g_joport I/O Port<br>Driver on r_joport |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Objects                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | New Object +      Remove |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |





#### 5.2.6 Creating Interrupts from the Interrupts Tab

On the **Interrupts** tab, the interrupt of the driver selected in the **Stacks** tab is registered.



#### Figure 63 : Configuring interrupt in Interrupt Tab

And on the Interrupts tab, the user can add a peripheral interrupt create by user. This can be done by adding a new event via the **New User Event** button.

#### 5.2.7 Viewing Event Links

RZ/V2L FSP doesn't support **Event Links** tab, and it is grayed out.



#### RZ/V2L

#### 5.2.8 Adding and Configuring HAL Drivers

For applications that run outside or without the RTOS, you can add additional HAL drivers to your application using the HAL/Common thread. To add drivers, follow these steps:

- 1. Click on the HAL/Common icon in the **Stacks** pane. The Modules pane changes to **HAL/Common** Stacks.
- 2. Click New Stack to see a drop-down list of HAL level drivers available in the FSP.
- 3. Select a driver from the menu **New Stack > Driver**.

| *(Blinky) FSP Config                                                 | uration ×               |                     | Q、 (部) 職 C/C++ 優 FSP Configurati<br>一 D |
|----------------------------------------------------------------------|-------------------------|---------------------|-----------------------------------------|
| Stacks Configuration                                                 |                         |                     | Generate Project Content                |
| Threads         New Thread:         Remove         HAL/Common Stacks |                         | @ g_ioport I/O Port |                                         |
| Objects                                                              | ᡚ New Object > 🔊 Remove |                     |                                         |

Figure 64 : e<sup>2</sup> studio Project configurator - Adding drivers

4. Select the driver module in the **HAL/Common Modules** pane and configure the driver properties in the **Properties** view.

e<sup>2</sup> studio adds the following files when you click the Generate Project Content button:

- The selected driver module and its files to the rzv/fsp directory
- The main() function and configuration structures and header files for your application as shown in the table below.

| File               | Contents                                                                                                        | Overwritten by Generate<br>Project Content? |
|--------------------|-----------------------------------------------------------------------------------------------------------------|---------------------------------------------|
| rzv_gen/main.c     | Contains main() calling generated<br>and user code. When called, the<br>BSP already has Initialized the<br>MPU. | Yes                                         |
| rzv_gen/hal_data.c | Configuration structures for HAL Driver only modules.                                                           | Yes                                         |
| rzv_gen/hal_data.h | Header file for HAL driver only modules.                                                                        | Yes                                         |
| src/hal_entry.c    | User entry point for HAL Driver only code. Add your code here.                                                  | No                                          |

The configuration header files for all included modules are created or overwritten in this folder: rzv\_cfg/fsp\_cfg



# 5.3 Reviewing and Adding Components

The **Components** tab enables the individual modules required by the application to be included or excluded. Modules common to all RZ/V MPU projects are preselected. All modules that are necessary for the modules selected in the **Stacks** tab are included automatically. You can include or exclude additional modules by ticking the box next to the required component.

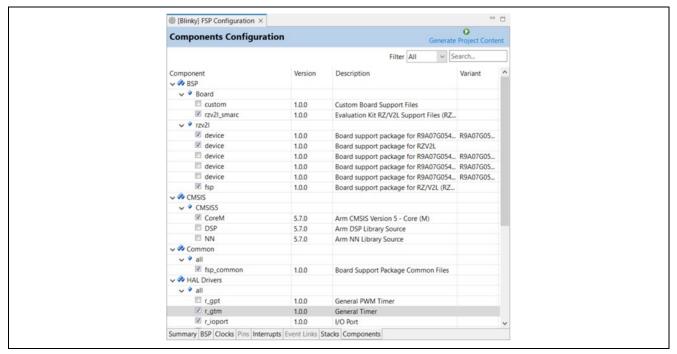


Figure 65 : Components Tab

Clicking the **Generate Project Content** button copies the .c and .h files for each selected component into the following folders:

- rzv/fsp/inc/api
- rzv/fsp/inc/instances
- rzv/fsp/src/bsp
- rzv/fsp/src/<Driver\_Name>

 $e^2$  studio also creates configuration files in the rzv\_cfg/fsp\_cfg folder with configuration options set in the **Stacks** tab.

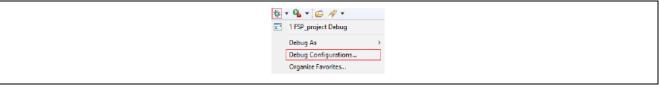


## 5.4 Debugging the Project

Once your project builds without errors, you can use the Debugger to download your application to the board and execute it.

To debug an application, follow these steps:

1. On the drop-down list next to the debug icon, select Debug Configurations.



#### 2. In the Debug Configurations view, click on your project listed as MyProject Debug.

|                                                                     | quations                                                                           |                 |                 | 15     |
|---------------------------------------------------------------------|------------------------------------------------------------------------------------|-----------------|-----------------|--------|
| Create, manage, and run con                                         | ignations                                                                          |                 |                 | )      |
| 🗈 🖹 🖻 🛪 🗉 🗍                                                         | Name: MyProject Debug                                                              |                 |                 |        |
| type filter text                                                    | Main 🎋 Debugger 🕨 Startup 🔲 🖸                                                      | ommon by Source |                 |        |
| C/C++ Application                                                   | Project:                                                                           |                 |                 |        |
| C/C++ Remote Applicati                                              | MyProject                                                                          |                 |                 | Browse |
| GDB Hardware Debuggin                                               | C/C++ Application:                                                                 |                 |                 |        |
| GDB OpenOCD Debuggin<br>GDB Simulator Debuggin                      | In a man to a                                                                      |                 |                 |        |
| Java Applet                                                         |                                                                                    | Variables       | Search Project  | Browse |
| Java Application                                                    | Build (if required) before launching recate Build Configuration: Use Active tation |                 |                 |        |
| Launch Group (Deprecation                                           |                                                                                    |                 |                 |        |
| Remote Java Application                                             |                                                                                    |                 |                 |        |
| <ul> <li>Renesas GDB Hardware D</li> <li>MyProject Debug</li> </ul> | Use workspace settings                                                             | Configure Works |                 |        |
| Renesas Simulator Debug                                             |                                                                                    |                 |                 |        |
|                                                                     |                                                                                    |                 |                 |        |
|                                                                     |                                                                                    |                 |                 |        |
| < >                                                                 |                                                                                    |                 |                 |        |
| Filter matched 14 of 16 items                                       |                                                                                    |                 | Reyert          | Apply  |
|                                                                     |                                                                                    |                 |                 | Close  |
|                                                                     |                                                                                    |                 | Reyert<br>Dobug |        |

 Set the Secure and Non-secure Vector Address in the Connection Settings tab of the Debugger tab. Click the "..." button in Secure Vector Address field and select "\_\_Secure\_Vectors" from the list in the Select Symbol window.

Also, click the "..." button in **Non-secure Vector Address** field and select "\_\_\_Vectors" from the list in the **Select Symbol** window.

| Debug Configurations             |                                        |                                | - 0 ×    | Filter:                                              |              |
|----------------------------------|----------------------------------------|--------------------------------|----------|------------------------------------------------------|--------------|
| Create, manage, and run configur | rations                                |                                |          | Symbol                                               | Address ^    |
|                                  |                                        |                                |          |                                                      |              |
|                                  |                                        |                                | ,        | SystemInit_S                                         | 0x72eff549   |
| 🗋 🖻 🗫 🗎 🗶 🗖 🗸 🗸                  | Name: Blinky Debug_Flat                |                                |          | <ul> <li>UsageFault_Handler_NS</li> </ul>            | 0x6001084d   |
|                                  | -                                      |                                |          | UsageFault_Handler_S                                 | 0x72eff535   |
| type filter text                 | 📄 Main 🎋 Debugger 🔛 Startup 🔲 Comr     | non 🤤 Source                   |          | Mann Poret S                                         | 0+72+#591    |
| C C/C++ Application              |                                        |                                |          | Secure_Vectors                                       | 0x1001ff80   |
| C/C++ Remote Application         | Debug hardware: J-Link ARM V Target D  | evice: R9A07G044L23GBG_1       |          | Vectors                                              | 0x00010000   |
| EASE Script                      |                                        |                                |          | <ul> <li>_bsp_clock_init_veneer</li> </ul>           | 0x72eff5b9   |
| C GDB Hardware Debugging         | GDB Settings Connection Settings Debug | Tool Settings                  |          | bsp_clock_freq_var_init                              | 0x600107b1   |
| GDB OpenOCD Debugging            | ✓ JTAG Scan Chain                      |                                | ^        | bsp_clock_init                                       | 0x60010835   |
| GDB Simulator Debugging (I       | Multiple Devices                       | No                             | *        | bsp_init                                             | 0x600108d9 🗸 |
| 🜌 Java Applet                    | IRPre                                  | 0                              |          |                                                      |              |
| Java Application                 | DRPre                                  | 0                              |          |                                                      |              |
| 🙀 Launch Group                   | ✓ Connection                           |                                |          | OK                                                   | Cancel       |
| Remote Java Application          | Register initialization                | No                             | ~        |                                                      |              |
| ✓ C Renesas GDB Hardware Deb     | Reset on connection                    | No                             | ×        |                                                      |              |
| C <sup>®</sup> Blinky Debug_Flat | Reset before run                       | No                             | ~        |                                                      |              |
| En Renesas Simulator Debuggir    | ID Code (Bytes)                        | FFFFFFFFFFFFFFFFFFFFFFFFFFFFFF |          | Select Symbol                                        | ×            |
|                                  | Hold reset during connect              | No                             | ~        | - ,                                                  |              |
|                                  | Reset before download                  | No                             | ~        | Filter                                               |              |
|                                  | Prevent Releasing the Reset of the CM  | 3 Core Yes                     | <u> </u> |                                                      |              |
|                                  | Secure Vector Address                  |                                |          | Symbol                                               | Address ^    |
|                                  | Non-secure Vector Address              |                                |          | UsageFault_Handler_NS                                | 0x6001084d   |
|                                  | Core clock (MHz)                       | 0                              |          | UsageFault_Handler_S                                 | 0x72eff535   |
|                                  | v TrustZone                            | 0                              |          | Warm_Reset_S                                         | 0x72eff581   |
|                                  | Set TrustZone secure/non-secure bour   | idation No.                    | ×        | Course Masters                                       | 0-1001#80    |
|                                  | Set musizione secure/non-secure bour   | luaries no                     | · •      | Vectors                                              | 0x00010000   |
|                                  |                                        |                                |          | bsp_clock_init_veneer                                | 0x72e#5b9    |
| < >                              |                                        |                                |          | <ul> <li>bsp_clock_freq_var_init</li> </ul>          | 0x600107b1   |
| Filter matched 13 of 15 items    |                                        | Revert                         | Apply    | <ul> <li>bsp_clock_init</li> </ul>                   | 0x60010835   |
|                                  |                                        |                                |          | <ul> <li>bsp_crock_init</li> <li>bsp_init</li> </ul> | 0x600108d9   |
|                                  |                                        |                                |          | bsp_init     bsp_irg_cfg                             | 0x60010849   |
|                                  |                                        | <u>D</u> ebug                  | Close    | - usp_ird_crg                                        | 0x00010849   |
| ?                                |                                        |                                |          |                                                      |              |

These commands are for setting the address of Secure and Non-secure Vector Offset mapped in Blinky project.

Please note that these addresses vary in accordance with linker settings.



4. Connect the board to your PC via a standalone Segger J-Link debugger and click **Debug**.

Note: For details on using J-Link and connecting the board to the PC, see 3.2.2.JTAG connection.



# 5.5 Modifying Toolchain Settings

There are instances where it may be necessary to make changes to the toolchain being used (for example, to change optimization level of the compiler or add a library to the linker). Such modifications can be made from within e<sup>2</sup> studio through the menu **Project > Properties > Settings** when the project is selected. The following screenshot shows the settings dialog for the GNU Arm toolchain. This dialog will look slightly different depending upon the toolchain being used.

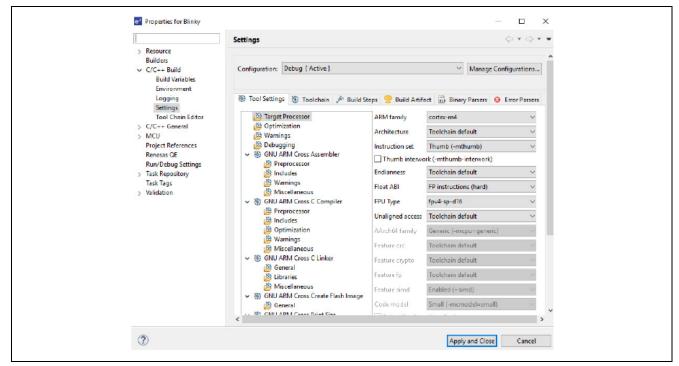


Figure 66 : e<sup>2</sup> studio Project toolchain settings

The scope for the settings is project scope which means that the settings are valid only for the project being modified.

The settings for the linker which control the location of the various memory sections are contained in a script file specific for the device being used. This script file is included in the project when it is created and is found in the script folder (for example, /script/fsp.ld).



## 5.6 Importing an Existing Project into e<sup>2</sup> studio

- 1. Start by opening e<sup>2</sup> studio.
- 2. Open an existing Workspace to import the project and skip to step d. If the workspace does not exist, proceed with the following steps:
  - a. At the end of e<sup>2</sup> studio startup, you will see the Workspace Launcher Dialog box as shown in the following figure.

| e Eclipse Launcher                                                                                                  |                       | ×      |
|---------------------------------------------------------------------------------------------------------------------|-----------------------|--------|
| Select a directory as workspace                                                                                     |                       |        |
| $\ensuremath{e}^2$ studio uses the workspace directory to store its preferences and d                               | evelopment artifacts. |        |
| Workspace: C:\Users\ <user_name\e2studio\workspace< td=""><td>~</td><td>Browse</td></user_name\e2studio\workspace<> | ~                     | Browse |
| Use this as the default and do not ask again                                                                        |                       |        |
| <u>R</u> ecent Workspaces                                                                                           |                       |        |
|                                                                                                                     | Launch                | Cancel |

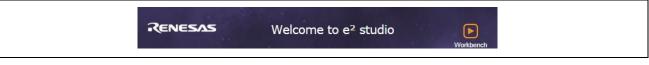
Figure 67 : Workspace Launcher dialog

b. Enter a new workspace name in the Workspace Launcher Dialog as shown in the following figure. e<sup>2</sup> studio creates a new workspace with this name.

| el Eclipse Launcher X                                                                                  |
|--------------------------------------------------------------------------------------------------------|
| Select a directory as workspace                                                                        |
| e <sup>2</sup> studio uses the workspace directory to store its preferences and development artifacts. |
| Workspace: C-\Users\ <username>\e2studio\new_workspace V</username>                                    |
| Use this as the default and do not ask again                                                           |
| ▶ <u>R</u> ecent Workspaces                                                                            |
| Launch Cancel                                                                                          |

Figure 68 : Workspace Launcher dialog - Select Workspace

- c. Click Launch.
- d. When the workspace is opened, you may see the Welcome Window. Click on the **Workbench** arrow button to proceed past the Welcome Screen as seen in the following figure.



#### Figure 69 : Workbench arrow button

3. You are now in the workspace that you want to import the project into. Click the **File** menu in the menu bar, as shown in the following figure.

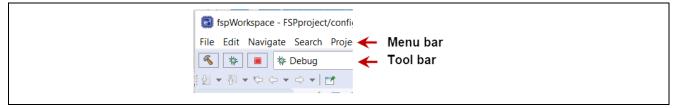


Figure 70 : Menu and tool bar



4 Click Import on the File menu or "Import project" on Project Explorer, as shown in the following figure.

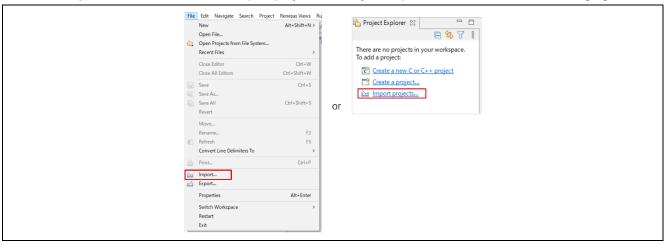


Figure 71 : File drop-down menu

5. In the **Import** dialog box, as shown in the following figure, choose the **General** option, then **Existing Projects into Workspace**, to import the project into the current workspace.

| Import                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | – 🗆 X  |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--|
| Select<br>Create new projects from an archive file or directory.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 25     |  |
| Select an import wizard:<br>type filter text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |        |  |
| type filter text<br>General<br>CMSIS Pack<br>CMSIS Pack<br>File System<br>File |        |  |
| (                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Cancel |  |

Figure 72 : Project Import dialog with "Existing Projects into Workspace" option selected

- 6. Click Next.
- 7. To import the project, use either Select archive file or Select root directory.



#### a. Click **Select root directory** file as shown in the following figure.

| -                      |                                    |        |          |          |
|------------------------|------------------------------------|--------|----------|----------|
| Import                 |                                    | -      |          | $\times$ |
| Import Projects        |                                    |        |          | 5        |
|                        | rch for existing Eclipse projects. |        |          | 7        |
|                        | · · · · · ·                        |        | <u> </u> | -4       |
| <b>O1</b>              | 1,                                 |        |          | _        |
| Select root directory: | J                                  | ~      | Browse   |          |
| O Select archive file: |                                    | $\sim$ | Browse   |          |
| Projects:              |                                    |        |          |          |
|                        |                                    |        | Select / | AII      |
|                        |                                    |        | Deselect | All      |
|                        |                                    |        | Refres   | h        |
|                        |                                    |        |          |          |
|                        |                                    |        |          |          |
|                        |                                    |        |          |          |
|                        |                                    |        |          |          |
| Options                |                                    |        |          |          |
| Search for nested pro  |                                    |        |          |          |
| Copy projects into we  |                                    |        |          |          |
|                        | ed projects upon completion        |        |          |          |
| Hide projects that alr | Iready exist in the workspace      |        |          |          |
| Working sets           |                                    |        |          |          |
| Add project to worki   | king sets                          |        | New      |          |
|                        | -                                  |        | Select   |          |
| Working sets:          |                                    |        | Select   |          |
|                        |                                    |        |          |          |
|                        |                                    |        |          |          |
|                        |                                    |        |          |          |
| ?                      | < Back Next > Finish               |        | Cance    |          |
| •                      |                                    |        | 201111   |          |
|                        |                                    |        |          |          |

Figure 73 : Import Existing Project dialog 1 - Select root directory

- 8. Click Browse.
- 9. For **Select root directory**, browse to the project folder that you want to import.
- 10.Select the file for import.
- 11.Click Open.
- 12. Select the project to import from the list of **Projects**, as shown in the following figure.

| Import                                                                                      |                          |   |       | ×                         |
|---------------------------------------------------------------------------------------------|--------------------------|---|-------|---------------------------|
| Import Projects<br>Select a directory to sea                                                |                          |   |       |                           |
| <ul> <li>Select root directory:</li> <li>Select archive file:</li> <li>Projects:</li> </ul> | C:\works_RZV\work\Blinky | ~ |       | wse                       |
| Blinky (C:\works_RZV\work\Blinky)                                                           |                          | [ | Desel | ct All<br>ect All<br>resh |

Figure 74 : Import Existing Project dialog 2

13.Click **Finish** to import the project.



# **Revision History**

|      |                | Descriptio | n                                                                                                                  |
|------|----------------|------------|--------------------------------------------------------------------------------------------------------------------|
| Rev. | Date           | Page       | Summary                                                                                                            |
| 1.00 | Jan.14.22      | -          | First Edition issued                                                                                               |
| 1.10 | 1.10 Jan,31.23 |            | Updated e2sutio version to install for Windows PC and<br>changed images of e2studio installation                   |
|      |                | 16 to 20   | Updated e2studio version to install for Linux PC and changed images of e2studio installation                       |
|      |                | 23 to 24   | Updated pack version to install                                                                                    |
|      |                | 34 to 36   | Changed Chapter 4.6 to 4.9 to a sub-chapter of Chapter 4.5<br>(These have been changed to Chapters 4.5.1 to 4.5.4) |
|      |                | 35, 49     | Updated the method of specifying Secure Vector Address and Non-secure Vector Address                               |



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

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

#### 1. Precaution against Electrostatic Discharge (ESD)

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

2. Processing at power-on

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