Renesas Synergy™ Platform

Renesas Synergy™ Platform Pin Configurator Usage

Introduction

This application note describes how to use pin configurator for Renesas Synergy™ Platform in e^2 studio or the IAR Embedded Workbench (IAR EW for Synergy).

Objectives

The objective of this application note is to help users to be familiar with the procedure of configuring pins of the Synergy project by using the Pin Configurator of e^2 studio or IAR EW for Synergy.

Required Resources

The procedure in this application note applies to all Renesas Synergy™ devices and development boards. Before following the procedure in this application note, make sure the following resources are available

- A PC running Microsoft® Windows® 7 or 10 with the following Renesas software installed:
- IAR EW for Synergy v8.23.3 or e^2 studio v7.3.0 (or later)
- Synergy Software Package (SSP) v1.6.0 or later
- Renesas Synergy™ Standalone Configurator (SSC) v7.3.1 (only for IAR EW for Synergy)

You can download the required Renesas software and view the installation instruction from the Renesas Synergy™ Platform (https://www.renesassynergy.com).

Operating Environment

Target devices	Development Kit for Renesas Synergy™ S7G2. Development Kit for Renesas Synergy™ S124. Development Kit for Renesas Synergy™ S3A7.
SSP	SSP v1.6.0 or later
IDE	e^2 studio v7.3.0 (or later) or IAR EW for Synergy v8.23.3
Toolchains	GNU ARM® Compiler GCC_7.2.1.20170904 (included in e^2 studio) IAR EW for Synergy

Contents

1. Generating a Synergy Project

This chapter describes how to create a Synergy C project used for demonstrating the operation of pin configurator. If you already have a Synergy project, please skip to chapter 2.

1.1 Generating a Synergy Project using e² studio

1. Invoke e² studio and launch a workspace. Select **File** → **New** → **Synergy C Project** to open the project creation wizard.

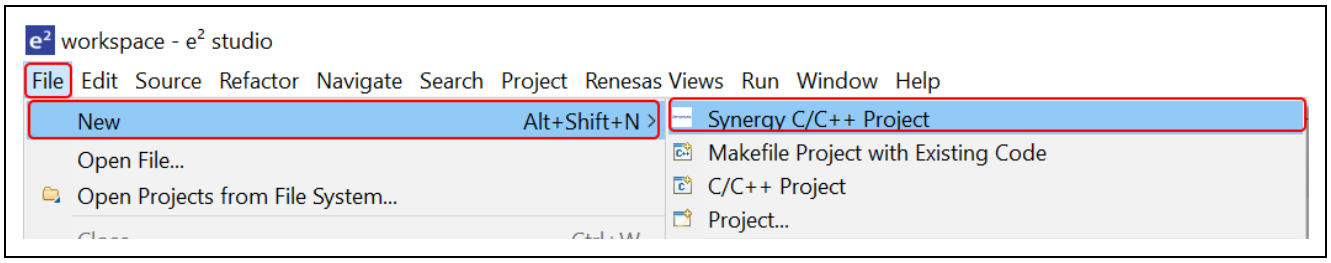

Figure 1. New Synergy C Project

2. Select **Renesas Synergy C Executable Project** and click **Next**.

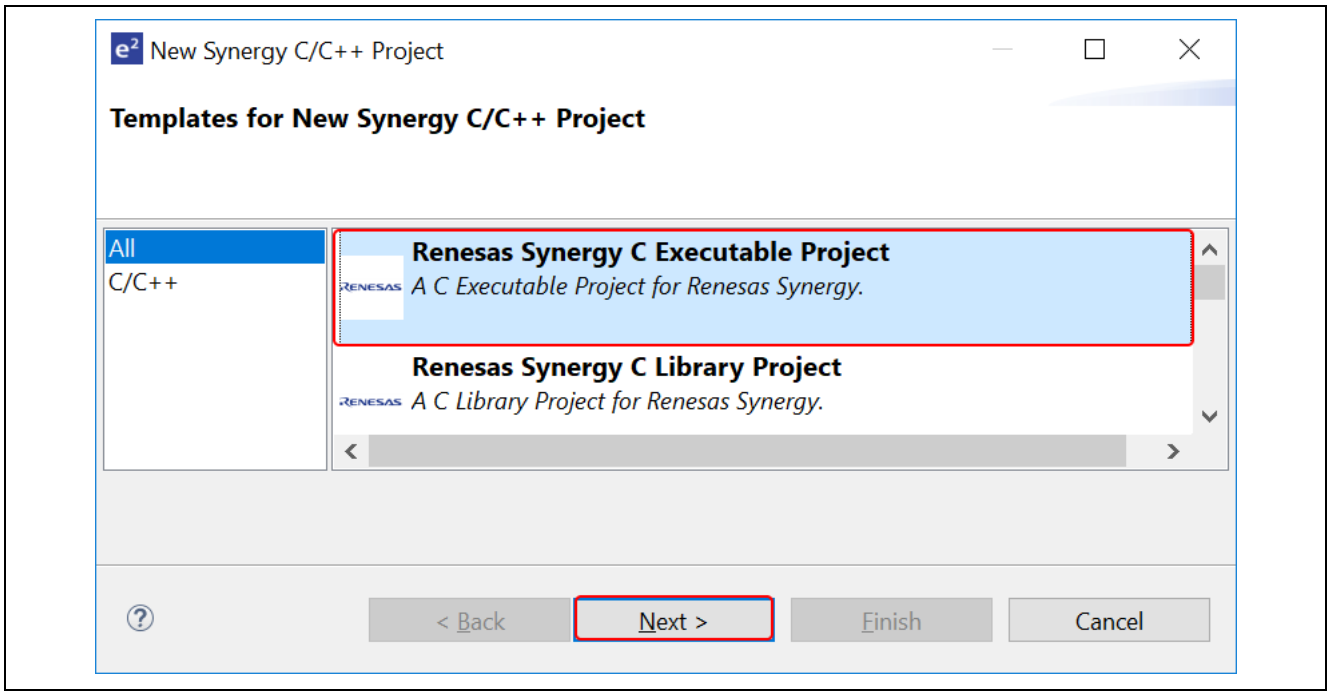

Figure 2. Project template

3. In the project creation wizard, input project information:
   A. **Project name**: enter a name, for ex: **Pin_Configurator_Example**.
   B. **Use default location**: Checked.
   C. **Toolchain**: **GCC ARM Embedded**.
   D. **License**: In case license file is not input:
      a. Click **Change license file** to open the **Synergy License** dialogue box.
      b. Click **[...]** button and browse to this location for license: `{e² studio installed folder}\internal\projectgen\arm\licenses` and select the license file in XML format. This license file is available only when SSP is installed.
   E. Click the **Next** button to continue.

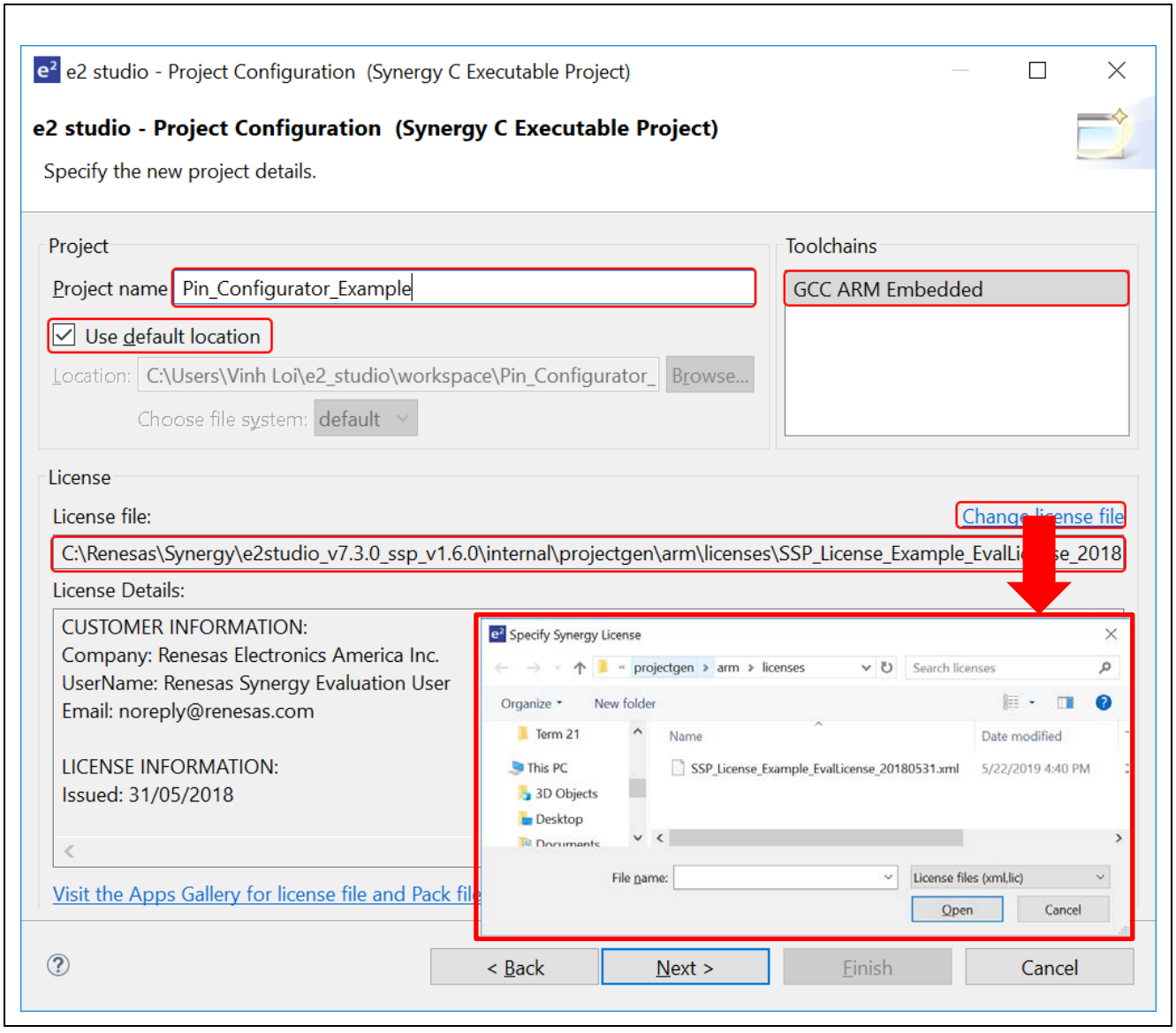

Figure 3. Synergy Project Creation Wizard

4. In the Device Selection dialog, input device and tool information:
   A. **Board**: **S7G2 DK**
   B. **Toolchain version**: Latest GNU compiler approved for use with Renesas Synergy. Currently 7.2.1.20170904
   C. Other fields are kept as default as shown in the figure below.
   D. Click **Next** button to continue.

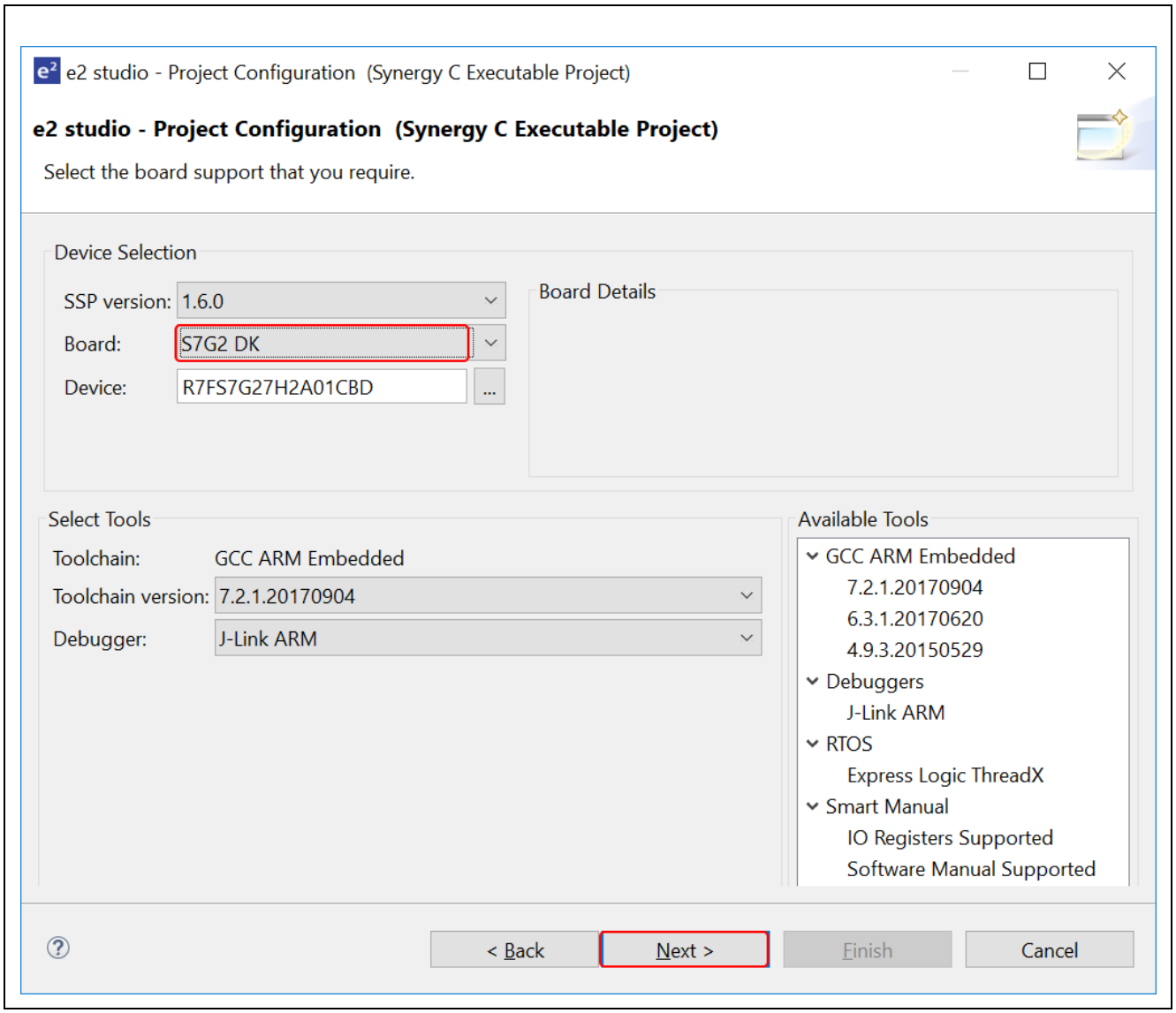

Figure 4. Device Selection

5. In the project templates dialog, select project type: **Blinky** and click **Finish** to create project.

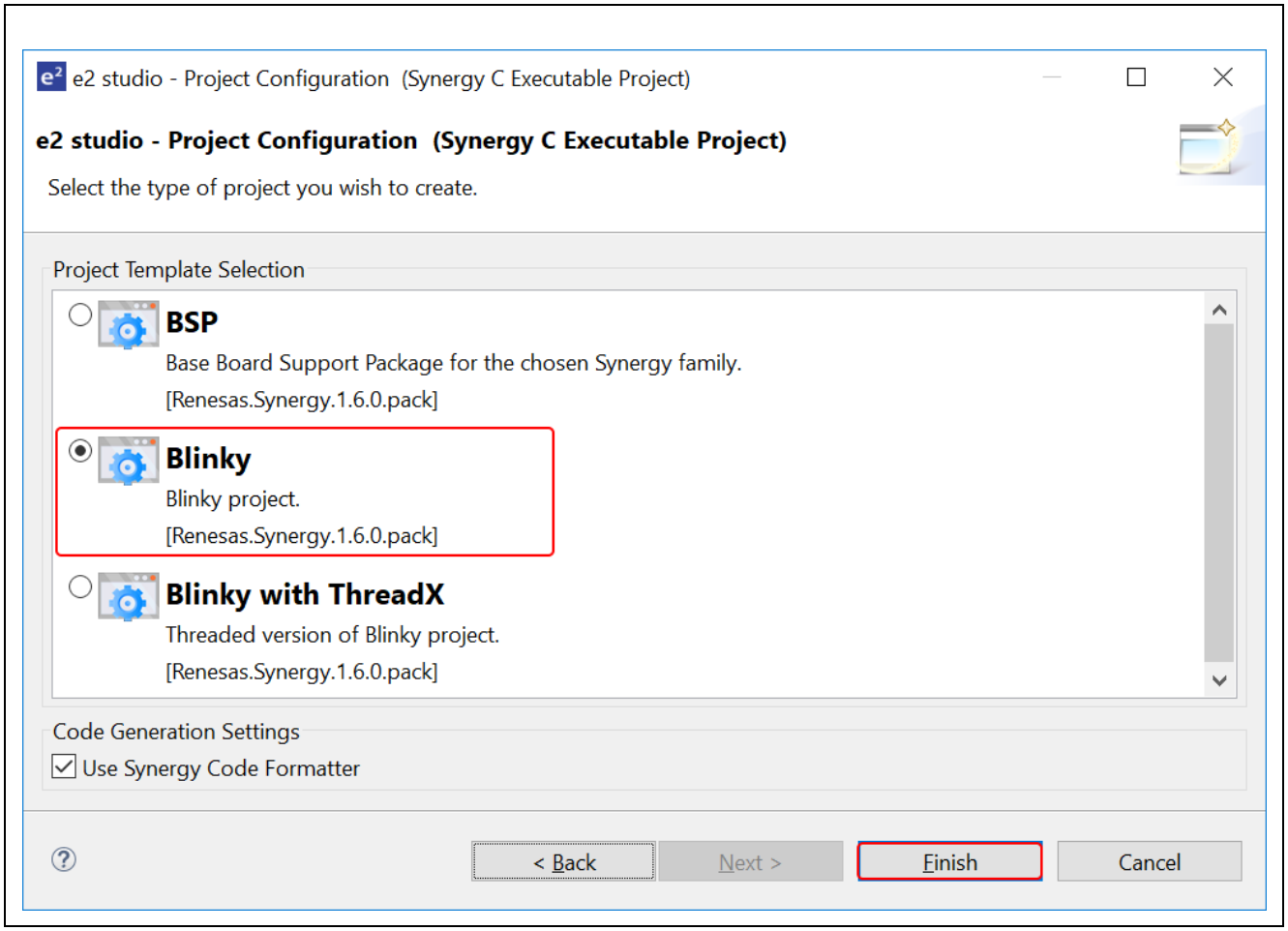

Figure 5. Project Templates

6. You may be prompted to open the Synergy Configuration perspective. Click **Yes** to open the perspective.

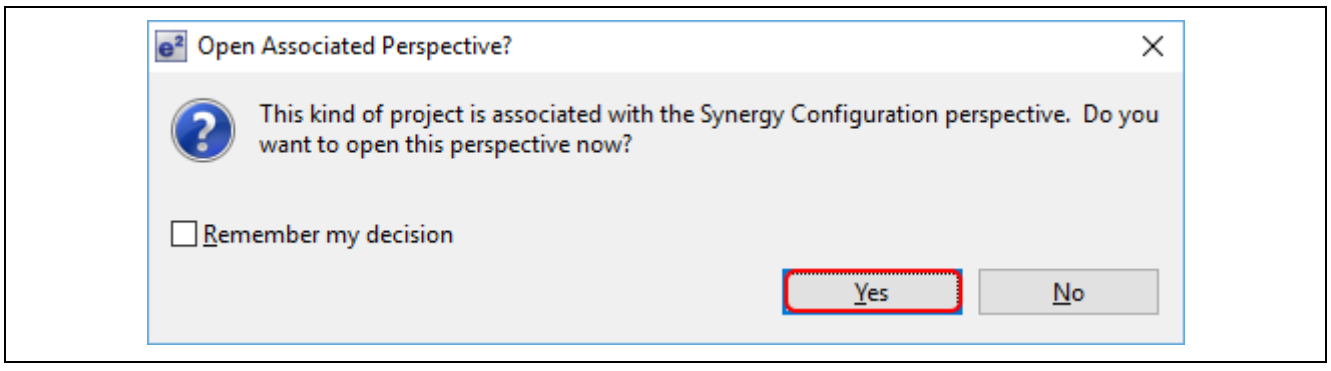

Figure 6. Open Synergy Configuration Perspective

7. New Synergy Project is successfully created and launched in Synergy Configuration perspective. There are 3 panes in this perspective: **Project Explorer**, **Synergy Configuration**, and **Package**.

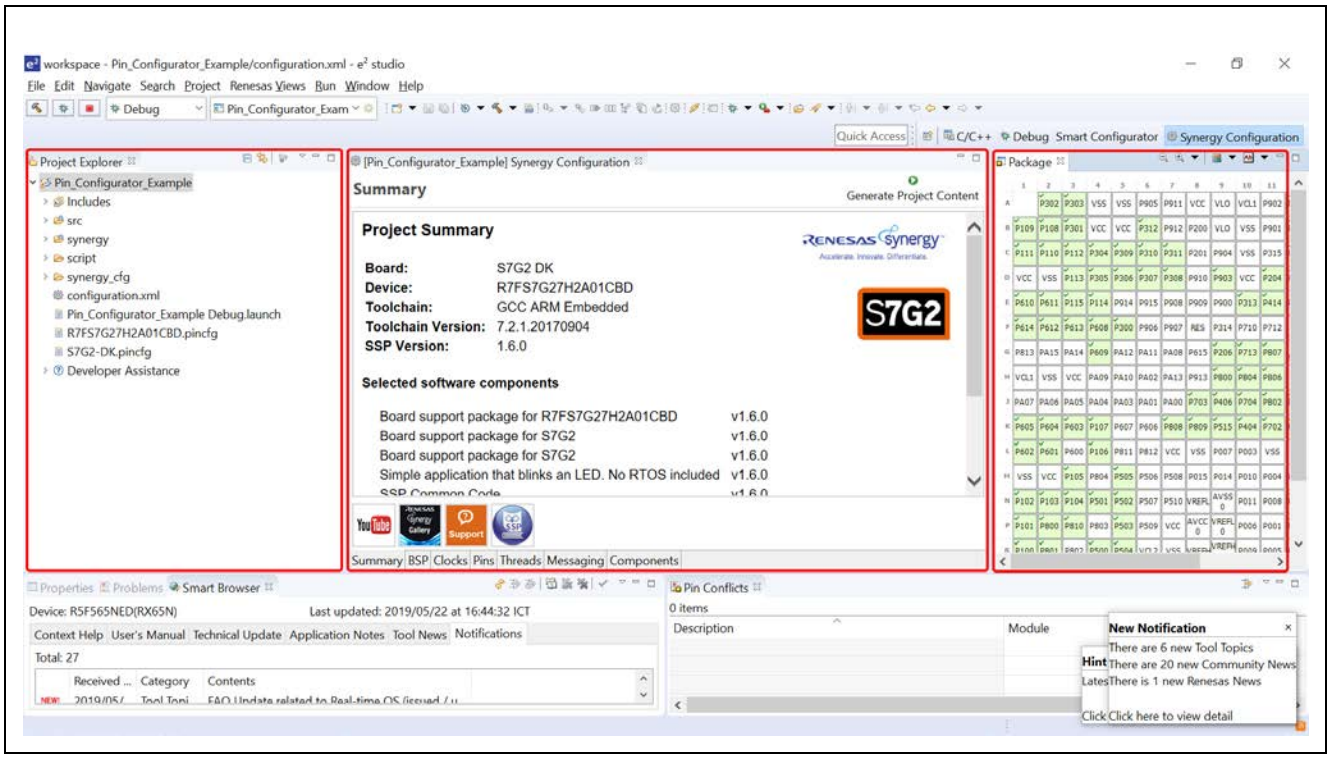

Figure 7. New project opened in "Synergy Configuration" Perspective

1.2 Generating a Synergy Project using IAR EW for Synergy

1. In the IAR EW for Synergy menu, choose **Renesas Synergy → New Synergy Project…**

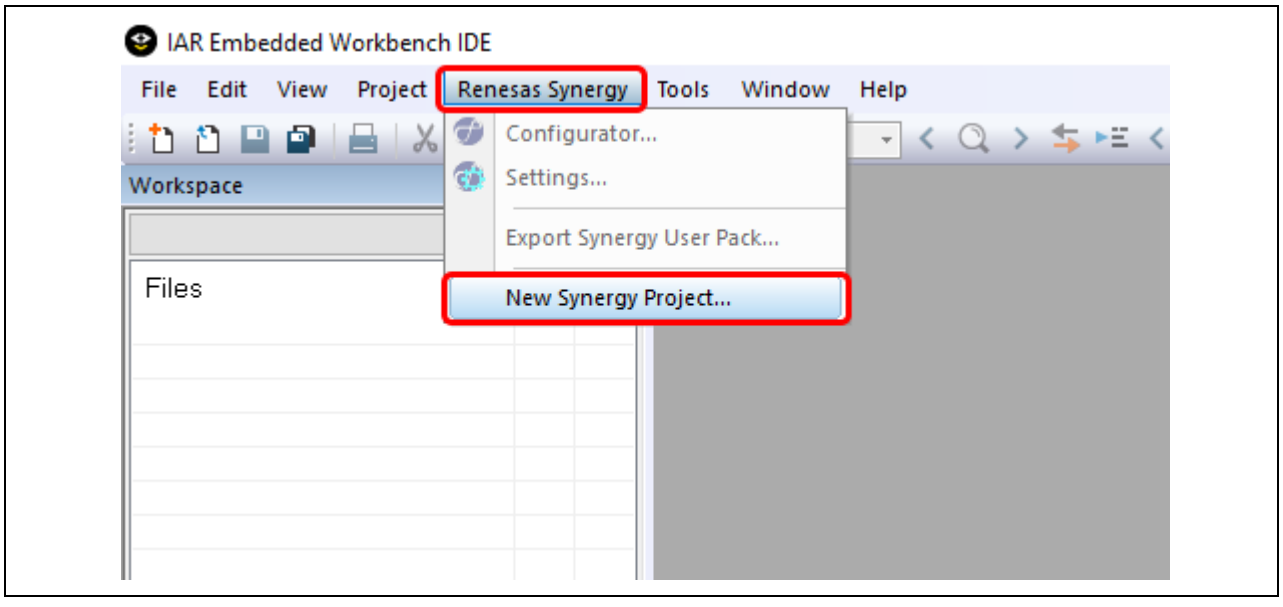

Figure 8. Create New Project

2. In the **Save Workspace As** dialog box that appears, choose a folder to save the workspace in and enter the workspace name: **MyWorkspace** and click **Save**.

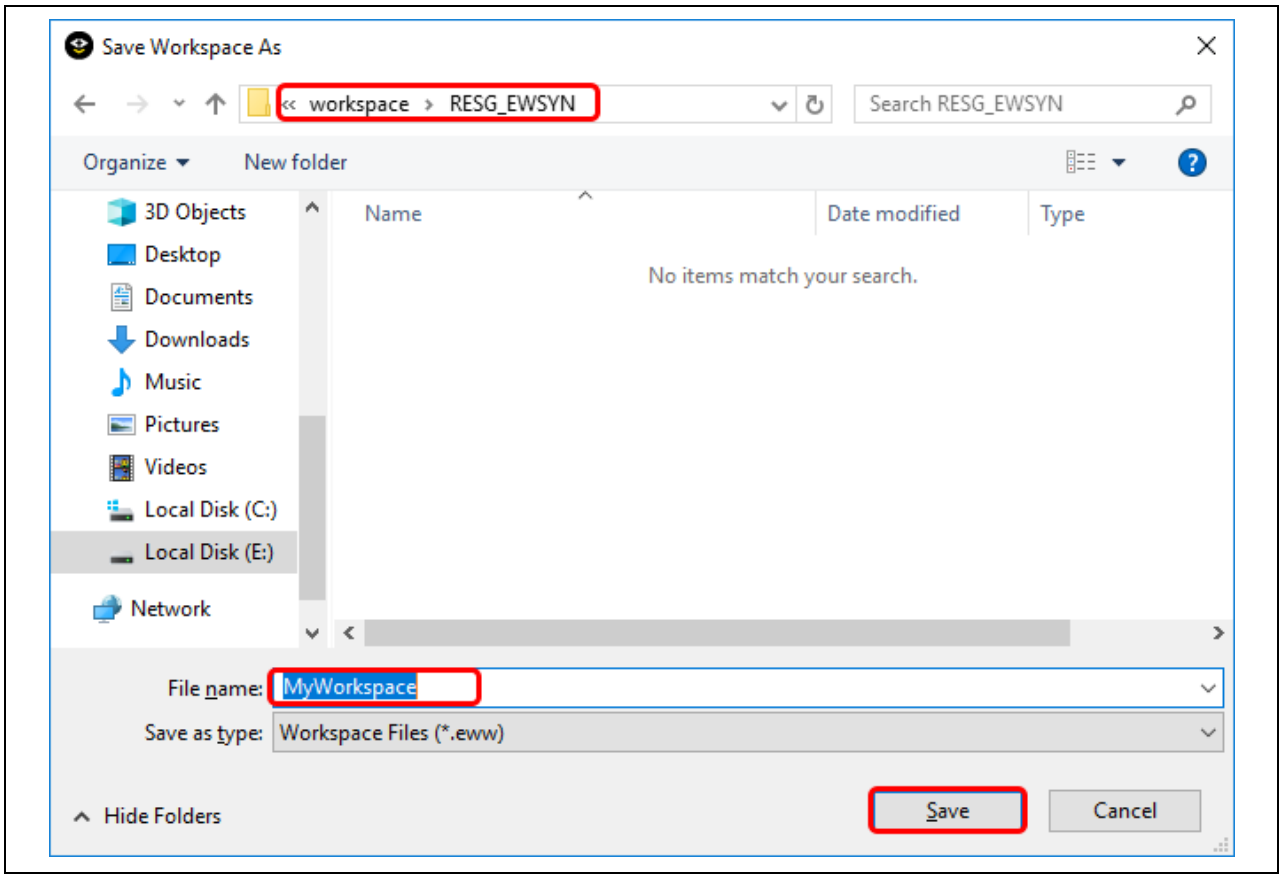

Figure 9. Save Workspace

3. In the **Renesas Synergy Settings** dialog box that appears, specify:
   A. Location where Renesas Synergy SSC/SSP is installed: `C:\Renesas\Synergy\SSC_[SSC version]` (default installation folder).
   B. License file: `C:\Renesas\Synergy\SSC_[SSC version]\internal\projectgen\arm\licenses`
      a. Note 1: The SSP license MUST be installed under the `SSC_[SSC version]` folder.
      b. Note 2: If the license is installed in e² studio, user may copy the [internal] folder of e² studio (`C:\Renesas\e2studio \internal\projectgen\arm\Licenses`) to the SSC [SSC version] folder.
   C. **Replace encrypted files with decrypted files**: unchecked

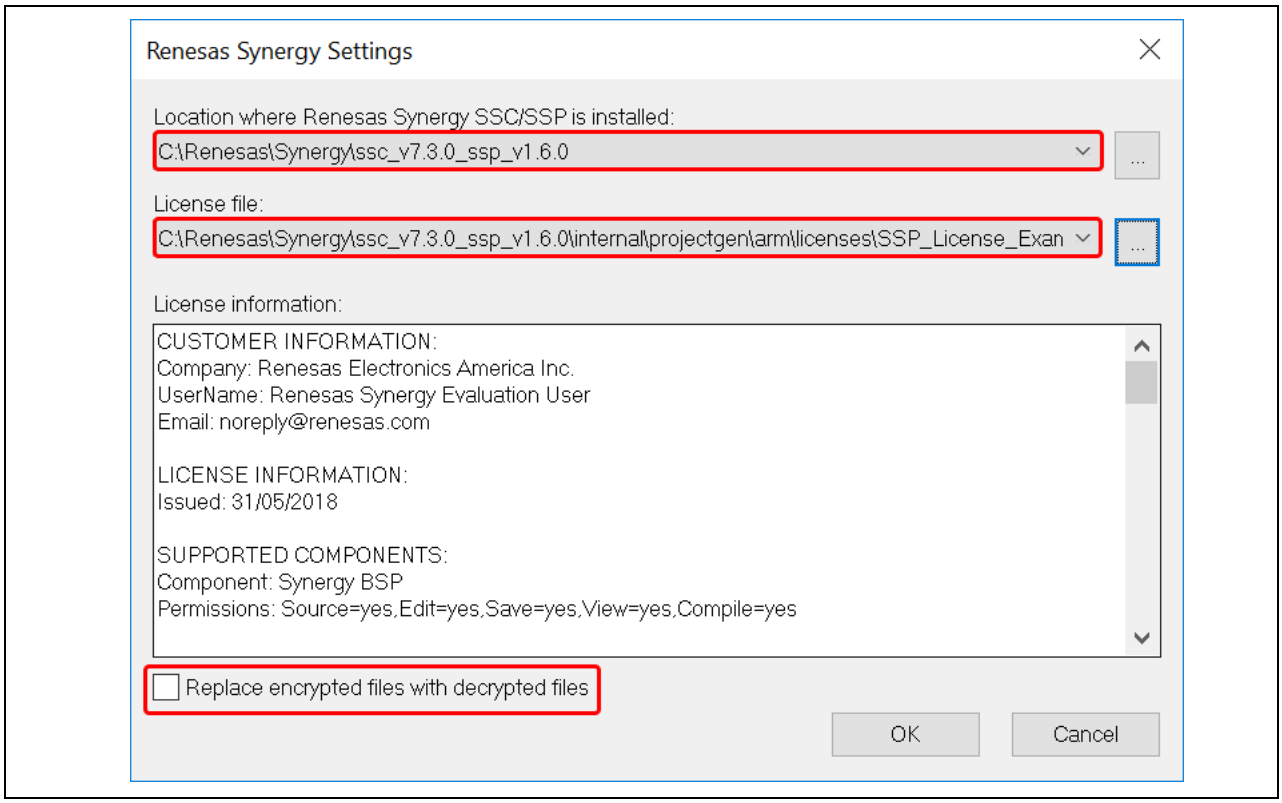

Figure 1-10 Renesas Synergy Settings

4. In the **Save As** dialog box that appears, choose a folder that save the project and enter the project name: **Pin_Configurator_Example** and click **Save**.

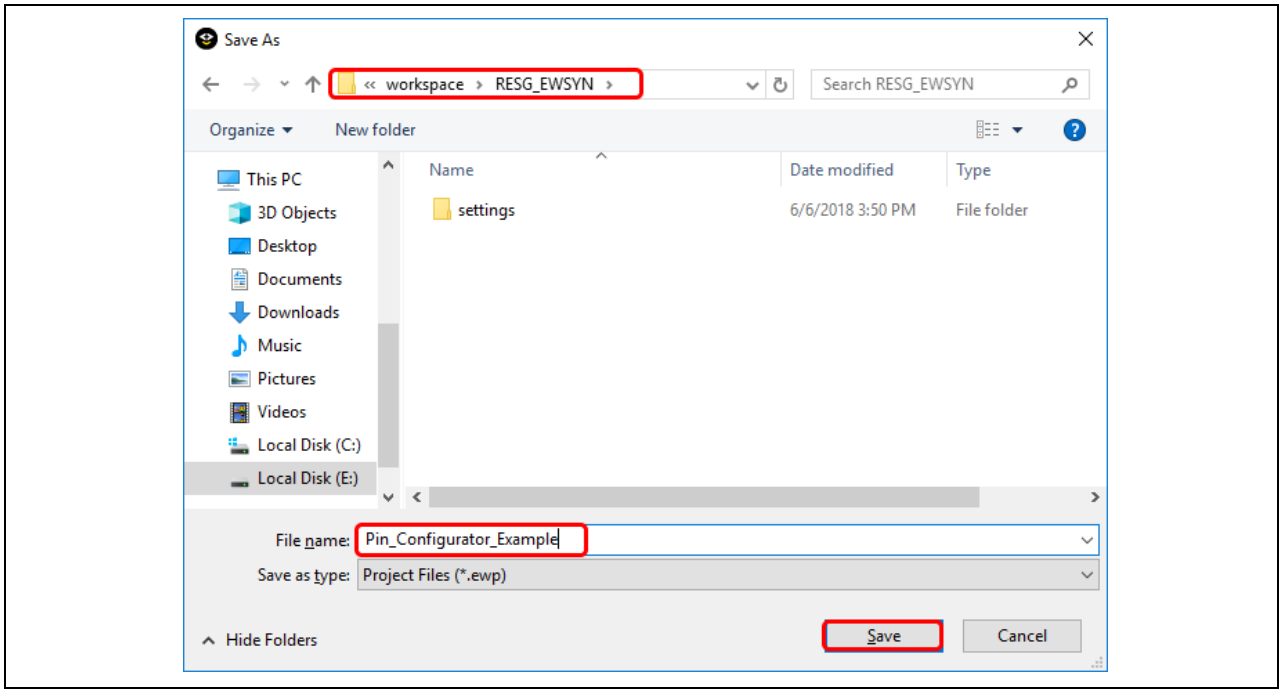

Figure 11. Save project

5. When the **Synergy Standalone Configurator** opens, specify:
   A. **SSP version**: **1.6.0** or later
   B. **Board**: **S7G2 DK**
   C. **Device**: **R7FS7G27H2A01CBD**
   D. Click **Next**

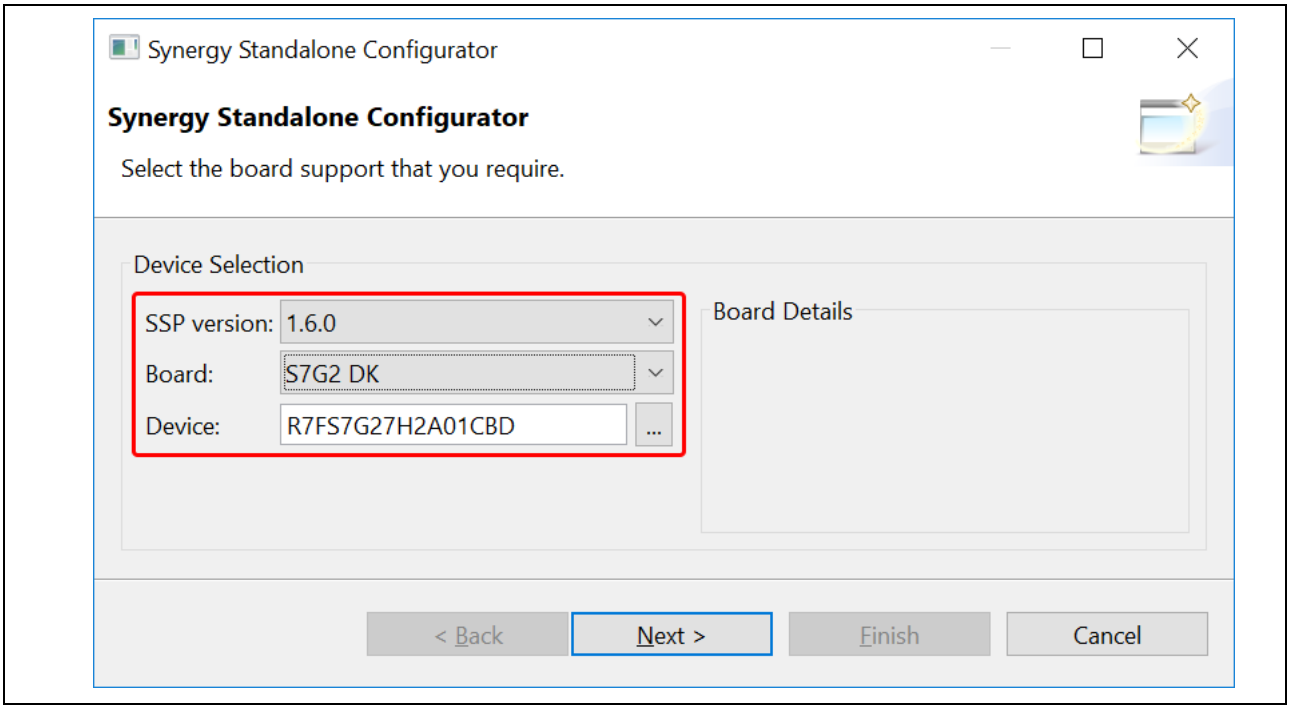

Figure 12. Device Selection

6. In the **Project Template Selection**, select **Blinky**. Click **Finish**.

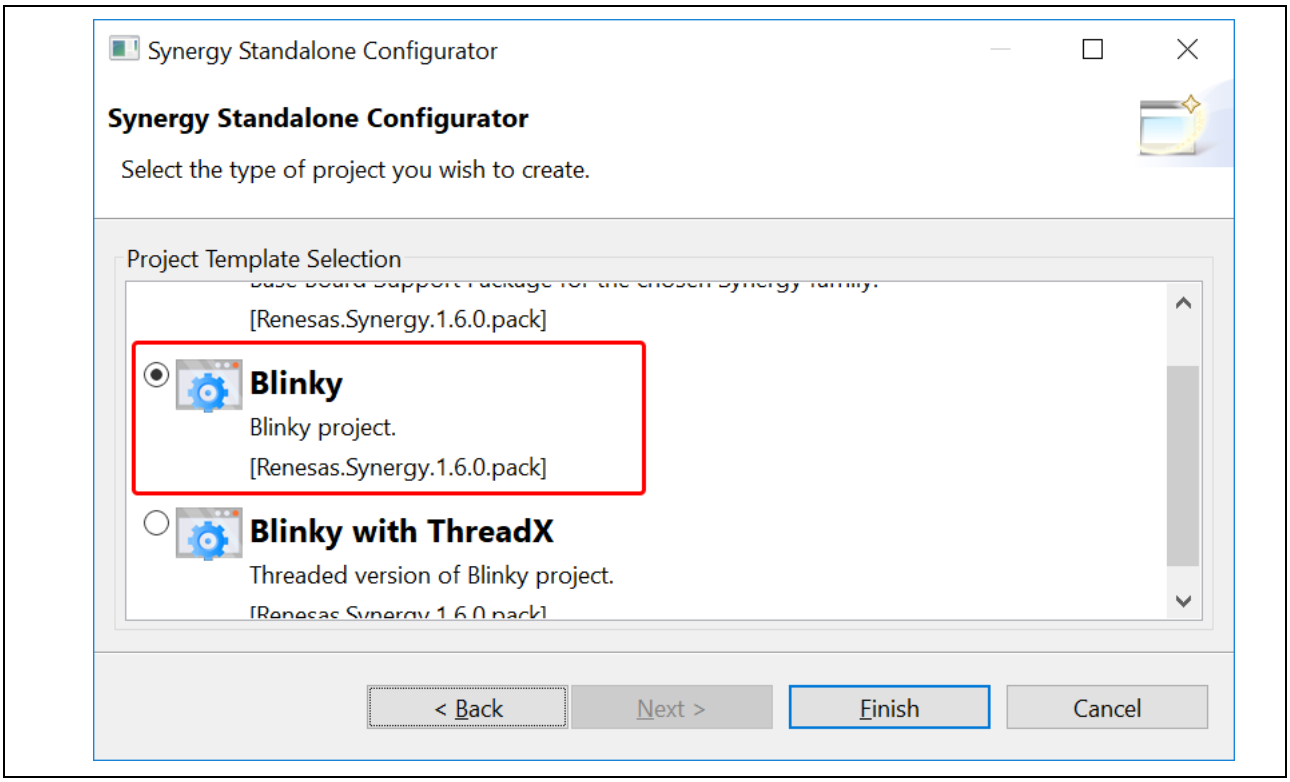

Figure 13. Select project template

7. The **Synergy Standalone Configurator** window will be launched.

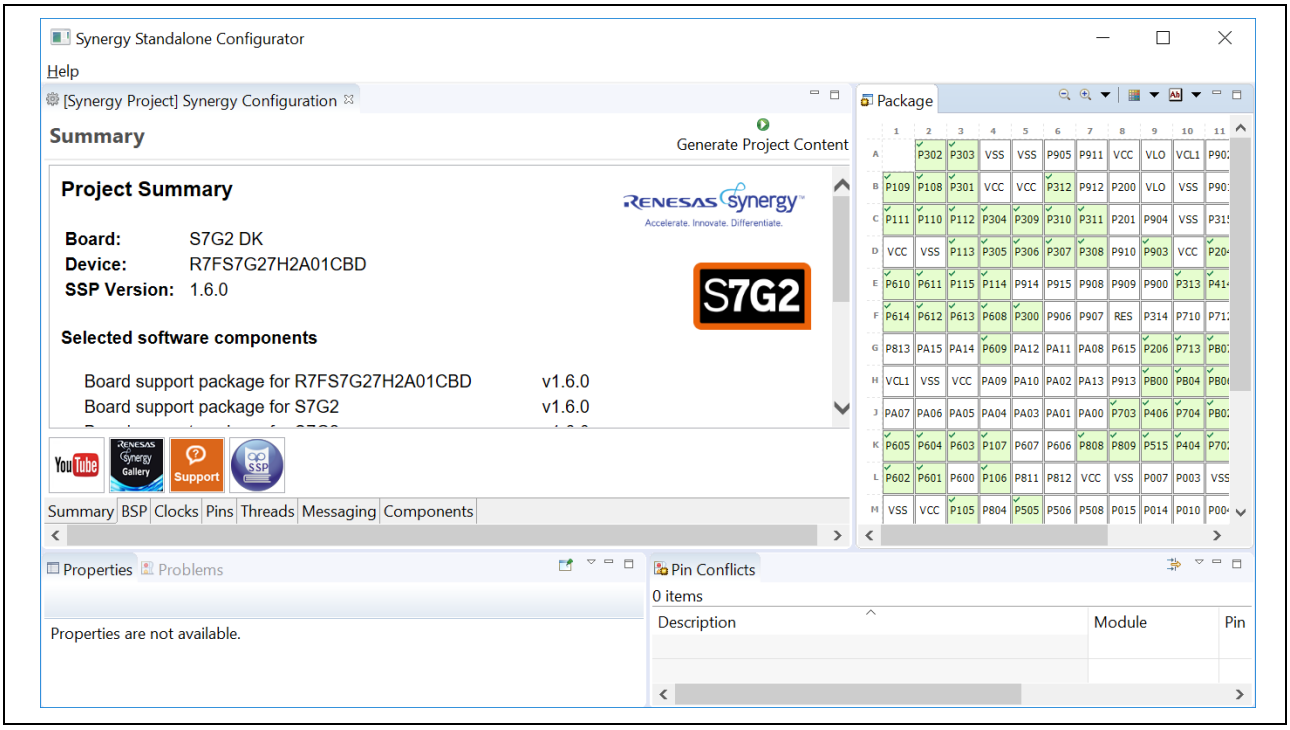

Figure 14. Synergy Configurator

8. We will work with the above configurator later. For now, switch back to **IAR EW for Synergy** window. The Synergy project is generated successfully.

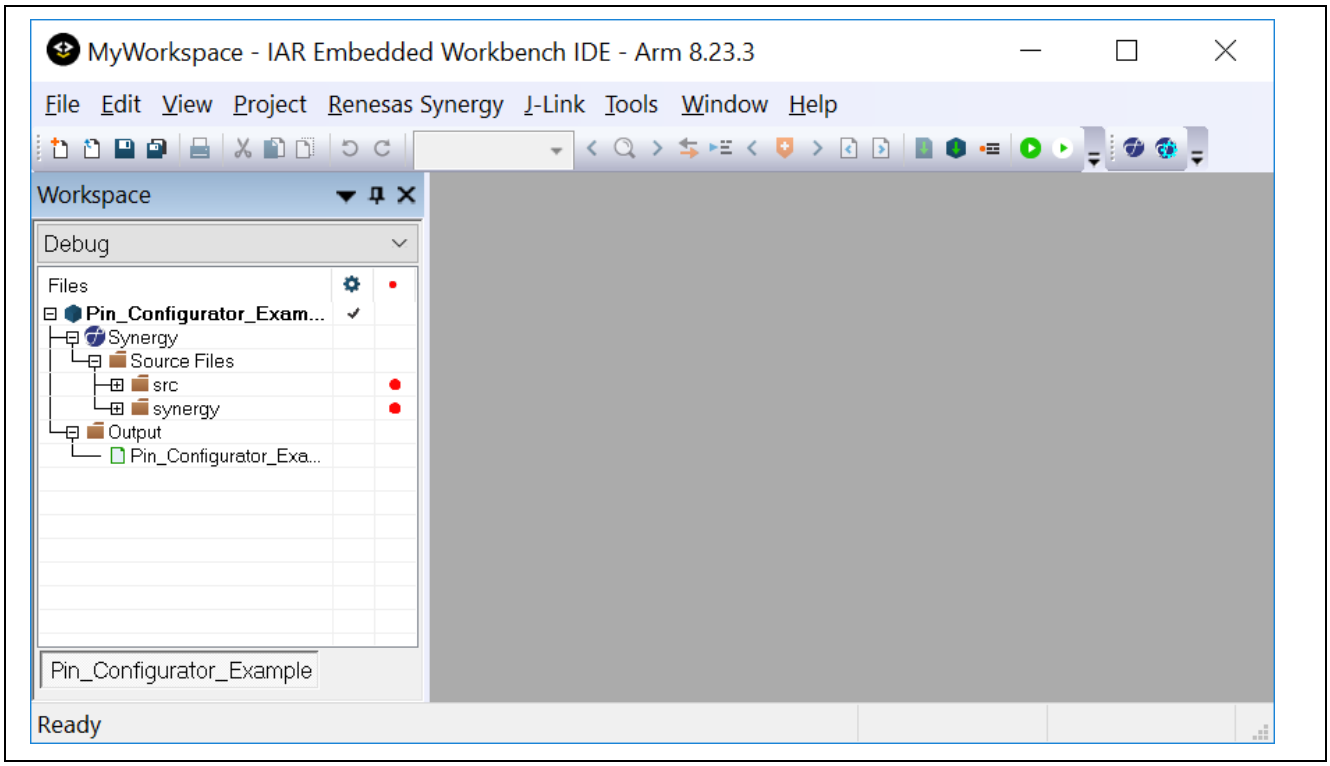

Figure 15. Project is created

2. Launching Pin Configurator

This chapter describes how to launch the Pin Configurator using e^2 studio or IAR EW for Synergy.

2.1 Launching Pin Configurator using e² studio

1. In e² studio, double click the file `Configuration.xml` in Project Explorer to open the **Synergy Configuration Editor**.
2. When the **Synergy Configuration Editor** launches, the first page displayed is the **Summary** page. Click the **Pins** tab to open the **Pin Configurator** page.

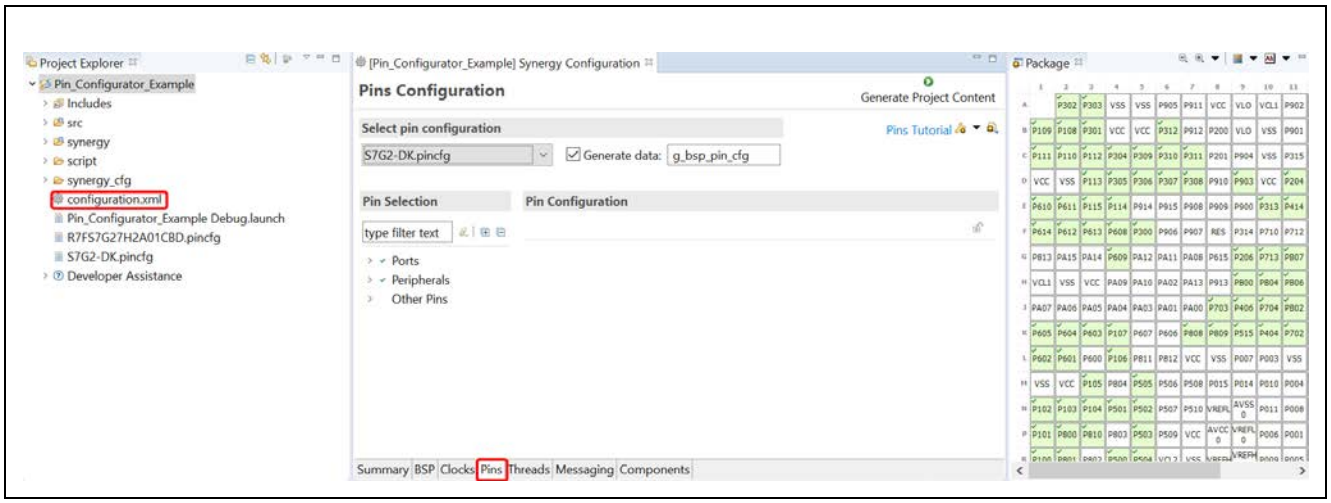

Figure 16. Launch Synergy Configuration Editor in e² studio

2.2 Launching Pin Configurator using IAR EW for Synergy

The Synergy Standalone configurator has been opened in step 8 of section 1.2.

If the configurator is closed, in the IAR EW for Synergy menu, choose **Renesas Synergy → Configurator…** to open it again.

You can also click on the  icon on the toolbar to open the configurator.

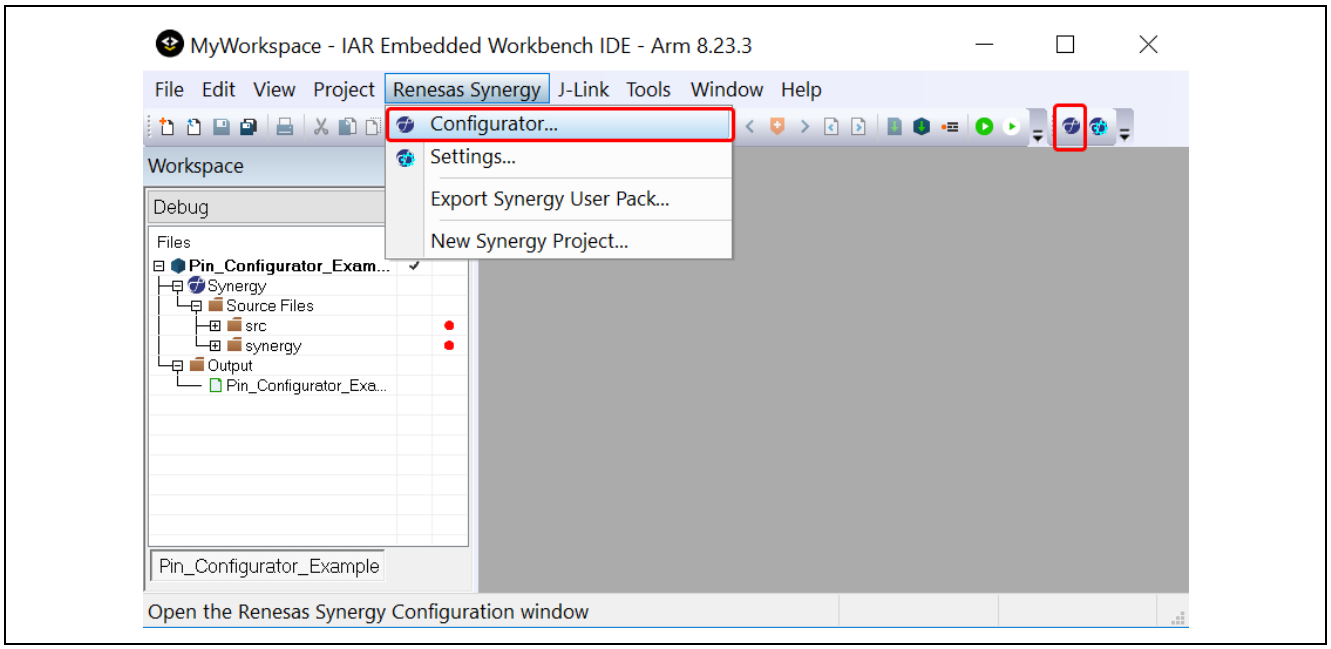

Figure 17. Launch Synergy Configuration Editor in IAR EW for Synergy

When launching the Synergy Configuration Editor, the page displayed is the [Summary] page. Click the **Pins** tab to launch the **Pin Configurator** page.

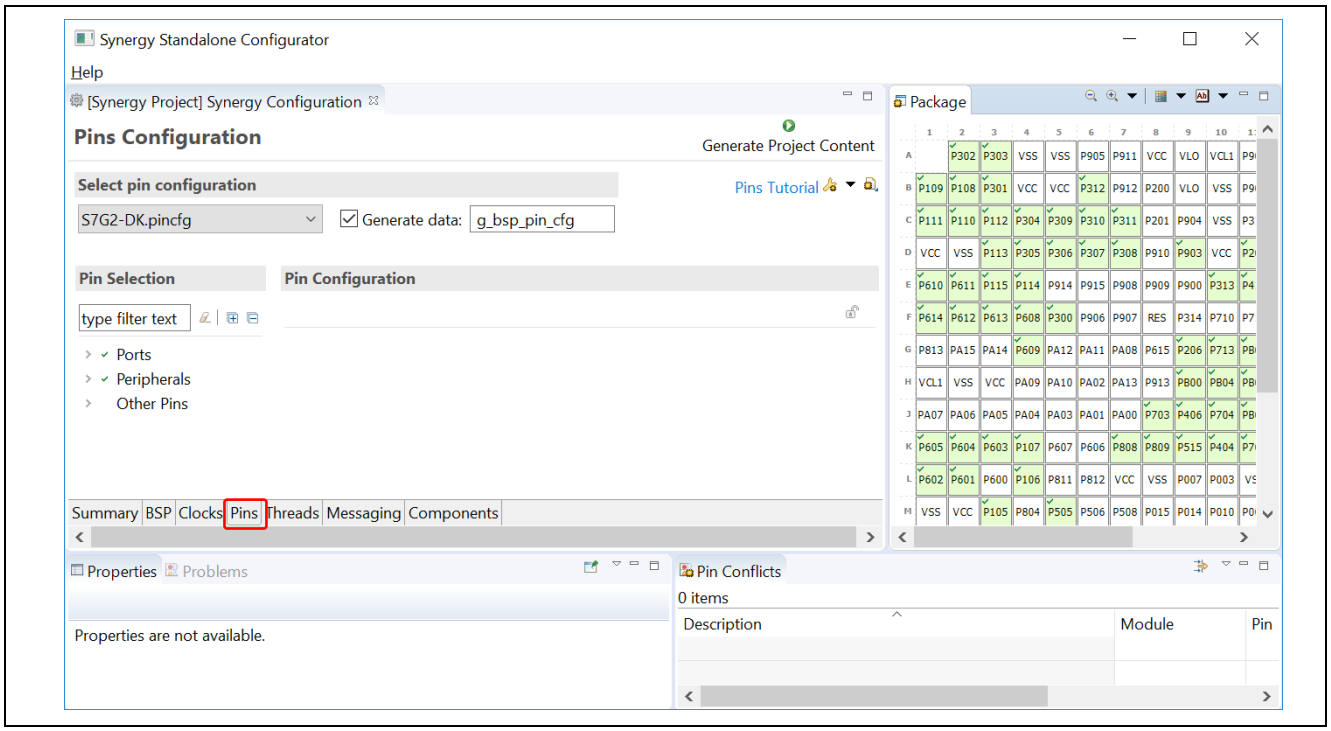

Figure 18. Launch Pin page

3. Pin Configurator GUI

The **Pin Configurator** allows you to configure the pins in the Synergy project. The GUI of the **Pin Configurator** in e^2 studio and IAR EW for Synergy are the same. It consists of 4 main parts:

1. **Select pin configuration**
2. **Pin Selection**
3. **Pin Configuration**
4. **Package**

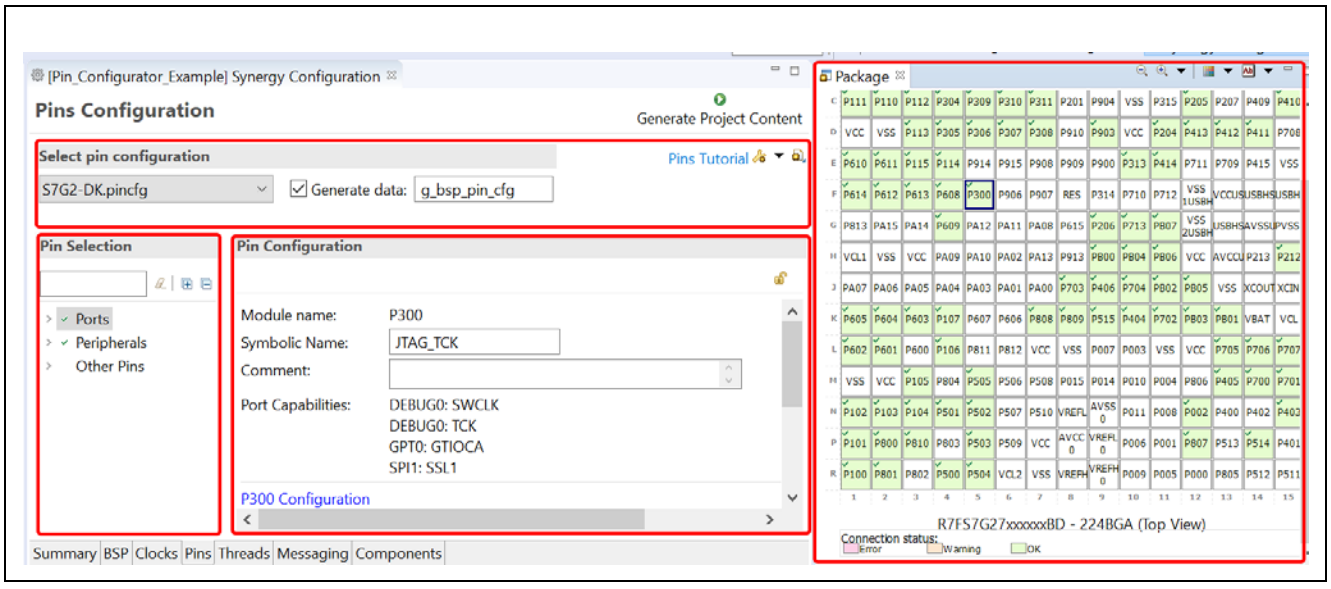

Figure 19. Pin Configurator GUI

The details and how to use each part of the **Pin Configurator** will be described in the following chapters.

4. How to use the Select pin configuration pane

The **Select pin configuration** pane is used to select the pin configuration file. A pin configuration file represents the setting for a specific Synergy device. When modifying the pin setting, the changes will be saved to the pin configuration file.

4.1 GUI Introduction

The **Select pin configuration** pane consists of the following components:

1. **configuration drop-down list**: allows you to select an existing pin-configuration file or create a new configuration file.
2. **Generate data**:
   A. Checkbox: checked by default. Generate pin configuration to source code.
   B. Text box: contains the name of the data structure to be generated for the pin-configuration. The default data structure **g_bsp_pin_cfg** is necessary for the project as it defines initial pin configuration. Renaming will cause build error but adding new data structure is possible by following chapter 4.3.
3. **Pins Tutorial link**: open a tutorial video on web browser.
4. **Select device button**  : change the device of the pin configuration.
5. **Import button**  : import an existing (compatible) Pin Configuration into the Synergy project

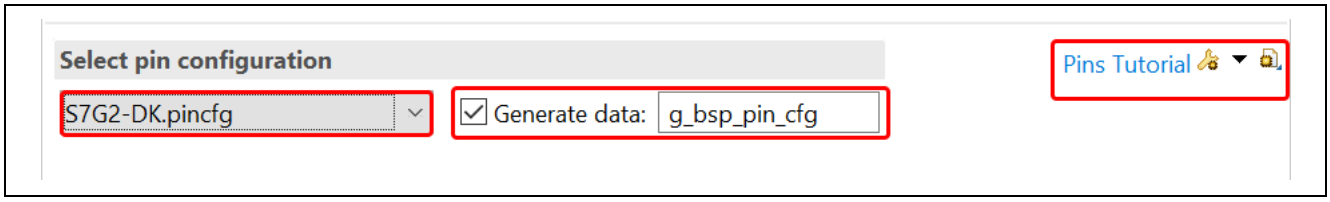

Figure 20. Select pin configuration

4.2 Using Single Configuration file (default)

When a new Synergy project is created, a pincfg file for the selected device and the pincfg contained in the selected BSP will be generated. These pin-configuration files are named after the device name (`R7FS7G27H2A01CBD.pincfg`) and board name (`S7G2-DK.pincfg`).

In e² studio, they are displayed in the **Project Explorer** window.

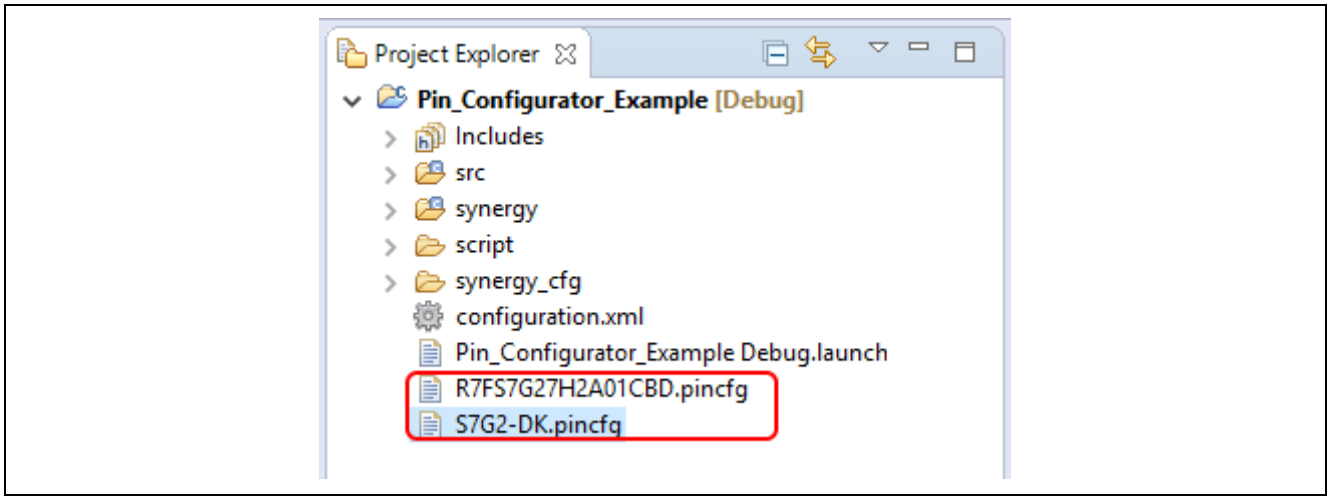

Figure 21. Pin configuration files in e² studio

In IAR EW for Synergy, the pin configuration files are not displayed in the **Workspace** window. To view them, open Windows Explorer and go to the project folder.

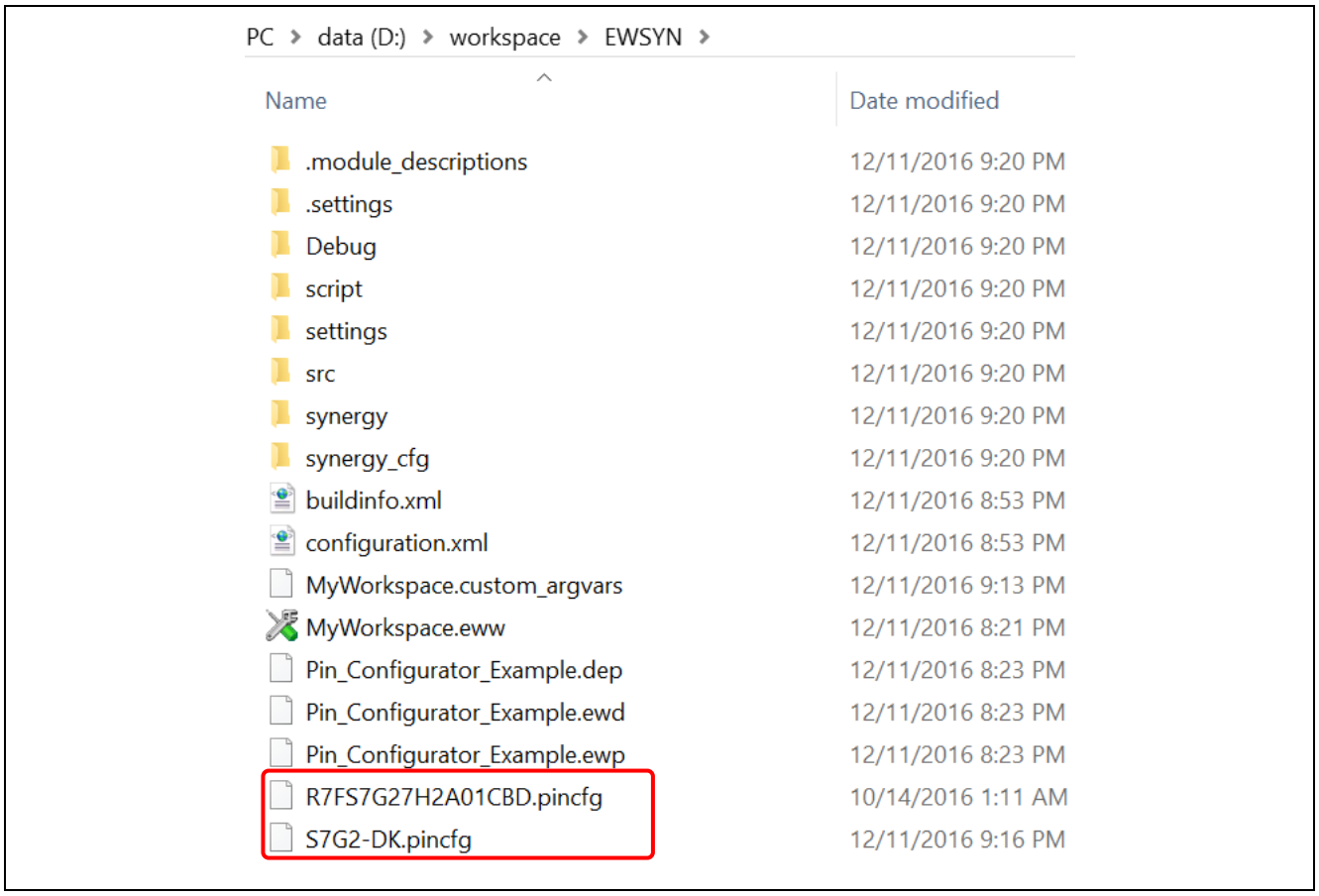

Figure 22. Pin configuration files in IAR EW for Synergy

Normally, you can ignore the `R7FS7G27H2A01CBD.pincfg` and perform every pin configuration with `S7G2-DK.pincfg`.

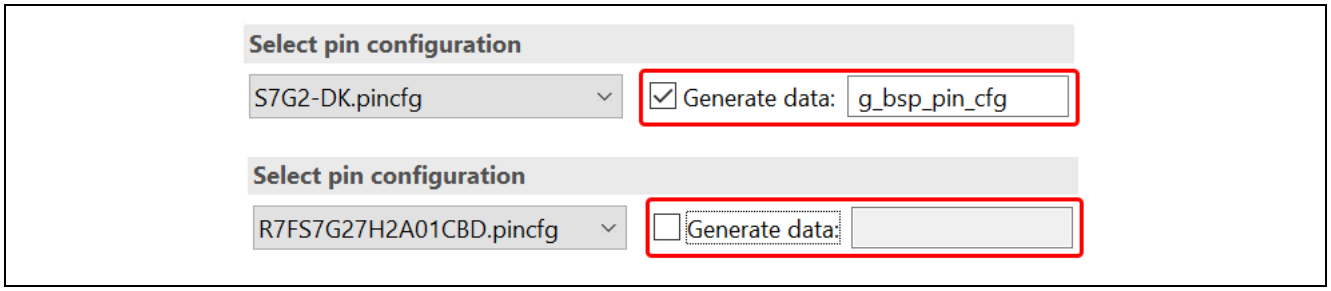

Figure 23. Only the S7G2-DK.pincfg is used

4.3 Using Multiple Pin-Configuration files

A Synergy project usually only needs to use one pin-configuration file. However, in some applications, multiple pin configuration files are needed. It allows dynamic switching of pin configurations during run time, for example, for setting different power modes.

The multiple pin configurations will be created in different data structures. The following steps describe how to create a new pin configuration file manually.

1. Select **New default configuration…** in the configuration drop-down list to create a new configuration file.
2. Rename the newly created configuration file as you like.

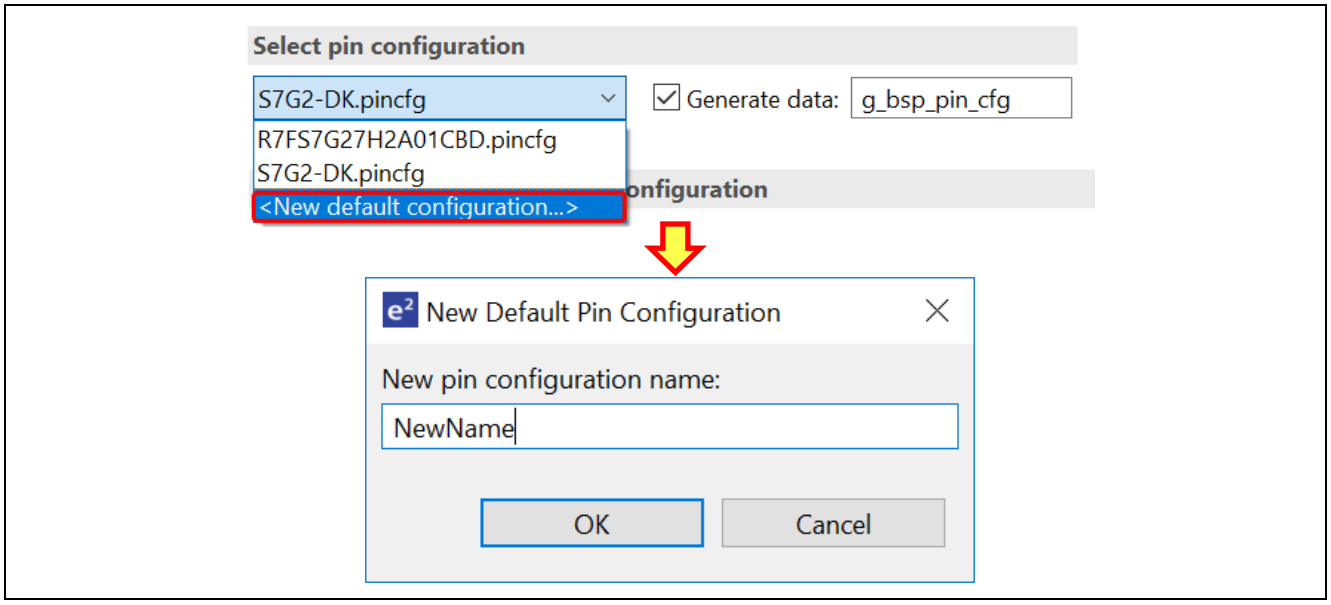

Figure 24. Create a new pin-configuration file

3. The new configuration file is automatically added to the **Select pin configuration** drop-down list.

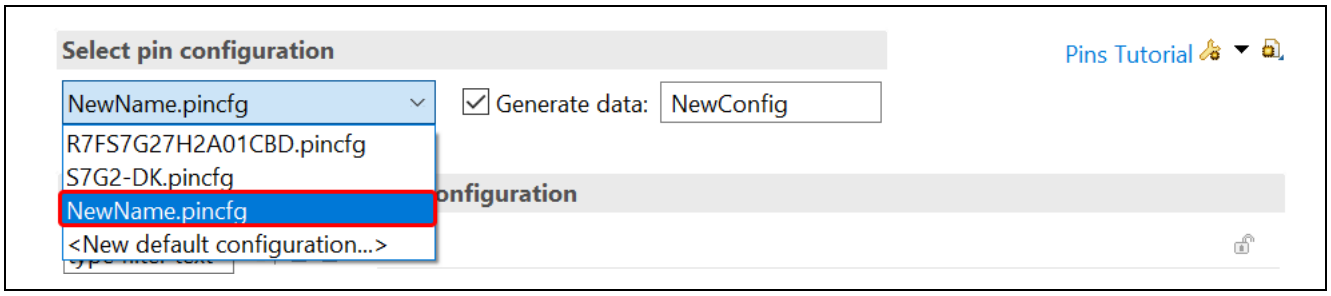

Figure 25. New configuration file is added to the drop-down list

4. Select **NewName.pincfg** in the drop-down list and enter a unique name for it in the text box. For example: **NewConfig**.

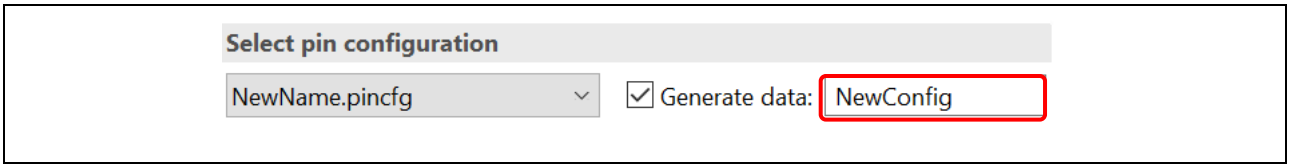

Figure 26. Unique name for the new pin configuration

4.4 Importing a Pin Configuration

User can import an existing (compatible) pin configuration into a Synergy project. This is a 'partial' import, which means that the new setting will be merged to the current settings. The following steps describe how to use the import function.

1. Select a pin configuration file to import to. In this case, select the **NewName.pincfg** created in section 4.3.

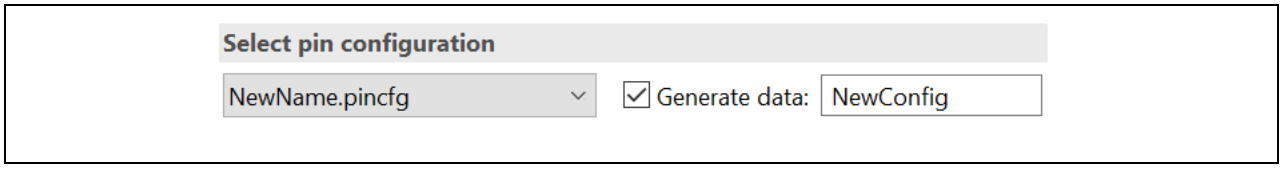

Figure 27. Select NewName.pincfg

2. Click on the  button to open the **Import Pin Configurations from File** dialog

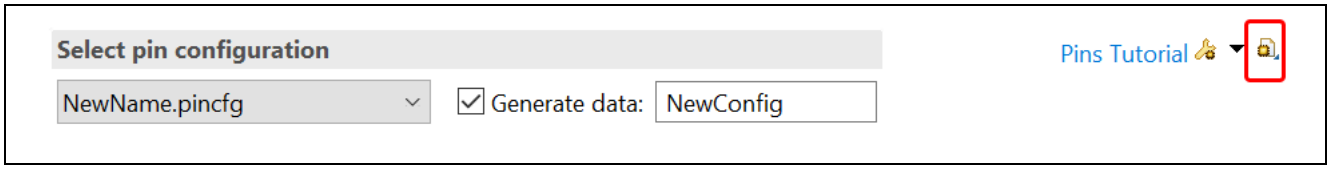

Figure 28. Click the Import button

3. Select file to import:
   A. In e² studio, click on **Workspace...** to select file from user's workspace or click on **File System...** to select file from file system.
   B. In IAR EW for Synergy, click on **File System...** to select file from file system.

   In this example, click **File System...**, go to the Project Folder and select `S7G2-DK.pincfg` to import from it.

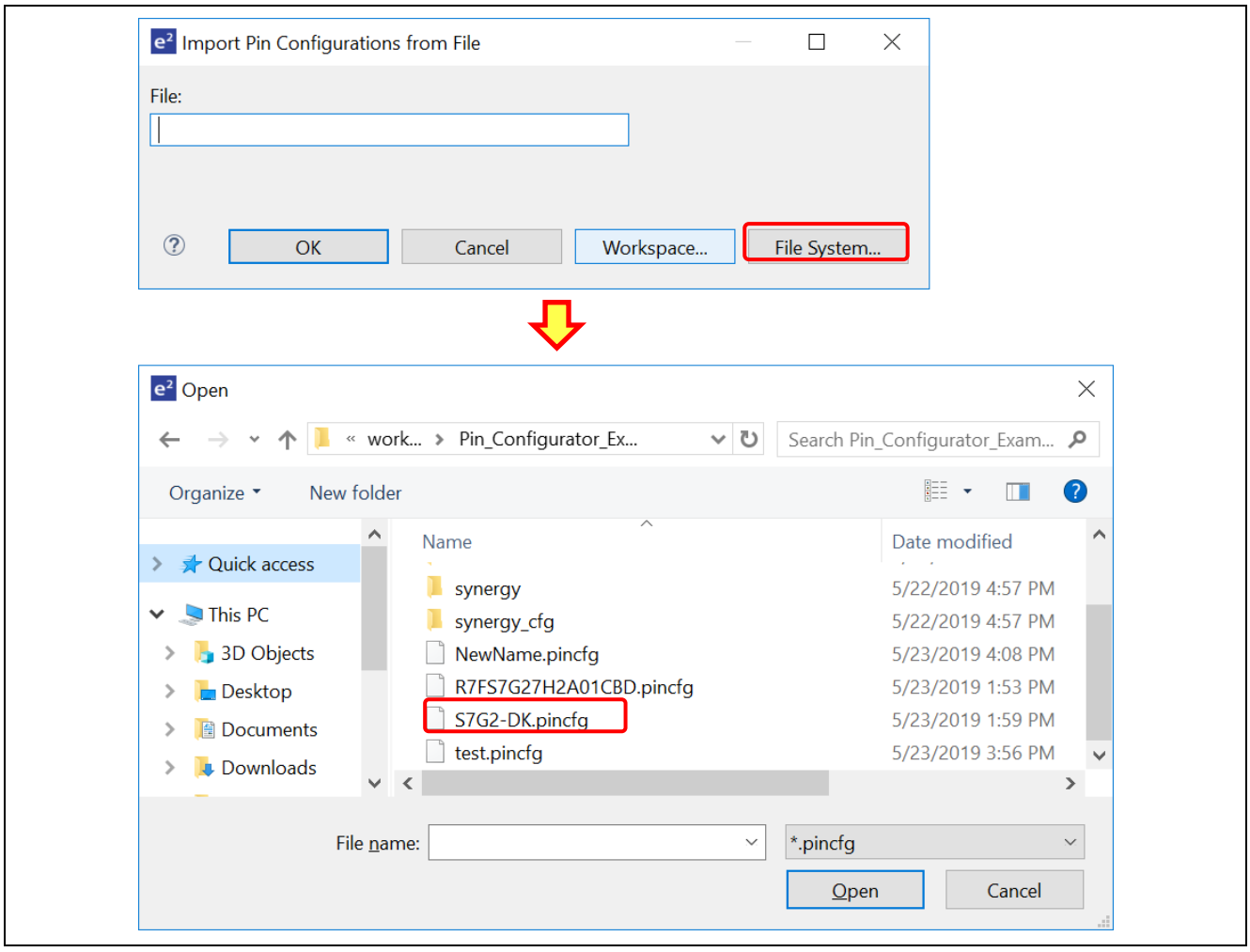

Figure 29. Import Setting from S7G2-DK.pincfg

4. Click OK. If there is no conflict, the settings of `S7G2-DK.pincfg` will be imported to `NewName.pincfg`.

5. If conflicts exist, the import function points out conflicts and provides the following options to the user:
   A. Cancel the import operation
   B. Ignore the conflicts and import the conflicting settings anyway
   C. Continue the import operation without importing the conflicting settings.

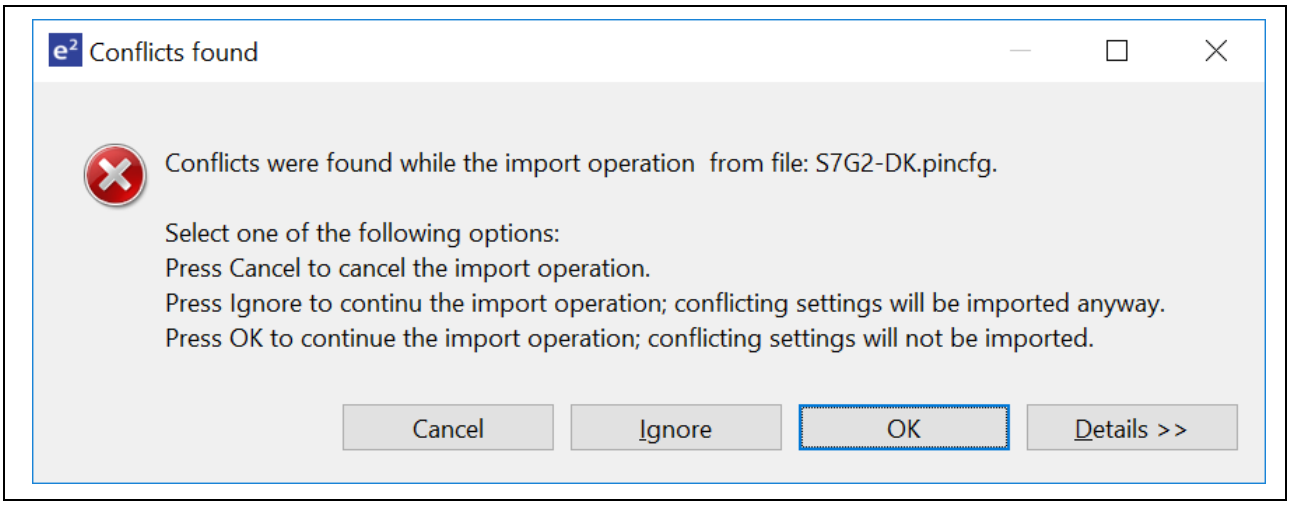

Figure 30. Conflicts found during the import process

4.5 Changing the selected device of Pin Configuration file

User can change the device in a pin configuration file. The following steps describe how to use this function.

1. Select a pin configuration file to change the device. In this case, select the **NewName.pincfg** created in section 4.3.

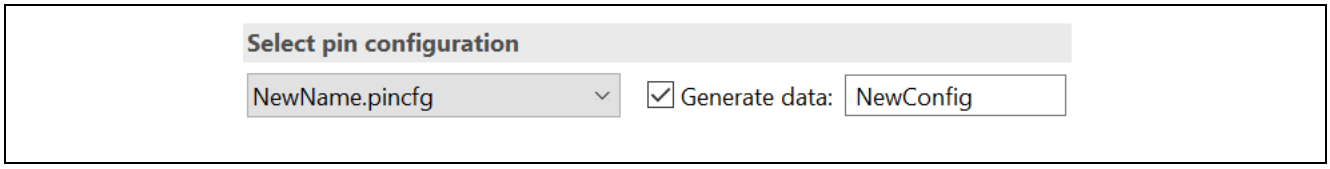

Figure 31. Select pin configuration file

2. Click the  button to open the drop-down list and select the desired device to change to. In this example, we change the device from **renesas.s7g2_bd** to **renesas.s7g2_fc.**

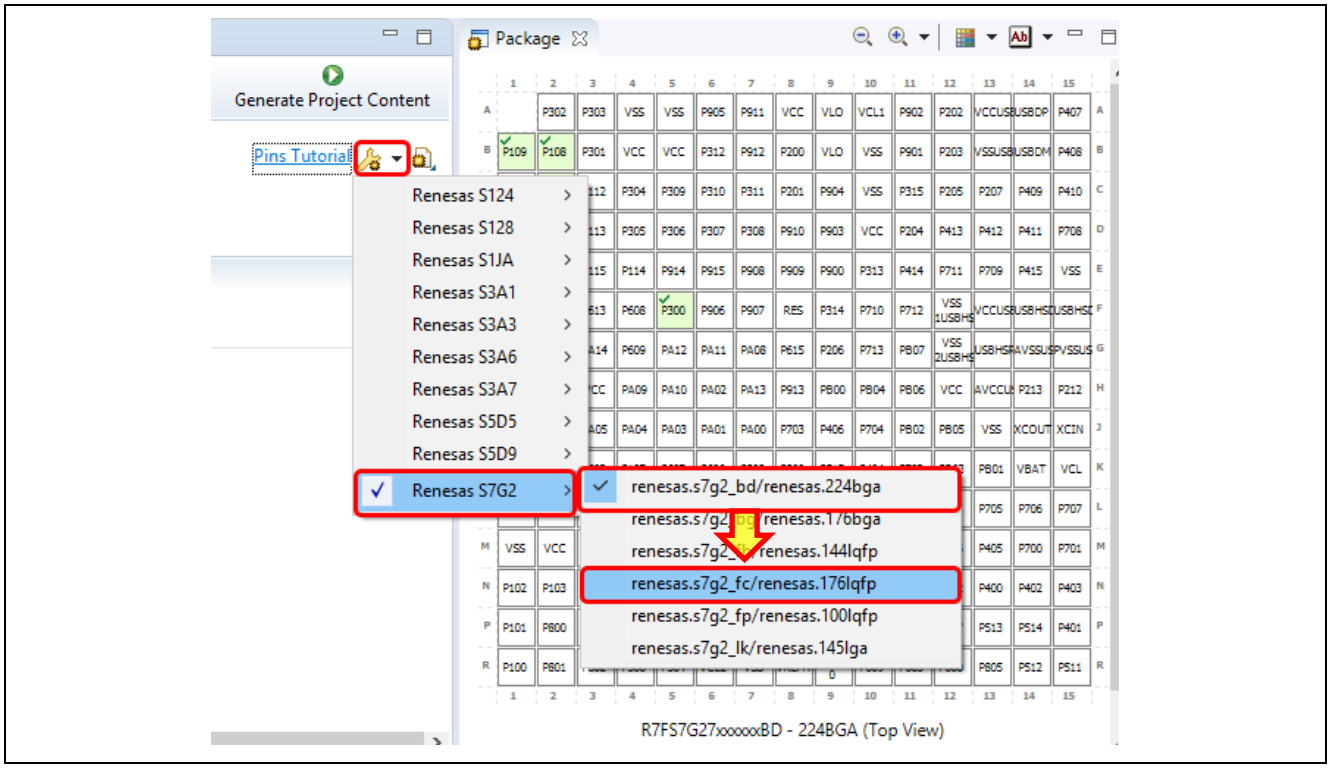

Figure 32. Change the selected device

3. The MCU package of the new device selected will be displayed in the **Package** view.
Note: This change only affects the currently selected pin configuration. The device of other pin configurations remains unchanged.

In e^2 studio, the **Package** view is opened by default in the **Synergy Configuration** perspective. If it is closed, select **Window → Show View → Pin Configurator → Package** to open it.

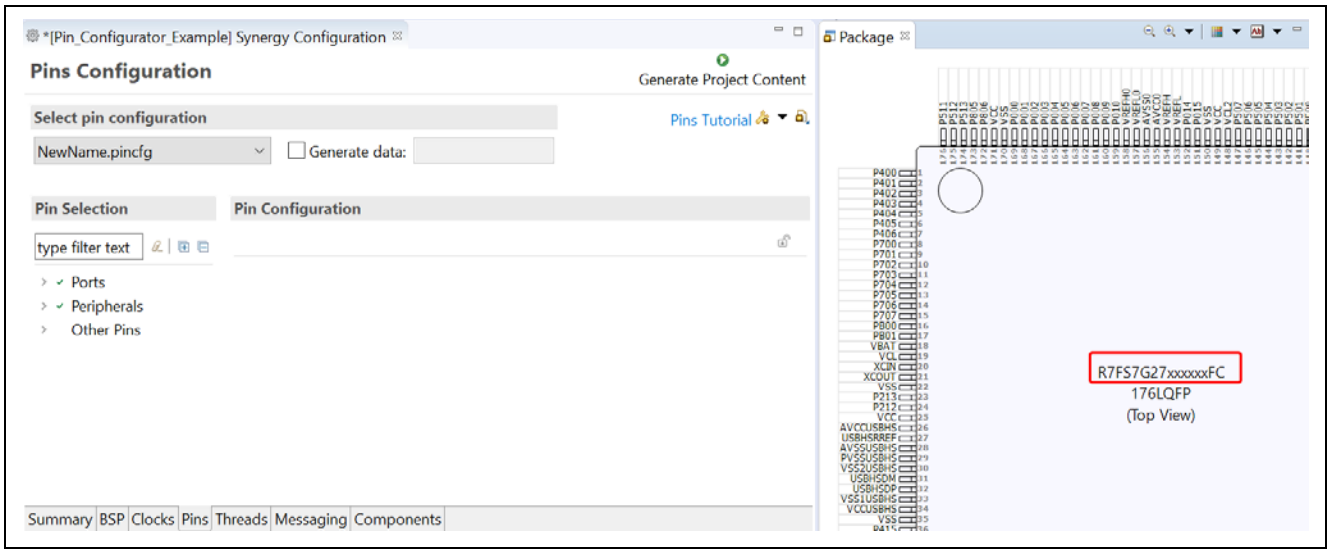

Figure 33. Package view is updated after changing device

4. If conflicts exist, the device changing function points out conflicts and provides the following options to the user:
   A. Cancel the device changing operation.
   B. Ignore the conflicts and continue to change the device, conflicting settings will be imported.
   C. Click **OK** to continue changing device. Conflict settings will not be imported.

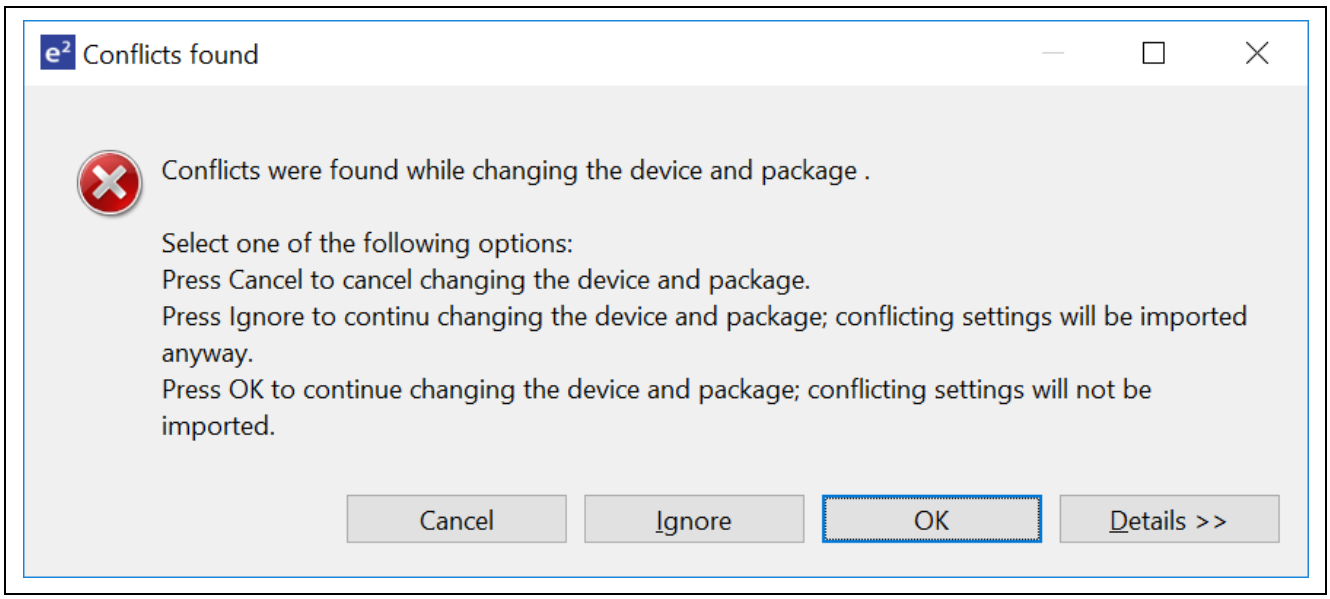

Figure 34. Conflicts found during changing device

5. To continue chapter 5, change the pin configuration from `NewName.pincfg` back to `S7G2-DK.pincfg`.

5. How to use the Pin Selection pane

The **Pin Selection** pane shows all of the pins that are available for the device. The pins are categorized into groups - “Ports”, “Peripherals”, and “Other Pins”.

Note: The usage of **Pin Selection** is the same for IAR EW for Synergy and e² studio.

1. The **Pin Selection** pane contains:
   A. Filter text box
   B. **Clear** button
   C. **Expand All** button
   D. **Collapse All** button
   E. Pins tree which contains the categorized pins

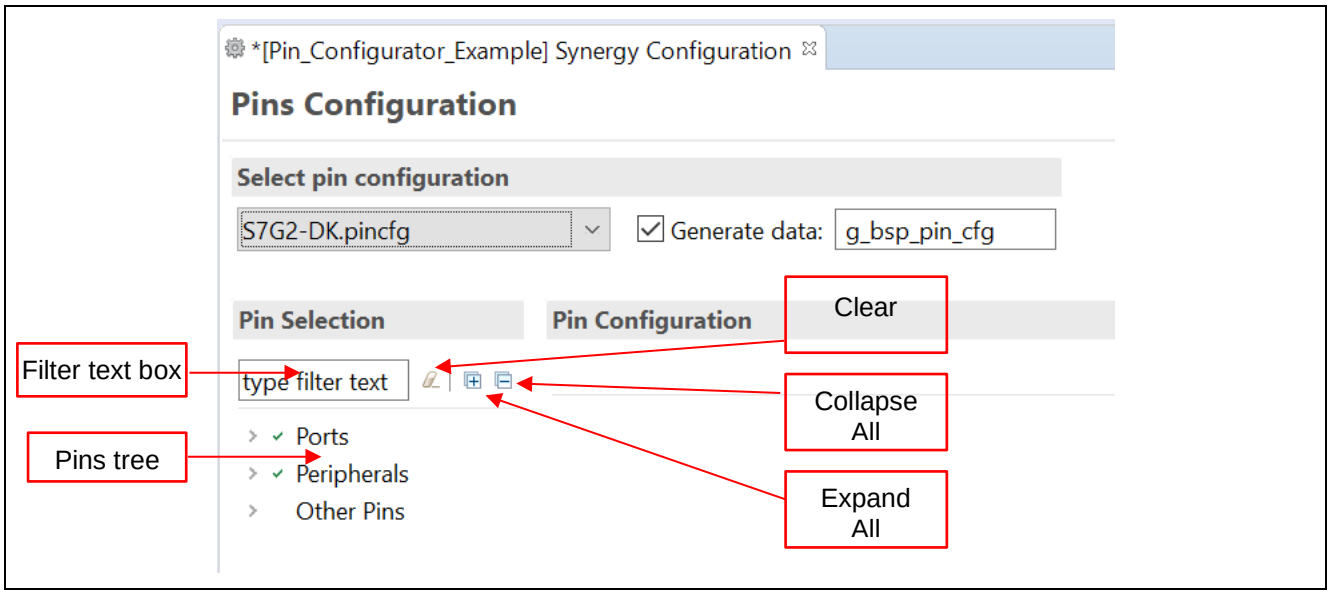

Figure 35. Pin Selection Pane

2. Typing text in the filter text box will list out the pins that contain the text. Clicking on the **Clear** button will clear the text box and the filter results.

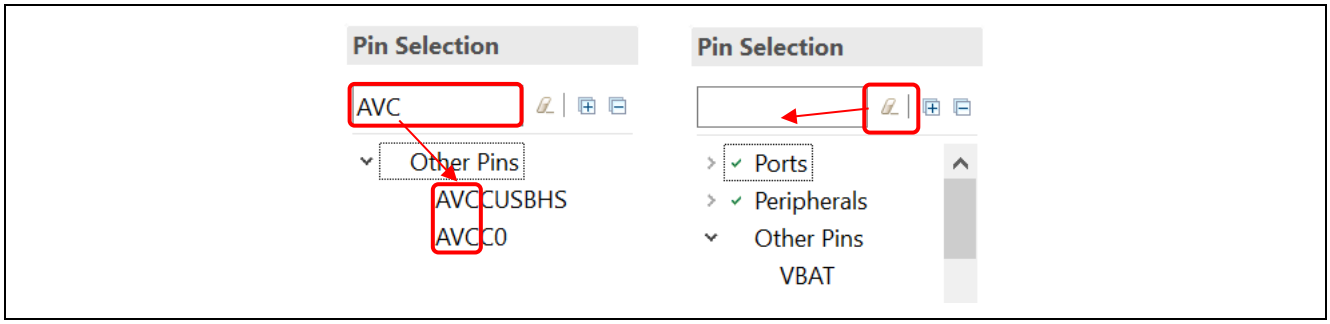

Figure 36. Use the filter text box

3. The **Expand All** button and the **Collapse All** button will expand and collapse the pins tree respectively.

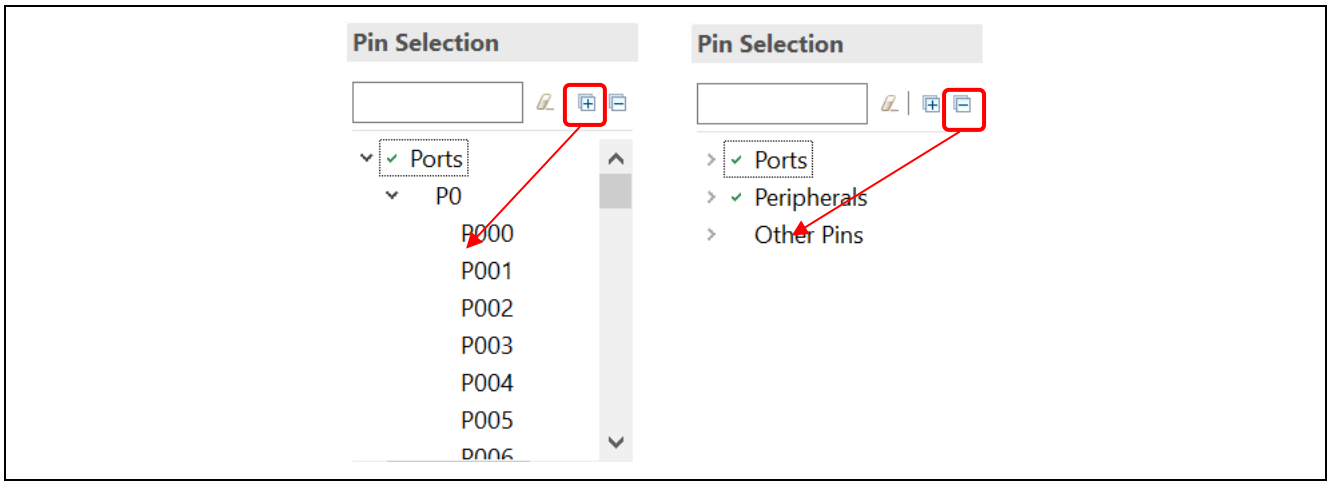

Figure 37. Use the Expand All and Collapse All button

4. Selecting a port or peripheral in the **Pin Selection** pane will show its settings in the **Pin Configuration** area. It can then be modified and set up as necessary. The icon of the selected pin will also be marked with blue border in the **Package** view.

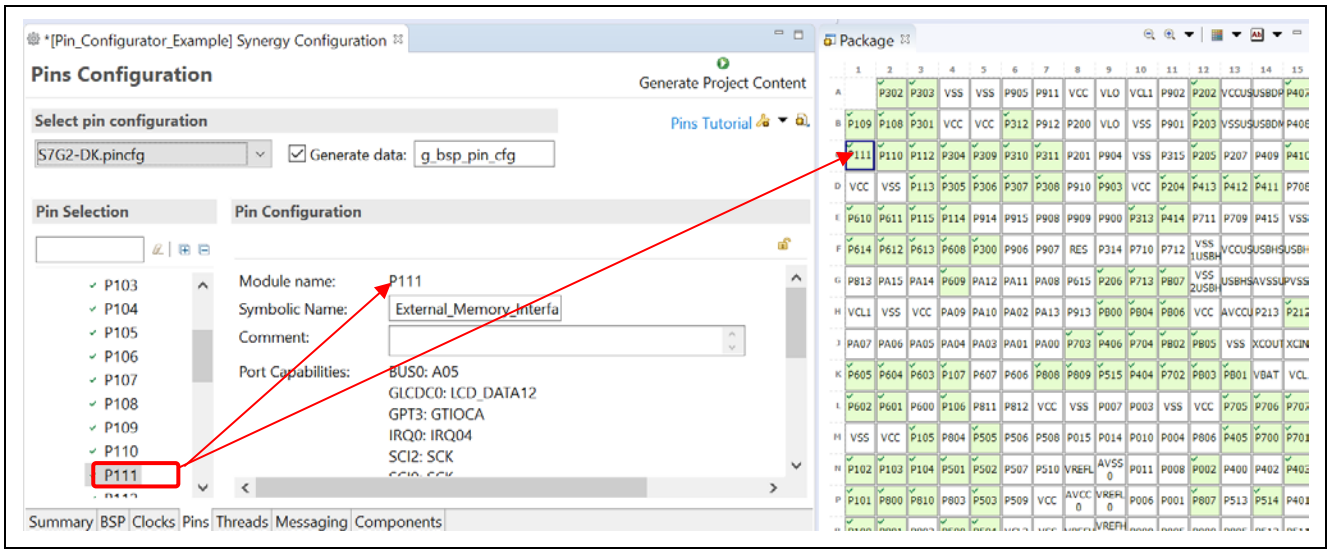

Figure 38. Select a Port in Pin Selection pane

6. How to use the Pin Configuration pane

The **Pin Configuration** pane allows user to change the setting of Ports and Peripherals that are selected in the **Pin Selection** pane.

Note: The use of **Pin Configuration** is the same for IAR EW for Synergy and e^2 studio.

1. The **Pin Configuration** pane contains:
   A. **Lock/Unlock Settings** button
   B. **Setting** area

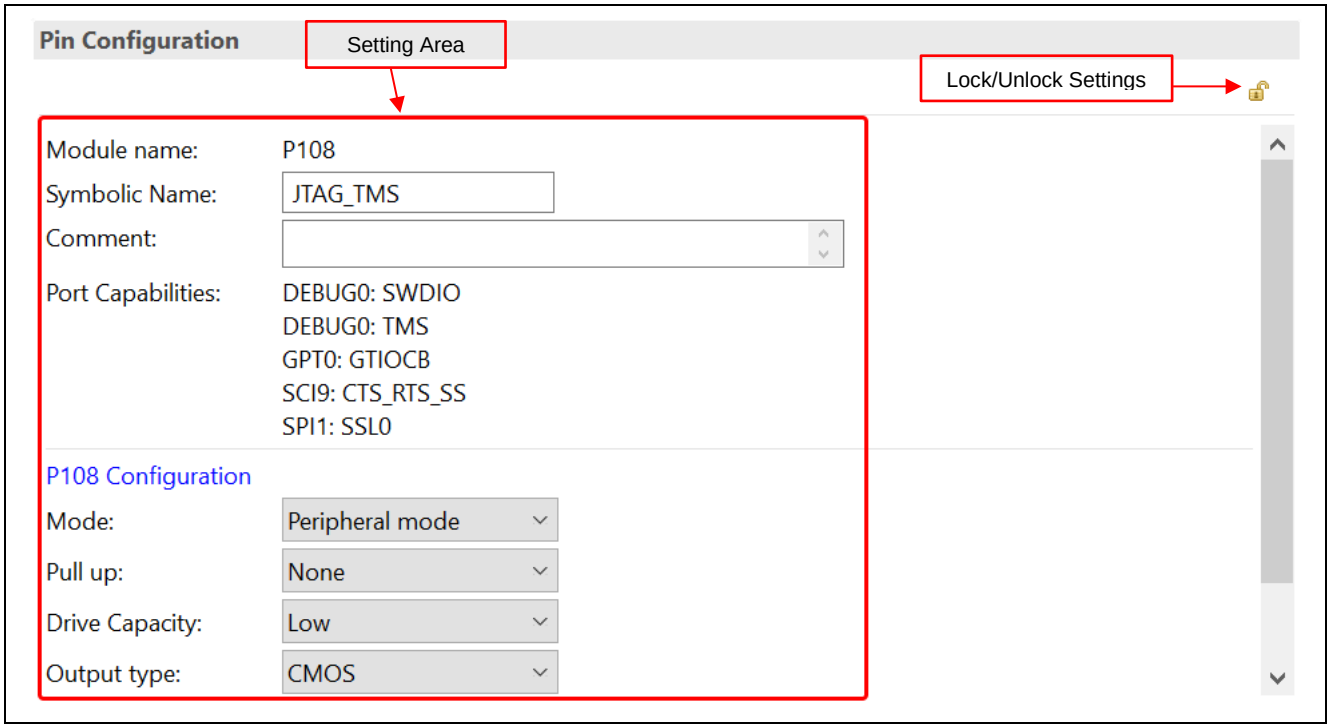

Figure 39. Pin Selection Pane

2. Click on the **Lock/Unlock Setting** button to disable/enable the modification of the selected item in the **Pin Configuration** pane.

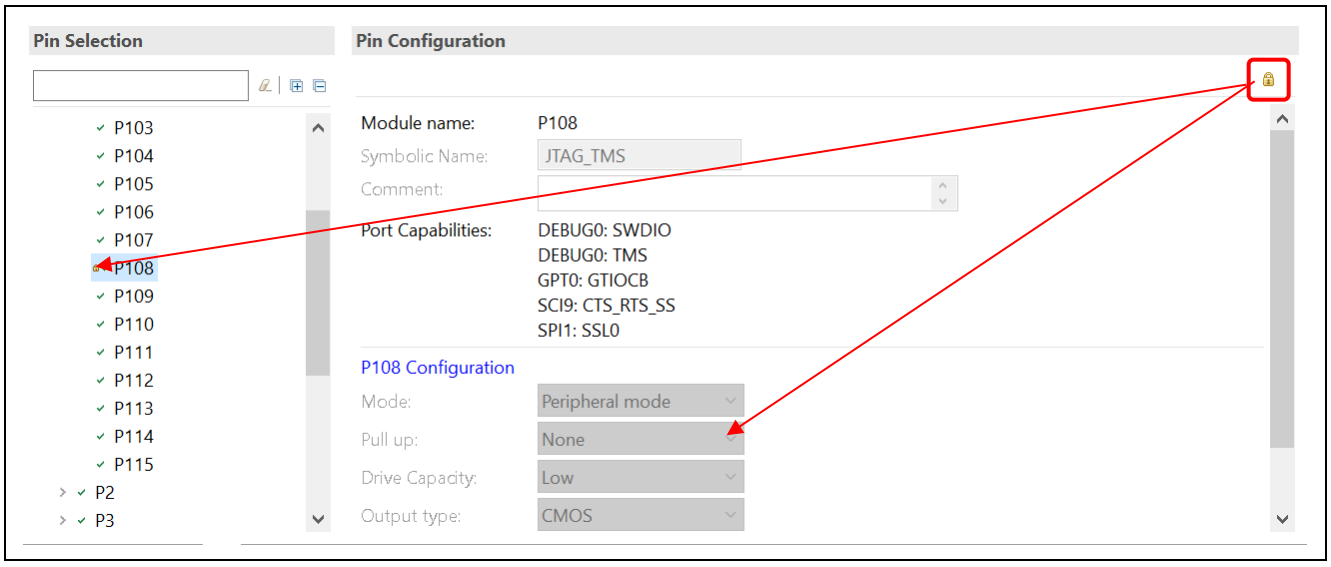

Figure 40. Lock a selected Pin

3. Click on the  (follow connection) button in the setting area of a connected pin to go to the setting area of the corresponding peripheral and vice versa.

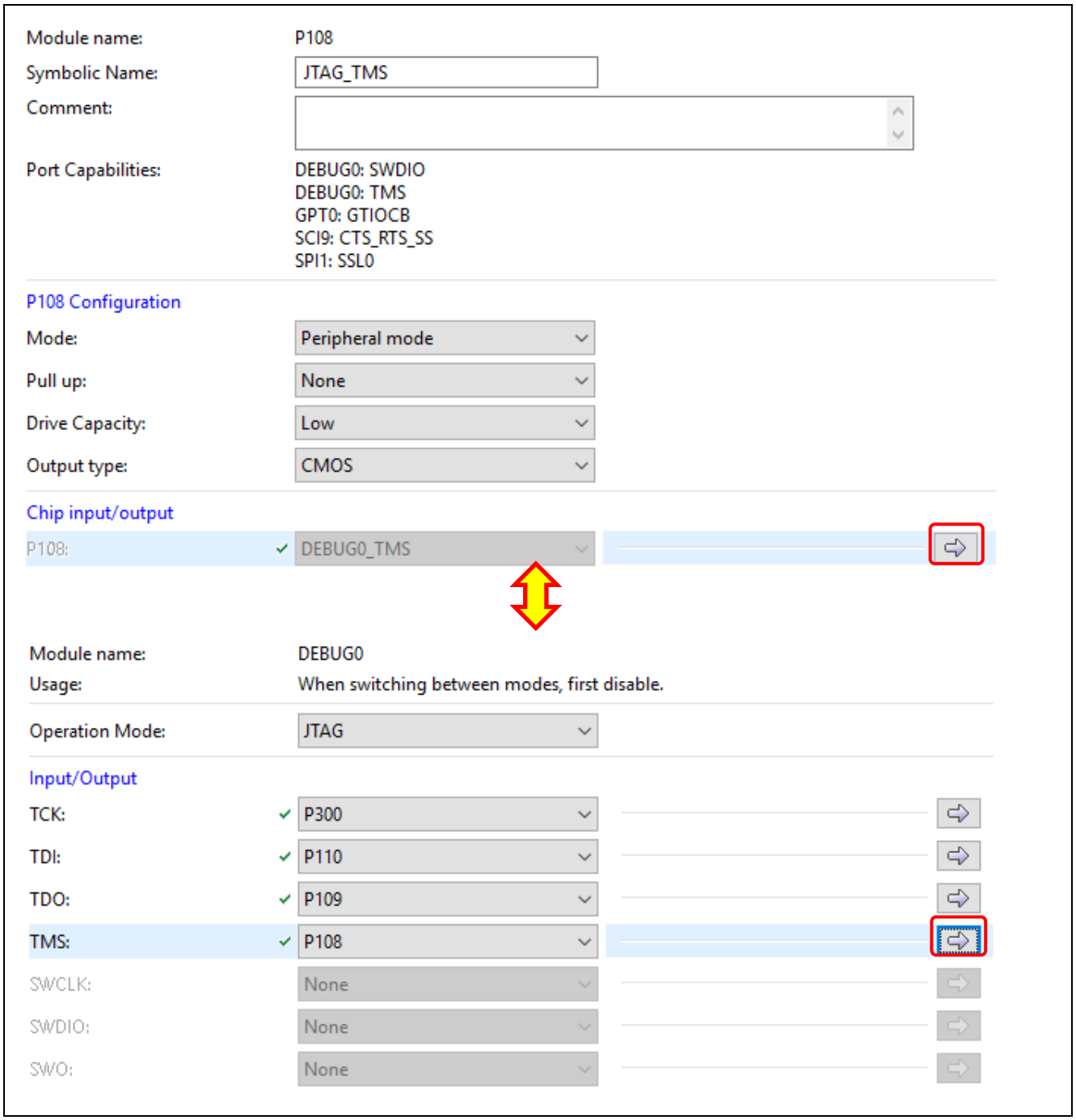

Figure 41. Switching between Pin and Peripheral setting

4. If a module setting is configured incorrectly, that module will be marked with the error symbol in the **Pin Selection** pane and **Pins Configuration** pane. The details of the conflicts will be shown in the **Pin Conflicts** or **Problems** window. All conflicts need to be resolved before generating the source code. For example, in DEBUG0 module, change the TCK to **None** to make the setting wrong. After finishing, change it back to P300.

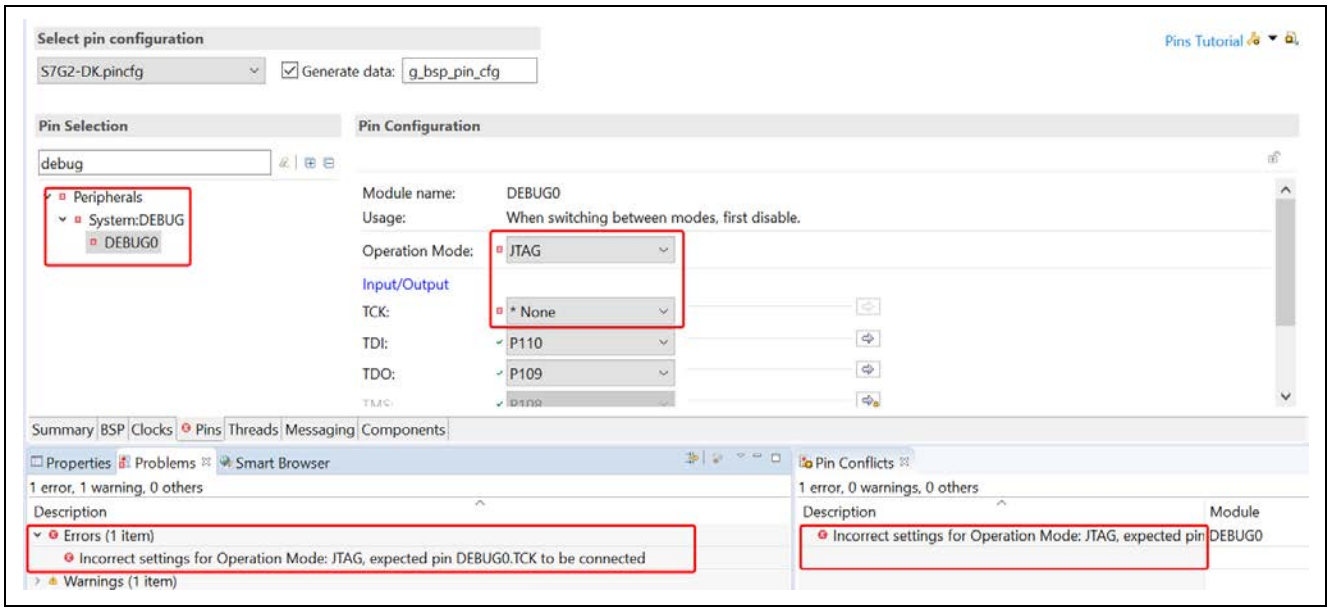

Figure 42. Error in Pin Configuration

5. After the pins are configured correctly, press **Ctrl + S** to save the changes.

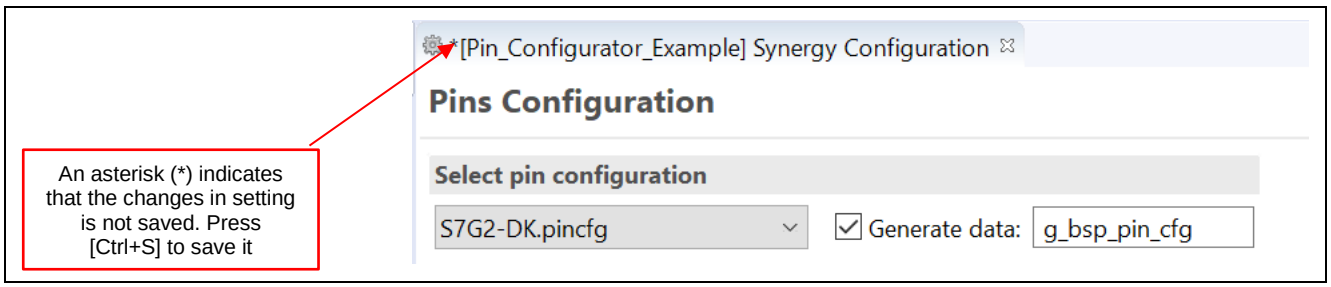

Figure 43. Unsaved setting

7. How to use the Package View

The **Package** view displays all available pins in the device along with their attributes.

Note: The usage of **Package** view is the same for IAR EW for Synergy and e^2 studio.

In e^2 studio, the **Package** view is opened by default in the **Synergy Configuration** perspective. If it is closed, select **Window** → **Show View** → **Pin Configurator** → **Package** to open it.

1. The **Package** view contains:
   - **A. Pins table**
     Display all the pins along with their attribute. The Pins attribute are shown as background color and label.
   - B. **Zoom In**, **Zoom Out** button
     Zoom in and zoom out the **Pins table**
   - C. **Select Attribute for Background Color** button
     Change the background colors of the pin according to the in attributes selected.
   - D. **Select Attribute for Labels** button
     Switch between the module name and symbolic name of the pins.
   - E. Description text
     Describe the color being used in the **Pins table**.

Figure 44. Package View GUI

2. When an item in the **Pin Selection** is selected, all the corresponding pins will be bordered with blue line. In this example, PB04, PB05, PB02 and PB03 are used by the Serial Communications Interface (SCI8), thus they are marked by blue line in the package view.

Figure 45. Pins of SCI8 are marked with blue line in Package view

3. Selecting a pin in the **Package** view will show its setting in the **Pin Configuration** pane.

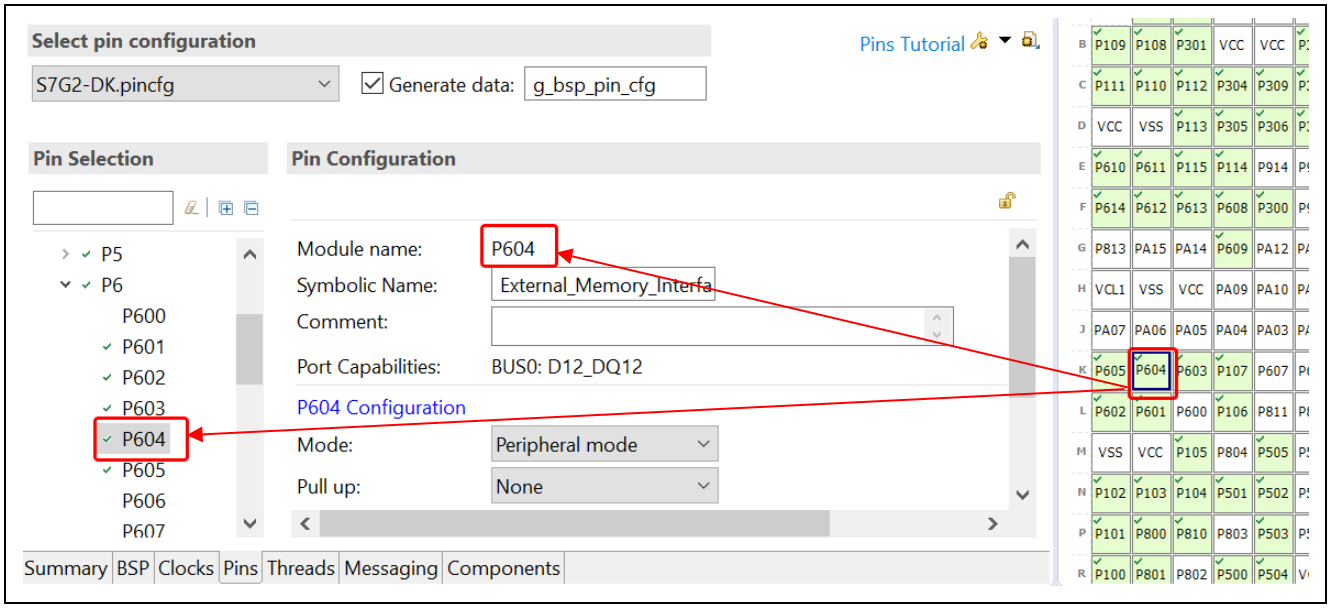

Figure 46. Select a Pin in Package view

4. When a pin is configured correctly, it is marked with an ✔ (OK) symbol. If it is incorrectly configured, it is marked with ✘ (Error) symbol.

Figure 47. Correct and error symbol in Package view

5. You can change the background color of the pins based on the selected attribute. Click on the button on the top right corner of **Package** view to show the drop-down list:
   A. Connection Status (default): Error, Warning, OK
   B. Drive Capacity: High, Medium, Low
   C. Mode: Analog Mode, Disable, IRQ Mode, Input Mode, Output mode (Initial High), Output mode (Initial Low), Peripheral mode.
   D. Output Type: CMOS, n-ch open drain
   E. Pull Up: None, input pull-up

   Selecting one item from the list will change the background color of the **Pins table**. The colors will be described in the Description Text area.

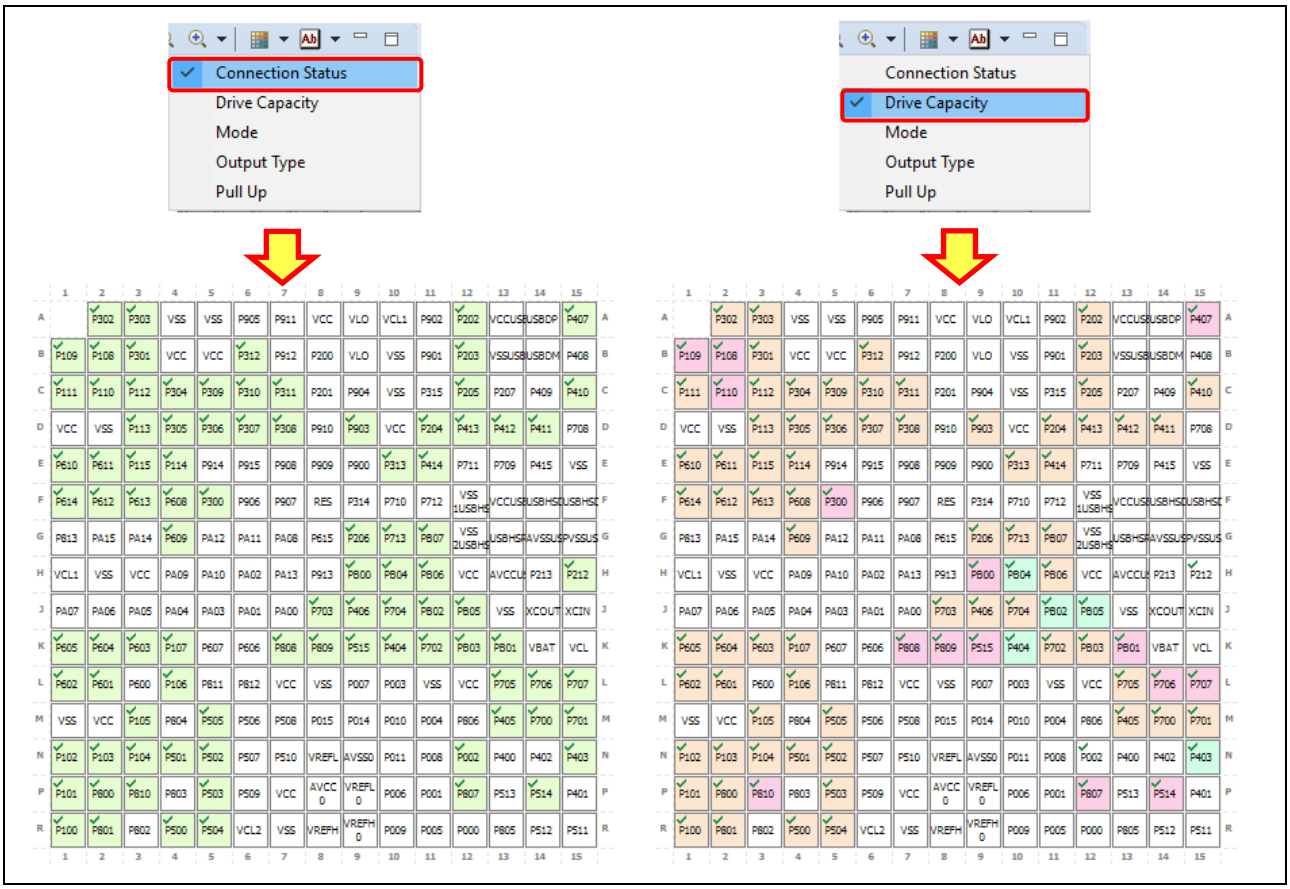

Figure 48. List of Pins attributes

6. You can also switch between the module name and symbolic name of the pins by clicking on the button on the top right corner of **Package** view:

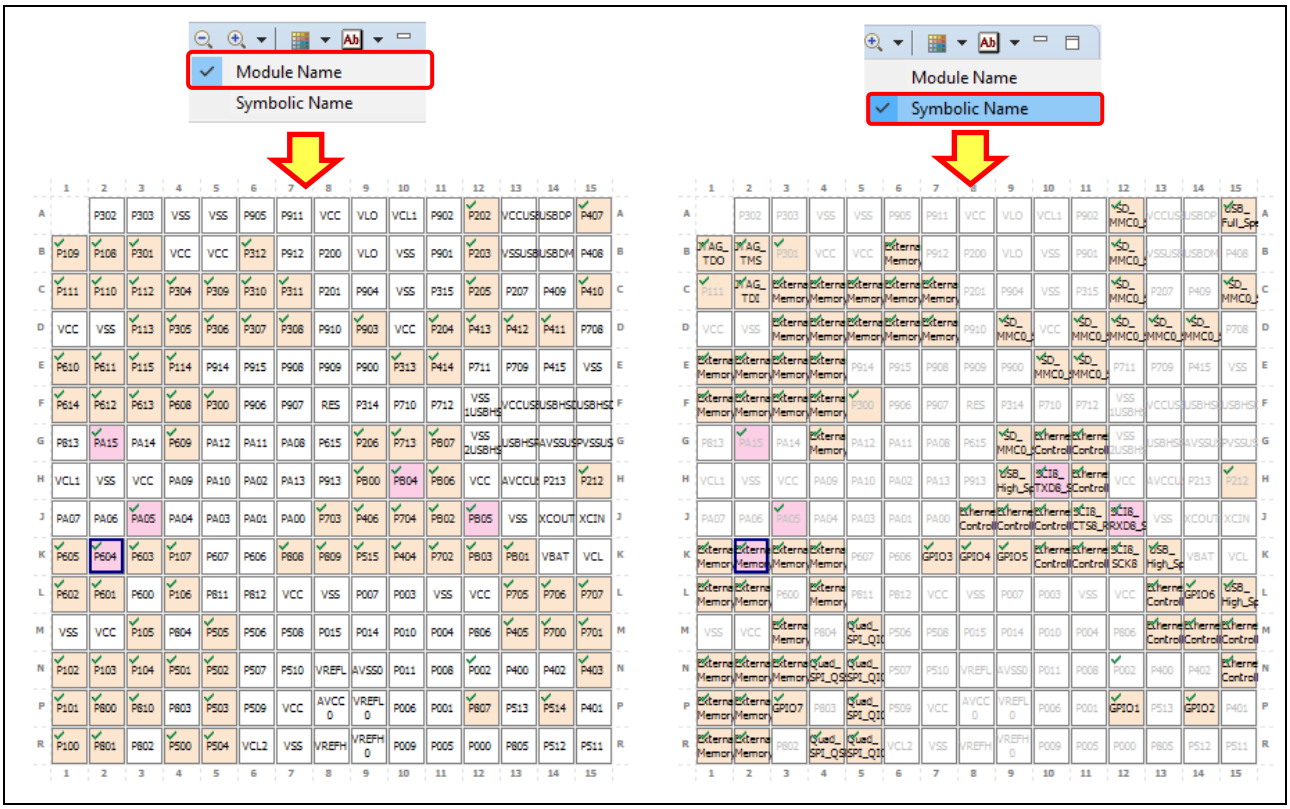

Figure 49. Module name and Symbolic name in Package view

8. Generating Pin Configuration source code

8.1 Generating source code in e² studio

1. After configuring the pins, you can click on the **Generate Project Content** button to generate the necessary pin configuration source files for the project

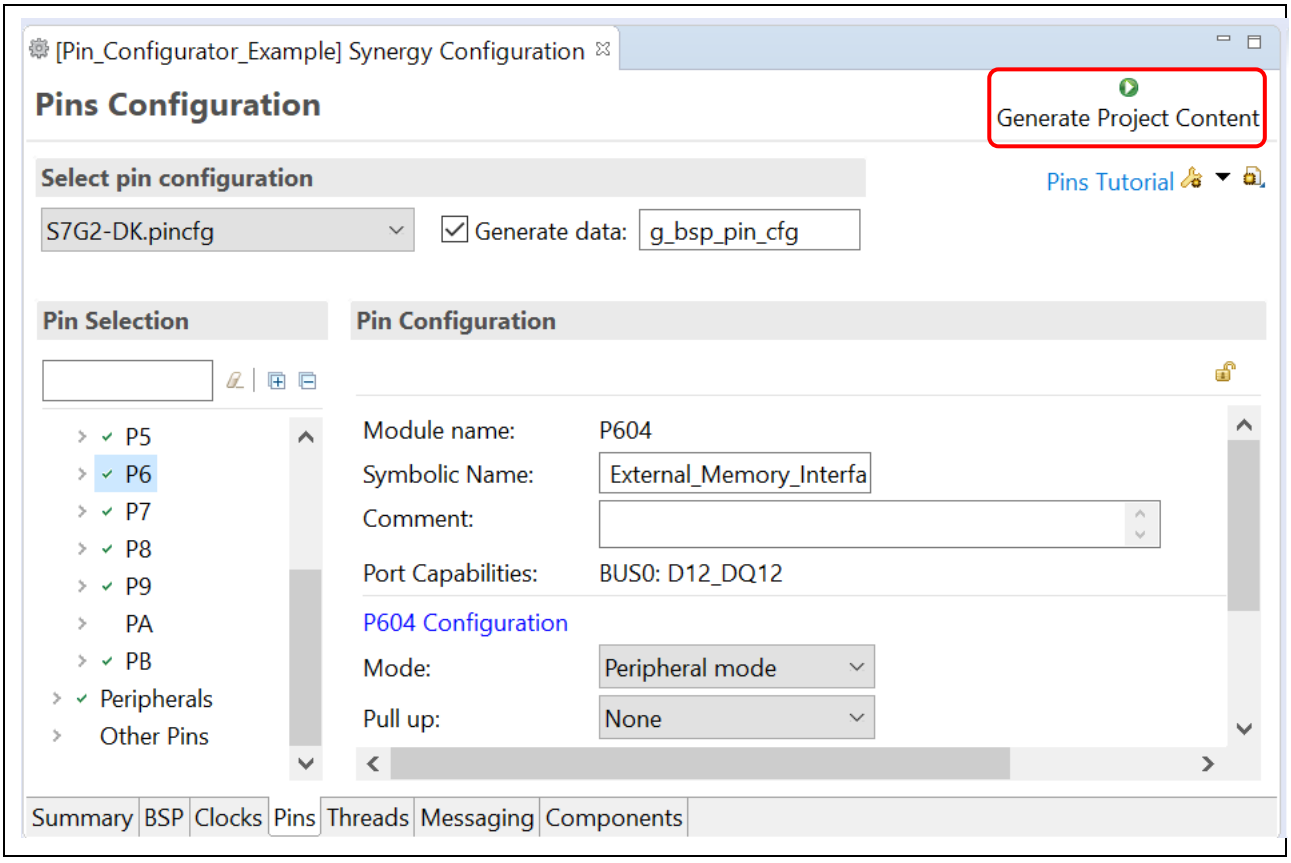

Figure 50. Generate Project Content button

2. The source code for pin Configuration is generated at `synergy_cfg/ssp_cfg/bsp/bsp_pin_cfg.h` and `src/synergy_gen/pin_data.c`.
   Note: Do not edit these files as they will be overwritten when building the project and whenever the **Generate Project Content** button is pressed.

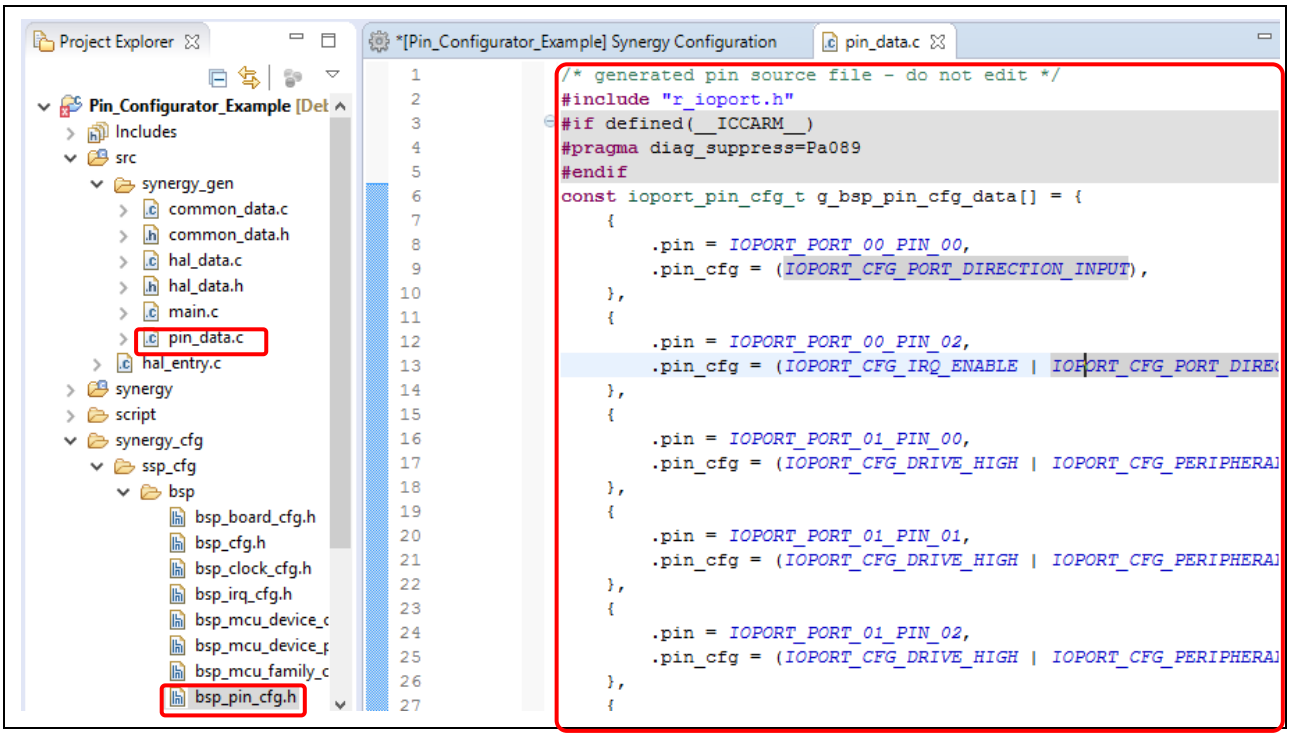

Figure 51. Source code for Pin Configuration

3. In case of using multiple pin configurations, different data structures can be created in `pin_data.c`. This allows dynamic switching of pin configurations during run time (for example, for different power modes).
   In this example, we use two pin configuration files to generate two data structures.

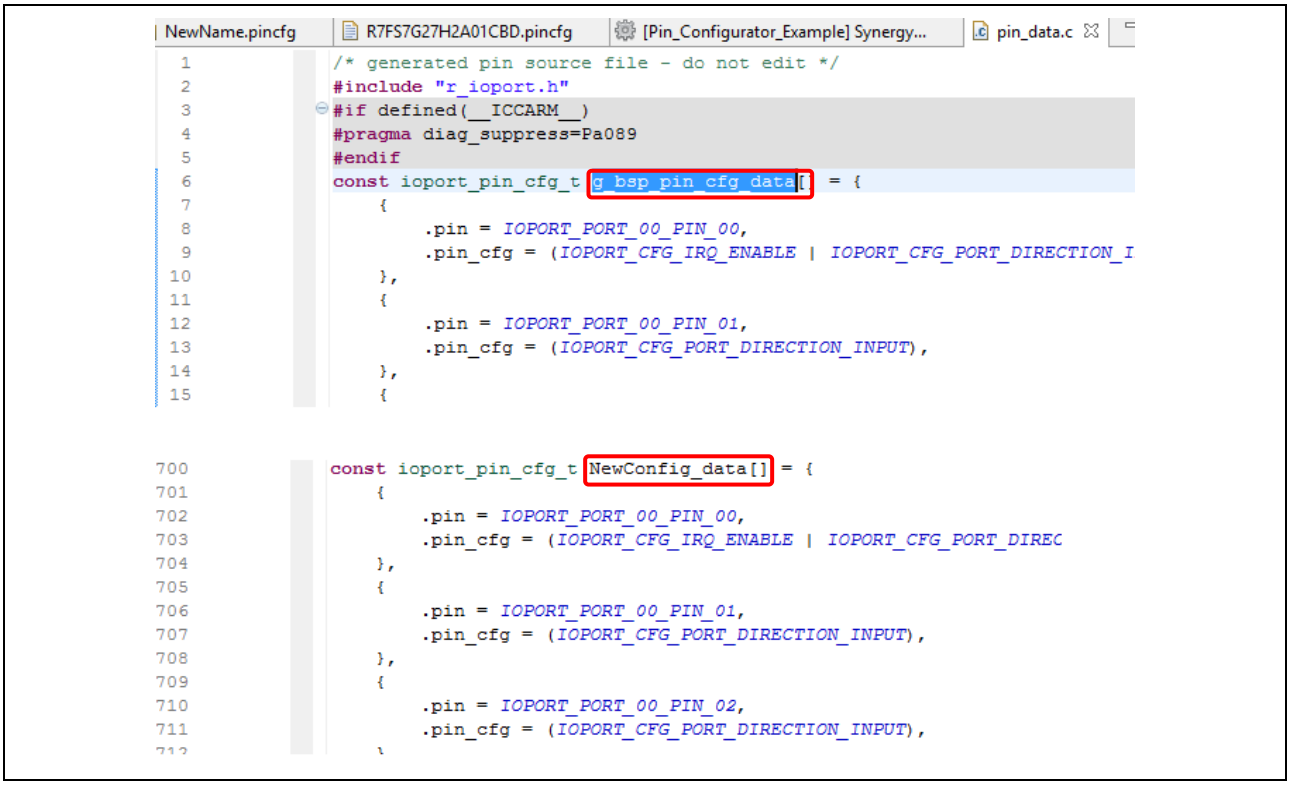

Figure 52. Different data structures for different Configurations

4. Each pin configuration will have its own CSV file which contains all pin configurations. The CSV files can be found at `synergy_cfg/ssp_cfg/bsp/*.csv`.

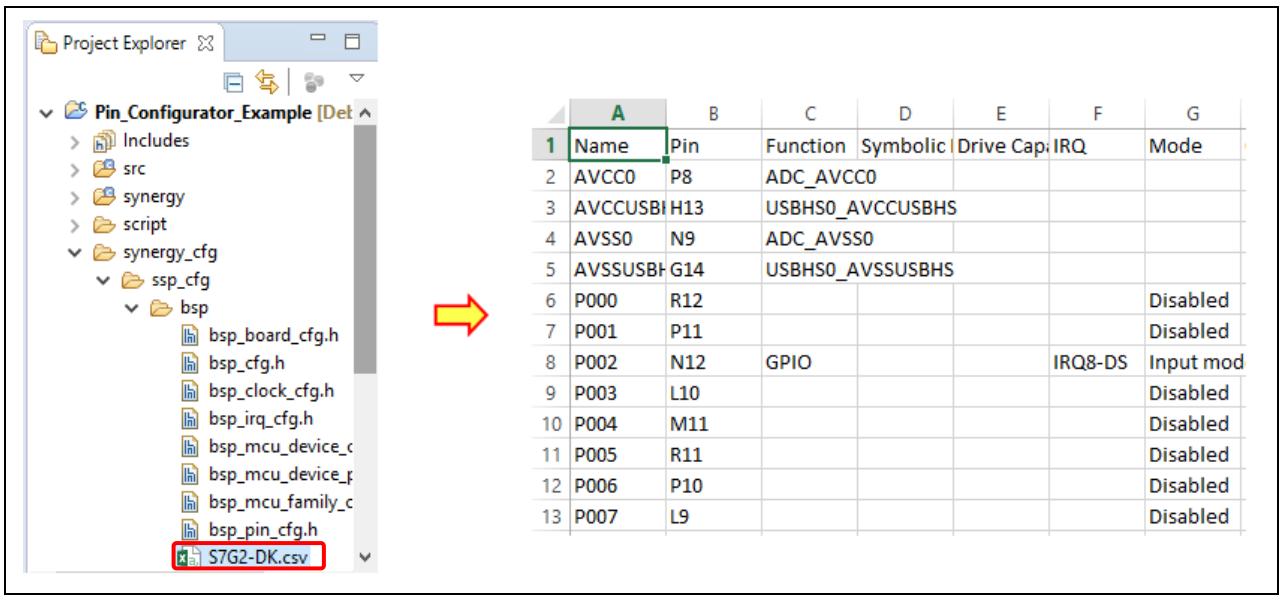

Figure 53. CSV files

8.2 Generating source code in IAR EW for Synergy

1. After configuring the pins, you can click on the **Generate Project Content** button to generate the necessary pin configuration source files for the project.

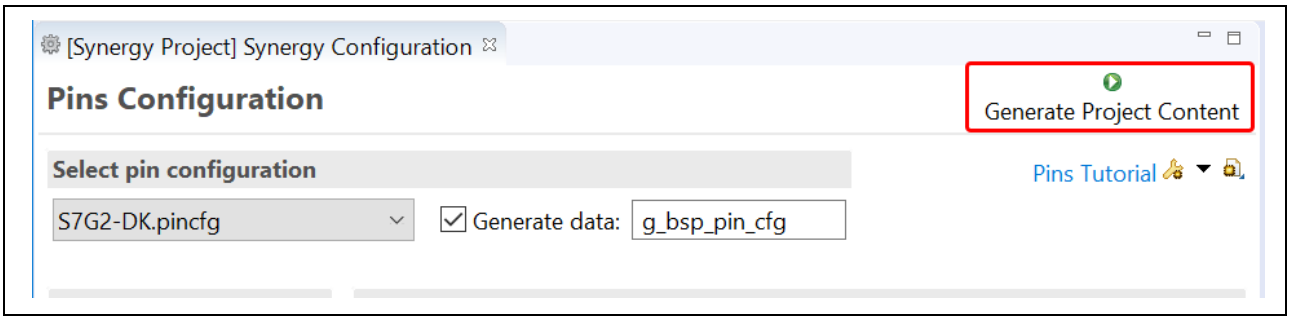

Figure 54. Generate Project Content button

2. The source code is generated at `<ProjectDir>\Synergy\Source Files\src\synergy_gen\pin_data.c`.

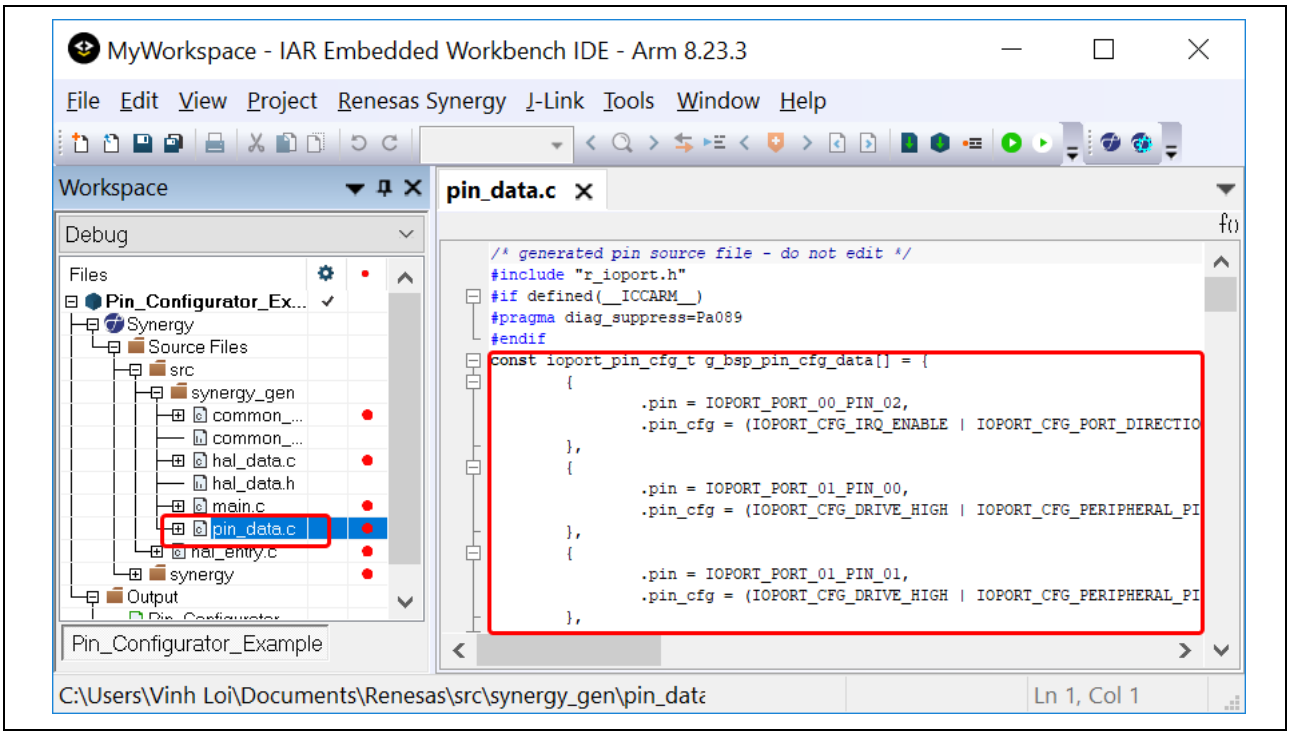

Figure 55. Source code for Pin Configuration

3. In case of using multiple pin configurations, different data structures can be created in `pin_data.c`. This allows dynamic switching of pin configurations during run time (For example, for different power modes). In this example, we will use `S7G2-DK.pincfg` and `NewName.pincfg` to generate two data structures. The data structures are named after the unique names that were entered in the text box in previous steps: **g_bsp_pin_cfg** and **NewConfig**

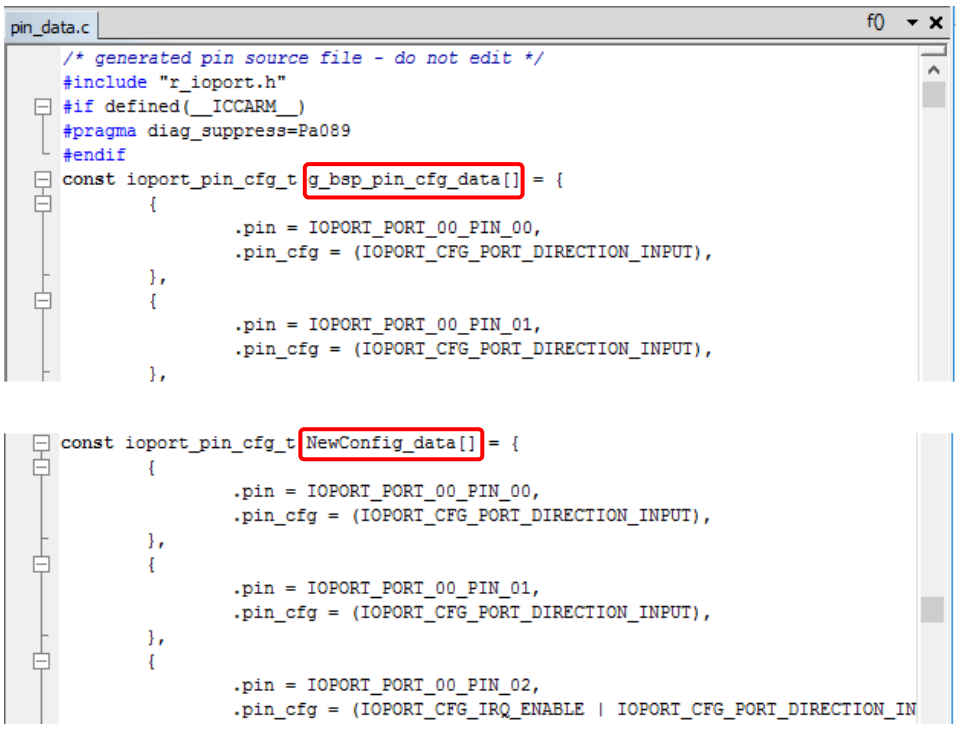

Figure 56. Different data structures for different Configurations

4. Each pin configuration will have its own CSV file which contains all pin configurations. The CSV files are not shown on the **Workspace** window, but you can open Windows Explorer and locate the file at `<ProjectDir>\synergy_cfg\ssp_cfg\bsp\.`

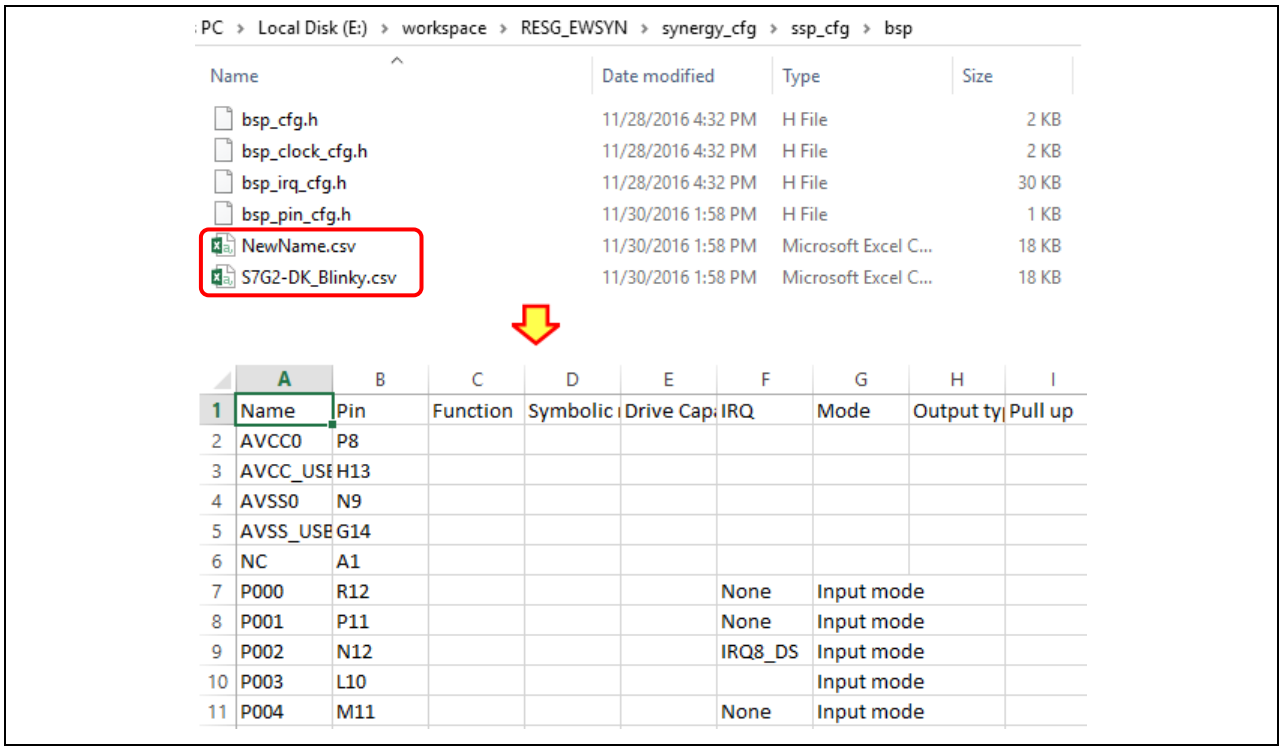

Figure 57. CSV files

9. Additional Information

For more information on the Pin Configurator or other Synergy Configurator sections, please refer to e² studio Help Contents.

Select **Help → Help Contents**, go to **Synergy Contents → Synergy configuration editor** to open the topic related to the Synergy Configurator.

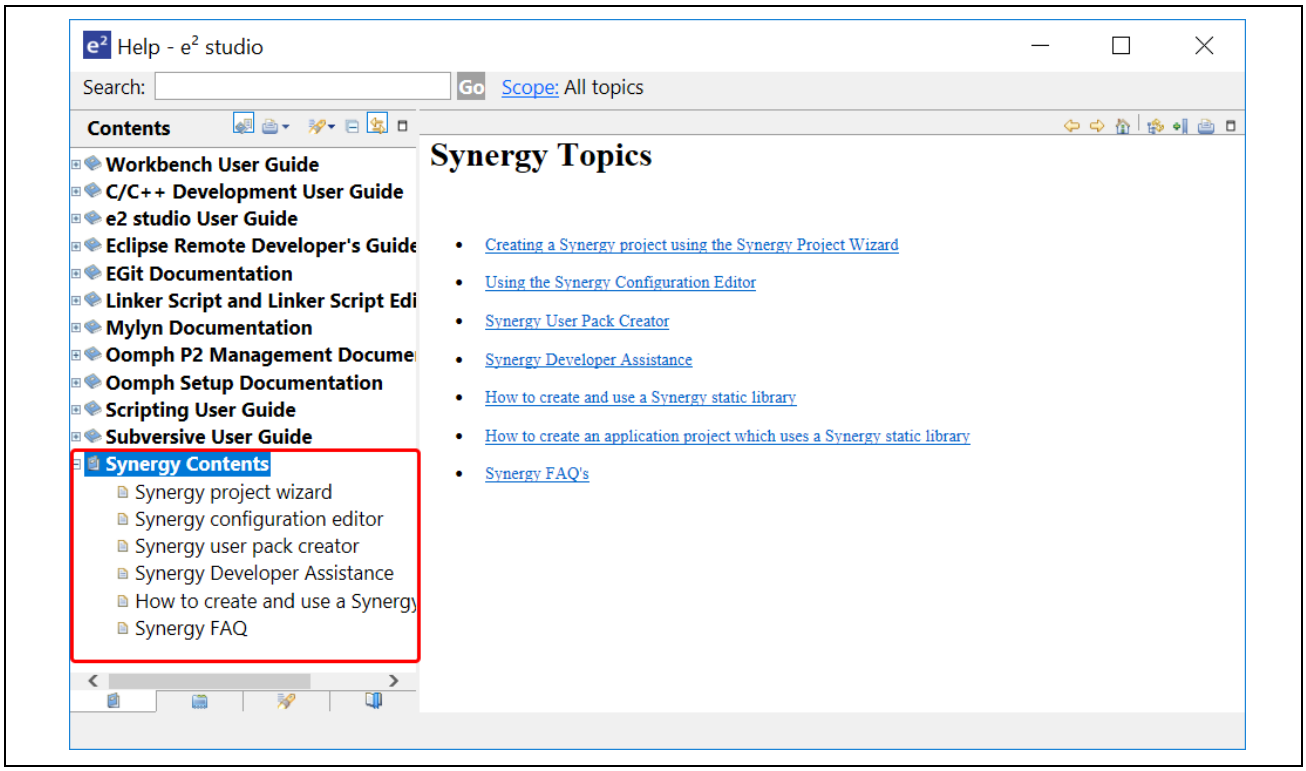

Figure 58. Synergy Topic in e² studio Help Contents

For introduction and installation guide of IAR EW for Synergy, refer to IAR EW for Synergy Help Contents

Select **Help → Contents…**, go to **IAR Embedded Workbench(R) for Renesas Synergy(TM)**.

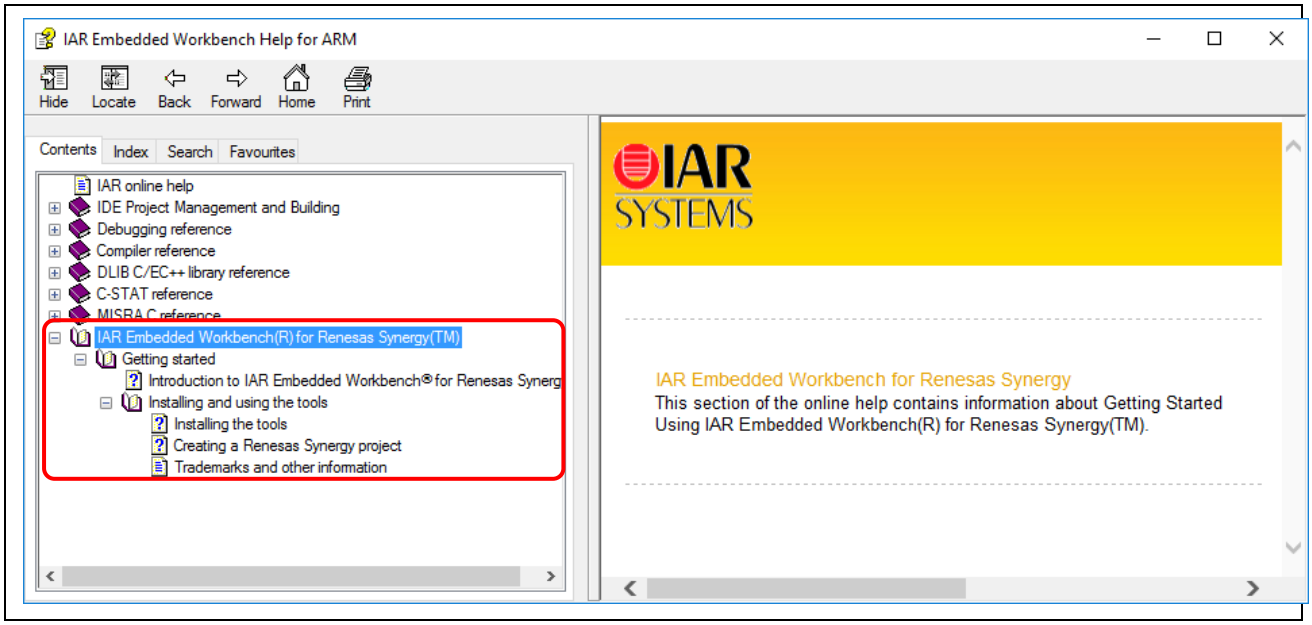

Figure 59. Synergy Topic in IAR EW for Synergy Help Contents

Website and Support

Visit the following vanity URLs to learn about key elements of the Synergy Platform, download components and related documentation, and get support.

Synergy Software	www.renesas.com/synergy/software
Synergy Software Package	www.renesas.com/synergy/ssp
Software add-ons	www.renesas.com/synergy/addons
Software glossary	www.renesas.com/synergy/softwareglossary
Development tools	www.renesas.com/synergy/tools
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MCU glossary	www.renesas.com/synergy/mcuglossary
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Training	www.renesas.com/synergy/training
Videos	www.renesas.com/synergy/videos
Chat and web ticket	www.renesas.com/synergy/resourcelibrary

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Jan.01.19	—	First release document
1.01	Sep.30.19	—	Updated for SSP v1.6.0

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