Renesas Synergy™ Platform

Customizing a SSP Module

Introduction

This application note describes how to create a copy of a Synergy Software™ Package (SSP) Module, which you can customize for your application.

Background

There may be cases that you want to modify the functionality of an existing SSP Module. To do so, you must make a copy of the Module, which you can then customize. SSP Modules cannot be modified **in-place** because their source files are automatically extracted and copied each time the project is built, overwriting any modifications that you might have made.

Goals and Objectives

The goal of this application note is to show you how to create a customizable copy of a SSP Module.

Prerequisites

The reader of this application note is assumed to have some experience developing SSP-based applications using the Renesas Synergy™ e2 studio ISDE and SSP.

Required Resources

To perform the steps in this application note, you will need:

- Synergy Board: DK-S124 Synergy MCU Group.
- A PC running Microsoft® Windows® 7 and above with the following Synergy software installed:
  - e² studio ISDE Version: 7.3.0 or later
  - Synergy Software Package (SSP) v1.6.0 or later
  - IAR Embedded Workbench® for Renesas Synergy™ v8.23.3.
  - Synergy Standalone Configurator (SSC) v 7.3.0.

You can download the required Synergy Software Platform resources by visiting the Renesas Synergy Gallery at https://www.renesas.com/us/en/products/synergy/software/ssp.html.

Time Required

You can perform the steps in this application note in under 30 minutes. The high-level steps involved are:

1. Use the Synergy Configurator in the e² studio ISDE to instantiate the SSP Module in your Synergy project.
2. Generate the project content.
3. Copy the Module's source files to a directory outside of the directories used for Synergy code. Synergy directories are overwritten on every build. The recommended directory to place your custom SSP Module is the top-level `src` folder, which is at the same level as the Synergy folder in the Project Explorer view in the e² studio ISDE.
4. In the Renesas Synergy Project, exclude original module driver from the build to avoid duplicated source.
5. Build the project.

These steps allow you to treat the copied sources as any other project sources. You can modify the custom Module source code without your custom source code being deleted in the next project rebuild. These steps are described in detail in this document.

Contents

1. Customizing a SSP Module

For example, let's assume you would like your own version of the Analog to Digital Converter Driver (ADC). What is needed is a customized version of this Module, a replacement for the existing ADC Driver supplied by the SSP.

Note: If you want a **new** module in addition to the existing module, the process would be significantly more complex, requiring renaming entries in all the files that need to be copied. This use case is not covered by this application note.

The following process shows how to replace a SSP Module with your own customized version of the module. You can implement a different directory structure below the top level `src` folder. For example, creating separate file folders that the directory structure would need to be reflected in the project's **Include Path** settings.

2. Connecting to the Board

Follow the procedure in your target board's *Quick Start Guide* to set up the J-Link® Debug Probe connection from your PC to the JTAG connector on the target board and power-up the board.

3. Importing and Building the Project: e² studio.

Follow the procedure in the *Synergy Project Import Guide* (r11an0023eu0121-synergy-ssp-import-guide.pdf), which is included in this package, to import the project into the e² studio ISDE, and to build and debug the project. When prompted to select the debug configuration, select **AnalogSensorsLED_DK_S124 Debug** (under Renesas **GDB Hardware Debugging**).

4. Adding the SSP Module to be customized to the Existing Project

This feature of customizing the SSP Module is available for all the Synergy MCU Group and on all SSP modules that require user modification. For example, in the case of the Ethernet PHY driver, if the project requires a different PHY driver other than the default driver supported in the SSP, you can customize the new driver in a similar way to the example shown in this application note. For demonstration purposes, this application note shows the customizing of SSP module on the DK-S124 Analog sensor as an example. It can be done on all other boards as well. You can refer to the example project as part of this application note to understand the code details and its working after the customization.

After importing the project and double clicking the **configuration.xml Threads** window, shown below:

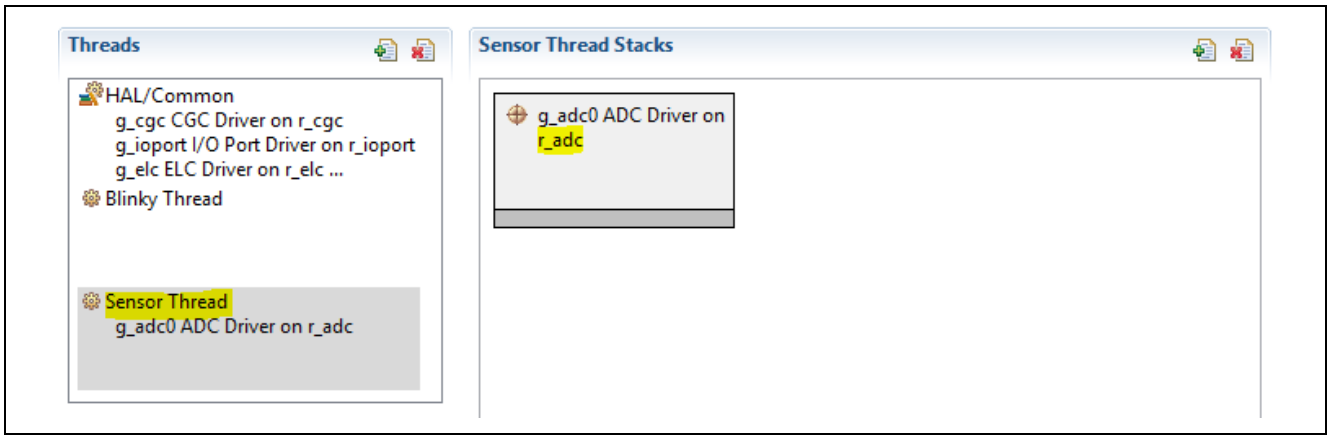


Figure 1. Configuration.xml Threads window

4.1 Generating Project Content

Click the **Generate Project Content** button at the top right of the Synergy Project Editor window in e² studio.

Figure 2. Generate Project Content button

4.2 Making a Copy of the SSP Module

Using the Project Explorer window, navigate to the `synergy/ssp/src/driver` folder.

Select the `r_adc` driver folder from `synergy/ssp/src/driver`, and copy it using the **Edit > Copy** menu option. Then, select the top-level `src` folder and paste the copy using the **Edit > Paste** menu option.

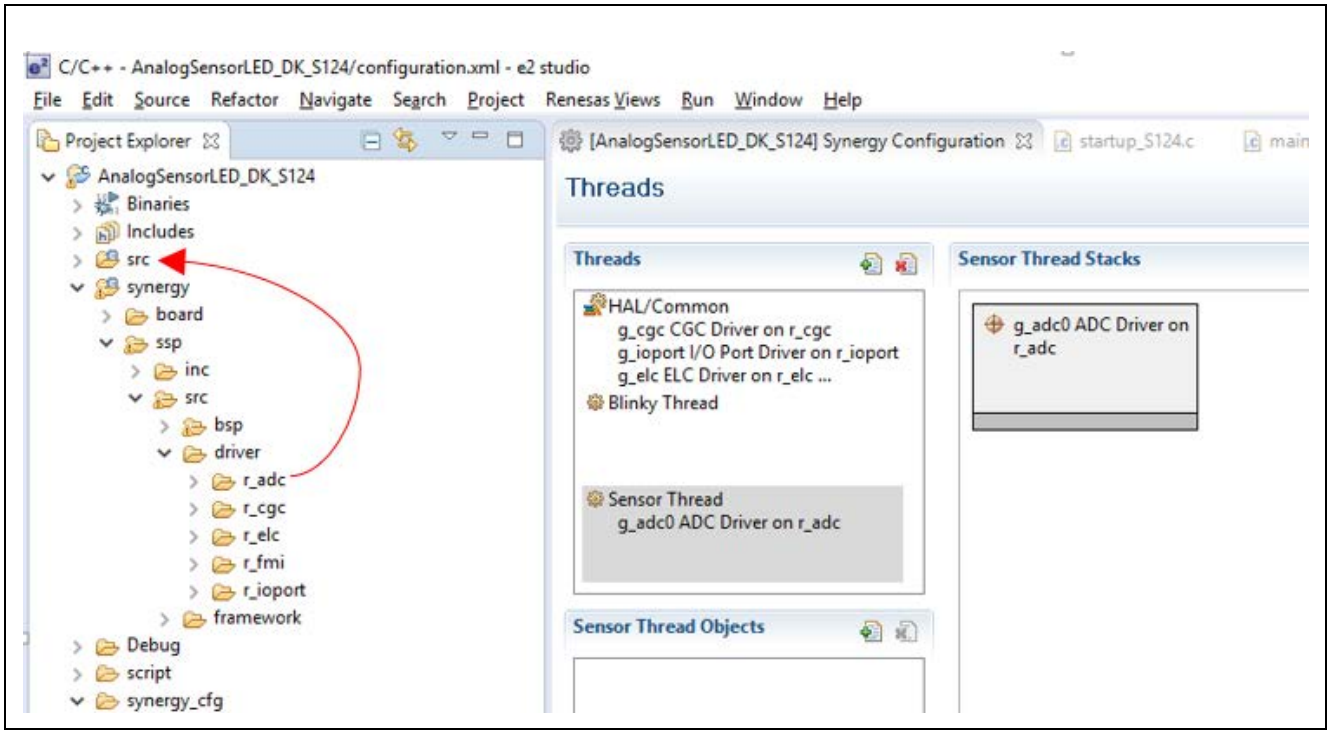


Figure 3. Making a copy of the SSP Module

4.3 Copying Required Files

Using **Copy** and **Paste** under the **Edit** menu options and copy all the Module related files in the `synergy_cfg/ssp_cfg/driver, synergy/ssp/inc/driver/api, and synergy/ssp/inc/driver/`instances directories. For the ADC Driver:

- Copy the `r_adc_cfg.h` file from `synergy_cfg/ssp_cfg/driver` to your top-level `src` folder.
- Copy the `r_adc_api.h` file from `synergy/ssp/inc/driver/api` to your top-level `src` folder.
- Copy the `r_adc.h` file from `synergy/ssp/inc/driver/instances` to your top-level `src` folder.

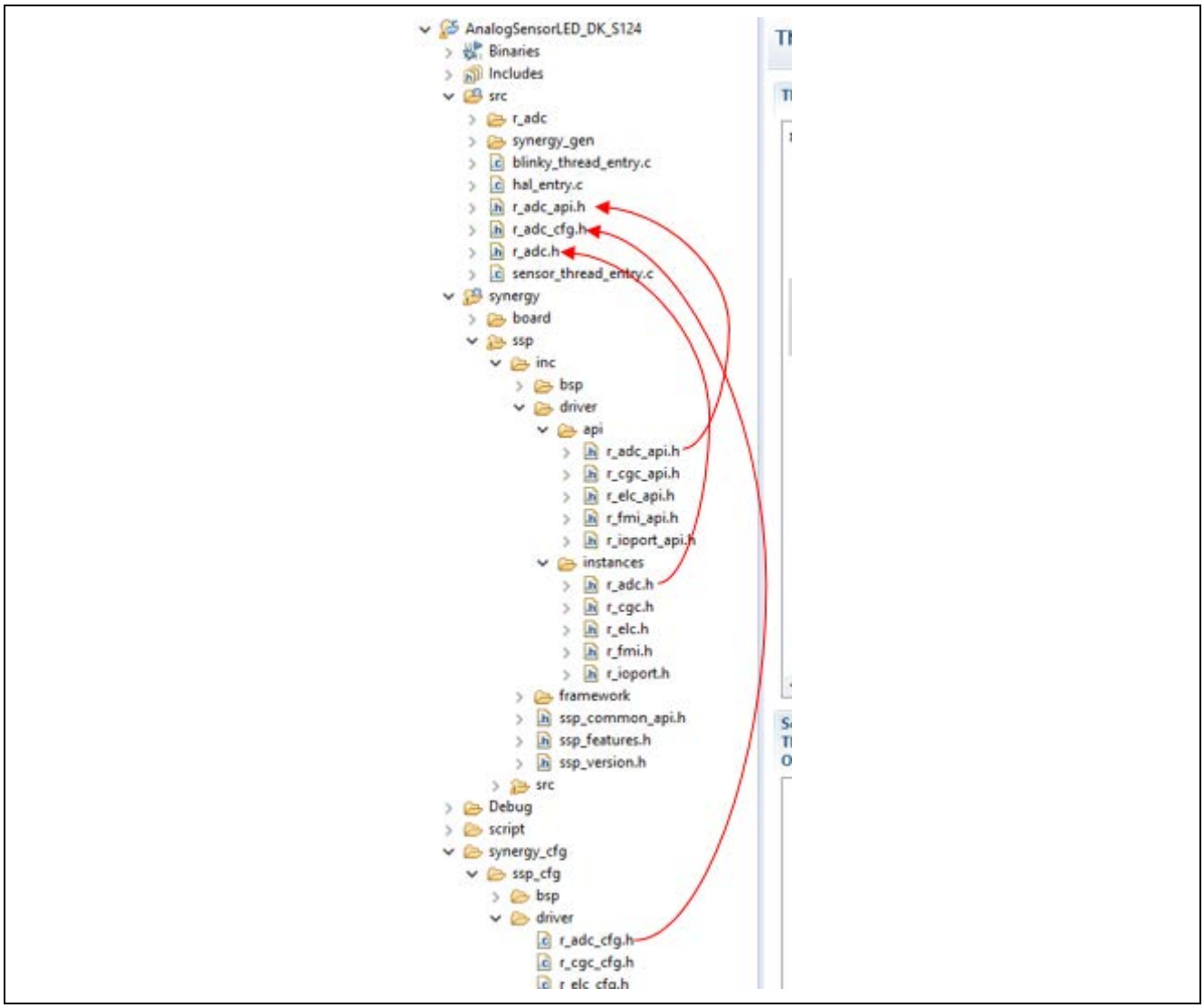
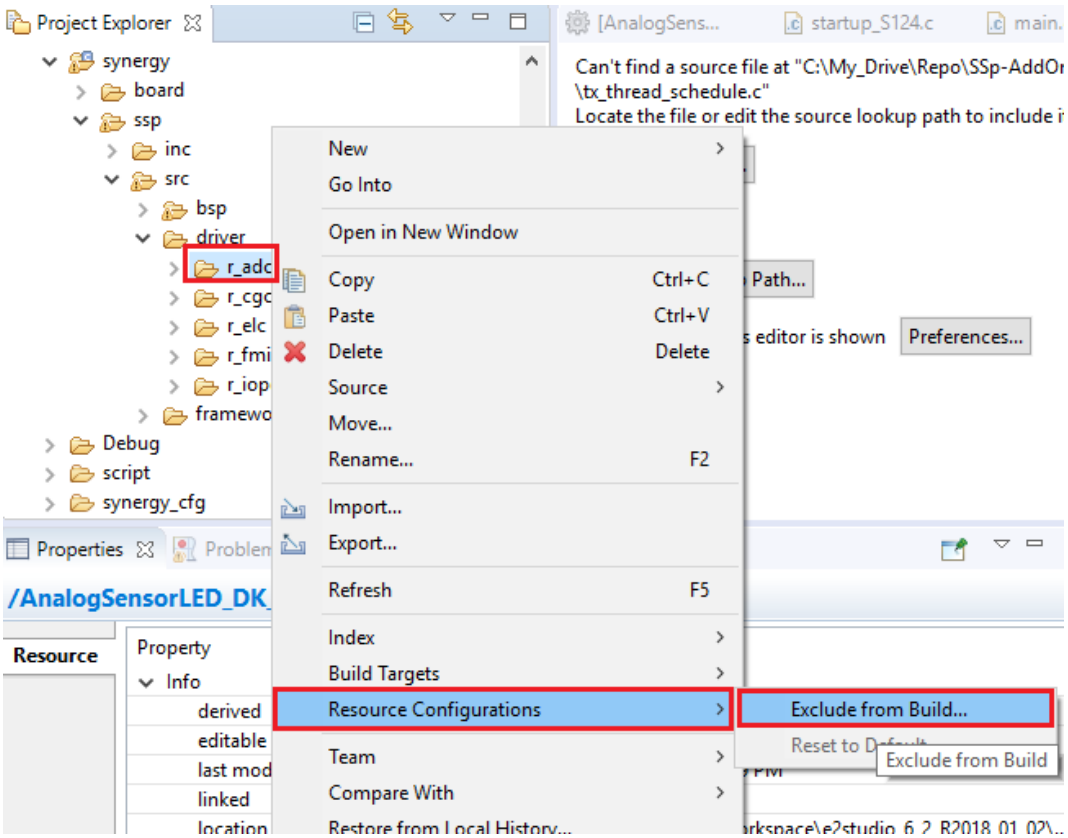


Figure 4. Making a copy of the SSP Module

4.4 Exclude the Original SSP Module from the build

To prevent a conflict between the ADC Module sources in the `src` directory and those created with the e^2 studio ISDE GUI, the ISDE-created Module must be excluded from the project build. **Right click** the original driver Module `r_adc` and select **Resource Configurations > Exclude from build…**. Choose **Select All** and **OK**.



This will exclude the original driver from build.

Figure 5. Exclude the original driver from the build

4.5 Building and Running the Project

Right-click the project in the **Project Explorer** view and select **Build Project** from the menu or use the shortcut on the task bar. After the **Build** is successful click the **debug configuration** window and click **debug** as the following screenshots show.

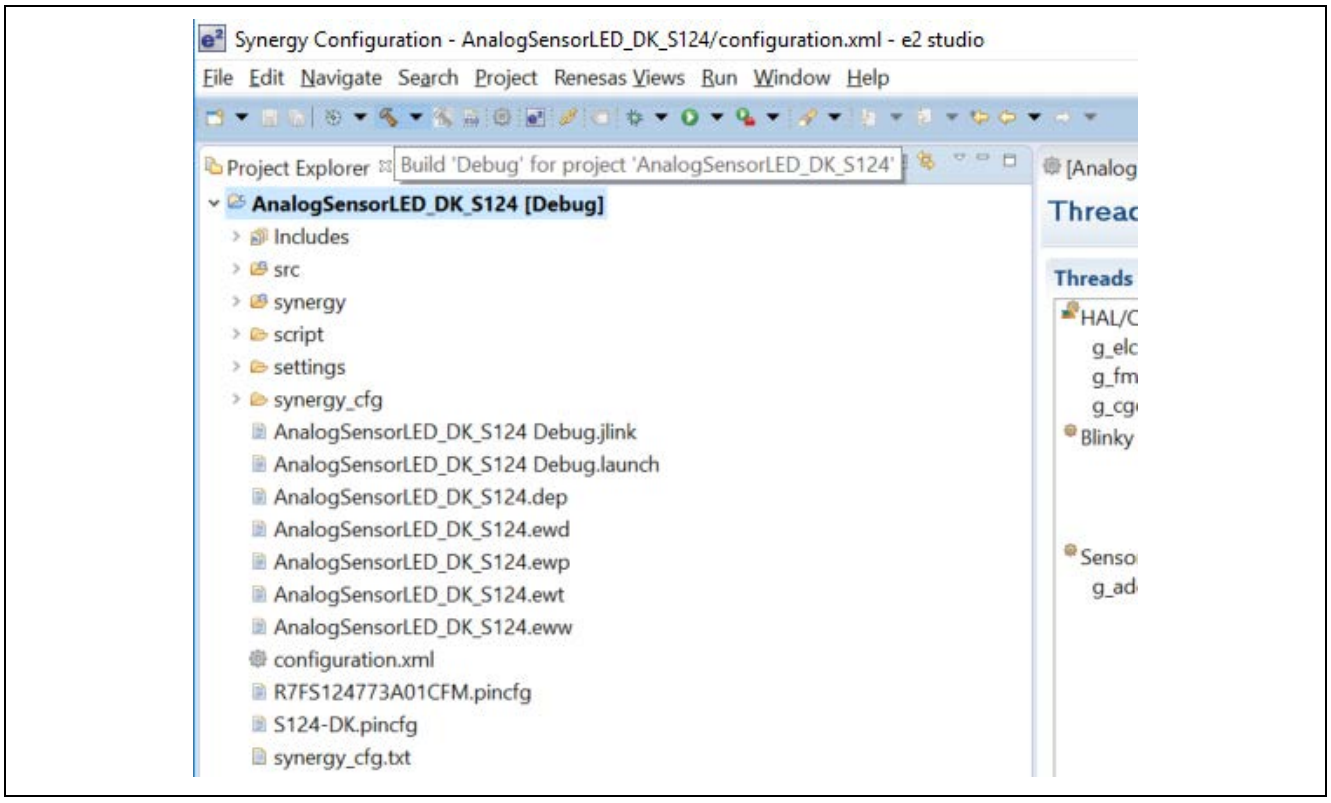


Figure 6. Project Explorer view and Build Project

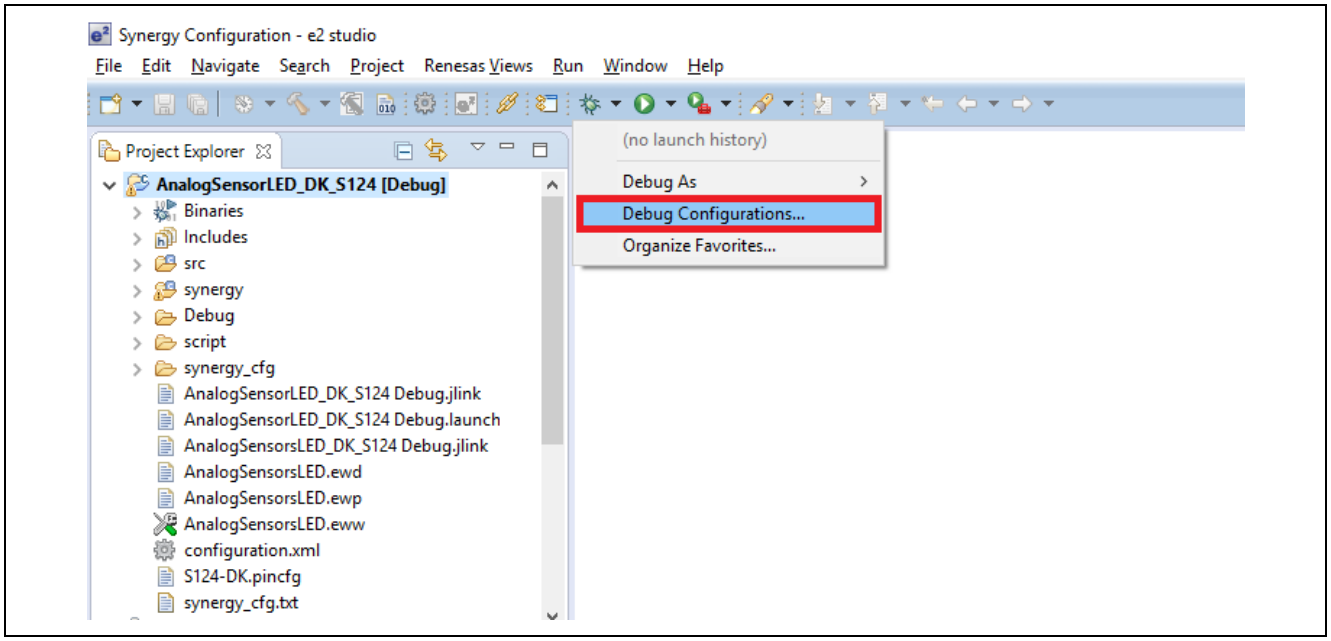


Figure 7. Debug Configurations

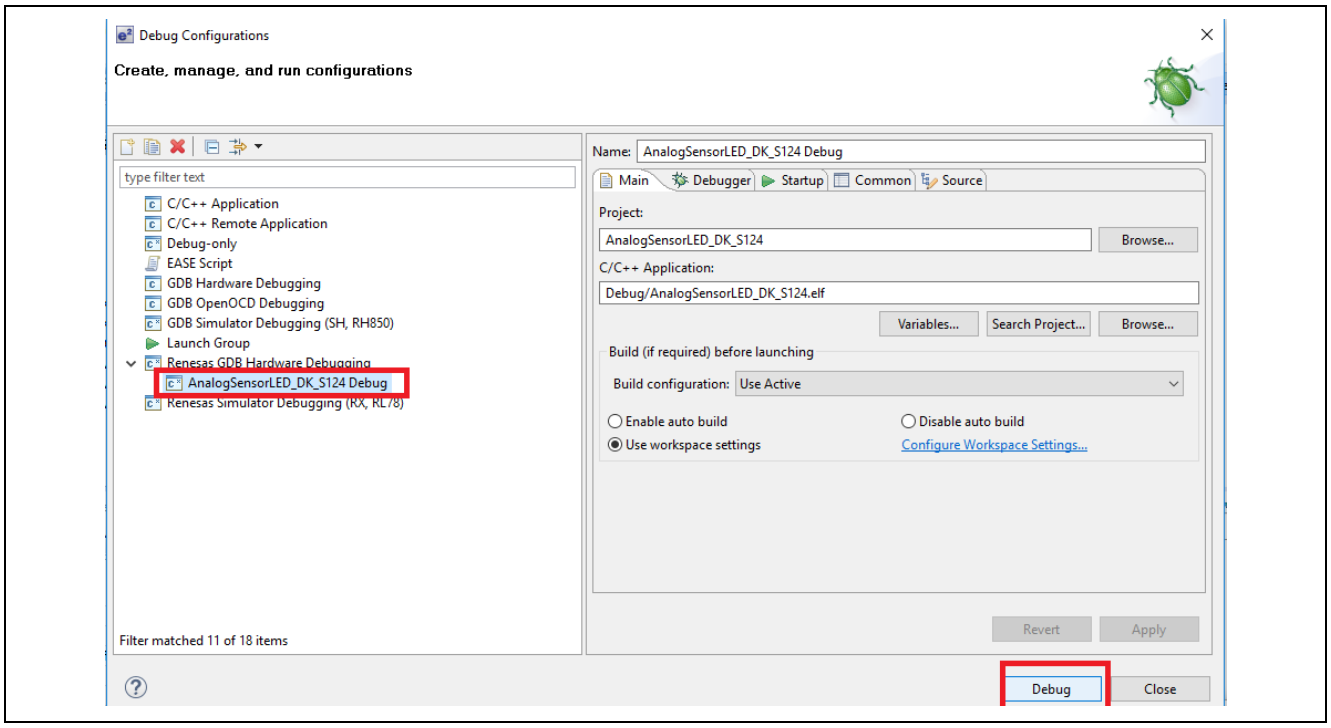


Figure 8. Select file and click the Debug button

Click the **Debug** button or press **F8**. 

To stop this project, click on 

5. Importing and Building the Project: IAR Embedded Workbench

Follow the steps in the *Renesas Synergy™ Project Import Guide* (r11an0023eu0121-synergy-ssp-import-guide.pdf), to import the project **AnalogSensorLED_DK_S124** in IAR Embedded Workbench® for Renesas Synergy™. The IAR EW for Synergy window looks like the screen below once the import is successful.

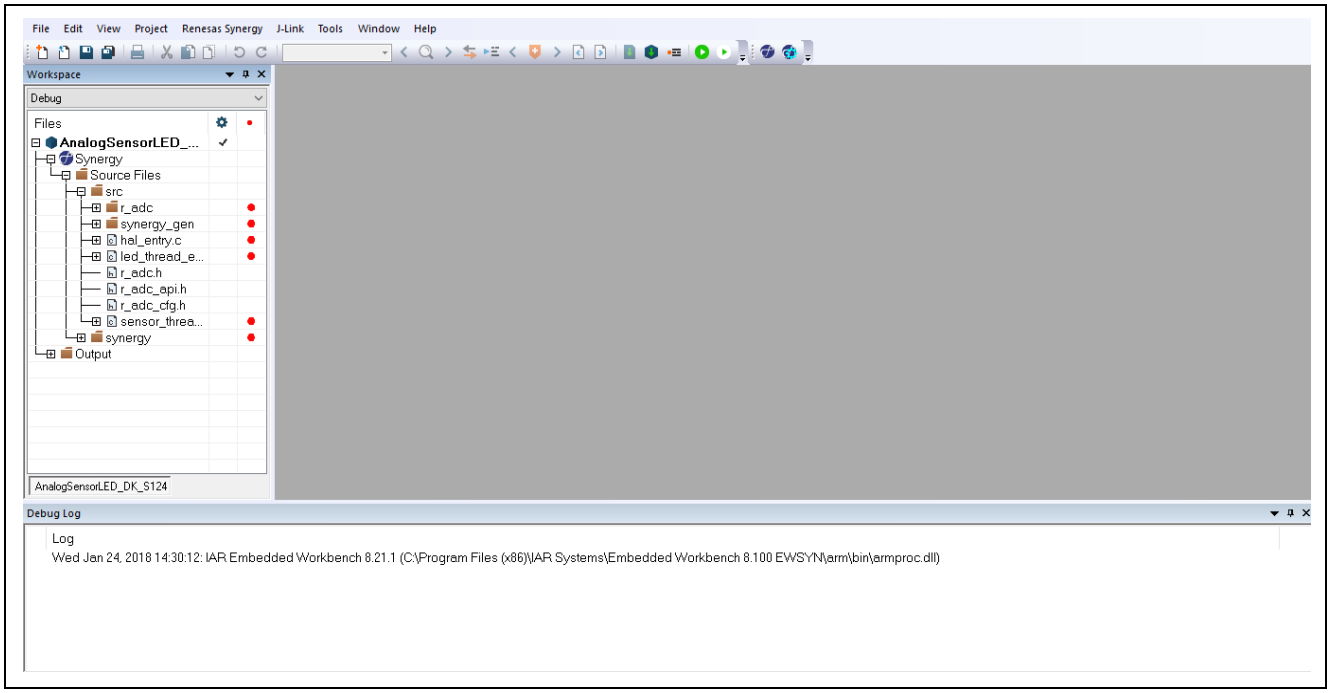


Figure 9. Successful import screen

5.1 Generating Project Content

From the Renesas Synergy™ Configurator, **click** the **Generate Project Content** button.

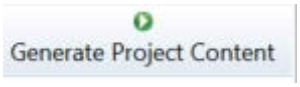


Figure 10. Generate Project Content button

5.2 Making a Copy of the SSP Module

Copy the driver `r_adc` from **Project Name**-> **Synergy** ->**Source Files** -> **synergy** -> **ssp** -> **src** ->**driver** to **Project Name**-> **Synergy** ->**Source Files**->**src.** See figure below.

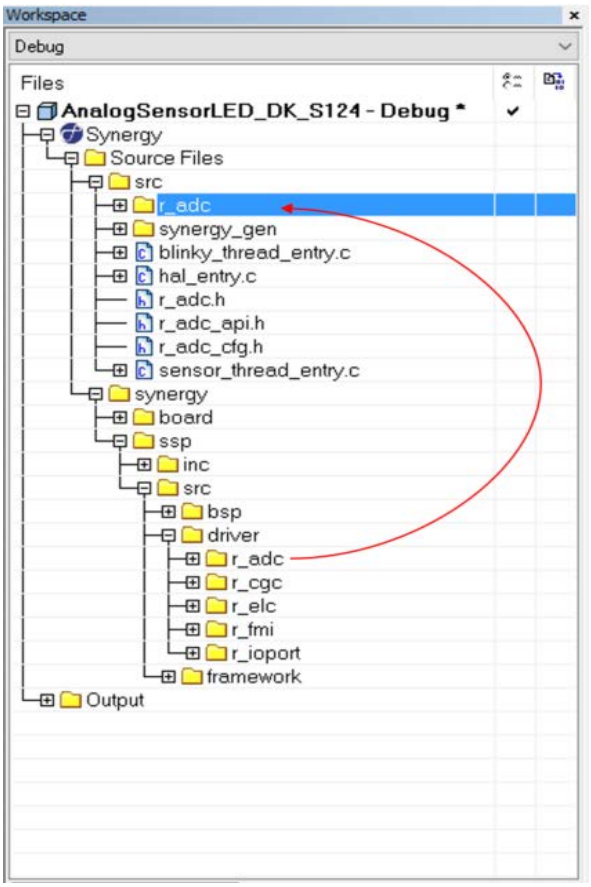


Figure 11. Copy the driver r_adc file

5.3 Copying Required Files

Using the **File** explorer, locate where the original application program folder is located and copy all the Module related files in the **synergy_cfg/ssp_cfg/driver**, **synergy/ssp/inc/driver/api,** and **synergy/ssp/inc/driver/instances** directories similar to e^2 studio.

For the ADC Driver:

- Copy the `r_adc_cfg.h` file from `synergy_cfg/ssp_cfg/driver` to the top-level `src` folder.
- Copy the `r_adc_api.h` file from `synergy/ssp/inc/driver/api` to your top-level `src` folder.
- Copy the `r_adc.h` file from `synergy/ssp/inc/driver/instances` to your top-level `src` folder

5.4 Exclude the Original SSP Module from the build

Since `r_adc` driver is present twice in the project, one driver must be disabled. Before compiling the project using the **Make** button, **right-click** `r_adc` located under the **Project Name-> Synergy ->Source Files -> synergy -> ssp -> src ->driver** and select **Options**. See the following figures for details.

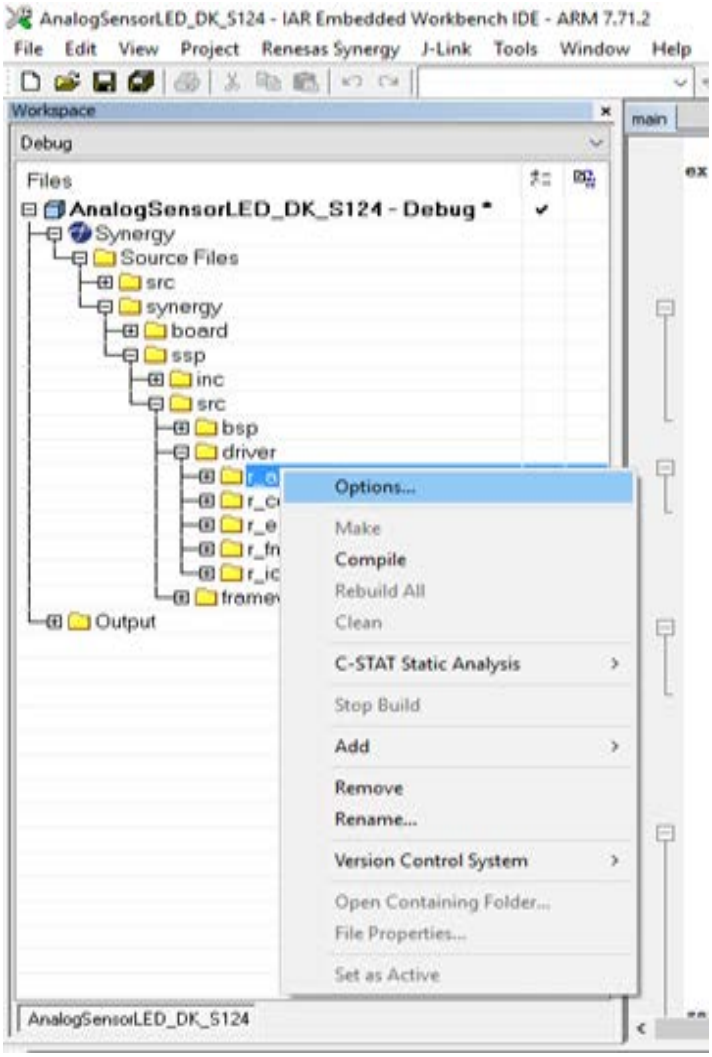


Figure 12. Options and Exclude from Build

From the pop-up window, select **Options** and check the box, **Exclude from Build**. Press **OK**.

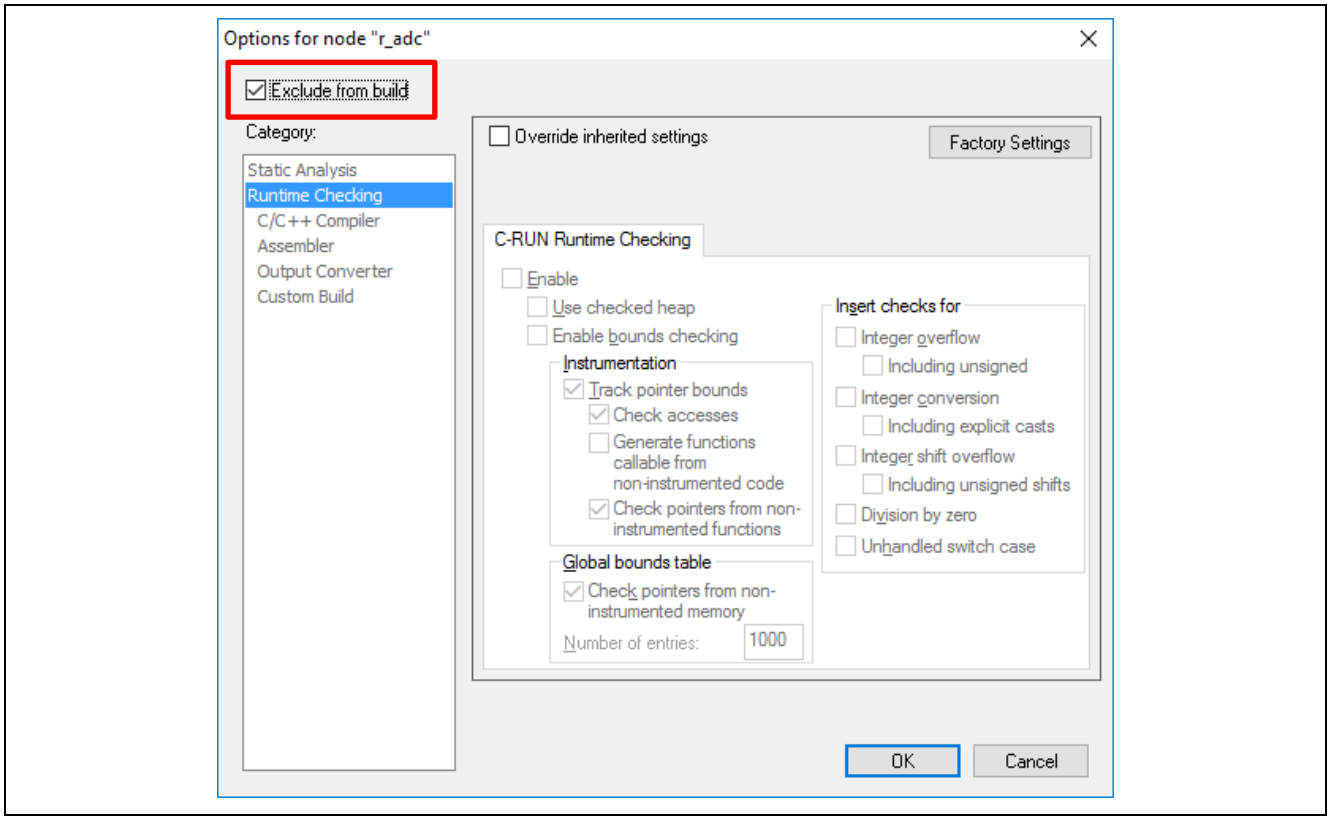


Figure 13. Check box Exclude from build

5.5 Building and Running the Project

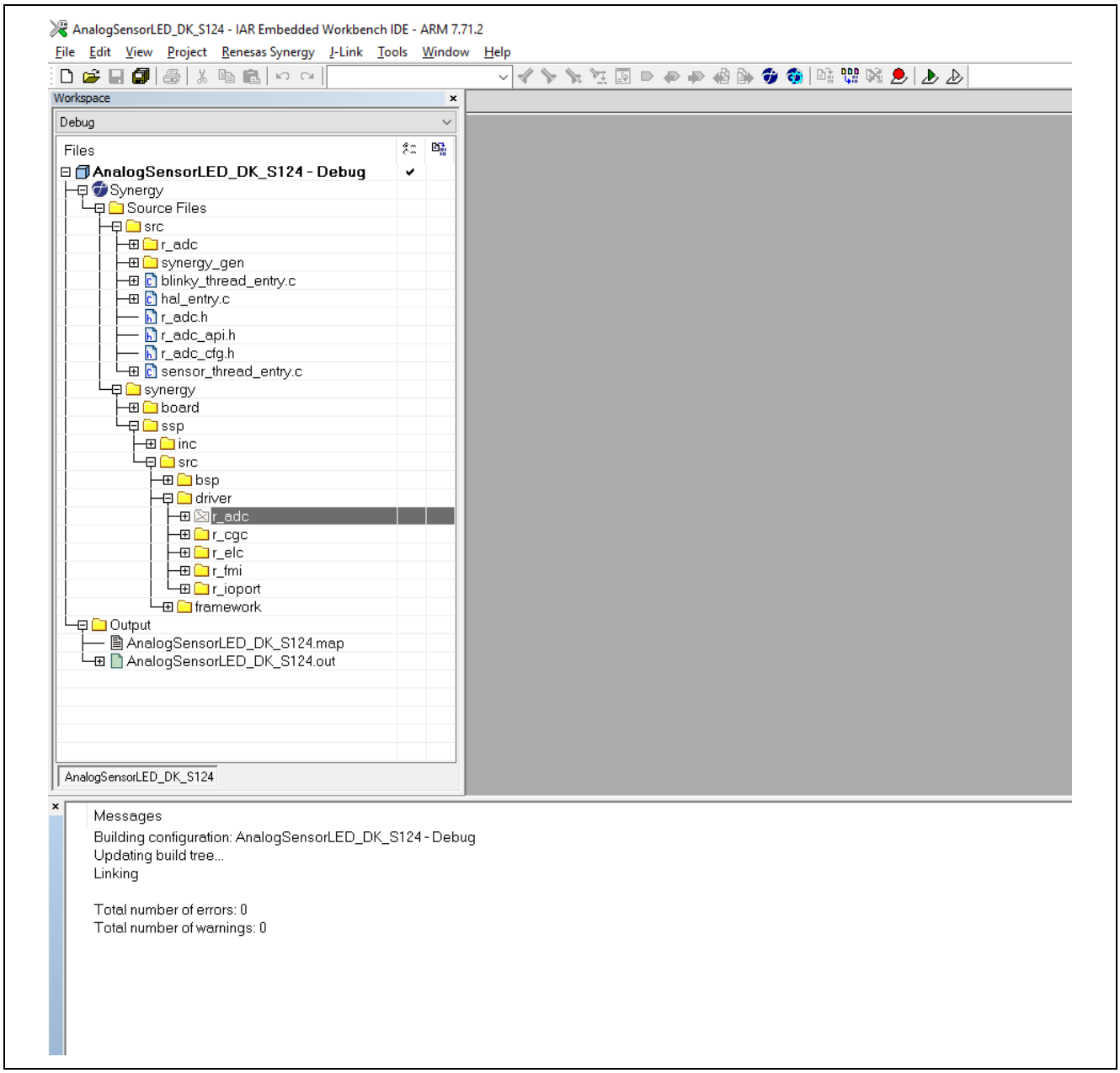


Figure 14. Messages after build

6. Next Steps

You now have a customizable copy of the ADC SSP Module in the `src` directory. The custom module is already included in your project. You can edit the custom module source code as needed for your application, then rebuild the project.

7. Reference

SSP User Manual: Available in html format in the SSP distribution package and as a pdf from the Synergy Gallery: https://www.renesas.com/us/en/products/synergy/software/ssp.html.

Links to all the most up-to-date reference materials and resources are available by visiting the Synergy Knowledge Base at www.renesas.com/synergy/knowledgebase.

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Knowledgebase	www.renesas.com/synergy/knowledgebase
Forums	www.renesas.com/synergy/forum
Training	www.renesas.com/synergy/training
Videos	www.renesas.com/synergy/videos
Chat and web ticket	www.renesas.com/synergy/resourcelibrary

Revision History

		Description	
Rev.	**Date**	**Page**	**Summary**
0.85	Oct.09.15	—	Initial Version
0.86	Jan.12.16	6	Updated support URL.
		2	Clarified the process of modifying an SSP module.
1.00	May.09.16	—	Updated to SSP 1.1.0.
1.01	Oct.19.16	—	Minor formatting changes
1.02	Oct.27.16	6	Added steps to exclude build and removed the module remove section
1.03	May.26.17	—	Updated to SSP 1.2.1
1.04	Jun.23.17	—	Updated to SSP 1.3.0-P.2
1.05	Jun.26.17	—	Updated to SSP 1.3.0. Added the IAR workbench steps and rectified some errors.
1.10	Aug.02.17	—	Initial release
1.11	Sep.27.17	1	Required resources of SSP version changed
1.12	Mar.01.18	—	Updated for SSP v1.4.0. Fixed warnings.
1.13	Mar.04.19	—	Updated for SSP 1.6.0

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Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
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