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

This application note shows you how to create a customizable SSP Module copy.

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: 7.5.1 or later
  - Synergy Software Package (SSP) v1.7.0 or later
  - IAR Embedded Workbench® for Renesas Synergy™ v8.23.3.
  - Synergy Standalone Configurator (SSC) v 7.5.1.

To download the required SSP resources, visit www.renesas.com/synergy/software.

Time Required

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

1. Using the Synergy Configurator in the e² studio ISDE to instantiate the SSP Module in your Synergy project.
2. Generating the project content.
3. Copying the source files for the module to a directory outside the directories used for the 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 seen in e² studio ISDE.
4. Excluding the original module driver in the Renesas Synergy project from the build to avoid a duplicated source.
5. Building the project.

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

Contents

1. Customizing a SSP Module

As an example, let's assume you would like your own version of the Analog-to-Digital Converter (ADC) Driver. 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 application note does not cover this use case.

The following process shows how to replace the 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, needs 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 *Renesas Synergy™ Project Import Guide* (r11an0023eu0121-synergy-ssp-import-guide.pdf), included in this package. This document tells you how to import the project into e² studio ISDE, 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

Customizing the SSP Module is available for the entire 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 PHY driver different from the default driver supported in the SSP, you can customize the new driver similar to the example shown in this application note. For demonstration purposes, this application note shows how to customize the SSP module on the DK-S124 Analog sensor as an example. Customization can be done on all other boards as well. You can refer to the example project included as part of this application note to understand its code details and workings after customization.

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

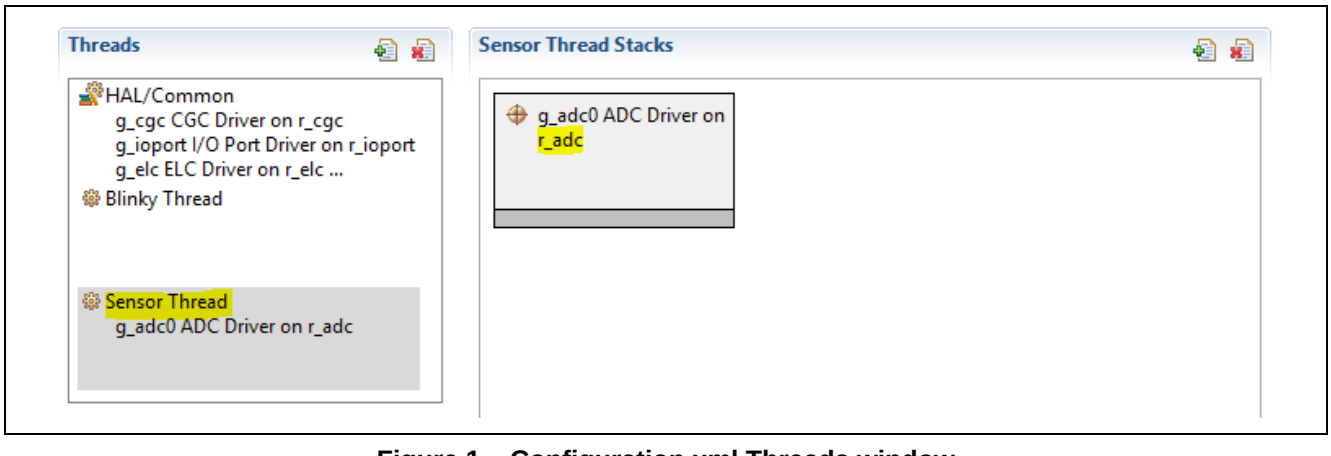


Figure 1. Configuration.xml Threads window

4.1 Generating Project Content

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

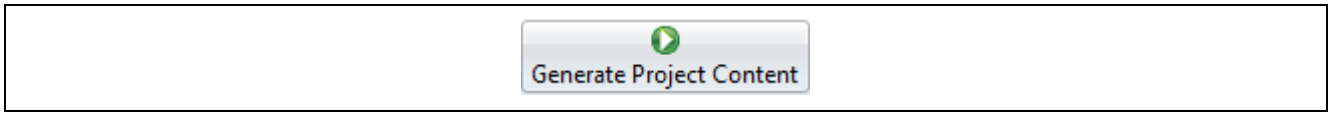


Figure 2. Generate Project Content button

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. Next, select the top-level `src` folder and paste the copied driver using the **Edit > Paste** menu option.

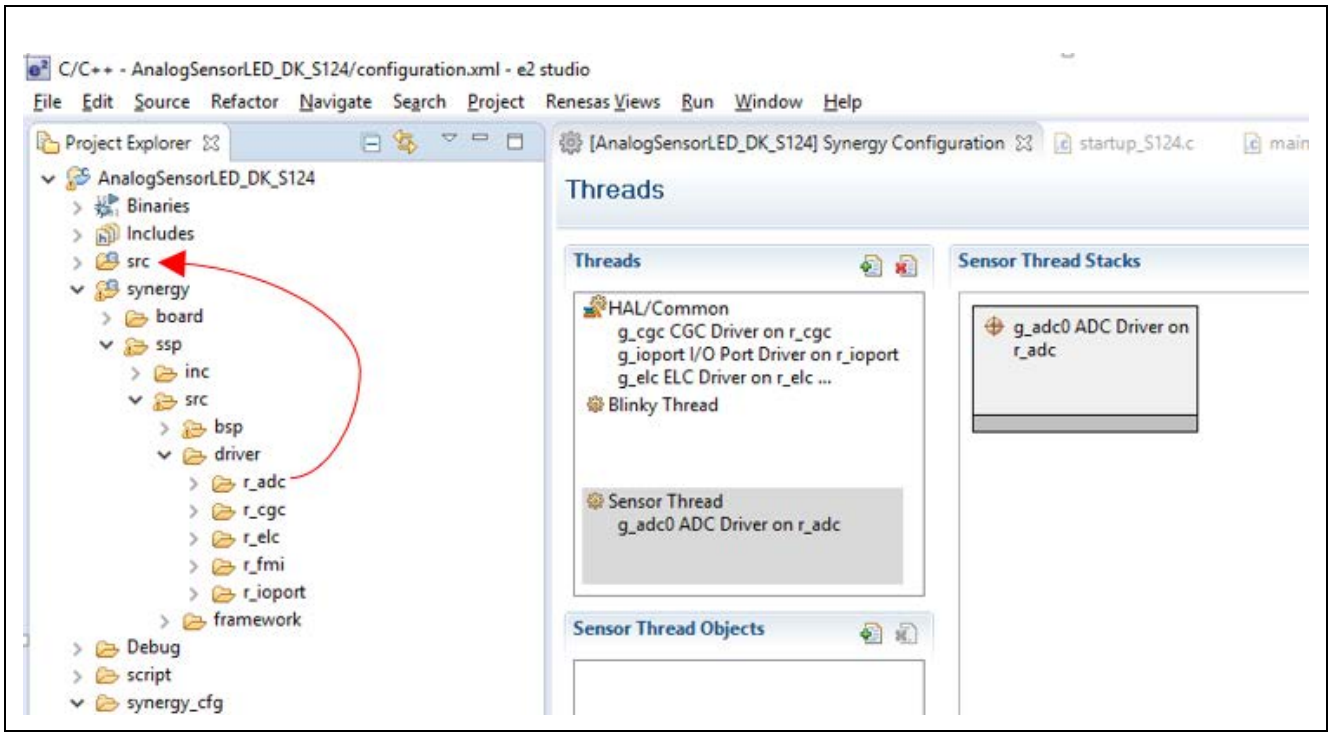


Figure 3. Making a copy of the SSP Module

4.3 Copying Required Files

Using **Copy** and **Paste**, under the **Edit** menu options, 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.

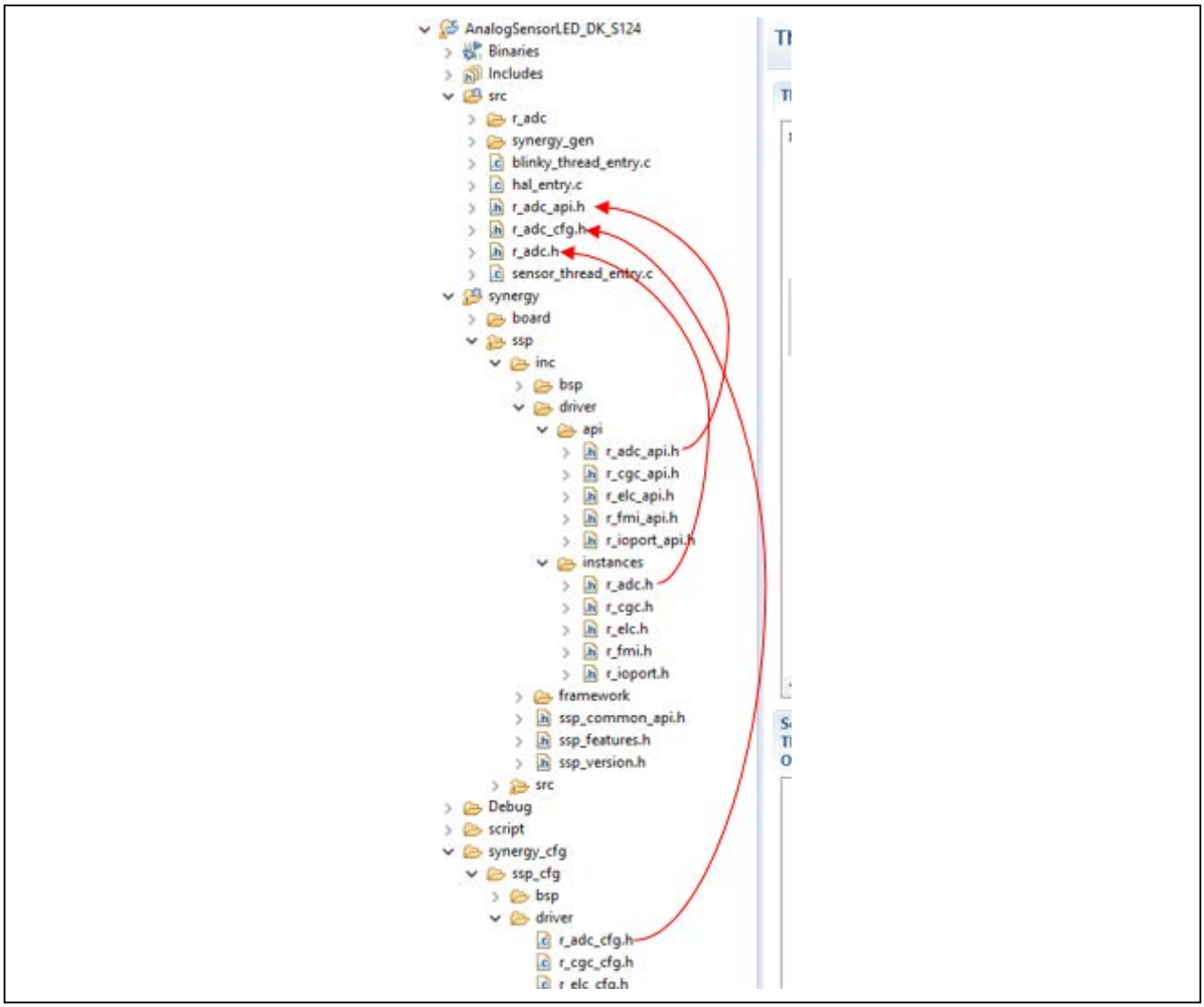
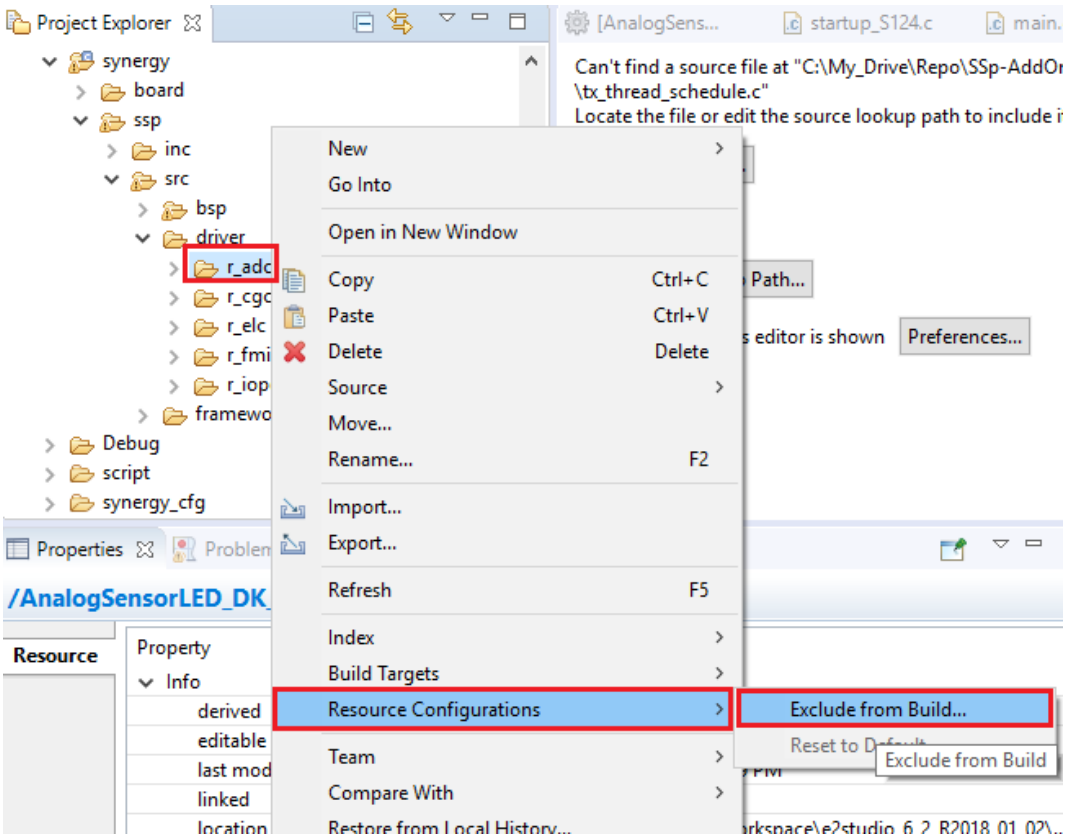


Figure 4. Making a copy of the SSP Module

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 then click **debug** as the following screenshots show.

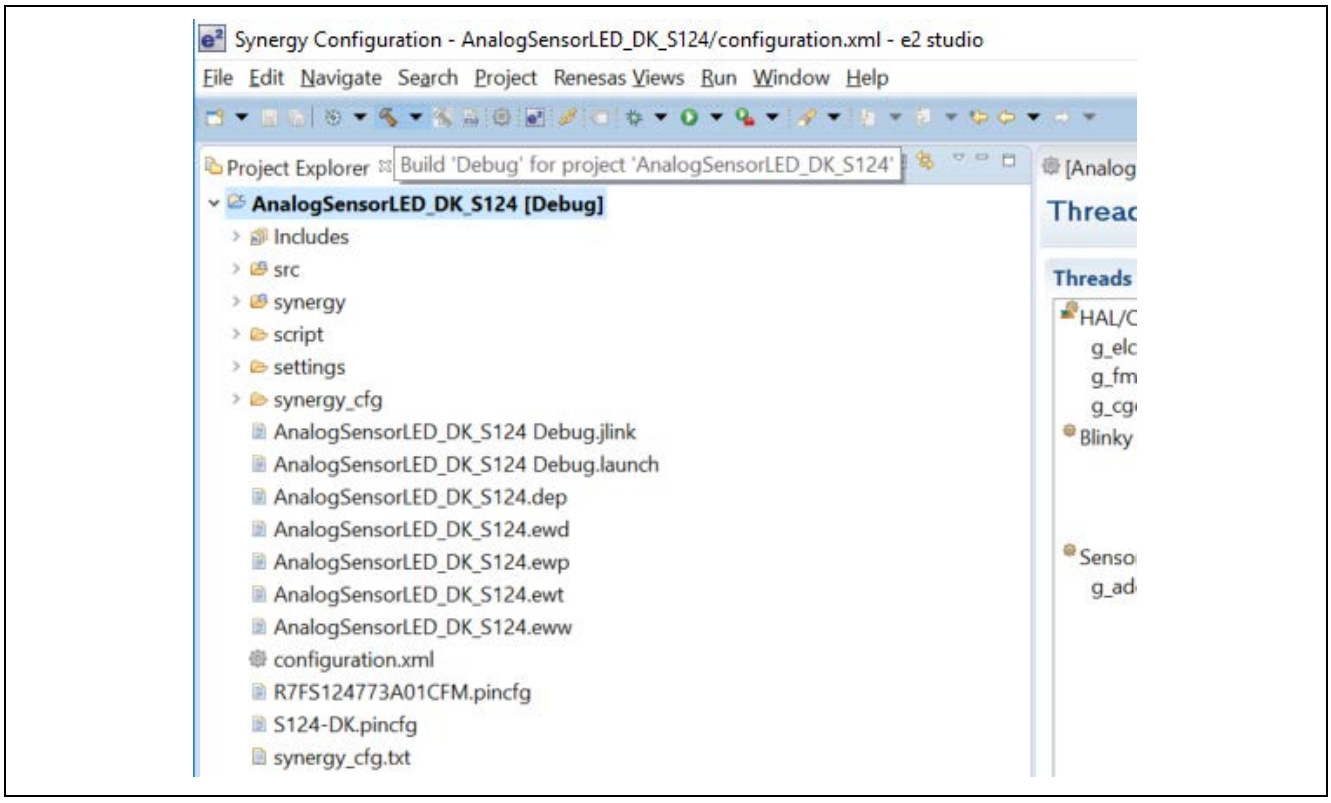


Figure 6. Project Explorer view and Build Project

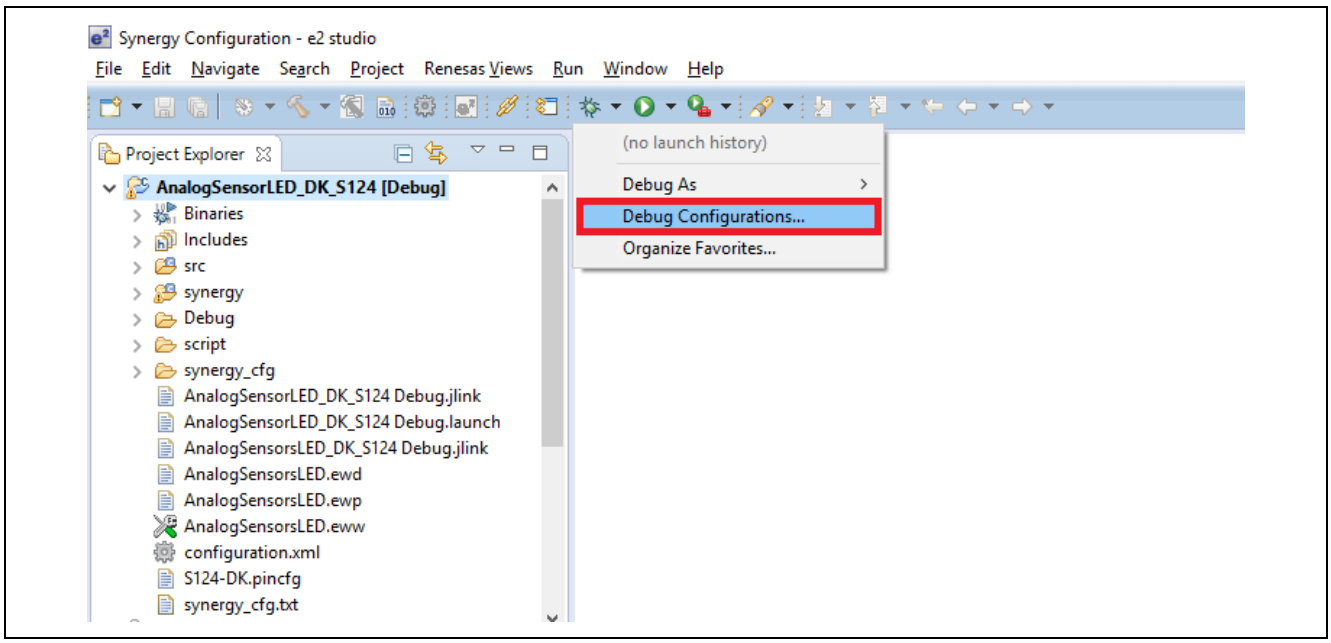


Figure 7. Debug Configurations

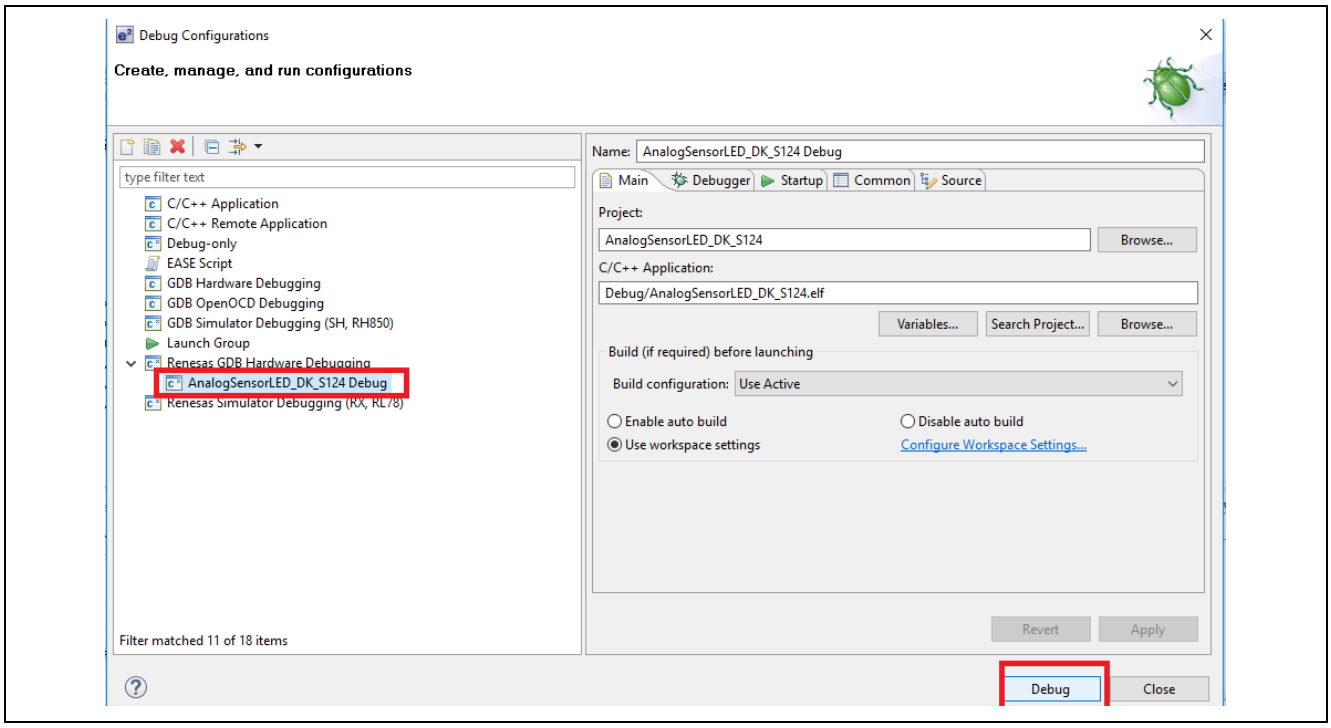


Figure 8. Select file and click the Debug button

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

To stop this project, click the **Stop**  icon.

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 following screen once the import is successful.

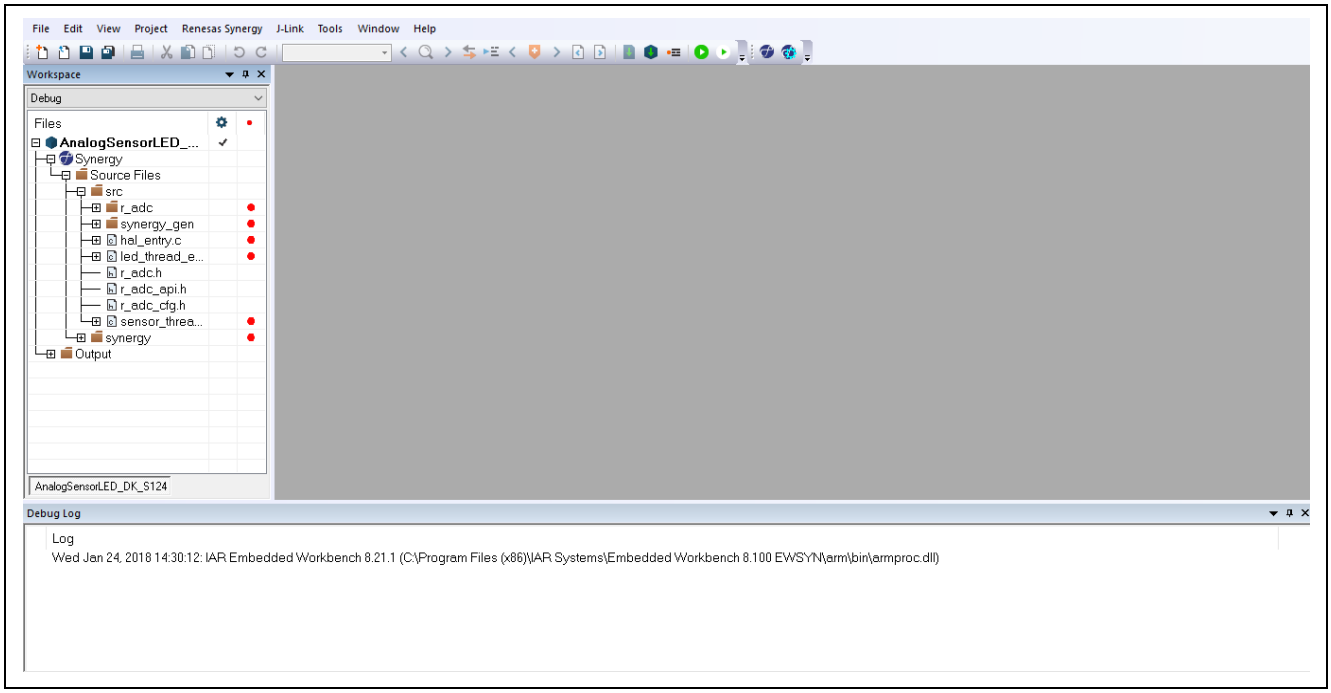


Figure 9. Successful import screen

5.1 Generating Project Content

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

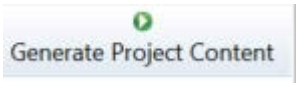


Figure 10. Generate Project Content button

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**, as shown in the following figure.

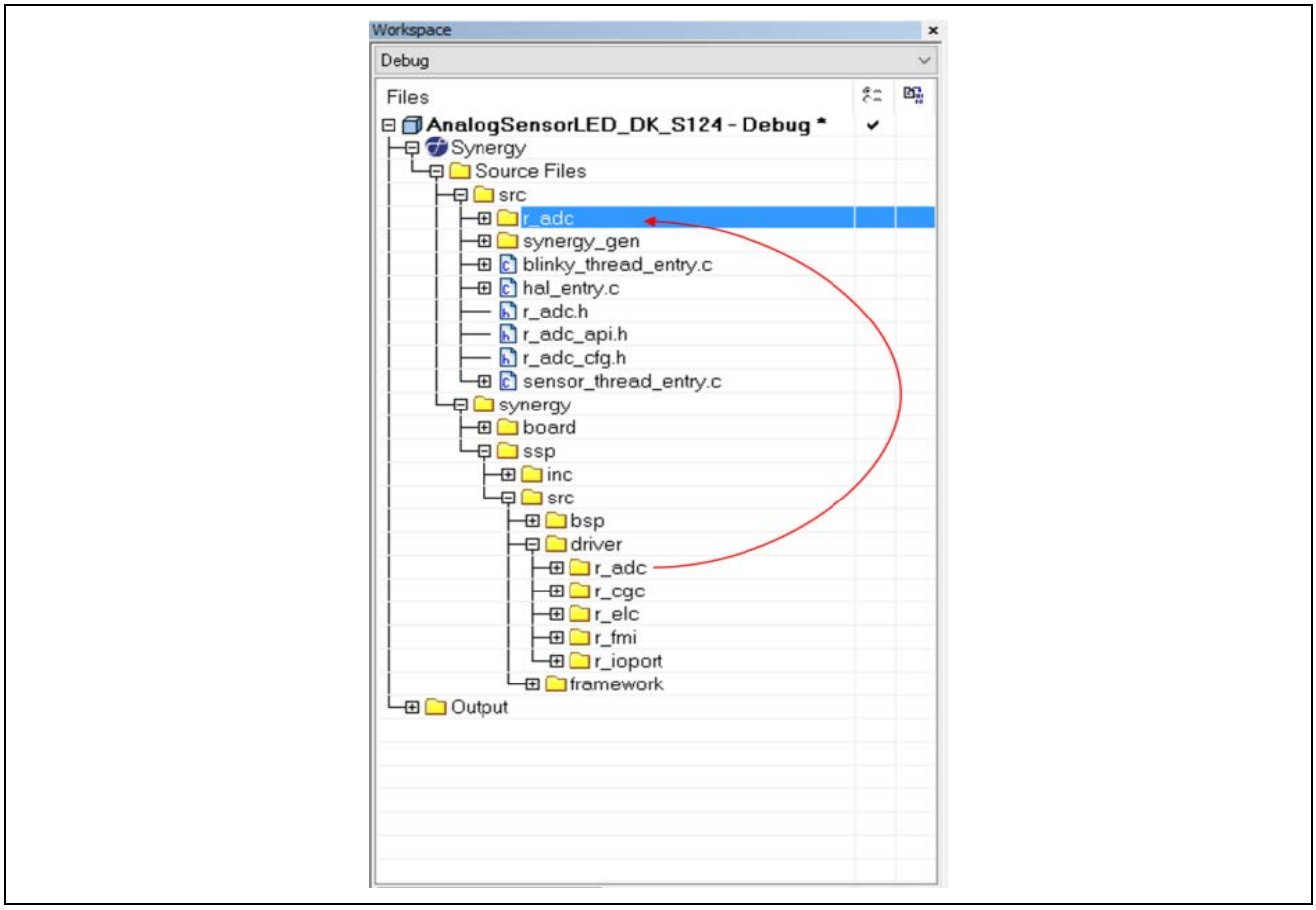


Figure 11. Copy the driver r_adc file

5.3 Copying Required Files

Using the **File Explorer**, locate where the original application program folder and copy all the Module-related files in the directories `synergy_cfg/ssp_cfg/driver`, `synergy/ssp/inc/driver/api`**,** and `synergy/ssp/inc/driver/instances`, 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

Note: In case of IAR IDE, after copying the files, close the project; while closing the project save it if given the option to do so. Open the project and you will see the copied files.

5.4 Exclude the Original SSP Module from the build

Since the 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.

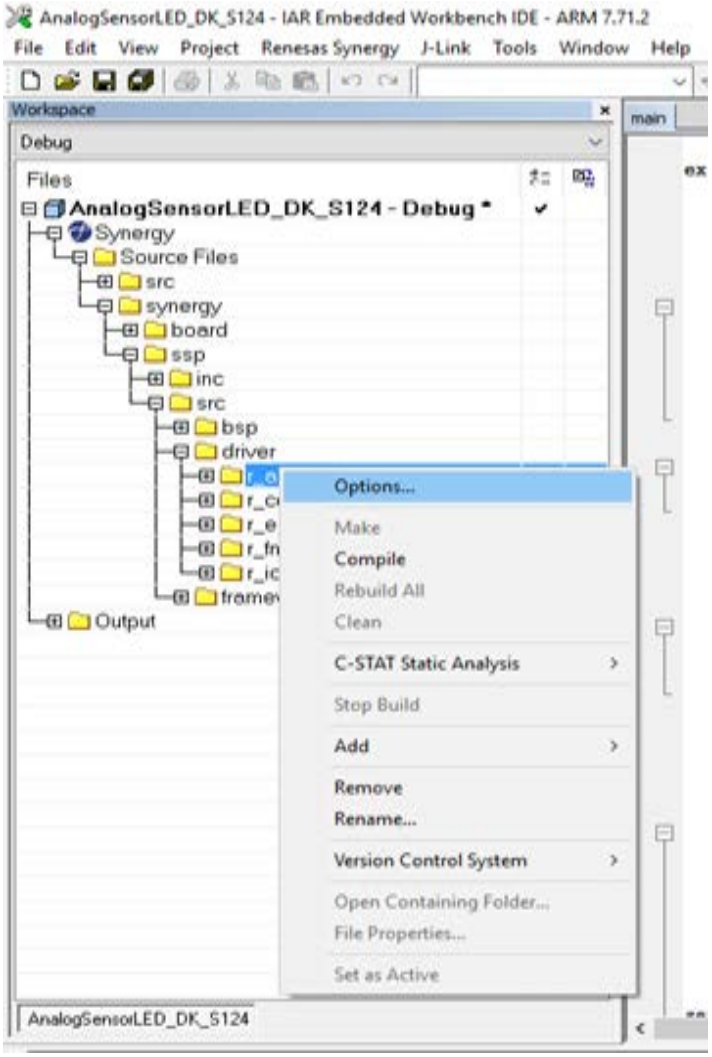


Figure 12. Options and Exclude from Build

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

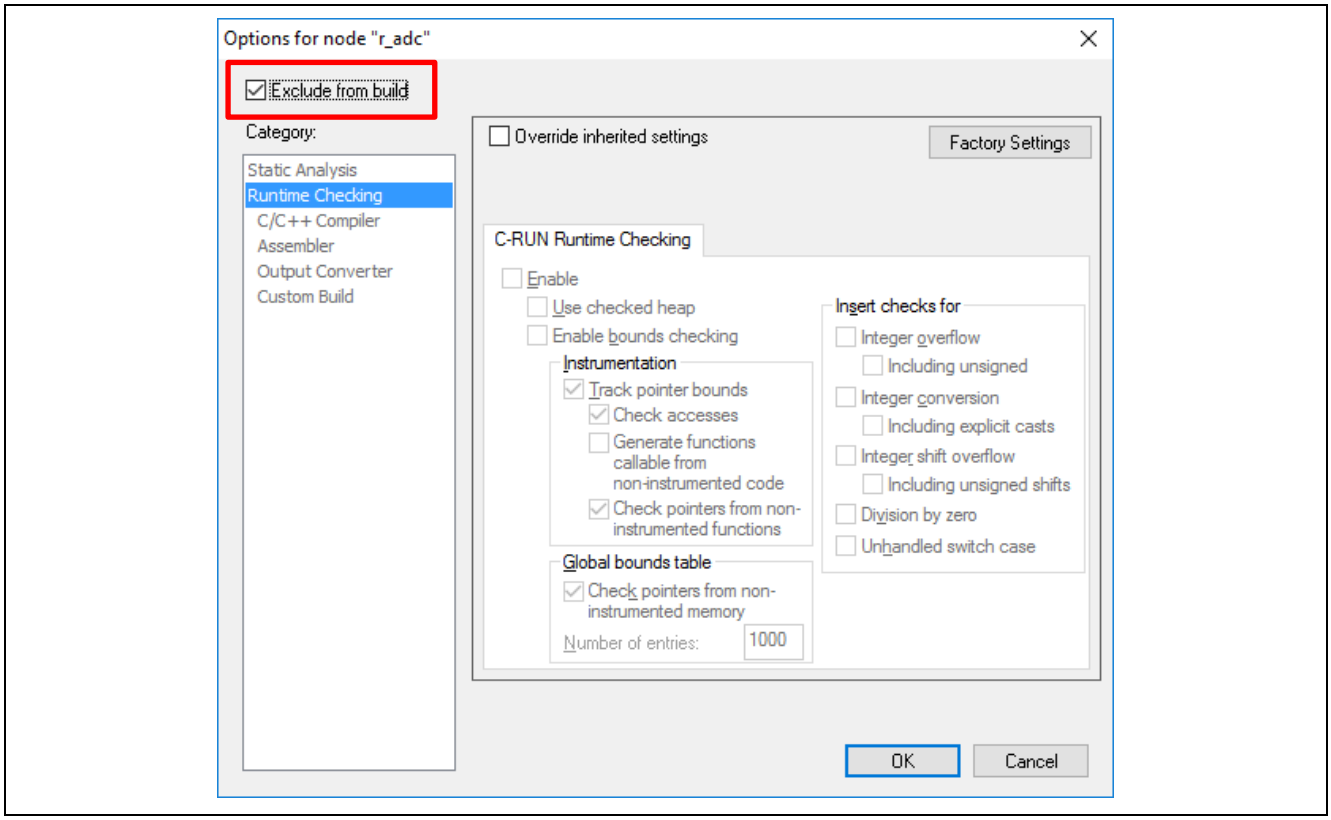


Figure 13. Check box Exclude from build

5.5 Building and Running the Project

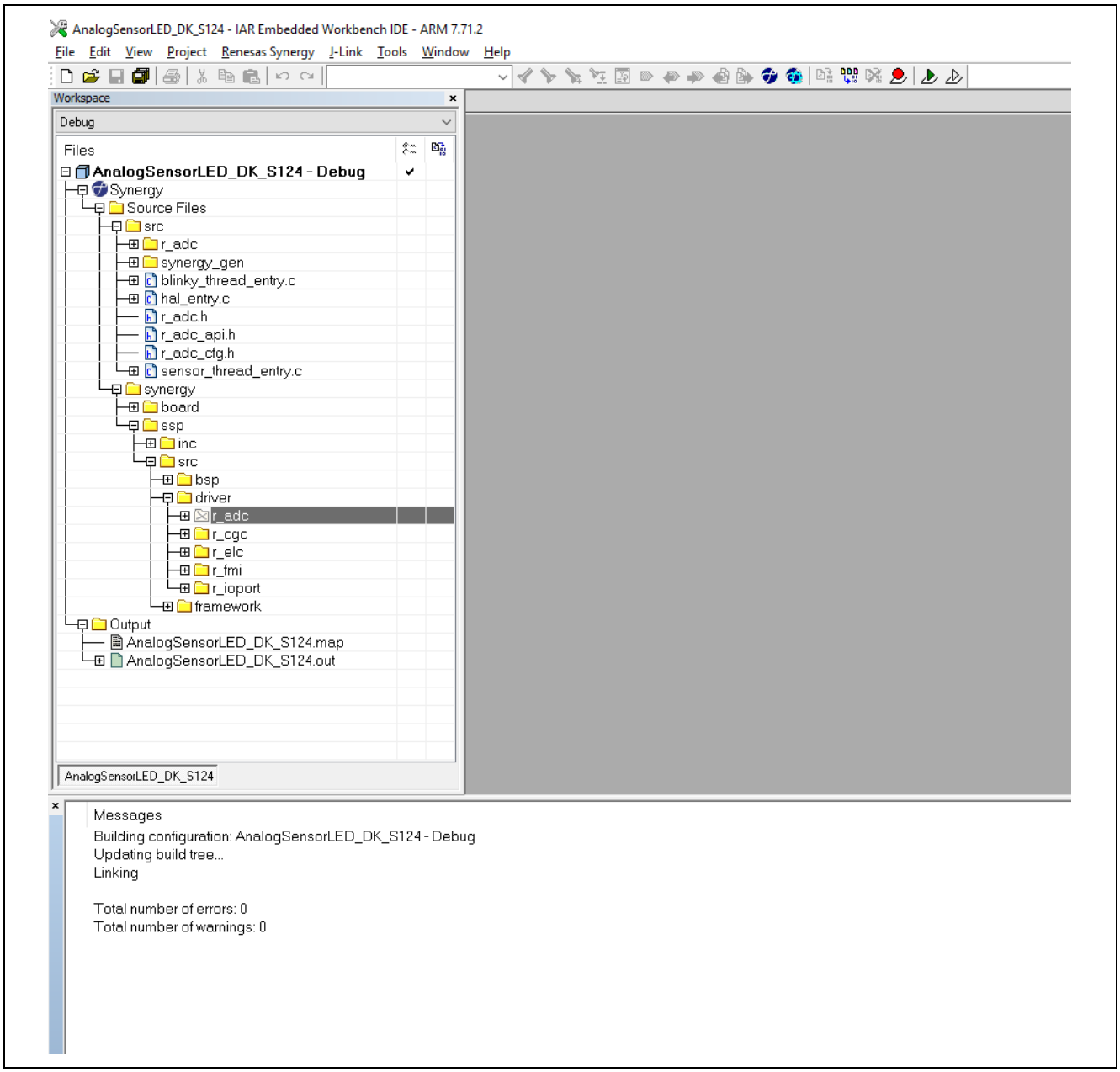


Figure 14. Messages after build

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, you can 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: www.renesas.com/synergy/ssp.

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.

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.

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Partner projects	www.renesas.com/synergy/partnerprojects
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Self-service support resources:	
Documentation	www.renesas.com/synergy/docs
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

Rev.	Date	Description	
		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
1.14	Oct.11.19	—	Updated for SSP 1.7.0

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