User's Manual

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RSSK-RA0L1

Renesas Solution Starter Kit
Capacitive Touch Evaluation System
Quick Start Guide

Renesas RA Family
RA0 Series

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Precautions

This Evaluation Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area, or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. There is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

• Ensure attached cables do not lie across the equipment.

• Reorient the receiving antenna.

• Increase the distance between the equipment and the receiver.

• Connect the equipment into an outlet on a circuit different from that which the receiver is connected.

• Power down the equipment when not in use.

• Consult the dealer or an experienced radio/TV technician for help.

Note: It is recommended that wherever possible shielded interface cables are used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken:

• The user is advised that mobile phones should not be used within 10 m of the product when in use.

• The user is advised to take ESD precautions when handling the equipment.

The Evaluation Kit does not represent an ideal reference design for an end product and does not fulfill the regulatory standards for an end product.

Renesas RA Family

RSSK-RA0L1 Capacitive Touch Evaluation System Quick Start Guide

Contents

Figures

1. Introduction

This Quick Start Guide (QSG) provides:

- An overview of the Quick Start example project that the RA0L1 Capacitive Touch Evaluation System comes pre-programmed with.
- Instructions for running the Quick Start example project.
- Instructions for importing, modifying, and building the Quick Start example project using Flexible Software Package (FSP) and e^2 studio Integrated Development Environment (IDE).

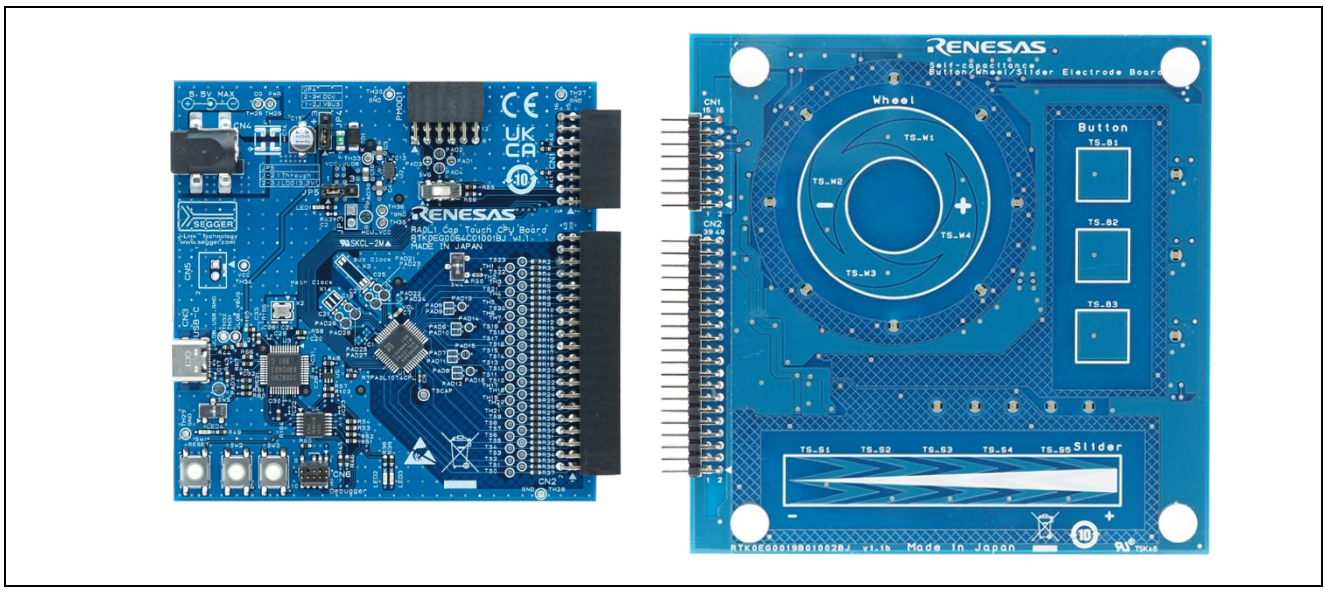
1.1 Assumptions and Advisory Notes

1. Tool experience: It is assumed that the user has prior experience working with IDEs such as e^2 studio.
2. Subject knowledge: It is assumed that the user has basic knowledge about microcontrollers, embedded systems, FSP, and QE for Capacitive Touch to modify the example project described in this document.
3. The screen shots provided throughout this document are for reference. The actual screen content may differ depending on the version of software and development tools used.

2. Contents

The following components are included in the kit:

1. RA0L1 Cap Touch CPU board (RTK0EG0064C01001BJ)
2. Capacitive Touch Evaluation Application Board
   Self-Capacitance Buttons / Wheels / Slider Board (RTK0EG0019B01002BJ)



3. Overview of the Quick Start Example Project

The Quick Start example project detects touch positions from the touch electrodes on the Capacitive Touch Evaluation Application Board which is connected to the Touch CPU board, and lights up the LEDs for the corresponding electrode positions.

3.1 Quick Start Example Project Flow

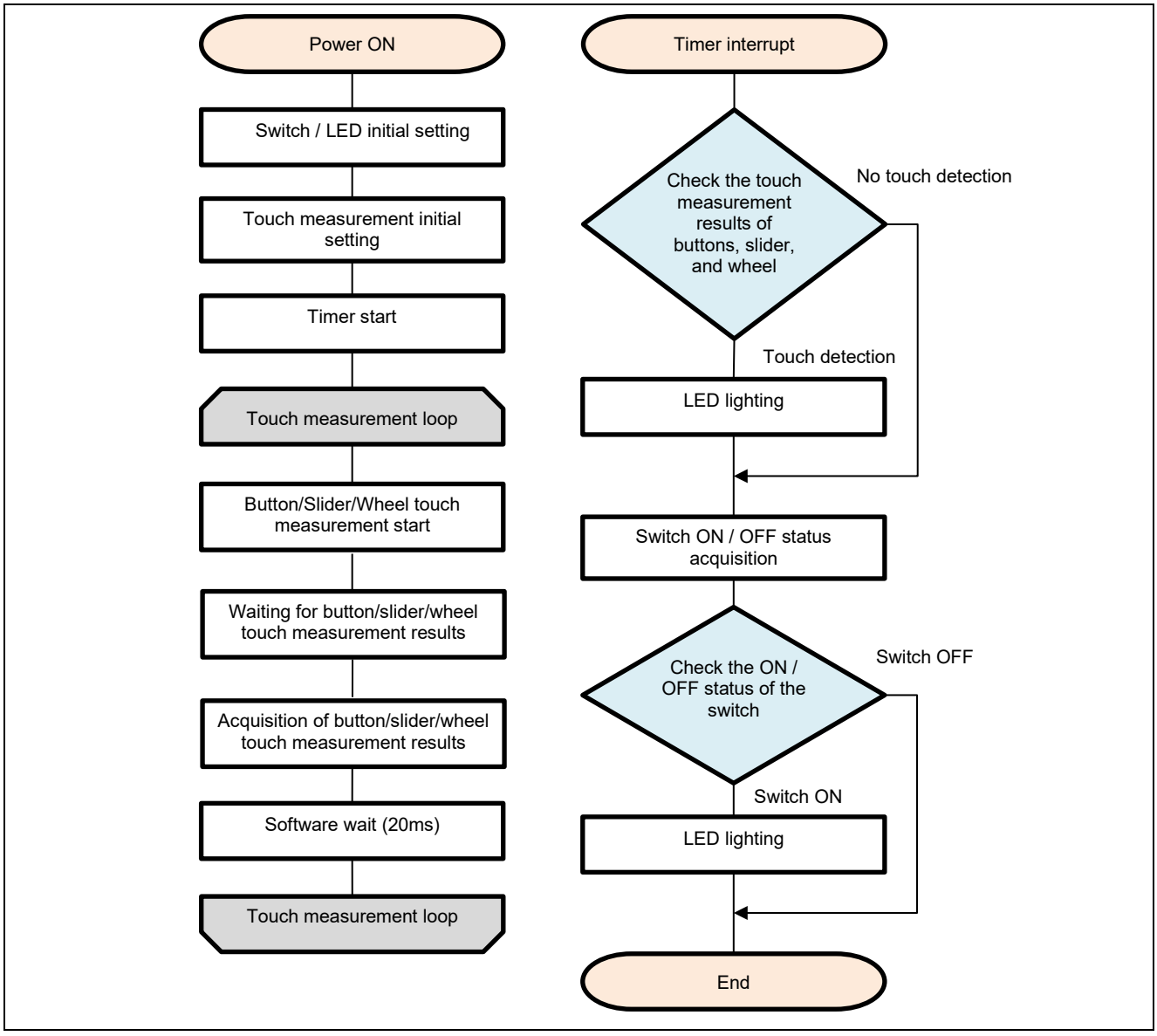


Figure 1. Quick Start Example Project Flow

4. Running the Quick Start Example Project

This section lists the requirements and instructions to power up the RA0L1 CPU board and run the Quick Start example project.

Hardware Requirements:

- RA0L1 Touch CPU board
- Capacitive Touch Evaluation Application Board
  - Self-Capacitance Buttons / Wheel / Slider Board
- One USB Type-A to Type-C or USB Type-C to Type-C cable (Note 1)
- PC with at least one USB port

Note 1: The USB Type-A to Type-C or USB Type-C to Type-C cable is not included in the RSSK-RA0L1, but is required for power supply from the USB port as well as communications between the CPU board and the PC.

Software Requirements:

- Microsoft® Windows® 10 operating system
- e^2 studio IDE
- FSP
- SEGGER J-Link® USB drivers
- Quick Start example project

The FSP, J-Link USB drivers, and e2 studio are bundled in a downloadable platform installer available on the FSP webpage at renesas.com/ra/fsp. New users are recommended to use the Quick Install option provided in the installation wizard, to minimize the amount of manual configuration needed.

4.1 Connecting and Powering Up the Board

1. Connect the CN1 and CN2 headers on the application board to the corresponding CN1 and CN2 connectors on the CPU board. Make sure both headers are inserted to match the direction and number of pins and the pins are fully inserted into the sockets.

2. Insert the MicroB plug end of the USB cable into the CN2 pin on the CPU board, and connect the opposite end of the cable to the USB port on your PC or to a 5V power supply. When the PC is connected, LED1 on the board will light up in red, indicating that the board is powered on.

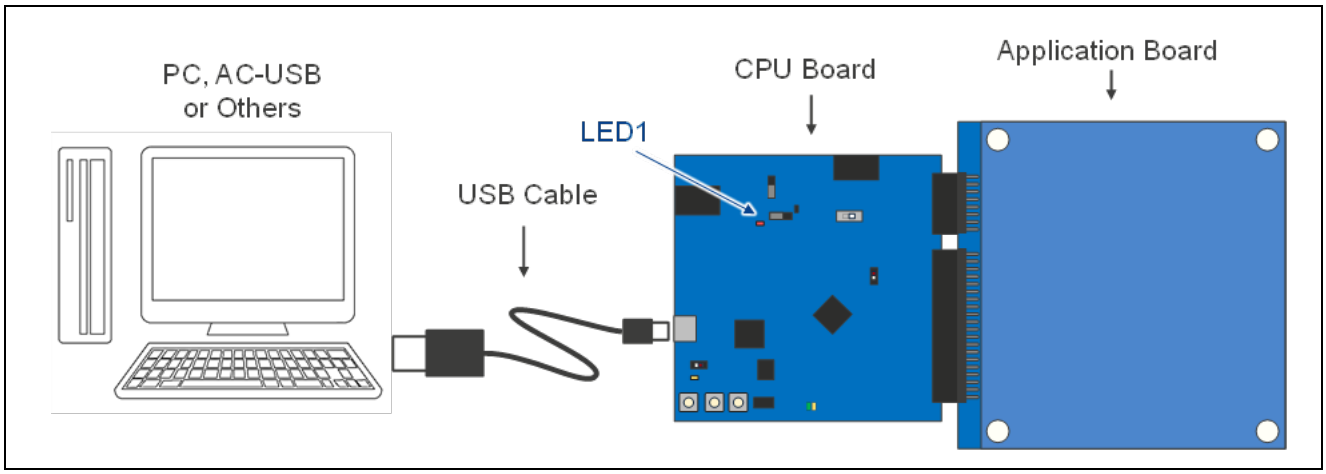


Figure 2. Connecting and Powering Up the Board

Note: When connecting the USB cable to the PC, the USB serial port driver is automatically installed the first time it is connected. Do not remove the USB cable during driver installation. To verify that the USB serial port driver has been successfully installed, open the Windows Device Manager on the host PC. Open the **ports (COM and LPT)** and make sure that the **JLink CDC UART Port (COMxx)** is listed.

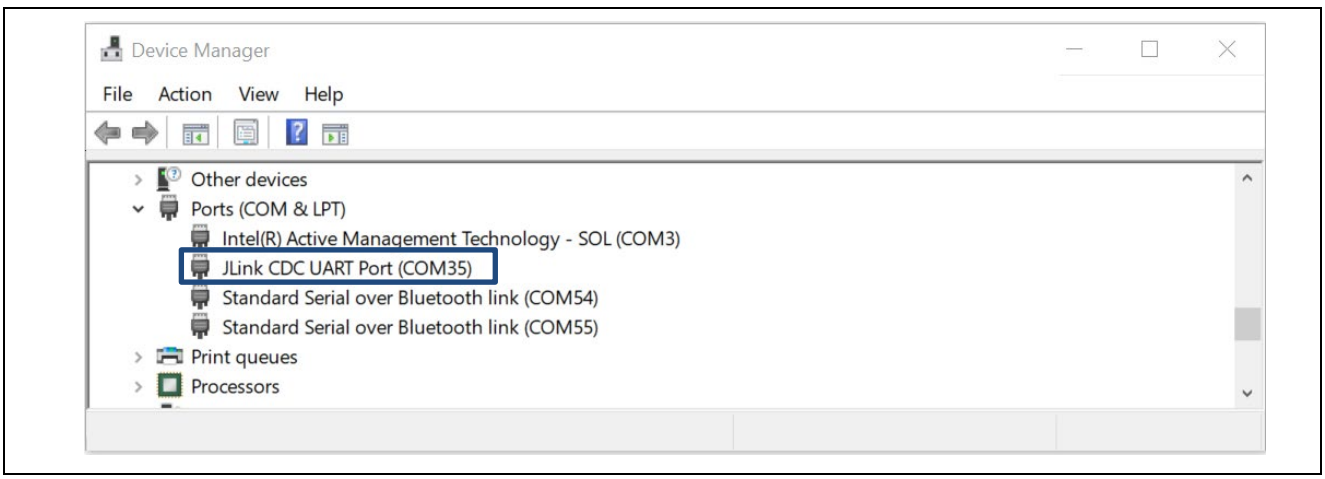


Figure 3. USB Serial Device in Windows Device Manager

4.2 Running the Quick Start Example Project

To run the Quick Start Example Project, use the following instructions:

1. On power up or RESET, After power-up or reset, the CPU board and application board LEDs light up in a pattern. After all the LEDs are turned off, the initial tuning of the touch sensor is executed, and touch detection becomes possible.
2. Touching an electrode will illuminate the associated LED to indicate the touch position.

If the LEDs don't illuminate in response to touch panel operations, make sure the switch and jumpers on the CPU board are set as shown in the following figure. After confirming the correct settings, press the reset button (SW1) to restart operations and check the LEDs again.

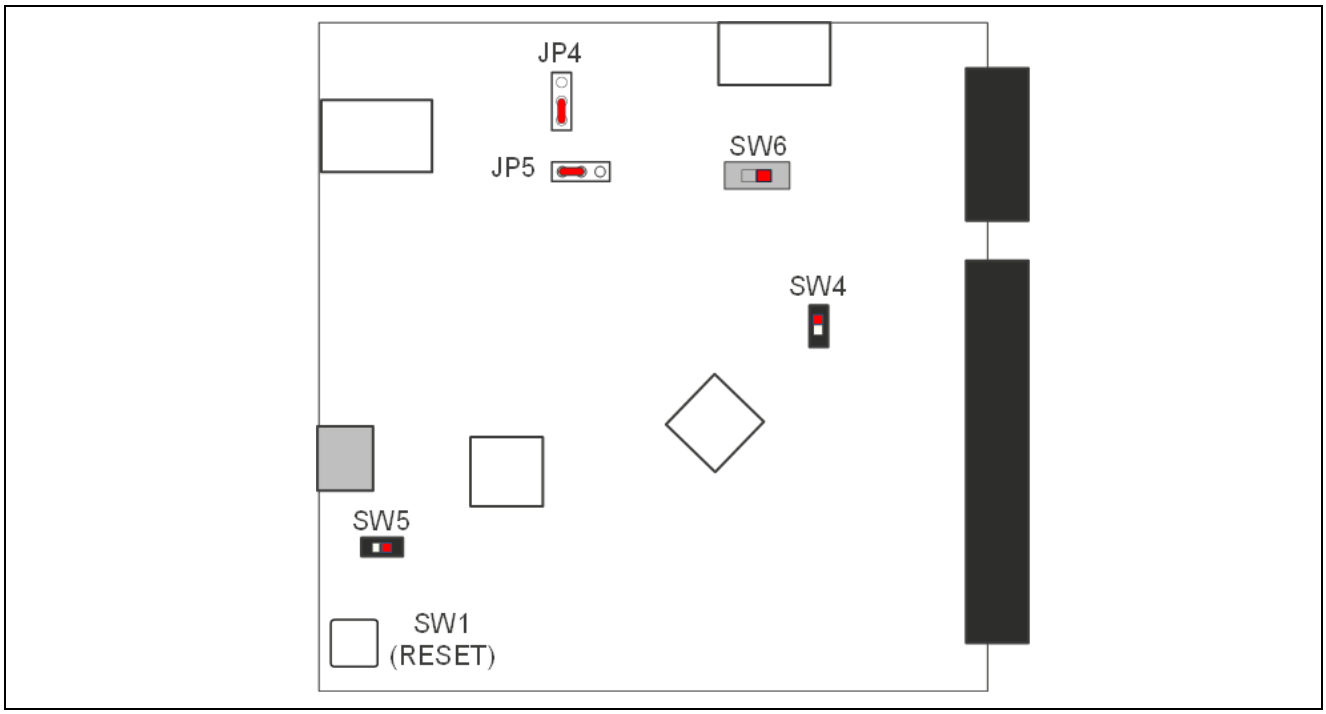


Figure 4. Board default settings

5. Customizing the Quick Start Example Project

This section provides instructions on customizing the Quick Start example project.

5.1 Downloading and Installing Software Development Tools

Before the Quick Start example project can be modified, it is necessary to download and install software and development tools on the host PC.

The QE for Capacitive Touch [RA] tool is a capacitive touch sensor development assistance tool necessary for modifying capacitive touch sensor functions. Please download the tool from the following URL and install to the e² studio.

https://www.renesas.com/qe-capacitive-touch

5.2 Downloading and Importing the Quick Start Example Project

1. Download the Quick Start example project from https://www.renesas.com/rssk-touch-ra0l1.
2. Launch e² studio.
3. Browse to the Workspace where the project file is to be imported. Enter the name in the Workspace dialog box to create a new workspace.

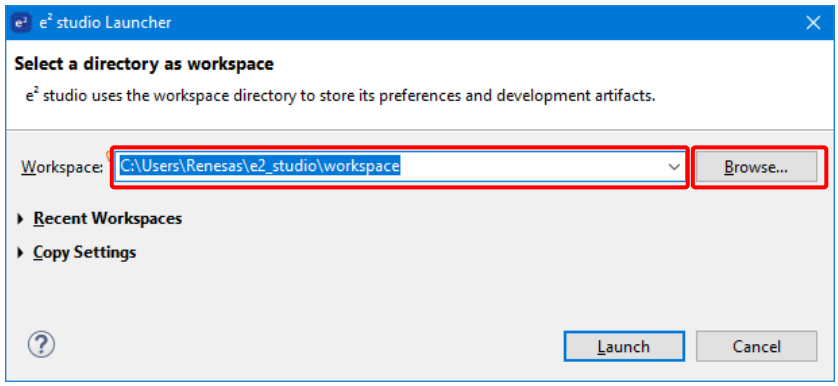


Figure 5. Creating a New Workspace

4. Click **Launch**.

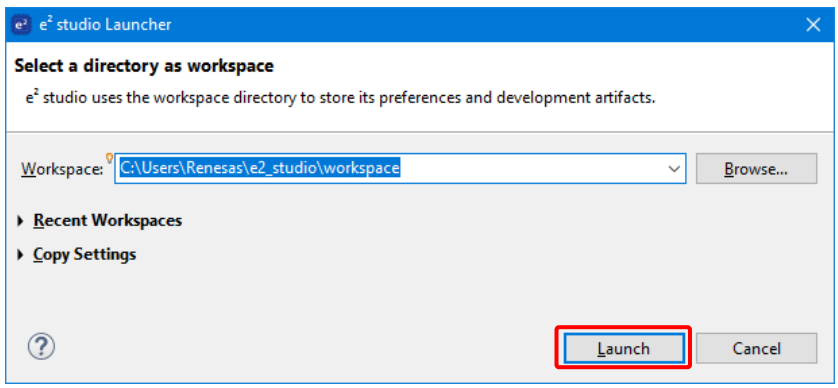


Figure 6. Launching the Workspace

5. Click **Import** from the **File** drop-down menu.

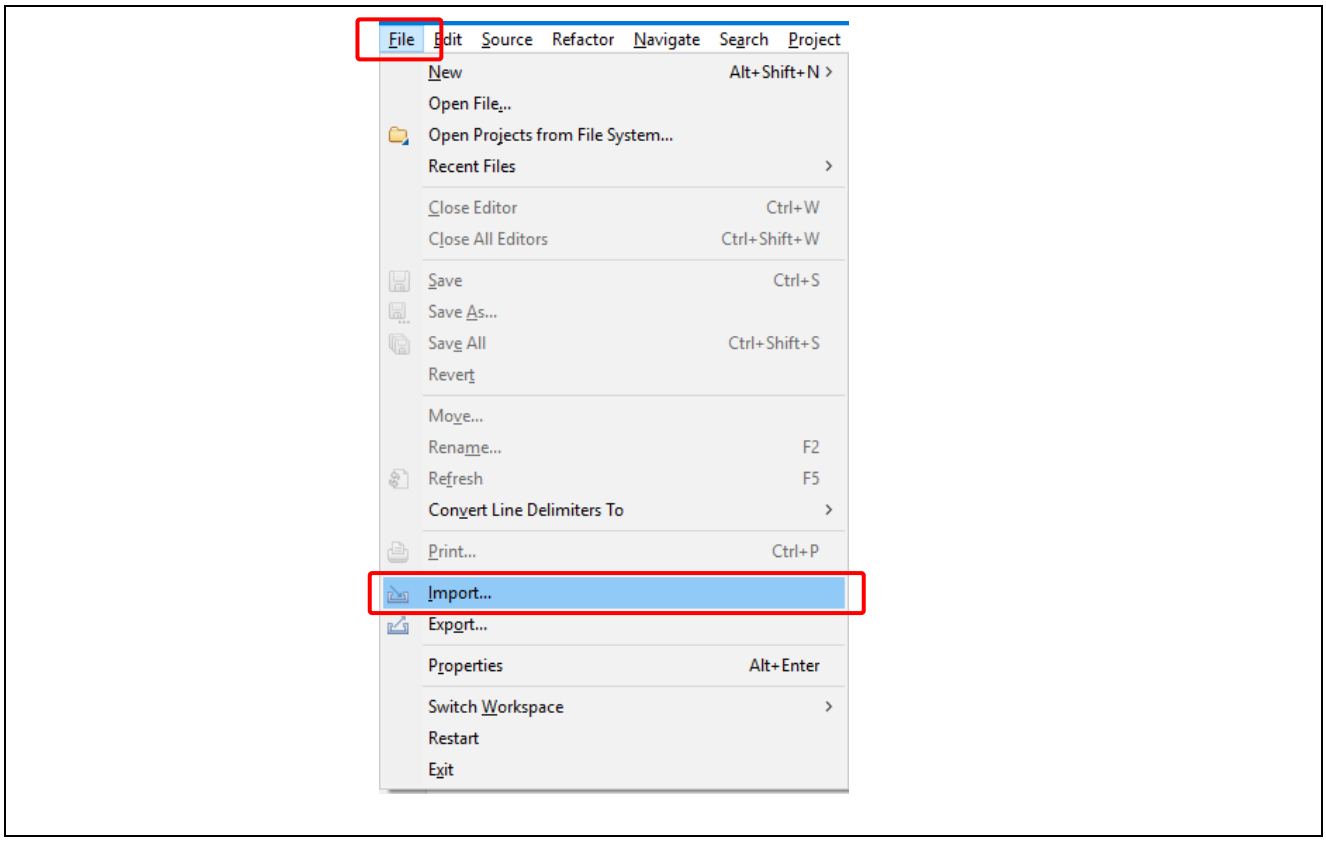


Figure 7. Importing the Project

6. In the **Import** dialog box, select **General**, and then select **Existing Projects** into **Workspace**.

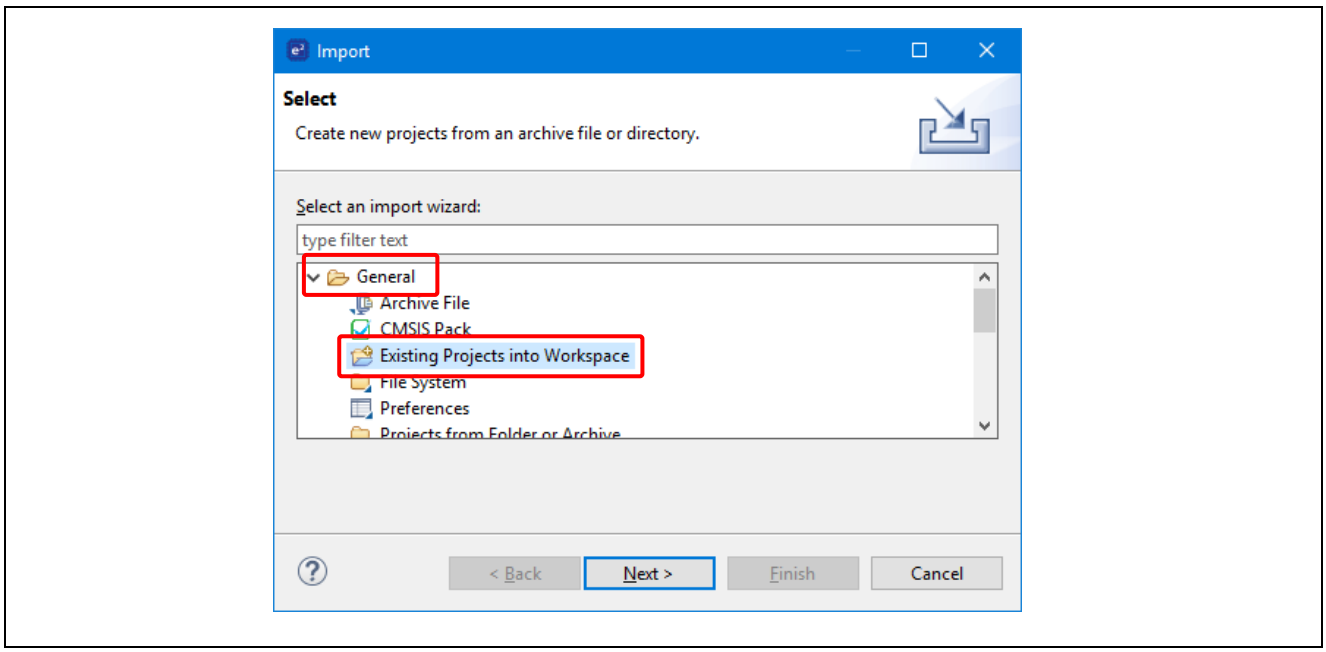


Figure 8. Importing Existing Projects into the Workspace

7. Click **Next**.

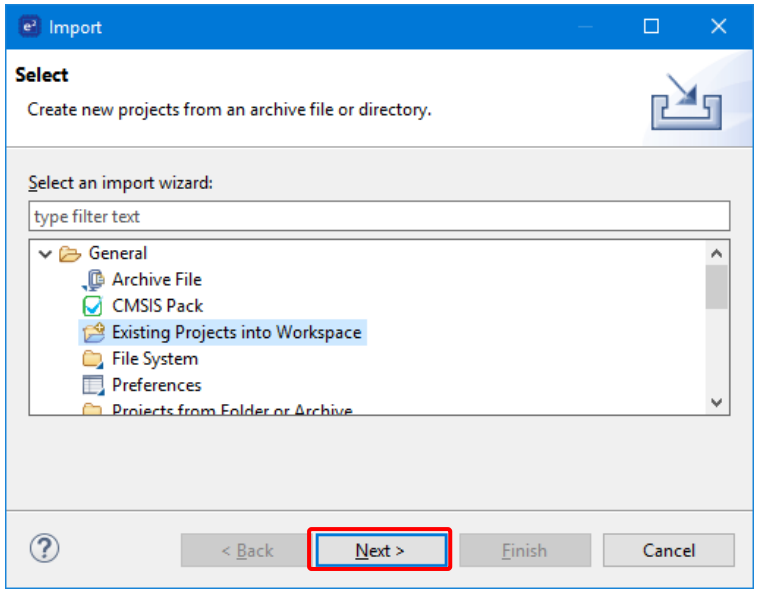


Figure 9. Clicking Next to Import Existing Projects into the Workspace

8. Click **Select root directory** and click **Browse** to go to the location of the Quick Start example project folder.

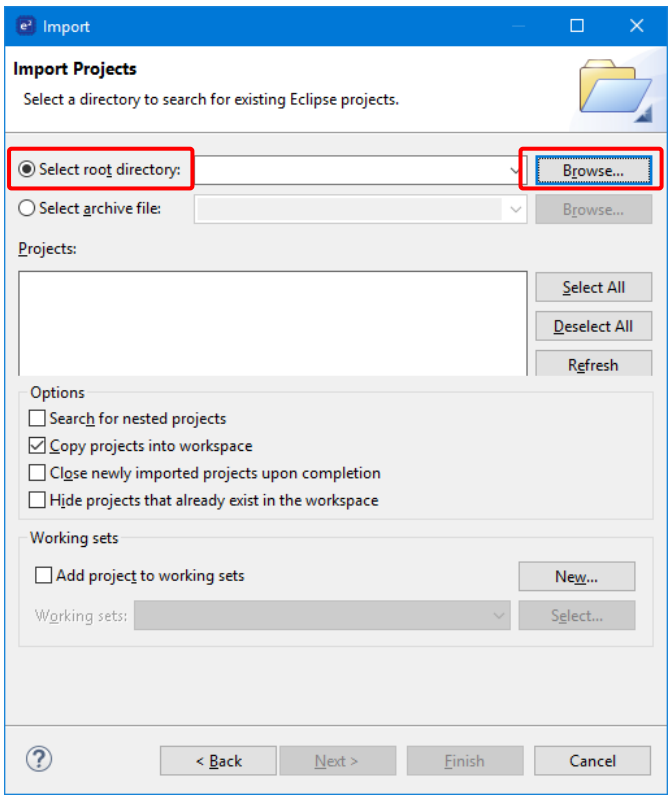


Figure 10. Selecting the Root Directory

9. Select the Quick Start example project and click **Finish**.

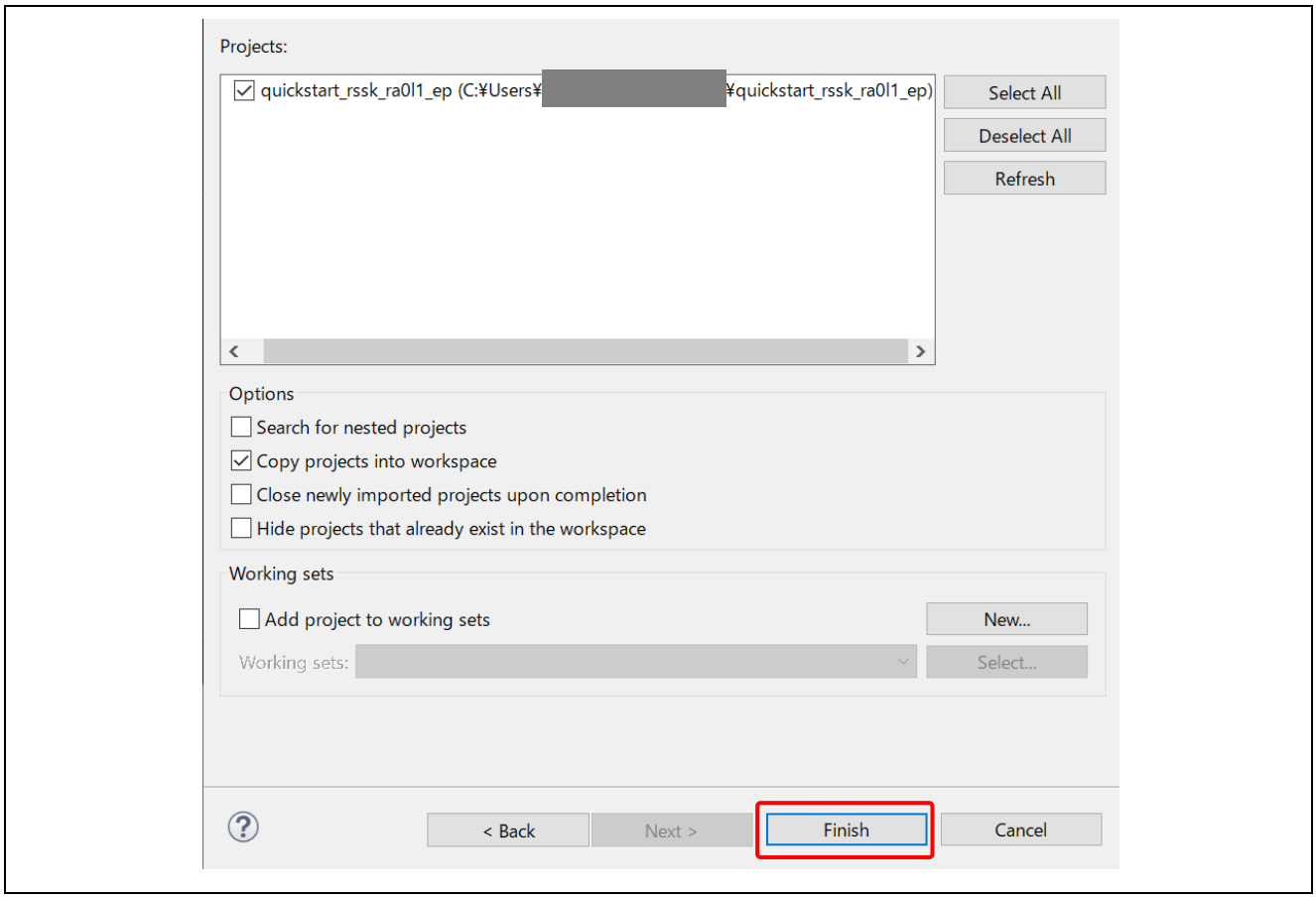


Figure 11. Finishing Importing the Quick Start Example Project

5.3 Modifying, Generating, and Building the Quick Start Example Project

This section provides instructions to modify the Quick Start example project. The Quick Start example project can be modified by editing the source code and reconfiguring the properties of the MCU peripherals, pins, clocks, interrupts, and so forth.

Note: The specific modifications that can be performed to the Quick Start example project are not prescribed in this QSG. User discretion is advised while modifying the Quick Start example project.

1. Once the Quick Start example project is imported, click the **configuration.xml** file to open the configurator. The configurator provides an easy to use interface to configure the properties of MCU peripherals, pins, clocks, and so forth.

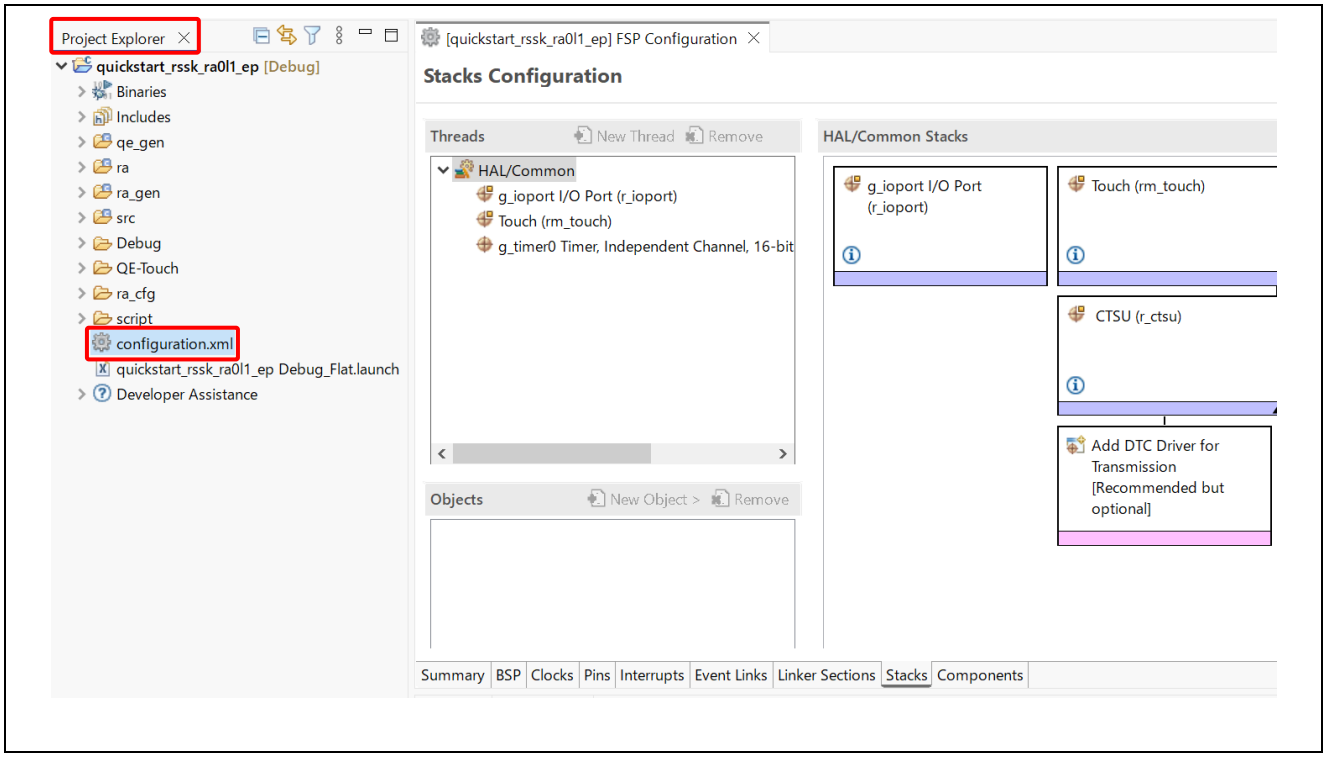


Figure 12. Opening the Configurator

2. For example, in the **Stacks** tab of the configurator, the user can click to select modules to modify the configuration settings, as required. The following screen shot illustrates modifying the timer driver configuration.

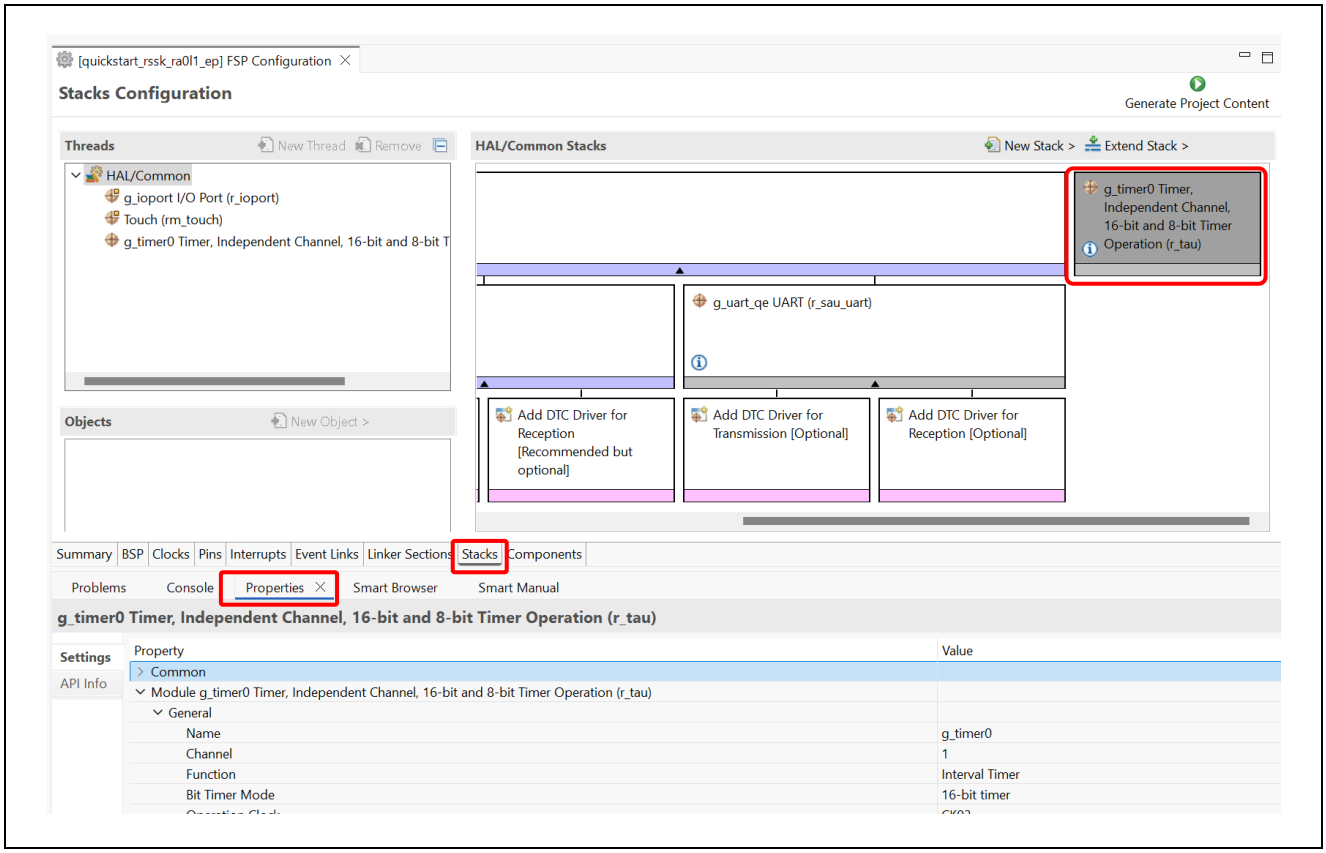


Figure 13. Modifying the Configuration Settings

3. After the desired modifications are made, click **Generate Project**. A dialog box may appear with an option of saving the configuration changes. Click **Proceed**.

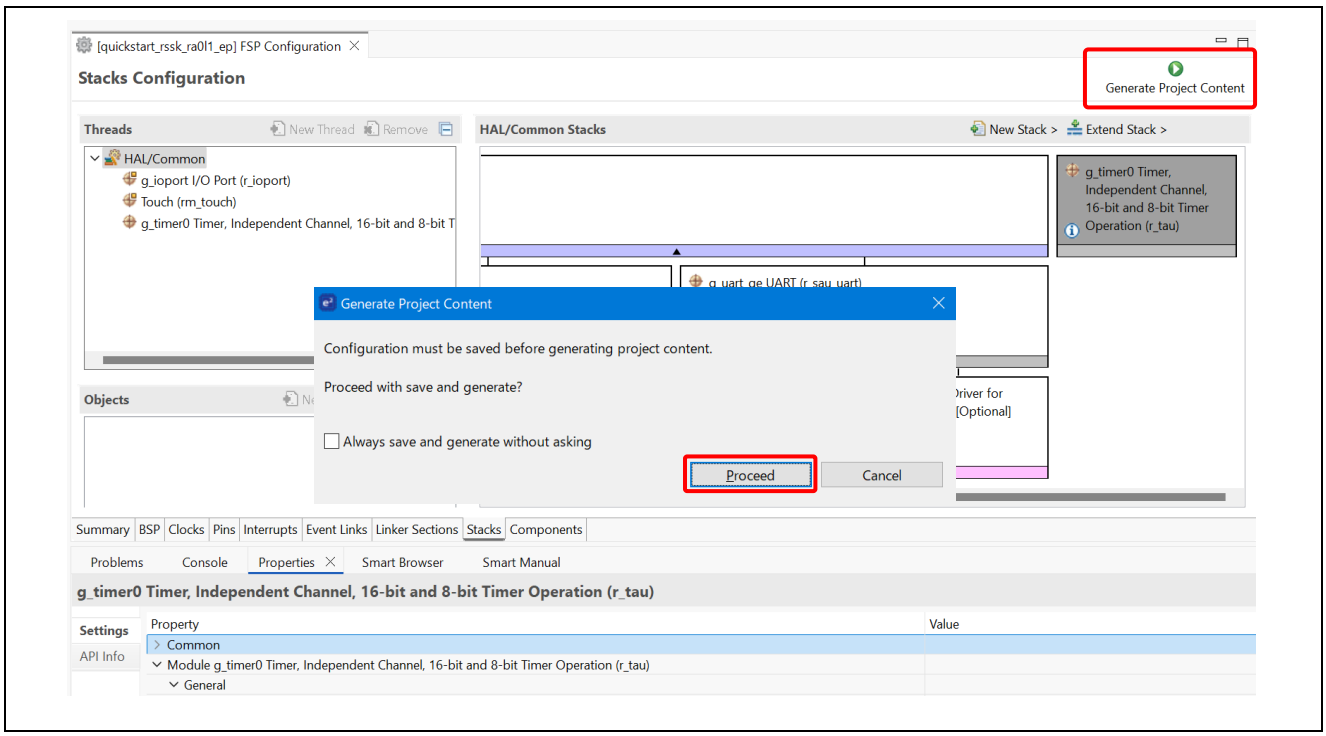


Figure 14. Saving the Configuration Changes

4. Modify the source files in the **/src** folder as needed and save the changes.
5. Build the project by clicking the build icon.

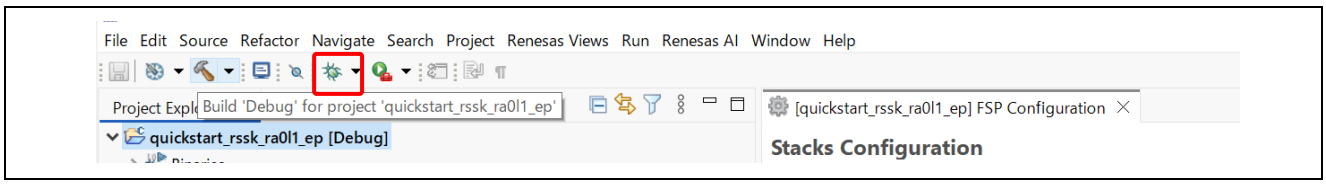


Figure 15. Building the Project

6. A successful build produces an output as follows.

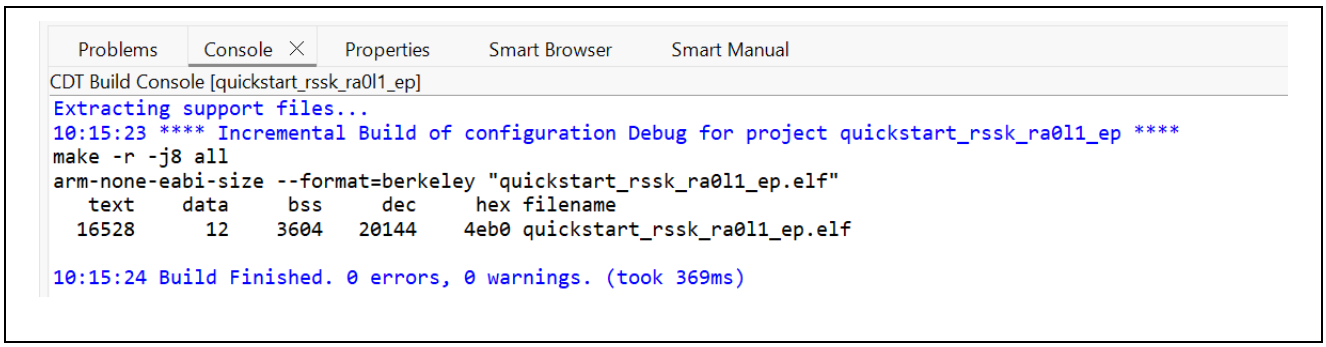


Figure 16. Successful Build Output

5.4 Setting Up Debug Connection between the RA0L1 Cap Touch CPU Board and Host PC

To program the modified Quick Start example project on to the RA0L1 Cap Touch CPU board, a debug connection is necessary between the RA0L1 Cap Touch CPU board and host PC.

1. Connect the USB cable to the USB Type-C connector (CN3) on the RA0L1 Cap Touch CPU board.

Note: The RA0L1 Cap Touch CPU board supports 2 debugging modes. In this section and the following sections, default debugging interface, J-Link onboard (J-Link OB) is used.More information on debugging interface is available in RA0L1 Group Capacitive Touch Evaluation System user's manual.

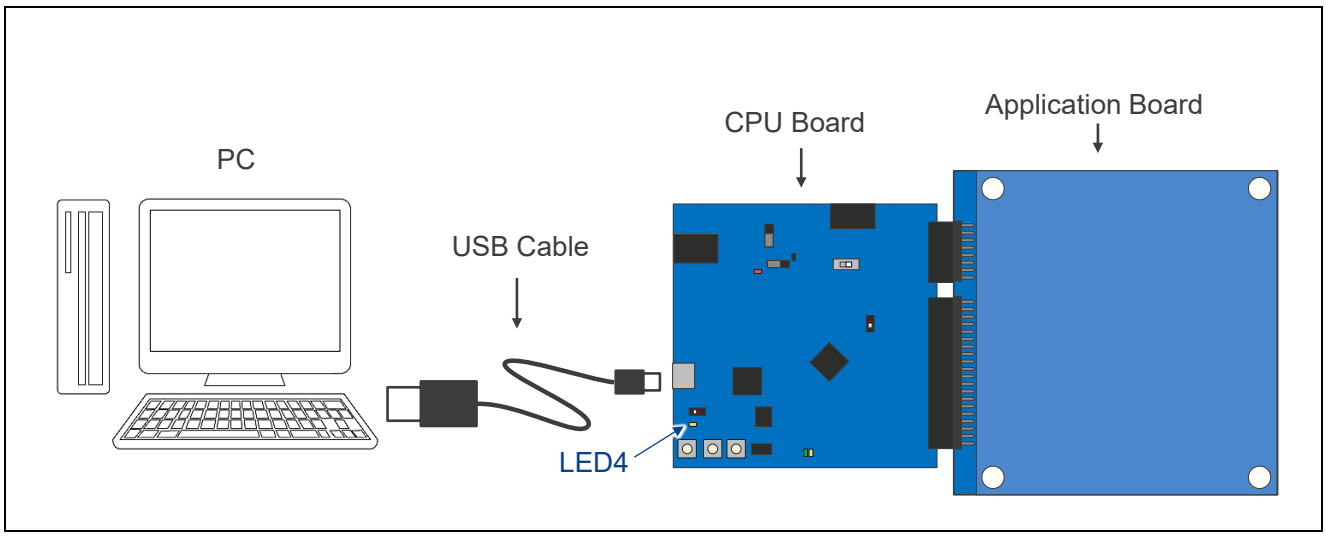


Figure 17. Connecting the RA0L1 Cap Touch CPU Board to a Host PC using J-Link OB

2. Verify that the debug LED (LED4) stops blinking and lights up orange indicating that the J-Link drivers are detected by the RA0L1 Cap Touch CPU board.

Note : The debug LED (LED4) continues to blink when J-Link drivers are not detected by the RA0L1 Cap Touch CPU board. In that case, make sure that the RA0L1 Cap Touch CPU board is connected to the host PC through the USB Type-C onboard debug interface(CN3) and that J-Link drivers are installed on the host PC by checking in the Windows Device Manager (expand **Universal Serial Bus controller**, and locate **J-Link driver**).

5.5 Downloading and Running the Modified Quick Start Example Project

In e^2 studio, click the drop-down menu for the debug icon, select Debug Configurations option.

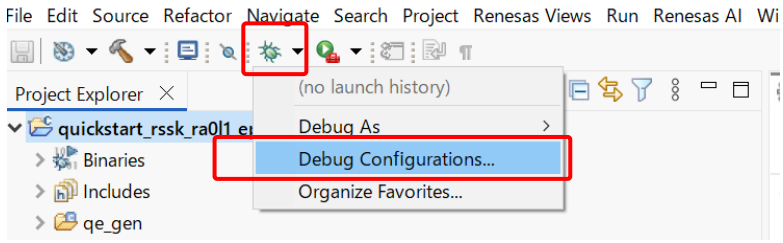


Figure 18. Selecting the Debug Configurations

When the Debug Configurations window opens, click the **Debugger** tab, and select **J-Link ARM** from the Debug hardware drop-down menu. If the Target Device has switched to something other than **R7FA0L107**, please reselect **R7FA0L107** . After completing the selections, click **Close**. When the Save Modifications dialog box opens, select **YES** to save the new configuration. After your configuration is completed, proceed to step 1.

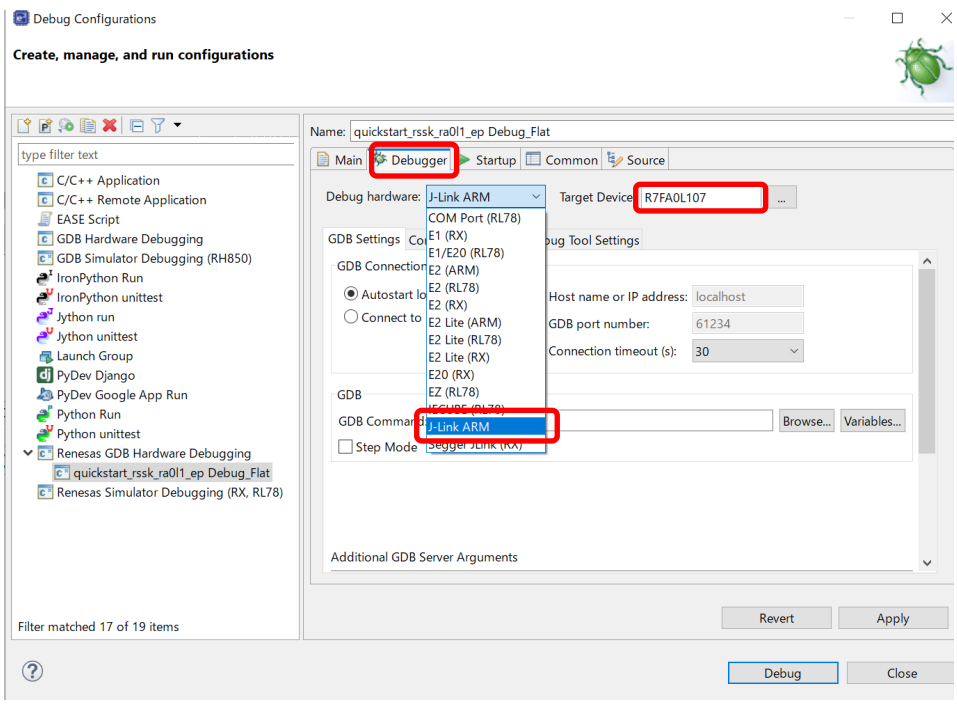


Figure 19. Selecting J-Link ARM Debugger

1. In e^2 studio, click the drop-down menu for debug icon, select **Debug As** option, and choose **Renesas GDB Hardware Debugging**.

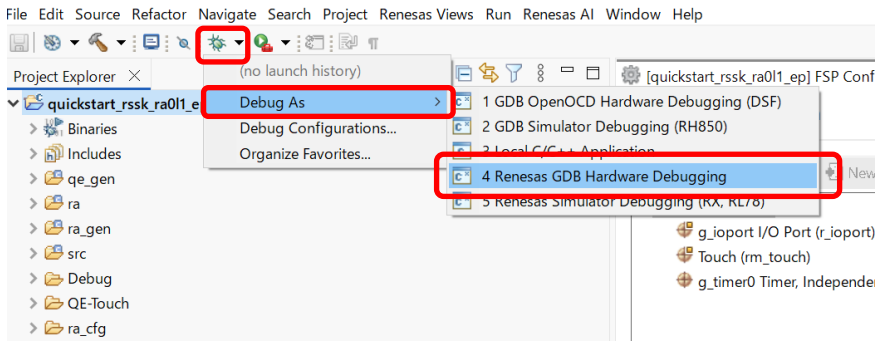


Figure 20. Selecting the Debug Option

2. A dialog box may appear. Click **Switch.**

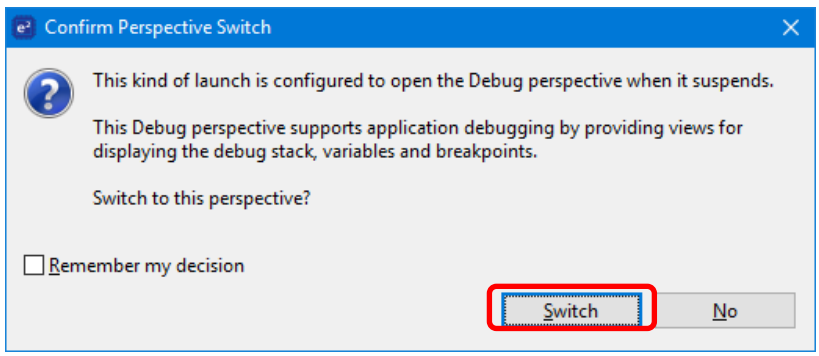


Figure 21. Opening the Debug Perspective

3. Press **F8** or **Resume** icon to begin executing the project.

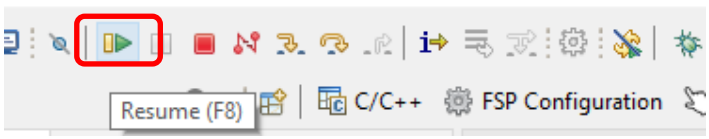


Figure 22. Executing the Project

4. The modified Quick Start example project is programmed into the kit and is running. The project can be paused, stopped, or resumed using the debug controls.

6. Next Steps

1. To learn more about this product, refer to the user's manual and design package available on the RA0L1 Group Capacitive Touch Evaluation System web page at renesas.com/rssk-touch-ra0l1.
2. To learn more about using QE for Capacitive Touch (RA) and FSP to create touch interface for capacitive touch sensors, tune touch sensors, implement touch middleware in an application, and monitoring touch performance, refer to the following application note.

   RA Family Using QE and FSP to Develop Capacitive Touch Applications (R01AN4934)
   https://www.renesas.com/us/en/document/apn/using-qe-and-fsp-develop-capacitive-touch-applications?r=1398061

3. For more information about quickstart sample project, refer to the following application note.

   RA0L1 Group Capacitive Touch Evaluation System Example Project (R20AN0812)
   https://www.renesas.com/document/scd/ra0l1-group-capacitive-touch-evaluation-system-example-project-sample-code

7. Website & Support

Visit the following URLs to learn about the kit and the RA family of microcontrollers, download tools and documentation, and get support.

RSSK-RA0L1 Resources	renesas.com/rssk-touch-ra0l1
RA Product Information	renesas.com/ra
RA Product Support Forum	renesas.com/ra/forum
Renesas Support	renesas.com/support
Renesas Capacitive Touch Key Portal	renesas.com/solutions/touch-key

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Sep.9.25	-	First release
1.01	Nov.4.25	13	Figure 13&14 changed
		14	Figure 16 changed
		15	MCU number fixed

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