Quick Start Guide

RA6M3 Group

Evaluation Kit for RA6M3 Microcontroller Group
EK-RA6M3
Quick Start Guide

Renesas RA Family
RA6 Series

All information contained in these materials, including products and product specifications, represents information on the product at the time of publication and is subject to change by Renesas Electronics Corp. without notice. Please review the latest information published by Renesas Electronics Corp. through various means, including the Renesas Electronics Corp. website (http://www.renesas.com).

Renesas Electronics
www.renesas.com

Rev.1.02 Jun 2020

Notice

1. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation or any other use of the circuits, software, and information in the design of your product or system. Renesas Electronics disclaims any and all liability for any losses and damages incurred by you or third parties arising from the use of these circuits, software, or information.
2. Renesas Electronics hereby expressly disclaims any warranties against and liability for infringement or any other claims involving patents, copyrights, or other intellectual property rights of third parties, by or arising from the use of Renesas Electronics products or technical information described in this document, including but not limited to, the product data, drawings, charts, programs, algorithms, and application examples.
3. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
4. You shall not alter, modify, copy, or reverse engineer any Renesas Electronics product, whether in whole or in part. Renesas Electronics disclaims any and all liability for any losses or damages incurred by you or third parties arising from such alteration, modification, copying or reverse engineering.
5. Renesas Electronics products are classified according to the following two quality grades: “Standard” and “High Quality”. The intended applications for each Renesas Electronics product depends on the product’s quality grade, as indicated below.
   "Standard": Computers; office equipment; communications equipment; test and measurement equipment; audio and visual equipment; home electronic appliances; machine tools; personal electronic equipment; industrial robots; etc.
   "High Quality": Transportation equipment (automobiles, trains, ships, etc.); traffic control (traffic lights); large-scale communication equipment; key financial terminal systems; safety control equipment; etc.

   Unless expressly designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not intended or authorized for use in products or systems that may pose a direct threat to human life or bodily injury (artificial life support devices or systems; surgical implantations; etc.), or may cause serious property damage (space system; undersea repeaters; nuclear power control systems; aircraft control systems; key plant systems; military equipment; etc.). Renesas Electronics disclaims any and all liability for any damages or losses incurred by you or any third parties arising from the use of any Renesas Electronics product that is inconsistent with any Renesas Electronics data sheet, user’s manual or other Renesas Electronics document.
6. When using Renesas Electronics products, refer to the latest product information (data sheets, user’s manuals, application notes, “General Notes for Handling and Using Semiconductor Devices” in the reliability handbook, etc.), and ensure that usage conditions are within the ranges specified by Renesas Electronics with respect to maximum ratings, operating power supply voltage range, heat dissipation characteristics, installation, etc. Renesas Electronics disclaims any and all liability for any malfunctions, failure or accident arising out of the use of Renesas Electronics products outside of such specified ranges.
7. Although Renesas Electronics endeavors to improve the quality and reliability of Renesas Electronics products, semiconductor products have specific characteristics, such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Unless designated as a high reliability product or a product for harsh environments in a Renesas Electronics data sheet or other Renesas Electronics document, Renesas Electronics products are not subject to radiation resistance design. You are responsible for implementing safety measures to guard against the possibility of bodily injury, injury or damage caused by fire, and/or danger to the public in the event of a failure or malfunction of Renesas Electronics products, such as safety design for hardware and software, including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult and impractical, you are responsible for evaluating the safety of the final products or systems manufactured by you.
8. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. You are responsible for carefully and sufficiently investigating applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive, and using Renesas Electronics products in compliance with all these applicable laws and regulations. Renesas Electronics disclaims any and all liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
9. Renesas Electronics products and technologies shall not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations. You shall comply with any applicable export control laws and regulations promulgated and administered by the governments of any countries asserting jurisdiction over the parties or transactions.
10. It is the responsibility of the buyer or distributor of Renesas Electronics products, or any other party who distributes, disposes of, or otherwise sells or transfers the product to a third party, to notify such third party in advance of the contents and conditions set forth in this document.
11. This document shall not be reprinted, reproduced or duplicated in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products.

(Note1) “Renesas Electronics” as used in this document means Renesas Electronics Corporation and also includes its directly or indirectly controlled subsidiaries.
(Note2) “Renesas Electronics product(s)” means any product developed or manufactured by or for Renesas Electronics.

(Rev.4.0-1 November 2017)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

Contact information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/.

© 2020 Renesas Electronics Corporation. All rights reserved.

Renesas EK-RA6M3 Disclaimer

By using this EK-RA6M3, the User accepts the following terms, which are in addition to, and control in the event of disagreement, with Renesas' General Terms and Conditions available at https://www.renesas.com/en-us/legal/disclaimer.html.

The EK-RA6M3 is not guaranteed to be error free, and the entire risk as to the results and performance of the EK-RA6M3 is assumed by the User. The EK-RA6M3 is provided by Renesas on an "as is" basis without warranty of any kind whether express or implied, including but not limited to the implied warranties of good workmanship, fitness for a particular purpose, title, merchantability, and non-infringement of intellectual property rights. Renesas expressly disclaims any implied warranty.

Renesas does not consider the EK-RA6M3 to be a finished product and therefore the EK-RA6M3 may not comply with some requirements applicable to finished products, including, but not limited to recycling, restricted substances and electromagnetic compatibility regulations. Refer to Certifications section, for information about certifications and compliance information for the EK-RA6M3. It is the kit User's responsibility to make sure the kit meets any local requirements applicable to their region.

Renesas or its affiliates shall in no event be liable for any loss of profit, loss of data, loss of contract, loss of business, damage to reputation or goodwill, any economic loss, any reprogramming or recall costs (whether the foregoing losses are direct or indirect) nor shall Renesas or its affiliates be liable for any other direct or indirect special, incidental or consequential damages arising out of or in relation to the use of this EK-RA6M3, even if Renesas or its affiliates have been advised of the possibility of such damages.

Renesas has used reasonable care in preparing the information included in this document, but Renesas does not warrant that such information is error free nor does Renesas guarantee an exact match for every application or parameter to part numbers designated by other vendors listed herein. The information provided in this document is intended solely to enable the use of Renesas products. No express or implied license to any intellectual property right is granted by this document or in connection with the sale of Renesas products. Renesas reserves the right to make changes to specifications and product descriptions at any time without notice. Renesas assumes no liability for any damages incurred by you resulting from errors in or omissions from the information included herein. Renesas cannot verify, and assumes no liability for, the accuracy of information available on another company's website.

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

EK-RA6M3

Contents

1. Introduction 6
1.1 Assumptions and Advisory Notes 6
2. Kit Contents 6
3. Overview of the Quick Start Example Project 7
3.1 Quick Start Example Project Flow 7
4. Running the Quick Start Example Project 8
4.1 Connecting and Powering Up the EK-RA6M3 Board 8
4.2 Running the Quick Start Example Project 9
5. Customizing the Quick Start Example Project 12
5.1 Downloading and Installing Software and Development Tools 12
5.2 Downloading and Importing the Quick Start Example Project 12
5.3 Modifying, Generating, and Building the Quick Start Example Project 16
5.4 Setting Up Debug Connection between the EK-RA6M3 board and Host PC 19
5.5 Downloading and Running the Modified Quick Start Example Project 20
6. Next Steps 21
7. Website and Support 22
Revision History 23

Figures

Figure 1. EK-RA6M3 Kit Contents 6
Figure 2. Quick Start Example Project Flow 7
Figure 3. Connecting the EK-RA6M3 Board to the Host PC via USB Full Speed Port 8
Figure 4. USB Serial Device in Windows Device Manager 9
Figure 5. Selecting the Serial Port on Tera Term 10
Figure 6. Welcome Message 10
Figure 7. Kit Information 11
Figure 8. Next Steps 11
Figure 9. Creating a New Workspace 13
Figure 10. Launching the Workspace 13
Figure 11. Importing the Project 14
Figure 12. Importing Existing Projects into the Workspace 15

Figure 13. Clicking Next to Import Existing Projects into the Workspace 15
Figure 14. Selecting the Root Directory..... 16
Figure 15. Finishing Importing the Quick Start Example Project..... 16
Figure 16. Opening the Configurator 17
Figure 17. Modifying the Configuration Settings 17
Figure 18. Saving the Configuration Changes 18
Figure 19. Building the Project 18
Figure 20. Successful Build Output 18
Figure 21. Connecting the EK-RA6M3 Board to the Host PC via USB Debug Port 19
Figure 22. Selecting the Debug Option 20
Figure 23. Opening the Debug Perspective 20
Figure 24. Executing the Project 20

1. Introduction

This Quick Start Guide (QSG) provides:

- An overview of the Quick Start example project that the EK-RA6M3 board 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 and terminal emulation programs such as Tera Term.
2. Subject knowledge: It is assumed that the user has basic knowledge about microcontrollers, embedded systems, and FSP to modify the example project described in this document.
3. Prior to running the Quick Start example project or programming the EK-RA6M3 board, default jumper settings must be used. Refer to the EK-RA6M3 user's manual for the default jumper settings.
4. 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. Kit Contents

The following components are included in the kit:

1. EK-RA6M3 board
2. Micro USB device cable (type-A male to micro-B male)
3. Micro USB host cable (type-A female to micro-B male)
4. Ethernet patch cable

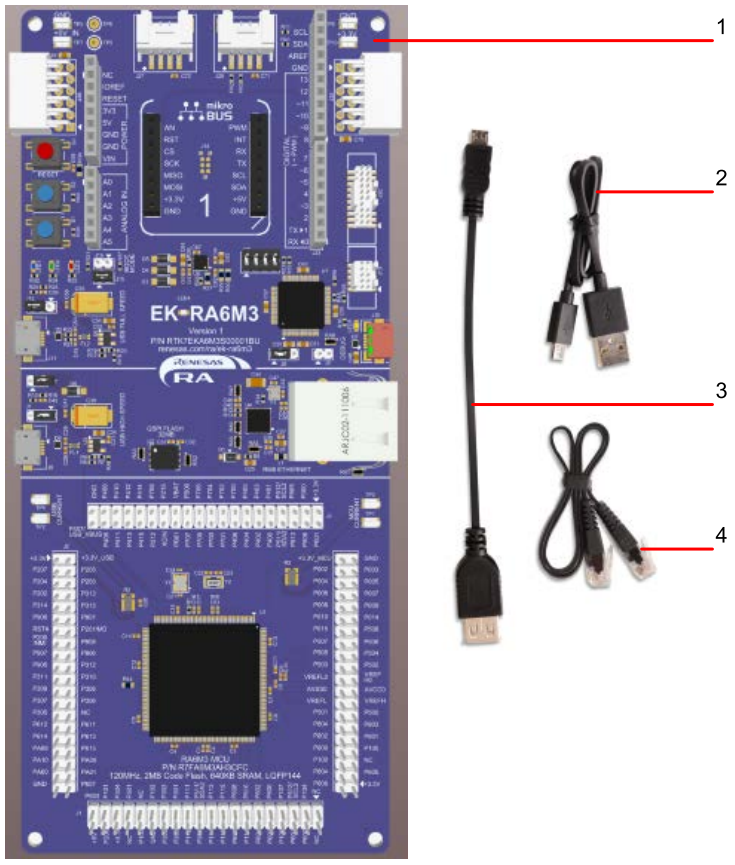


Figure 1. EK-RA6M3 Kit Contents

3. Overview of the Quick Start Example Project

The Quick Start example project allows the user to change the frequency and intensity of the on-board user LEDs (LED1, LED2, and LED3) using the user buttons (S1 and S2). The supported frequencies are 1 Hz, 5 Hz, and 10 Hz and the supported intensities are 10%, 50% and 90%.

When the EK-RA6M3 board running the Quick Start example project is connected to a host PC via USB as a Full Speed CDC Device, the kit information, MCU die temperature, user LED blinking frequency, and so forth, can be displayed on a terminal console.

3.1 Quick Start Example Project Flow

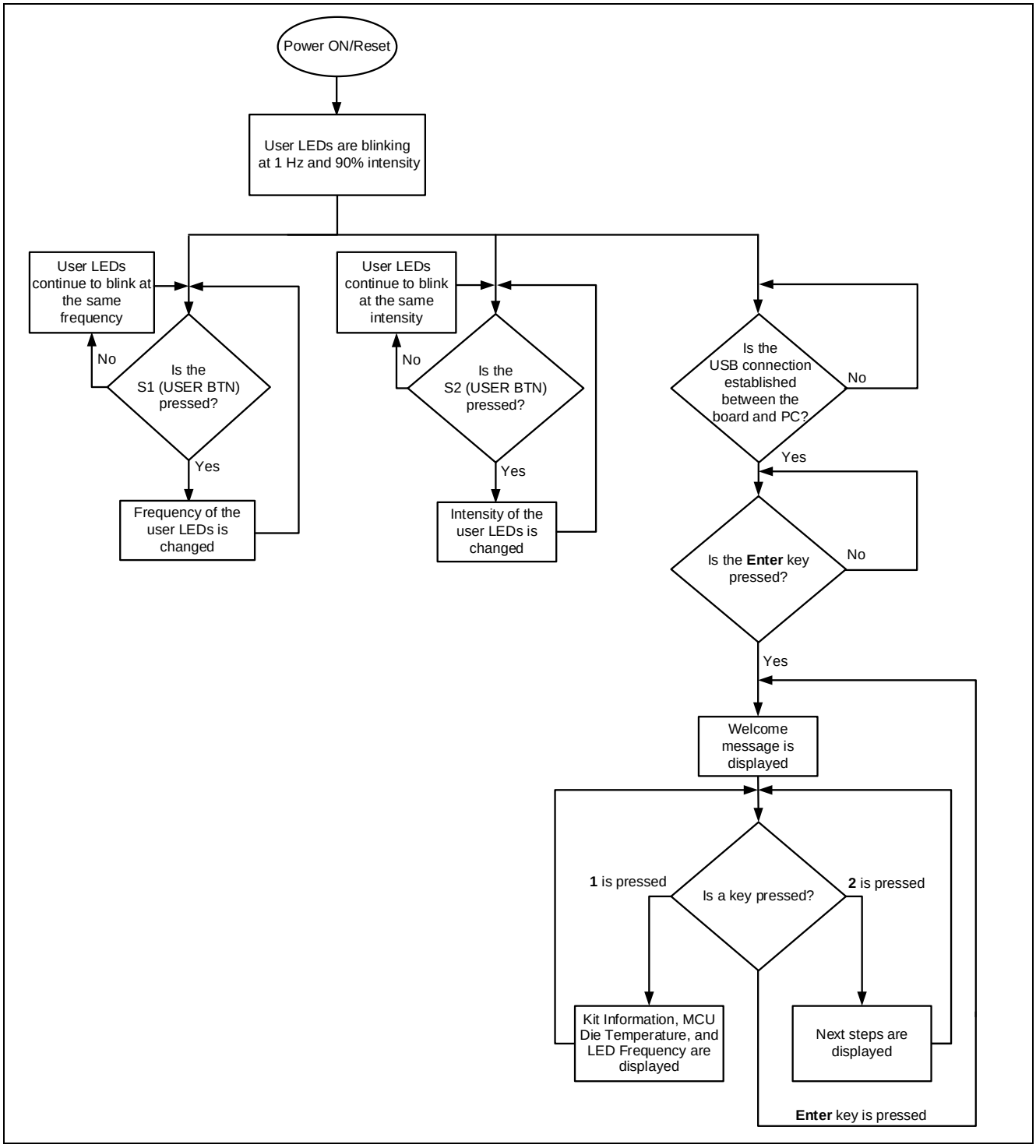


Figure 2. Quick Start Example Project Flow

4. Running the Quick Start Example Project

This section lists the requirements and instructions to power up the EK-RA6M3 board and run the Quick Start example project.

Hardware Requirements

- EK-RA6M3 board
- Micro USB device cable
- A PC with at least 1 USB port

Software Requirements

- Windows® 10 operating system
- USB Serial Drivers (included in Windows 10)
- Tera Term (or similar) terminal console application

4.1 Connecting and Powering Up the EK-RA6M3 Board

1. Connect the micro USB end of the micro USB device cable to micro-AB USB Full Speed port (J11) of the EK-RA6M3 board.
2. Connect the other end of this cable to the USB port of the host PC. Power LED (LED4) on the EK-RA6M3 board lights up white, indicating that the EK-RA6M3 board is powered on.

Note: If the EK-RA6M3 board is not powered through micro-AB USB Full Speed port (J11) and the host PC, then USB CDC functionality of the Quick Start example project cannot be demonstrated because of the absence of a USB Full Speed Device connection with the host PC.

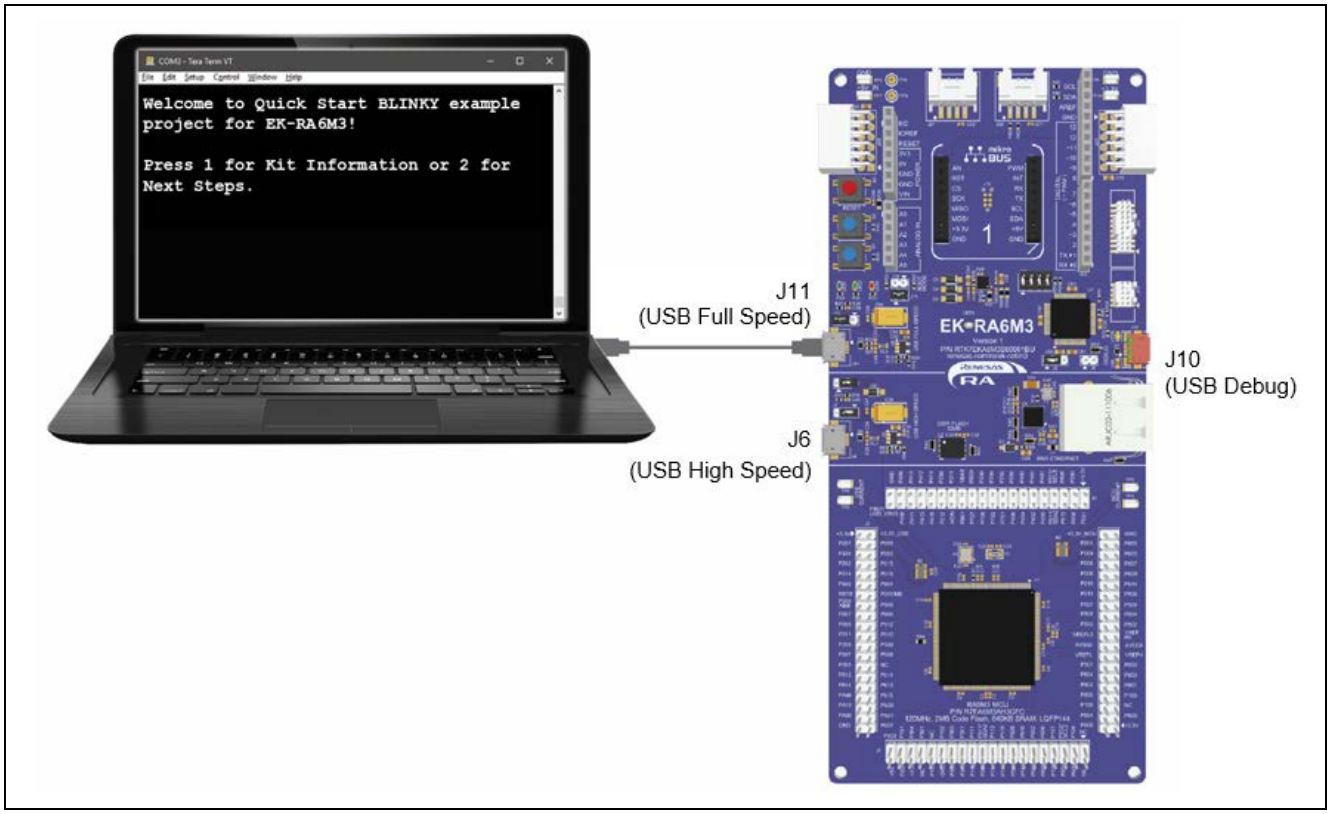


Figure 3. Connecting the EK-RA6M3 Board to the Host PC via USB Full Speed Port

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, the three user LEDs (blue LED1, green LED2, and red LED3) start blinking at 1 Hz frequency and at 90% intensity.

   Note: The debug LED (LED5) will blink or light up orange; this can be ignored for now.

2. Press the first user button (S1) on the EK-RA6M3 board to change the blinking frequency of the user LEDs. With every press of the first user button (S1), the frequency will switch from 1 Hz to 5 Hz to 10 Hz and cycle back.
3. Press the second user button (S2) on the board to change the intensity of the user LEDs. With every press of the user button (S2), the intensity will switch from 90% to 50% to 10% and cycle back.
4. On the host PC, open Windows Device Manager. Expand **Ports (COM & LPT)**, locate **USB Serial Device (COMxx)** and note down the COM port number for reference in the next step.

Note: USB Serial Device drivers are required to communicate between the EK-RA6M3 board and the terminal application on the host PC.

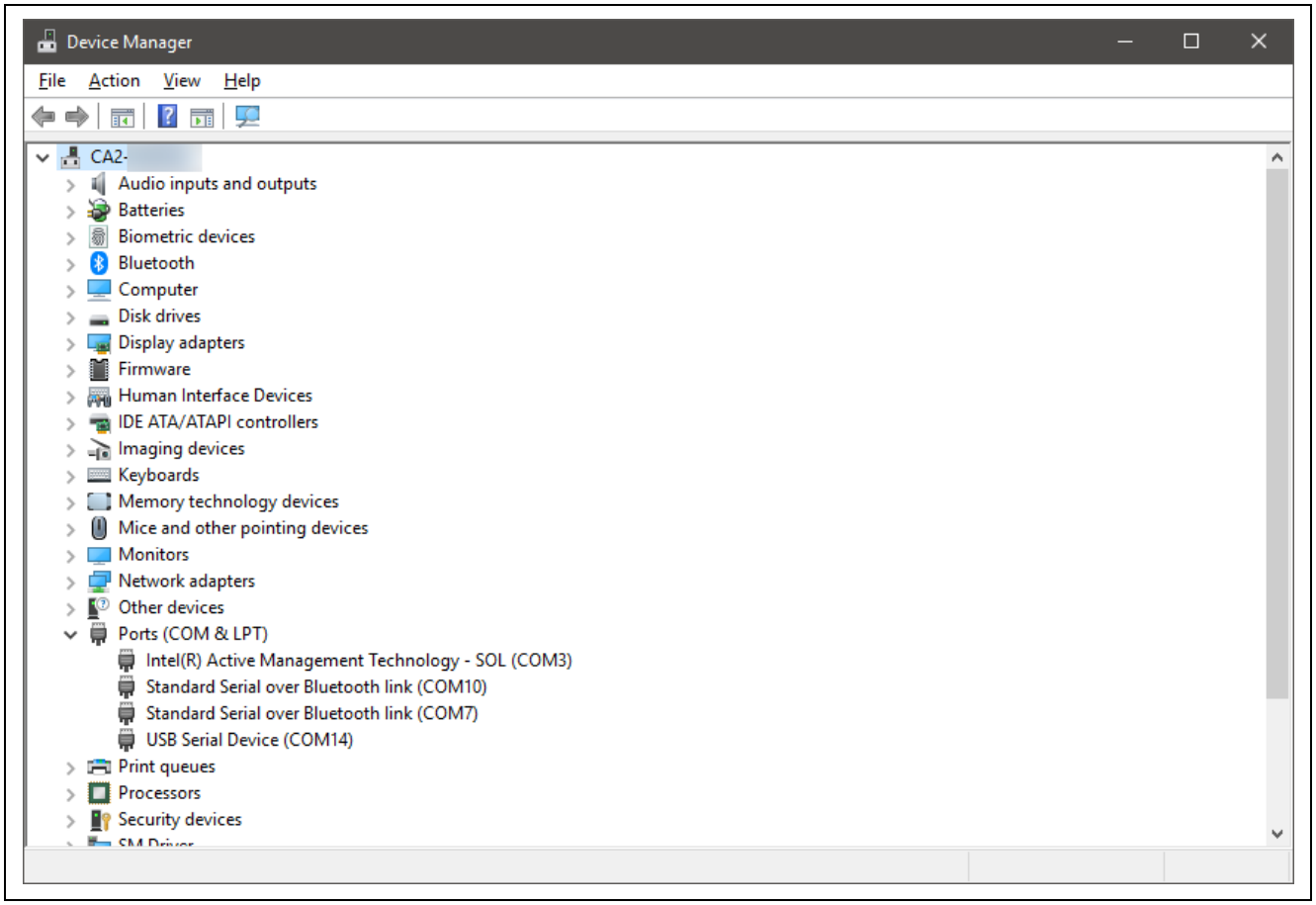


Figure 4. USB Serial Device in Windows Device Manager

5. Open Tera Term, select **Serial** and **COMxx: USB Serial Device (COMxx)** and click **OK**.

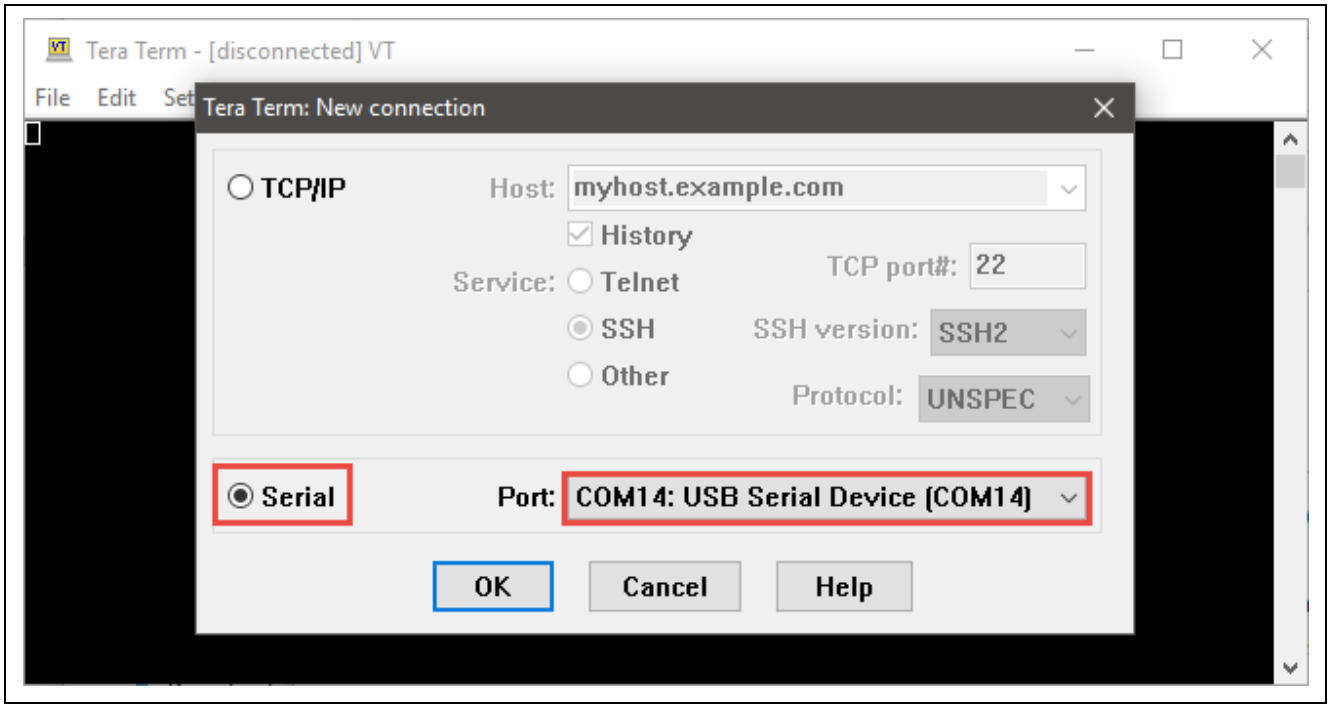


Figure 5. Selecting the Serial Port on Tera Term

6. Press **Enter** key. The welcome message will be displayed.

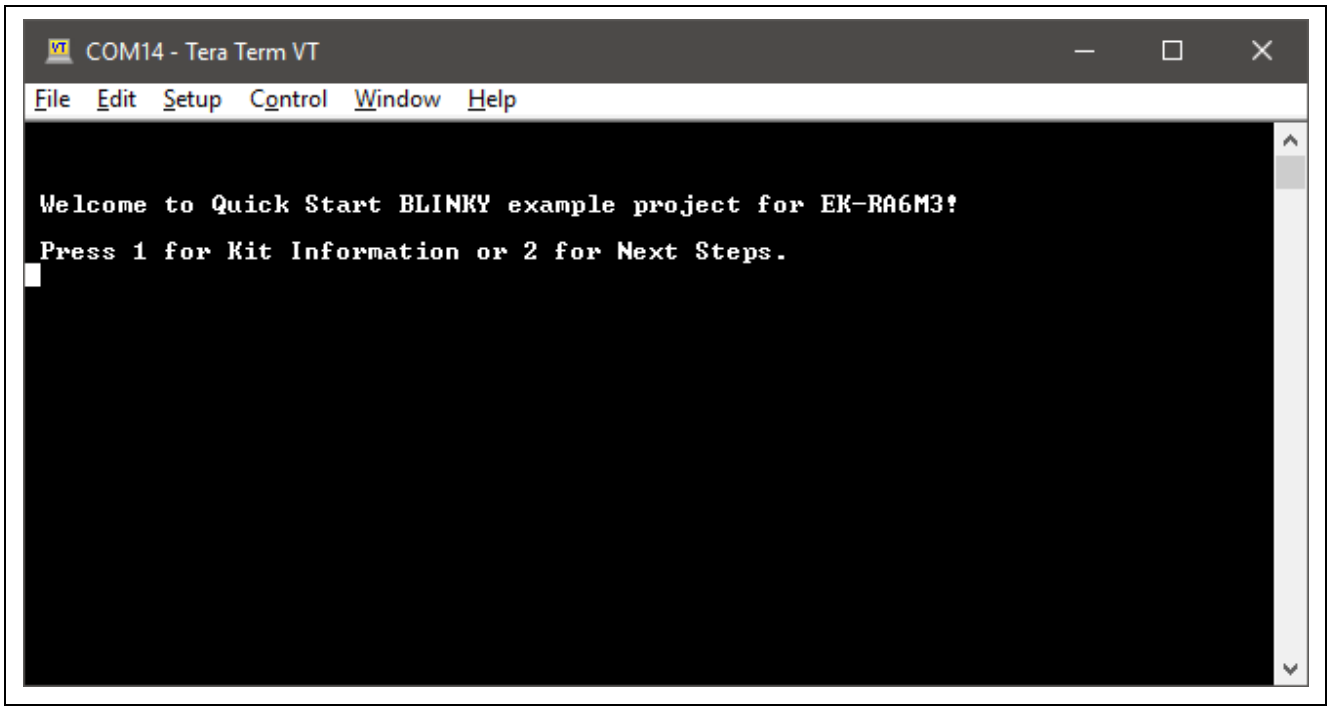


Figure 6. Welcome Message

7. Press **1** to display the kit name, part number, MCU die temperature, and the user LEDs' current blinking frequency.

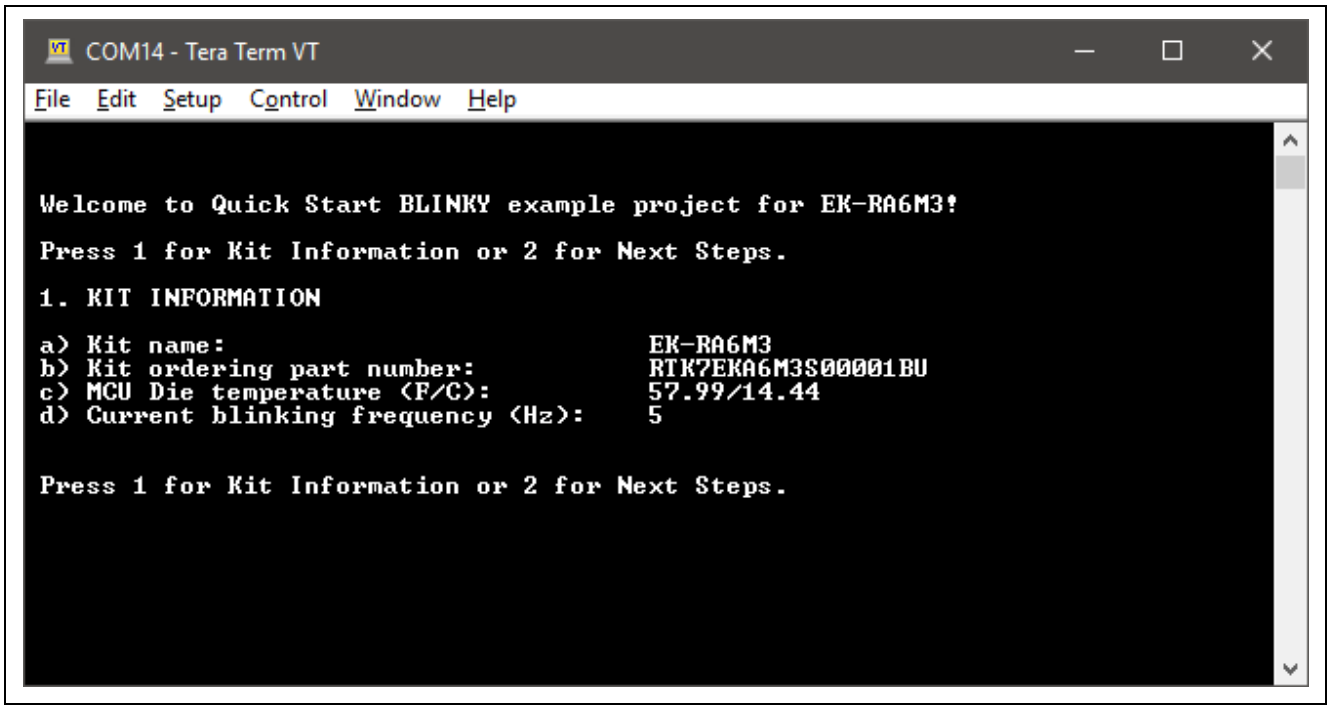


Figure 7. Kit Information

8. Press **2** to display Next Steps.

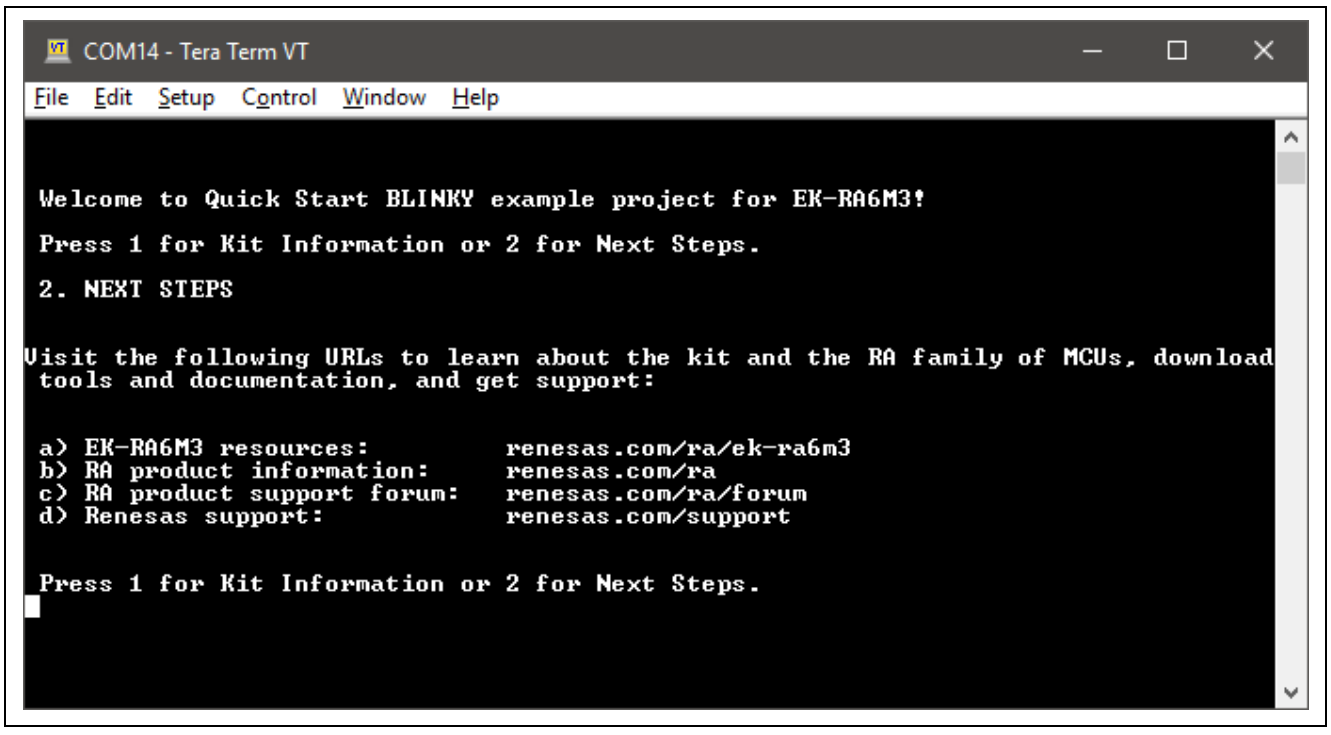


Figure 8. Next Steps

Note: At any point, the user can press the **Enter** key to return to the welcome message.

5. Customizing the Quick Start Example Project

This section lists the requirements and instructions for customizing the Quick Start example project.

Hardware Requirements

- EK-RA6M3 board
- Micro USB device cable
- A PC with at least 1 USB port

Software Requirements

- Windows® 10 operating system
- e² studio IDE
- SEGGER J-Link® USB drivers
- FSP
- Quick Start example project

5.1 Downloading and Installing Software and 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 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.

There is no need to download and install software, development tools, and drivers separately.

5.2 Downloading and Importing the Quick Start Example Project

1. Download and extract the Quick Start example project to a local directory on the host PC.
   - The Quick Start example project (source code and project files) is available in the EK-RA6M3 Example Projects Bundle that is available in the Downloads tab of EK-RA6M3 webpage at renesas.com/ra/ek-ra6m3.
   - Download and extract the example projects bundle (`xxxxxxxxxxxxxxx-ek-ra6m3-exampleprojects.zip`) to a local directory on the host PC.
   - Browse to the Quick Start example project at `xxxxxxxxxxxxxxx-ek-ra6m3-exampleprojects\ek_ra6m3\_quickstart\quickstart_ek_ra6m3_ep`
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.

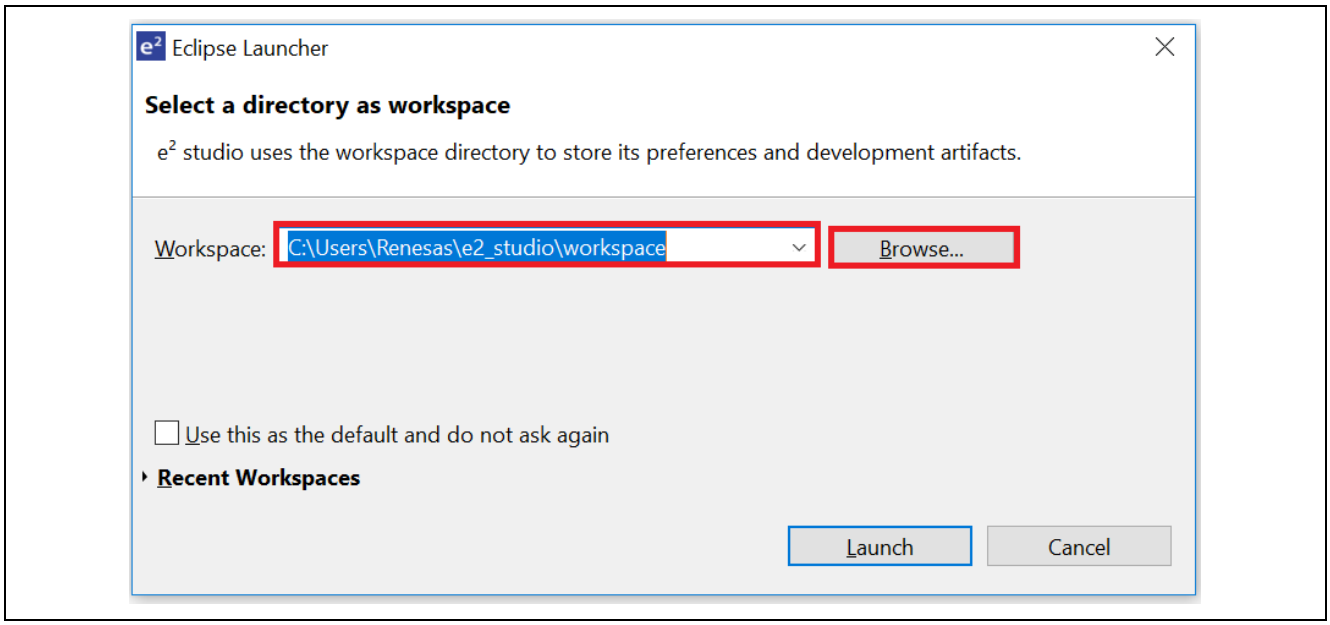


Figure 9. Creating a New Workspace

4. Click **Launch.**

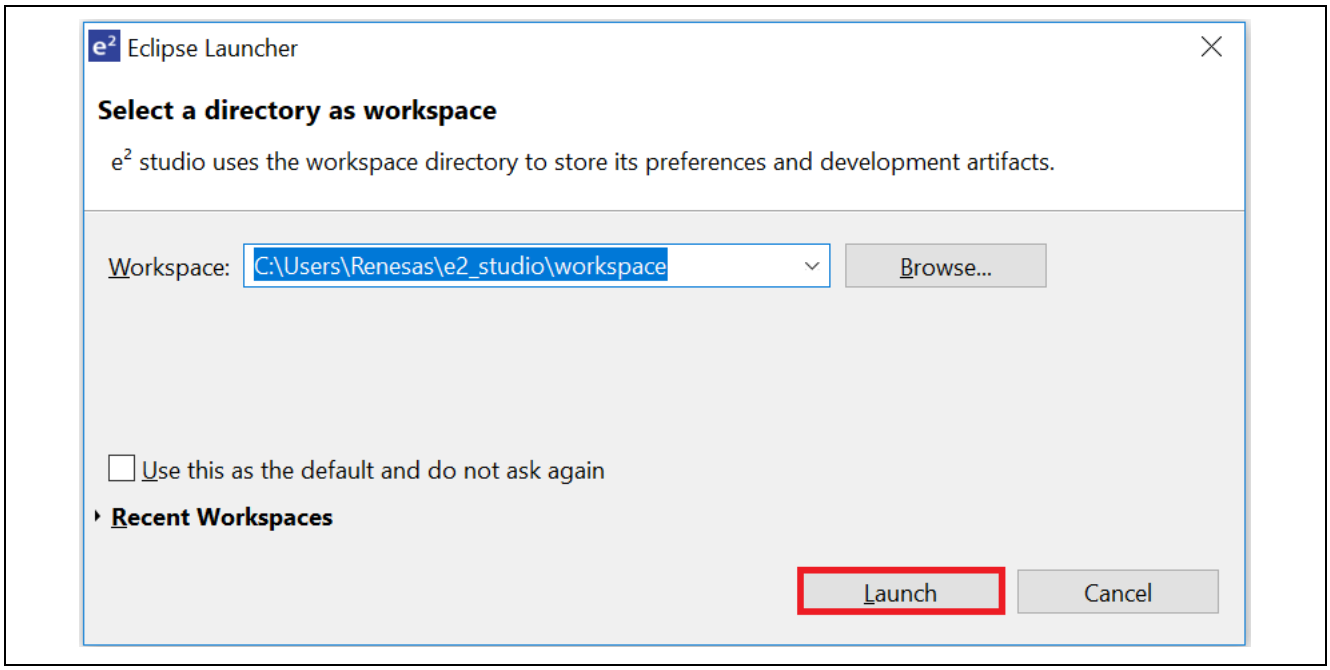


Figure 10. Launching the Workspace

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

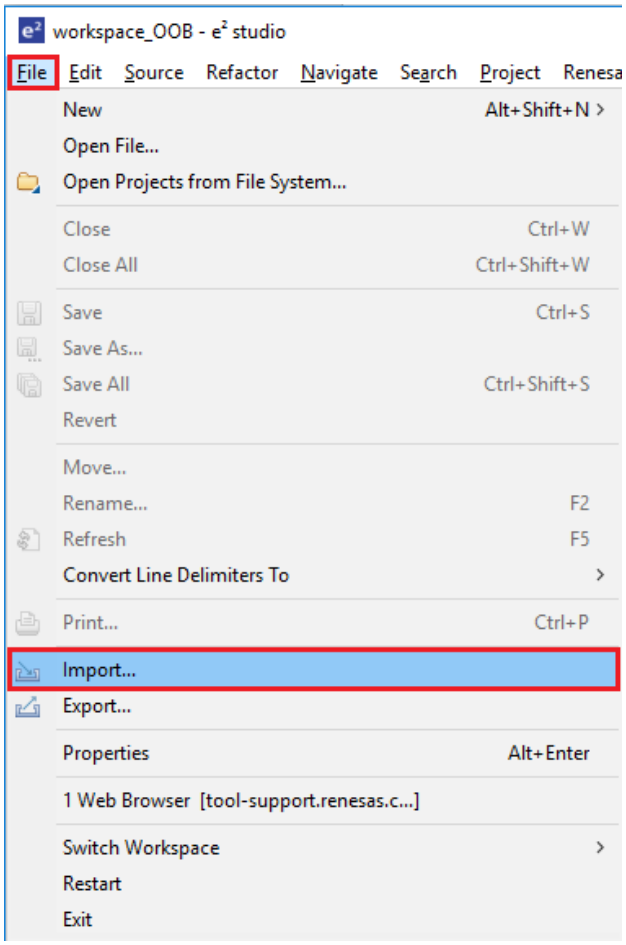


Figure 11. Importing the Project

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

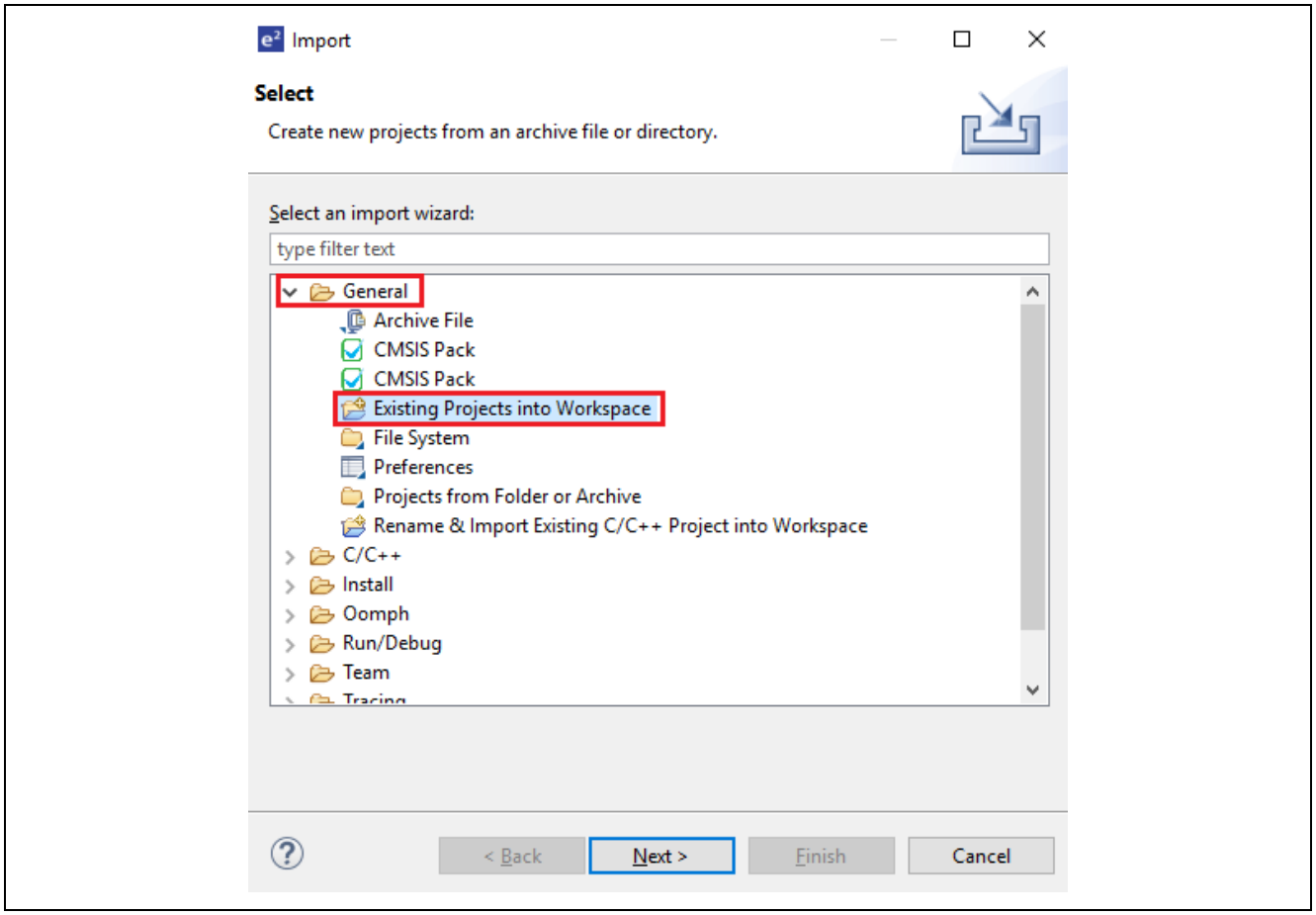


Figure 12. Importing Existing Projects into the Workspace

7. Click **Next**.

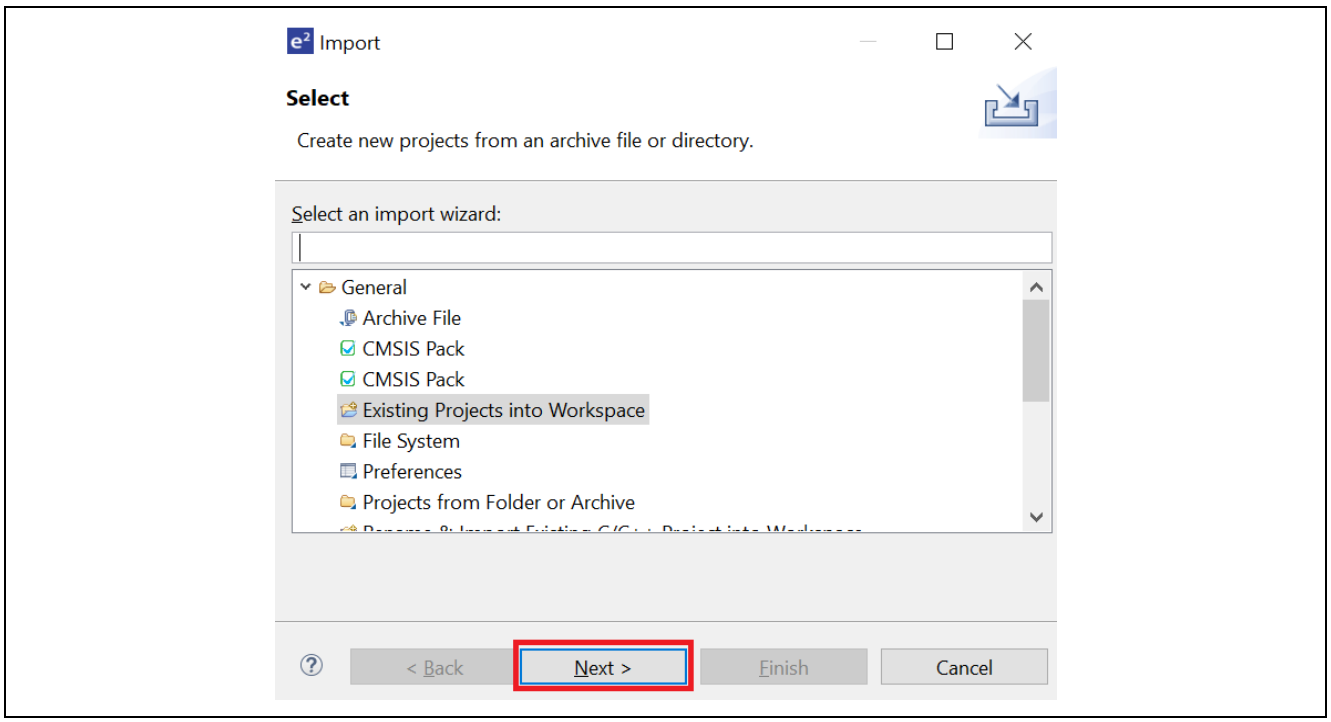


Figure 13. Clicking Next to Import Existing Projects into the Workspace

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

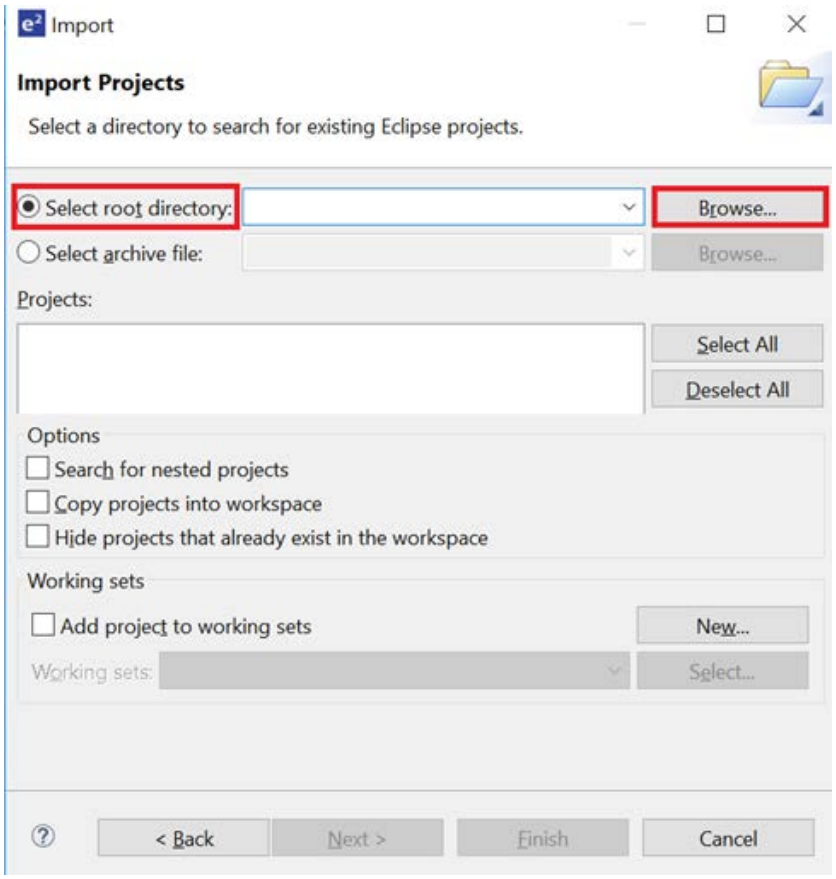


Figure 14. Selecting the Root Directory

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

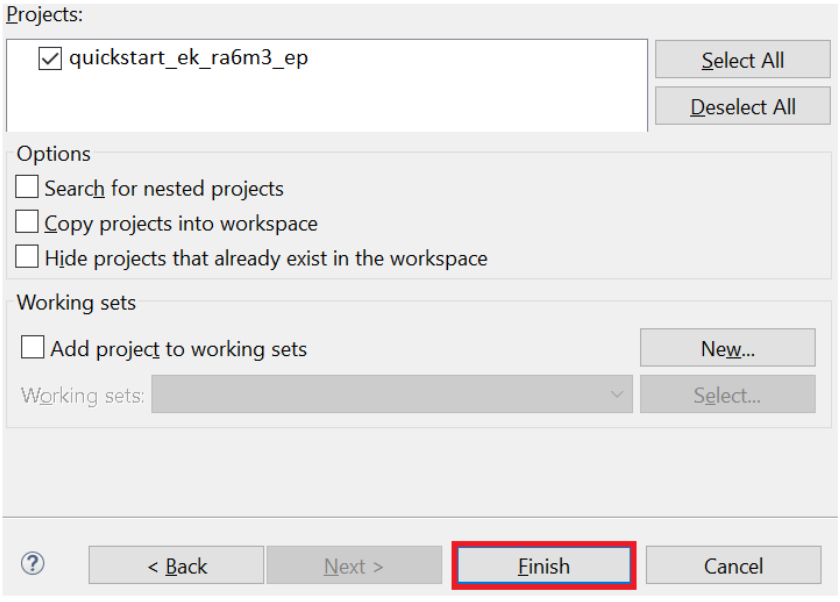


Figure 15. Finishing Importing the Quick Start Example Project

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.

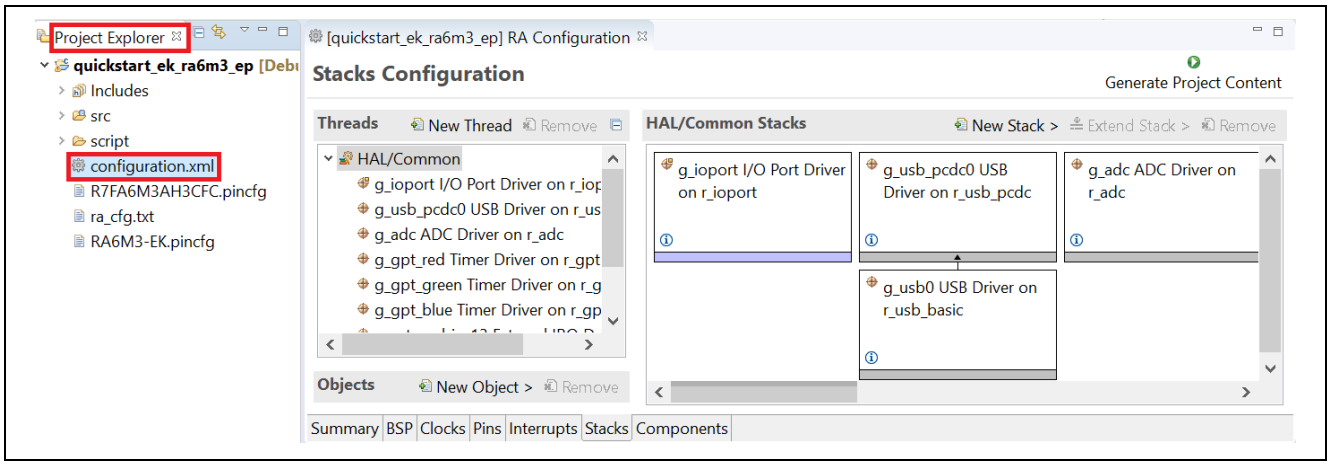


Figure 16. Opening the Configurator

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 ADC driver configuration.

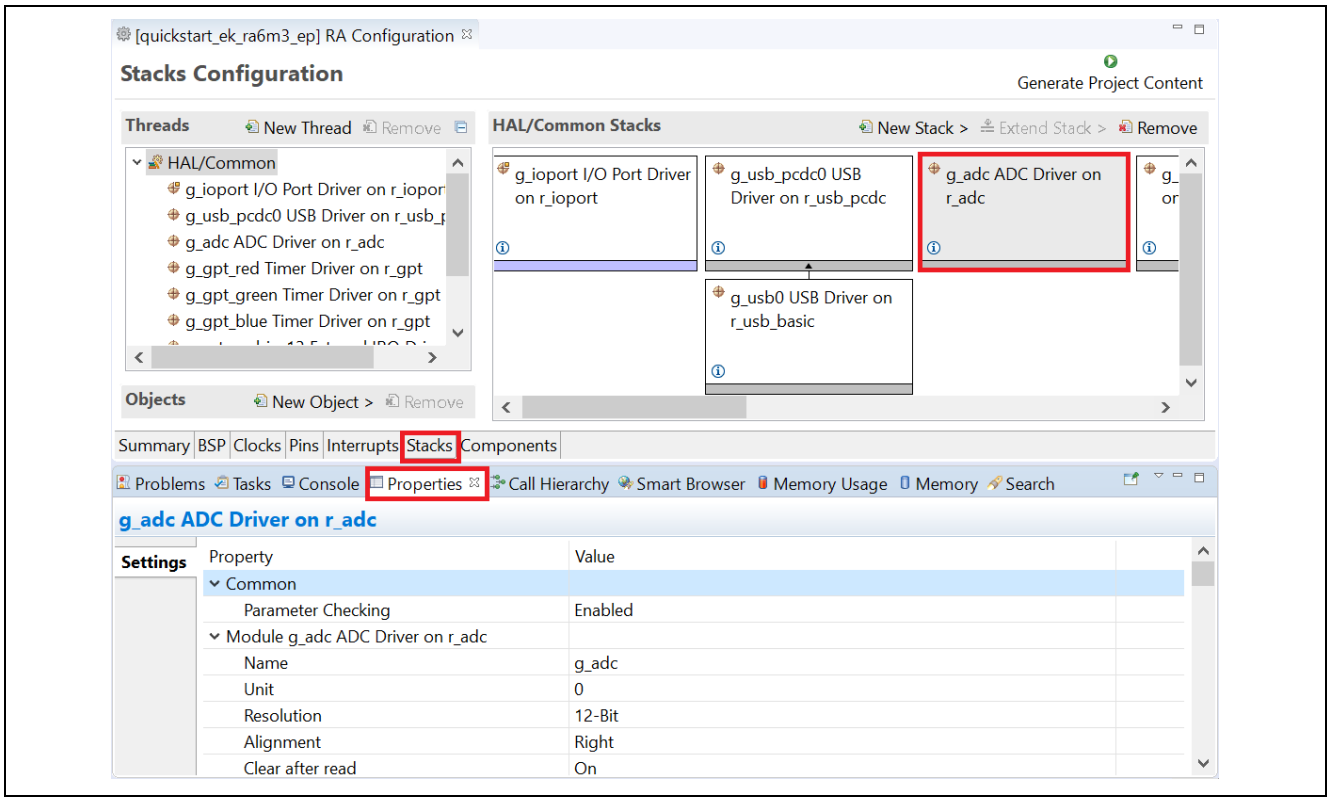


Figure 17. Modifying the Configuration Settings

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**.

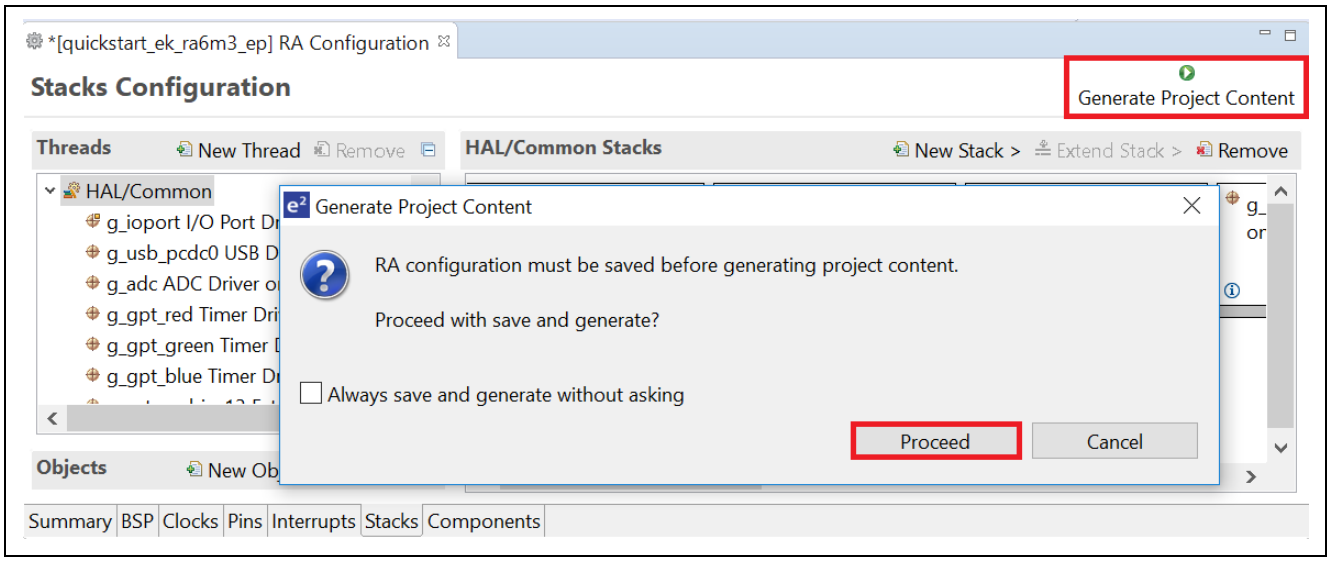


Figure 18. Saving the Configuration Changes

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

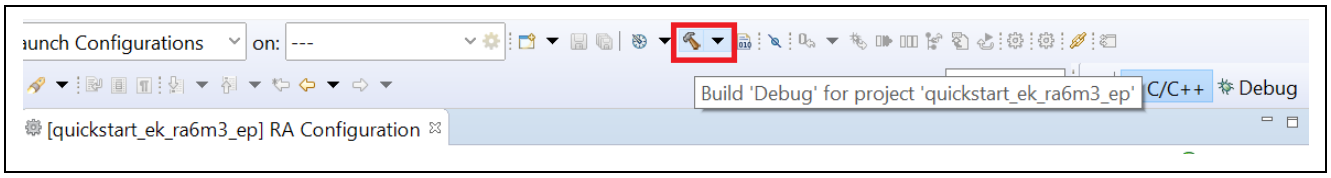


Figure 19. Building the Project

6. A successful build produces an output as follows.

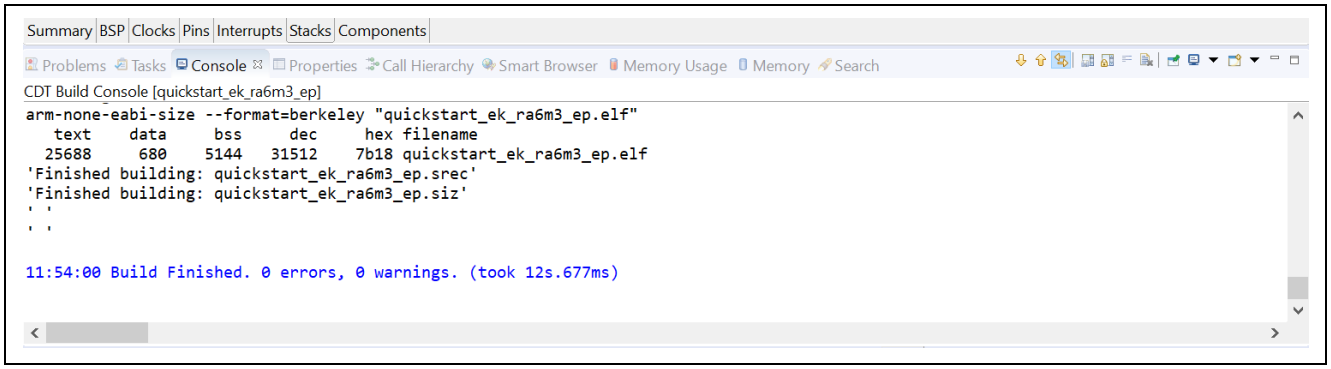


Figure 20. Successful Build Output

5.4 Setting Up Debug Connection between the EK-RA6M3 board and Host PC

To program the modified Quick St example project on to the EK-RA6M3 board, a debug connection is necessary between the EK-RA6M3 board and host PC.

1. Disconnect the USB cable from micro-AB USB Full Speed port (J11) and connect it to micro-B USB debug port (J10) of the EK-RA6M3 board.

Note: The EK-RA6M3 board supports 3 debugging modes. In this section and the following sections, default debugging mode, Debug On-Board, is used. More information on debugging modes is available in EK-RA6M3 user's manual.

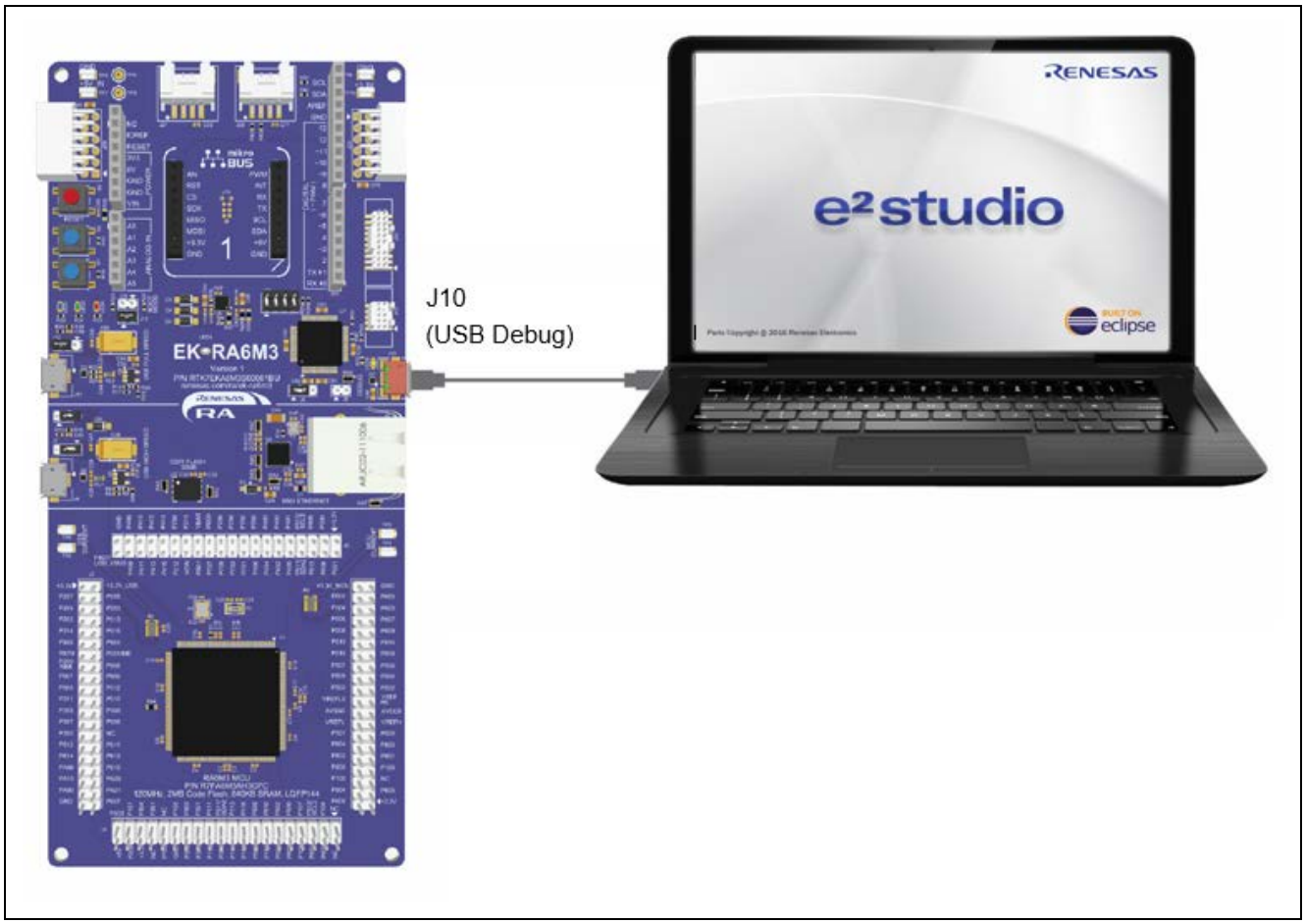


Figure 21. Connecting the EK-RA6M3 Board to the Host PC via USB Debug Port

2. Verify that the debug LED (LED5) stops blinking and lights up orange indicating that the J-Link drivers are detected by the EK-RA6M3 board.

Note: The debug LED (LED5) continues to blink when J-Link drivers are not detected by the EK-RA6M3 board. In that case, make sure that the EK-RA6M3 board is connected to the host PC through the micro-B USB debug port (J10) 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

1. In e² studio, click the drop-down menu for the debug icon, select **Debug As** option, and choose **Renesas GDB Hardware Debugging.**

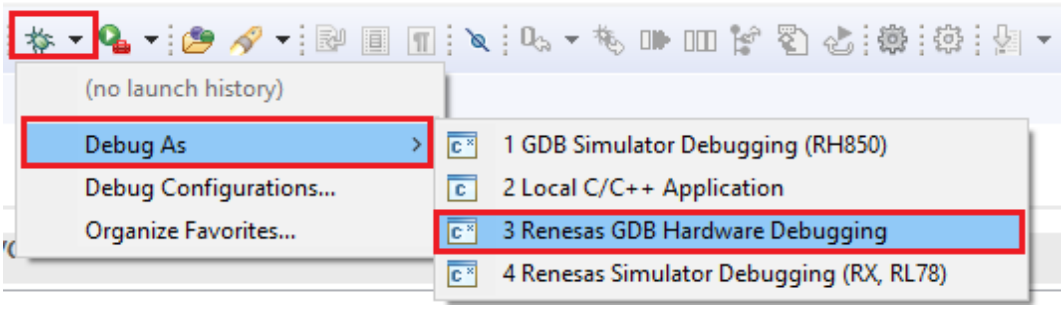


Figure 22. Selecting the Debug Option

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

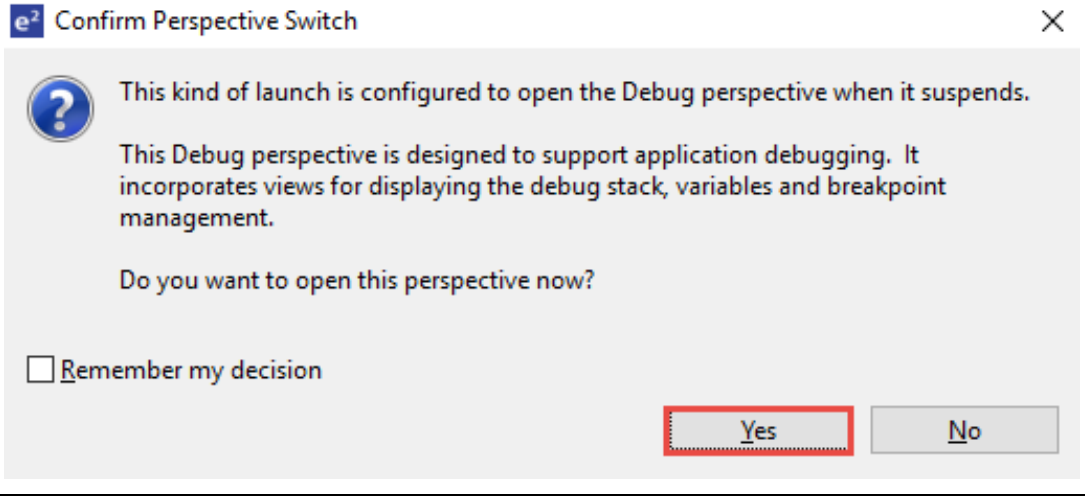


Figure 23. Opening the Debug Perspective

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

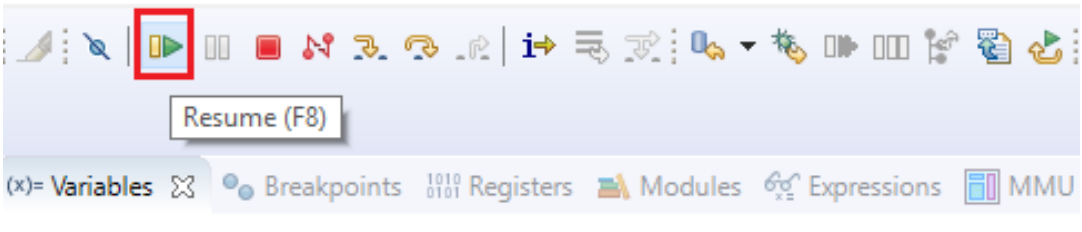


Figure 24. Executing the Project

4. The modified Quick Start example project is programmed into the EK-RA6M3 board and is running. The project can be paused, stopped, or resumed using the debug controls.

6. Next Steps

1. To learn more about the EK-RA6M3 kit, refer to the EK-RA6M3 user's manual and design package available in the Documents and Download tabs respectively of the EK-RA6M3G webpage at renesas.com/ra/ek-ra6m3.
2. Renesas provides several example projects that demonstrate different capabilities of the RA MCUs. These example projects can serve as a good starting point for users to develop custom applications. Example projects (source code and project files) for EK-RA6M3 kit are available in the EK-RA6M3 Example Projects Bundle. The example projects bundle is available in the Downloads tab of EK-RA6M3 webpage.
   - Download and extract the example projects bundle (`xxxxxxxxxxxxxxx-ek-ra6m3-exampleprojects.zip`) to a local directory on the host PC.
   - Refer to the list of all example projects (`xxxxxxxxxxxxxxx-ek-ra6m3-exampleprojects.pdf`) available inside the example projects bundle.
   - Browse to the desired example project (for example: adc_ek_ra6m3_ep) in the example projects bundle (`xxxxxxxxxxxxxxx-ek-ra6m3-exampleprojects\ek_ra6m3\adc\adc_ek_ra6m3_ep`)
   - For help on using example projects, refer to `Example Project Usage Guide.pdf` in the RA Example Repository on GitHub at github.com/renesas/ra-fsp-examples/tree/master/example_projects. The archived versions of the source code of the example projects are available the example project repository.

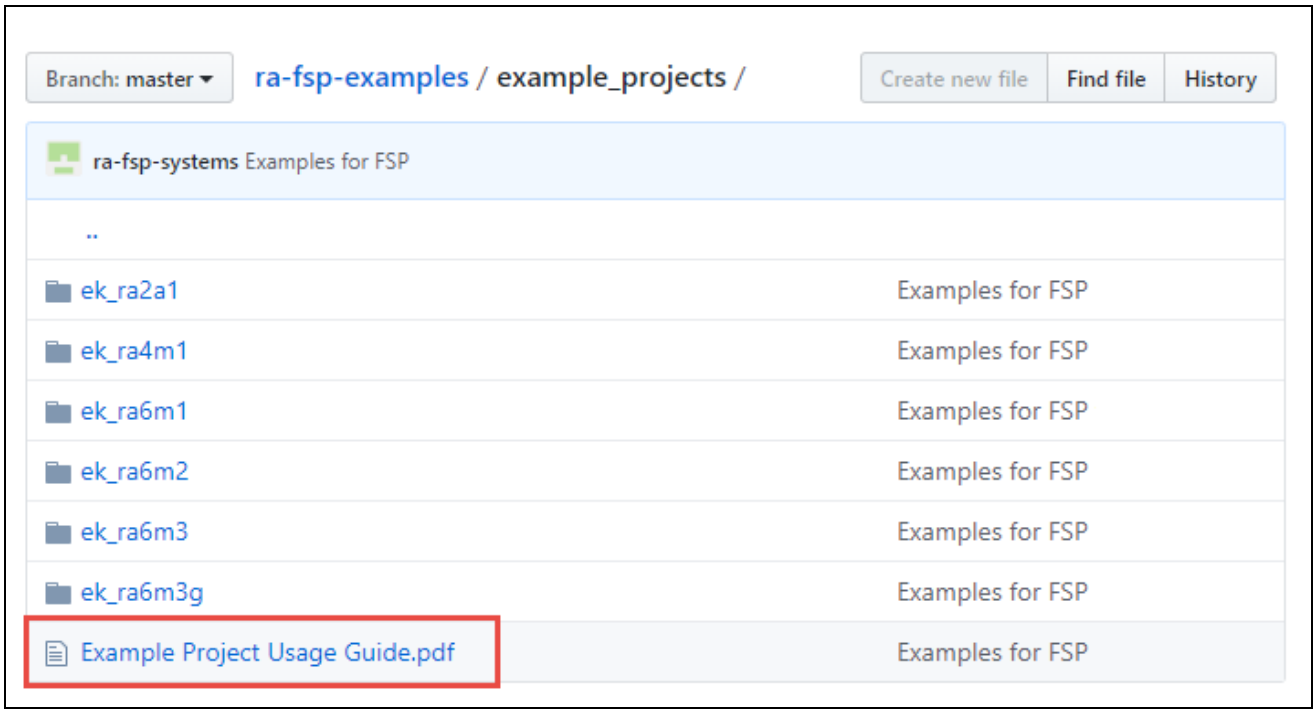


Figure 25. Example Project Directory Contents

7. Website and Support

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

EK-RA6M3 Resources	renesas.com/ra/ek-ra6m3
RA Product Information	renesas.com/ra
RA Product Support Forum	renesas.com/ra/forum
Renesas Support	renesas.com/support

Revision History

Rev.	Date	Description	
		Page	Summary
1.00	Sep.17.19	—	Initial release
1.01	Nov.15.19	—	Updated sections 5.2, Downloading and Importing the Quick Start Example Project and 6, Next Steps.
1.02	Jun.12.20	12, 20	Updated Example Project information

EK-RA6M3 – Quick Start Guide

Publication Date: Jun.12.20

Published by: Renesas Electronics Corporation

EK-RA6M3 – Quick Start Guide

Renesas Electronics Corporation

R20QS0011EU0102