

**QCIOT-RRQ61051EVZ**

Wi-Fi 6 and Bluetooth LE PMOD™/Click Board

**Introduction**

This document is a quick start guide for the QCIOT-RRQ61051EVZ Wi-Fi 6 PMOD Evaluation Board. It explains the required hardware setup and basic steps to connect the PMOD board to a Renesas RA4E2 MCU evaluation board – EK-RA4E2.

The RRQ61051 PMOD is intended for evaluation and early development of Wi-Fi 6 connectivity using Renesas microcontrollers.

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## 1. Kit Contents

- QCIOT-RRQ61051EVZ Wi-Fi 6 and BLE combo evaluation board
- Click Board connectors that can be soldered if needed

## 2. System Requirements

### 2.1 Hardware Requirements

- Example code is made for Renesas EK-RA4E2 board but could be easily modified to be used with any MCU board with PMOD or click connectors
- QCIOT-RRQ61051EVZ default firmware support AT command interface over UART
- USB micro cable is required to flash, debug and power the setup

### 2.2 Software Requirements

- [Renesas e<sup>2</sup> studio](#)
- [Renesas Flexible Software Package \(FSP\)](#)
- Sample application supporting RRQ61051
- [Adafruit](#) account
- Terminal application (Tera Term or similar for debug output, if needed)

## 3. RRQ61051 Wi-Fi 6 PMOD Overview

### 3.1 Key Features

- Wi-Fi 6 (802.11ax) module in PMOD form factor
- Standardized PMOD connector for fast evaluation
- Designed for Renesas RA family MCU evaluation boards
- Click™ connector placeholder (requires manual soldering)

*Note:* The PMOD connector is the **primary interface**. The Click connector, if populated, is optional. Verify signal routing in the schematics before use.

### 3.2 Functional Block Diagram

QCIOT-RRQ61051EVZ board is intended to be used in host MCU supervised applications where all the communication stacks are running on a RRQ61051 module and host MCU takes care of user application (see [Figure 1](#)).

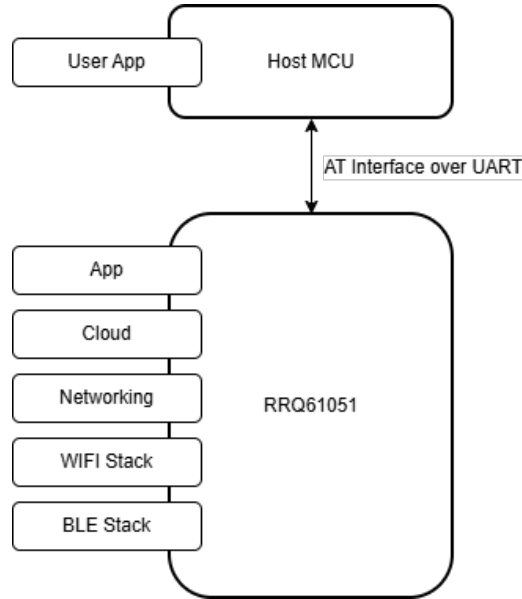


Figure 1. MCU Supervised Application Block Diagram

Note: System architecture is not limited to MCU supervised one. It is up to users to modify the firmware running on the RRQ61051 module and use it in various scenarios.

#### 4. Hardware Setup

Hardware setup for this quick start shows the cost effective RA4E2 MCU controlling the QCOT-RRQ61051EVZ board.

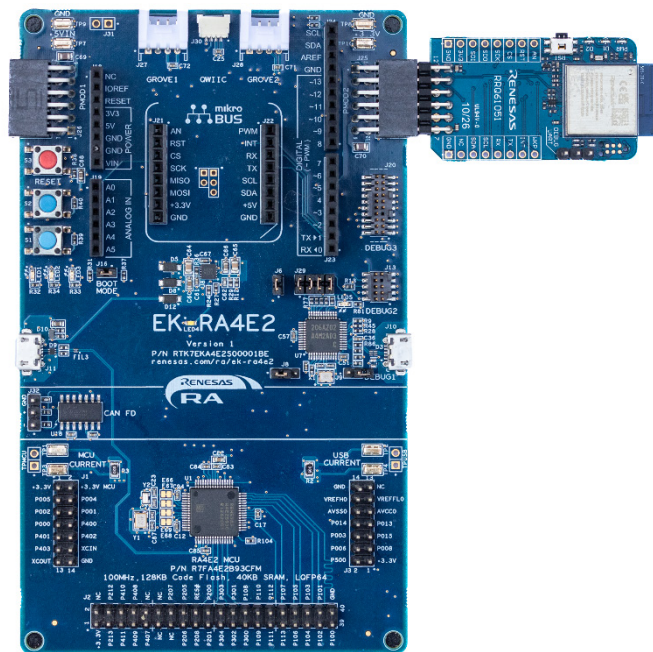


Figure 2. EK-RA4E2 and QCOT-RRQ61051EVZ Hardware Setup

With small code modifications, any RA MCU board could be used to run this application example.

## 4.1 Connecting the PMOD Board

1. Ensure the host MCU board is powered off.
2. Align the RRQ61051 PMOD board with the Type 3 (UART) PMOD connector on the host board.
3. Insert the PMOD board carefully, ensuring correct orientation as shown in [Figure 2](#).
4. Power on the host MCU board.

**Important:** Some PMOD signals may be multiplexed with other peripherals on the host board. Always review the **schematics** before enabling additional interfaces.

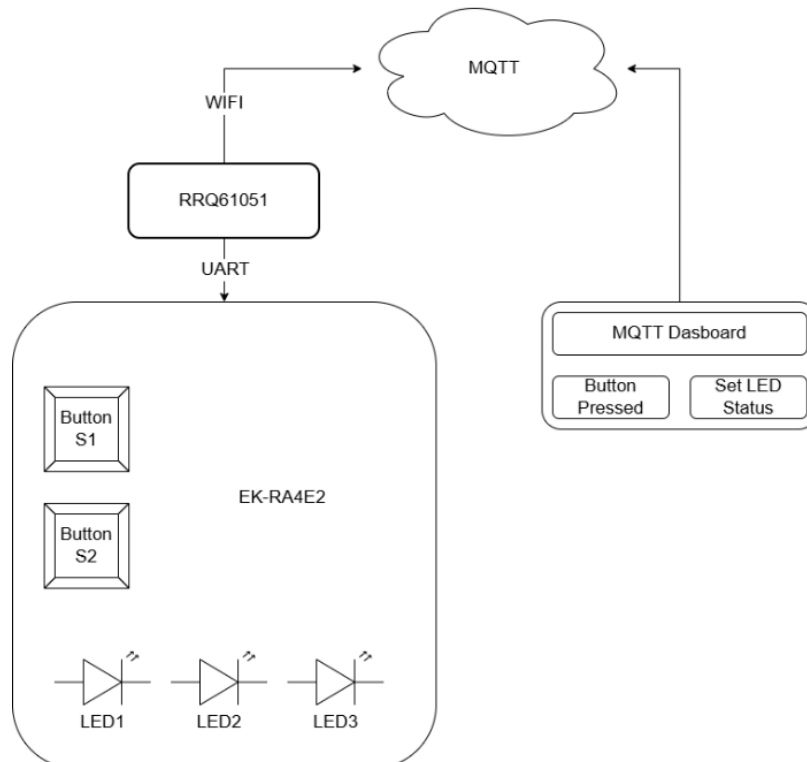
## 5. Getting Started

### 5.1 Power-Up and Reset

- Power is supplied via the host MCU board through the PMOD connector.
- Observe status LEDs for power and activity indication.
  - Red LED on QCIOT-RRQ61051EVZ Board Indicates power status
  - White LED (LED4) on EK-RA4E2 indicates power status of the board.
- Status can be observed on EK-RA4E2 user LEDs
- LEDs D1 and D2 on the QCIOT-RRQ61051EVZ are not used on the quick start application.

## 6. MQTT Connection Using DA16200 FSP Driver Example

MQTT using existing DA16200 FSP driver example shows easy way to connect to the cloud using existing tools.



**Figure 3. MQTT Quick Start Example Application**

This example application connects to the Adafruit cloud and creates predefined topics. After a button press, it sends a clear text message to MQTT informing which button has been pressed.

This application is also subscribed to an LED topic (feed) that allows a user to change the behavior of the LEDs on the EK board.

## 6.1 Running the Example Application

### 6.1.1 Launch Renesas e<sup>2</sup> studio

The example has been made using the Renesas e2 studio 2025-12 version and GCC ARM Embedded Tool chain. It is recommended to keep the same or newer versions.

### 6.1.2 Import the RRQ61051 Wi-Fi PMOD Example Project

Complete project import procedure is displayed in Figure 4 and listed here:

1. Click on **File**.
2. Select **Import**.
3. Choose General/Existing Projects into Workspace.
4. Click **Next**.
5. Click on the **Select archive file** radio button.
6. Click on **Browse** for the project.
7. If the correct archive file was selected, you will see a project that should be imported into the workspace.
8. Click **Finish**.

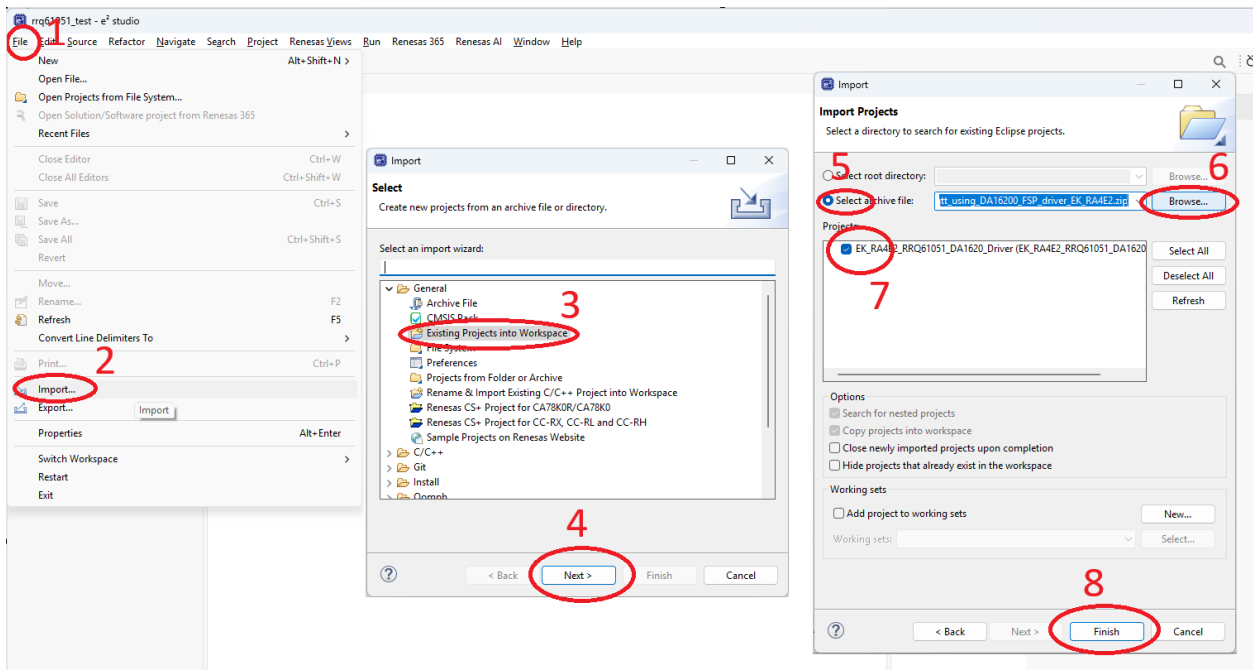


Figure 4. Import Existing Project into e2 studio

### 6.1.3 Configure an MQTT Username and Password

MQTT Username and Password are configured into the FSP configuration as it is shown in Figure 5.

Step by step procedure:

1. Open FSP configuration by double-clicking on the **configuration.xml** file.
2. Select the **FSP Configuration** tab.
3. Click on **MQTT Client on DA16XXX** in threads window.
4. Click on **MQTT Client stack DA16XXX**.
5. Enter MQTT User Name and MQTT password.

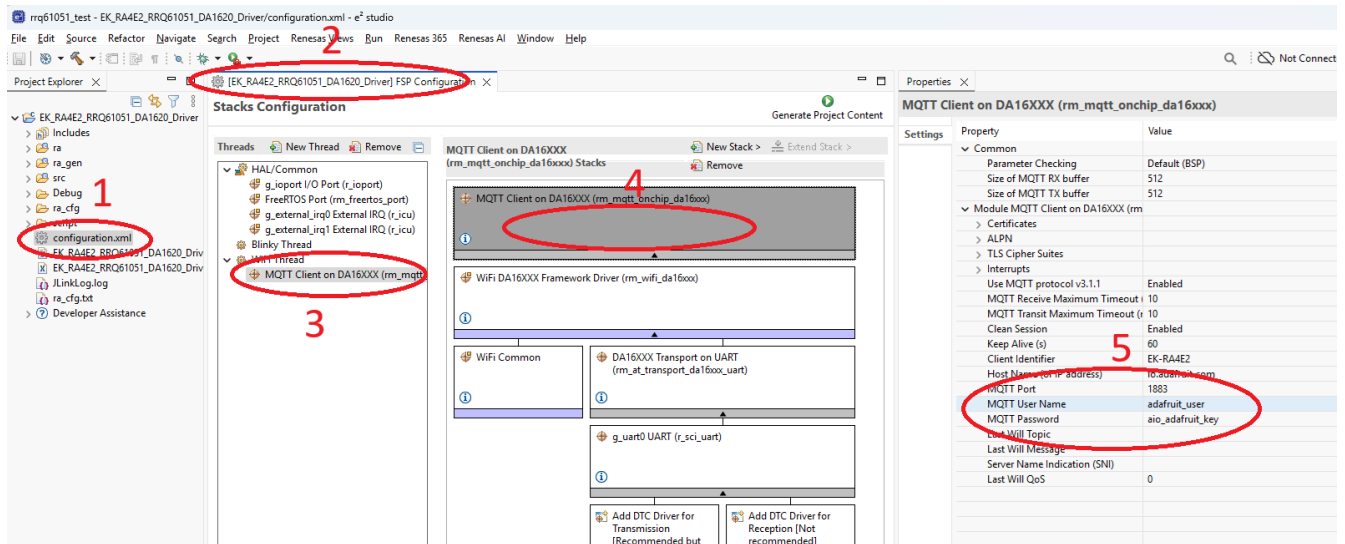


Figure 5. Setup MQTT Credentials

In the case of Adafruit, username and password can be found by clicking on a yellow key icon on the top right corner of [io.adafruit.com](https://io.adafruit.com) website (see Figure 6).

ADAFRUIT\_IO\_USERNAME should be pasted into **MQTT User Name** field and ADAFRUIT\_IO\_KEY into **MQTT Password** field.

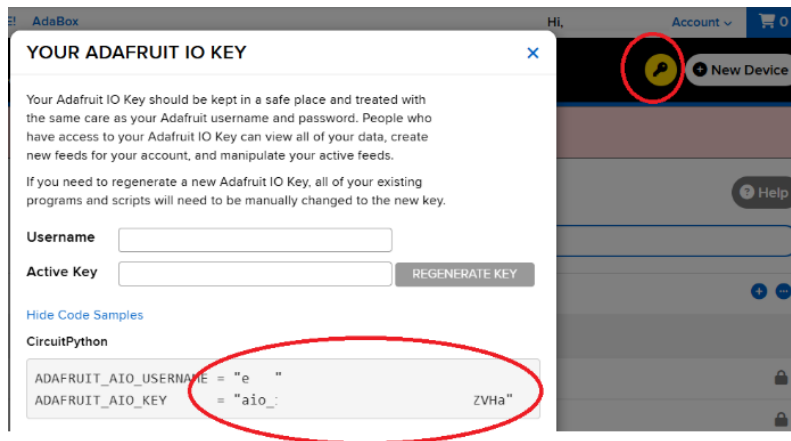


Figure 6. Adafruit IO Keys

### 6.1.4 Configure Access Point SSID and Passphrase

To configure Access Point SSID and passphrase you must open `mqtt_onchip_basic.c` file and define those two parameters as `WIFI_SSID` and `WIFI_PWD` (see [Figure 7](#)).

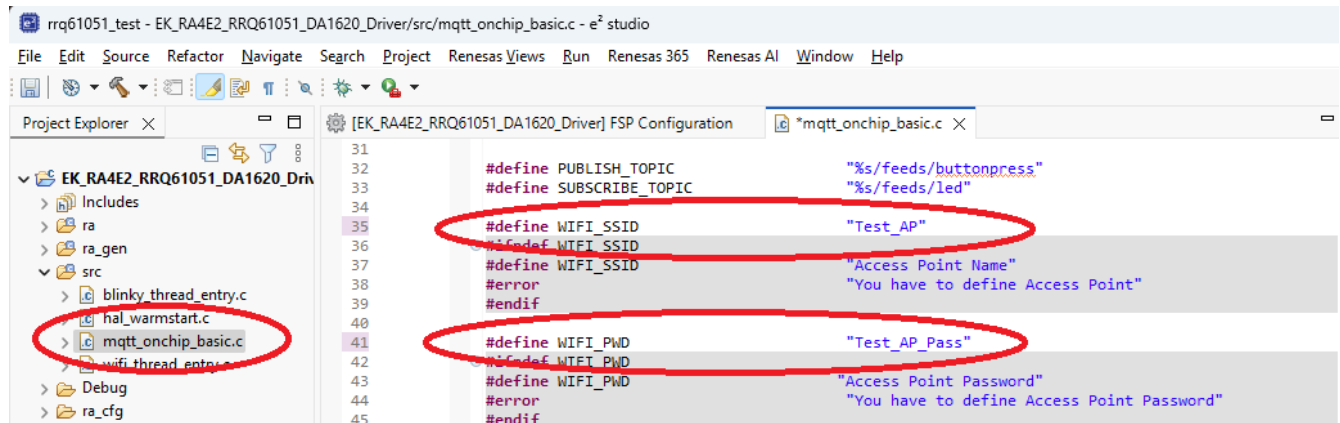


Figure 7. Enter WiFi Credentials

### 6.1.5 Fix DA16200 and RRQ61051 Compatibility Issue

The RRQ61051 SDK returns an error if you attempt setting QoS after the connection has been established. It does it before establishing connection. See the lines marked in red in [Figure 8](#).

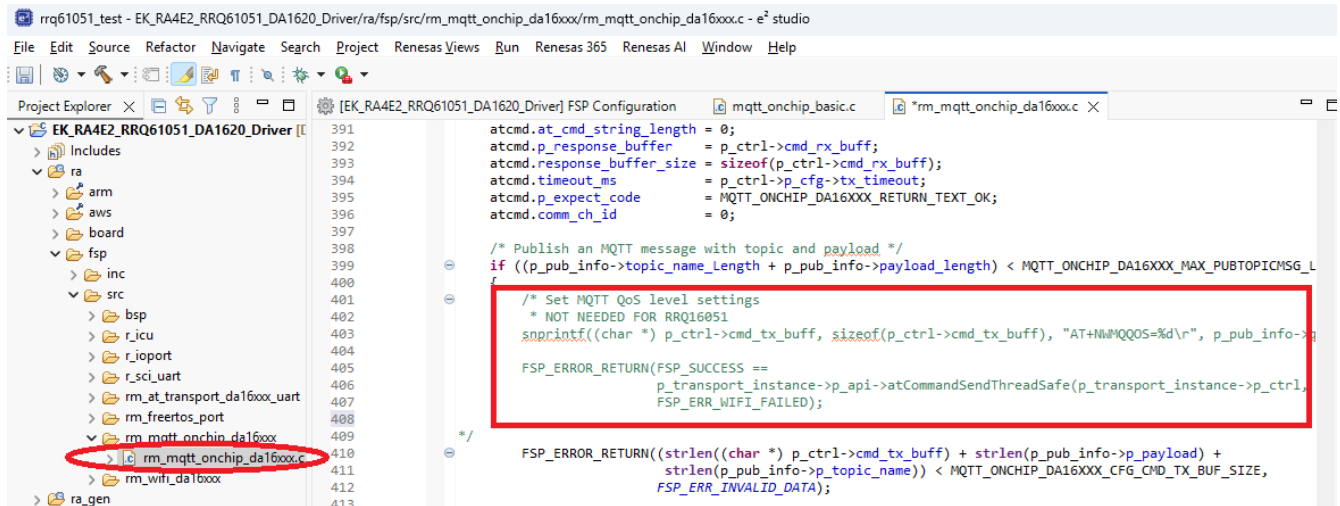


Figure 8. Quick Fix Adapting DA16xxx FSP Driver

### 6.1.6 Compile and Flash the Project

After project compilation, you might get two warnings as shown in Figure 9. These warnings just inform that steps mentioned in sections 6.1.3 and 6.1.5 are properly completed. The warning macros can be commented out, deleted or ignored.

```

Extracting support files...
18:13:53 **** Incremental Build of configuration Debug for project EK_RA4E2_RRQ61051_DA1620_Driver ****
make -r -j8 all
Building file: ../src/mqtt_onchip_basic.c
../src/mqtt_onchip_basic.c:6:2: warning: #warning "Romeve if you have already entered your mqtt user name and password in FSP" [-Wcpp]
6 | #warning "Romeve if you have already entered your mqtt user name and password in FSP"
  | #warning
../src/mqtt_onchip_basic.c:9:2: warning: #warning "Modifications are needed for DA16200 driver. Explanation is below" [-Wcpp]
9 | #warning "Modifications are needed for DA16200 driver. Explanation is below"
  | #warning
Building target: EK_RA4E2_RRQ61051_DA1620_Driver.elf
arm-none-eabi-objcopy -O srec "EK_RA4E2_RRQ61051_DA1620_Driver.elf" "EK_RA4E2_RRQ61051_DA1620_Driver.srec"
arm-none-eabi-size --format=berkeley "EK_RA4E2_RRQ61051_DA1620_Driver.elf"
   text    data     bss     dec     hex filename
 69124    508   30344   99976   18688 EK_RA4E2_RRQ61051_DA1620_Driver.elf

18:13:54 Build Finished. 0 errors, 2 warnings. (took 1s.189ms)
    
```

Figure 9. Project Compilation Result

## 6.2 Test Application

LEDs on the EK-RA4E2 shows the status of application:

- Blue LED (LED1) is illuminated right after starting WiFi module. It informs about successful initialization.
- Green LED (LED2) is illuminated after successful connection to the access point.
- Red LED (LED3) is illuminated after successful MQTT connection
- All three LEDs start blinking after successful initial topics post.

At this stage, you can open Adafruit feeds window and you should see the view like the one in Figure 10.

Feed Name	Key	Last value	Recorded
<input type="checkbox"/> buttonpress	buttonpress	Button not pressed	less than a minute ago
<input type="checkbox"/> led	led	2:1	less than a minute ago

Figure 10. Adafruit Feeds after Initial Topics Post

By pressing the S1 and S2 buttons on the EK board, you should get information in Buttons feed on Adafruit website (see Figure 11).

Created at	Value	Location
2026/05/06 06:10:48PM	Button pressed 1	✗
2026/05/06 06:10:37PM	Button pressed 2	✗
2026/05/06 06:09:33PM	Button not pressed	✗

Figure 11. Button Press Feedback on Adafruit

The test application subscribes to MQTT “led” feed. The purpose of it is to change the blinking LEDs. By writing <led\_index>:<blink> command, you can switch on or off selected LEDs. For example:

- Write: 1:0 – to switch off blue LED
- Write: 2:0 – to switch off green LED
- Write: 3:0 – to switch off red LED

To switch LED back on, <blink > value should be 1. Examples are also shown in the Adafruit led feed window in

Created at	Value	Location
2026/05/06 06:11:53PM	2:0	×
2026/05/06 06:11:41PM	3:0	×
2026/05/06 06:09:33PM	1:1	×
2026/05/06 06:09:33PM	2:1	×
2026/05/06 06:09:33PM	3:1	×
2026/05/06 06:08:07PM	3:1	×

Figure 12. LED Feed Adafruit Window Showing how to Switch Off/On LEDs

## 7. Ordering Information

Part Number	Description
QCIOT-RRQ61051EVZ	RRQ61051 PMOD Board
EK-RA4E2	Evaluation Kit for RA4E2 MCU Group

## 8. Revision History

Revision	Date	Description
1.00	Jun 5, 2026	Initial release.

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