RA6W1 Getting Started Guide

This document is intended to help new or existing developers quickly start evaluating the EVB and using SDK to develop Wi-Fi applications with the RA6W1 chipset.

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1. Terms and Definitions

API	Application Program Interface
Arm	Advanced Risk Machine
Bluetooth LE	Bluetooth® Low Energy
COM	Communication Port
CPU	Central Processing Unit
DMP	Dynamic Power Management
EVB	Evaluation Board
EVK	Evaluation Kit
FSP	Flexible Software Package
GCC	GNU Compiler Collection
GPIO	General-Purpose Input/Output
IC	Integrated Circuit
IDE	Integrated Development Environment
MCU	Micro Controller Unit
PMGR	Power Manager
QSPI	Quad Serial Peripheral Interface
RAM	Random Access Memory
ROM	Read Only Memory
RTC	Real Time Clock
RTOS	Real Time Operating System
SD	Secure Digital
SDK	Software Development Kit
SMA	SubMiniature version A
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver/Transmitter
UDP	User Datagram Protocol
WLCSP	Wafer Level Chip Scale Package
WSL	Windows Subsystem for Linux

2. References

[1] RA6W1 Datasheet, Renesas Electronics.
[2] RA6W1 DEVKT Electric Schematic, Renesas Electronics.
[3] RA6W1 EVK Hardware Description, Manual, Renesas Electronics.
[4] RA6W1 FSP Documentation, Renesas Electronics.

Note 1 References are for the latest published version, unless otherwise indicated.

3. Overview

RA6W1 is a highly integrated ultra-low-power Wi-Fi system on chip (SoC) that allows you to develop Wi - Fi solutions using a single chip. This Getting Started Guide provides an overview of setting up the RA6W1 EVK, Programming the released SDK images, instructions for importing and building images with the sample project template using e^2 studio Integrated Development Environment (IDE).
The following are the quick guidelines to start using EVB:

- RA6W1 EVB hardware (see Section 4 Evaluation Kit).
- Setting up the evaluation board (see Section 5 Set Up RA6W1 EVK).
- Programming firmware image (see Section 5.1 Firmware Image Programming).
- Configuring EK- RA6W1 Serial Debug Interface image (see Section 5.2 Configure RA6W1 EVK Serial Debug Interface).
- Provisioning Wi-Fi (see Section 5.3 Provision Wi-Fi).
- Evaluating throughput with iPerf (see Section 6.1 Test Throughput with iPerf Traffic Generator).
- Measuring current consumption (see Section 6.2 Measure Current Consumption).
- Software Development Kit and Build Setup (see Section 7 Software Development Kit and Build Setup).

4. Evaluation Kit

The RA6W1 EVK is designed to test and develop Wi-Fi applications quickly. The EVK is provided to simplify the process of starting a project with the RA6W1.
The EVKcontains:

- Evaluation kit (EVK): made by a motherboard with debugging and power measurement circuitry and a daterboard containing the RA6W1 chip and related needed circuitry.
- USB cable.

4.1 RA6W1 EVK

Figure 1 shows the hardware configuration of the RA6W1 EVK and Table 1 shows EK-RA6W1 components and descriptions.

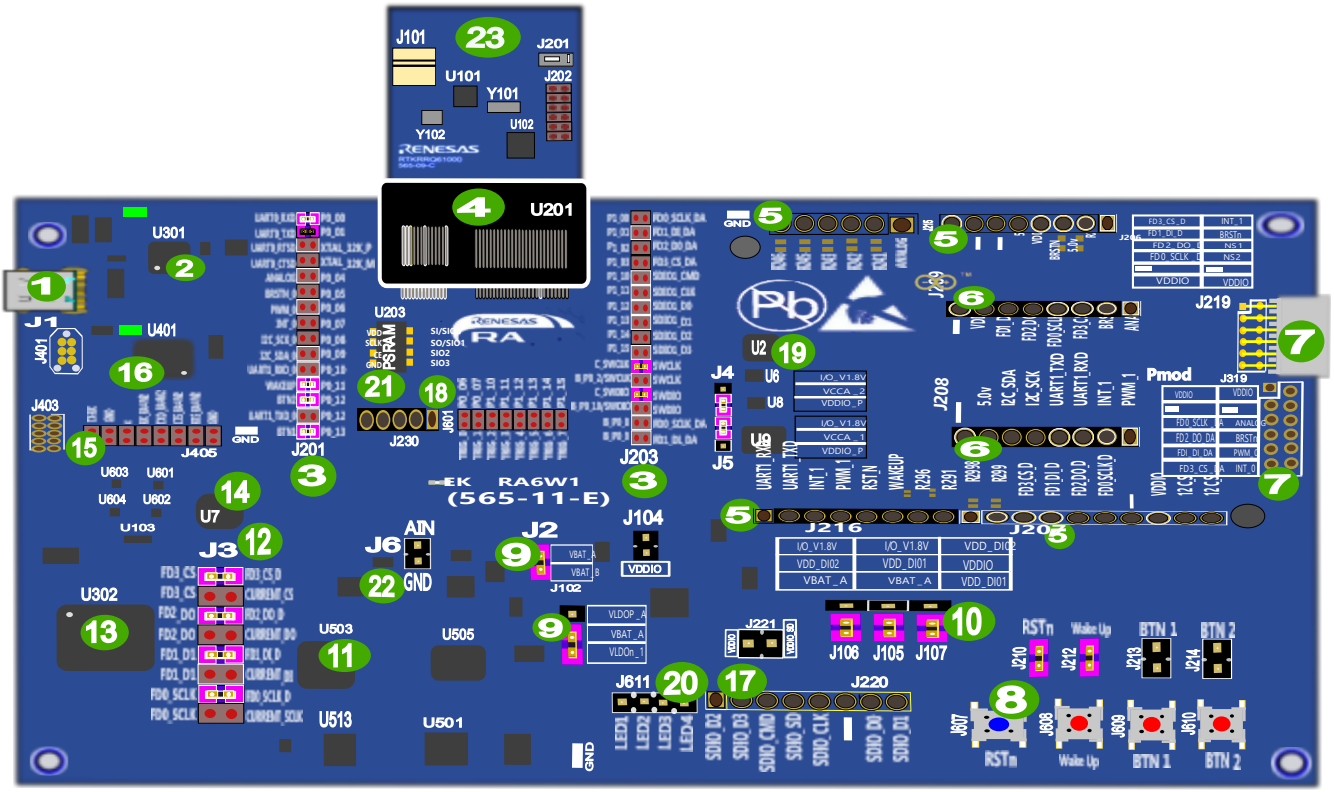

Figure 1. RA6W1 EVK hardware configuration

Table 1. RA6W1 EVK components

No	Name	Description
1	USB302 – USB port	Provides power and data port for the RA6W1 EK.
2	U301 – USB HUB	Connects JTAG and UART interfaces to the PC.
3	J201/J203 – Signal/Power breakout headers	Exposes all the pins of the Daughterboard and Motherboard to allow wiring for custom configurations as well as monitoring of the hardware signals. See Figure 2and Figure 3.
4	U201- daughterboard connector	The interface mating connector for the Daughterboard.
5	J206/J207/J215/J216 - Arduino sockets	The sockets for plugging in Arduino interface add-on boards. See Figure 9.
6	J208/J209 - MikroBUS™ sockets	Sockets for plugging in MikroBUS™ interface add-on boards. It is multiplexed with PMOD (to be used with DA1453x). See Figure 13.
7	J219 - PMOD	The socket for plugging in PMOD interface add-on boards. J319 is a header, No mounted. J219 and

No	Name	Description
	connectors	J319 share some signals which are multiplexed with MikroBUS™. See Figure 5.
8	J607 - Push-buttons	J607 push-button used to reset Daughterboard, J608/J609/J610 push buttons for general use. See Figure 11.
9	J2/J102 - Power selection	The current sense circuit option. Using this current measurement circuit, you can monitor the current consumption of Daughterboard through Smart Snippets Toolbox software application.
10	J105/J106/J107 - I/O voltage selection	Selects the I/O voltage applied to the Daughterboard (1.8 V, 3.3 V).
11	U503 - Current sense	The current sense circuit.
12	J3 - SPI interface switch	Selects the I/O voltage generated for the Daughterboard board (1.8 V, 3.3 V). See Figure 14.
13	U302 - USB interface IC	Provides communication between Daughterboard UART port and PC. It also transfers the current measurement samples to PC.
14	U7 - Level translators	Transfers the data between Daughterboard and FTDI (U302) in proper voltage level.
15	J405 - External J-link connector	Provides access toWi-Fi SoC or Bluetooth LE SoC. See Figure 6.
16	U401 – MCU	Place where the SWD implementation of SEGGER applied.
17	J220 - SDIO header	Must be mounted.
18	J601 – Trigger	The trigger signals monitored and presented on Smart Snippets Toolbox. See Figure 12.
19	U2/U6/U8/U9 - Level translators	For the interface section (PMOD, Android and MikroBUS).
20	J611 – LEDs	Four LEDs are connected to this header. To enable an LED, a jumper wire must be connected between a GPIO and one of the pins of J611.
21	U202 - PSRAM	PSRAM. See Figure 4.
22	J6 – AIN GND	AIN is a generic Analog Input which is accessible on J6 header.
23	Daughterboard	

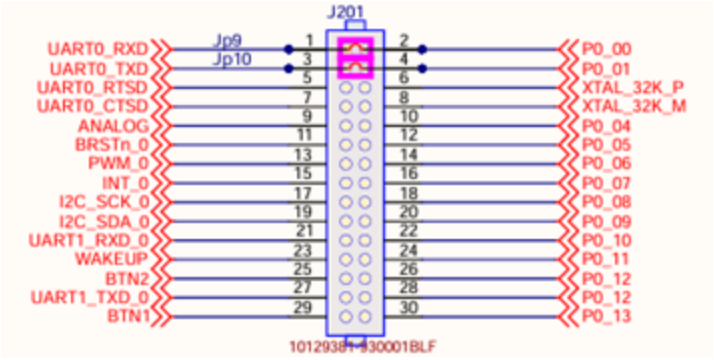

Figure 2. Breakout header J201

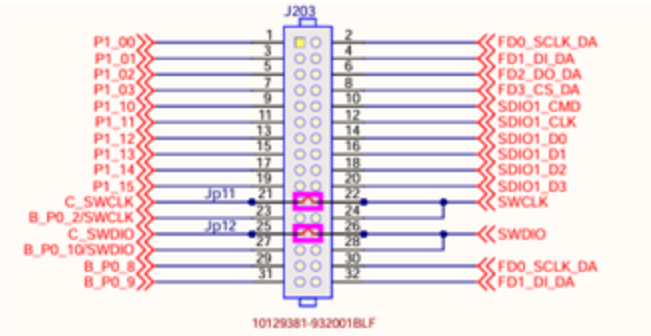

Figure 3. Breakout header J203

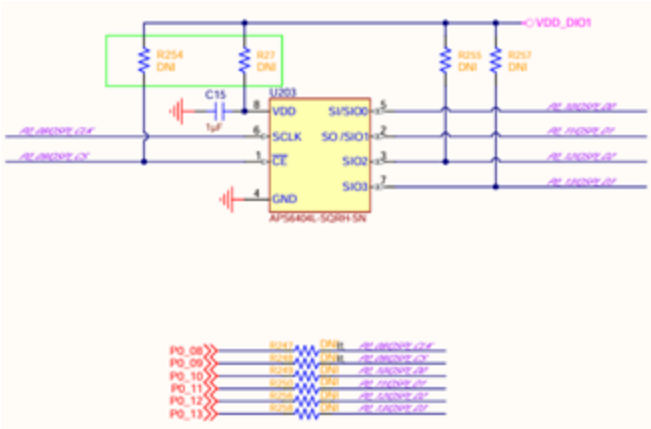

Figure 4. PSRAM

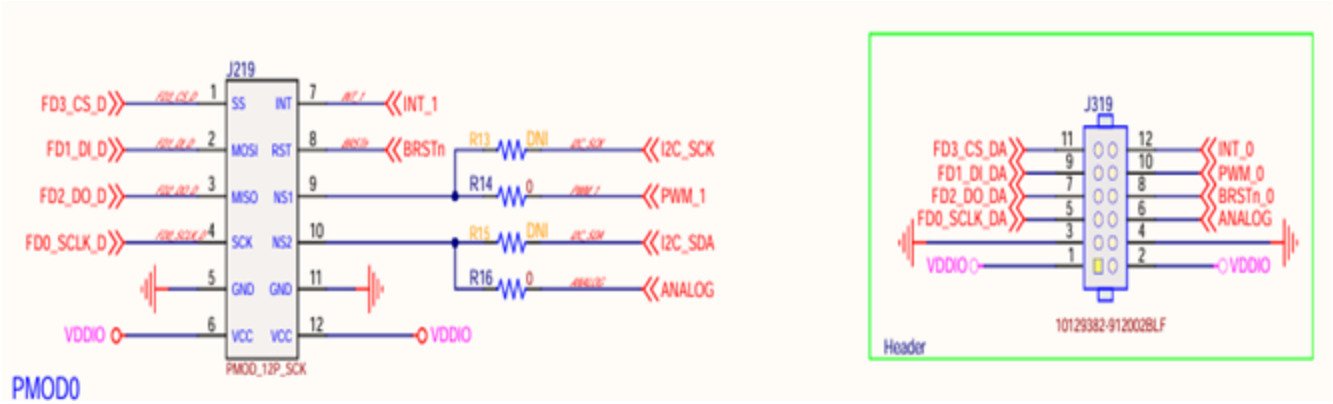

Figure 5. PMOD

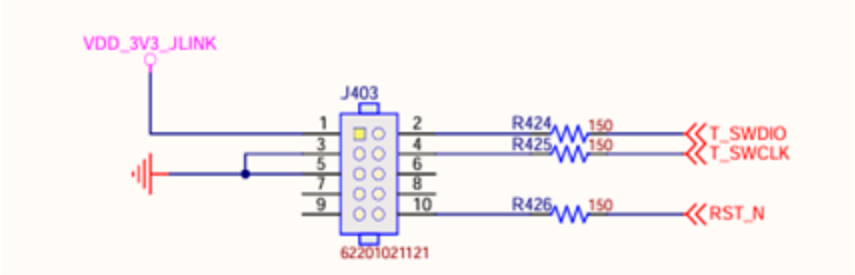

Figure 6. External J-link connector

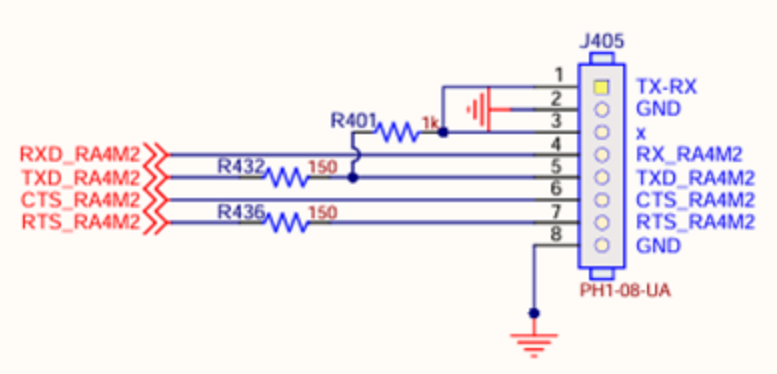

Figure 7. Auxiliary UART

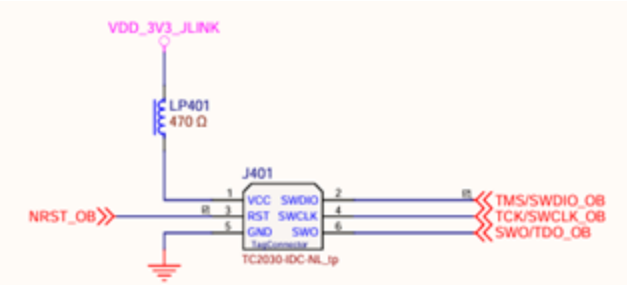

Figure 8. Programming RA4M2

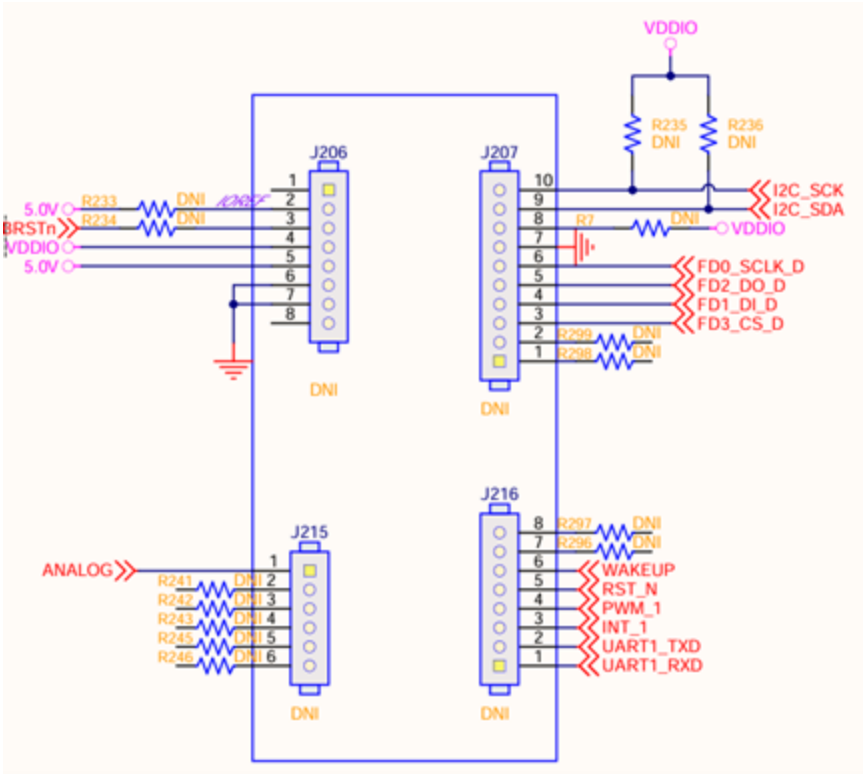

Figure 9. Arduino Interface

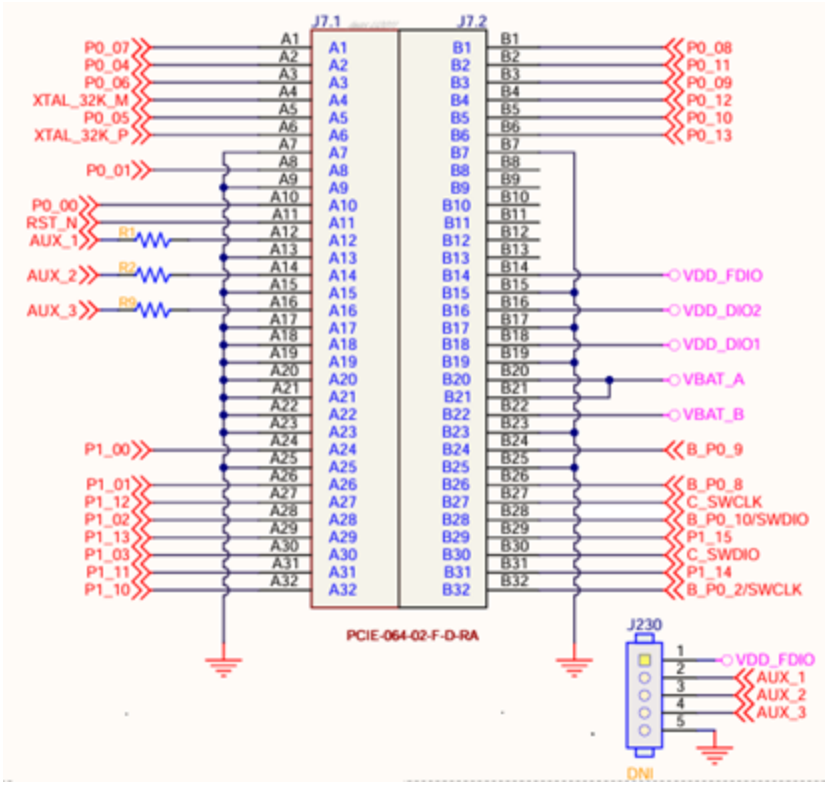

Figure 10. Daughter_Board Connector

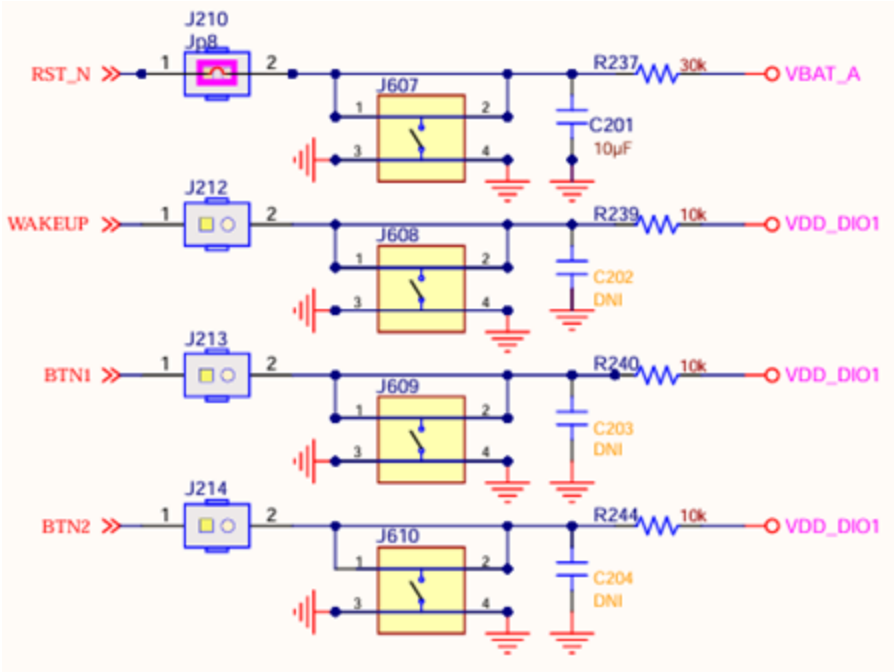

Figure 11. Buttons

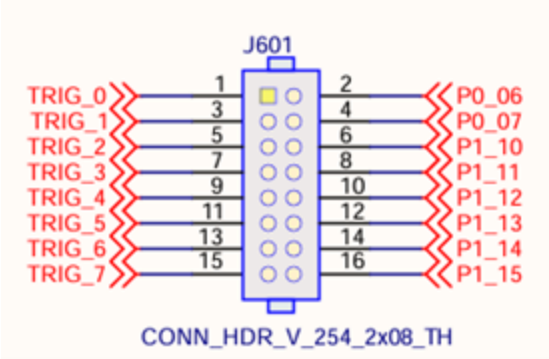

Figure 12. Trigger

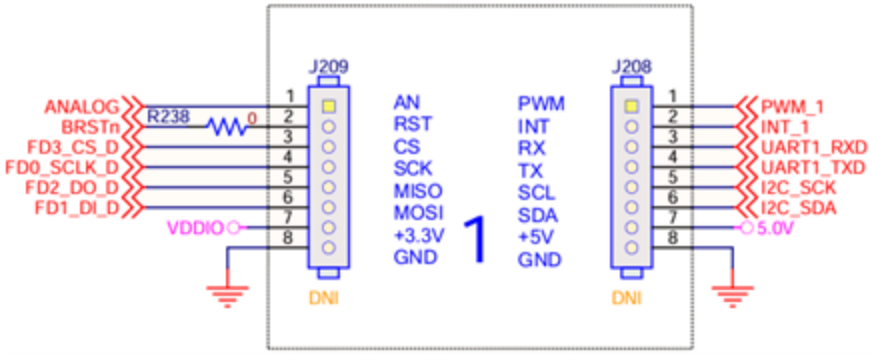

Figure 13. Micro BUS

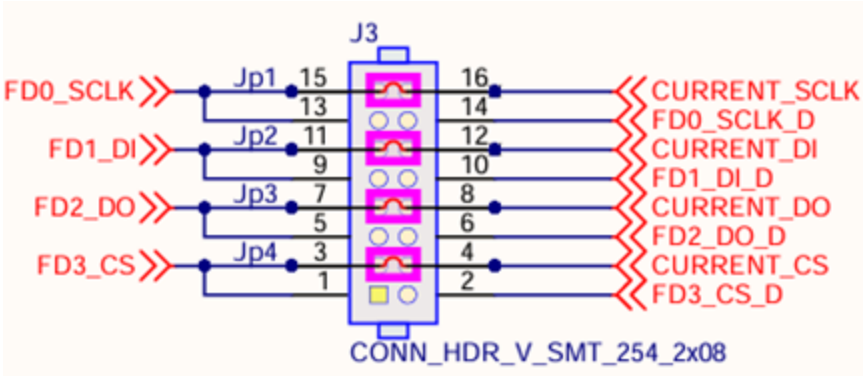

Figure 14. J3

Figure 15 shows the hardware configuration of the daughterboard of RA6W1 EVK.

NOTE
Renesas recommends using a daughterboard with antenna.

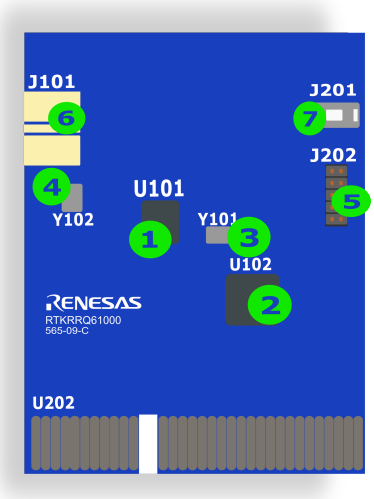

Figure 15. RTK RA6W1 daughterboard

Table 2 shows the components of EK-RA6W1 daughterboard.

Table 2. RA6W1 EVK daughterboard components

No	Name	Description
1	U101 – RA6W1	RA6W1 – WLCSP
2	U102 – Serial flash	Serial flash – AT25SL641
3	Y101 – Crystal	40 MHz crystal
4	Y102 – Crystal	32.768 kHz crystal
5	U202 – J-flash connector	J-link for SPI flash connector
6	J101 – SMA connector	SMA connector for external antenna
7	J201 – Reset switch	Switches to reset the RA6W1

5. Set Up RA6W1 EVK

Before setting up ensure that the Evaluation Kit (EVK) and the required software are properly connected and installed. Use the USB cable included in the EVK to connect the host computer and the EVK. When the EVB is connected to the USB port (USB302 on the RA6W1 EVK) USB Serial COM ports are created.

- For Windows, three USB Serial COM ports are displayed in the device manager (see Figure 16).

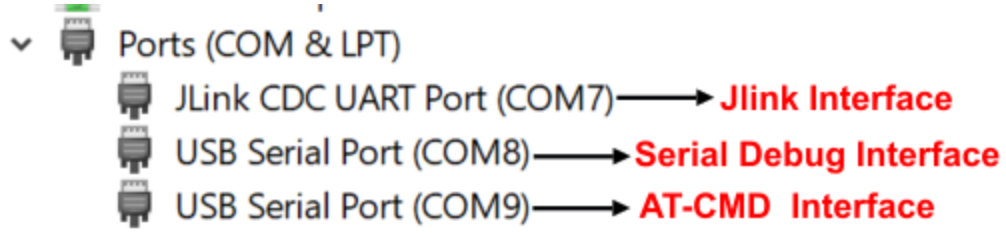

Figure 16. Windows – COM ports

NOTE
If Windows Device Manager displays **Unknown Device**, the FTDI serial driver is not installed. Download the driver by following the URL and installing it manually: http://www.ftdichip.com/Drivers/.

The lower numbered J-Link CDC UART Port (COM7, in this case) is the onboard J-Link. The next USB Serial Port (COM8, in this case) is for the RA6W1 debug interface. The higher numbered USB Serial Port (COM9, in this case) is for the RA6W1 AT command interface or current consumption measurement. A serial terminal application can be used for debugging RA6W1.

The **Tera Term** terminal emulator program is recommended and can be downloaded from https://github.com/TeraTermProject/teraterm/releases/tag/v5.2.

- For Linux, two Serial COM ports are created. It can be checked using the following command in Terminal.

```
developer:~$ ls /dev/ttyUSB*
developer:~$ /dev/ttyUSB0 /dev/ttyUSB1
```

The lower numbered USB Serial Port (/dev/ttyUSB0, in this case) is for the RA6W1 debug interface. The higher numbered USB Serial Port (/dev/ttyUSB1, in this case) is for the RA6W1 AT command interface or current consumption measurement. A serial terminal application can be used for debugging RA6W1.

Minicom is recommended for Linux and to install minicom on Linux, run this command:

```
developer:~$ sudo apt-get install minicom
```

When the terminal emulation application is installed, connect the USB cable to USB302 on the RA6W1 EVK and start the terminal emulation program. In the terminal emulation program, go to the Serial Port setup and select the preferred COM Port.

5.1 Firmware Image Programming

5.1.1 Program Firmware Images for Windows

Programming firmware images to the EVK requires the Renesas Flash Programmer (RFP) tool. The RFP provides a graphical interface to flash binary images into the RA6W1 EVK through the on-chip debug interface.

System requirements:

- OS: Windows 11 (64 bit)
- USB drivers (installed along with RFP setup)
- Renesas Flash Programmer V3.21.00 or later
- Hardware: RA6W1 EVK.

To program firmware:

1. Download and launch the Renesas Flash Programmer installer.
2. In the **Software License Agreement** dialog, select **Agree**, then click **Next**.

3. During installation, in the **Windows Security** dialog, to install the Renesas USB driver, select **Always trust software from "Renesas Solutions Corp."**, and click **Install**, and then click **Next**.

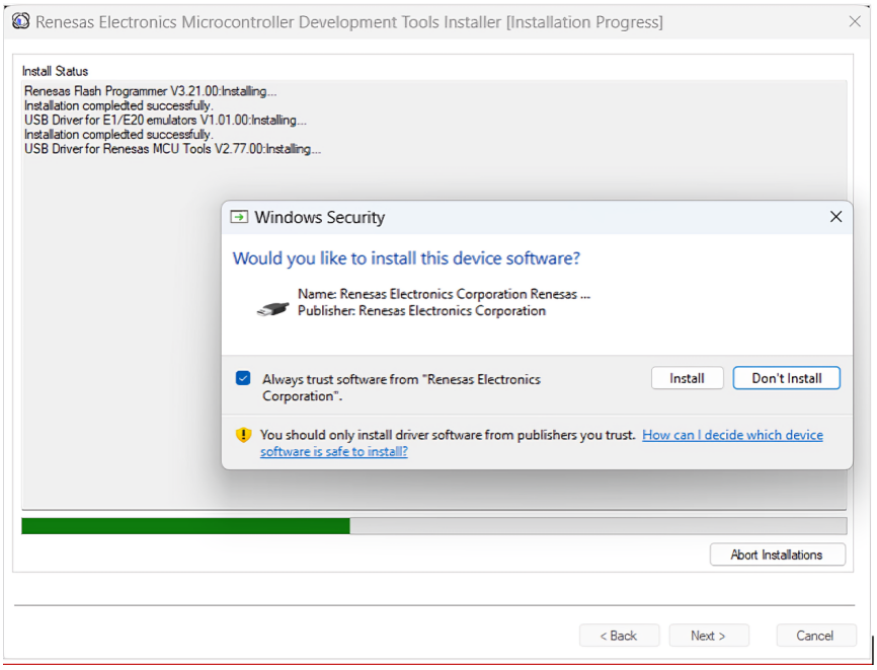

Figure 17. Windows Security prompt for USB driver installation

4. After installation is completed, to exit the setup, click **Finish**.
5. From the Windows Start menu, launch the Renesas Flash Programmer tool.

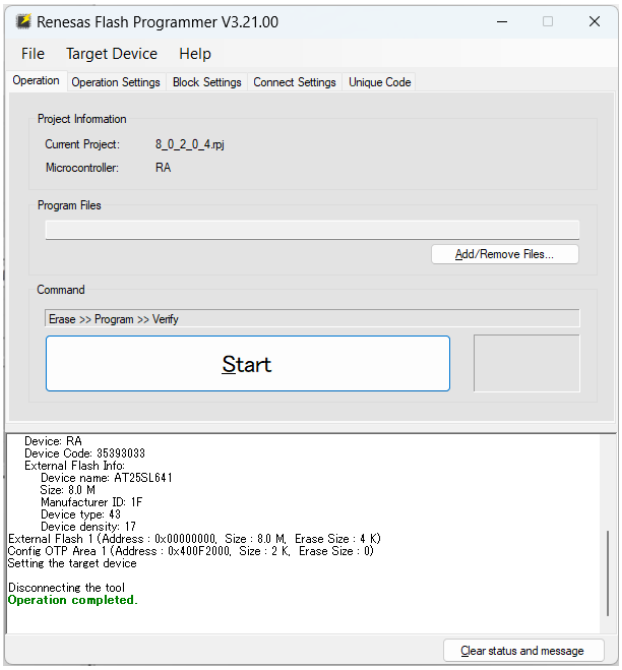

Figure 18. RFP GUI

6. Connect the RA6W1 EVK to the PC using the USB debug interface.

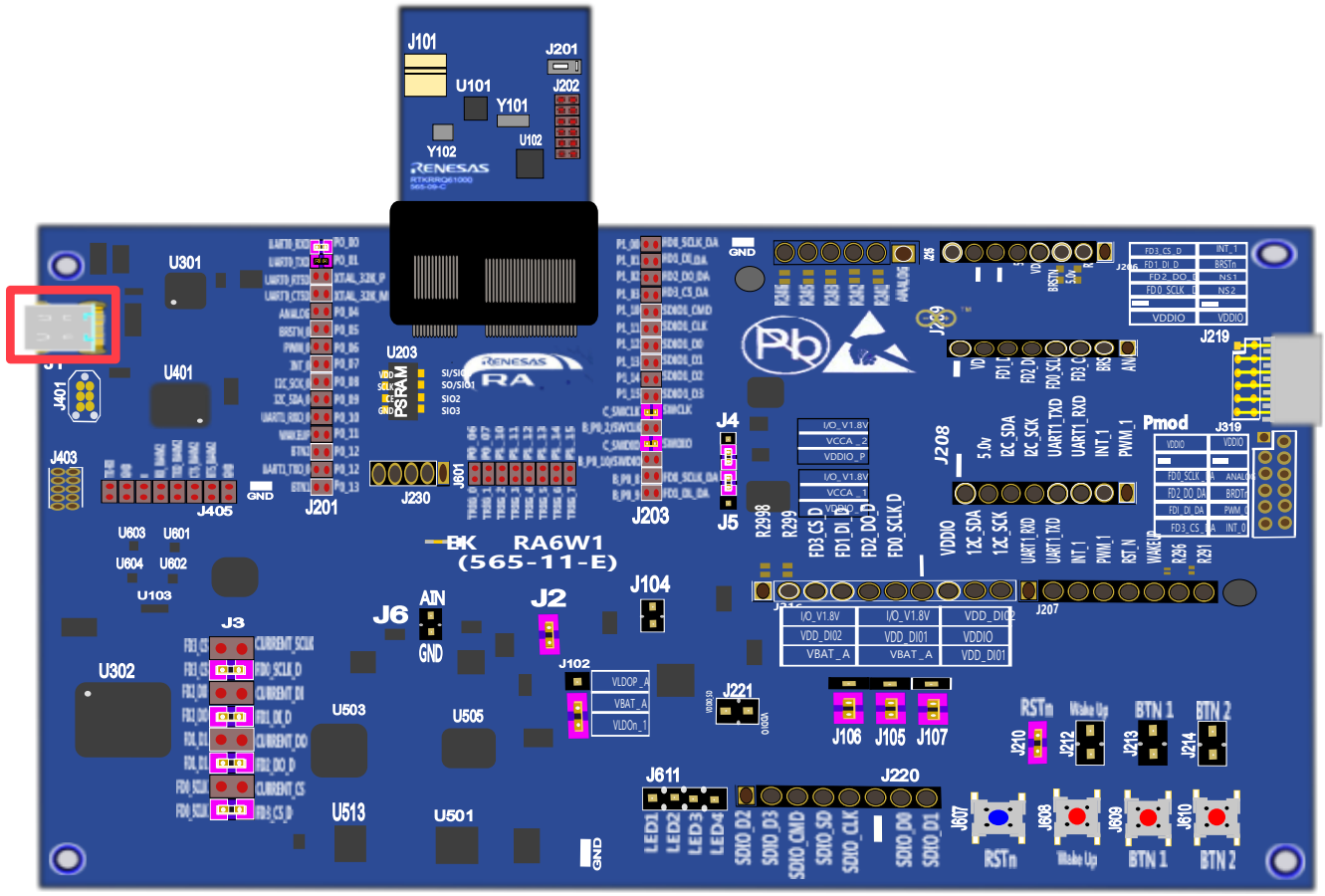

Figure 19. RA6W1 EVK hardware

7. In the tool, to create a new project, go to **File** > **New Project**, and do the following:
   a. In **Microcontroller**, select the **RA6W1, RA6W2** as the target microcontroller.

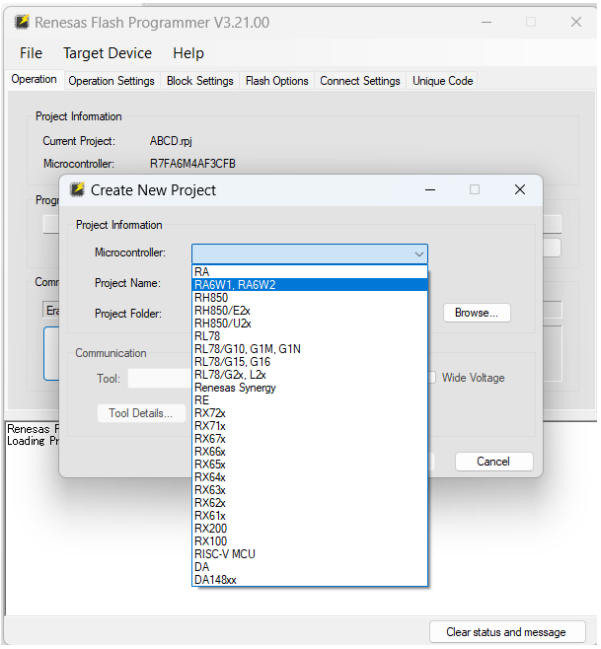

Figure 20. Selecting target microcontroller

   b. In **Project Name**, enter a project name and click **Connect**.

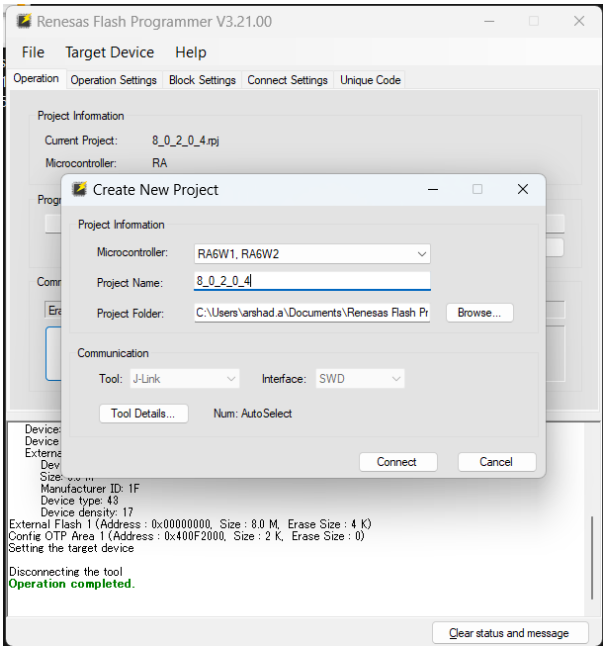

Figure 21. Connecting RA6W1RA6W2 EVK

After the device is connected, the status message displays **Operation completed**.

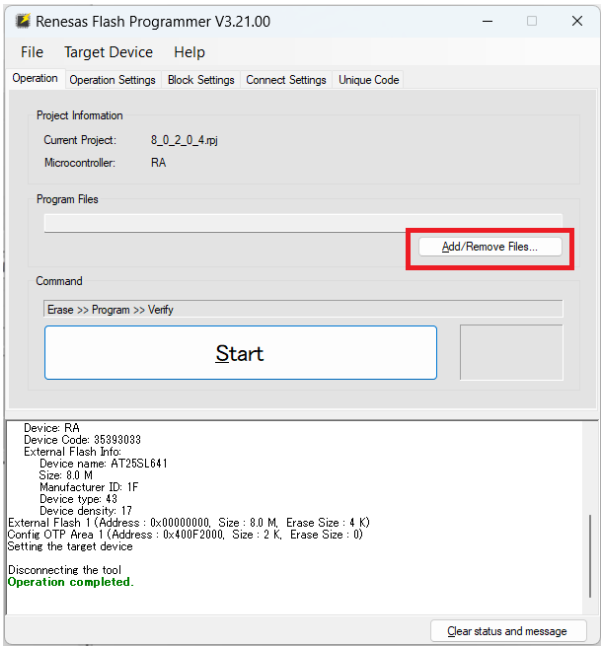

Figure 22. Connection status – operation completed

8. In the **File Details** dialog, to confirm the file selection, click **OK**.

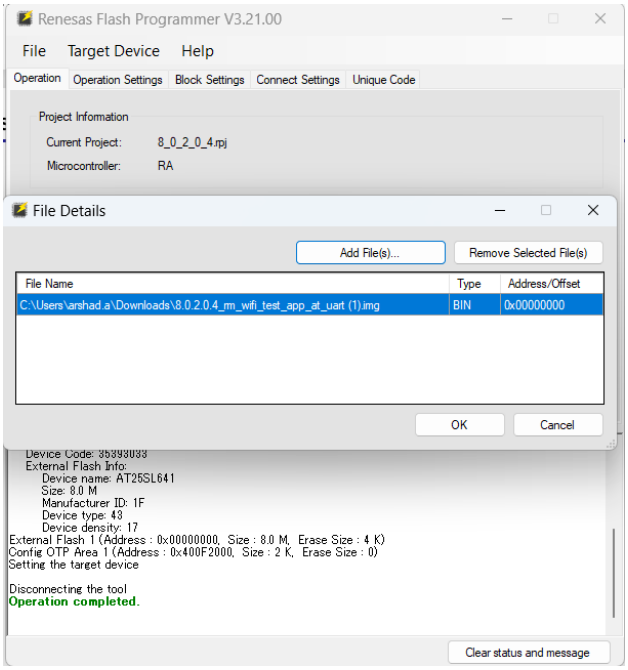

Figure 23. Confirming file selection

9. In **Renesas Flash Programmer**, to flash the image, click **Start**.

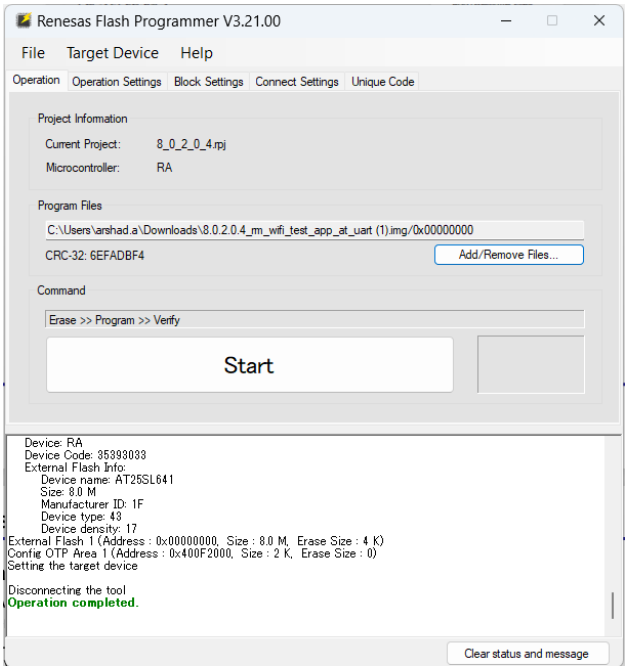

Figure 24. Start programming

The **Progress Report** dialog appears, showing the running progress.

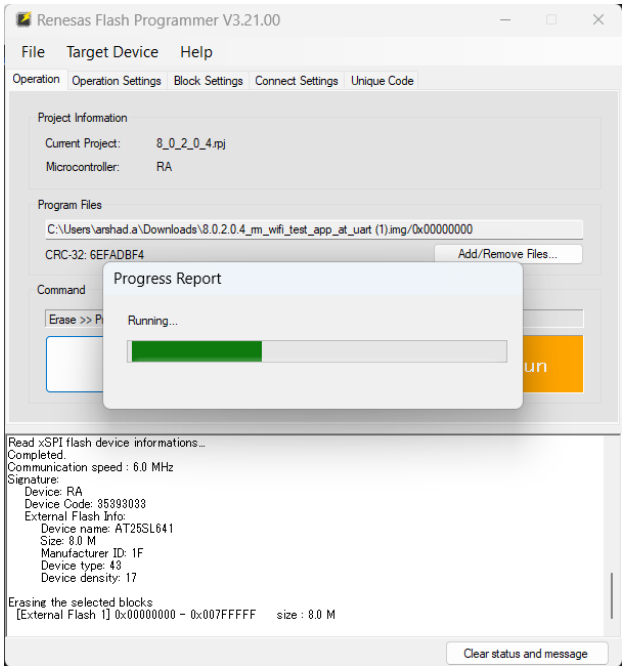

Figure 25. Progress report

When the programming is completed, the status window displays ″Operation completed″, indicating that the firmware image is successfully written to the RA6W1 EVK.

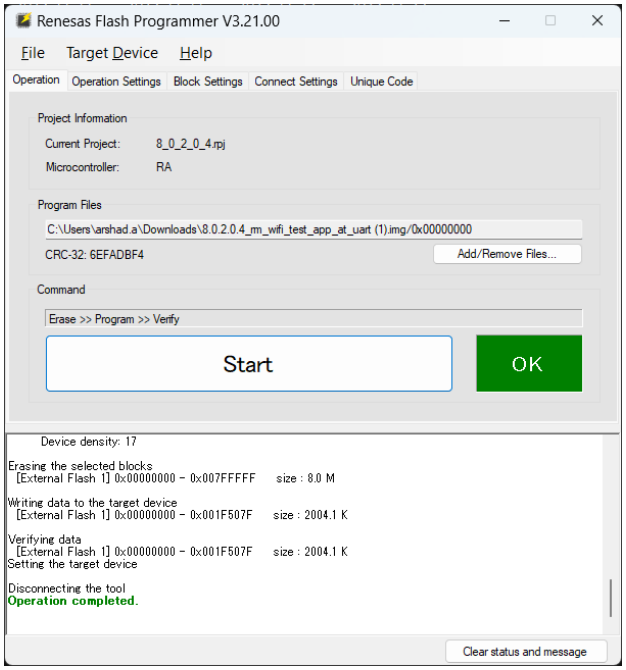

Figure 26. Programming completed successfully

5.1.2 Program Firmware Images for Linux

Programming firmware images to EVK in Linux requires the CLI tool of Renesas Flash Downloader.
System requirements:

- OS: Ubuntu 22.04.4 LTS or later.
- J-Link Linux driver – J-Link Version 864 or later.
- Renesas Flash Programmer V3.21.00 or later
- Hardware: RA6W1RA6W2 EVK.

To program the firmware:

1. Extract the RFP_CLI_Linux_V32100_x64.tgz.

```
tar -xzf RFP_CLI_Linux_V32100_x64.tgz
```

2. Go to the extracted folder and check the J-Link serial number.

```
cd linux-x64/
./rfp-cli -d RA6W1 -lt
```

3. Program the firmware.

```
./rfp-cli -d RA6W1 -tool jlink:<jlink_serial_no> -if swd -s 25M -auto -bin 0 <path_to_.img
file>
```

For example of successful operation, see Figure 27.

```
developer@thinkpalm-ThinkCentre-Neo-50s-Gen-3:~/Downloads/RFP_CLI_Linux_V32100_x64/linux-x64$ ./rfp-cli -d RA6W1 -lt
Renesas Flash Programmer CLI V1.14
Module Version: V3.21.00.000

[Tool]
jlink    J-Link
  1100010295
developer@thinkpalm-ThinkCentre-Neo-50s-Gen-3:~/Downloads/RFP_CLI_Linux_V32100_x64/linux-x64$ ./rfp-cli -d RA6W1 -tool jlink:1100010295 -if swd -s 25M -auto -bin 0 /hom
e/developer/Downloads/8.0.2.99.7_rm_wifi_test_app.img
Renesas Flash Programmer CLI V1.14
Module Version: V3.21.00.000
Load: "/home/developer/Downloads/8.0.2.99.7_rm_wifi_test_app.img" (Offset=00000000)

Connecting the tool (J-Link)
      J-Link Firmware: J-Link OB-RA4M2-CortexM compiled Nov 10 2025 13:48:15
Tool: J-Link (SEGGER J-Link (unknown))
Interface: SWD

  Loading flash configurations file... (Resources/RA6W1/flash_configurations)
  Completed.
  Loading bootloader binary... (Resources/RA6W1/uartboot.bin)
  Completed. 40.9 K
  Read xSPI flash device informations...
  Completed.
Speed: 25,000,000 Hz
Connected to RA

Erasing the target device
  [External Flash 1]   00000000 - 007FFFFF
  [External Flash 1]   00000000 - 001F2FFF
Writing data to the target device
  [External Flash 1]   00000000 - 001F20FF
Verifying data on the target device
  [External Flash 1]   00000000 - 001F20FF


Disconnecting the tool

Operation successful
developer@thinkpalm-ThinkCentre-Neo-50s-Gen-3:~/Downloads/RFP_CLI_Linux_V32100_x64/linux-x64$
```

Figure 27. Programming of firmware in Linux

5.1.3 Program Firmware Images for macOS

Programming firmware images to EVK in macOS requires the CLI tool of Renesas Flash Downloader.
System requirements:

- OS: Mac OS 14 (Sonoma) or later versions.
- J-Link driver – J-Link Version 864 or later.
- Renesas Flash Programmer V3.21.00 or later
- Hardware: RA6W1 EVK.

To program firmware:

1. Extract the RFP_CLI_macOS_V32100_arm64.zip.

```
tar -xzf RFP_CLI_macOS_V32100_arm64.zip
```

2. Go to the extracted folder and check the J-Link serial number.

```
cd macos-arm64
```

```
./rfp-cli -d RA6W1 -lt
```

3. Program the firmware using this command:

```
./rfp-cli -d RA6W1 -tool jlink:<jlink_serial_number> -if swd -s 25M -auto -bin 0 <path_to_.img
file>
```

For example of successful operation, see Figure 28.

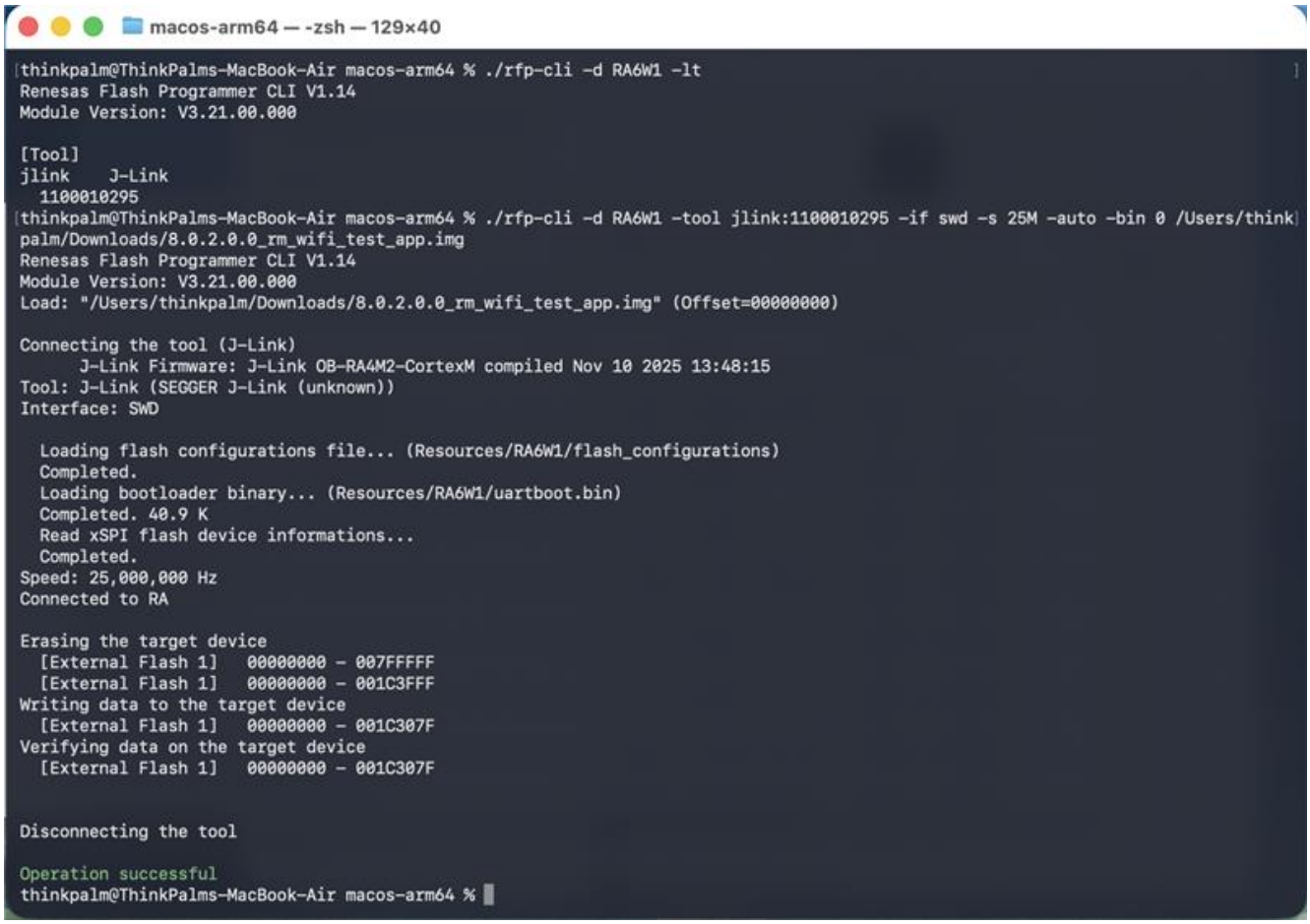

Figure 28. Programming of firmware in macOS

5.2 Configure RA6W1 EVK Serial Debug Interface

The RA6W1 provides a command/debug interface on UART0 for performing configuration and diagnostic functions. Connect the USB cable to the USB302 on the RA6W1 EVK and start the terminal emulation program.

5.2.1 Configure Tera Term Serial Terminal Application for Windows

1. In the Tera Term program, go to the **Serial Port** setup and select the lower numbered COM port (COM8, in this case) and configure it as in Table 3 and Table 4.

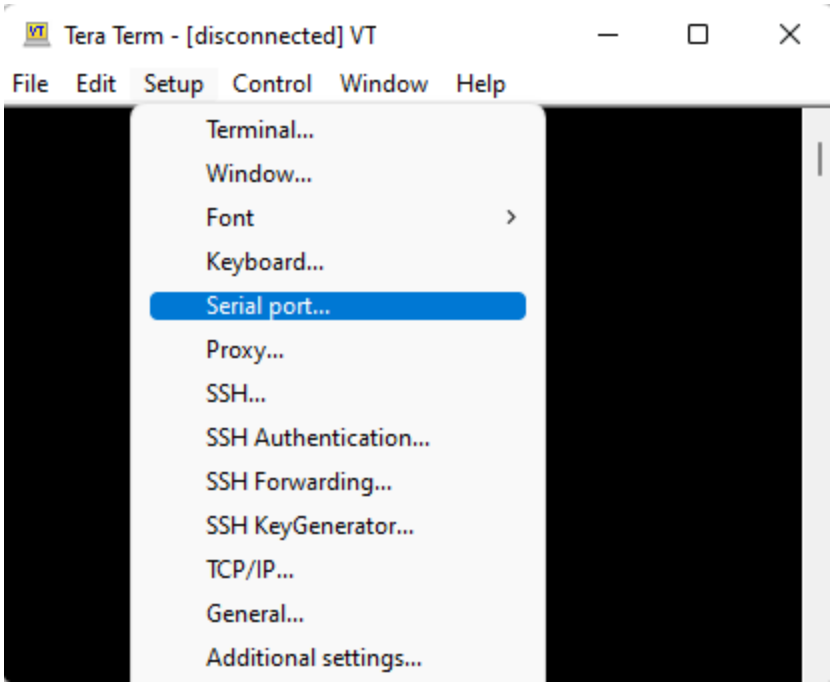

Figure 29. Serial port setup

2. Connect USB cable to RA6W1 EVK and pressing Enter. The following prompt appears in the UART console:
   `[/RA6W10`

Table 3. Serial port configuration values

Settings	Value
Baud Rate	115200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control (Hardware/Software)	None

Table 4. Terminal settings

Settings	Value
Receive	LF
Transmit	CR + LF

5.2.2 Configure Minicom for Linux

1. Connect the USB cable to the USB302 on the RA6W1 EVK and open a terminal for the minicom.
2. Start minicom using the following command:

```
developer:~$ sudo minicom -D /dev/ttyUSB0
```

3. Enter the password.
   After entering the password, minicom terminal view opens, see Figure 30.

NOTE
/dev/ttyUSB0 is for the debug interface and **/dev/ttyUSB1** is for the AT command interface

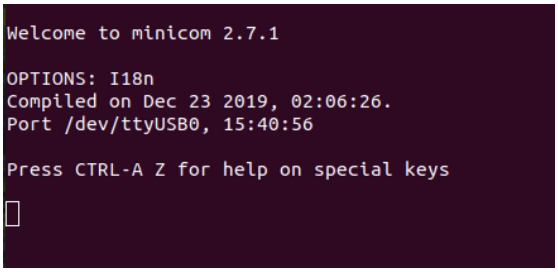

Figure 30. Minicom terminal view

4. To configure minicom, press Ctrl+A followed by Z. It prompts a command summary as shown in Figure 31.

Figure 31. Minicom command summary

5. When prompt appears, type O to select O for "cOnfigure Minicom..O".
6. In the configuration prompt, select **Serial port setup**.
7. Configure minicom values using letters as shown in Table 3 using letters to configure. For example, to select Baud rate, use **E.**

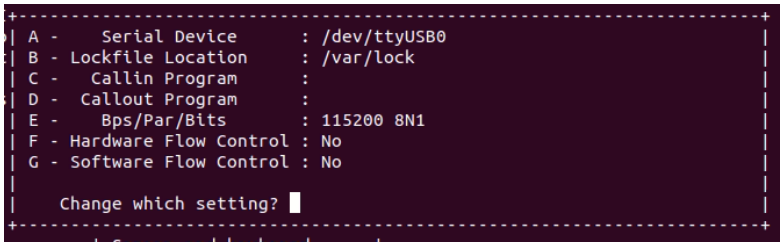

Figure 32. Setting minicom values

8. After it is configured, use "setup as dfl" for saving as default.
9. Press Enter.
   The **Configuration saved** dialog appears.

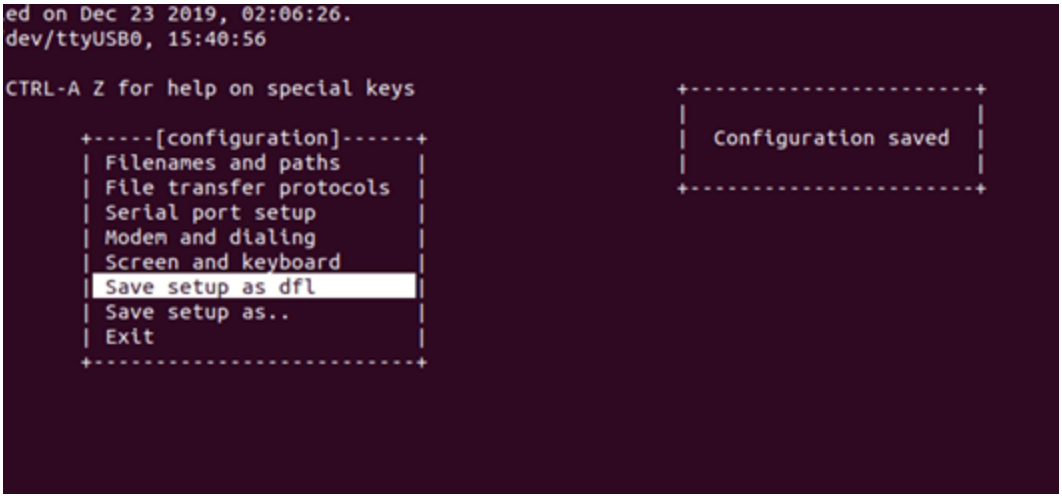

Figure 33. Configuration saved

10. Click **Exit**.
11. For proper minicom printing, press Ctrl+A followed by Z. It prompts the command summary in Figure 34.

Figure 34. Minicom command summary window

12. Select U for **Add Carriage Ret..U**.
13. To complete the configuration, press Enter. See Figure 35.

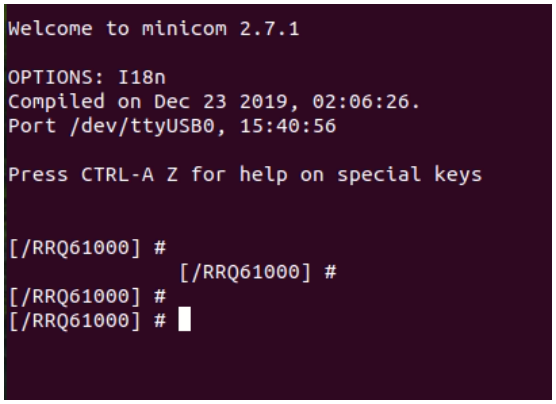

Figure 35. Successful configuration

5.2.3 Configure RA6W1 EVK AT Command Interface

5.2.3.1 AT Command Jumper Configuration

For using ATCommands, flash `8.0.2.0.X_rm_wifi_test_app_at_uart.img`.

The following jumper connections are necessary to facilitate the AT command UART connection, see Figure 36:

- Connect **P0_04** on J201 to **FD0_SCLK_DA** on J203
- Connect **P0_05** on J201 to **FD1_DI_DA** on J203
- Connect **FD3_CS** on J3 to **FD3_CS_D** on J3
- Connect **FD2_DO** on J3 to **FD2_DO_D** on J3
- Connect **FD1_DI** on J3 to **FD1_DI_D** on J3
- Connect **FD0_SCLK** on J3 to **FD0_SCLK_D** on J3

After connecting the jumpers, connect the RA6W1 to laptop through USB cable to access the AT command terminal.

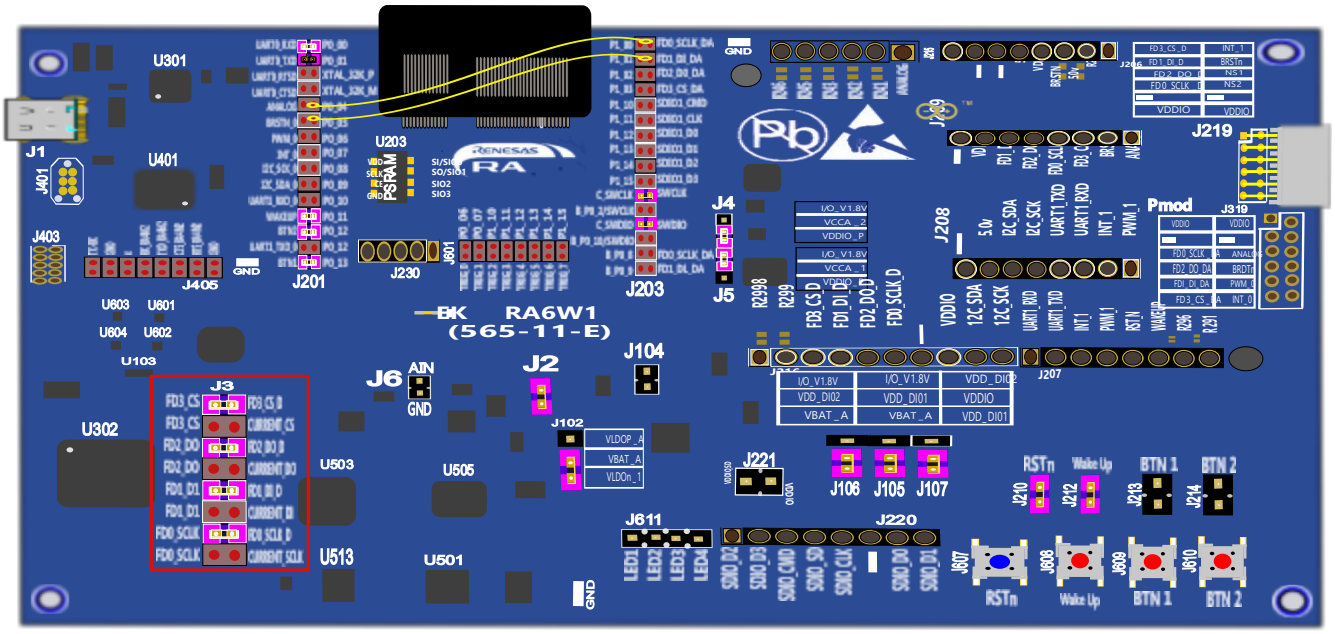

Figure 36. Jumper connections

5.2.3.2 AT Command Terminal Configuration

The RA6W1 provides an AT command interface on UART1 for performing configuration. Connect the USB cable to the USB302 on the RA6W1 EVK and start the terminal emulation program. In the terminal emulation program, go to the Serial Port setup and select the higher numbered COM port (COM9, in this case) and configure it as in Table 3 and Table 4.

When connecting USB cable to EK-RA6W1, the screen is initially blank. Enter the following command (which is hidden by default) in the blank screen to enable echo output:

```
ATE //(hidden)
Echo on //(command return)
OK
```

5.3 Provision Wi-Fi

Provisioning a Wi-Fi device is the process of setting up the device to connect to a network and function properly. This involves configuring network settings, ensuring secure authentication, and assigning necessary parameters.

5.3.1 Factory Reset (Optional)

Factory reset reverts the board to default configurations. To reset the board to default settings, enter: factory in the UART console window through Tera Term (or your console emulator).

After Factory Reset, the RA6W1 reboots. The Easy Setup Wi-Fi configuration wizard appears automatically.

5.3.2 Setup for Station Mode

You can configure the Wi-Fi functions of the RA6W1 by running the Easy Setup Wi-Fi configuration wizard.

NOTE
In case of factory reset, the Easy Setup Wi-Fi configuration wizard appears and then follows the following prompts. If reconfiguring, complete the following step.

To configure the RA6W1 for operating in Station mode, open its debug console and run the `setup` command at the [/RA6W1] prompt. To complete the setup, follow the following prompts:

```
[/RA6W1-RRQ61001] # setup                          Start the Easy Setup Wizard.

Stop all services for the setting.
Are you sure ? [Yes/No] : Y                          Enter Y to stop the services.

[RA6W1-RRQ61001 EASY SETUP - V4]

Country Code List:
AD  AE  AF  AI  AL  AM  AN  AR  AS  AT  AU  AW  AZ  BA  BB  BD  BE  BF  BG  BH
BL  BM  BN  BO  BR  BS  BT  BY  BZ  CA  CF  CH  CI  CL  CN  CO  CR  CU  CX  CY
CZ  DE  DK  DM  DO  DZ  EC  EE  EG  ES  ET  EU  FI  FM  FR  GA  GB  GD  GE  GF
GH  GL  GP  GR  GT  GU  GY  HK  HN  HR  HT  HU  ID  IE  IL  IN  IR  IS  IT  JM
JO  JP  KE  KH  KN  KP  KR  KW  KY  KZ  LB  LC  LI  LK  LS  LT  LU  LV  MA  MC
MD  ME  MF  MH  MK  MN  MO  MP  MQ  MR  MT  MU  MV  MW  MX  MY  NG  NI  NL  NO
NP  NZ  OM  PA  PE  PF  PG  PH  PK  PL  PM  PR  PT  PW  PY  QA  RE  RO  RS  RU
RW  SA  SE  SG  SI  SK  SN  SR  SV  SY  TC  TD  TG  TH  TN  TR  TT  TW  TZ  UA
UG  UK  US  UY  UZ  VA  VC  VE  VI  VN  VU  WF  WS  YE  YT  ZA  ZW  ZZ

COUNTRY CODE ? [Quit] (Default KR, ZZ : for debug) : KR           Enter the country code.

SYSMODE(WLAN MODE) ?
        1. Station
        2. Soft-AP
        3. WiFi Direct
        4. WiFi Direct P2P GO Fixed
        5. Station & Soft-AP
MODE ?  [1/2/3/4/5/Quit] (Default Station) : 1                     Enter 1 for Station mode.

BAND ?
        1. 2.4 GHz
        2. 5 GHz
        3. AUTO
BAND ?  [1/2/3/Quit] (Default 3. AUTO) : 1                  Choose WiFi Frequency Band.

[ STATION CONFIGURATION ]
============================================================
[NO] [SSID]                          [SIGNAL] [CH] [SECURITY]
------------------------------------------------------------
[ 0] ASUS_TPT_24G                       -48   1         WPA2
[ 1] ASUS_KEYSGT_24G                    -50  11         WPA2
[ 2] SK_WiFiGIG_24G                     -54   6         WPA3
[ 3] ASUS_JIT_EAP_24G                   -56  6 WPA + WPA2 ENT
[ 4] DIRECT-GM2020                      -66  11  WPA2 + WPA3
[ 5] olleh_WiFi_B602                    -67   6         WPA2
[ 6] KT_GiGA_2G_Wave2_04A               -70   6         WPA2
[ 7] Vantest24g                         -79   6         OPEN
[ 8] [Hidden]                           -81   6         WPA2
------------------------------------------------------------
[Enter] Rescan
============================================================
```

```
Select SSID ? (0~8/Manual/Quit) : 0                    Enter the SSID NO from the list.

 PSK-KEY(ASCII characters 8~63 or Hexadecimal characters 64) ? [Quit]
**********                                  Enter the password for the AP.

Do you want to set advanced WiFi configuration ? [No/Yes/Quit] (Default No) : N
                                                              Enter N to skip this step.
Enable DPM (Dynamic Power Management) ? [Yes/No/Manual/Quit] : N

===========================================
BAND        : 2.4 GHz
SSID        : ASUS_TPT_24G
Security    : WPA2PSK
ENCRYPTION  : AES(CCMP)
Password    : **********
PMF         : Default
===========================================
WIFI CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y                    Enter Y to confirm the
configuration.


IP Connection Type ? [Automatic IP/Static IP/Quit] : A           Enter A for automatic DHCP IP
address.


IP Connection Type: Automatic IP
IP CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y                      Enter Y to confirm the
configuration.


SNTP Client enable ? [Yes/No/Quit] : N                           Enter N to disable time sync.


[/RA6W1-RRQ61001] #
Connection COMPLETE to cc:28:aa:7f:02:48

>>> Network Interface (wlan0) : UP
         Assigned addr   : 192.168.50.130
               netmask   : 255.255.255.0
               gateway   : 192.168.50.1
         DHCP Server IP  : 192.168.50.1
         Lease Time      : 24h 00m 00s
         Renewal Time    : 12h 00m 00s
```

The configuration is now completed and stored in NVRAM.

6. Test Procedures

The following sections describe several tests that verify the proper operation of the RA6W1 and demonstrates its various features.
The tests include:

- Throughput Test – demonstrates the Wi-Fi performance of the RA6W1.
- Current Consumption Measurements – demonstrates the amount of power used when the RA6W1 is in various Sleep modes or in Operational DPM mode.

6.1 Test Throughput with iPerf Traffic Generator

iPerf is a free IP-based a traffic generator tool that can be used for active measurements of the maximum achievable bandwidth on IP networks.
iPerf 2.1.3 (recommended) for Windows and Linux can be downloaded from https://sourceforge.net/projects/iperf2/files/.
There are various test setup types that can be used for Wi-Fi throughput tests:

- **Conducted –** uses RF cables to connect the communicating devices. This effectively eliminates issues caused by the wireless domain.
- **Wireless/Over the Air** – uses antennas connected to the station and access point, as opposed to RF cables, thus introducing additional elements and better replicating real-life usage.
- **Hybrid (Wireless plus Attenuation Control)** – is the same as a wireless test setup, using antennas, but digital attenuators are also introduced as part of the signal path between the AP's RF ports and antennas. This allows for total control over the RSSI, replicating varying distance between the Access Point and Station.

The provided examples work in any of the above scenarios.

NOTE
For clean and accurate results, Renesas recommends using an anechoic RF chamber for any of the mentioned tests. Also use a dedicated Access Point for tests. If iPerf does not work and the issue is related to firewall restrictions, contact IT department.

6.1.1 Configure Testbed

To configure the Testbed:

1. Download iPerf 2.1.3 from https://sourceforge.net/projects/iperf2/files/.
2. Create a folder called "iperf" in the C:\ directory.
3. Unzip the downloaded iPerf file (if necessary) and move the contents to the "iperf" folder.
4. Rename the downloaded iperf executable file from "iperf-2.1.3-win.exe" to "iperf.exe".
5. To ensure stable iPerf testing, run the Windows Security APP and turn off the network firewall. It is recommended to disable the laptop from all network firewalls before attempting a test.

To set up the Test Environment after setting up the iPerf:

1. Connect your computer to the LAN port of an Access Point (such as the Asus RT-AX88U) through an ethernet cable.

   The computer should receive an automatic IP address from the Access Points DHCP server. If the Access Point is configured to not provide automatic IP addresses, make sure to manually configure your computer to use a suitable IP address and subnet mask. Make sure that the computer is not connected to any other networks over ethernet or Wi-Fi.
2. Connect EK-RA6W1 EVK wirelessly to the same Access Point SSID (for instructions on how to configure the Wi-Fi connection for the RA6W1, see Section 5.3.2 Setup for Station Mode.
3. To verify a properly configured connection, ping the RA6W1 from your computer or ping it from the RA6W1 to your computer.

```
net
```

```
ping <destination IP address>
```

6.1.2 Configure RA6W1 EVK as iPerf Client

The provided UDP uplink iPerf example can be used to primarily evaluate TX throughput speeds.

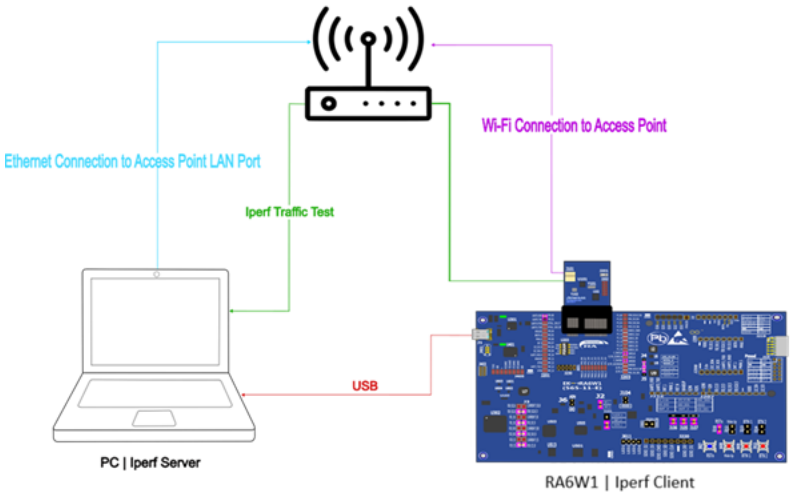

Figure 37. UDP uplink iPerf example

To configure as iPerf server for Windows:

1. Start an iPerf Server on your laptop by opening the command prompt and navigating to the directory in which iPerf is located.
2. Type "ipconfig" in the command prompt to see your laptop's IP address.

```
Ethernet adapter Ethernet:

   Connection-specific DNS Suffix  . : thinkpalm.lan
   Link-local IPv6 Address . . . . . : fe80::343:1650:a9:29f6%14
   IPv4 Address. . . . . . . . . . . : 172.27.10.72
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . : 172.27.10.100
```

Figure 38. IP address

3. Start the UDP server in the Windows command prompt.

   `iperf.exe –s –i1 –u`

```
C:\Users\itamar.ben.amitai\Downloads\iperf-2.0.10-win>iperf.exe -s -i1 -u
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 64.0 KByte (default)
------------------------------------------------------------
```

Figure 39. Start UDP

To run traffic from the RA6W1 EVK to the iPerf server on the Windows computer:

1. Select the network Command mode, in the **Tera Term** console, by typing the `net` command.
2. Start the UDP client:

```
iperf -I WLAN0 -c <Server IP> -t 10 -i 1 -u
```

3. Read the throughput measurements from the iPerf server window.

```
C:\Users\itamar.ben.amitai\Downloads\iperf-2.0.10-win>iperf.exe -s -i1 -u
------------------------------------------------------------
Server listening on UDP port 5001
Receiving 1470 byte datagrams
UDP buffer size: 64.0 KByte (default)
------------------------------------------------------------
[364] local 10.0.0.9 port 5001 connected with 10.0.0.5 port 49297
[ ID] Interval       Transfer     Bandwidth        Jitter   Lost/Total Datagrams
[364]  0.0- 1.0 sec  1021 KBytes  8.36 Mbits/sec   2.360 ms    0/  711 (0%)
[364]  1.0- 2.0 sec  1.06 MBytes  8.88 Mbits/sec   1.881 ms    4/  759 (0.53%)
[364]  2.0- 3.0 sec   795 KBytes  6.52 Mbits/sec   1.144 ms    4/  558 (0.72%)
[364]  3.0- 4.0 sec  1.11 MBytes  9.29 Mbits/sec   3.610 ms    0/  790 (0%)
[364]  4.0- 5.0 sec  1.23 MBytes  10.3 Mbits/sec   2.575 ms    0/  878 (0%)
[364]  5.0- 6.0 sec   711 KBytes  5.82 Mbits/sec   3.087 ms    8/  503 (1.6%)
[364]  6.0- 7.0 sec   991 KBytes  8.11 Mbits/sec   4.242 ms    0/  690 (0%)
[364]  7.0- 8.0 sec  1.23 MBytes  10.3 Mbits/sec   3.405 ms    0/  876 (0%)
[364]  8.0- 9.0 sec   712 KBytes  5.83 Mbits/sec   4.903 ms    3/  499 (0.6%)
[364]  9.0-10.0 sec  1.20 MBytes  10.1 Mbits/sec   2.946 ms    0/  855 (0%)
[364]  0.0-10.1 sec  10.1 MBytes  8.36 Mbits/sec   9.263 ms 2147469244/2147476436 (1e+002%)
```

Figure 40. Measurements

6.1.3 Configure RA6W1 EVK as iPerf Server

The provided UDP downlink iPerf example can be used to primarily evaluate RX throughput speeds.

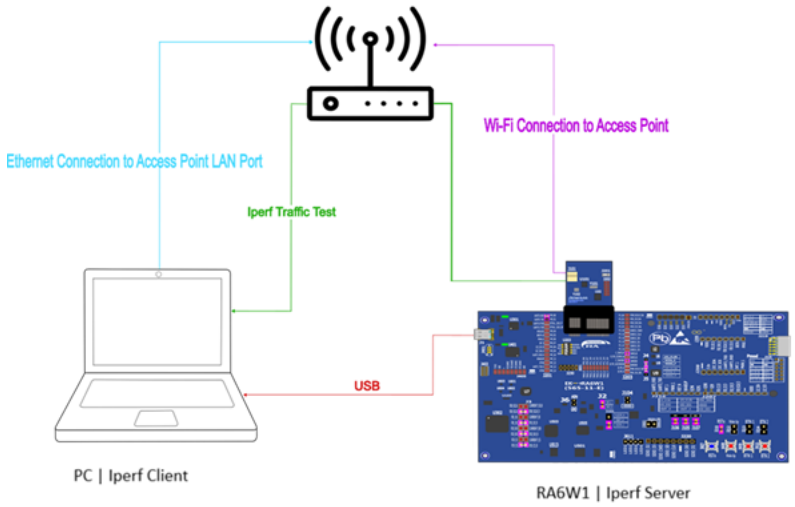

Figure 41. UDP downlink iPerf example

To configure RA6W1 EVK as iPerf Server:

1. Select the network command mode, by typing the net command in the **Tera Term** console.
2. Start the UDP server:
   `iperf -I WLAN0 -s -u -i 1`

Figure 42. Start UDP

3. Close the existing command prompt on the laptop running the UDP server.
4. Open the command prompt and navigate to the directory where iPerf is located.
5. Start the UDP client in the Windows command prompt:

   `iperf.exe -c <Server IP> -t 10 -i 1 -u -b100m`

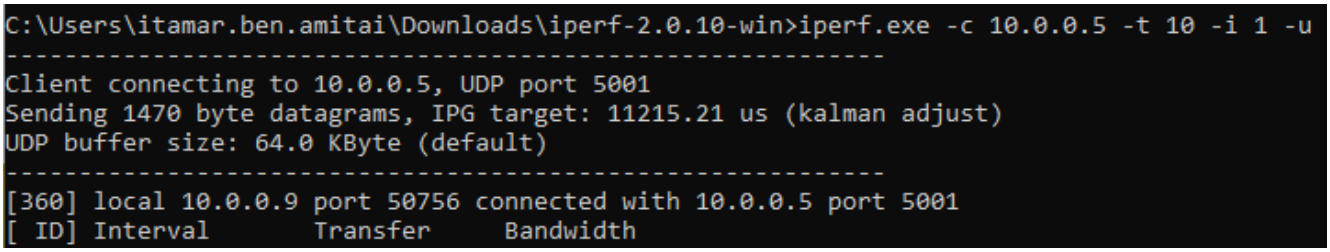

Figure 43. Start UDP client

6.2 Measure Current Consumption

NOTE
Current consumption measurement through Smart snippet is possible only after releasing the latest Evaluation Kit.

There are numerous available methods to measure current consumption to evaluate the power save performance of different sleep and DPM configurations.
The following instructions explain how to perform such measurements using the SmartSnippets Toolbox (Section 6.2.2 Measure with SmartSnippets) or a standard power analyzer (Section 6.2.3 Measure with Power Analyzer) and focus measuring current consumption in forced Sleep modes and DPM mode.

6.2.1 PMGR Sleep Mode CLI Commands

RA6W1 can be configured to temporarily enter Power Manager (PMGR) Sleep modes 2 to Sleep mode 3 for a 5 second duration through CLI commands (custom durations are not yet supported):

```
[/RA6W1-RRQ61001/pmgr] # pmgr force
- Usage: force [lld_states: PMGR_LLD_POWER_MODE_SLEEP2, PMGR_LLD_POWER_MODE_SLEEP3, PMGR_LLD_POWER_
MODE_SLEEP4, PMGR_LLD_POWER_MODE_DPM,    PMGR_LLD_POWER_MODE_CPU_WFI, PMGR_LLD_POWER_MODE_AUTO]
[/RA6W1-RRQ61001/pmgr] #
```

Example:

```
pmgr force PMGR_LLD_POWER_MODE_SLEEP3
```

To prepare SmartSnippets Toolbox:

1. Download and install the latest version of the SmartSnippets Toolbox for current measurement from the Renesas Product webpage or from the provided evaluation Software package.

NOTE
SmartSnippets support for RA6W1 is not publicly available yet – use a privately provided version: v5.0.27.4256.

Documentation/Download

See all documents & downloads results

type	Document title	language	date
Software and Tools - Software	SmartSnippets Toolbox V5.0.24 for Windows OS MSI 159.54 MB **Related documents:** • SmartSnippets Toolbox 5.0.24 Release Note • UM-B-083 SmartSnippets Toolbox User Manual (HTML)	English(English)	January 22, 2024

See all documents & downloads results

Figure 44. SmartSnippets toolbox

2. Connect jumpers between the pins highlighted in red in Figure 45. LED light turns on when jumper J102 is set.

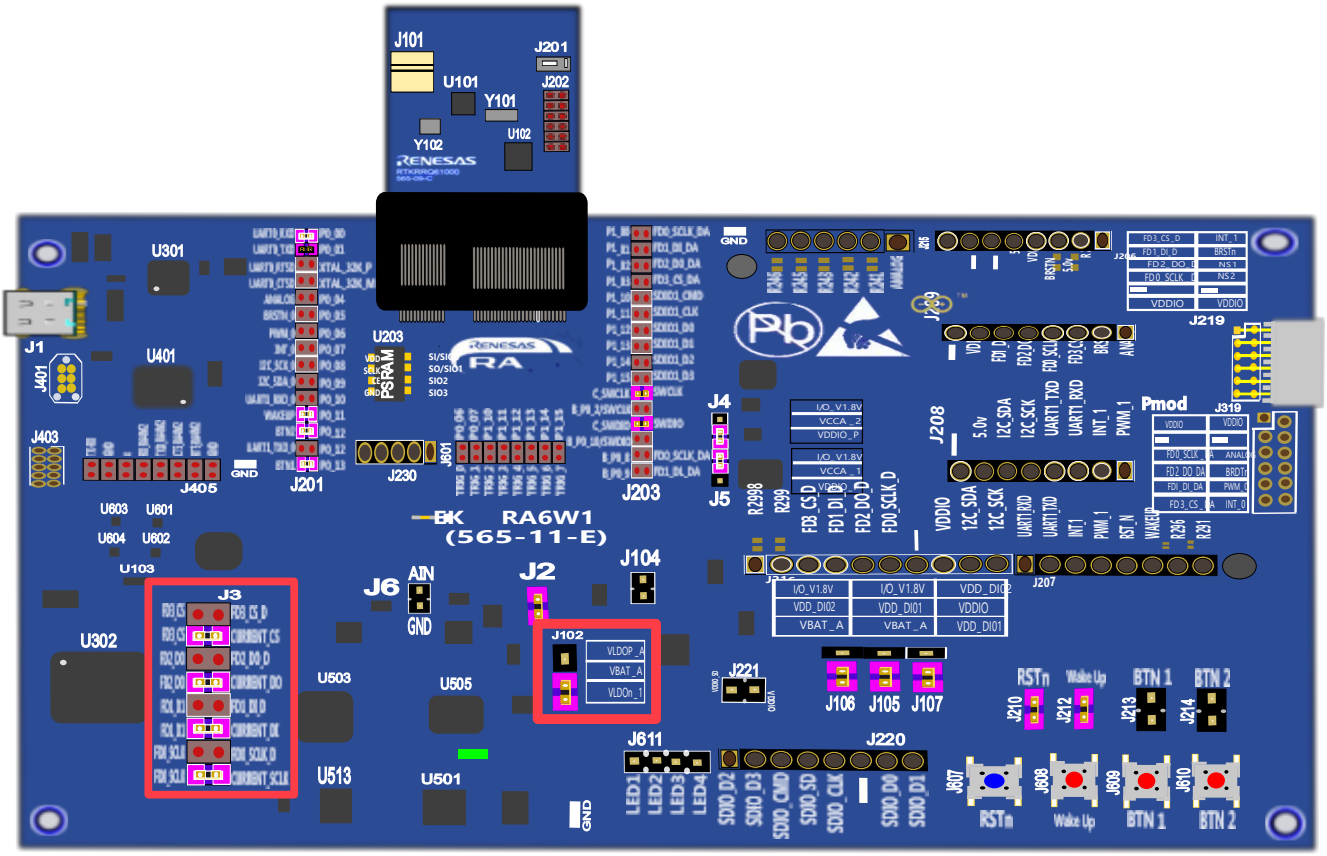

Figure 45. Jumper setting

3. Connect the EVK to your computer through USB.

6.2.2 Measure with SmartSnippets

To measure the current consumption with SmartSnippets:

1. Disassemble the RA6W1 daughterboard from the motherboard and power up the EVK through USB to your computer.
2. Close any open instances of the UART COM port.
3. Open SmartSnippets Toolbox on your computer.
4. Select **Board** > **Device** > **RA6W1**.

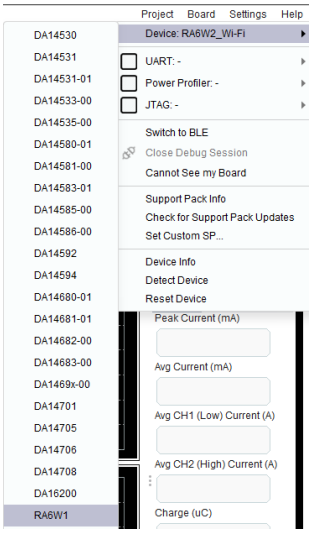

Figure 46. RA6W1

5. On the **Chart View** tab, select **VBAT_WI-FI** and **CH1/CH2 Charge** checkboxes.

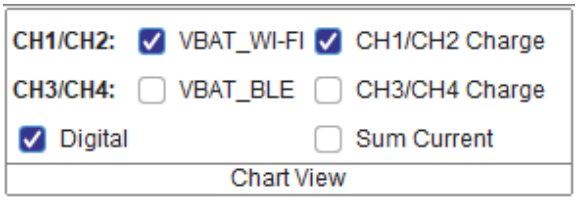

Figure 47. Chart View tab

You should see the VBAT Wi-Fi – CH1/CH2 current measurement window.

6. Identify the RA6W1 EVK -related COM ports through the Windows Device Manager.
7. Based on the identified pair of COM ports belonging to the RA6W1 EVK (in this case COM5 and COM6), select the following configurations:
   a. Select **Board** > **PowerProfiler** > (Higher-numbered COM port).

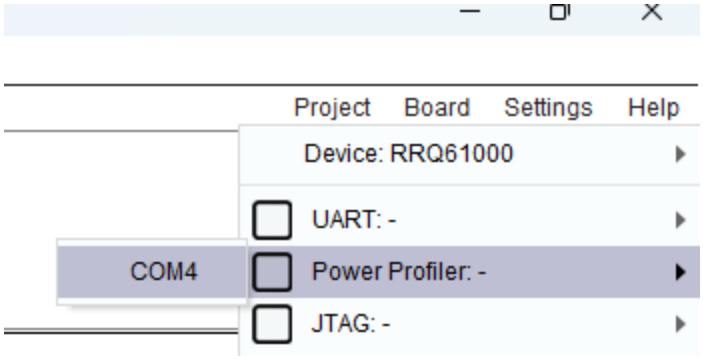

Figure 48. Power profiler port

b. Select **OffsetCalibration** > **CH1/CH2** in SmartSnippets.

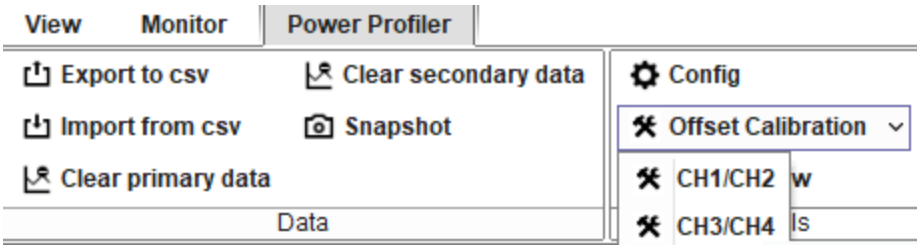

Figure 49. Offset calibration

NOTE
Offset calibration is required to find the current consumption values of motherboard before inserting daughterboard. This way the measurement of daughterboard is accurate. Calibration takes 10 seconds, and the values are saved in the configuration.

8. Connect the RA6W1 EVK daughterboard to the motherboard.

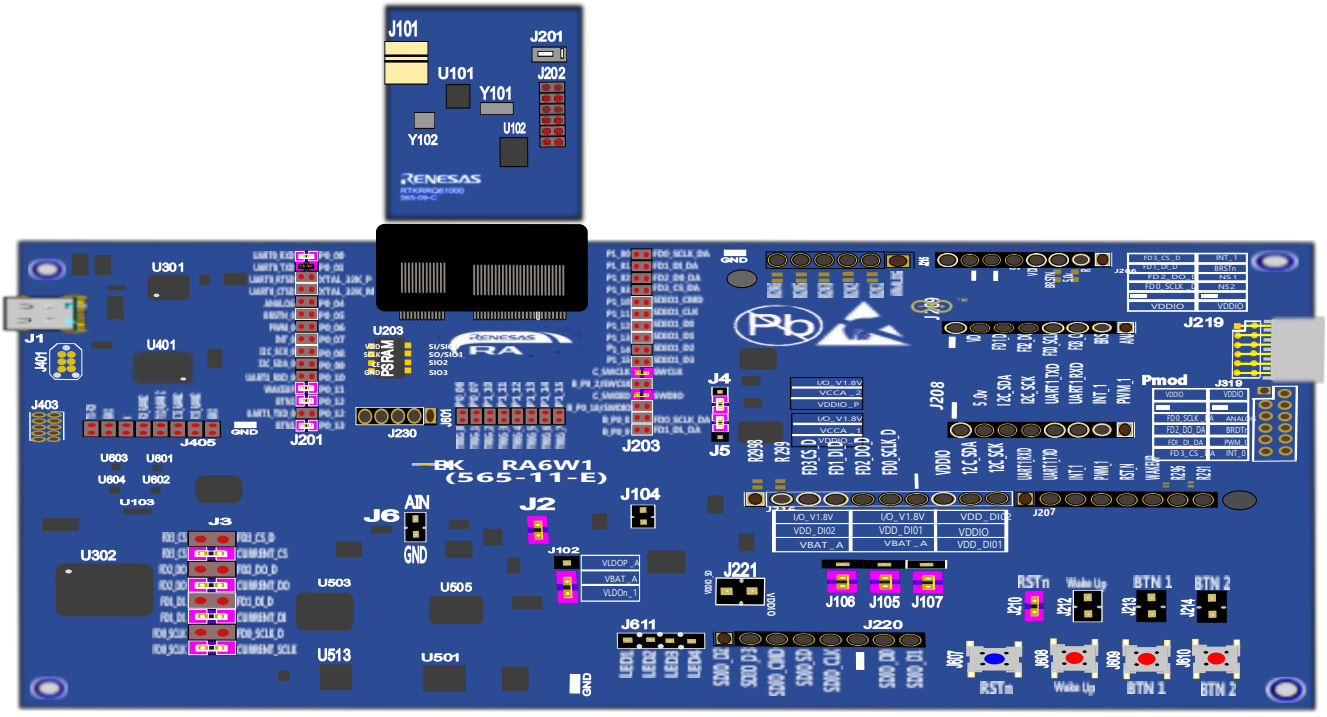

Figure 50. EVK daughterboard to the motherboard connection

9. Press down the **RST_N** (Reset) button on the RA6W1. If the board has previous connection to an AP, it automatically re-connects.

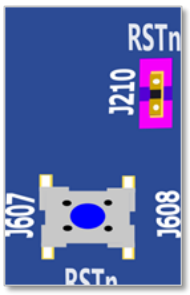

Figure 51. Reset button

10. In SmartSnippets, select **Start**.

11. Connect to the console through UART using Tera Term, see Section 5.2 Configure RA6W1 EVK Serial Debug Interface.
12. In the UART console, select the needed configuration:
    Example:
    Configure the RA6W1 as in **Station + DPM mode** (see Appendix A.2 Set up EVK for Station plus Soft AP Mode).
    //OR//
    Enter **forced sleep modes (2 or 3)** by using the following command syntax: "pmgr force <mode>"
    `pmgr force PMGR_LLD_POWER_MODE_SLEEP3`
13. When the needed DPM/Sleep mode is configured, close the instance of the UART console in Tera Term. This is important before you use the control functions in SmartSnippets, as both SmartSnippets and Tera Term use the same COM port.
14. In SmartSnippets, select **Stop**.
15. To measure the average current consumption over a selected period, on the **Tools** tab, click **Measure**.
16. Click and drag the measurement cursor over the section that you want measure in the top screen (CH1/CH2 Current – VBAT) and read the "Iav" measurement for the average current between the selected measurement points.

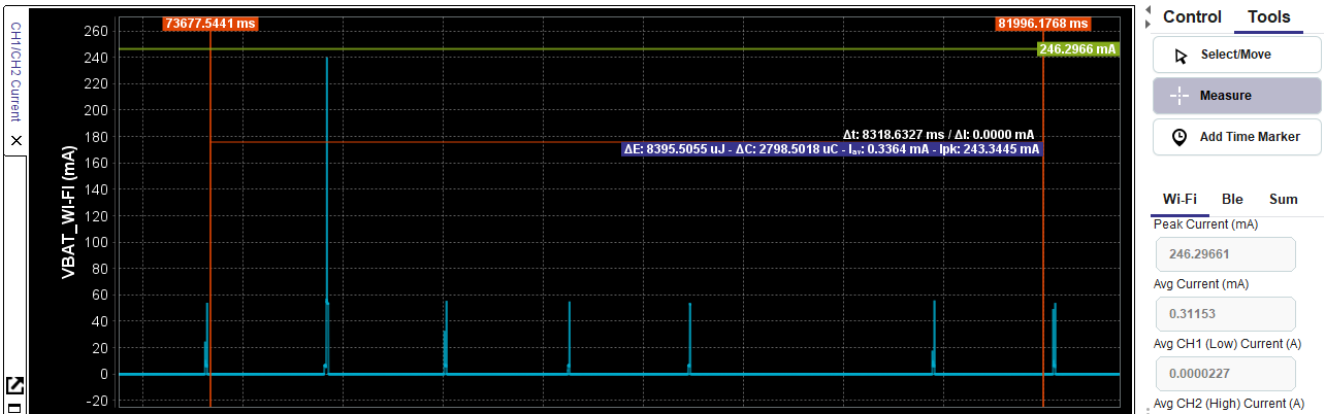

Figure 52. Measurement points

6.2.3 Measure with Power Analyzer

To measure the current consumption with Power Analyzer:

1. On the Power Analyzer, select the current measurement mode.
2. Connect jumpers between the pins and connect the current measurement points to the power analyzer, see Figure 53.

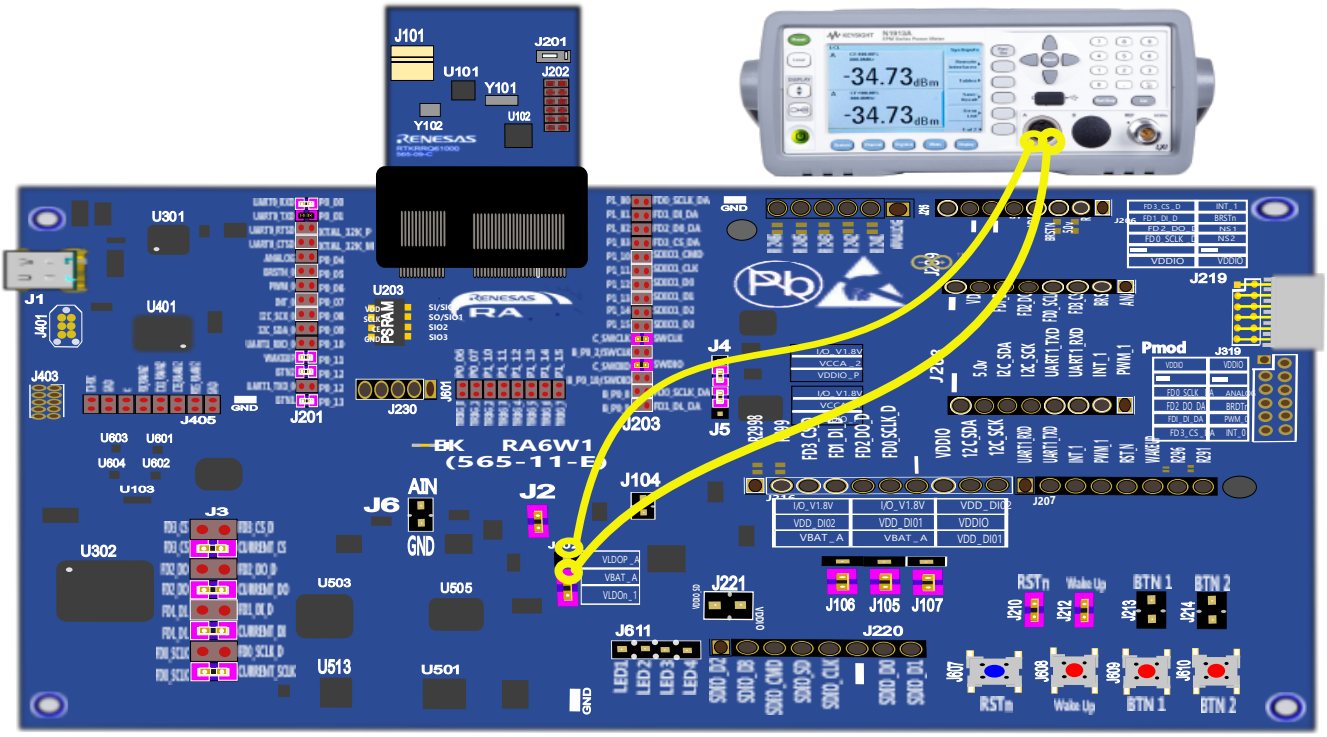

Figure 53. Jumper connections between pins

3. Assemble the daughterboard to the motherboard and turn on the EVK by connecting it to your computer through USB C.
4. Connect to the console through UART using Tera Term, see Section 5.2 Configure RA6W1 EVK Serial Debug Interface.
5. In the UART console, select the needed configuration:

   Example:
   Configure the RA6W1 as in **Station + DPM mode** (see Appendix A.3 Set up Station Mode with DPM Enabled).
   //OR//
   Enter forced Sleep modes (2 or 3) by using the following command syntax: "pmgr force <mode>"
   `pmgr force PMGR_LLD_POWER_MODE_SLEEP2`
6. Perform measurements with the power analyzer:

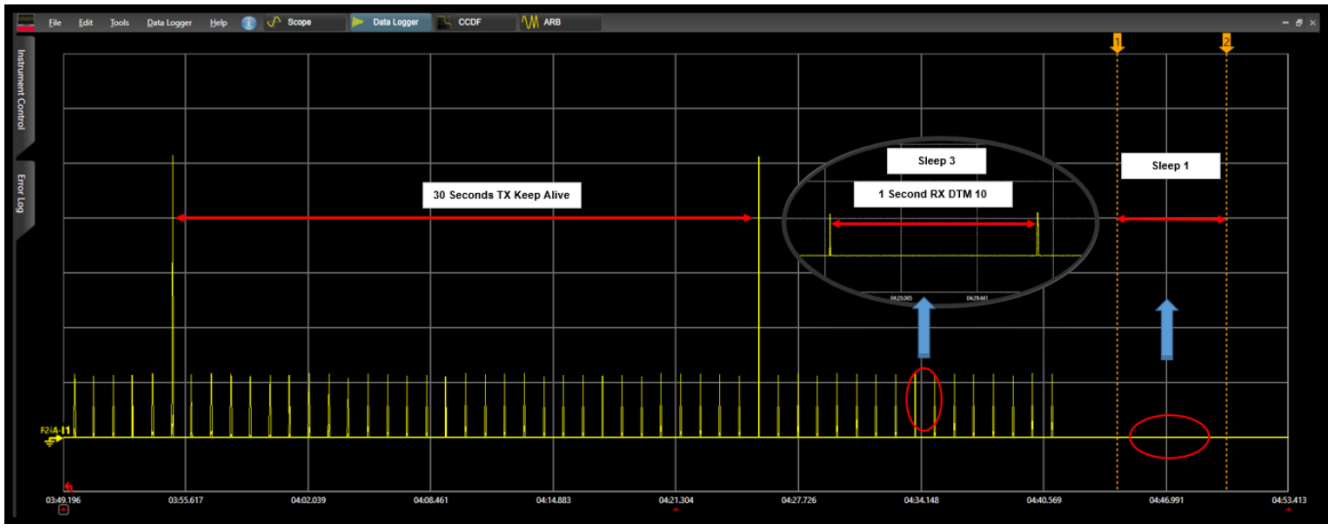

Figure 54. Measurements

6.2.4 Measure Sleep 1 Current Consumption

To measure the current consumption for Sleep 1 follow the same process as in Section 5.3.2 Setup for Station Mode and Appendix A.1 Set up Soft AP Mode, you do not need any configuration in the CLI.
The following modifications are needed in the test setup to force the device to Sleep 1 Mode:

1. Remove the pull-up on the RST of the daughterboard.

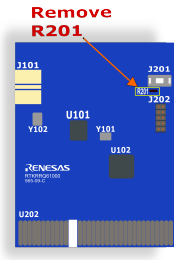

Figure 55. Remove resistor

2. Remove the J210 jumper on the motherboard.
3. Connecting a jumper between the T_SWDIO_GND and J210 RST_N pins.

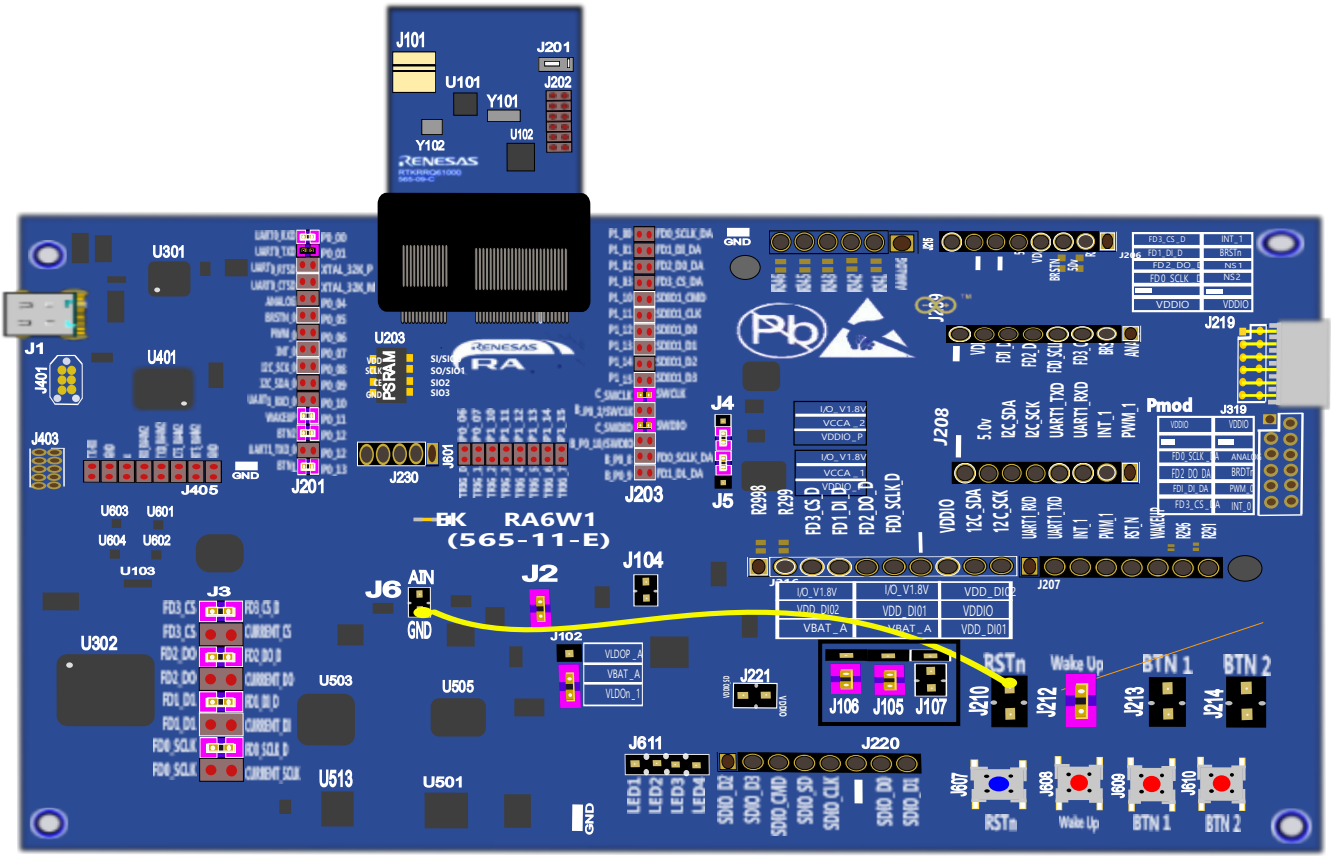

Figure 56. Connecting jumper between pins

7. Software Development Kit and Build Setup

Wi-Fi applications can be developed for the RA6W1 using the RA6W1 FreeRTOS Software Development Kit (SDK) and the Renesas e^2 studio IDE on either a Windows 10, Linux or macOS based development system.
To start developing applications for the RA6W1, complete the following steps:

1. Install and configure the e^2 studio IDE.
2. Import the RA6W1 SDK into the e^2 studio IDE and build an application.
3. Download and test the application.
4. Use J-Link debugger to debug the application.

Figure 57 shows the typical e^2 studio project for the RA6W1 FSP.

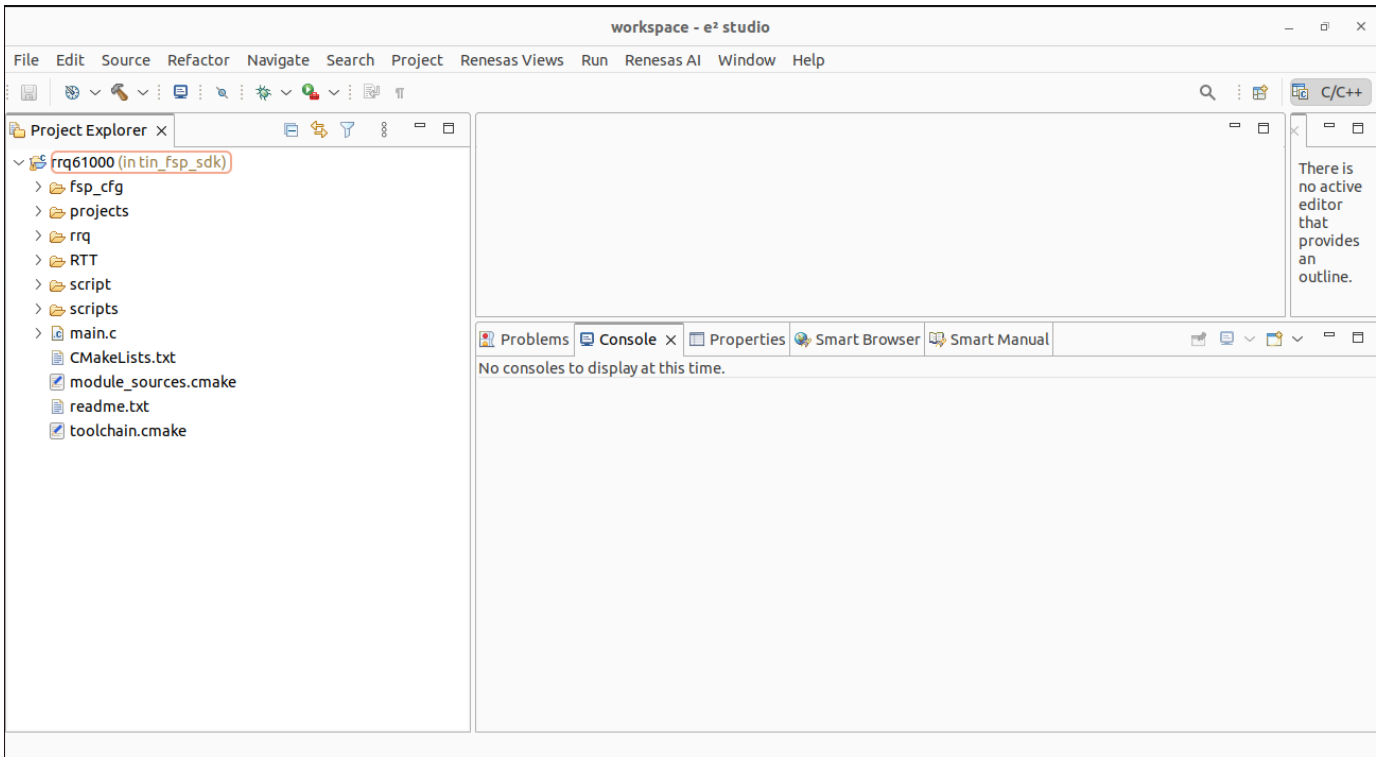

Figure 57. Project view

System requirements:

- Windows 10 64 bit or later versions
- Ubuntu 22.04 LTS or later versions
- macOS 14 (Sonoma) or later versions
- e^2 studio installer-2025-07 or later versions.

7.1 Install e^2 studio IDE for Windows

The following files are required for installation in Windows and can be found in RA6W1 Software release archive:

- e^2 studio installer – "e2studio_installer-2025-07_windows_host.exe".
- RA6W1 FSP pack – "RAFW_FSP_Packs_1.0.0".
- Sample project template – "8.0.2.0.X_rm_wifi_test_app.zip".

To install e^2 studio IDE for Windows:

1. Run the installer, in the **e²studio** setup wizard, select **Standard Install**, and then select **Next**.

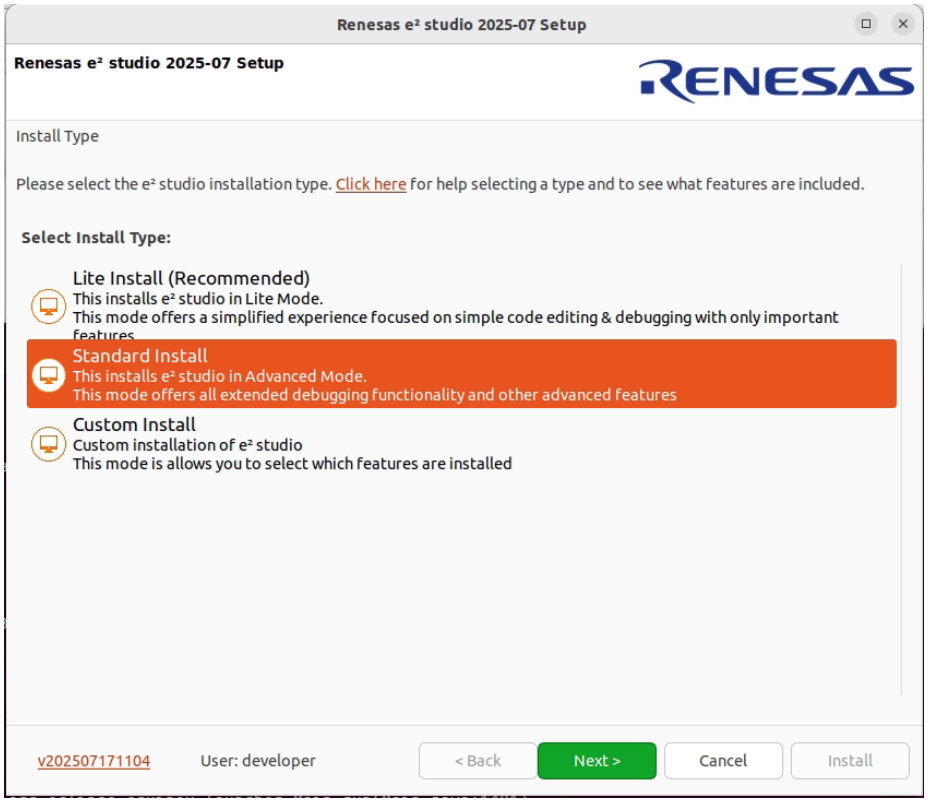

Figure 58. Standard installation

2. On the **Device Families** step, select **RA for Wireless**.

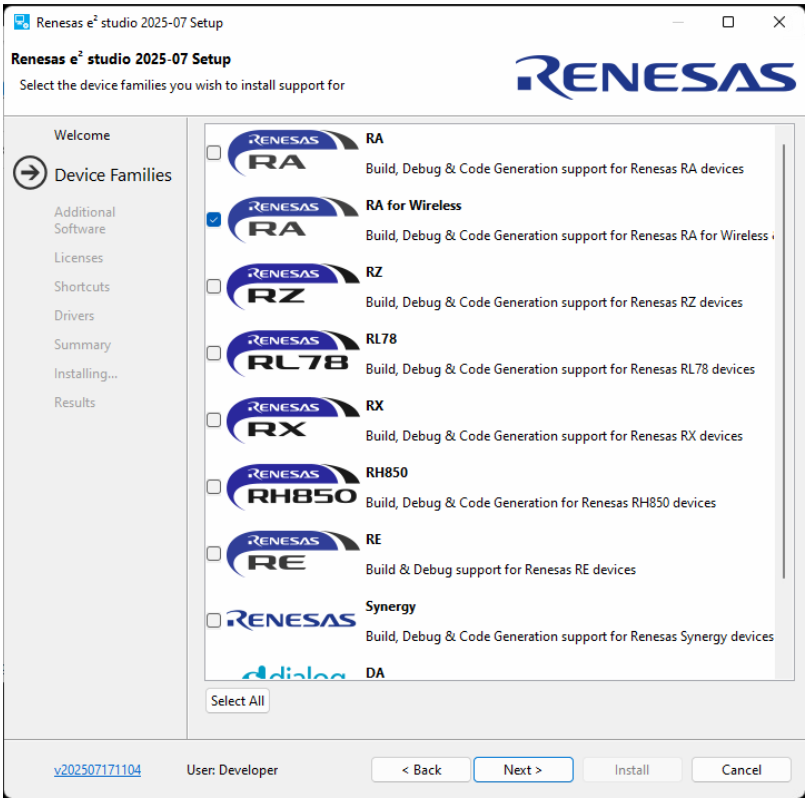

Figure 59. Device families

3. On the **Additional Software** step, expand **GCC Toolchains and Utilities**, select the **GNU ARM Embedded 10.3** checkbox, and click **Next**.

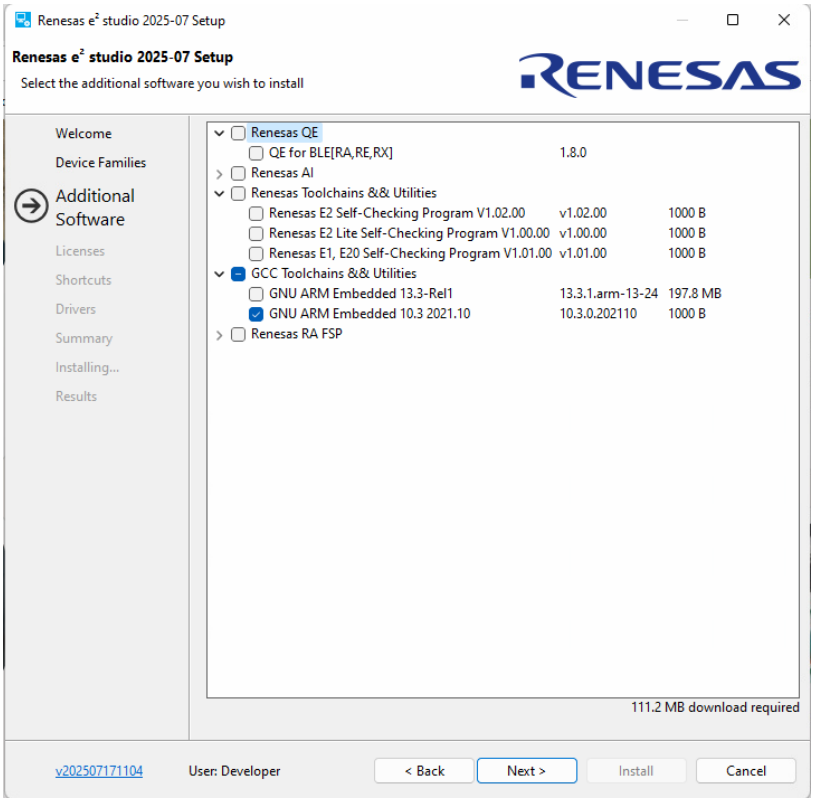

Figure 60. Additional software

4. On the **Licenses** step, accept the terms of the software agreement by selecting the checkbox, and click **Next**.
5. On the **Shortcuts** step, click **Next**.

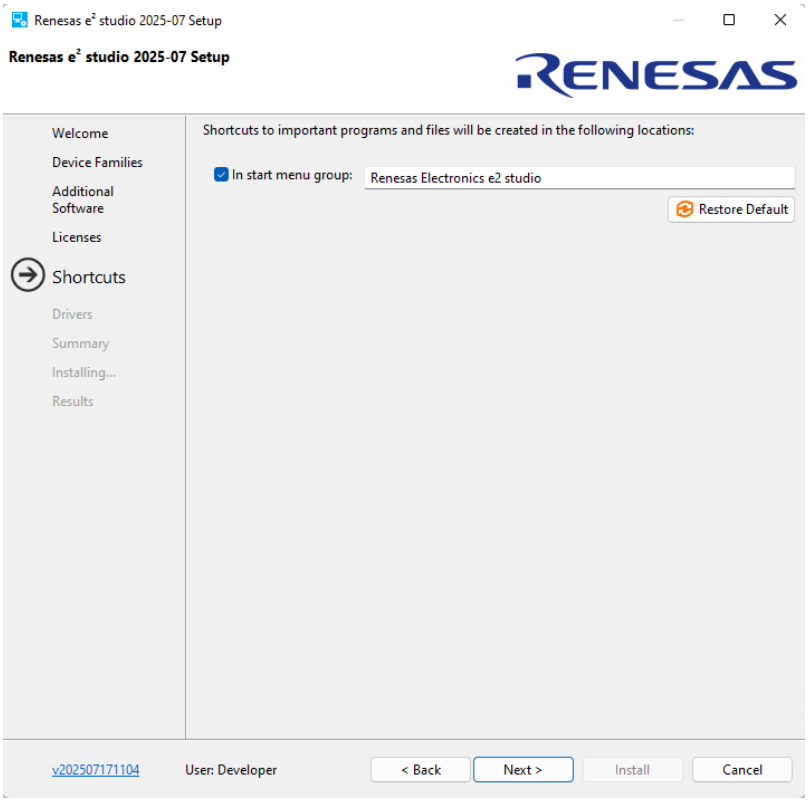

Figure 61. Shortcuts

6. On the **Summary** step, click **Install**.

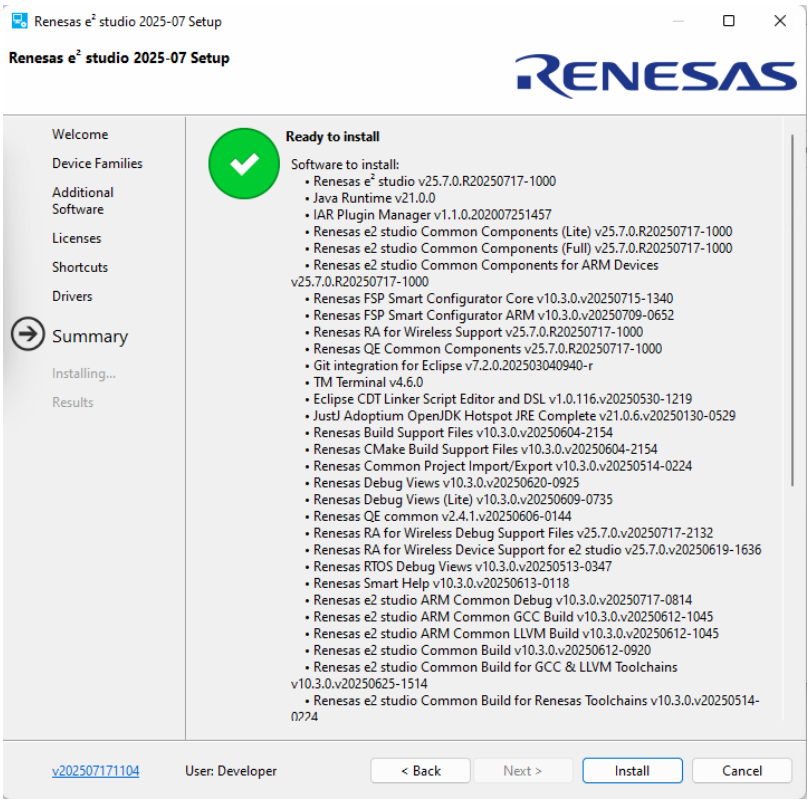

Figure 62. Ready to install

7. While installing e^2 studio, GNU Arm® Embedded 10.3 toolchain installation initializes.

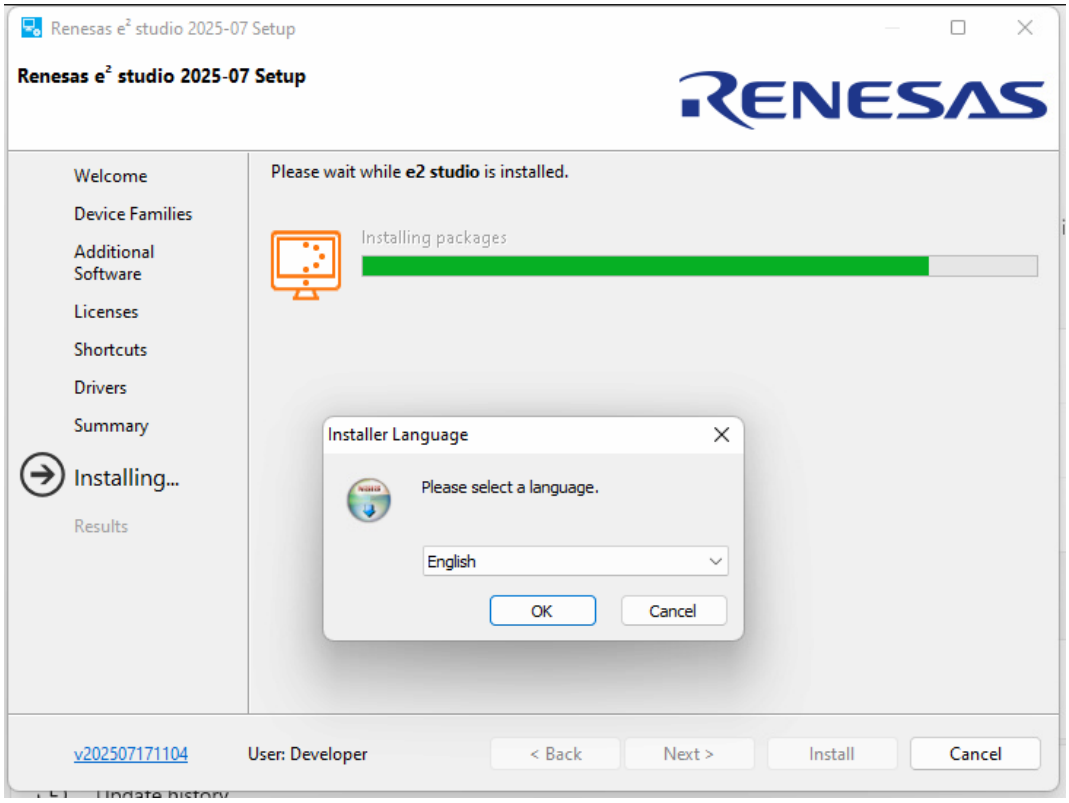

Figure 63. Toolchain installation

8. Complete the toolchain installation.

Figure 64. Toolchain setup wizard

9. When the e^2 studio is installed, select the **Launch e^2 studio** checkbox and click **OK**.

10. Open e^2 studio and continue with installing the RA6W1 FSP pack.

    See Section 7.4 Install RA6W1 FSP Pack.

7.2 Install e^2 studio IDE for Linux

The following files are required for installation in Linux and can be found in RA6W1 Software release archive:

- e^2 studio installer – "e2studio_installer-2025-07_linux_host.run".
- RA6W1 FSP pack – "RAFW_FSP_Packs_1.0.0".
- Sample project template – "8.0.2.0.X_rm_wifi_test_app.zip".

To install e^2 studio IDE for Linux:

1. Give the execution permissions to the e^2 studio installer and run installer, see Figure 65.

```
developer@thinkpalm-ThinkCentre-Neo-50s-Gen-3:~/Downloads$ chmod +x e2studio_installer-2025-07_linux_host.run
developer@thinkpalm-ThinkCentre-Neo-50s-Gen-3:~/Downloads$ ./e2studio_installer-2025-07_linux_host.run
Verifying archive integrity...  100%   MD5 checksums are OK. All good.
```

Figure 65. Installer

2. In the **e^{2}studio** setup wizard, select **Standard Install**, and select **Next**.

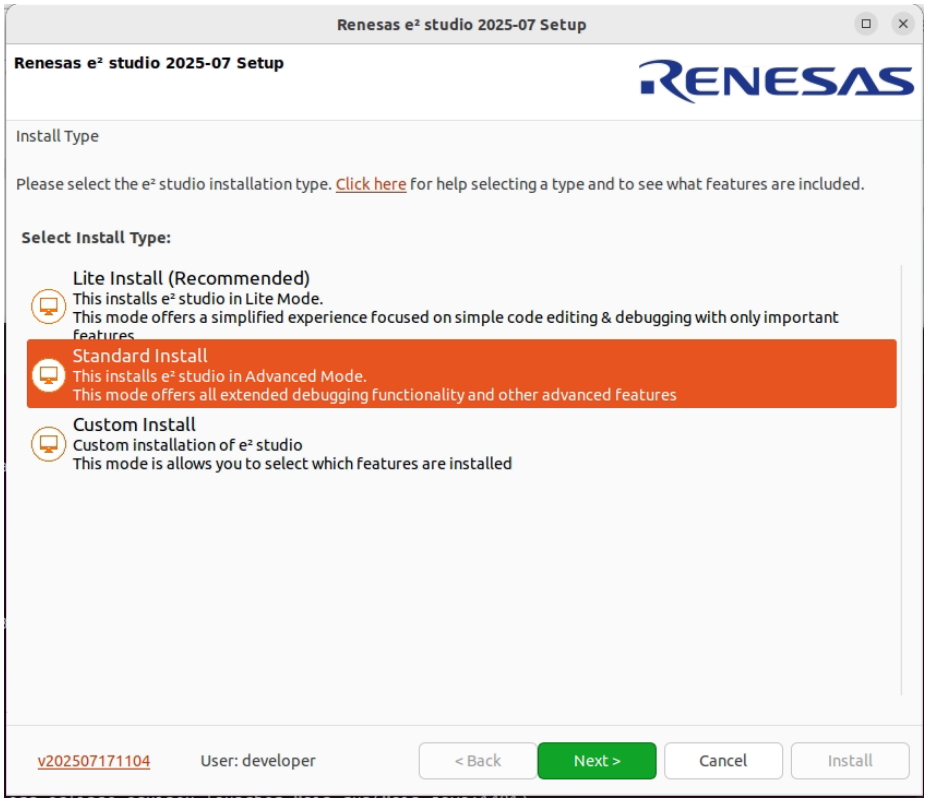

Figure 66. Standard installation

3. On the **Device Families** step, select **RA for Wireless**.

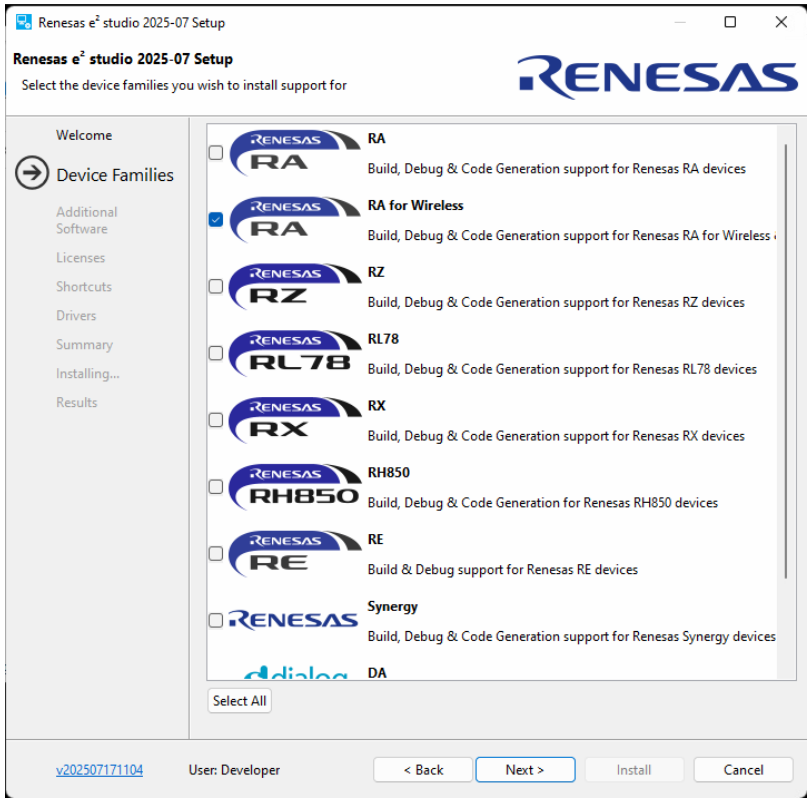

Figure 67. Device families

4. On the **Additional Software** step, expand **GCC Toolchains and Utilities**, select the **GNU ARM Embedded 10.3** checkbox, click **Next** > **Install**, see Figure 68.

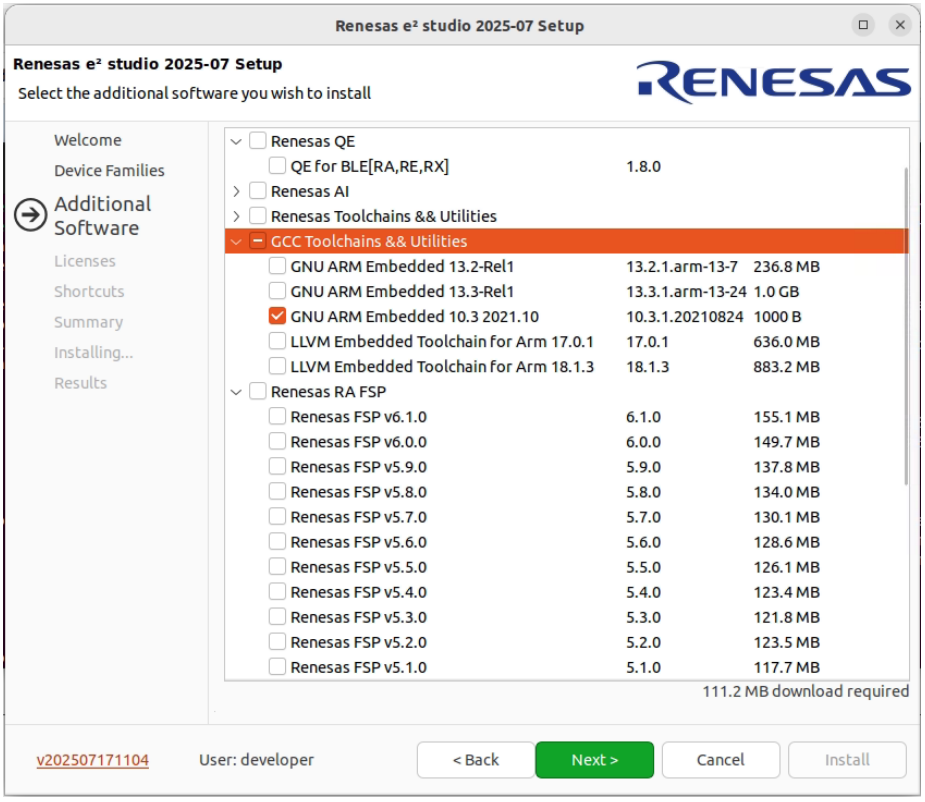

Figure 68. Device families

5. After completing e^2 studio installation, open e^2 studio and continue with installing the RA6W1 FSP pack. See Section 7.4 Install RA6W1 FSP Pack).

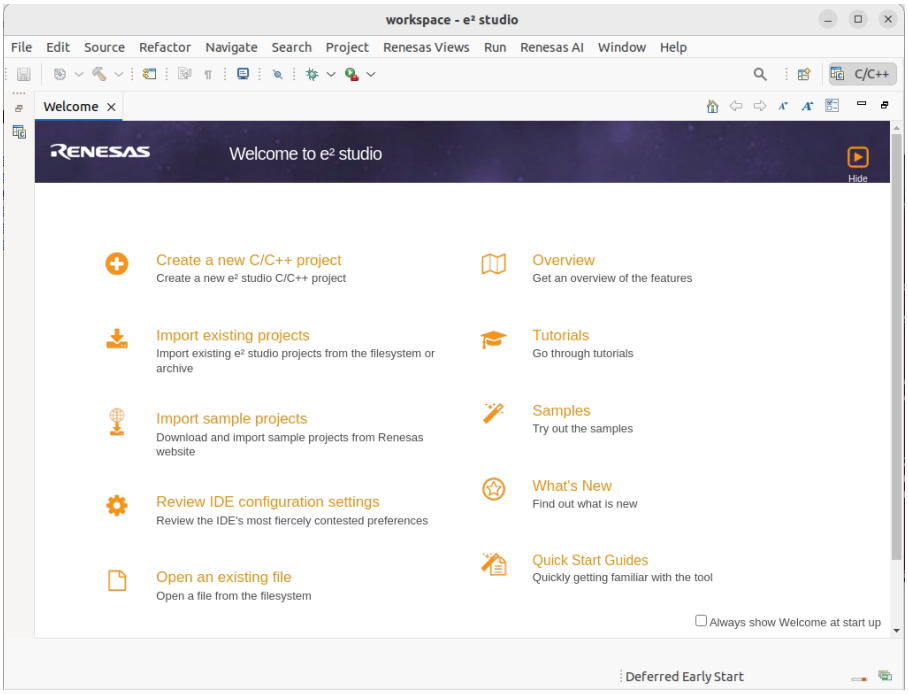

Figure 69. e^2 studio

7.3 Install e2 studio IDE for macOS

- e^2 studio installer – "e2studio_installer-2025-07_macosx_host.txz".
- RA6W1 FSP pack – "RAFW_FSP_Packs_1.0.0".
- Sample project template – "8.0.2.0.X_rm_wifi_test_app.zip".
- Toolchain Installer – “arm-gnu-toolchain-13.3.rel1-darwin-arm64-arm-none-eabi.pkg”.
- Python 3 Installer – “python-3.13.6-macos11.pkg”.

To install e2 studio IDE for macOS:

1. In the downloaded archive, extract the `E2studio.app` file and move it to the application folder.
2. In the application folder, double-click `E2studio.app` to start the e2 studio.
   If the `["E2studio.ap" is damaged and can’t be opened. You should move it to the Trash.]` error message appears when the e^2 studio is started, open the terminal window and run the following command:

```
xattr -d com.apple.quarantine /Applications/E2studio.app
```

Figure 70. Error in Starting the e² studio

3. In e^2 studio, go to **Help** > **Install New Software**.

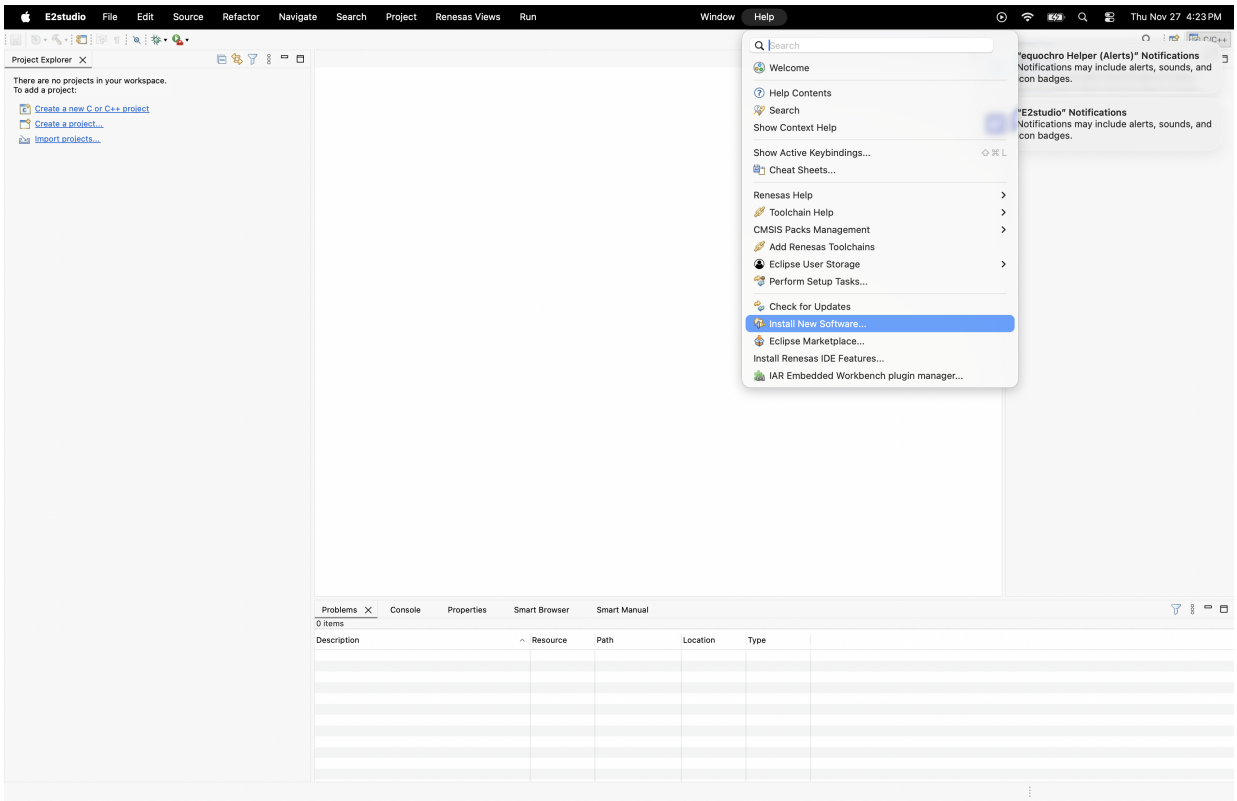

Figure 71. Install New Software

4. In the Install dialog do the following, and click **Next**:

a. a. Select the following website to Work with https://www2.renesas.eu/_custom/software/ree_eclipse/e2studio10/.
b. Select both **RA for Wireless** components to install.
c. Clear the **Group items by category** checkbox.

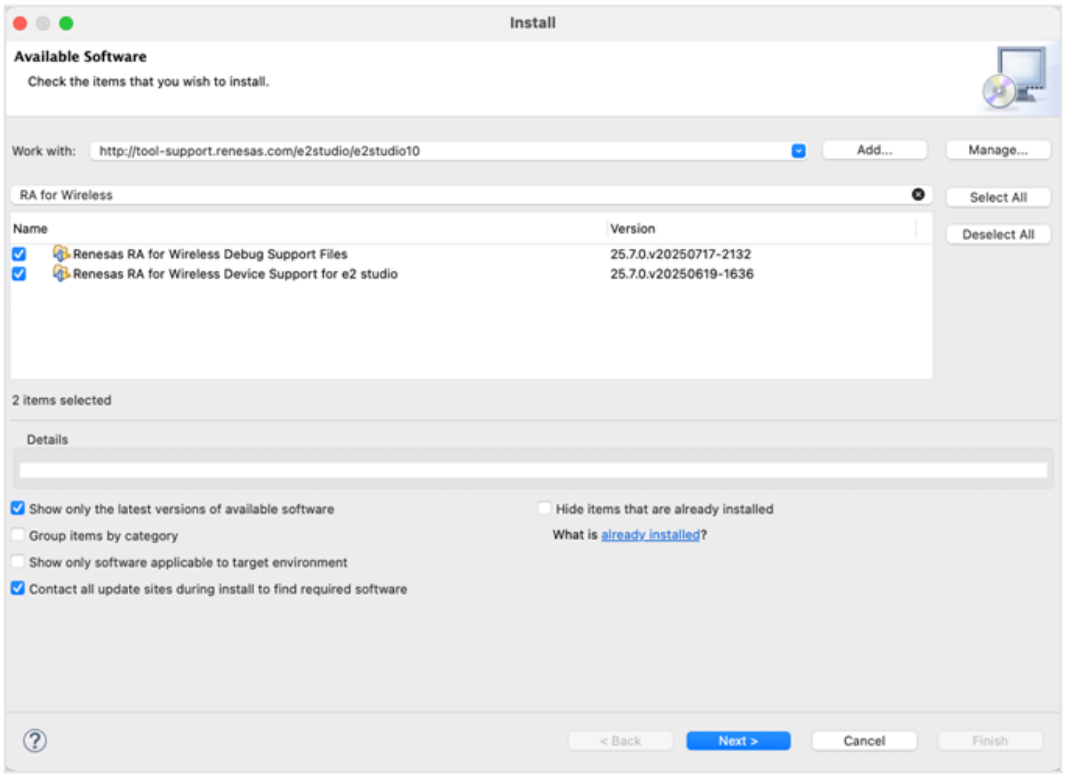

Figure 72. Additional components to install

5. Accept the terms and click **Finish**.
6. During installation, two dialogs appear: one for Trust Authority and another for Trust Artifacts. For both dialogs, select **Select All** and click **Trust Selected**.

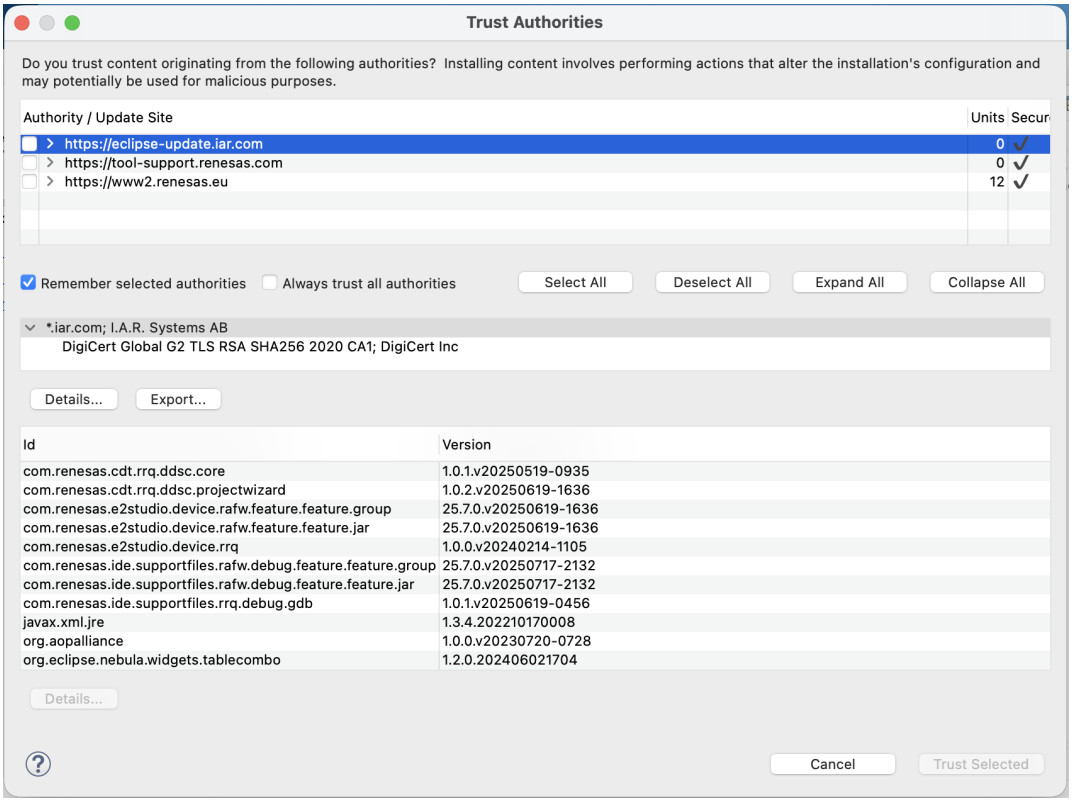

Figure 73. Trust Authorities

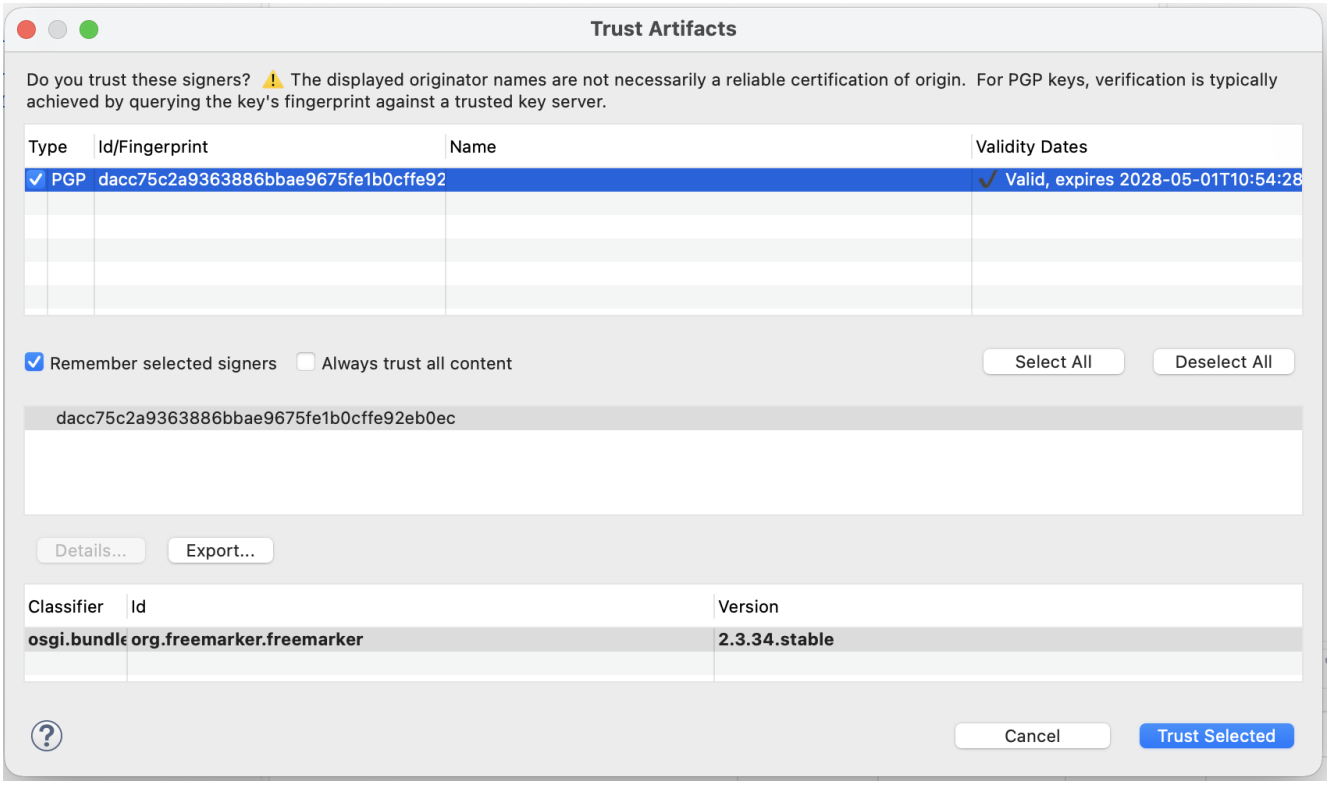

Figure 74. Trust Artifacts

After the Installation is completed, a dialog appears for restarting e2 studio.

7. Restart e^2 studio, by clicking **Restart Now**.

8. Install the Toolchain by double-clicking the installer.

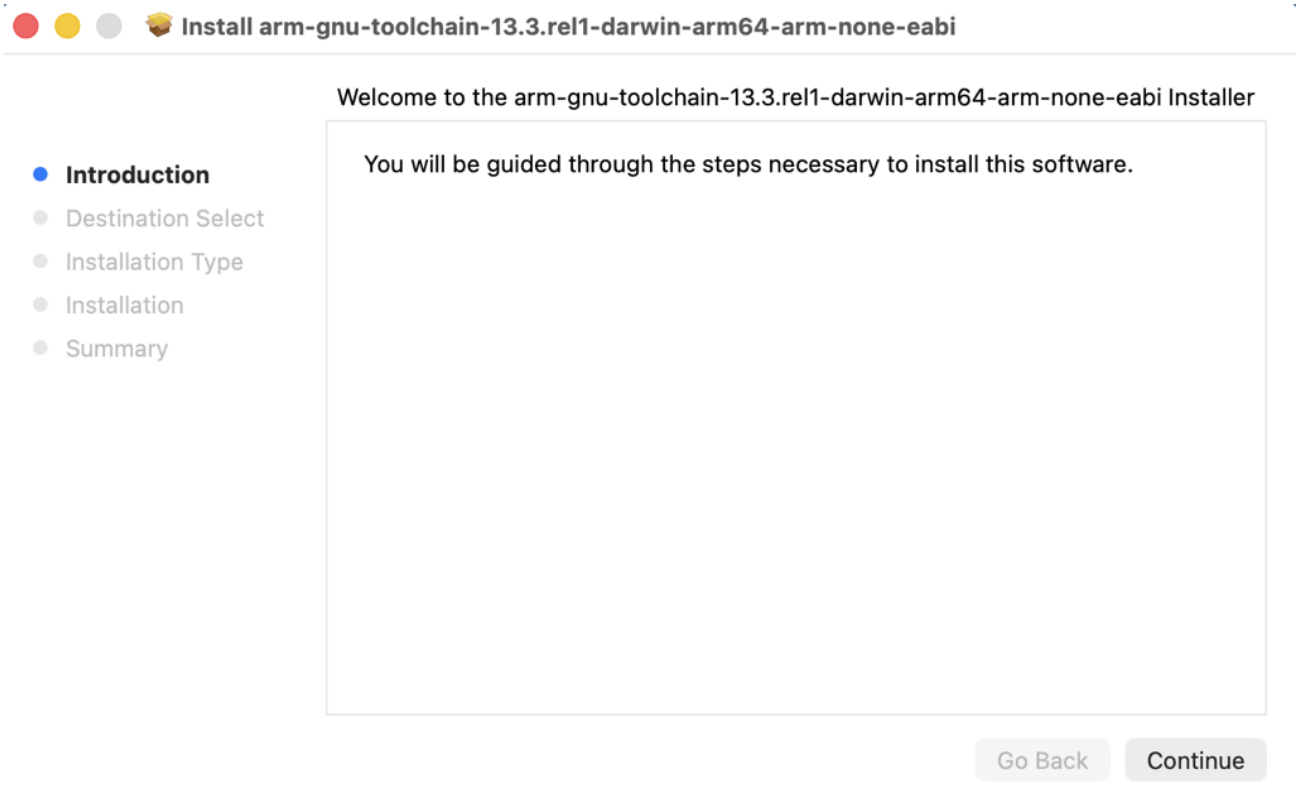

Figure 75. Toolchain Installer

9. After Toolchain Installation is successfully completed, in **e2 studio**, go to **Help** > **Add Renesas Toolchains**.

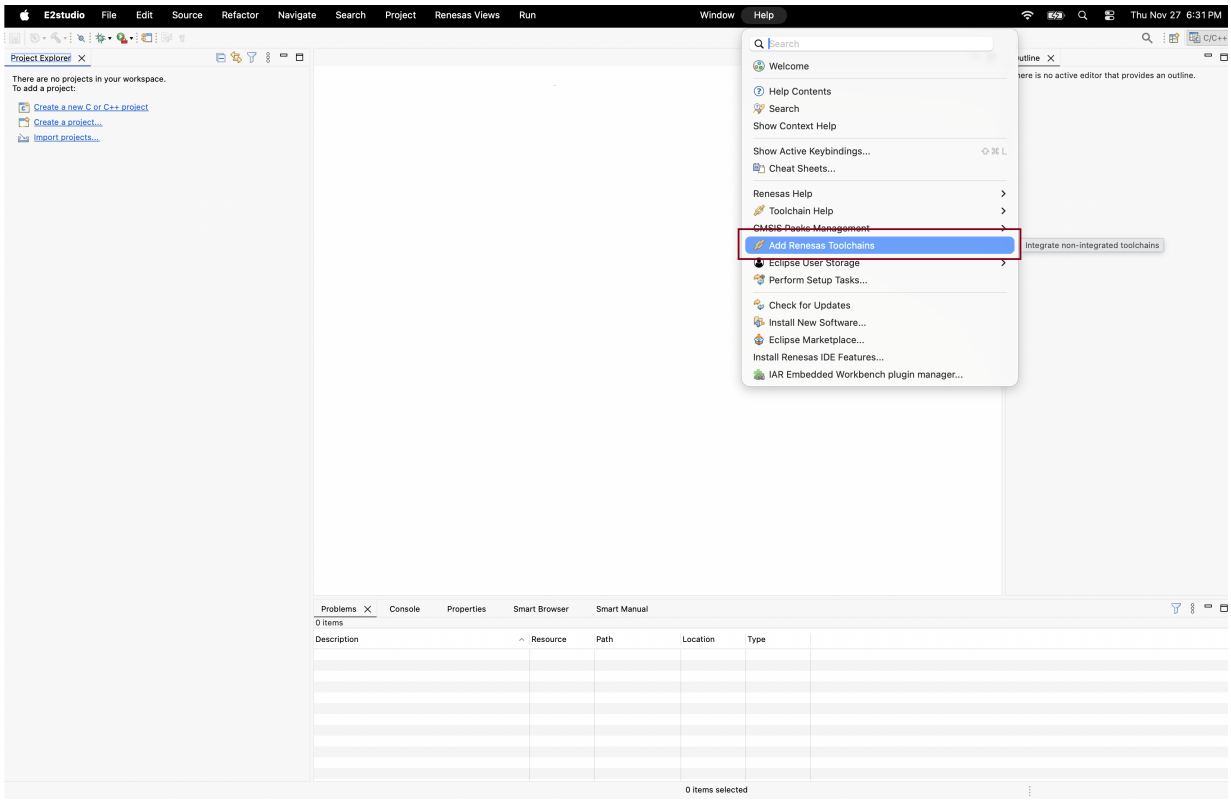

Figure 76. Add Renesas Toolchains

10. In the **Renesas Toolchain Management** dialog, click **Add**.

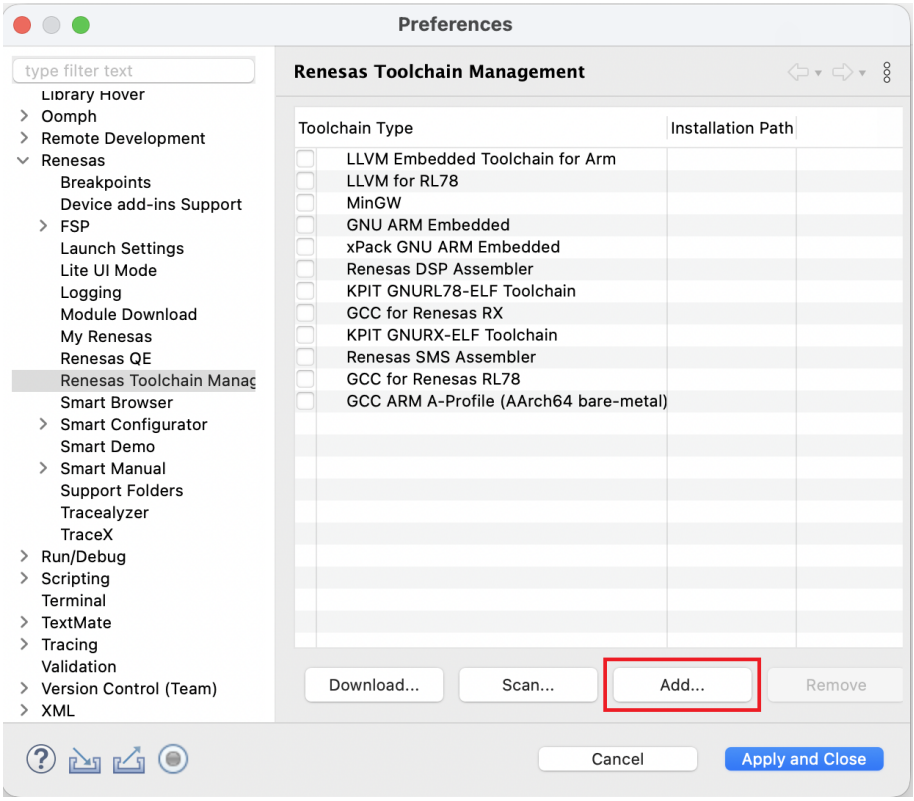

Figure 77. Renesas Toolchain Management

11. In the **Add New Toolchain** dialog, click **Browse**.
12. Go to **Applications** > **ArmGNUToolchain** > **13.3.rel1>arm-none-eabi**, and click **Open**.

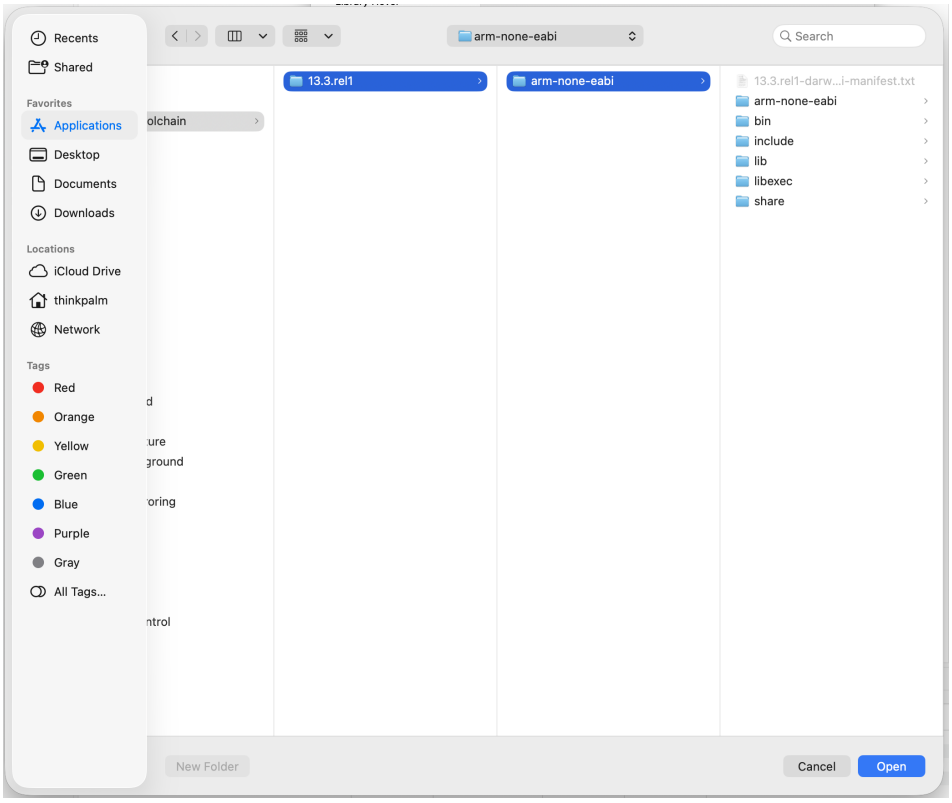

Figure 78. Choose the Installed Toolchain

13. In the **Add New Toolchain** dialog, click **OK**.
14. In the **Renesas Toolchain Management** dialog, click **Apply and Close**.

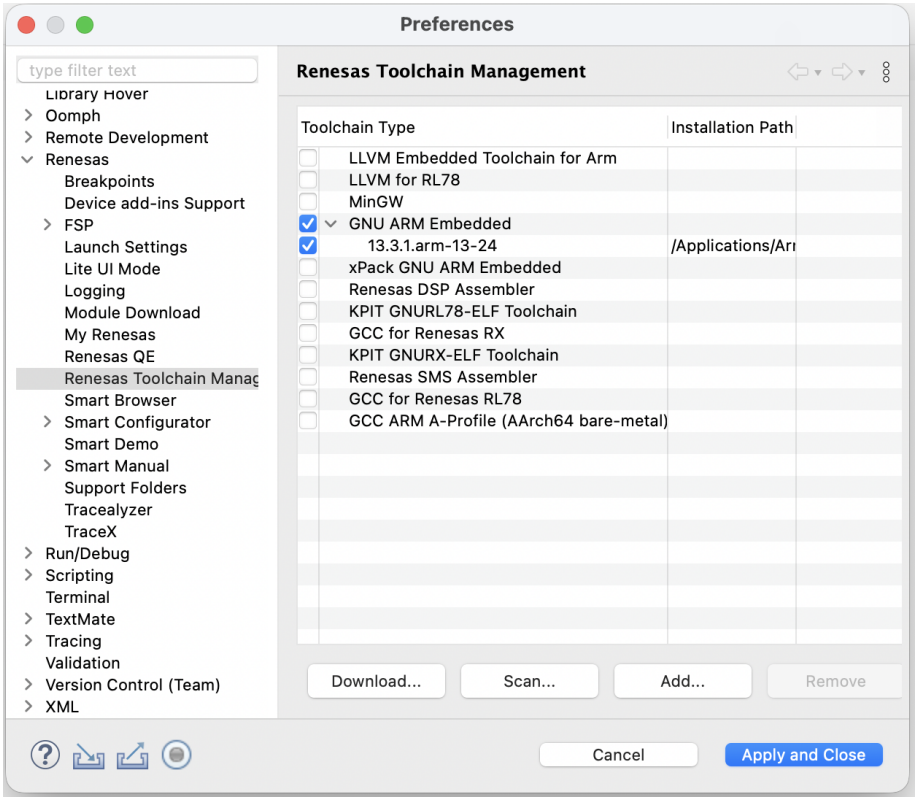

Figure 79. Finalize Toolchain Settings

15. Install Python3 by double-clicking Installer – `python-3.13.6-macos11.pkg`.

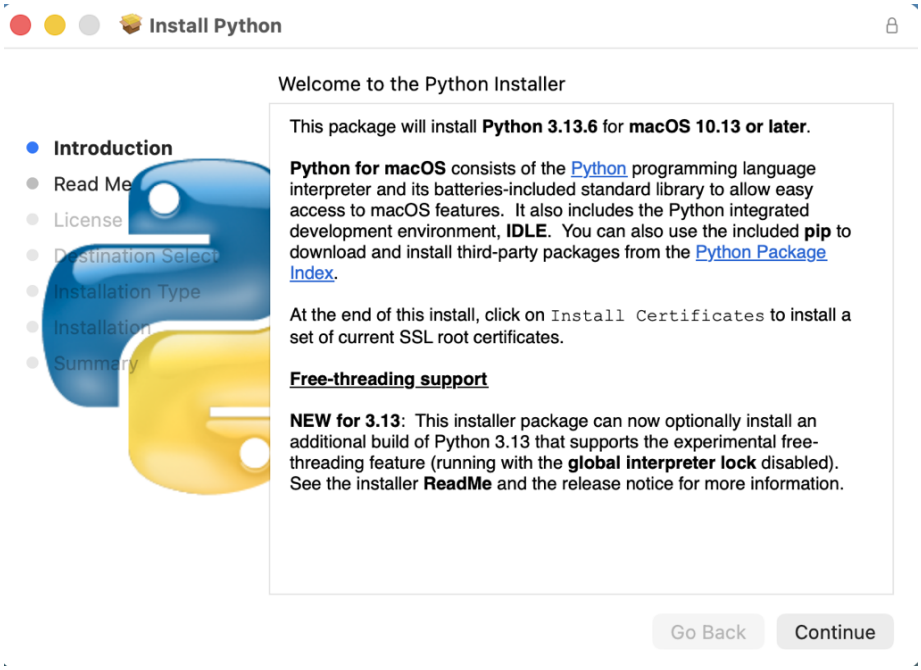

Figure 80. Python3 Installer

16. After Python3 installation is completed successfully, restart e^2 studio using **File** >**Restart**.

7.4 Install RA6W1 FSP Pack

To build the SDK, install the RA6W1 FSP pack:

NOTE
The same procedure applies to both Windows OS, Linux and macOS.

To install the latest **RA6W1 FSP Release package**:

1. Unzip the `RAFW_FSP_Packs_1.0.0.zip` to the e^2 studio install directory.
2. To find the exact e^2 studio install directory, click **Help** > **About e2 studio**. For macOS, click **e2studio** > **About e2studio**.
3. In the **About e2studio** dialog, click **Installation Details**.

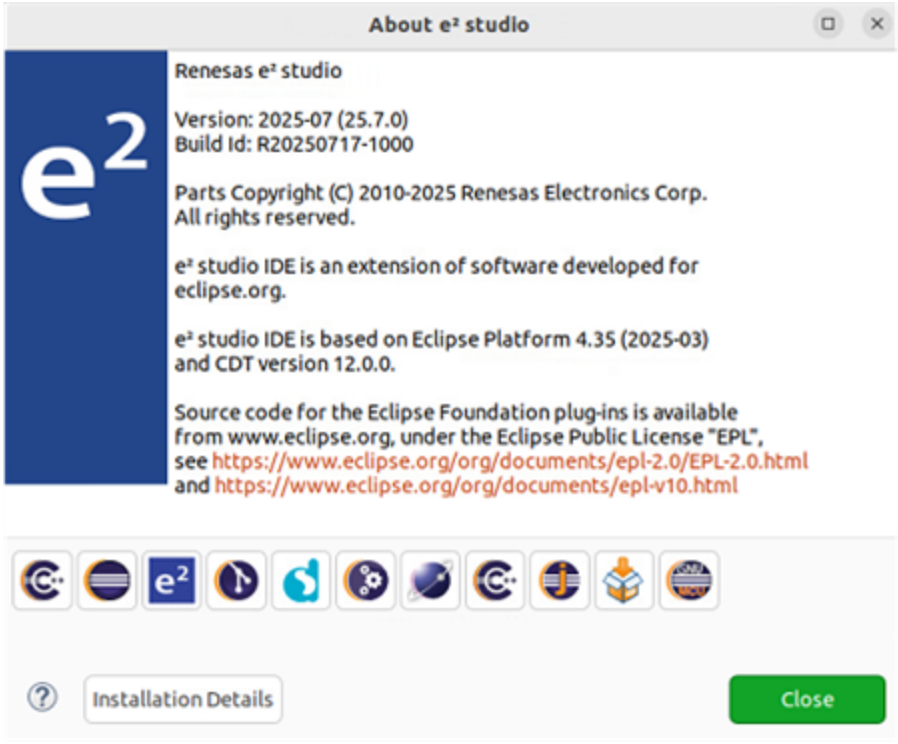

Figure 81. e^2 studio details

4. In the **e2 studio Installation Details** dialog, select the **Support Folders** tab.

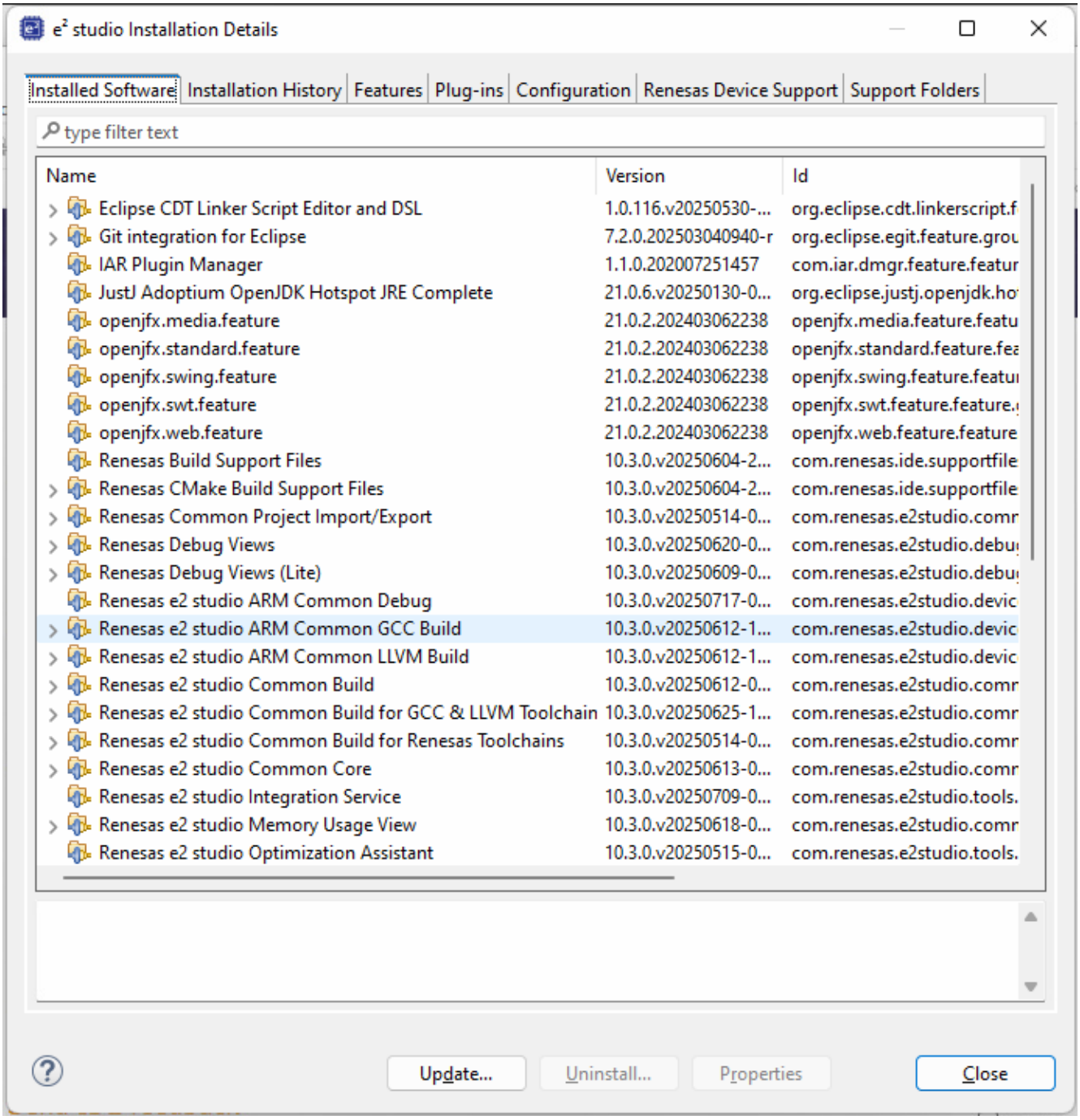

Figure 82. e² studio installation details

5. To open the system file manager in the directory that corresponds to e² studio install directory, click the e² studio support area link.

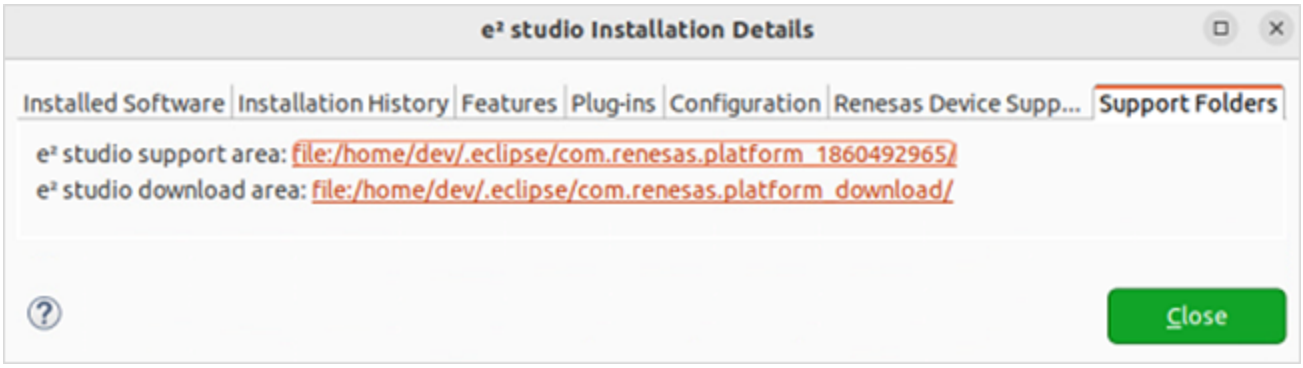

Figure 83. Support folders

6. Extract the `RAFW_FSP_Packs_1.0.0.zip` file.
7. Copy and paste the **Internal folder** to the **e2 studio support** folder.
   In MacOS, select the **Merge** option when copying the internal folder.
8. To restart e^2 studio, click **File** > **Restart**.

NOTE
For updating/re-installing the RA6W1_FSP_Packs, delete the following folders in the e^2 studio support folder first. ■ DebugComp\rrq\ ■ internal\cmsis\data\rrq\ ■ internal\devassist\rafw_fsp\ ■ internal\projectgen\rafw_fsp\. Then follow Step 5 and Step 9.

7.5 Load Project Template in e^2 studio

8.0.2.0.X_rm_wifi_test_app.zip is a project template to create the default Wi-Fi image of the released version.
To load the project template:

1. Extract the 8.0.2.0.X_rm_wifi_test_app.zip project template to a directory.
2. To import project template, click **File** > **Import**.
3. Under **General**, select **Rename & Import Existing C/C++ Project into Workspace**.

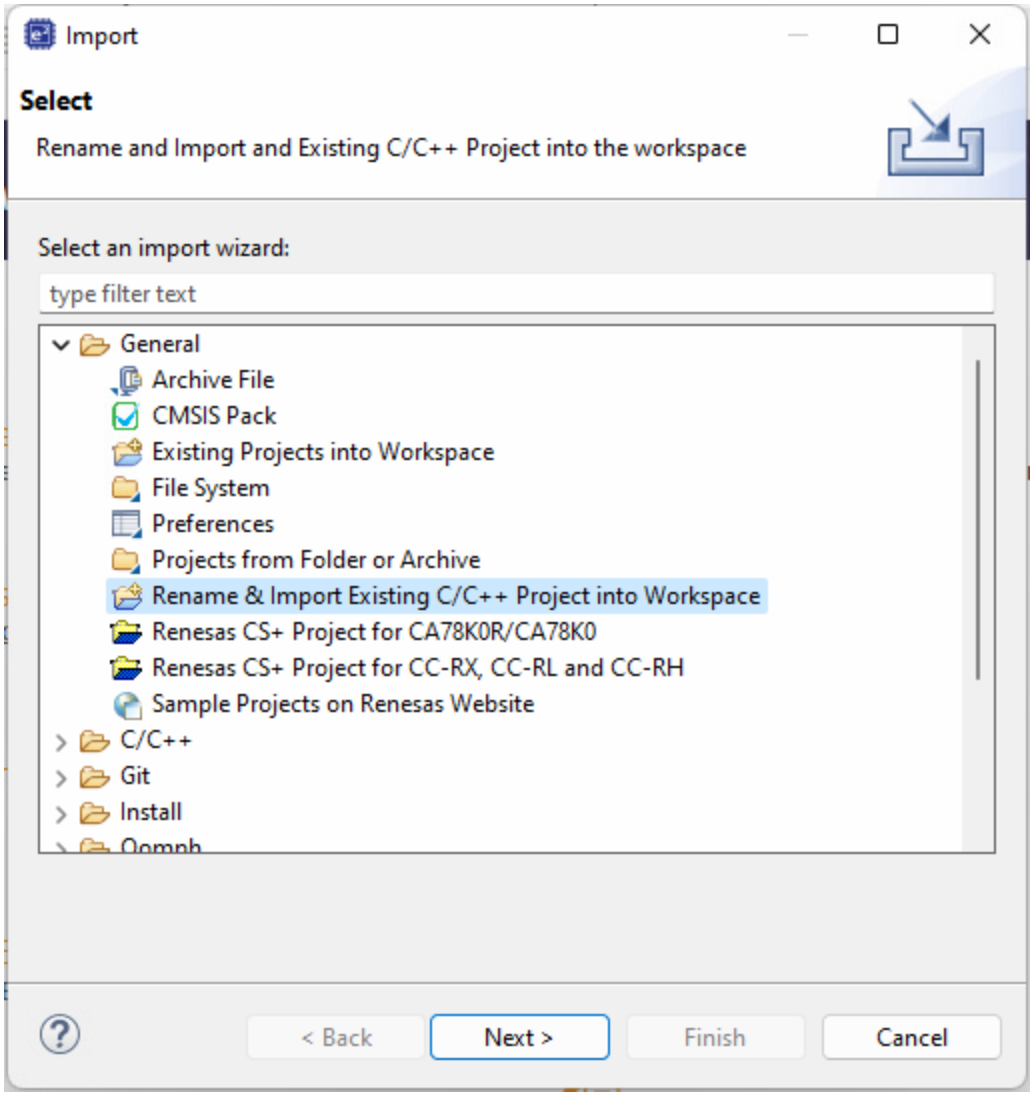

Figure 84. Rename and import

4. Go to the project template directory (unzip 8.0.2.0.X_rm_wifi_test_app.zip), and in the **Project name** field, enter the name and click **Finish**.
5. In the **Project name** field, enter the name and click **Finish**, see Figure 85.

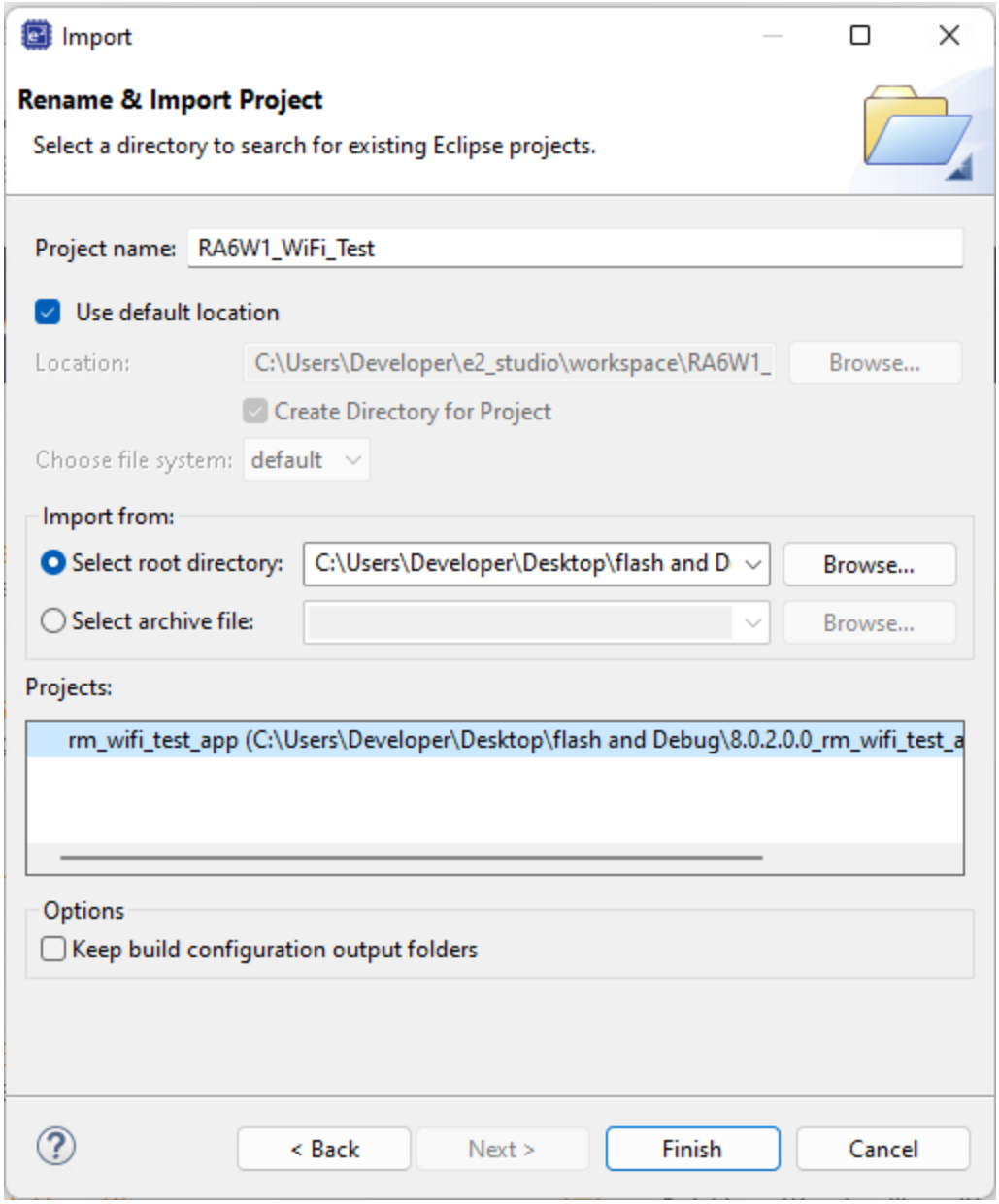

Figure 85. Finish import

6. After import finishes, install python using the following steps in Windows:
   a. Right-click the project, click **Show in Local Terminal** > **Terminal**.
   b. In console, enter "python3".

NOTE
For Windows, if Python 3 is installed already and above terminal appears, for python Integration, see Appendix D Python Integration in e2 studio Windows.

   c. Microsoft store appears and to install Python 3, click **Get**.

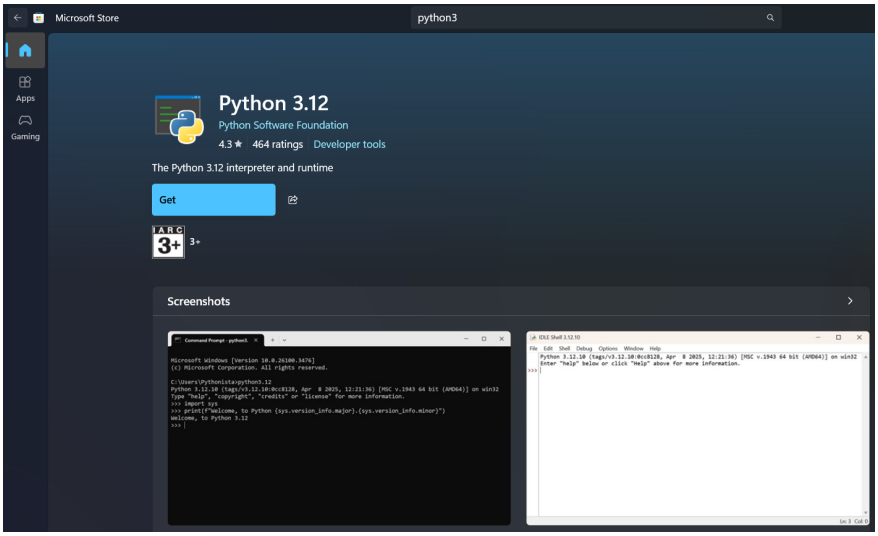

Figure 86. Install Python 3

7. Go to **configuration.xml** and click **Generate Project Content**.

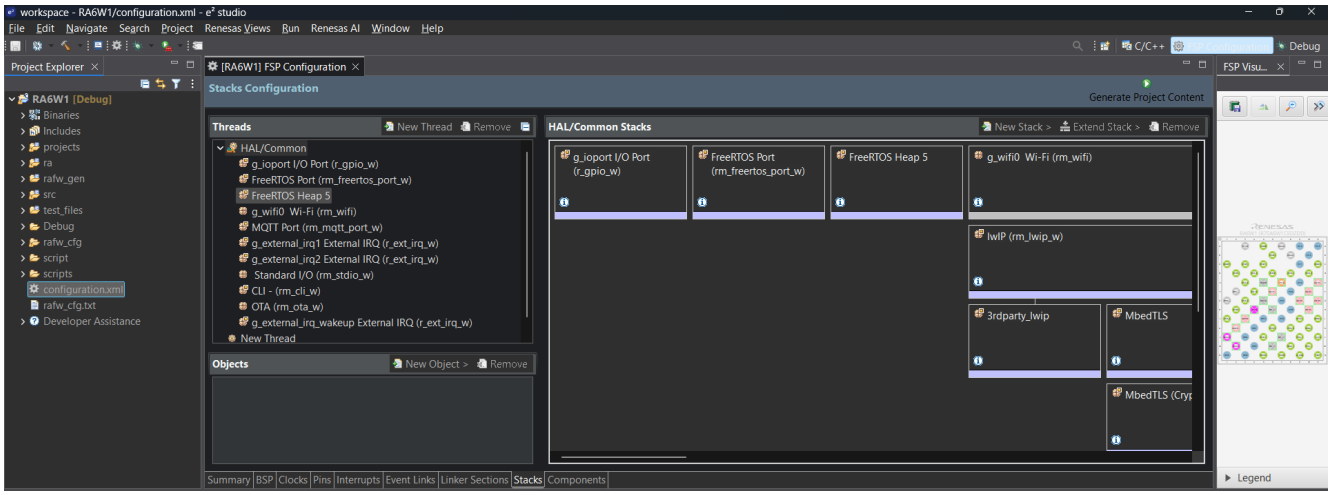

Figure 87. Configuration and generate project contents

8. To build the project, right-click the project and click **Build Project**.
9. To see the build progress, open the console window.

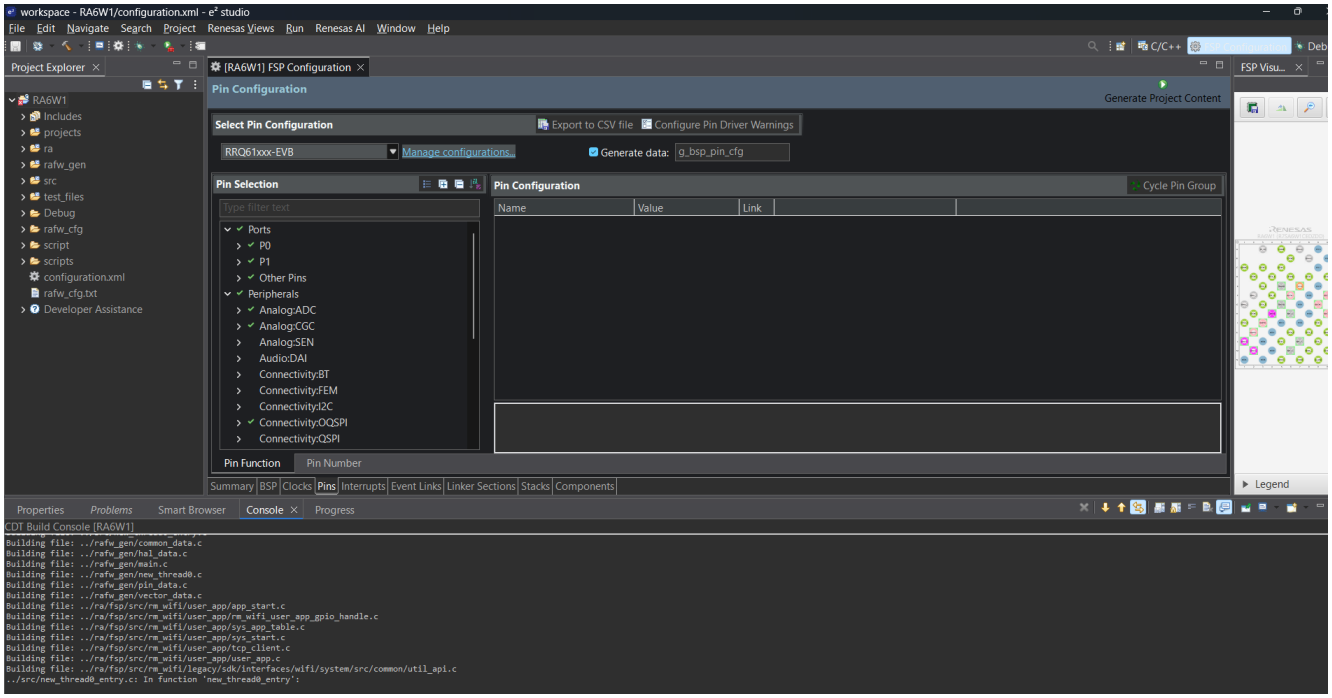

Figure 88. Console window

Figure 89 shows the successful build.

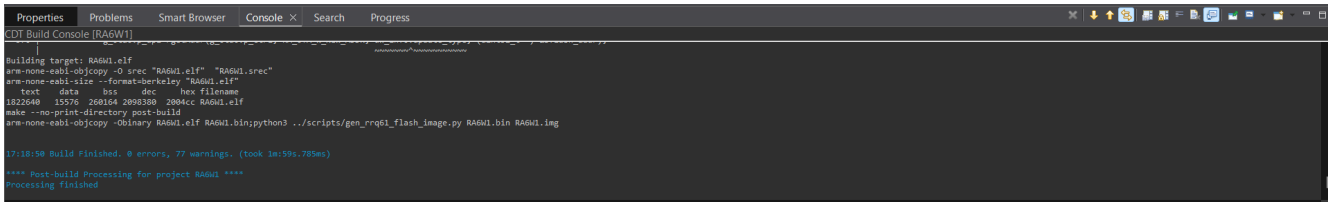

Figure 89. Successful build

10. If there is no ".img" file generated on Windows and Python 3 command does not show any error in console, follow the step 6.

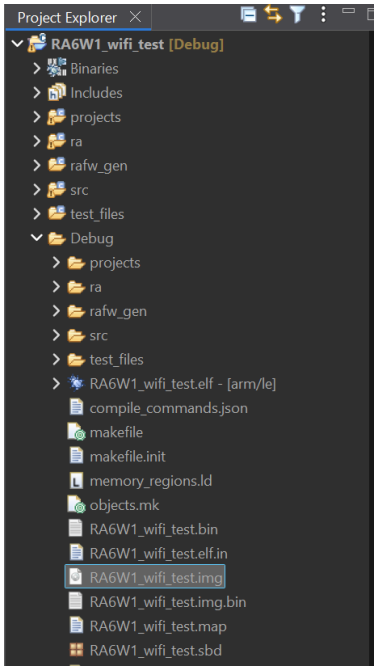

Figure 90. Image in Project Explorer tab

11. To program the firmware images, see Section 5.1 Firmware Image Programming .

7.6 Flash and Debug using e^2 studio

You can flash and debug in e^2 studio using J-Link.

System Requirements:

- e^2 studio installer-2025-07 or later versions
- Segger J-Link V878 or later.

To flash and debug in e^2 studio:

1. Install RA6W1 FSP Pack and Load Project Template in e^2 studio.
2. Build Debug for RA6W1.
3. Go to **Debug** > **Debug New_configuration**.

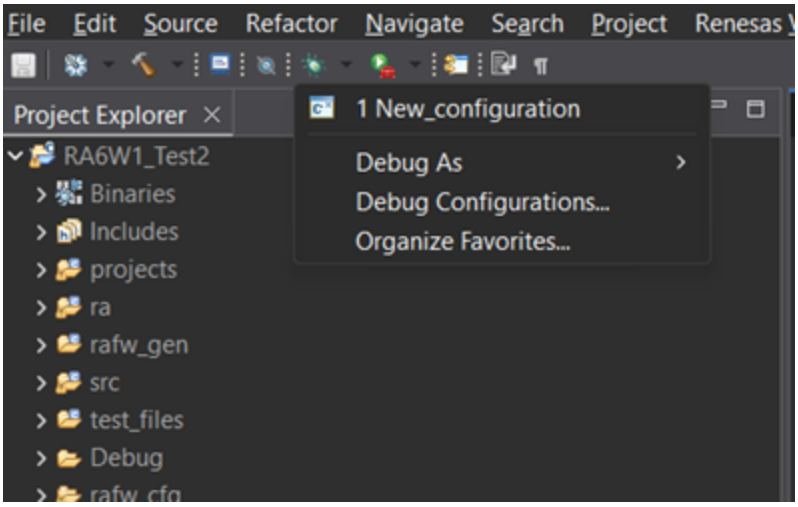

Figure 91. Debug Configuration in e^2 studio

4. In **Debug Configurations**, select **Renesas GDB Hardware Debugging**, and then select **Lauch Configuration**.

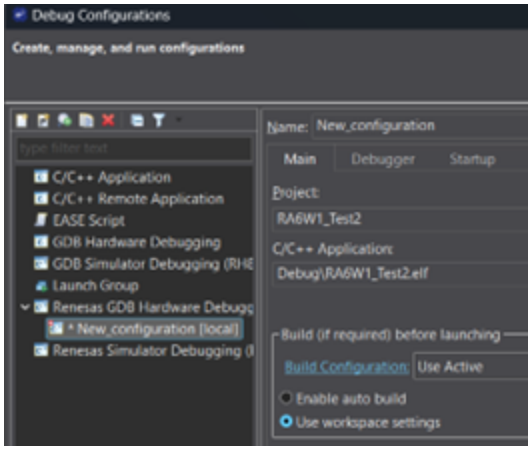

Figure 92. Debug Configuration page

5. On the **Main** tab, go to **Browse** > **Choose Project** > **OK**.

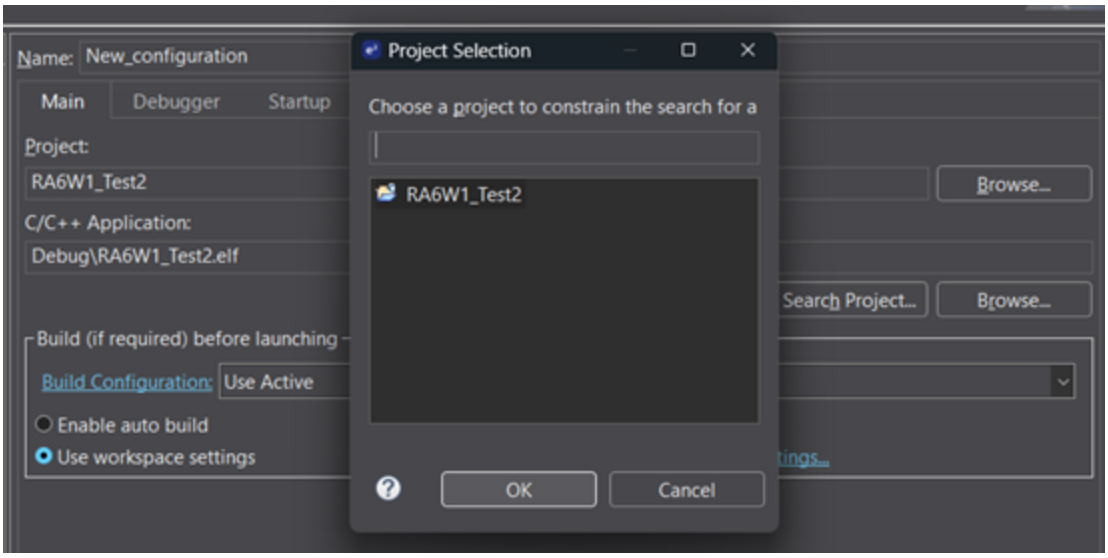

Figure 93. Main section of Debug Configuration

6. On the **Debugger** tab, set up the target device as follows:

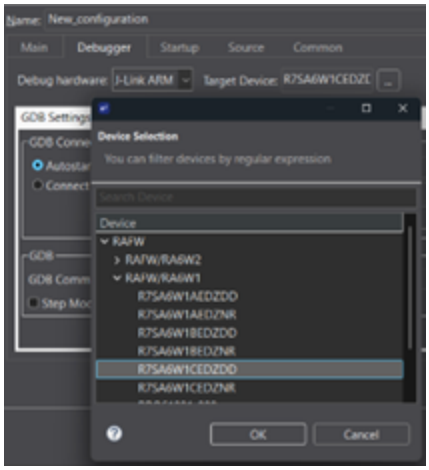

Figure 94. Device selection in Debugger

7. On the **Startup** tab, and change load type of **Program Binary** to **Symbols Only**.

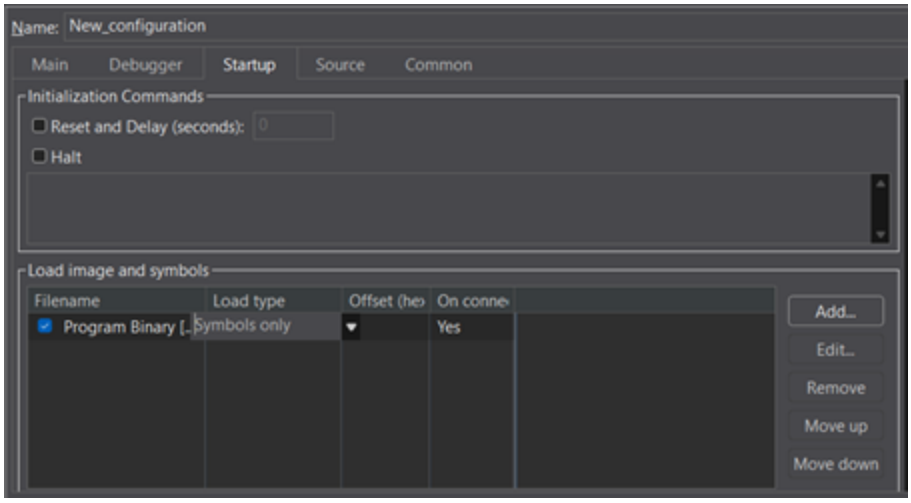

Figure 95. Symbols only

8. To add **Download Module (.img.bin)** from Debug, go to **Add** > **Workspace** > **Project File** > **Debug** > **test_files** > **.img.bin**.

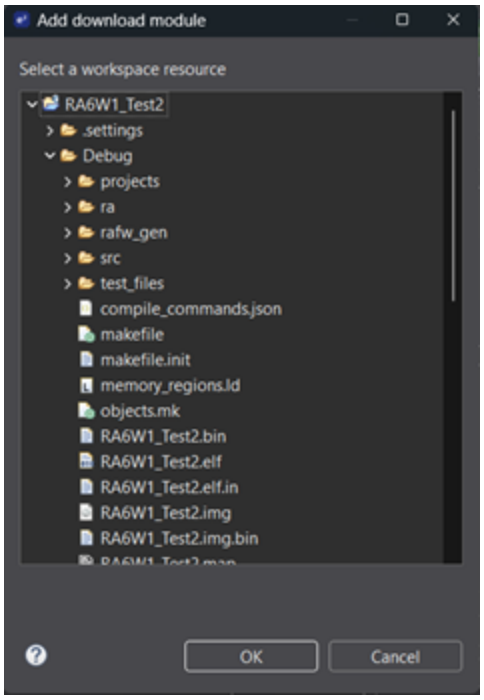

Figure 96. Add Download Module

9. Change Load Type of `.img.bin` into **Raw Binary** and **Offset** as `a000000`. Then click **Apply** > **Debug**.

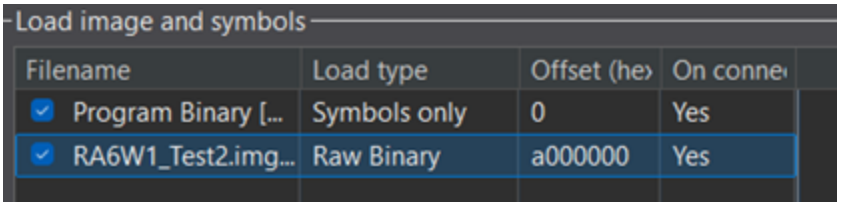

Figure 97. Change Load type and Offset

10. Click **Switch**.

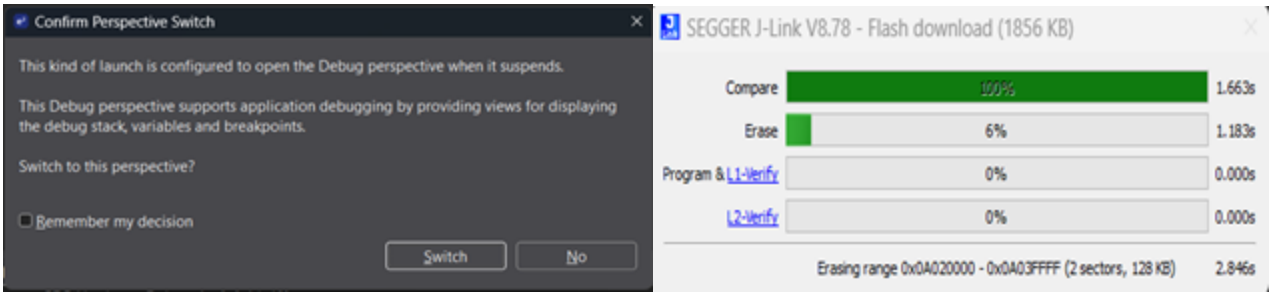

Figure 98. Confirm Perspective Switch and Segger J-Link

11. On **Debug** page, click **Play**.

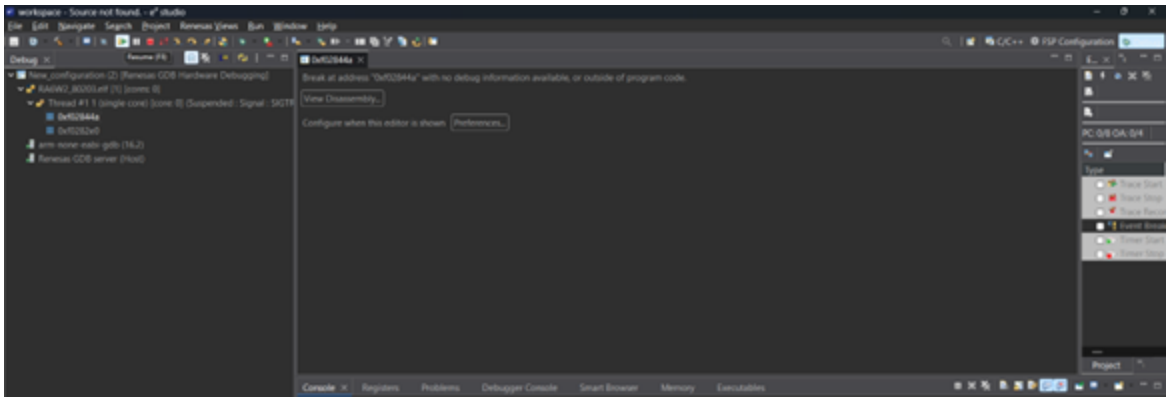

Figure 99. Debug Page

12. By putting a breakpoint in a file you can debug normally using debug interface. Go to C/C++ > Choose a breakpoint > Debug > Resume button.

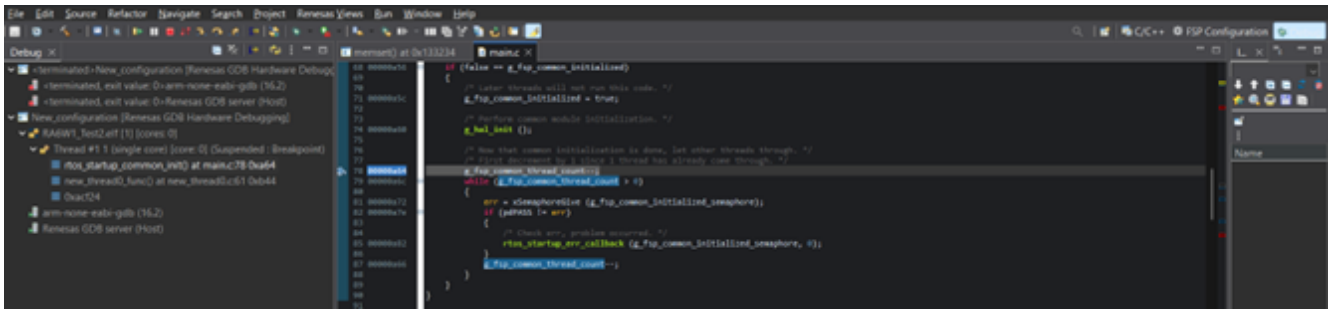

Figure 100. Debug by setting breakpoint

Appendix A Configuration Modes Setup

A.1 Set up Soft AP Mode

Soft AP mode allows you to provision the RA6W1 through the Wi-Fi interface using a mobile application and configure it by running the Easy Setup Wi-Fi configuration wizard.
To configure the RA6W1 for operating in Soft AP mode:

1. Open the RA6W1 debug console and run the `setup` command in the `[/RA6W1-RRQ61001] #]` prompt.
2. To complete the setup, complete the following prompts:

```
[/RA6W1-RRQ61001] #setup                          Start the Easy Setup Wizard.

Stop all services for the setting.
 Are you sure ? [Yes/No] : Y                      Enter Y to stop the running services.

[RA6W1 -RRQ61001 EASY SETUP - V4]

Country Code List:
AD  AE  AF  AI  AL  AM  AR  AS  AT  AU  AW  AZ  BA  BB  BD  BE  BF  BG  BH  BL
BM  BN  BO  BR  BS  BT  BY  BZ  CA  CF  CH  CI  CL  CN  CO  CR  CU  CX  CY  CZ
DE  DK  DM  DO  DZ  EC  EE  EG  ES  ET  EU  FI  FM  FR  GA  GB  GD  GE  GF  GH
GL  GP  GR  GT  GU  GY  HK  HN  HR  HT  HU  ID  IE  IL  IN  IR  IS  IT  JM  JO
JP  KE  KH  KN  KP  KR  KW  KY  KZ  LB  LC  LI  LK  LS  LT  LU  LV  MA  MC  MD
ME  MF  MH  MK  MN  MO  MP  MQ  MR  MT  MU  MV  MW  MX  MY  NG  NI  NL  NO  NP
NZ  OM  PA  PE  PF  PG  PH  PK  PL  PM  PR  PT  PW  PY  QA  RE  RO  RS  RU  RW
SA  SE  SG  SI  SK  SN  SR  SV  SY  TC  TD  TG  TH  TN  TR  TT  TW  TZ  UA  UG
UK  US  UY  UZ  VA  VC  VE  VI  VN  VU  WF  WS  YE  YT  ZA  ZW  ALL

 COUNTRY CODE ? [Quit] (Default KR) : US          Enter the country code.

SYSMODE(WLAN MODE) ?
        1. Station
        2. Soft-AP
        3. WiFi Direct
        4. WiFi Direct P2P GO Fixed
        5. Station & Soft-AP
 MODE ?  [1/2/3/4/5/Quit] (Default Station) : 2      Enter 2 for Soft-AP mode.
BAND ?
        1. 2.4 GHz
        2. 5 GHz
 MODE ?  [1/2/Quit] (Default 1. 2.4 GHz) : 1              Enter 1 for 2.4 Band.
[ SOFT-AP CONFIGURATION ]

 SSID ? (Default RA6W1-RRQ61001_B0A977) : TEST_AP         Enter the SSID name.

 CHANNEL ? [1~11, Auto:0/Quit] (Default Auto) :      Enter to select Auto channel selection.

AUTHENTICATION ?
         1. OPEN
         2. WEP(Unsupported)
         3. WPA-PSK
         4. WPA2-PSK
         5. WPA/WPA2-PSK
         6. WPA3-SAE (WPA3-Personal)
         7. WPA2-PSK+WPA3-SAE (Recommend)
         8. WPA3-OWE
 AUTHENTICATION ? [1/3/4/5/6/7/8/Quit] : 4        Enter 4 to select WPA2-PSK authentication.

PSK-KEY(ASCII characters 8~63 or Hexadecimal characters 64) ? [Quit]
12345678                          Enter the password for the AP.
```

```
 Do you want to set advanced WiFi configuration ? [No/Yes/Quit] (Default No) : N
                                Enter N to skip this step.
==========================================
BAND        : 2.4 GHz
SSID        : TEST_AP
CHANNEL     : AUTO(ACS)
Security    : WPA2PSK
ENCRYPTION  : AES(CCMP)
Password    : 12345678
WIFI MODE   : 11b/g/n    (2.4 GHz)
PMF         : Default
 WIFI CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y        Enter Y to confirm the WIFI
                                configuration.

 IP ADDRESS ? [Quit] (Default 10.0.0.1) :            Enter to select the default IP Address.

 SUBNET ? [Quit] (Default 255.255.255.0) :               Enter to select the default Subnet.

 GATEWAY ? [Quit] (Default 10.0.0.1) :             Enter to select the default Gateway.
==========================================
[WLAN1]
IP ADDRESS: 10.0.0.1
SUBNET    : 255.255.255.0
GATEWAY   : 10.0.0.1
==========================================
 IP CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y            Enter Y to confirm the IP configuration.

 DHCP SERVER CONFIGURATION ? [Yes/No/Quit] : Y        Enter Y to confirm the DHCP Server
                                configuration.

 DHCP SERVER LEASE IP Count(MAX 10) ? [Quit] (Default 10) :
                                Enter to select the default Lease Count.

 DHCP SERVER LEASE TIME(60 ~ 86400 SEC) ? [Quit] (Default 1800) :
                                Enter to select the default Lease Time.
==========================================
[DHCP SERVER]
Start IP  : 10.0.0.2
END IP    : 10.0.0.11
LEASE TIME: 1800
==========================================

 DHCP SERVER CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y    Enter Y to confirm the configuration.

[/RA6W1-RRQ61001] # >>> wpa_supplicant_deinit ...
[wpa_supplicant_deinit_iface] CTRL-EVENT-TERMINATING
>>> Request Supplicant start
>>> Renesas RA6W1-RRQ61001 wpa_supplicant 2.10 - Sep/2023
>>> Add SoftAP Inteface (softap1) ...
>>> MAC address (softap1) : 74:90:50:b0:a9:77
[init_net_ifaces]: Switching WiFi mode to: Soft-AP
[init_net_ifaces]: Setting up AP (wlan1)
Stop DHCP Server

INFO: DHCP Server is not running.
Start DHCP Server
>>> AP Operating Channel: AUTO

>>> DHCP Server Started
```

```
Soft-AP is Ready (74:90:50:b0:a9:77)
```

When all settings are completed, the configuration is saved, and the system reboots. Then, the **Soft AP mode started successfully** message appears.
When a station gets connected successfully, **AP-STA-CONNECTED** with M address of station message is printed.

```
 AP-STA-CONNECTED fa:87:d8:62:3d:a1
```

A.2 Set up EVK for Station plus Soft AP Mode

To configure the RA6W1 for operating in Station + Soft AP mode:

1. Open the RA6W1 debug console and run the setup command in the [/RA6W1-RRQ61001Y] prompt.
2. To complete the setup, complete the following prompts:

```
[/RA6W1 -RRQ61001] # setup

Stop all services for the setting.
 Are you sure ? [Yes/No] : y

[RA6W1 -RRQ61001 EASY SETUP – V4]

Country Code List:
AD  AE  AF  AI  AL  AM  AN  AR  AS  AT  AU  AW  AZ  BA  BB  BD  BE  BF  BG  BH
BL  BM  BN  BO  BR  BS  BT  BY  BZ  CA  CF  CH  CI  CL  CN  CO  CR  CU  CX  CY
CZ  DE  DK  DM  DO  DZ  EC  EE  EG  ES  ET  EU  FI  FM  FR  GA  GB  GD  GE  GF
GH  GL  GP  GR  GT  GU  GY  HK  HN  HR  HT  HU  ID  IE  IL  IN  IR  IS  IT  JM
JO  JP  KE  KH  KN  KP  KR  KW  KY  KZ  LB  LC  LI  LK  LS  LT  LU  LV  MA  MC
MD  ME  MF  MH  MK  MN  MO  MP  MQ  MR  MT  MU  MV  MW  MX  MY  NG  NI  NL  NO
NP  NZ  OM  PA  PE  PF  PG  PH  PK  PL  PM  PR  PT  PW  PY  QA  RE  RO  RS  RU
RW  SA  SE  SG  SI  SK  SN  SR  SV  SY  TC  TD  TG  TH  TN  TR  TT  TW  TZ  UA
UG  UK  US  UY  UZ  VA  VC  VE  VI  VN  VU  WF  WS  YE  YT  ZA  ZW  ZZ

 COUNTRY CODE ? [Quit] (Default KR, ZZ : for debug) : us

SYSMODE(WLAN MODE) ?
        1. Station
        2. Soft-AP
        3. WiFi Direct
        4. WiFi Direct P2P GO Fixed
        5. Station & Soft-AP
 MODE ?  [1/2/3/4/5/Quit] (Default Station) : 5
BAND ?
        1. 2.4 GHz
        2. 5 GHz
        3. AUTO
 MODE ?  [1/2/3/Quit] (Default 3. AUTO) : 1
[ STATION CONFIGURATION ]
================================================================================
[NO] [SSID]                                             [SIGNAL] [CH] [SECURITY]
--------------------------------------------------------------------------------
[ 0] WiFi_Net_2.4G                                         -26   6     WPA2-ENT
[ 1] RenesasMatter                                         -26  10         WPA2
[ 2] REL-GLOBAL                                            -27   6     WPA2-ENT
```

```
[ 3] NETGEAR81                                          -36   3         WPA2
[ 4] GGG_AP_2G                                          -36  11         WPA2
--------------------------------------------------------------------------------
[Enter] Rescan
================================================================================
 Select SSID ? (1~5/M1~M5/Manual/Quit) : 1

 PSK-KEY(ASCII characters 8~63 or Hexadecimal characters 64) ? [Quit]
[123456789|123456789|123456789|123456789|123456789|123456789|1234]
:*********

 Do you want to set advanced WiFi configuration ? [No/Yes/Quit] (Default No) : n

BAND        : 2.4 GHz
SSID        : RenesasMatter
Security    : WAP2PSK
ENCRYPTION  : TKIP/AES(CCMP)
Password    :*********
PMF         : Default
============================================
 WIFI CONFIGURATION CONFIRM ? [Yes/No/Quit] : y

 IP Connection Type ? [Automatic IP/Static IP/Quit] : a

IP Connection Type: Automatic IP

 IP CONFIGURATION CONFIRM ? [Yes/No/Quit] : y

 SNTP Client enable ? [Yes/No/Quit] : n

[ SOFT-AP CONFIGURATION ]

 SSID ? (Default RA6W1 -RRQ61001_B0A977) : TEST_AP             Enter the SSID name.


AUTHENTICATION ?
         1. OPEN
         2. WEP(Unsupported)
         3. WPA-PSK
         4. WPA2-PSK
         5. WPA/WPA2-PSK
         6. WPA3-SAE (WPA3-Personal)
         7. WPA2-PSK+WPA3-SAE (Recommend)
         8. WPA3-OWE
 AUTHENTICATION ? [1/3/4/5/6/7/8/Quit] : 4            Enter 4 to select WPA2-PSK authentication.


PSK-KEY(ASCII characters 8~63 or Hexadecimal characters 64) ? [Quit]
12345678                            Enter the password for the AP.

 Do you want to set advanced WiFi configuration ? [No/Yes/Quit] (Default No) : N
                                  Enter N to skip this step.
============================================
BAND        : 2.4 GHz
SSID        : TEST_AP
Security    : WPA2PSK
ENCRYPTION  : AES(CCMP)
Password    : 12345678
PMF         : Default
 WIFI CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y        Enter Y to confirm the WIFI
```

```
                                configuration.

 IP ADDRESS ? [Quit] (Default 10.0.0.1) :            Enter to select the default IP Address.

 SUBNET ? [Quit] (Default 255.255.255.0) :               Enter to select the default Subnet.

 GATEWAY ? [Quit] (Default 10.0.0.1) :             Enter to select the default Gateway.
==========================================
[WLAN1]
IP ADDRESS: 10.0.0.1
SUBNET    : 255.255.255.0
GATEWAY   : 10.0.0.1
==========================================
 IP CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y            Enter Y to confirm the IP configuration.

 DHCP SERVER CONFIGURATION ? [Yes/No/Quit] : Y        Enter Y to confirm the DHCP Server
                                configuration.

 DHCP SERVER LEASE IP Count(MAX 10) ? [Quit] (Default 10) :
                               Enter to select the default Lease Count.

 DHCP SERVER LEASE TIME(60 ~ 86400 SEC) ? [Quit] (Default 1800) :
                               Enter to select the default Lease Time.
==========================================
[DHCP SERVER]
Start IP  : 10.0.0.2
END IP    : 10.0.0.11
LEASE TIME: 1800
==========================================

 DHCP SERVER CONFIGURATION CONFIRM ? [Yes/No/Quit] : Y    Enter Y to confirm the configuration.

[/RA6W1-RRQ61001] # >>> wpa_supplicant_deinit ...
[wpa_supplicant_deinit_iface] CTRL-EVENT-TERMINATING
>>> Request Supplicant start
>>> Renesas RA6W1-RRQ61001 wpa_supplicant 2.10 - Sep/2023
>>> MAC address (sta0) : 74:90:50:b0:a9:76
>>> Add SoftAP Inteface (softap1) ...
>>> MAC address (softap1) : 74:90:50:b0:a9:77

>>> Start STA & SOFT-AP Concurrent mode...
[init_net_ifaces]: Switching WiFi mode to: Station & Soft-AP
[init_net_ifaces]: Setting up Concurrent mode (AP + STA)
Stop DHCP Server

INFO: DHCP Server is not running.
Start DHCP Server
>>> AP Operating Channel: 11(2462)

Soft-AP is Ready (74:90:50:b0:a9:77)

>>> DHCP Server Started

Connection COMPLETE to 34:0a:33:78:e5:68

>>> Network Interface (wlan0) : UP
         Assigned addr   : 192.168.0.104
             netmask   : 255.255.255.0
               gateway   : 192.168.0.1
         DHCP Server IP  : 192.168.0.1
```

```
          Lease Time      : 08h 00m 00s
          Renewal Time    : 04h 00m 00s
```

When all settings are completed, the configuration is saved, and the "**Start STA & SOFT-AP Concurrent mode**" message appears.

A.3 Set up Station Mode with DPM Enabled

Dynamic Power Management (DMP) is a synthesis of breakthrough in ultra-low-power technologies that enable extremely low-power operation of the RA6W1. DPM shuts down all microelements on the chip when not in use, which allows a near zero level of power consumption when not actively transmitting or receiving data. DPM also enables Ultra-low-power Transmit and Receive modes when the SoC needs to be awake to exchange information with other devices. Advanced algorithms enable the device to stay asleep until the exact required moment to wake up to Transmit or Receive mode.
By default, the DPM functionality is enabled upon the device's connection to an Access Point. This can be reconfigured by running the Easy Setup Wi-Fi configuration wizard. DPM allows for considerably reduced power consumption by periodically entering various sleep modes when full functionality is not required.
To configure the RA6W1 for operating in Station + DPM mode:

1. Open theRA6W1 debug console and run the setup command in the `[/RA6W1-RRQ61001]` prompt.
2. To complete the setup, complete the following prompts:

```
[/RA6W1 -RRQ61001/dpm] # setup

Stop all services for the setting.
 Are you sure ? [Yes/No] : y


[ RA6W1 -RRQ61001 EASY SETUP – V4 ]

Country Code List:
AD  AE  AF  AI  AL  AM  AN  AR  AS  AT  AU  AW  AZ  BA  BB  BD  BE  BF  BG  BH
BL  BM  BN  BO  BR  BS  BT  BY  BZ  CA  CF  CH  CI  CL  CN  CO  CR  CU  CX  CY
CZ  DE  DK  DM  DO  DZ  EC  EE  EG  ES  ET  EU  FI  FM  FR  GA  GB  GD  GE  GF
GH  GL  GP  GR  GT  GU  GY  HK  HN  HR  HT  HU  ID  IE  IL  IN  IR  IS  IT  JM
JO  JP  KE  KH  KN  KP  KR  KW  KY  KZ  LB  LC  LI  LK  LS  LT  LU  LV  MA  MC
MD  ME  MF  MH  MK  MN  MO  MP  MQ  MR  MT  MU  MV  MW  MX  MY  NG  NI  NL  NO
NP  NZ  OM  PA  PE  PF  PG  PH  PK  PL  PM  PR  PT  PW  PY  QA  RE  RO  RS  RU
RW  SA  SE  SG  SI  SK  SN  SR  SV  SY  TC  TD  TG  TH  TN  TR  TT  TW  TZ  UA
UG  UK  US  UY  UZ  VA  VC  VE  VI  VN  VU  WF  WS  YE  YT  ZA  ZW  ZZ

 COUNTRY CODE ? [Quit] (Default KR, ZZ : for debug) : us

SYSMODE(WLAN MODE) ?
        1. Station
        2. Soft-AP
        3. WiFi Direct
        4. WiFi Direct P2P GO Fixed
        5. Station & Soft-AP
MODE ?  [1/2/3/Quit] (Default Station) : 1
BAND ?
        1. 2.4 GHz
        2. 5 GHz
        3. AUTO
 BAND ?  [1/2/3/Quit] (Default 3. AUTO) : 1
```

```
[ STATION CONFIGURATION ]
================================================================================
[NO] [SSID]                                              [SIGNAL] [CH] [SECURITY]
--------------------------------------------------------------------------------
[ 0] REL-GLOBAL_2.4G                                        -21   6     WPA2-ENT
[ 1] WiFi_Net_2.4G                                          -22   6     WPA2-ENT
[ 2] REL-GLOBAL                                             -22   6     WPA2-ENT
[ 3] WiFi_Public_2.4G                                       -23   6         WPA2
[ 4] RenesasMatter                                          -27  10         WPA2
--------------------------------------------------------------------------------
[Enter] Rescan
================================================================================

 Select SSID ? (1~5/M1~M5/Manual/Quit) : 5

 PSK-KEY(ASCII characters 8~63 or Hexadecimal characters 64) ? [Quit]
:********

 Do you want to set advanced WiFi configuration ? [No/Yes/Quit] (Default No) : n

 Enable DPM (Dynamic Power Management) ? [Yes/No/Quit] : y

 DPM factors : Defaults ? [Yes/No/Quit] : y

============================================
DPM MODE           : Enable
Keep Alive Time    : 30000 ms
User Wakeup Time   : 0 ms
TIM Wakeup Count   : 10 dtim
============================================
 DPM CONFIGURATION CONFIRM ? [Yes/No/Quit] : y

============================================
BAND        : 2.4 GHz
SSID        : RenesasMatter
Security    : WAP2-PSK
ENCRYPTION  : TKIP/AES(CCMP)
Password    : ********
PMF         : Default
============================================
 WIFI CONFIGURATION CONFIRM ? [Yes/No/Quit] : y

 IP Connection Type ? [Automatic IP/Static IP/Quit] : a

IP Connection Type: Automatic IP

 IP CONFIGURATION CONFIRM ? [Yes/No/Quit] : y

 SNTP Client enable ? [Yes/No/Quit] : n


[/RA6W1-RRQ61001/dpm] #
Connection COMPLETE to 34:0a:33:78:e5:68

>>> Network Interface (wlan0) : UP
         Assigned addr   : 192.168.0.104
               netmask   : 255.255.255.0
               gateway   : 192.168.0.1
         DHCP Server IP  : 192.168.0.1
         Lease Time      : 08h 00m 00s
```

```
         Renewal Time    : 06h 40m 00s

>>> Start DPM Power-Down !!!
```

When the RA6W1 is in DPM Sleep mode, user input is not accepted by the debug terminal. To re-enable the input, see Appendix A.4 Disable DPM Mode.

A.4 Disable DPM Mode

When RA6W1 enters DPM Sleep mode, the debug terminal does not accept the input because the UART interfaces are powered down. To exit this state and restart the setup process, complete the following steps:

1. Copy the string `PDM off` to the clipboard.
   For example, open Notepad, type `dpm off`, and then copy (Ctrl+C) the command string.
2. To restart the EVB, use the **RST_N** button.
3. After restarting, before the message **>>> Start DPM Power-Down !!!** appears on the console, paste the `dpm off` string in the terminal window, and press Enter.

When this procedure is done successfully, the UART console responds as normal. If DPM mode does not stop successfully, try the process again:

```
dpm off

[/RA6W1 -RRQ61001/dpm] #

Rebooting...


Wakeup source is 0x4

        ****************************************************
        *              RA6W1-RRQ61001 SDK Information
        * -------------------------------------------------
        *
        * - CHIP Name       : RA6W1-RRQ61001 (D3095B)
        * - SKU Type        : 0x20, Dual Band (2.4 + 5 GHz) WI-FI 6
        * - CPU Type        : Cortex-M33 (160MHz)
        * - Kernel Version  : FreeRTOS V11.1.0+
        * - SFLASH Type     : 8 MB (Renesas AT25SL)
        * - SDK Version     : V8.0.1.0.5
        * - F/W Version     : RA6W1-RRQ61001-65f88bebf4-1
        * - Boot Index      : 0
        *
        ****************************************************


System Mode : Station Only (0)
Network init...OK
>>> Renesas RA6W1-RRQ61001 wpa_supplicant 2.10 - Sep/2023
>>> MAC address (sta0) : 74:90:50:b0:a9:76
>>> Start STA mode...

Connection COMPLETE to 34:0a:33:78:e5:68

>>> Network Interface (wlan0) : UP
         Assigned addr   : 192.168.0.104
               netmask   : 255.255.255.0
               gateway   : 192.168.0.1
```

```
          DHCP Server IP  : 192.168.0.1
          Lease Time      : 08h 00m 00s
          Renewal Time    : 04h 00m 00s
```

DPM can be restarted at any time with the `dpm on` command.

Appendix B AT Command Wi-Fi Provisioning

You can provision the Wi-Fi connection using AT commands through the AT command terminal. For AT command interface configuration, see Section Section 5.2.3 Configure RA6W1 EVK AT Command Interface. To provision a Wi-Fi connection, complete the following steps:

1. To see nearby apps, enable echo output and then initiate a Wi-Fi scan.

   ```
   ATE
   AT+WFSCAN
   ```

2. Configure the desired Wi-Fi connection with the following command:
   - AT+WFJAP=<SSID>,<Security>,<Encryption>,<Passphrase>
     - <SSID>: AP SSID
     - <Security>: Security protocol.
       0 (OPEN), 1 (WEP), 2 (WPA), 3 (WPA2), 4 (WPA+WPA2), 5 (WPA3 OWE), 6 (WPA3 SAE), 7 (WPA2 RSN and WPA3 SAE)
     - <Encryption>:
       0 (TKIP), 1 (AES), 2 (TKIP+AES)
     - <Key>: Passphrase. 8 ~ 63 characters are allowed

Example:
If selecting Dlink_AP_24G_FZ, the configuration selected should be as follows:

- <SSID>: Dlink_AP_24G_FZ
- <Security>: 4 for WPA+WPA2 Security protocol.
- <Encryption>: 2 for TKIP+AES encryption.
- <Key>: 12345678 (password of AP).

The example of the command: `AT+WFJAP=Dlink_AP_24G_FZ,4,2,12345678`
The RA6W1 reboots and connects to the given SSID, with DPM enabled by default.
The procedure is similar for a 5 GHz connection. In this example, the only changes are to <Security> (changed to WPA3), and <Encryption> (changed to AES).
`AT+WFJAP=R15-5G,6,1,12345678`
The additional useful commands for Wi-Fi configuration:

```
AT+WFSTAT   // for getting the Wi-Fi configuration.
ATF    // for factory reset
```

Appendix C Flash Using flash_img_downloader Script

Programming firmware images to the EVK requires the flash downloader. The flash downloader (flash_img_downloader.zip) is provided with binary images (see Figure 101).

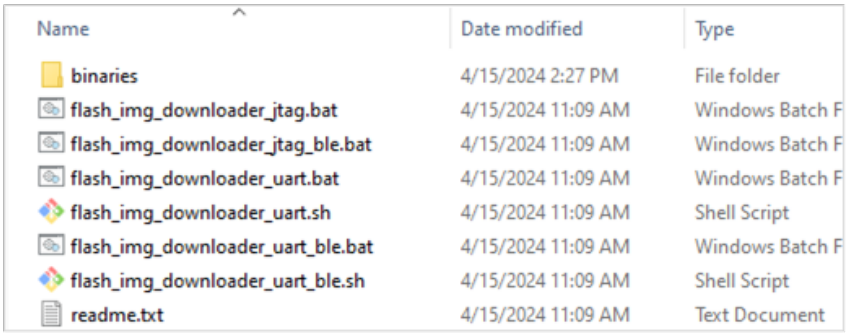

Figure 101. Flash downloader

System requirements:

- OS (Windows 10 64 bit/Ubuntu 20.04 LTS 64 bit).
- Python 3.12.x and pycryptodome package.

NOTE

Install mandatory python library.
`pycryptodome`

- For Windows
  Open a Windows command prompt and enter the following commands:
  `python -m pip install pycryptodome`
- For Linux OS
  Open a terminal window and enter the following commands:
  `python -m pip install pycryptodome`

Check python version using `python –version`
`Python 3.1.X`

To program the firmware image through the UART, you have the following options:

- For Windows, use `flash_img_downloader_uart.bat` batch file.
- For Linux, use `flash_img_downloader_uart.sh` shell script file.
- Hardware: RA6W1 EVK, see Figure 102.

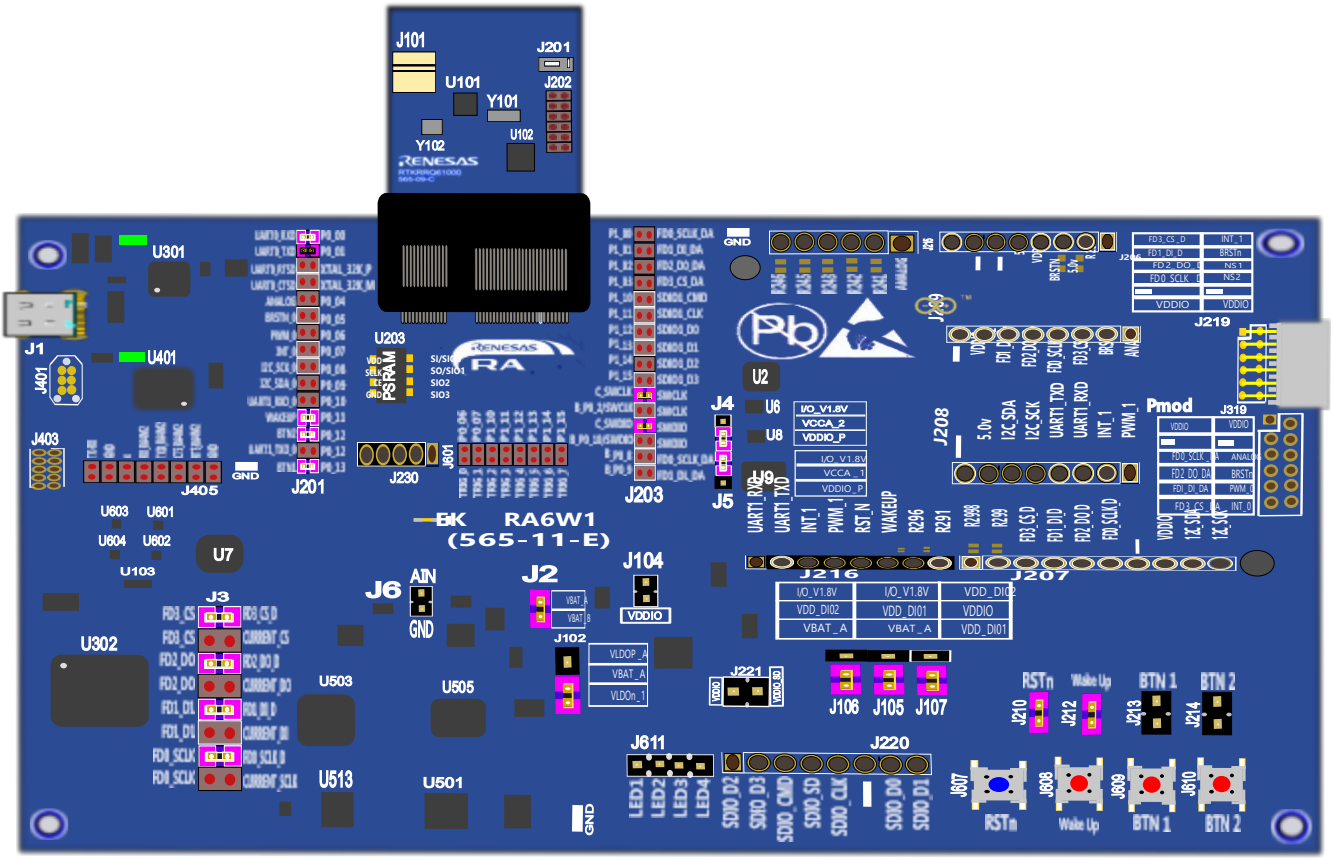

Figure 102. RA6W1 EVK hardware

- This tool is for both Windows and Linux and the programming can be done automatically.
- Software: Flash Downloader for UART.

To program the firmware image using Windows:

1. Execute the batch script in the Windows command prompt.
   Usage: `flash_img_downloader_uart.bat [img full path]`
   Example: `flash_img_downloader_uart.bat <full_path>/8.0.2.0.0_rm_wifi_test_app.img`

```
C:\Users\arshad.a\Desktop\AnoopG\flash_img_downloader_crct\flash_img_downloader_crct\flash_img_downloader_crct>flash_img_downloader_uart.bat C:\Users\arshad.a\Downloads\8.0.2.0.4_rm_wifi_test_app.img
```

Figure 103. Run flash downloader with UART

2. Enter COM port to use (lowest numbered COM port).

NOTE
Before running the flash downloader with UART, close any other instances of this COM port to make sure of COM port availability.

```
..
.. QSPI PROGRAMMING
..

Enter COM port to use [e.g. COM1] : 5
UART COM port used: COM5
```

Figure 104. Enter COM port for UART

3. If prompted, to start programming the firmware, press the RST_N (Reset) button on the RA6W1 EVK.

```
Setting serial port baud rate to 115200.
Connecting to device...
Press RESET.
```

Figure 105. Reset RA6W1 EVK

The script finishes programming the firmware image through UART.

```
Setting serial port baud rate to 115200.
Connecting to device...
Press RESET.
```

Figure 106. Finished programming a firmware image with UART

4. After firmware programming is completed, open the Terminal Emulator and configure Tera Term Serial Terminal Application for Windows, see Section 5.2.1 Configure Tera Term Serial Terminal Application for Windows. .
5. Press the Reset button on the EVK.
6. Check the booting status through UART.

C.1 Program Firmware Images for Windows

Figure 107. Flash boot with downloaded image

C.2 Program Firmware Images for Linux

To program the firmware image using Linux:

1. Execute the Shell script in the Terminal.
   Usage: `flash_img_downloader_uart.sh [img full path]`
   Example: `flash_img_downloader_uart.sh <full_path>/8.0.2.0.0_rm_wifi_test_app8.img`

```
thinkpalm ~/Downloads/flash_img_downloader /home/thinkpalm/Downloads/8.0.2.0.4_rm_wifi_test_app.img
```

Figure 108. Run flash downloader with UART

NOTE
While programming, make sure the port of RA6W1 interface should be `/dev/ttyUSB0`. Also close any other minicom instances of this port to make sure of port availability.

2. If prompted, to start programming the firmware, press the RST_N (Reset) button on the RA6W1 EVK.

```
Setting serial port baud rate to 115200.
Connecting to device...
Press RESET.
```

Figure 109. Reset RA6W1 EVK

The script finishes programming the firmware image through UART.

```
Writing to address: 0x00000000 offset: 0x001cb000 chunk size: 0x00001000
Writing to address: 0x00000000 offset: 0x001cc000 chunk size: 0x00001000
Writing to address: 0x00000000 offset: 0x001cd000 chunk size: 0x00001000
Writing to address: 0x00000000 offset: 0x001ce000 chunk size: 0x00001000
Writing to address: 0x00000000 offset: 0x001cf000 chunk size: 0x00001000
Writing to address: 0x00000000 offset: 0x001d0000 chunk size: 0x000001cc
done.
end
.....
..
.. FINISHED!
..
.....
```

Figure 110. Finished programming a firmware image with UART

3. After firmware programming completes, open the Terminal Emulator and configure as in Section 5.2.2 Configure Minicom for Linux.
4. On the EVK, press the **Reset** button.
5. Check the booting status through UART.

```
Wakeup source is 0x4

        ******************************************************
        *              RA6W1-RRQ61001 SDK Information
        * ---------------------------------------------------
        *
        * - CHIP Name       : RA6W1-RRQ61001 (D3095B)
        * - SKU Type        : 0x20, Dual Band (2.4 + 5 GHz) WI-FI 6
        * - CPU Type        : Cortex-M33 (160MHz)
        * - Kernel Version  : FreeRTOS V11.1.0+
        * - SFLASH Type     : 8 MB (Renesas AT25SL)
        * - SDK Version     : V8.0.2.0.0
        * - F/W Version     : RA6W1-RRQ61001-24edf65ff2-1
        * - Boot Index      : 0
        *
        ******************************************************
```

Figure 111. Flash boot with downloaded image

Appendix D Python Integration in e^2 studio Windows

If Python 3 is already installed and it is not showing in the e^2 studio terminal, follow the steps:

1. In Windows, go to **Apps** > **Advanced app settings** > **App execution aliases** > **python3.exe**.

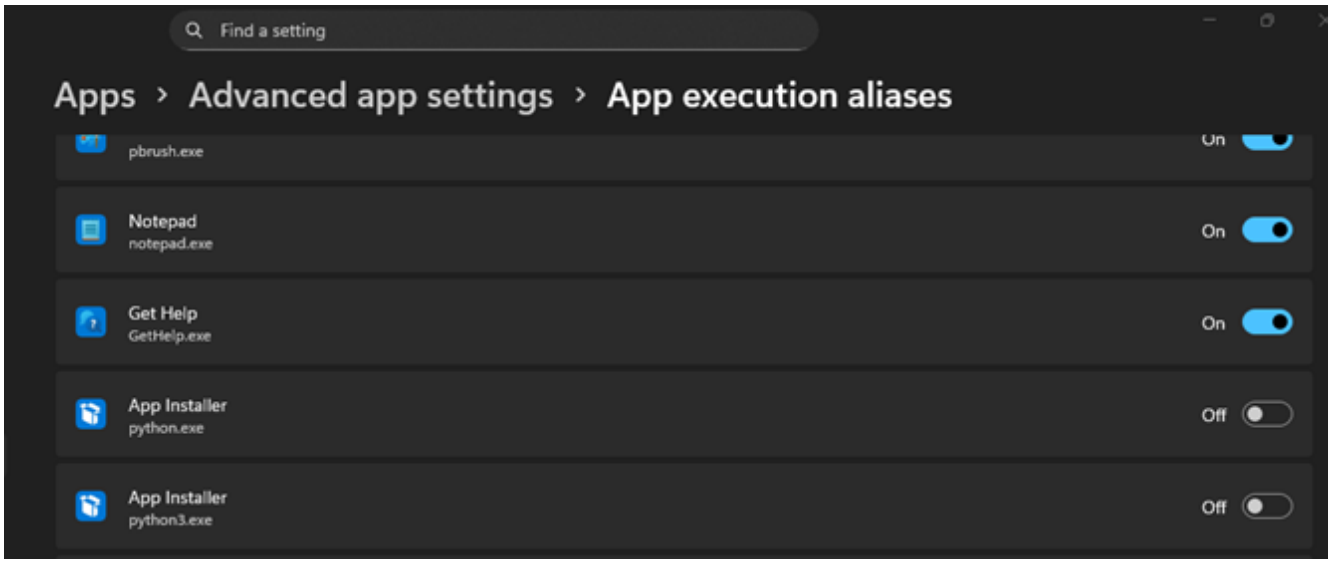

Figure 112. App execution aliases

2. Create a `python3.bat` file with the following script.

```
@echo off
python %*
```

3. Copy the `python3.bat` file to the already existing python3 installation location.

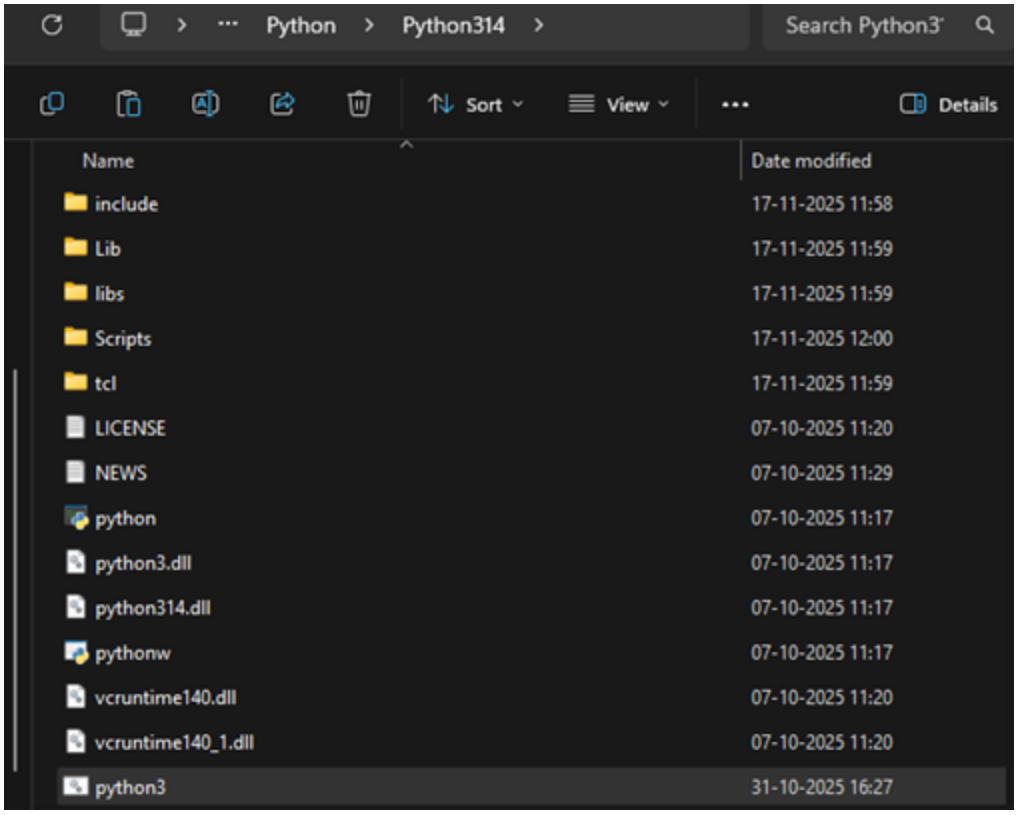

Figure 113. Python3 Installation folder

4. Restart e^2 studio and check if Python 3 is properly integrated using the below command.

```
python3 --version
```

Appendix E SFlash Memory Maps

This section describes the memory maps for the external SFlash device and how to change the SFlash device memory map used in the SDK.

NOTE

The RA6W1 SDK currently supports the following SFlash types:

- **8-MB SFlash**
- Renesas - AT25SL641

To use a different type of SFlash with the RA6W1, contact Renesas Electronics to confirm compatibility.

The RA6W1 SDK supports 8-MB SFlash.

Table 5. 8-MB SFlash map for RA6W1

Address	Name	Description	Size (kB)
0x0000_0000	Product Header		4
0x0000_1000	Product Header - Backup		4
0x0000_2000	RTOS #0	(64*1024 * 40)	2560
0x0028_2000	Reserved	RTOS binary size – Expandable area	508
0x0030_0000	NVRAM	NVRAM VEE Segment #1	40
0x0030_A000	NVRAM	Backup (Multiplier 8)	280
0x0035_0000	TLS_Cert_Base		704
0x0035_2000	TLS Certificate WPA_Enterprise	CA	4 or Unused
0x0035_3000		Cert	4 or Unused
0x0035_4000		Private key	4 or Unused
0x0035_5000		Diffie-Hellmann key	4 or Unused
0x0035_6000	TLS Certificate OTA_Update	CA	4 or Unused
0x0035_7000		Cert	4 or Unused
0x0035_8000		Private key	4 or Unused
0x0035_9000		Diffie-Hellmann key	4 or Unused
0x0035_A000	TLS Certificate HTTPs Client	Cert	4 or Unused
0x0035_B000		Private key	4 or Unused
0x0035_C000		Diffie-Hellmann key	4 or Unused
0x0035_D000		CA	4 or Unused
0x0035_E000	TLS Certificate HTTPs Server	Cert	4 or Unused
0x0035_F000		Private key	4 or Unused
0x0036_0000		Diffie-Hellmann key	4 or Unused
0x0036_1000		Cert	4 or Unused
0x0036_2000	TLS Certificate MQTTs Client	Cert	4 or Unused
0x0036_3000		Private key	4 or Unused
0x0036_4000		Diffie-Hellmann key	4 or Unused
0x0036_5000		CA	4 or Unused
0x0036_6000	TLS Certificate CoAPs Client	Cert	4 or Unused
0x0036_7000		Private key	4 or Unused
0x0036_8000		Diffie-Hellmann key	4 or Unused
0x0036_9000		Cert	4 or Unused
0x0036_A000	TLS Certificate CoAPs Server	CA	4 or Unused
0x0036_B000		Cert	4 or Unused

Address	Name	Description	Size (kB)
0x0036_C000		Private key	4 or Unused
0x0036_D000		Diffie-Hellmann key	4 or Unused
0x0036_E000	TLS Certificate AT-CMD #0 ~ #15	AT command TLS Certificate Key #0 ~ #15	64 or Unused
0x0038_F000	TLS Certificate Matter		16 or Unused
0x003F_E000	Secure Asset Product Area		4 or Unused
0x0040_0000	RTOS #1	(64*1024 * 40)	2560
0x0068_0000	Reserved	RTOS binary size – Expandable area	512
0x0070_0000	User Area #1		1020
0x007F_F000	Partition Table		4

8. Revision History

Revision	Date	Description
1.04	Mar 26, 2026	Updated the AT Command Jumper Configuration section.
1.03	Nov 28, 2025	Updated Mother-Board to RevE. Updated sections about EVK and its setup, test procedures, SDK and build setup. Added appendix about Python integration.
1.02	Aug 31, 2025	Updated sections about programming firmware images, station mode, SDK and bild setup, and flash_img_downloader.
1.01	May 30, 2025	■ Updated sections about measuring Sleep 1 current consumption and SFlash memory maps. ■ Changed the chip name from RRQ61000 to RA6W1.
1.00	Mar 13, 2025	First release.

Status Definitions

Status	Definition
DRAFT	The content of this document is under review and subject to formal approval, which may result in modifications or additions.
APPROVED or unmarked	The content of this document has been approved for publication.

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