

QCIOT-RRQ61051EVZ

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

Description

The QCIOT-RRQ61051EVZ is a Wi-Fi 6 and Bluetooth® Low Energy (LE) combo module board featuring PMOD™ connector and possibility to add extended headers converting this board to MikroElektronika Click interface compatible solution. This evaluation board is built on a RRQ61051 module which contains the RA6W1 MCU featuring an Arm® Cortex®-M33 processor. It also includes a dual-band 802.11a/b/g/n/ac/ax Wi-Fi subsystem, on-chip memory, flexible peripheral interfaces, and advanced power management capabilities. The module integrates 8MB of Flash, a 40MHz crystal, RF matching components, and offers three antenna options for design flexibility. This module offers a standalone, single-chip solution that supports complex, low-power IoT applications requiring both Wi-Fi and Bluetooth LE connectivity.

Board Contents

- QCIOT-RRQ61051EVZ Wi-Fi 6 and BLE combo evaluation board
- Click Board connectors, which can be soldered if required.

Features

- Arm Cortex-M33: 160MHz
- 704kB SRAM
- Wi-Fi 6, 802.11a/b/g/n/ac/ax 2.4/5GHz, 1x1, 20MHz, MCS9 115Mbps, OFDMA, TWT
- Bluetooth LE 5.1
- WPA/WPA2- Enterprise/Personal, WPA2 SI, WPA3 SAE, and OWE
- 8Mbyte QSPI Flash
- QSPI PSRAM controller
- 2x SPI, 3x UART, 2x I²C, SDIO 3.0 (Device)
- 12-bit ADC, I²S, PDM, PWM
- True Random Number Generator (TRNG)
- Worldwide certified module
- Encryption: AES, DES/3DES, CHACHA, SHA1/224/256, RSA, DH, ECC
- Operating temperature range -40°C to 85°C
- PMOD and Click interface compatible board

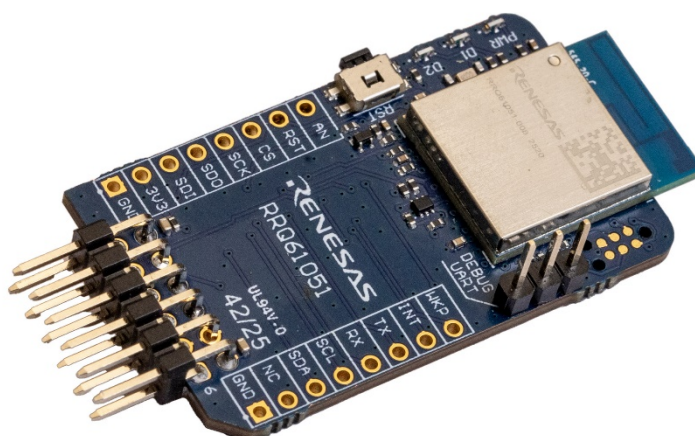


Figure 1. Board Image

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1. Functional Description

The board contains one key component and acts as a carrier board for the RRQ61051-008 module (see [Figure 2](#)).

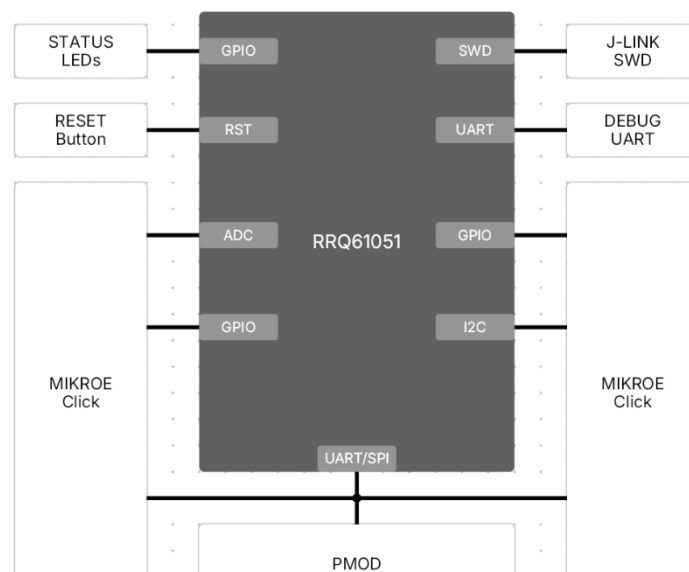


Figure 2. QCIOT-RRQ61051EVZ Block Diagram

Three connectors are on the board. The pinout is described in the Connectors section.

- Digilent PMOD Type 3A
- MikroElektronika Click board compatible interface
- Debug headers for WiFi module debugging

1.1 Board Operation

The board acts as a simple MCU supervised solution where all the network stacks are running on the QCIOT-RRQ61051EVZ board while the MCU hosts the user application. A simplified block diagram is shown in [Figure 3](#).

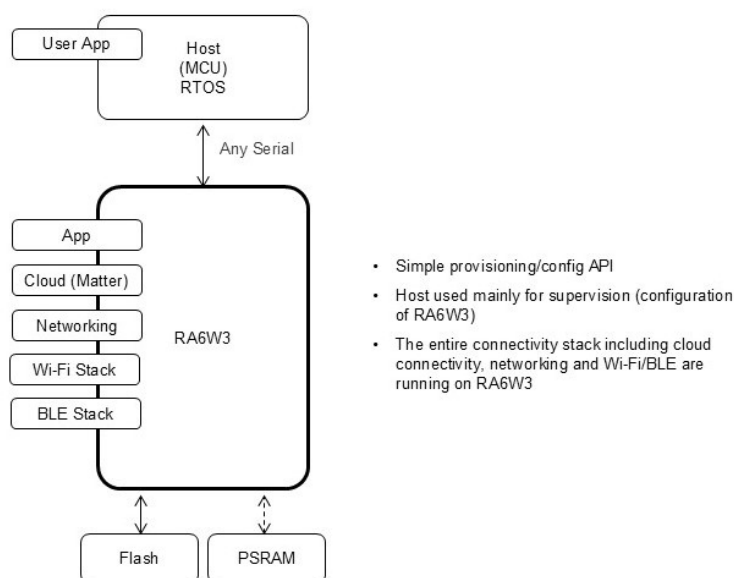


Figure 3. MCU Supervised Application Block Diagram

1.2 Connectors

1.2.1 PMOD Connector

The default communication interface is the PMOD Connector. The Connection diagram and pinout are shown in Figure 4.

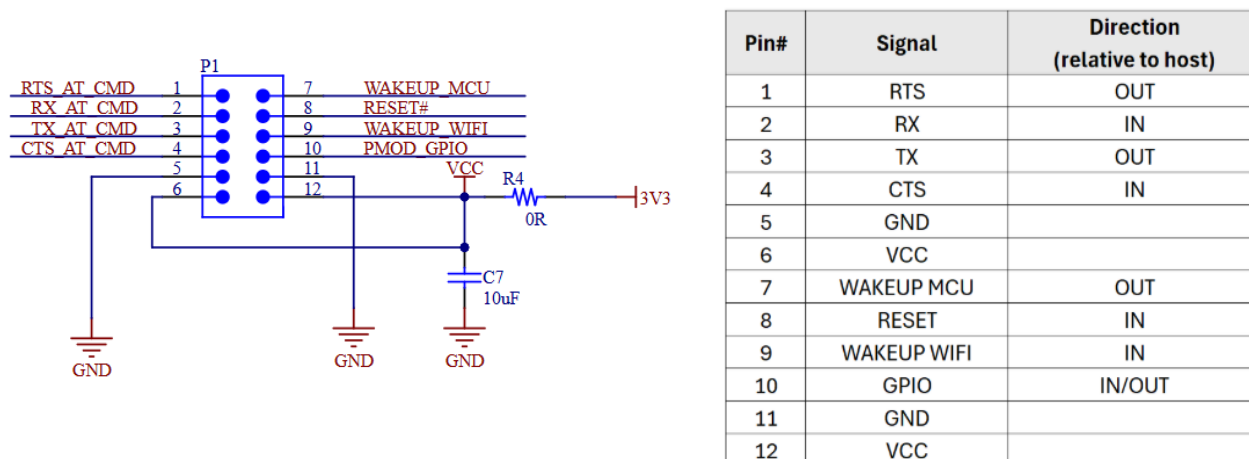


Figure 4. PMOD Type 3A Connector

1.2.2 Click Connector

The click connector is a MikroElektronika Click board compatible connector. The pinout is shown in Figure 5.

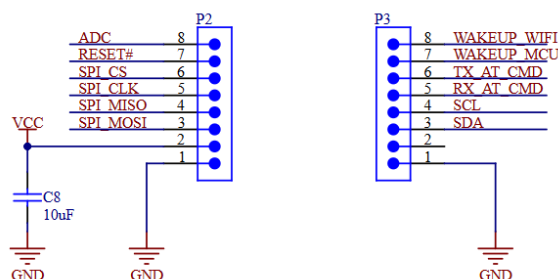


Figure 5. Clicker Connectors Pinout

Note: By default, the P2 and P3 connectors are not assembled. SPI and UART share the same pins that are selected using solder bridges (see the section [Solder Bridges](#)). For more detail, review the figures in the [Schematic Diagrams](#) section.

1.2.3 Serial Debug Interface

The Serial Debug interface is used to trace log messages, configure the board, or for firmware updates. The pinout is described in Table 1. For more detail, review the figures in the [Schematic Diagrams](#) section.

Table 1. Serial Debug Interface Pinout

PIN	Signal	Description
GND	Ground	-
1	RX	Receive signal from the host to the module.
2	TX	Transmit signal from the module to the host.

1.3 Solder Bridges

There are eight solder bridges that allow SPI signals to be routed to the Click interface. The default interface on the board is UART; it is connected to the PMOD connector. The same interface supporting image is flashed to the board after production. Explanations for the solder bridges are provided in [Table 2](#).

Table 2. Solder Bridges

Designator	Default State	Function
SB1	OPEN	P0.08 is connected to P2.6
SB3	OPEN	P0.05 is connected to P2.3
SB5	OPEN	P0.12 is connected to P2.4
SB7	OPEN	P0.09 is connected to P2.5
SB2	CLOSED	P0.08 is connected to P1.1
SB4	CLOSED	P0.05 is connected to P1.2 and P3.5
SB6	CLOSED	P0.12 is connected to P1.3 and P3.6
SB8	CLOSED	P0.09 is connected to P1.4

1.4 Test Points

The RRQ61051-008 module has BLE functionality. To monitor and debug communication between the RA6W1 and BLE chips, there are test points placed on the bottom of the board (see [Table 3](#)).

Table 3. Test Points Description

Designator	Signal	Description
TP1	BLE_UART_TX	BLE chip UART TX signal.
TP2	BLE_UART_RX	BLE chip UART RX signal.
TP3	BLE_HW_RST	BLE chip reset signal.
TP4	BLE_UART_RTS	BLE chip UART RTS signal.
TP5	BLE_UART_CTS	BLE chip UART CTS signal.
TP6	COEX_iBtAct	WIFI and BLE Coexistence control signal.
TP7	RFSW1	RF Switch control signal.
TP8	RFSW2	RF Switch control signal.

1.5 Setup and Configuration

The board setup and configuration are completed using a PMOD interface over the UART with an AT command interface.

It is possible to upload different firmware images supporting different interfaces. Before proceeding, review the board schematic in the [Schematic Diagrams](#) section and firmware documentation.

2. Board Design

Figure 6 shows the top and bottom board images.

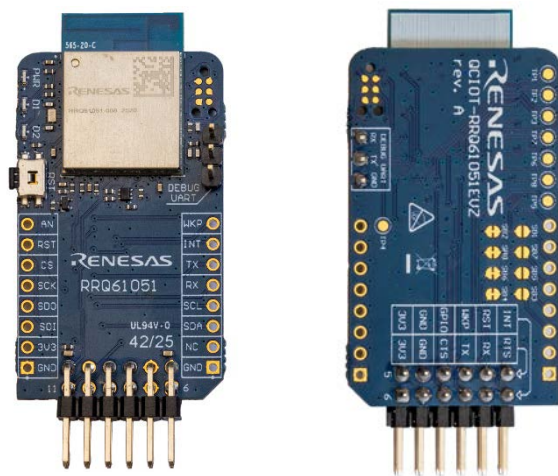


Figure 6. QCIOT-RRQ61051EVZ, Wi-Fi 6 and Bluetooth LE PMOD and Click Board (Top and Bottom)

2.1 Hardware Design

The board is designed with the PMOD connector as the primary interface. The Click connector is optional. Before using the Click headers, refer to the schematics in the following section, because some interfaces share the same pins. To avoid crosstalk, these signals are routed using solder bridges, as described in the [Solder Bridges](#) section.

2.2 Schematic Diagrams

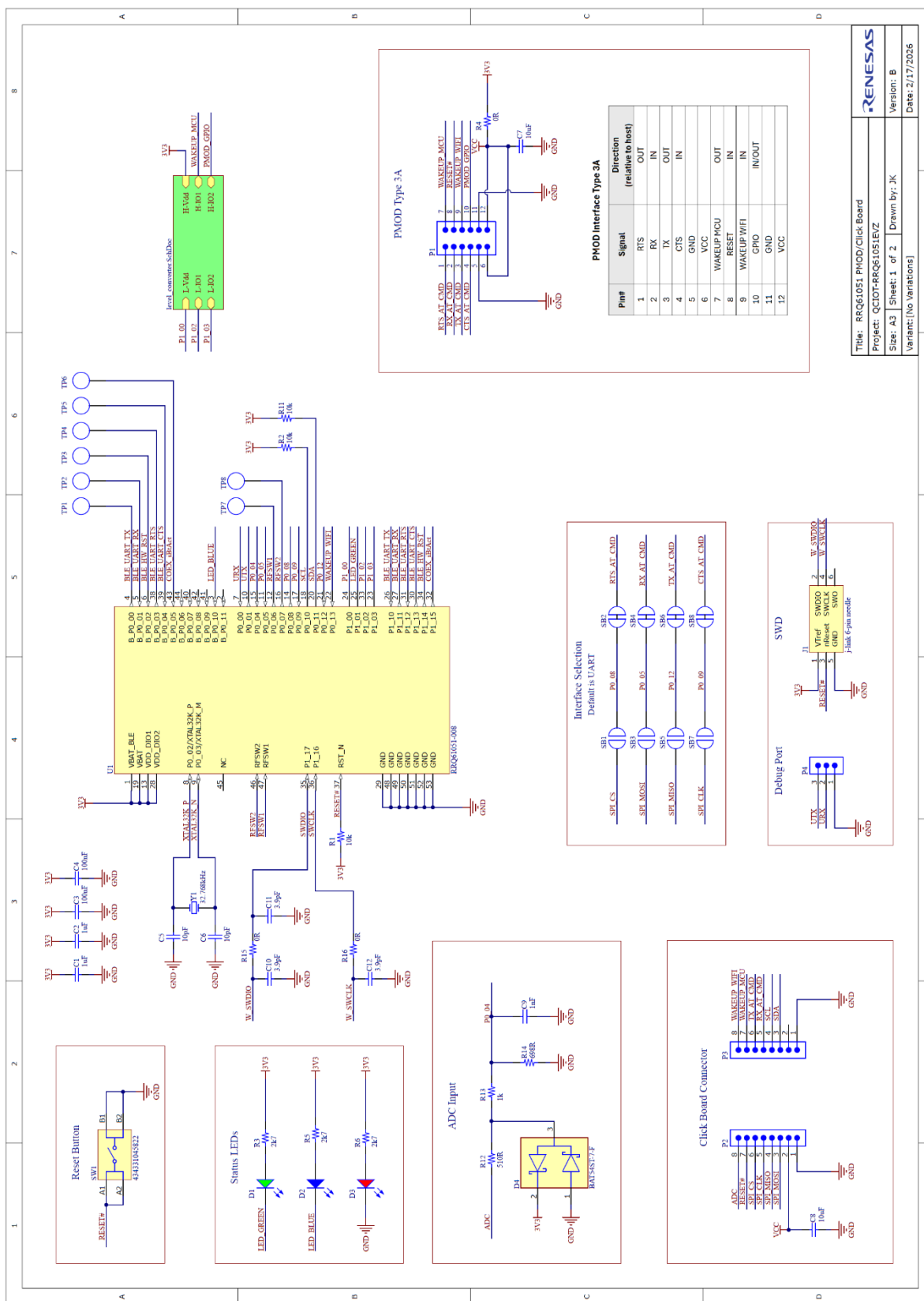


Figure 7. Board Schematic

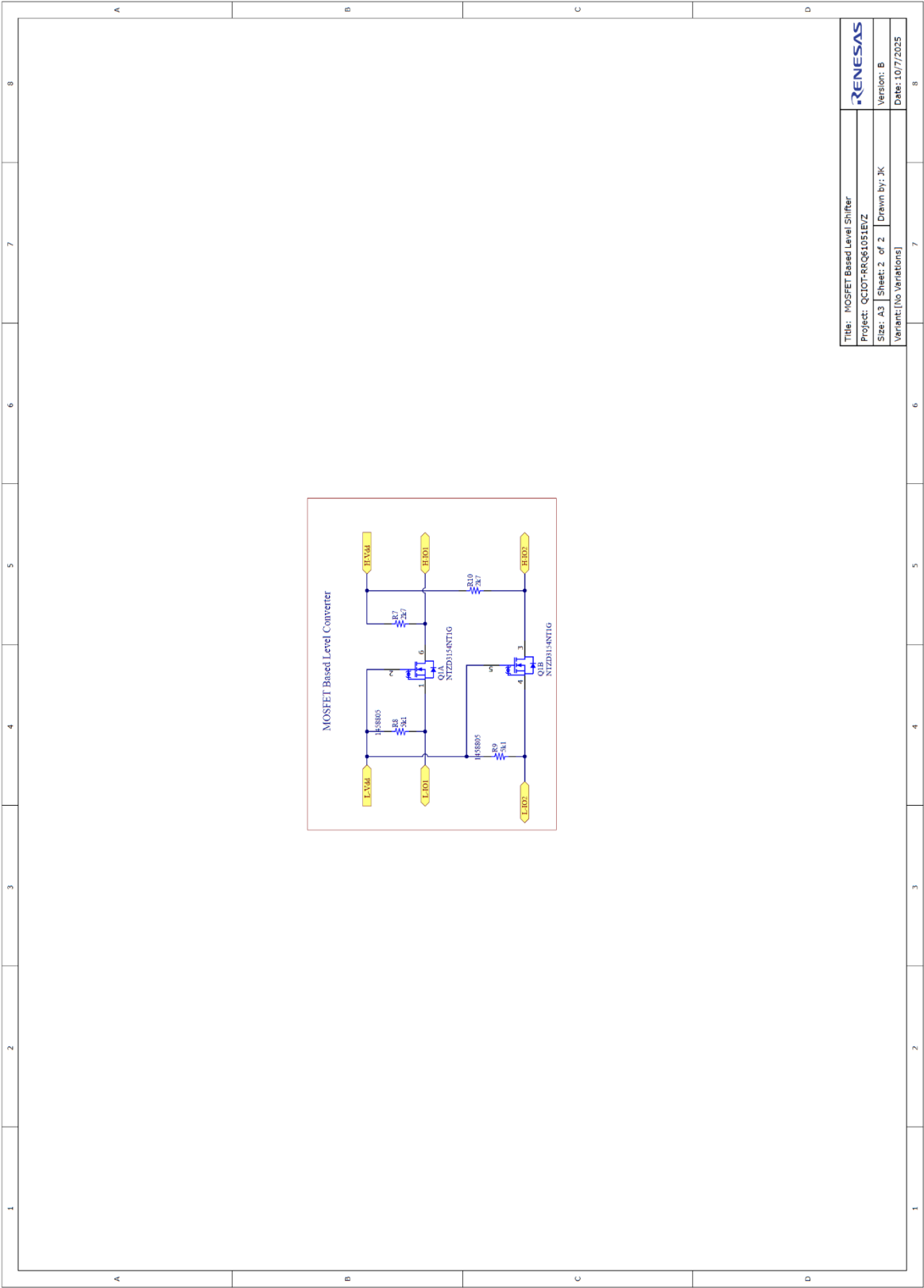


Figure 8. Level Shifter Schematic

2.3 Bill of Materials

Qty	Reference Designator	Description	Manufacturer	Manufacturer Part Number
2	C1, C2	CAP CER 1 μ F 10V X6S 0402	Wurth Elektronik	885012105012
2	C3, C4	CAP CER 0.1 μ F 50V X7R 0402	Wurth Elektronik	885012205092
2	C5, C6	CAP CER 10PF 50V C0G/NP0 0402	Wurth Elektronik	885012005074
2	C7, C8	CAP CER 10 μ F 10V X5R 0402	Murata	GRT155R61A106ME13J
1	C9	CAP CER 1000PF 50V X7R 0402	Wurth Elektronik	885012205061
3	C10, C11, C12	CAP CER 3.9PF 50V $\pm$ 0.25pF C0G/NP0 0402	Wurth Elektronik	885392005047
1	D1	Led, Green, 360Mcd, 525Nm Rohs Compliant	Wurth Elektronik	155060GS73200
1	D2	Led, Blue, 145Mcd, 470Nm Rohs Compliant	Wurth Elektronik	155060BS73200
1	D3	Led, Red, 150Mcd, 624Nm Rohs Compliant	Wurth Elektronik	155060RS73200
1	D4	Diode Array Schottky 30V SOT523	Diodes Inc.	BAT54ST-7-F
1	P1	CONN header R/A 12POS 2.54MM	Wurth Elektronik	61301221021
2	P2, P3	CONN RCPT 8POS 2.54 PCB	Samtec	SSQ-108-03-G-S
1	P4	CONN header 3POS 2.54MM	Wurth Elektronik	61300311121
1	Q1	Small Signal MOSFET, 20V, 540 mA, Dual N-Channel, 6-Pin SOT-563, Pb-Free, Tape and Reel	Onsemi	NTZD3154NT1G
3	R1, R2, R11	RES 10k Ω 1% 1/16W 0402	Yageo Group	RC0402FR-0710KP
5	R3, R5, R6, R7, R10	RES 2.7k Ω 1% 1/16W 0402	Yageo Group	RC0402FR-072K7L
3	R4, R15, R16	RES 0 Ω JUMPER 1/16W 0402	Yageo Group	RC0402JR-070RL
2	R8, R9	RES 5.1k Ω 1% 1/16W 0402	Yageo Group	RC0402FR-075K1L
1	R12	RES 510 Ω 1% 1/16W 0402	Yageo Group	RC0402FR-07510RL
1	R13	RES 1k Ω 1% 1/16W 0402	Yageo Group	RC0402FR-071KP
1	R14	RES 698 Ω 1% 1/16W 0402	Yageo Group	RC0402FR-07698RL
1	SW1	SMT Tact Switch 4.7x3.5 mm side push	Wurth Elektronik	434331045822
1	U1	Renesas Wi-Fi + Bluetooth® LE Combo Module	Renesas Electronics	RRQ61051-008
1	Y1	830066431 WE-XTAL Quartz Crystal	Wurth Elektronik	830066431

2.4 Board Layout

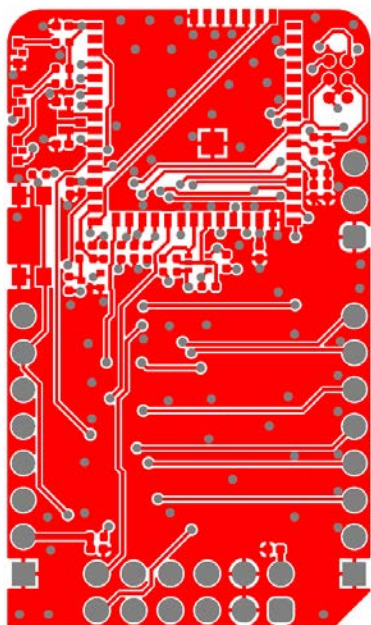


Figure 9. Top Layer

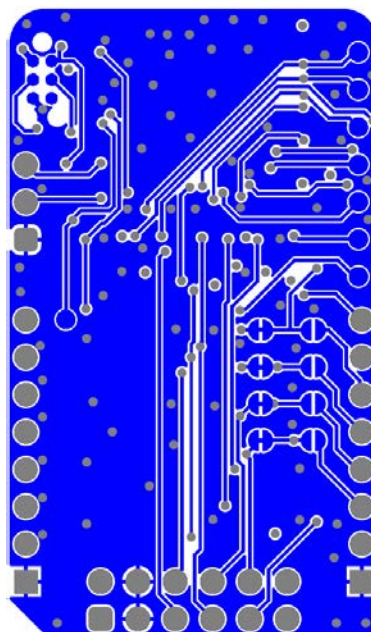


Figure 10. Bottom Layer

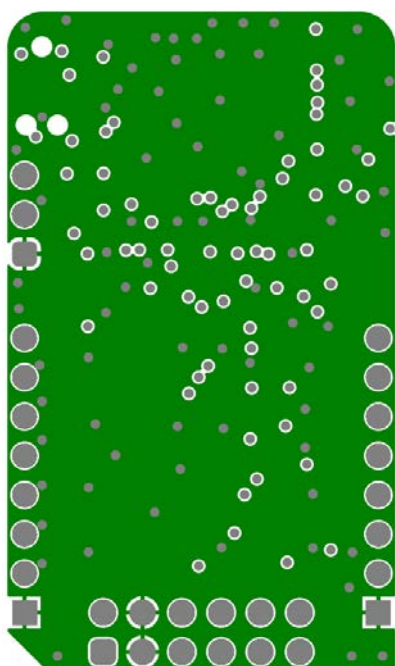


Figure 11. Int1 Layer

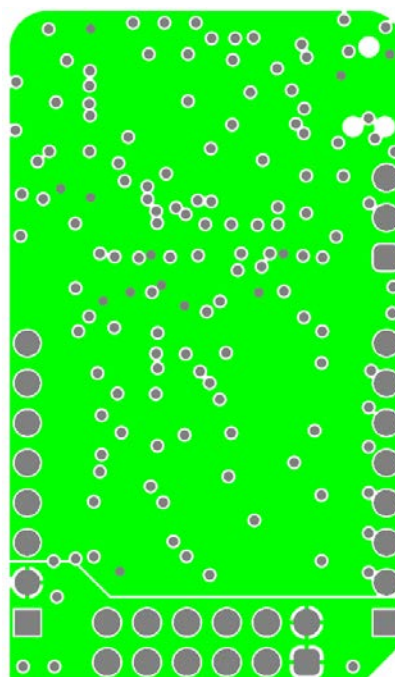


Figure 12. Int2 Layer

3. Firmware Image Programming

Firmware images can be programmed with the Renesas Flash Programmer GUI using J-Link, as described in the Renesas Flash Programmer GUI section.

3.1 Renesas Flash Programmer GUI

The Renesas Flash Programmer can be downloaded here [Renesas Flash Programmer \(Programming GUI\) | Renesas](#).

Using the Renesas Flash Programmer, the firmware image is flashed using the J-Link interface that is connected to the board using needle adapters. The J-Link interface pads are on both sides of the board (see [Figure 13](#)).

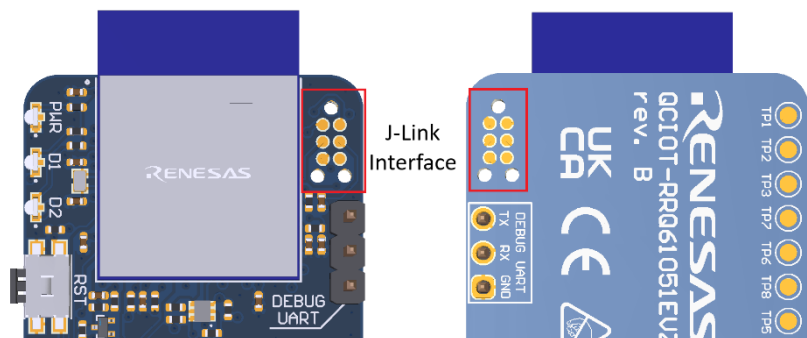


Figure 13. J-Link Interface

The J-Link can be connected to the board using the Tag-Connect or Segger 6 pin Needle adapter. [Figure 14](#) shows a 6-pin Tag-Connect Plug-of-Nails™ connector and a TC2030-CLIP.

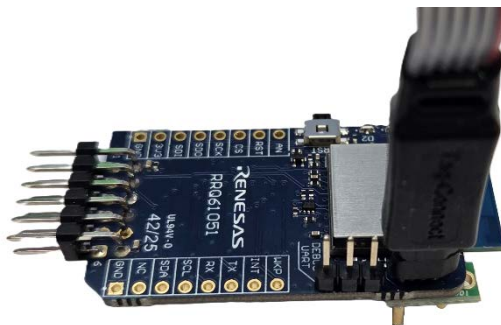


Figure 14. J-Link Connection Using Tag-Connect Needle Adapter

After the J-Link is connected to the board, configure the Renesas Flash Programmer.

3.1.1 Setting up Renesas Flash Programmer

The following are the initial steps for configuring the Renesas Flash Programmer (see [Figure 15](#)).

1. Click **File > New Project**.
2. Select **RA6W1, RA6W2** Microcontroller Family.
3. Enter a project name and click **Connect**.

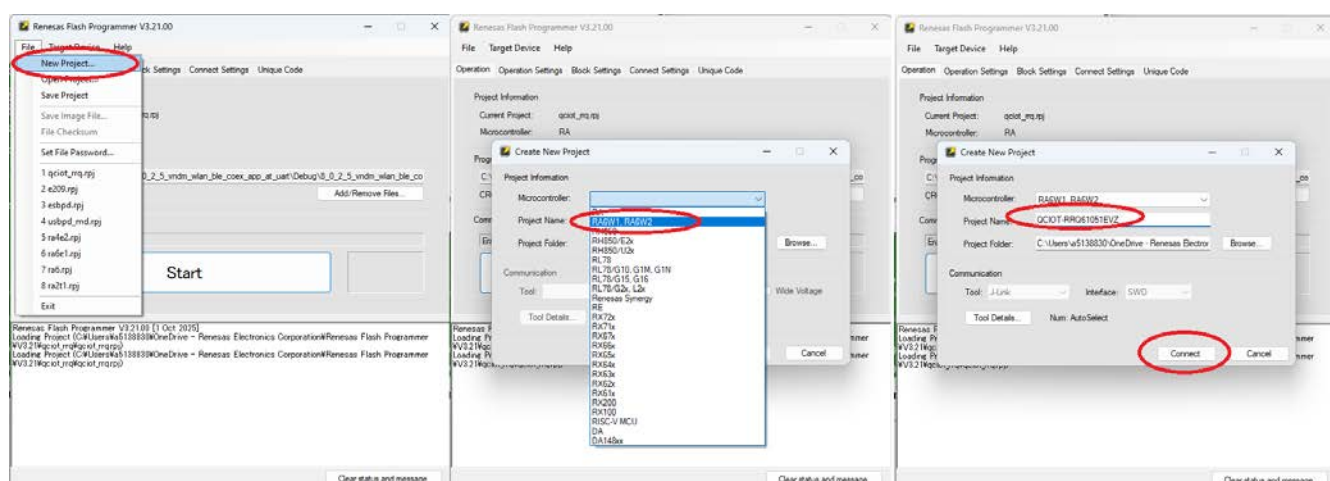


Figure 15. Setting up Renesas Flash Programmer

A successfully established connection is noted in the Status window with “Operation completed” in green (see Figure 16).

Next, the following procedure selects the firmware image.

1. Click on **Add/Remove Files**.
2. Select **Add File(s)** and browse for the firmware image
3. Set **Address/Offset** to 0h.
4. Click **OK**.

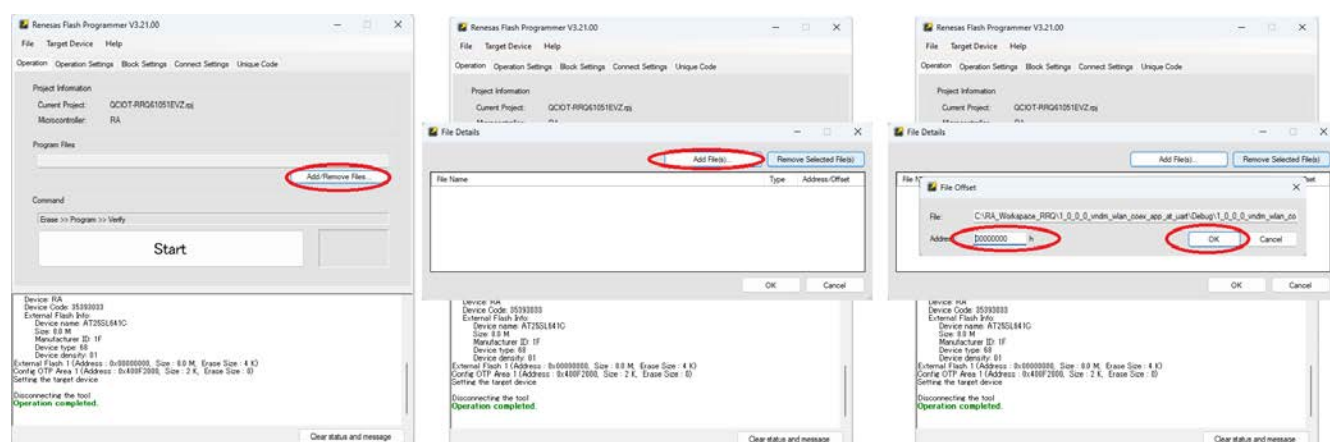


Figure 16. Selecting Firmware Image

After the project has been configured to flash the module, click **Start**. The result is displayed in the Status window. The entire procedure is about 2 minutes.

4. AT Command Interface

In Table 4 there is a list of AT commands supported by the module.

Table 4. AT Command List

#	AT Command	Description
1	AT+TRTS=<ip_type>, <local_port>[,<max allowed peers>]	Configure the local port number for TCP server
2	AT+TRTC=<svr_ip>,<svr_port>[,<local_port>]	Configure the information for TCP client
3	AT+TRUSE=<ip_type>,<local_port>	Open UDP socket
4	AT+TRUR=<remote_ip>,<remote_port>	Configure the IP_addr and port number of UDP client
5	AT+TRPRT=<cid>	Display session information by CID
6	AT+TRPALL	Display all session
7	AT+TRTRM=<cid>[,<remote_ip>,<remote_port>]	Close session by CID
8	AT+TRTALL	Close all session
9	AT+TRSAVE	Save current status of all session
10	AT+TCPDATAMODE=<mode>	Convert received TCP data to hex string. mode(0 1)
11	AT+TRSSLINIT=<role>	Initialize the SSL module
12	AT+TRSSLCFG=<cid>,<conf_id>,<conf_value>	Configure SSL connection
13	AT+TRSSLCO=<cid>,<server_ip>,<server_port>	Connect to an SSL server
14	AT+TRSSLCL=<cid>	Close SSL connection.
15	AT+TRSSLPRT=[<cid>]	Get SSL session
16	AT+TRSSLCERTLIST=<certificate type>	List certificates of list of CA data available
17	AT+TRSSLCERTDELETE=<certificate type>,<name>	Delete a certificate or CA list data
18	AT+TRSSLSAVE	Save current status of all TLS session
19	AT+TRSSLDELETE	Delete saved TLS session
20	AT+PRODGPIOWSET=<Port Num>,<Pin Num>,<mode>,<val>	Set the GPIO status to High or Low
21	AT+PRODGPIOWGET=<Port Num>,<Pin Num>	Get the GPIO status, which should be high(1) or low(0)
22	AT+PROD_GPIO_RUN <none>	Display GPIO RUN Test
23	AT+XTAL32K_OUT=<on off>	Set XTAL32K CLK OUT to GPIO
24	AT+PRODQSPI=<none>	Check if the QSPI flash is initialized and try to erase/write/read/compare some data. If all tests are done, erase the written data and send OK (result).
25	AT+PRODPWRIL=<Select Power Rail>	Select power rail
26	AT+PRODSLEEP=<mode>,<time>	Set into sleep mode.
27	AT+UOTPWASC=<offset>,<data>	Write OTP data
28	AT+UOTPRDASC=<address>,<cnt>	Read OTP data
29	AT+TCSMACWR=<mac>,<check_option>	Write MaRc address
30	AT+TCSMACRD <none>	Read Mac Address
31	AT+TCSXTALWR=<X-TAL_trim>,<check_option>	Write XTAL TRIM value
32	AT+TCSXTALRD <none>	Read X-TAL trim value
33	AT+TCSWAFERRD <none>	Read WAFER value on TCS
34	AT+XTALWR=<X-TAL_trim>	Write xtal trim
35	AT+XTALRD	read xtal trim.
36	AT+TCSADD=<tcs_data>	Add tcs data
37	AT+GPIOWSET=<Port Num>,<Pin Num>,<mode>,<val>	Set the GPIO status to High or Low
38	AT+GPIOWGET=<Port Num>,<Pin Num>	Get the GPIO status, which should be high(1) or low(0).
39	AT+SETCONFIG=<action>,<wake_source>,<port>,<pin>[,<edge_type>]	Set / Clear (1: Set, 2: Clear) wake source (0: RTC, 1: GPT, 2: GPIO, 3: ADC, 4: WIFI, 5: BLE) for port, pin and edge type

#	AT Command	Description
40	AT+GETCONFIG	Query the status of wake-up pins
41	AT+PMGRDPMKA=<period>	Set DPM Kepp-Alive Period (msec: 0 .. 600000)
42	AT+PMGRIPCOND=<ip_condition>	Set IP Condition to enter PMGR_LLD_DPM (1: IPv4, 2: IPv6, 3: Both)
43	AT+PMGRDPMTIMWU=<count>	Set DPM TIM Wakeup Time (DTIM count : 1 .. 6000)
44	AT+PMGRDPMUSERWU=<time>	Set DPM User Wakeup Time (msec : 0 .. 86400000)
45	AT+PMGRCONSTRAINT	Add or Remove PMGR constraint
46	AT+PMGRMCUWUDONE	Notification that MCU is ready
47	AT+PMGRWAKESRC=<action>,<wake_source>	Set / Clear action (1: Set, 2: Clear) PMGR wake source (0: RTC, 1: GPT, 2: GPIO, 3: ADC, 4: WIFI, 5: BLE)
48	AT+PMGRFORCE	Force sleep mode for the specified time
49	AT+NWOTADWSTART=<fw_type>,<uri>,<mcu_fw_name>	Start OTA download
50	AT+NWOTADWSTOP	Stop OTA download
51	AT+NWOTADWPROG=<fw_type>	Get OTA download progress
52	AT+NWOTARENEW	Replace with downloaded FW
53	AT+NWOTASETADDR=<sflash_addr>	Set SFLASH address to store downloaded data from the server
54	AT+NWOTAGETADDR=<fw_type>	Get SFLASH address to store downloaded data from the server
55	AT+NWOTAREADFLASH=<sflash_addr>,<size>	Read SFLASH as much as the input address and length
56	AT+NWOTAERASEFLASH=<sflash_addr>,<size>	Erase SFLASH as much as the input address and length
57	AT+NWOTACOPYFLASH=<dest_sflash_addr>,<src_sflash_addr>,<size>	Copy as much as the length from SFLASH address src_addr to dest_addr
58	AT+NWOTATLSAUTH=<tls_auth_mode>	Set mbedtls_ssl_conf_authmode
59	AT+NWOTAALPN=<alpn_count>,<alpn_1>,<alpn_2>,<alpn_3>	Configure TLS ALPN protocol name
60	AT+NWOTASNI=<sni>	Configure TLS SNI
61	AT+NWOTAALPNDEL	Delete ALPN
62	AT+NWOTASNIDEL	Delete SNI
63	AT+NWOTATLSVER=<tls_version>	Set TLS version
64	AT+NWOTASETBDX=<boot_index>	Set boot index (0 or 1)
65	AT+NWOTAGETBDX	Get boot index
66	AT+NWOTAFWNAME	Get downloaded MCU FW name in User Sflash area
67	AT+NWOTAFWSIZE	Get downloaded MCU FW size in User Sflash area
68	AT+NWOTAFWCRC	Get downloaded MCU FW CRC in User Sflash area
69	AT+NWOTAREADFW=<sflash_addr>,<size>	Read downloaded MCU FW in User Sflash area
70	AT+NWOTATRANSFW	Transfer downloaded MCU FW in User Sflash area
71	AT+NWOTAERASEFW	Erase downloaded MCU FW in User Sflash area
72	AT+NWOTABYMCU=<fw_type>,<size>	Receive RA6W1/RA6W2 RTOS from MCU
73	AT+TMLMACINIT=<none>	Initialize and start the LMAC task.
74	AT+RFTX=<freq>,<BW>,<numFrames>,<frameLen>,<txRate>,<txPower>	RF TX test
75	AT+RFTXSTOP <none>	RF TX stop
76	AT+RFCWTEST=<freq>,<power>	RF CW test
77	AT+RFCWSTOP <none>	RF CW stop

#	AT Command	Description
78	AT+RFRXSTART <none>	RF RX test start
79	AT+RFRXSTATISTICS <none>	RF Display PER
80	AT+RFRXSTATISTICSRESET <none>	Reset PER
81	AT+RFRXSTOP <none>	RF RX test stop
82	AT+RFCONTSTART=<freq>,<power>,<txRate>	RF TX continuous
83	AT+RFCONTSTOP <none>	RF TX continuous stop
84	AT+RFCHANNEL=<channel>,<band>	Change RF channel frequency
85	AT+RFFREQ=<freq>	Change RF frequency
86	AT+RFVER <none>	Display RF driver version
87	AT+RFTXPKT=<freq>,<BW>,<txRate>,<txPower>,<ccaThreshold>,<ccaTimeout>,<timeOut>,<data-ASCII encoded>	RF TX Packet test
88	AT+RFSCALEMODE=<scale mode> for set command, <none> for get command	RF scale mode get/set
89	AT+NWHTC=<uri>,<option>(<msg>)	HTTP Client Operation (get post put)
90	AT+NWHTCSTLSVER=<tls_version>	Set TLS version
91	AT+NWHTCJNI=<sni>	Configure TLS SNI
92	AT+NWHTCJNIDEL	Delete SNI
93	AT+NWHTCALPN=<alpn_count>,<alpn_1>,<alpn_2>,<alpn_3>	Configure TLS ALPN protocol name
94	AT+NWHTCALPNDEL	Delete ALPN
95	AT+NWHTCSTLSAUTH=<tls_auth_mode>	Set TLS auth mode
96	AT+NWHTS	Enable/Disable HTTP Server
97	AT+NWWSC=<operation>,<uri>[<msg>]	Websocket Client Operation(connect disconnect send)
98	AT+NWMQBR=<ip><port>	Configure IP address and Port number for MQTT Broker
99	AT+NWMQQOS=<qos>	Configure MQTT QoS level (0-2)
100	AT+NWMQTLS=<tls>	Enable/Disable tls mode for MQTT
101	AT+NWMQTLSVER=<tls_ver>	0 (1.2) 1 (1.3) 2 (1.2 and 1.3)
102	AT+NWMQALPN=<#><tls_alpn 1>...	Configure TLS ALPN protocol name
103	AT+NWMQSNI=<sni>	Configure TLS SNI
104	AT+NWMQCSUIT=<cipher suit 1><cipher suit 2>...	Configure cipher suits
105	AT+NWMQTS=<#><topic#n>...	Set topics for MQTT Subscriber
106	AT+NWMQATS=<topic>	Add a topic for MQTT Subscriber
107	AT+NWMQDTS=<topic>	Delete a topic for MQTT Subscriber
108	AT+NWMQUTS=<topic>	Unsubscribe from the specified topic
109	AT+NWMQTP=<topic>...	Topics for MQTT Publisher
110	AT+NWMQPING=<period>	Configure MQTT ping period
111	AT+NWMQV311=<use_v311>	Use MQTT protocol v3.1.1. default is v3.1
112	AT+NWMQCID=<client_id>	MQTT Client ID
113	AT+NWMQLI=<name><pw>	Login information for MQTT operation
114	AT+NWMQWILL=<topic><msg><qos>	Will information for MQTT
115	AT+NWMQDEL	Initialize MQTT Configurations
116	AT+NWMQCL=<mqtt_client>	Enable/Disable MQTT Client
117	AT+NWMQMSG=<msg>(<topic>)	Send message by MQTT Publisher
118	AT+NWMQTT=<ip><port><sub_topic><pub_topic><qos><tls>(<username><password>)	MQTT Client (Subscriber/Publisher) Operation
119	AT+NWMQAUTO=<auto>	Configure MQTT Auto Start
120	AT+NWMQTLSEBUFIN=<size>	Set MQTT TLS INCOMING buffer size
121	AT+NWMQTLSEBUFOUT=<size>	Set MQTT TLS OUTGOING buffer size
122	AT+NWMQTLSEAUTH=<authmode>	Set MQTT TLS AUTHMODE
123	AT+NWMQCS=<clean_session>	set clean session mode for MQTT
124	AT+NWIP=<iface>,<ip_addr>,<netmask>,<gw>	Setting for IP Address

#	AT Command	Description
125	AT+NWDNS=<dns_ip>	Setting for DNS
126	AT+NWDNS2=<dns_2nd_ip>	Setting for 2nd DNS
127	AT+NWHOSt=<name>	Get Host IP Address By Name
128	AT+NWPING=<iface>,<dst_ip_addr>,<count>	Ping test
129	AT+NWDHC=<dhcpc>	Enable/Disable DHCP Client
130	AT+NWDHCHN=<hostname>	Save User DHCP client hostname
131	AT+NWDHCHNDEL	Remove User DHCP client hostname
132	AT+NWDHR=<start_ip>,<end_ip>	Configure IP address range of DHCP Server
133	AT+NWDHLT=<lease_time>	Lease time of DHCP Server
134	AT+NWDHS=<dhcpcd>(<start_ip>,<end_ip>,<lease_time>)	Enable/Disable DHCP Server
135	AT+NWDHIP	Read Clients IP info
136	AT+NWSNS=<server_ip>	Configure IP address for Time Server
137	AT+NWSNS1=<server_ip>	Configure IP address for Time Server1
138	AT+NWSNS2=<server_ip>	Configure IP address for Time Server2
139	AT+NWSNUP=<period>	Configure update period of SNTP Client
140	AT+NWSNTP=<sntp>[,<server_ip>,<period>]	Enable/Disable SNTP Client service
141	AT+NWSNTP1=<sntp>(<server_ip>,<period>)	Enable/Disable SNTP Client service
142	AT+NWSNTP2=<sntp>[,<server_ip>,<period>]	Enable/Disable SNTP Client service
143	AT+NWCRT=<module>	Check if Certificates exist for the module specified
144	AT+NWCRT=<module>	Delete Certificates of the module specified
145	AT+WFMODE=<mode>	Set Wi-Fi Operation Mode
146	AT+WFMAC=<mac>	Current MAC_addr Setting/Inquiry
147	AT+WFSPP=<mac>	MAC Spoofing for Station (set only)
148	AT+WFOTP	OTP MAC (set only)
149	AT+WFSTAT	Get Wi-Fi profile
150	AT+WFSTA	Get STA status
151	AT+WFPBC	Push WSC Button
152	AT+WFPIN=<pin>	Enter WSC PIN/Generate PIN
153	AT+WFCWPS	Stop WPS Operation
154	AT+WFC=<code>	Set Country Code
155	AT+WFCAN=<band>	[STA] Get Scan Results. If <band> is specified : 2(2GHz), 5(5GHz)
156	AT+WFRSSI	Get current RSSI
157	AT+WFJAP=<ssid>,<auth>,<enc>,<key>[,<hidden>]	[STA] Connect to AP
158	AT+WFJAPA=<ssid>[,<key>][,<hidden>]	[STA] Connect to WPA/WPA2-AP with SSID/PSK only
159	AT+WFJAPA3=<wpa3_flag>,<ssid>[,<key>][,<hidden>]	[STA] Connect to WPA/WPA2/WPA3-AP with SSID/PSK only
160	AT+WFCAP	[STA] Connect to AP configured currently
161	AT+WFQAP	[STA] Disconnect from AP
162	AT+WFRAP=<roam>	[STA] Run/Stop STA Roaming
163	AT+WFRTH=<rssi>	[STA] Set Roaming threshold RSSI value
164	AT+WFDIS=<disabled>	[STA] Set Wi-Fi Profile Disabled(1) or Enable(0)
165	AT+WFEAP=<ssid>,<auth>,<enc>,<phase1>[,<phase2>][,<hidden>]	[STA] Set Enterprise AP profile
166	AT+WFEI=<id>[,<pw>]	[STA] Set Enterprise Log-in ID/PWD
167	AT+WFSAP=<ssid>,<auth>,<enc>,<key>,<ch>,<country>	[AP] Operation Soft-AP mode
168	AT+WFOAP	[AP] Operate Soft-AP
169	AT+WFTAP	[AP] Stop Soft-AP
170	AT+WFRAP	[AP] Restart Soft-AP
171	AT+WFLCST	[AP] Get Connected STA List
172	AT+WFAWM=<mode>	[AP] Set Wi-Fi mode

#	AT Command	Description
173	AT+WFAPCH=<ch>	[AP] Set Wi-Fi channel (0:auto)
174	AT+WFAPBI=<interval>	[AP] Set Beacon Interval
175	AT+WFAPUI=<timeout>	[AP] Set User inactivity timeout value (30–86400)
176	AT+WFAPRT=<threshold>	[AP] Set RTS threshold (1–2347)
177	AT+WFAPDE=<mac>	[AP] Send Deauth packet to a specific STA
178	AT+WFAPDI=<mac>	[AP] Send Disassoc packet to a specific STA
179	AT+WFWMMP=<wmm>	[AP] WMM on/off
180	AT+WFWMMP=<wmm>	[AP] WMM-PS on/off
181	AT+WFFP2P	[P2P] Find P2P devices
182	AT+WFS2P	[P2P] Stop the P2P Find operation
183	AT+WFCP2P=<mac>,<wps>,<join>	[P2P] Connect to the peer P2P device
184	AT+WFD2P	[P2P] Disconnect from P2P device
185	AT+WFP2P	[P2P] Read P2P Peers information
186	AT+WFLCH=<ch>	[P2P] Set listen channel value <0 1 6 11>
187	AT+WFOCH=<ch>	[P2P] Set operation channel value <0 1 6 11>
188	AT+WFGI=<intent>	[P2P] Set GO Intent (0–15)
189	AT+WFPFT=<timeout>	[P2P] Set P2P Find timeout value (1–86400 sec.)
190	AT+WFPDN=<name>	[P2P] Set P2P Device Name
191	AT+WFSMSAVE=<run_mode>	[CON] Save Switching system run-mode (0,1)
192	AT+WFPSMODE=<ps_mode>	Set/Get ps mode
193	AT+WFMODESWTCH	[CON] Switch system run-mode
194	AT+WFSBAND=<band>	Set setband param
195	AT+WFINIT=[<?>]	Run the Wi-Fi init or query the Wi-Fi init status
196	AT+WFINITMODE=<flag>	Set the Wi-Fi initialization enabled
197	AT+HOSTINITDONE	Customer MCU Init
198	?	Commands list with brief and usage
199	HELP=<command>	Print help message
200	AT	Attention command
201	AT+	List available commands
202	ATZ	AT command initialize
203	ATF	Restore to Factory mode (NVRAM clean)
204	ATE=[<?>]	Command echo
205	ATQ=[<?>]	Result Codes On/Off
206	ATB=<baudrate>[,<databits>][,<parity>][,<stopbits>][,<flow_ctrl>]	Setting UART parameters
207	AT+RESTART	System Restart
208	AT+CHIPNAME	Chipset Name (RA6W1/RA6W2)
209	AT+VER	FW Version info
210	AT+SDKVER	SDK Version info
211	AT+TIME=<date>,<time>	Set current time
212	AT+RLT	System Runtime Inquiry
213	AT+TZON=<sec>	Set Timezone (GMT; -43200 ~ 43200)
214	AT+DEFAP <boot>	Factory setting(AP mode) --- SSID:<CHIPNAME>_XXXXXX, Auth:WPA2/CCMP, IP:10.0.0.1, Enable DHCP
215	AT+DEFCCRNT <boot>	Factory setting(Concurrent mode) --- SSID:<CHIPNAME>_XXXXXX, Auth:WPA2/CCMP, IP:10.0.0.1, Enable DHCP

5. Terms and Definitions

Table 5. Terms and Definitions

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

6. References

- [RA6W1 Datasheet, Renesas Electronics](#).
- [RRQ61051 Datasheet, Renesas Electronics](#)

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

7. Ordering Information

Part Number	Description
QCIOT-RRQ61051EVZ	RRQ61051 PMOD Board

8. Revision History

Revision	Date	Description
1.01	Jul 8, 2026	Removed section 3.2 Flash Downloader. Function will not be supported.
1.00	Apr 17, 2026	Initial release.

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Corporate Headquarters

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

Contact Information

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