

RG500L EVB

User Guide

5G Module Series

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Safety Information

The following safety precautions must be observed during all phases of operation, such as usage, service or repair of any cellular terminal or mobile incorporating the module. Manufacturers of the cellular terminal should notify users and operating personnel of the following safety information by incorporating these guidelines into all manuals of the product. Otherwise, Quectel assumes no liability for customers' failure to comply with these precautions.



Full attention must be paid to driving at all times in order to reduce the risk of an accident. Using a mobile while driving (even with a handsfree kit) causes distraction and can lead to an accident. Please comply with laws and regulations restricting the use of wireless devices while driving.



Switch off the cellular terminal or mobile before boarding an aircraft. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. If there is an Airplane Mode, it should be enabled prior to boarding an aircraft. Please consult the airline staff for more restrictions on the use of wireless devices on an aircraft.



Wireless devices may cause interference on sensitive medical equipment, so please be aware of the restrictions on the use of wireless devices when in hospitals, clinics or other healthcare facilities.



Cellular terminals or mobiles operating over radio signal and cellular network cannot be guaranteed to connect in certain conditions, such as when the mobile bill is unpaid or the (U)SIM card is invalid. When emergency help is needed in such conditions, use emergency call if the device supports it. In order to make or receive a call, the cellular terminal or mobile must be switched on in a service area with adequate cellular signal strength. In an emergency, the device with emergency call function cannot be used as the only contact method considering network connection cannot be guaranteed under all circumstances.



The cellular terminal or mobile contains a transceiver. When it is ON, it receives and transmits radio frequency signals. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.



In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other cellular terminals. Areas with explosive or potentially explosive atmospheres include fuelling areas, below decks on boats, fuel or chemical transfer or storage facilities, and areas where the air contains chemicals or particles such as grain, dust or metal powders.

About the Document

Revision History

Version	Date	Author	Description
-	2021-06-02	Dover CAI	Creation of the document
1.0	2021-06-23	Dover CAI	First official release

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1 Introduction

This document describes detailed information about the usage of the EVB (Evaluation Board) for Quectel 5G RG500L Series QuecOpen module. The EVB is an auxiliary tool for engineers to develop and test the module.

2 General Overview

Quectel supplies RG500L EVB for engineers to develop applications based on Quectel 5G RG500L Series QuecOpen module. This EVB can be used to test basic functionalities of the module.

2.1. Key Features

The following table describes the detailed features of RG500L EVB.

Table 1: Key Features

Features	Description
Power Supply	DC power supply: 12 V $\pm$ 5 % Typical: 12 V/ 3 A
Module TE-A Interface	Supporting Quectel RG500L Series QuecOpen
Wi-Fi TE-A Interfaces	● 2.4G Wi-Fi TE-A ● 5G Wi-Fi TE-A or 5G&2.4G Wi-Fi TE-A
SD Card Interface	SD card connector
(U)SIM Card Interfaces	Dual (U)SIM cards supported: 1.8 V and 3.0 V
SLIC TE-A Interface	Supporting SI32185-TE-A or LE9643-TE-A SLIC board
USB Interfaces	USB1 (J1303): ● Debug UART ● For Linux console and log output ● Default baud rate: 921600 bps
	USB2 (J1001): ● USB Type-C interface ● USB 3.0 and USB 2.0 supported ● For AT command communication, data transmission and firmware upgrade ● Default baud rate: 115200 bps
Signal Indication	12 LED indicators are available for signal indication

Switches and Buttons	● PWRKEY button (S1202) ● RESET button (S1204) ● USB_BOOT switch (S1205) ● PCIe port switch (S0401) ● Power switch (S0203) ● RESTORE_KEY (S1201) ● WPS_KEY (S1203)
Physical Characteristics	Size: 235 mm × 190 mm
Antenna Interfaces	14 antenna interfaces

2.2. Component Placement of RG500L EVB

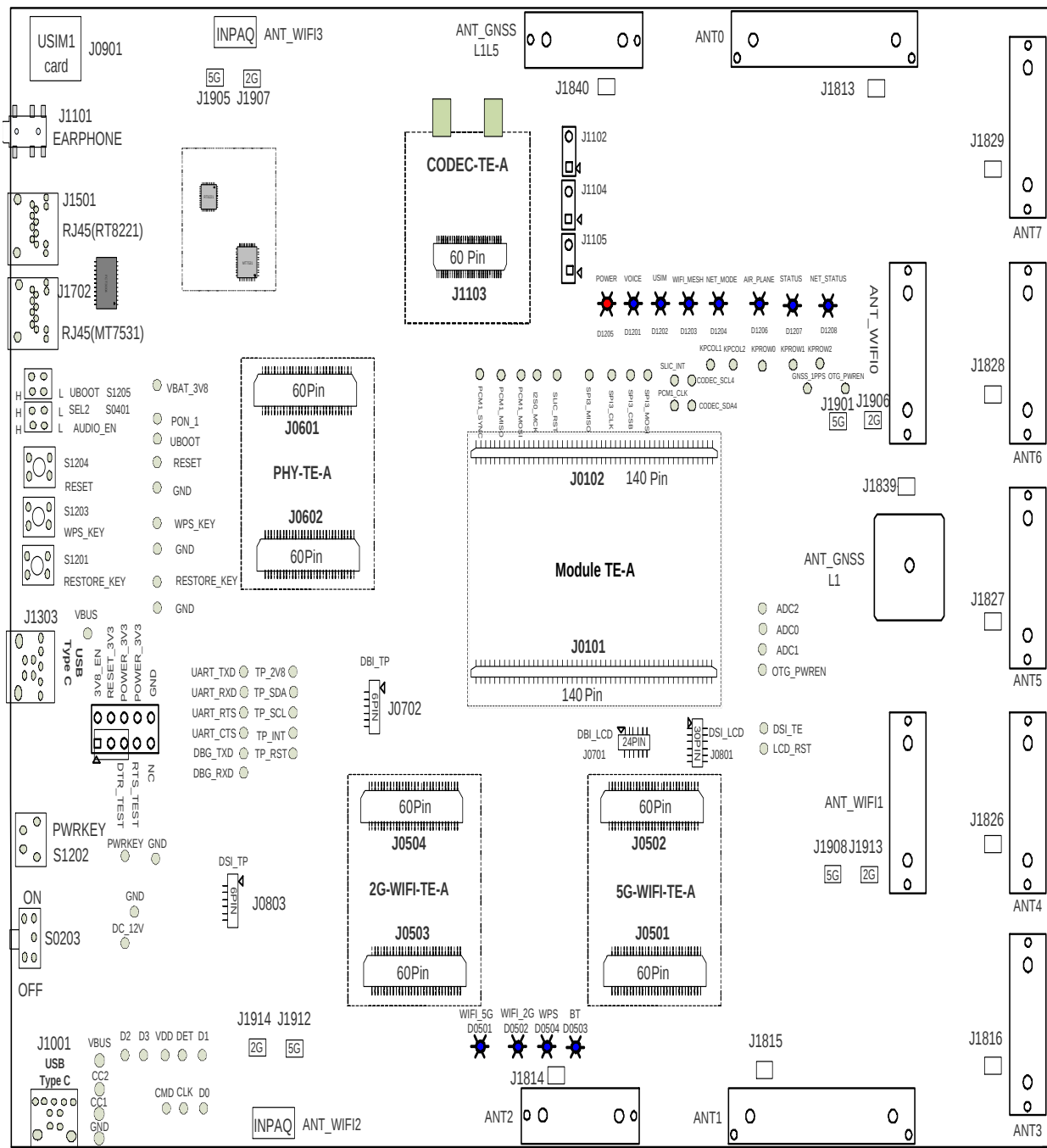


Figure 1: Top View for Component Placement of the EVB

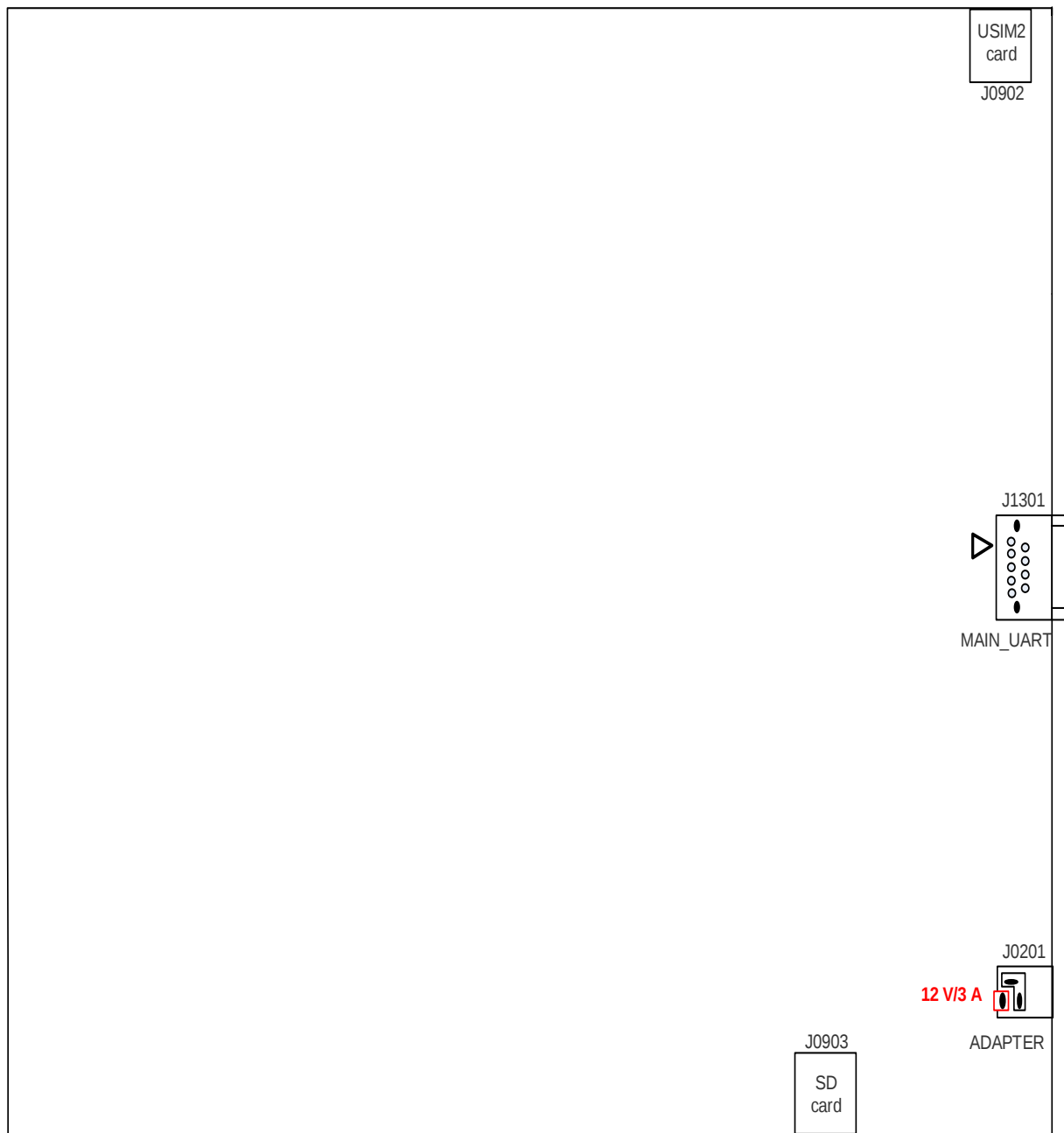


Figure 2: Bottom View for Component Placement of the EVB

Table 2: Components & Interfaces of RG500L EVB

Interface	Reference Designator	Description
Power Supply	J0201	The power jack on the EVB Typical supply voltage: 12 V/ 3 A
Power Switch	S0203	VBAT ON/OFF control
PWRKEY	S1202	Power key (push button) Used to turn on/off the module
USB_BOOT	S1205	Emergency download
PCIe Port Switch	S0401	Used to select PCIe port
RESET	S1204	Reset button (push button) Used to reset the module
USB Interfaces	J1001	For AT command communication, data transmission and firmware upgrade
	J1303	For Linux console and log output
DSI_LCD	J0801	DSI LCD connector
DSI_TP	J0803	DSI TP connector
DBI_LCD	J0701	DBI LCD connector
DBI_TP	J0702	DBI TP connector
SLIC TE-A Interface	J1103	SLIC board TE-A connector
(U)SIM Card Interfaces	J0901	(U)SIM1 card connector
	J0902	(U)SIM2 card connector
SD Card Interface	J0903	SD card connector
Module Status Indicators	D1205	Power supply on/off indicator, indicating whether the module's power supply is turned on or off
	D1207	Module's operation status indicator, indicating whether the module is powered on
	D1204	Network mode indicator, indicating whether the module has registered on 5G network
	D1208	Indicates the module's network activity status
	D1201	Indicates the VoIP function status
	D1202	Indicates the (U)SIM card function status

	D1203	Indicates the Wi-Fi mesh function status
	D1206	Indicates the module's flight mode
Wi-Fi/Bluetooth Status Indicators	D0501	Indicates the Wi-Fi 5G function status
	D0502	Indicates the Wi-Fi 2.4G function status
	D0504	Indicates the Wi-Fi WPS function status
	D0503	Indicates the Bluetooth function status
Module TE-A	J0101, J0102	Module TE-A connectors
5G Wi-Fi TE-A	J0501, J0502	5G Wi-Fi TE-A or 5G&2.4G Wi-Fi TE-A connectors
2.4G Wi-Fi TE-A	J0503, J0504	2.4G Wi-Fi TE-A connectors
Antenna Interfaces	J1840, J1813, J1829, J1828, J1827, J1826, J1816, J1815, J1814 J1839, J1901, J1906 J1908, J1913, J1914 J1912, J1905, J1907	Antenna connectors

2.3. Top and Bottom Views of RG500L EVB

The following figures show top and bottom views of the RG500L EVB.

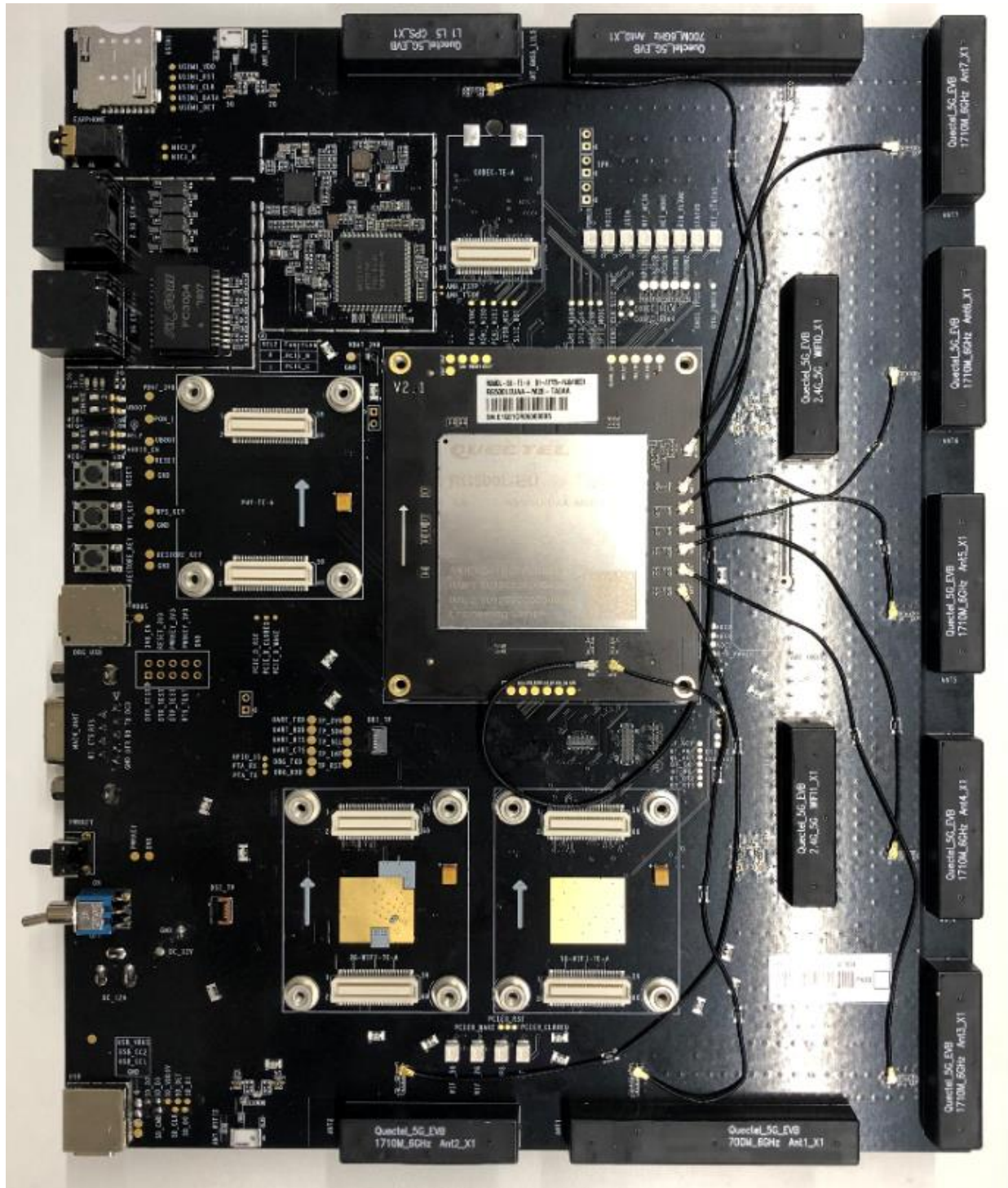


Figure 3: RG500L EVB Top View



Figure 4: RG500L EVB Bottom View

2.4. List of Accessories

All accessories of the RG500L EVB kit are listed below.

Table 3: Accessories List

Items	Description	Quantity (pcs)
Cables	USB Type-C cable	1
	RF cables	17
Antennas	Wi-Fi antennas	2
	Cellular antennas	8
	GNSS antennas (passive)	2
Audio	Earphone	1
USB Flash Drive	Including the module's related documents, tools & drivers, etc.	1
SLIC TE-A	SI32185-TE-A and LE9643-TE-A	2
Wi-Fi TE-A	5G Wi-Fi TE-A or 5G&2.4G Wi-Fi TE-A	1
	2.4G Wi-Fi TE-A	1
Screws	Used to fasten TE-As on the EVB	16
Instruction Sheet	A sheet of paper giving instructions for EVB connection, details of EVB accessories, etc.	1
Power Adapter	12 V/ 3 A power adapter	1

3 Interface Application

This chapter describes the hardware interfaces of the RG500L EVB, as listed below:

- Power supply
- Module TE-A interface
- SLIC TE-A interface
- USB interfaces
- (U)SIM card interfaces
- SD card interface
- Wi-Fi TE-A interfaces
- Antenna Interfaces

It also provides information about the buttons, switches, and status indicators to help developers use the EVB.

3.1. Power Supply (J0201)

The RG500L EVB can be powered by an external power adapter through the power jack (J0201).

The following two figures show a simplified power supply block diagram and the power interface of RG500L EVB.

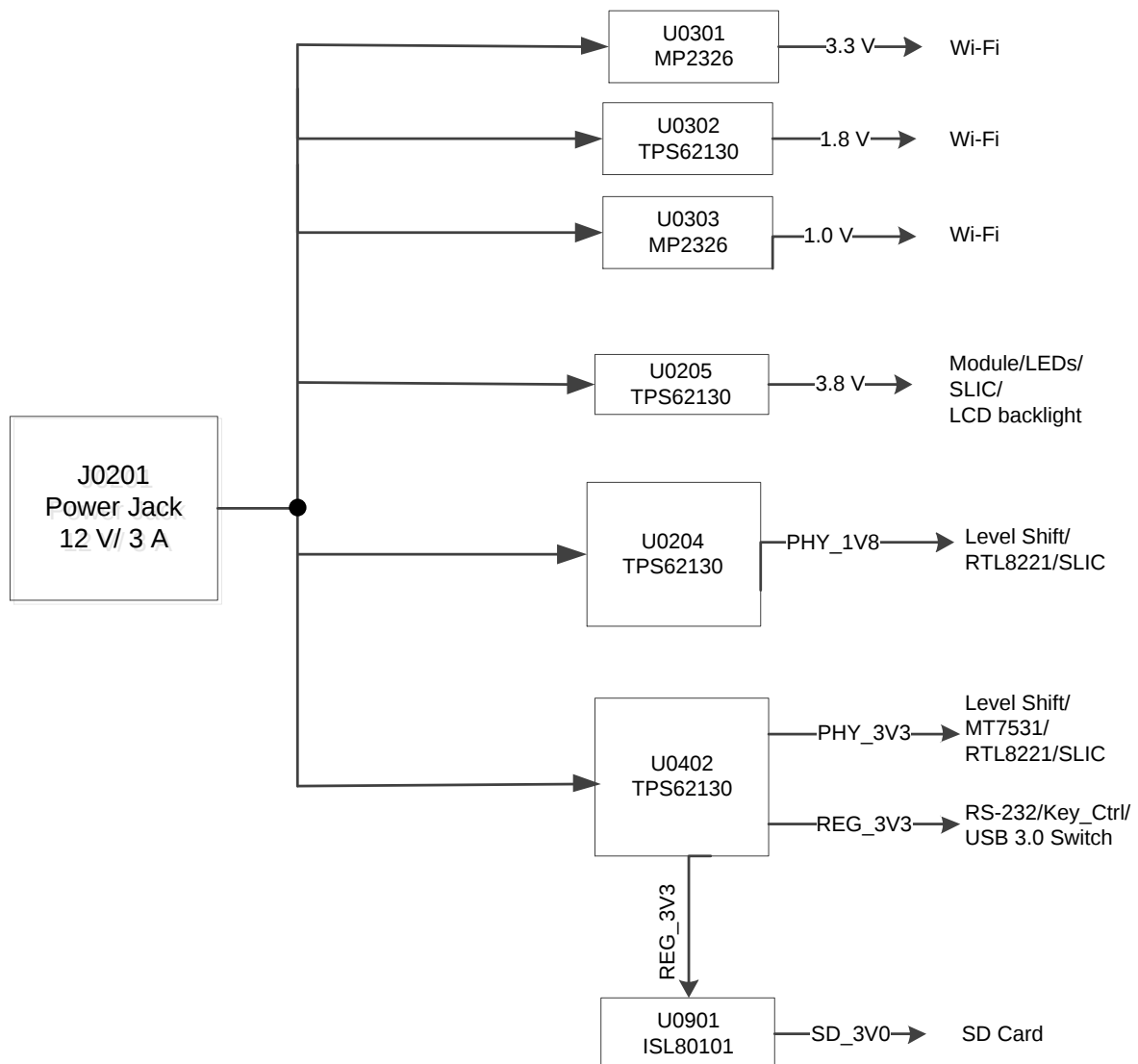


Figure 5: Block Diagram of the EVB Power Supply

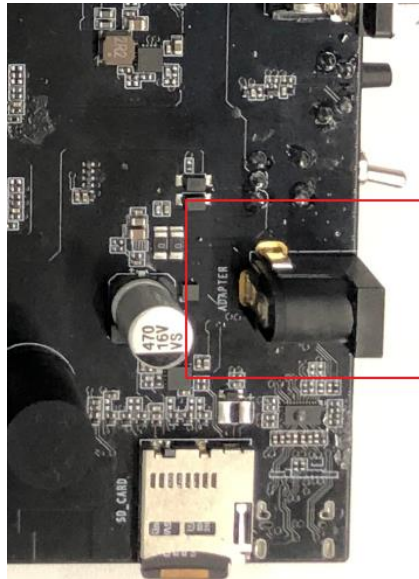


Figure 6: EVB Power Supply Interface

3.2. Module TE-A Interface (J0101/J0102)

Module TE-A interface is designed to accommodate the TE-A of the module. The TE-A is mounted onto and connected to the EVB via BTB connectors J0101 and J0102 so that the developer will be able to test the functionalities of the modules easily (please insert the TE-A as indicated by the arrow to prevent reverse insertion).

The following figure shows the connection between the module TE-A and the EVB.



Figure 7: Connection Between Module TE-A and EVB

3.3. SLIC TE-A Interface (J1103)

The SLIC TE-A interface is designed to accommodate the SLIC TE-A (SI32185-TE-A or LE9643-TE-A). The SLIC TE-A is mounted onto and connected to the EVB via BTB connector J1103.

The following two figures show the connection between SLIC TE-A and EVB.

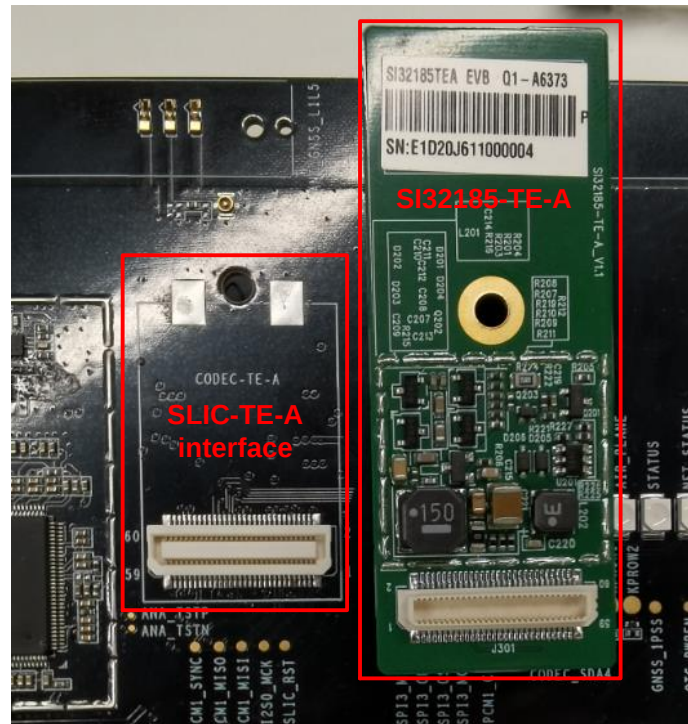


Figure 8: Connection Between SI32185-TE-A and EVB

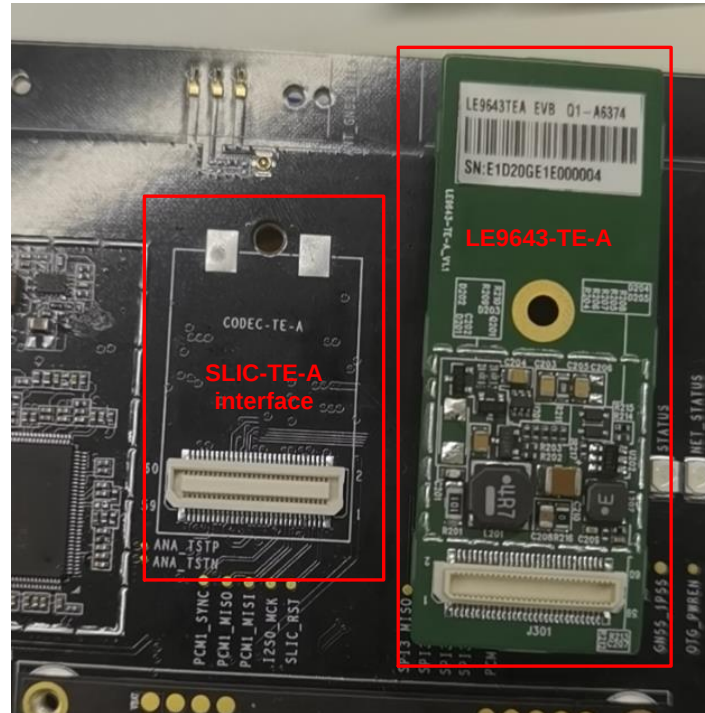


Figure 9: Connection Between LE9643-TE-A and EVB

3.4. USB Interfaces (J1001/J1303)

Two USB Type-C connectors J1001 and J1303 are provided. J1001 complies with USB 3.0/2.0 standard, and is used for AT command communication, data transmission and firmware upgrade. J1303 is the debug UART port and is used for Linux console and log output.

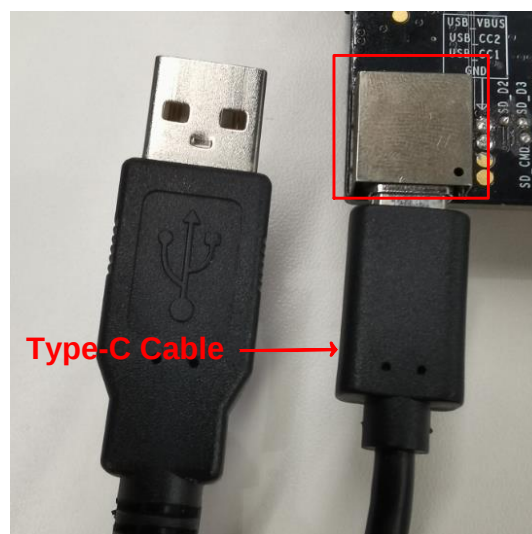


Figure 10: USB Interface Connection

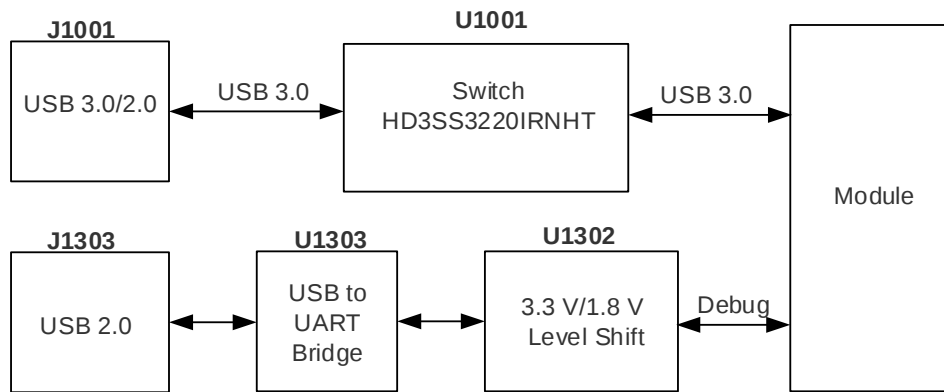


Figure 11: USB Block Diagram

3.5. (U)SIM Card Interfaces (J0901/J0902)

The RG500L EVB has two 8-pin push-push type (U)SIM card (1.8/3.0 V) connectors J0901 and J0902. The following figure shows a simplified connection schematic for J0901 and J0902.

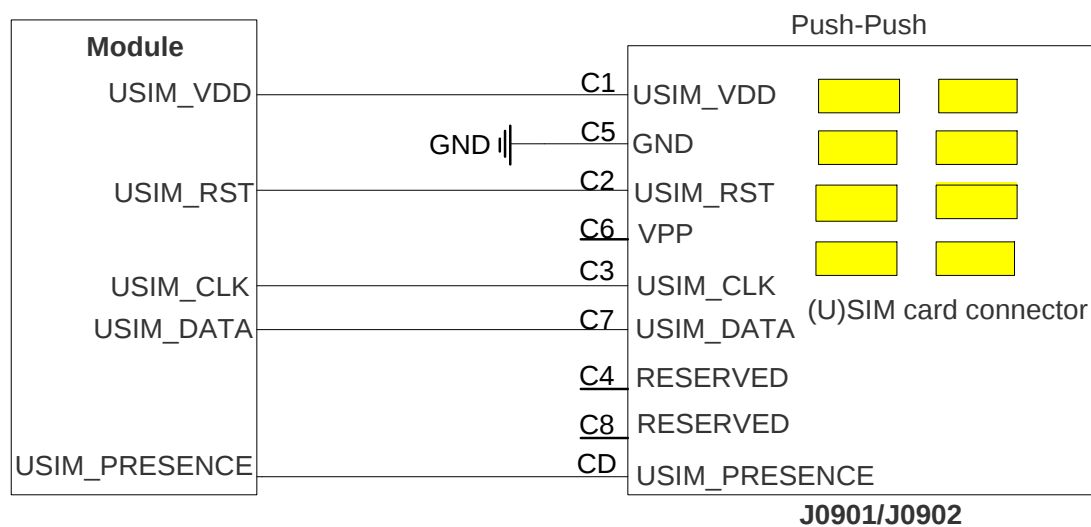


Figure 12: Simplified Connection Schematic for (U)SIM Card Connector

The figure and table below illustrate the pin assignment and definition of (U)SIM card connector J0901. For J0902, the pin assignment and definition is similar.

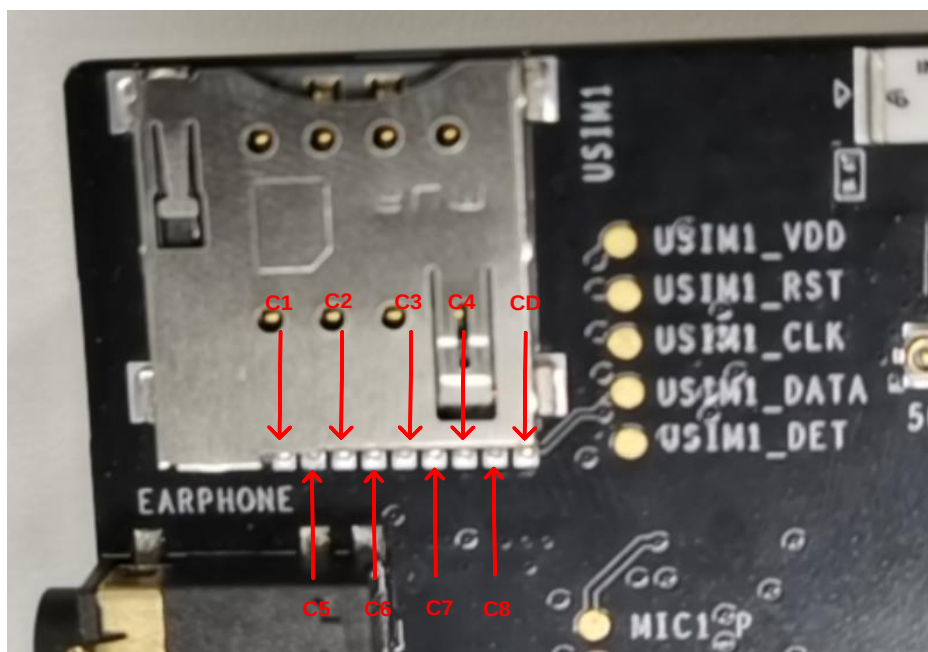


Figure 13: Pin Assignment of (U)SIM Card Connector (J0901)

Table 4: Pin Definition of (U)SIM Card Connector (J0901)

Pin No.	Pin Name	I/O	Function
C1	USIM_VDD	PO	(U)SIM card power supply, provided by the module
C2	USIM_RST	DO	(U)SIM card reset
C3	USIM_CLK	DO	(U)SIM card clock
C4	RESERVED	-	Not connected
C5	GND	-	Ground
C6	VPP	-	Not connected
C7	USIM_DATA	DIO	(U)SIM card data, bi-directional
C8	RESERVED	-	Not connected
CD	USIM_PRESENCE	DI	(U)SIM card insertion detection

3.6. SD Card Interface (J0903)

The RG500L EVB provides an SD card connector, which can be used for connection with an SD card. The following figure shows the simplified interface schematic for J0903.

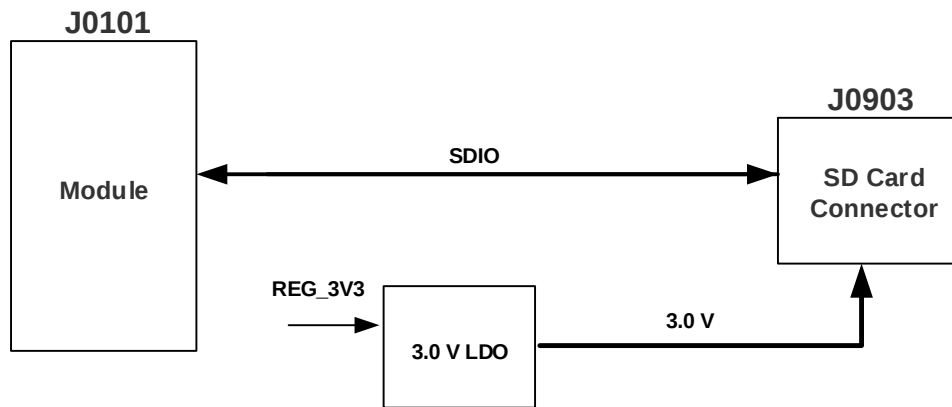


Figure 14: Simplified Interface Schematic for SD Card Connector

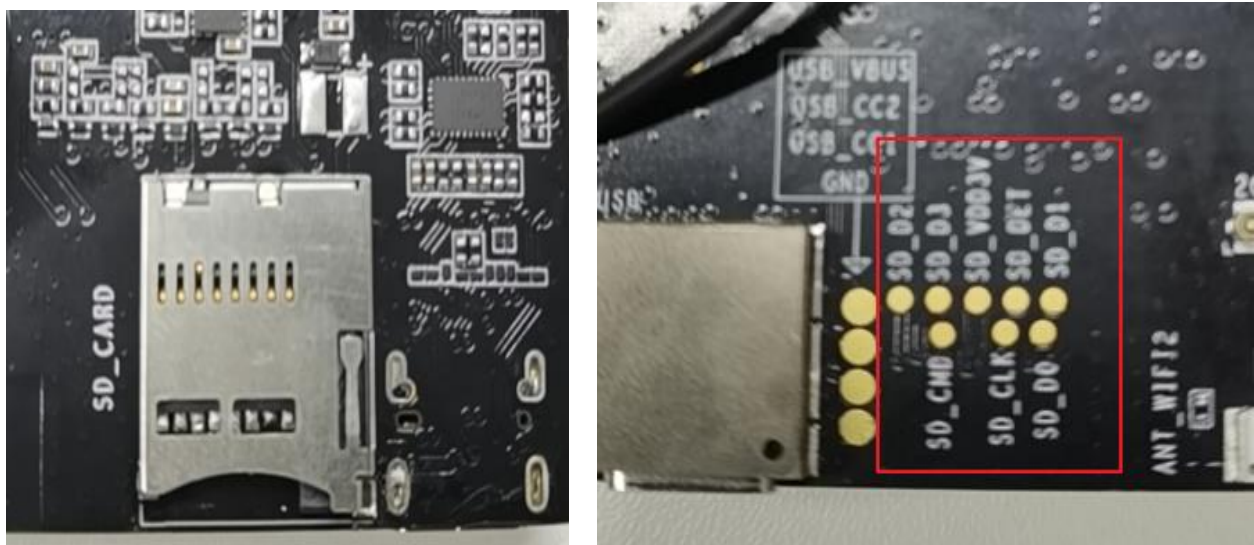


Figure 15: Pin Assignment of SD Card Connector (J0903)

3.7. Switches and Buttons

The RG500L EVB includes three switches (S0203, S0401 and S1205) and four buttons (S1201, S1202, S1203 and S1204), as shown in the following figures.

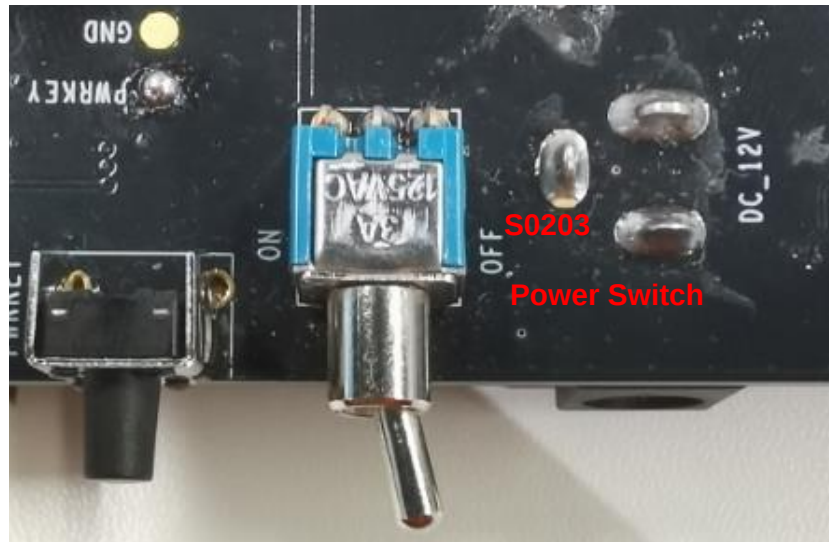


Figure 16: Power Switch (S0203)

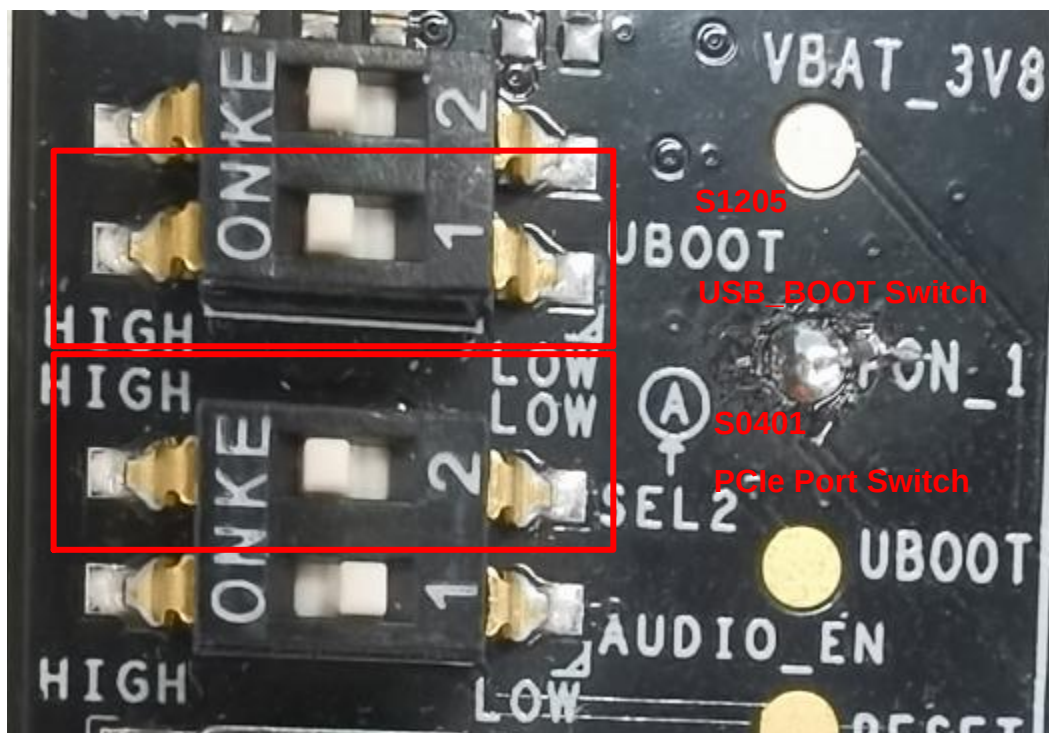


Figure 17: USB_BOOT Switch (S1205) and PCIe Port Switch (S0401)

Table 5: PCIe Port Switch Control Logic

PCIe Port Switch (SEL2)	Selected PCIe Port
0 (LOW)	PCIe1 (Default)
1 (HIGH)	PCIe2 (Only for internal use by Quectel)

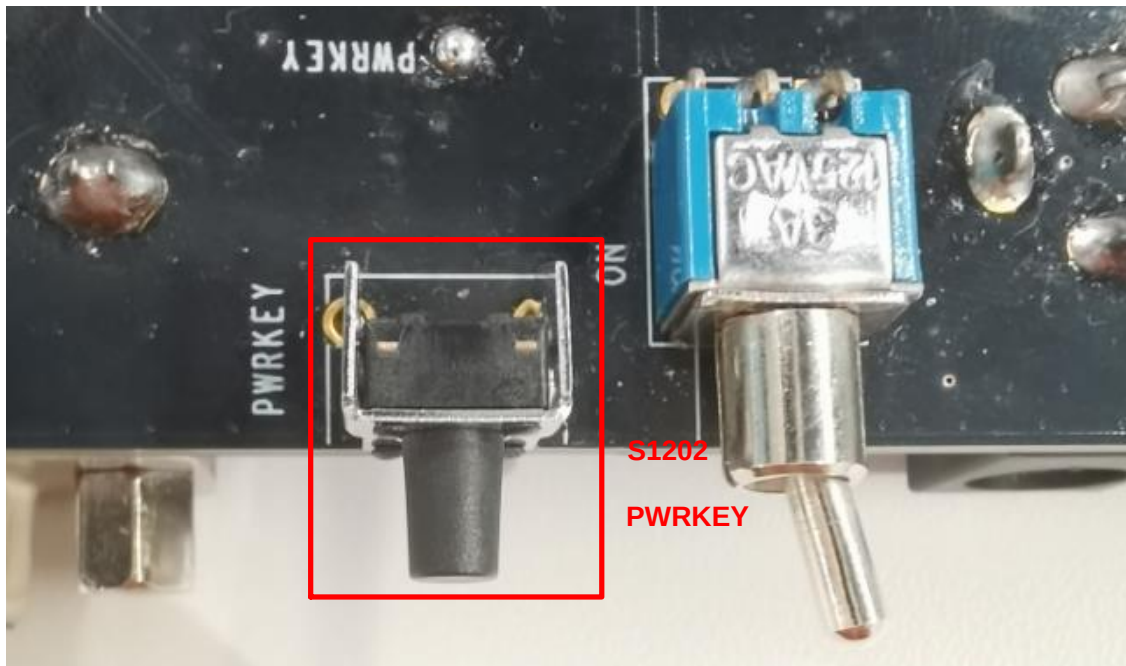


Figure 18: PWRKEY Button (S1202)

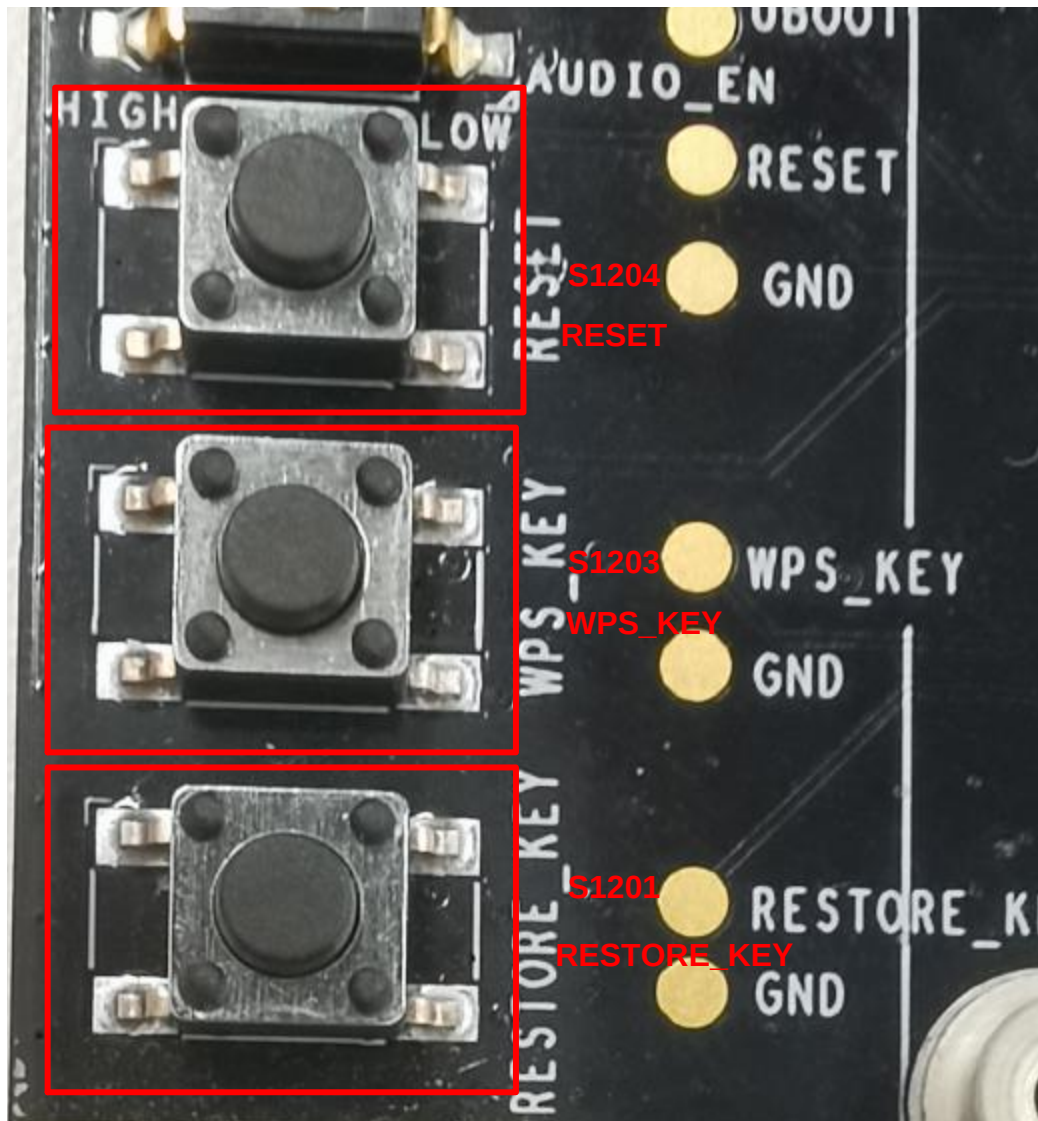


Figure 19: RESET/WPS_KEY/RESTORE_KEY Buttons (S1204/S1203/S1201)

Table 6: Description of Switches and Buttons

Switch/Button	Reference Designator	Description
Power Switch	S0203	VBAT ON/OFF control
PWRKEY Button	S1202	Power key used to turn on/off the module
PCIe Port Switch	S0401	Used to select PCIe port. For details, see Table 5 .
RESET Button	S1204	Reset button used to reset the module
WPS_KEY	S1203	Wi-Fi protected setup

RESTORE_KEY	S1201	Used to restore the module
USB_BOOT Switch	S1205	Emergency download control

3.8. Status Indicators

There are twelve status indication LEDs on the EVB, eight of which are module status indicators and the other four are Wi-Fi/Bluetooth status indicators. The following two figures show positions of these LED indicators.

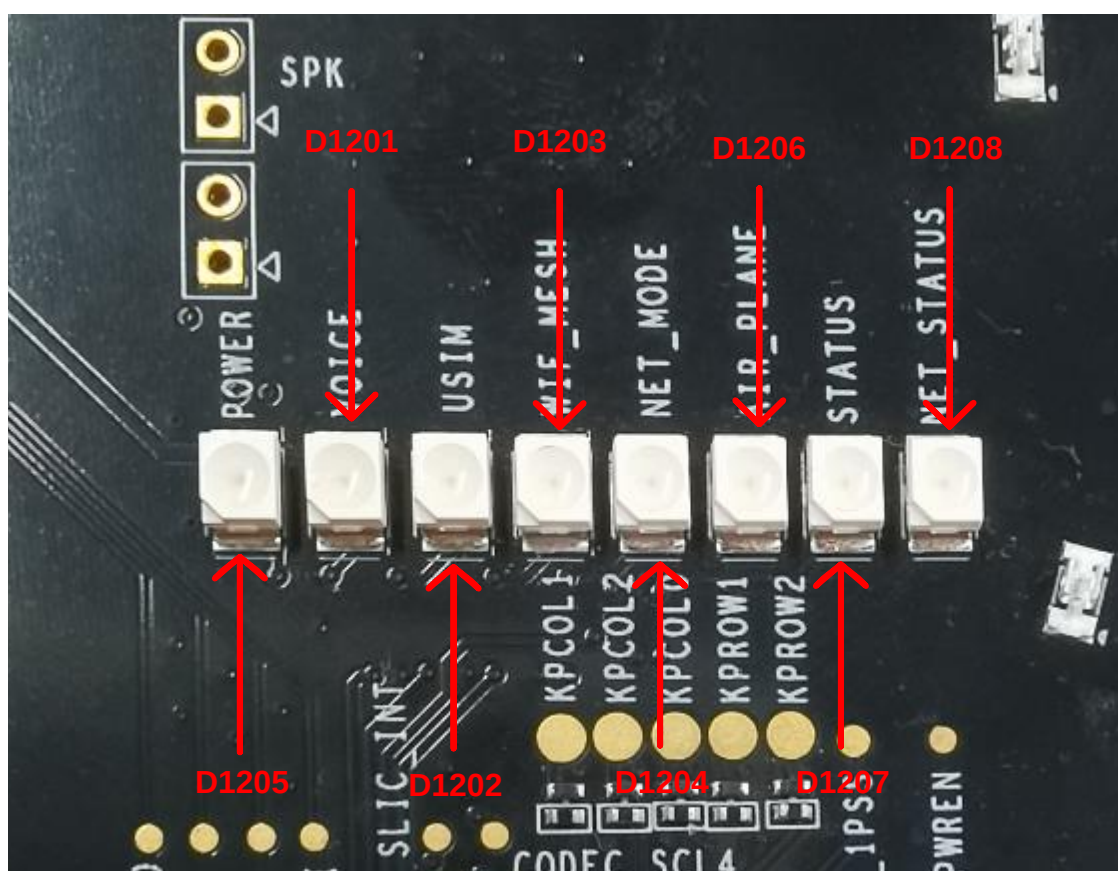


Figure 20: Module Status Indicators

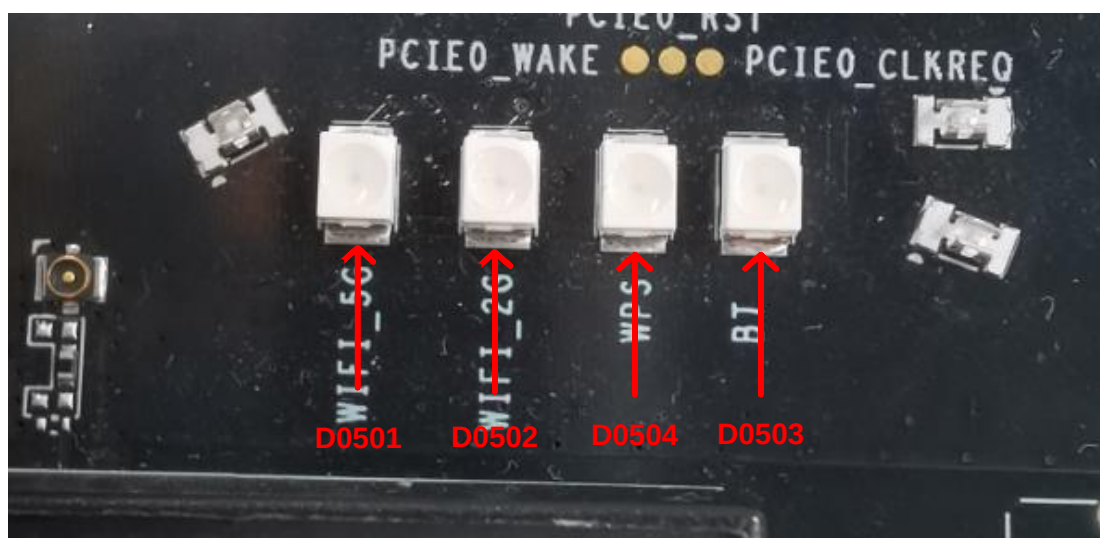


Figure 21: Wi-Fi/Bluetooth Status Indicators

Table 7: Description of 12 Status Indication LEDs

Reference Designator	Description
D1201	Indicates the VoIP function status.
D1202	Indicates the (U)SIM card function status.
D1203	Indicates the Wi-Fi mesh function status.
D1204	Network mode indicator, indicating whether the module has registered on 5G network.
D1205	Power supply on/off indicator, indicating whether the module's power supply is turned on or off. LED on: VBAT ON LED off: VBAT OFF
D1206	Indicates the module's flight mode.
D1207	Module's operation status indicator, indicating whether the module is powered on.
D1208	Indicates the module's network activity status.
D0501	Indicates the Wi-Fi 5G function status.
D0502	Indicates the Wi-Fi 2.4G function status.
D0504	Indicates the Wi-Fi WPS function status.
D0503	Indicates the Bluetooth function status.

3.9. Wi-Fi TE-A Interfaces (J0501/J0502/J0503/J0504)

The Wi-Fi TE-A interfaces are designed to accommodate the TE-A of Wi-Fi modules. The 2.4G Wi-Fi TE-A is connected to the EVB via BTB connectors J0503 and J0504. The 5G Wi-Fi TE-A or 5G&2.4G Wi-Fi TE-A is connected to the EVB via BTB connectors J0501 and J0502. The interfaces allow customers to test the Wi-Fi function of the module or to develop applications with Wi-Fi function easily (please insert the TE-A as indicated by the arrow to prevent reverse insertion).

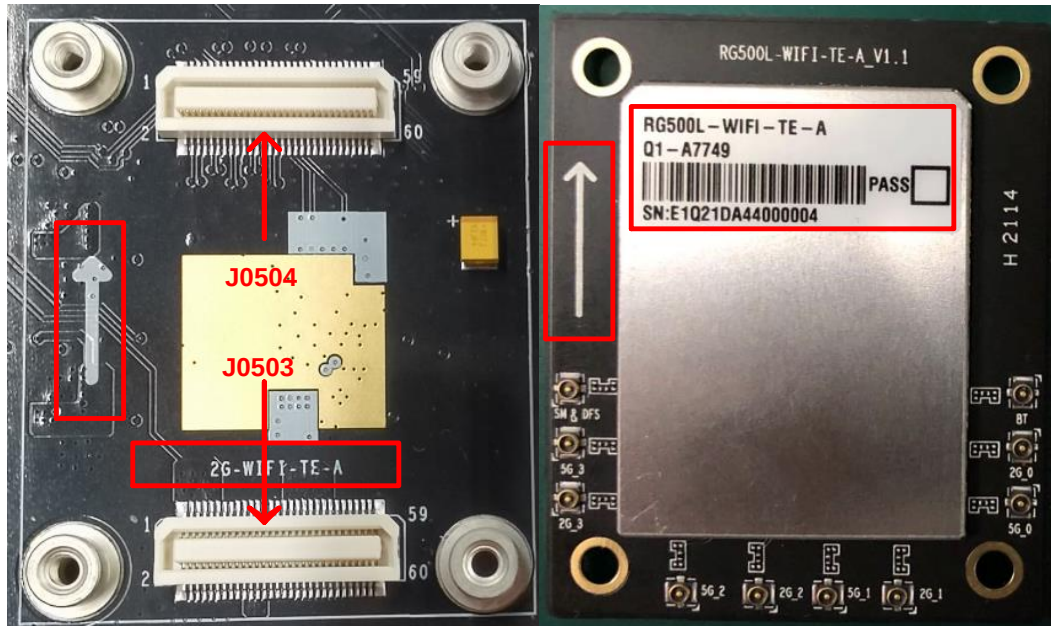


Figure 22: Connection Between 2.4G Wi-Fi TE-A and EVB

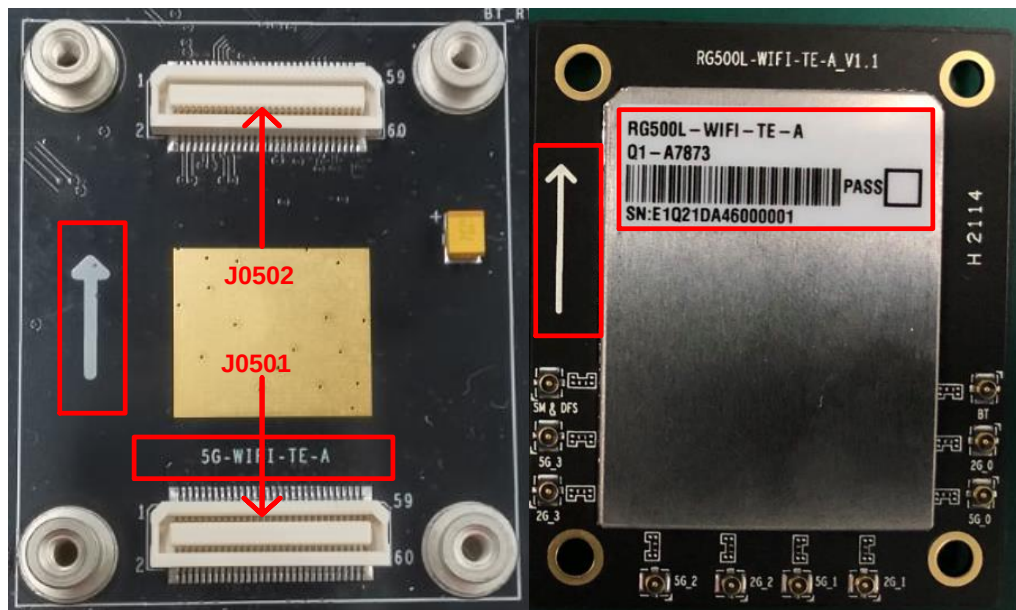


Figure 23: Connection Between 5G Wi-Fi TE-A and EVB

3.10. Antenna Interfaces

The RG500L EVB includes fourteen RF antenna interfaces: 8 cellular antenna interfaces, 2 GNSS antenna interfaces, and 4 Wi-Fi antenna interfaces. The following two figures show the assembly of these antenna interfaces.

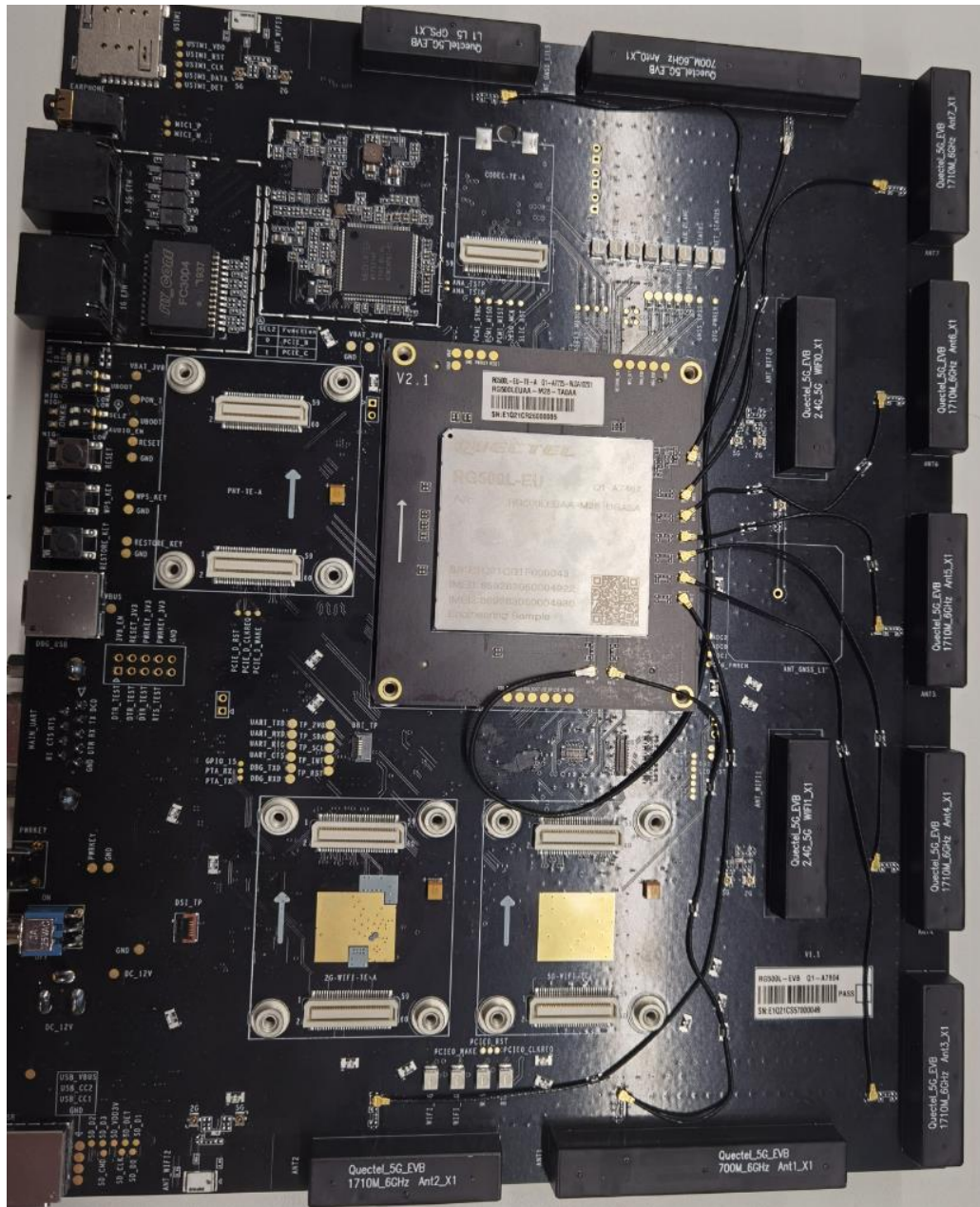


Figure 24: Cellular/GNSS Antenna Interfaces

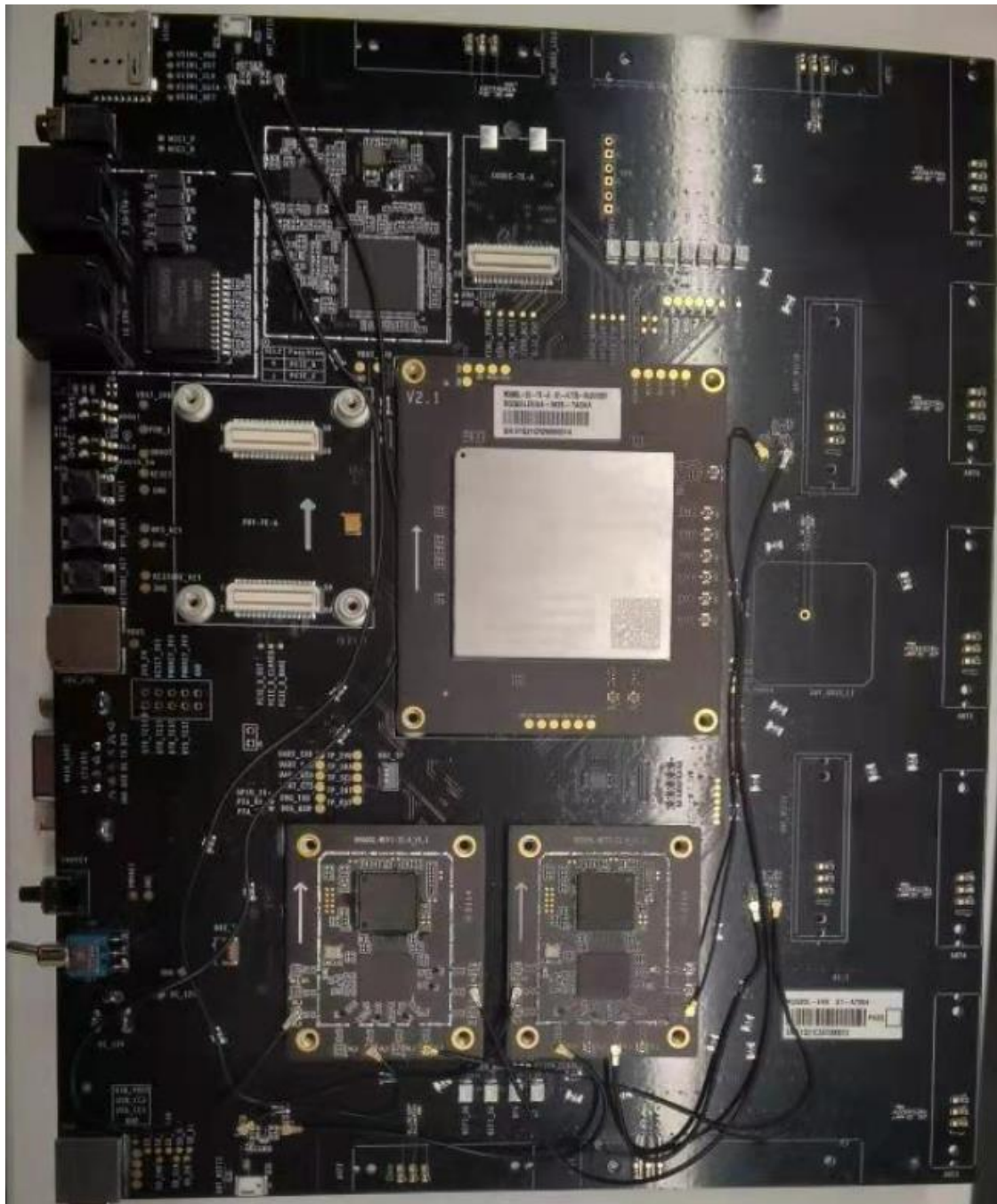


Figure 25: Wi-Fi Antenna Interfaces

4 EVB Operation Procedures

This chapter introduces how to use the RG500L EVB for the testing and evaluation of Quectel 5G RG500L Series QuecOpen module.

4.1. Turn on the Module

1. Insert the module TE-A to the EVB via connectors J0101 and J0102.
2. Insert two (U)SIM cards into the (U)SIM1 card connector (J0901) and (U)SIM2 card connector (J0902) respectively on EVB.
3. Use RF cable to connect the module TE-A to the EVB, and connect antennas to the EVB.
4. Connect the EVB to a 12 V/ 3 A power supply, and then switch S0203 to ON. Then D1205 (ON/OFF indicator of the module's power supply) will light up.
5. Press S1202 (PWRKEY) for at least 500 ms, then the module will be powered on and D1207 (indicating the module's operation status) will light up.

4.2. Communication via USB

1. Power on the module according to the procedure in **Chapter 4.1**.
2. Connect the EVB with a PC through USB Type-C interface using the USB cable, and then run the driver disk on the PC to install the USB driver. For details about USB driver installation, see **document [1]**. The USB port numbers can be viewed in Device Manager of the PC after the USB driver is installed, as shown below.



Figure 26: USB AT Ports Loaded on PC Device Management

3. Run the QCOM tool provided by Quectel on PC to realize the communication between the module and the PC.

The following figure shows the COM Port Setting of QCOM: select the correct “**COM Port**” (USB AT Port, i.e., MediaTek ELT Port (COM 6) or MediaTek ETS Port (COM 7) as shown in the figure above) and set the correct “**Baudrate**” (e.g., 115200 bps). For more details about QCOM usage and configuration, see [document \[2\]](#).

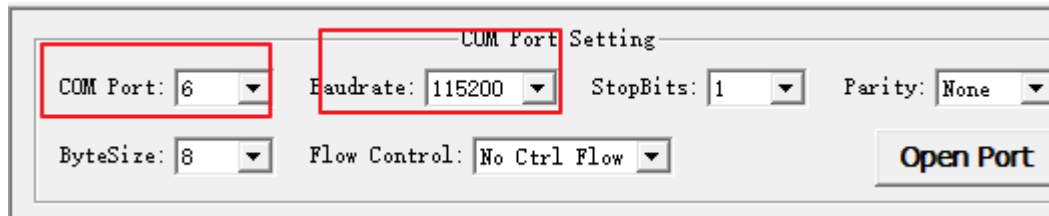


Figure 27: COM Port Setting Field on QCOM (USB AT Port Connection)

4.3. Firmware Upgrade

Firmware of the module is upgraded via USB port by default, and there are two methods for the upgrade: emergency download and normal download. Please refer to the following procedures to upgrade firmware through the EVB.

Before firmware upgrade, please ensure that the firmware upgrade tool QFlash is available on PC.

4.3.1. Emergency Download

1. Connect the EVB with the PC through USB Type-C cable.
2. Turn the USB_BOOT switch (S1205) to HIGH.
3. Insert the DC power adapter and turn the power switch (S0203) to ON.
4. Upgrade the firmware with QFlash. See [document \[3\]](#) for details about the use of QFlash.

4.3.2. Normal Download

1. Connect the EVB with the PC through USB Type-C cable.
2. Insert the DC power adapter and turn the power switch (S0203) to ON.
3. Wait for the USB port to be found in Device Management of the PC.
4. Upgrade the firmware with QFlash. See [document \[3\]](#) for details about the use of QFlash.

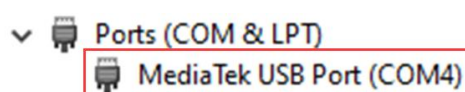


Figure 28: USB Port Loaded on PC Device Management

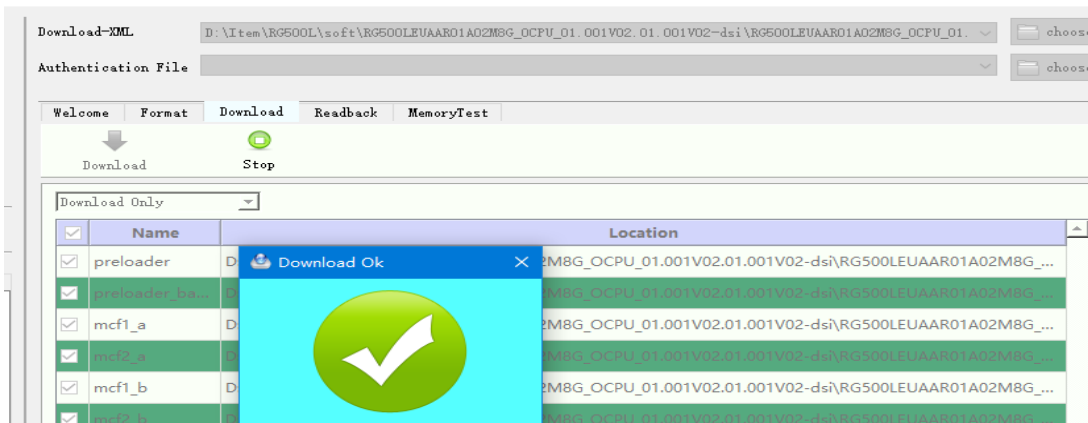


Figure 29: Firmware Download OK

4.4. Reset the Module

The reset option is only used in case of abnormality, for example, the software fails to respond for more than 5 seconds due to serious problems.

Short-press the button S1204 (RESET) for 250–550 ms, and then release it to reset the module.

4.5. Turn off the Module

There are two methods to turn off the module.

- Turn off the module with **AT+QPOWD**. This is a safe method because the module will log off from the network and save data before shutdown.
- Turn off the module with PWRKEY button (S1202). Long-press PWRKEY for at least 3000 ms, then the module will be powered off.

5 Appendix References

Table 8: Related Documents

Document Name
[1] Quectel_LTE&5G_Windows_USB_Driver_Installation_Guide
[2] Quectel_QCOM_User_Guide
[3] Quectel_QFlash_User_Guide

Table 9: Terms and Abbreviations

Abbreviation	Description
BTB	Board to Board
COM	Cluster Communication Port
DBI	Display Bus Interface
DC	Direct Current
DIO	Digital Input/Output
DI	Digital Input
DO	Digital Output
DSI	Display Serial Interface
SLIC	Subscriber Line Interface Circuit
EVB	Evaluation Board
GND	Ground
GNSS	Global Navigation Satellite System
I/O	Input/Output

LED	Light Emitting Diode
AT	Attention
PC	Personal Computer
TP	Touch Panel
LDO	Low Dropout Regulator
LCD	Liquid Crystal Display
PO	Power Output
RF	Radio Frequency
SD	Secure Digital
SDIO	Secure Digital Input and Output
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
VoIP	Voice over Internet Protocol
WPS	Wi-Fi Protected Setup
PCIe	Peripheral Component Interconnect Express