# 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 terminal or mobile incorporating the module. Manufacturers of the 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 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. |
|  | 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 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 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 terminals. Areas with explosive or potentially explosive atmospheres include fueling 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 |
| 1.1 | 2024-05-15 | Hubery HUANG | 1. Added AX1800/AX3000/AX3600 Wi-Fi solution (Figure 27, Figure 28 and Figure 29).<br>2. Added accessories assembly information (Chapter 2.4).<br>3. Updated accessories list (Chapter 2.5). |

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# 1 Introduction

This user guide describes the application details of RG500L EVB (evaluation board), which is an assistant tool for you to develop applications and test basic functionalities of applicable modules.

## 1.1. Applicable Modules

For details about the applicable modules of this EVB, see ***document [1]***.

# 2 Product Overview

Quectel supplies RG500L EVB for engineers to develop applications based on Quectel applicable modules. 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**

| Feature | Description |
|---|---|
| Power Supply | DC power supply: 12 V ±5 %<br>Typical: 12 V/ 3 A |
| Module TE-A Interface | Supporting Quectel applicable modules |
| Wi-Fi TE-A Interfaces | ● 2.4G Wi-Fi TE-A<br>● 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):<br>● Debug UART<br>● For Linux console and log output<br>● Default baud rate: 921600 bps |
| | USB2 (J1001):<br>● USB Type-C interface<br>● USB 3.0 and USB 2.0 supported<br>● For AT command communication, data transmission and firmware upgrade<br>● Default baud rate: 115200 bps |
| Signal Indication | 12 LED indicators are available for signal indication |

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

## 2.2. Component Placement

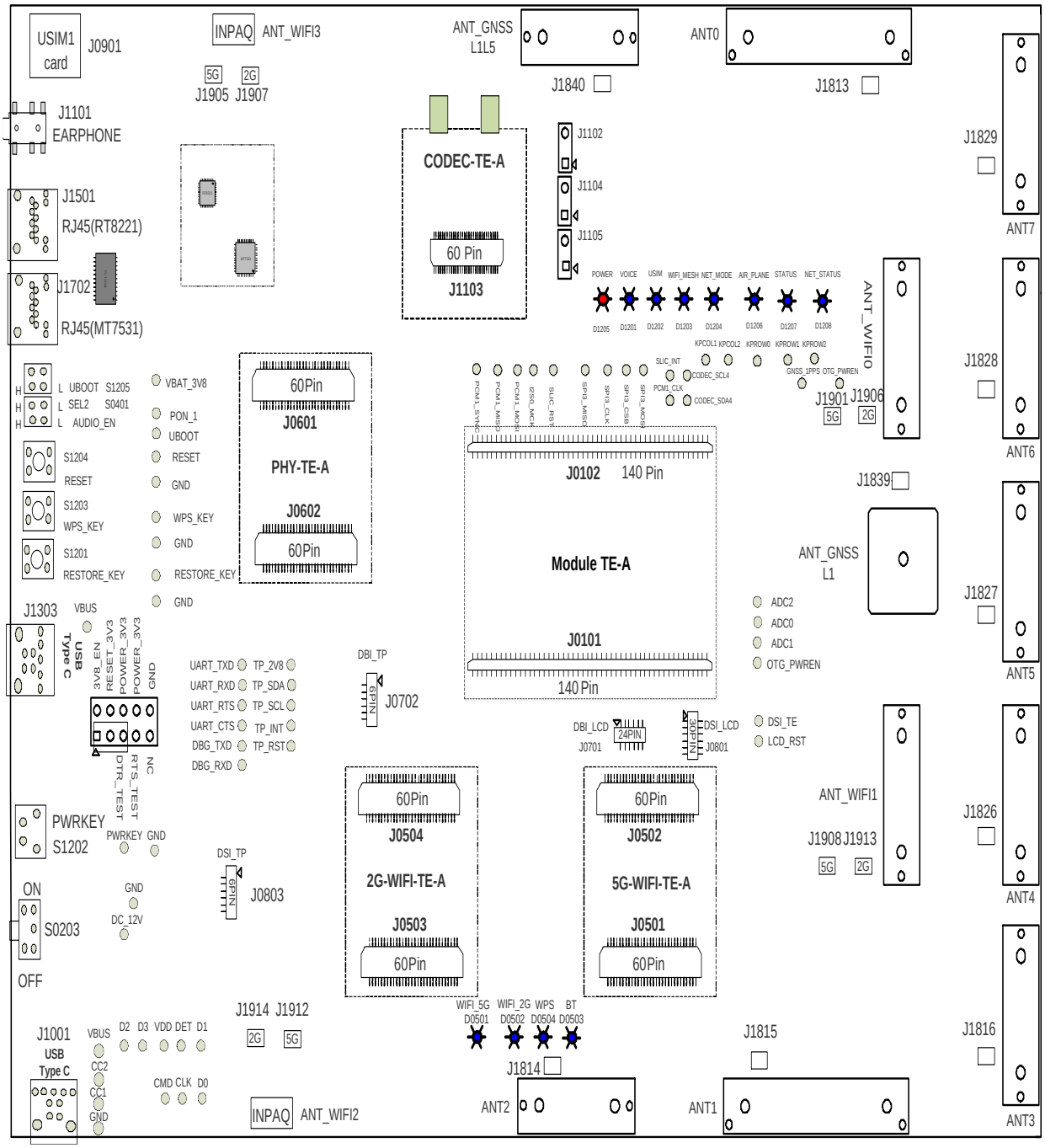



**Figure 1: Top View for Component Placement of the EVB**

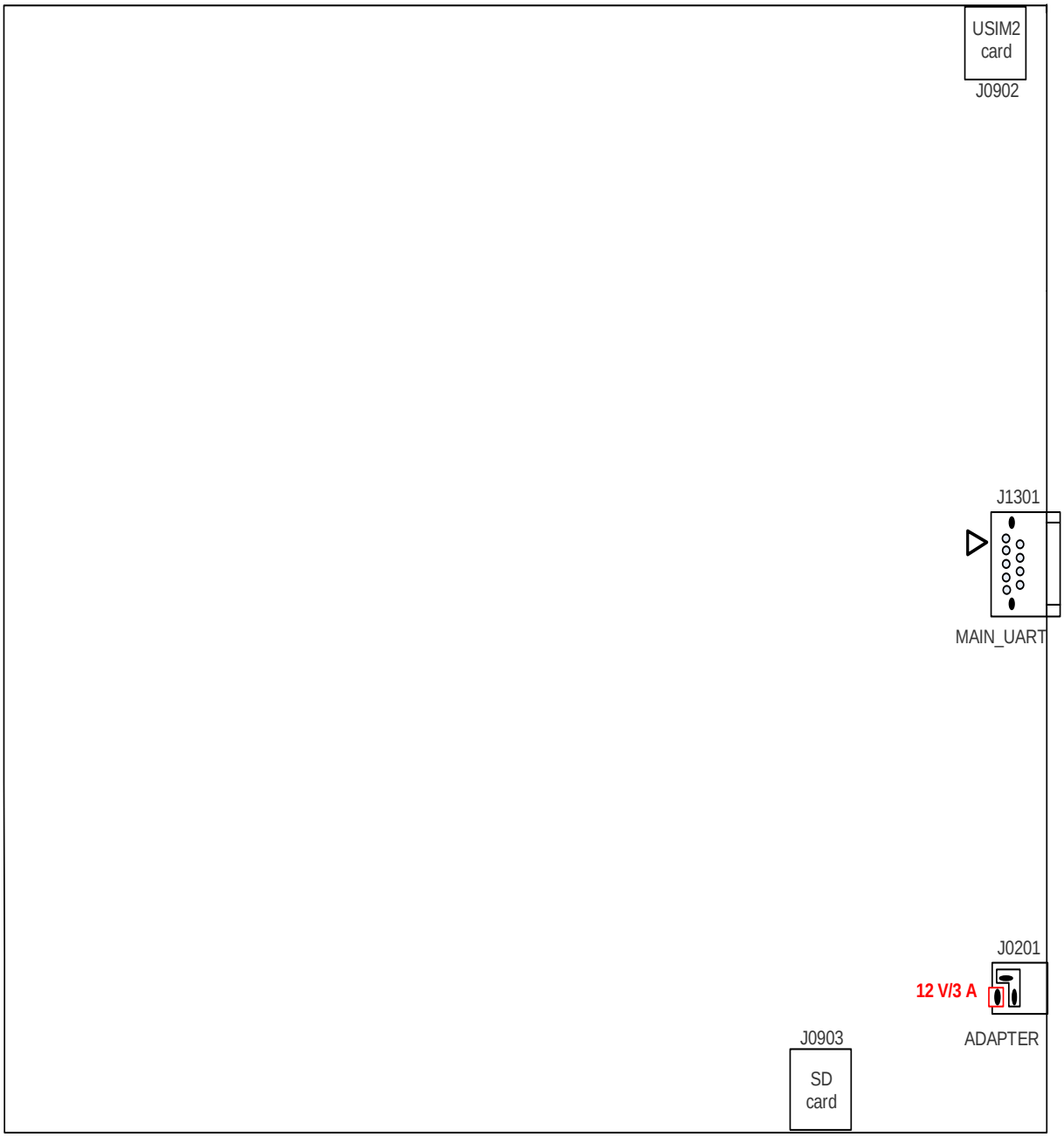



**Figure 2: Bottom View for Component Placement of the EVB**

**Table 2: Components & Interfaces of RG500L EVB**

| Interface | Reference Designator | Description |
|---|---|---|
| Power Supply | J0201 | The power jack on the EVB<br>Typical supply voltage: 12 V/ 3 A |
| Power Switch | S0203 | VBAT ON/OFF control |
| PWRKEY | S1202 | Power key (push button)<br>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)<br>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 turned 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.

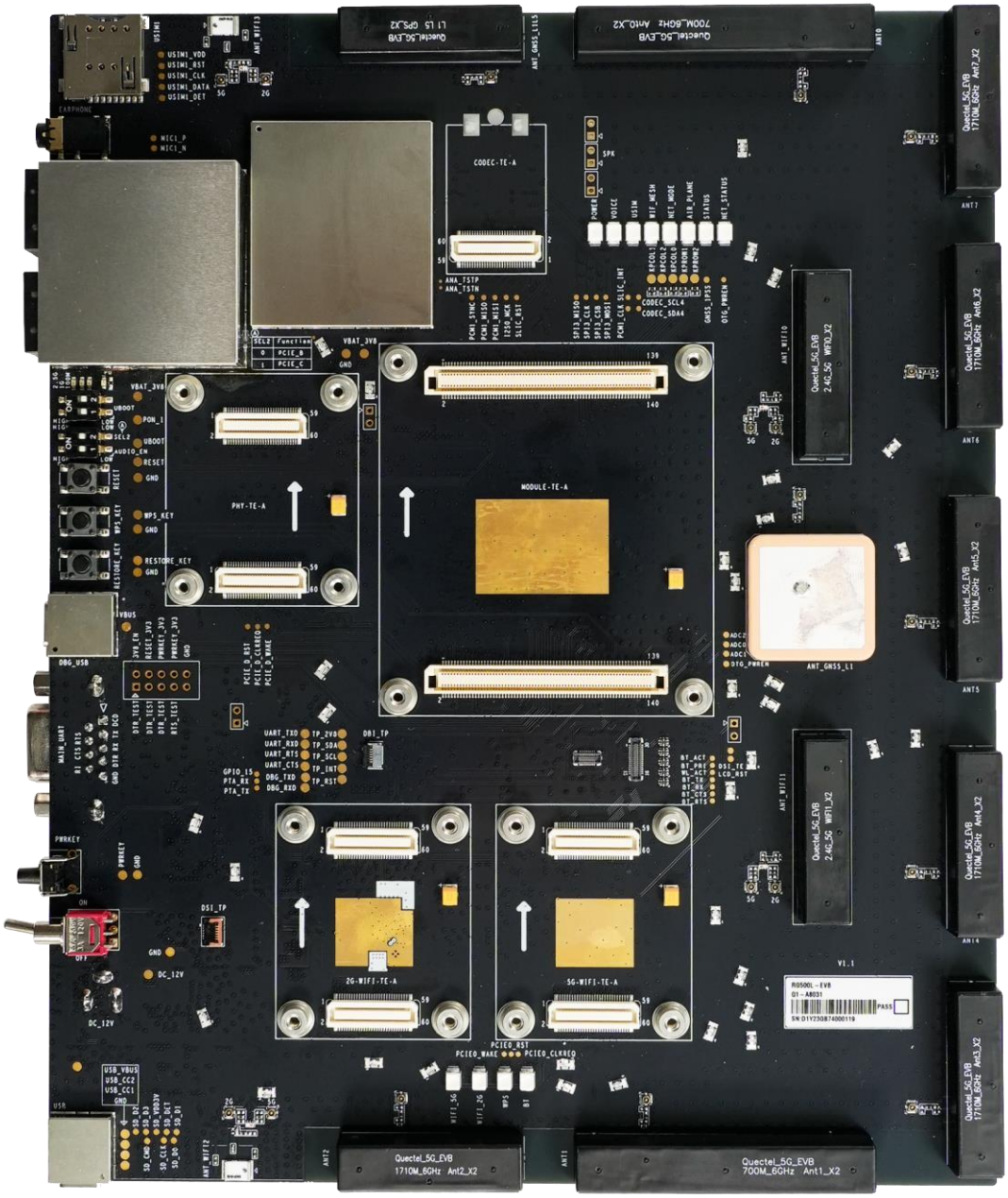



**Figure 3: RG500L EVB Top View**



**Figure 4: RG500L EVB Bottom View**

## 2.4. Accessories Assembly

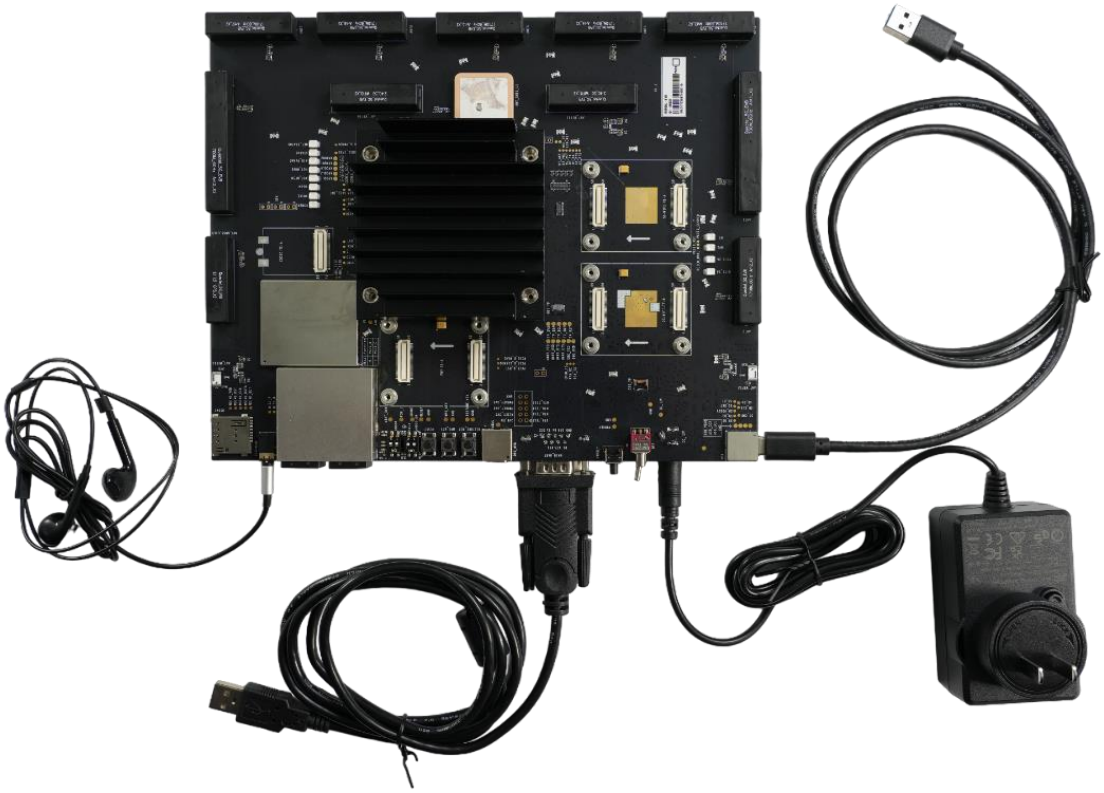


**Figure 5: RG500L EVB and Accessories Assembly**

## 2.5. Accessories List

All accessories of the RG500L EVB kit are listed as below. Please contact the supplier if there is something missing.



**Figure 6: RG500L EVB Kit Accessories**

**NOTE**

Images above are for illustration only and may differ from the actual products. For authentic product information, please refer to the accessories received from Quectel.

**Table 3: Accessories List**

| Item | Description | Quantity (pcs) |
|---|---|---|
| Power Adapter | +12 V/ 3 A power adapter | 1 |
| Cables | USB Type-C cable | 1 |
| | USB-to-RS232 converter cable | 1 |
| | RF cables | 17 |
| Antennas | Cellular antenna | 8 |
| | GNSS antenna (passive) | 2 |
| | Wi-Fi antennas | 4 |
| Audio | Earphone | 1 |
| Screws | Used to fasten TE-As on the EVB | 12 |
| Heatsink | ● Heatsink AL6063T5 Black Coating 80 mm × 79 mm<br>● Height: 22 mm | 1 |

# 3 Application Interfaces

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.

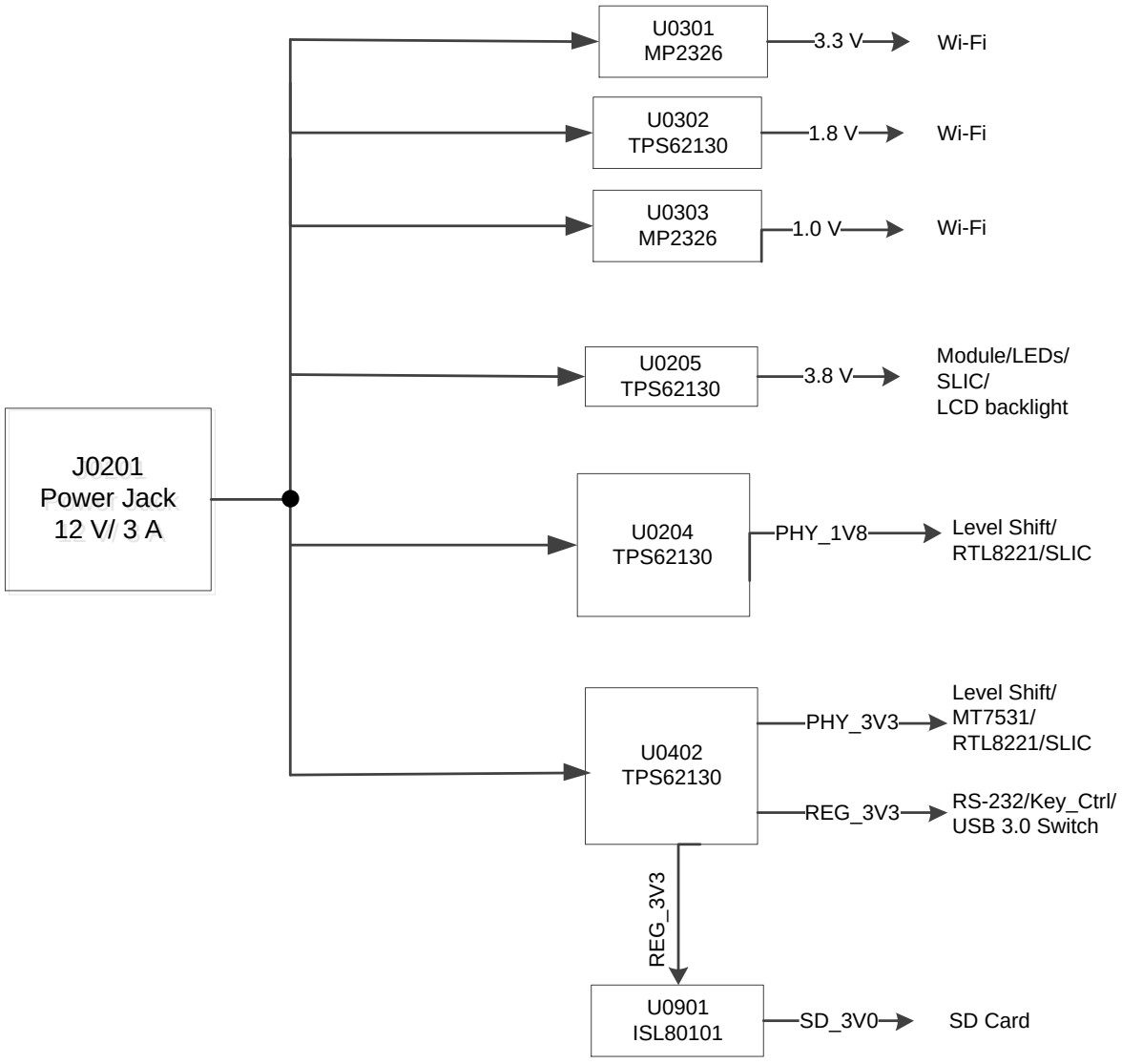



**Figure 7: Block Diagram of the EVB Power Supply**

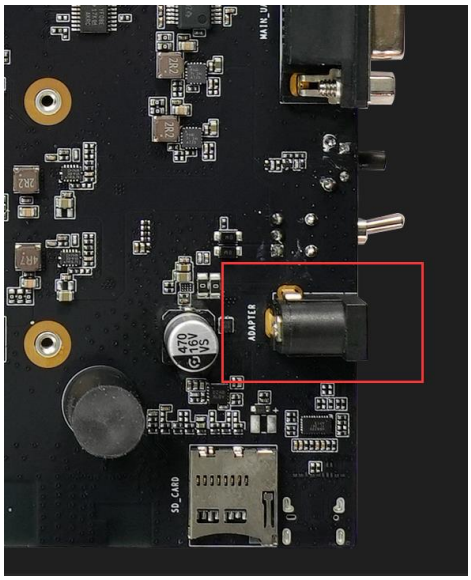



**Figure 8: EVB Power Supply Interface**

## 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.

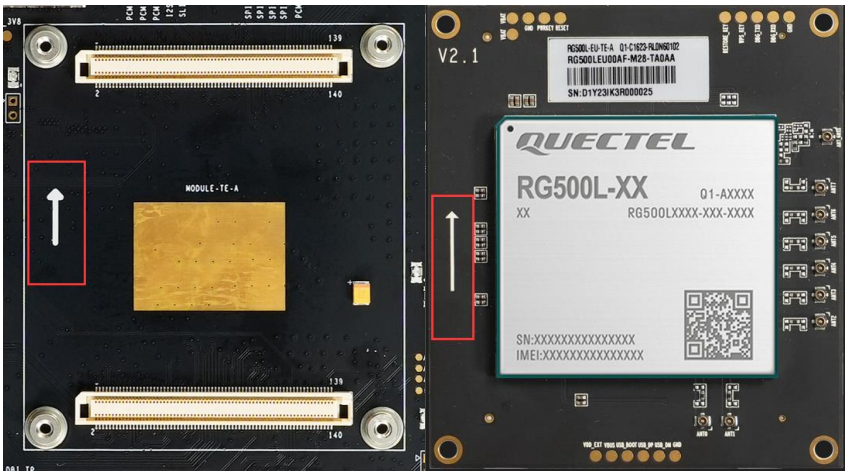



**Figure 9: Connection Between Module TE-A and EVB**

## 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.

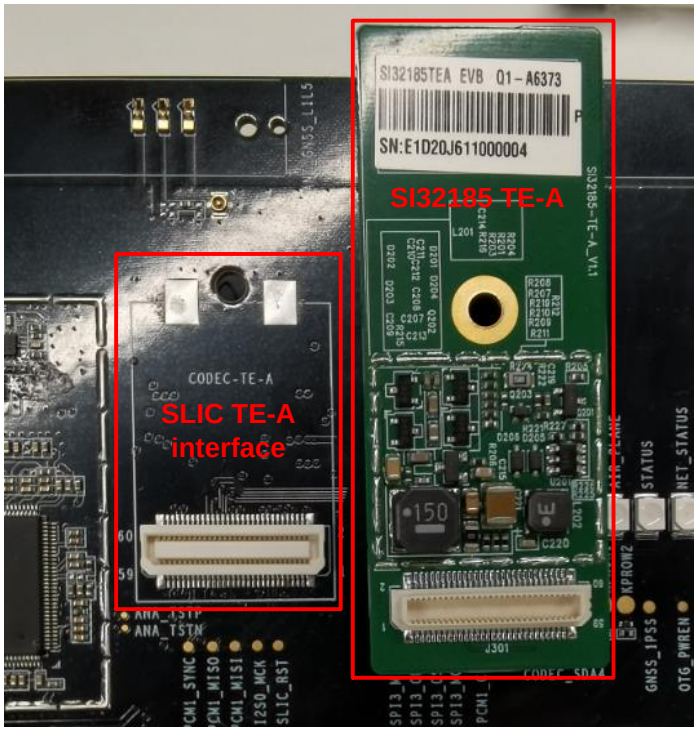



**Figure 10: Connection Between SI32185 TE-A and EVB**

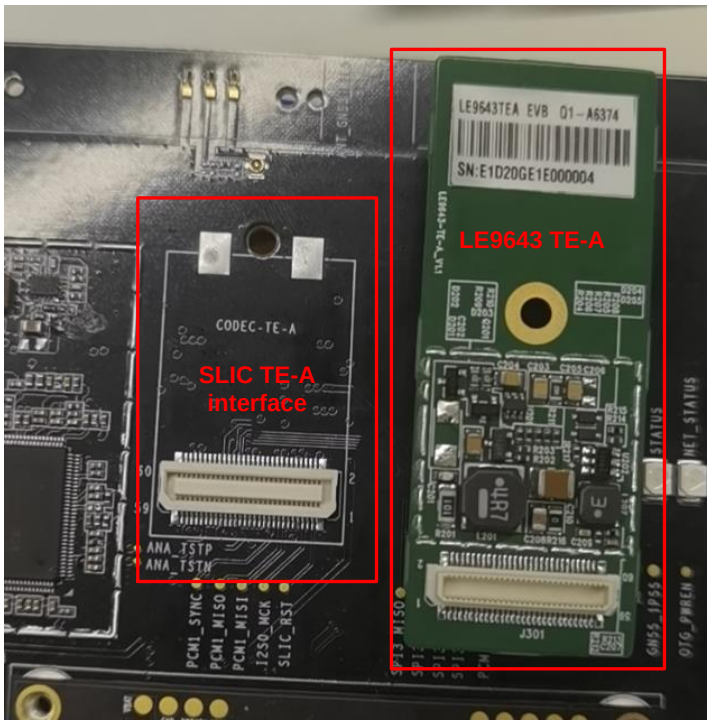



**Figure 11: Connection Between LE9643 TE-A and EVB**

## 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.

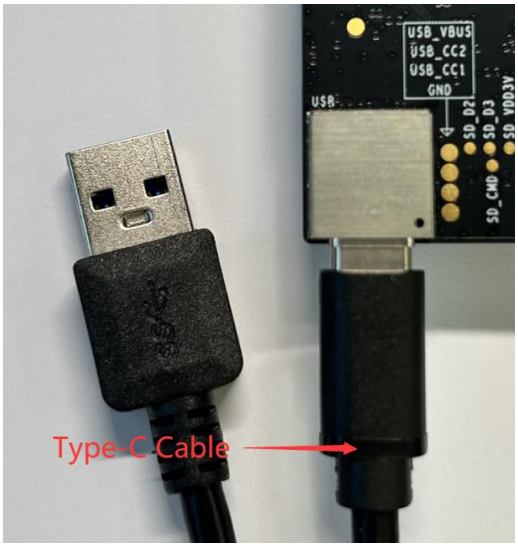



**Figure 12: USB Interface Connection**

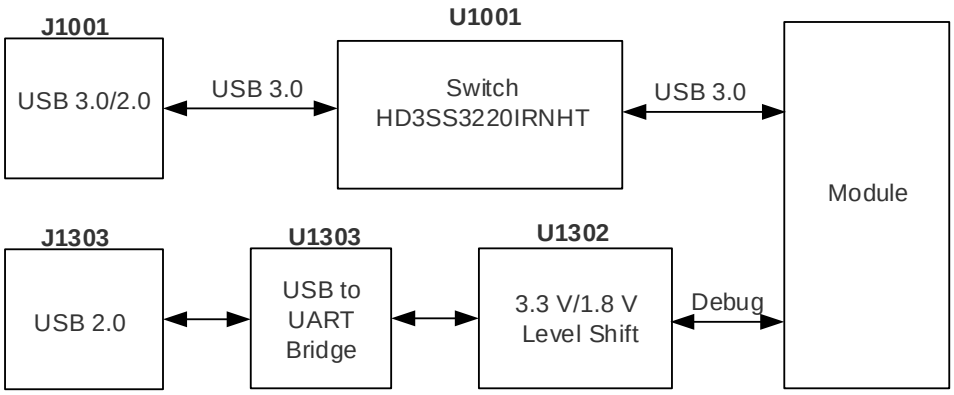



**Figure 13: USB Block Diagram**

## 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.

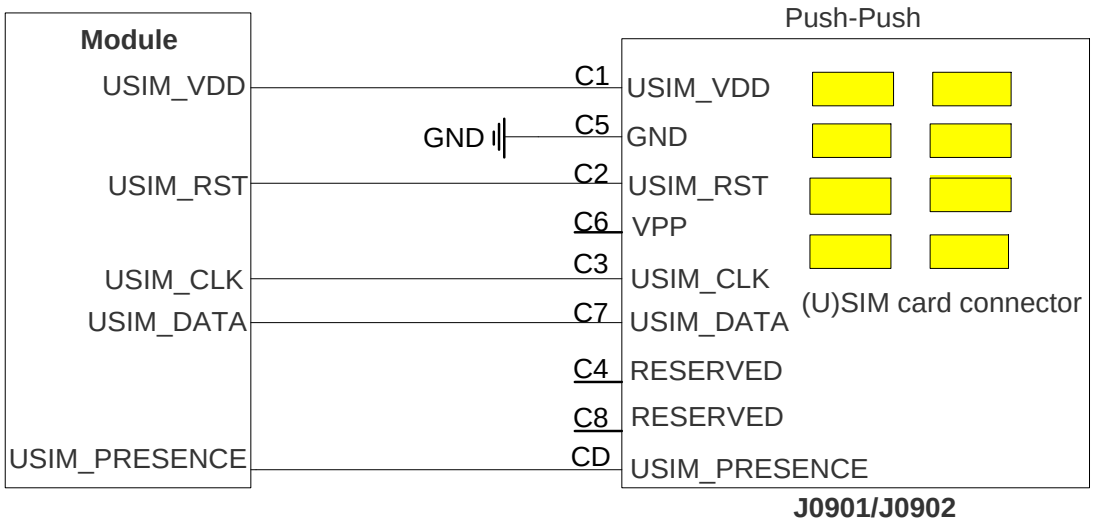



**Figure 14: Simplified Connection Schematic for (U)SIM Card Connector**

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.

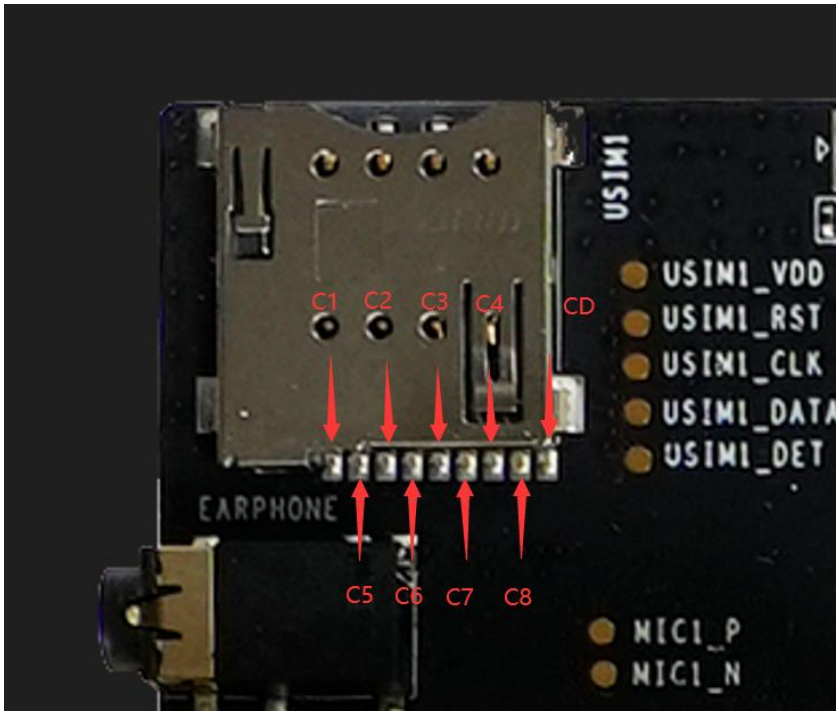



**Figure 15: Pin Assignment of (U)SIM Card Connector (J0901)**

**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.

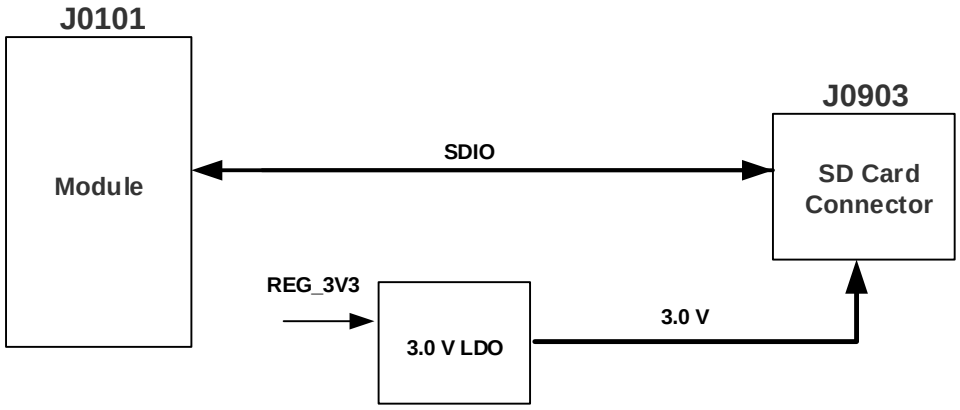



**Figure 16: Simplified Interface Schematic for SD Card Connector**

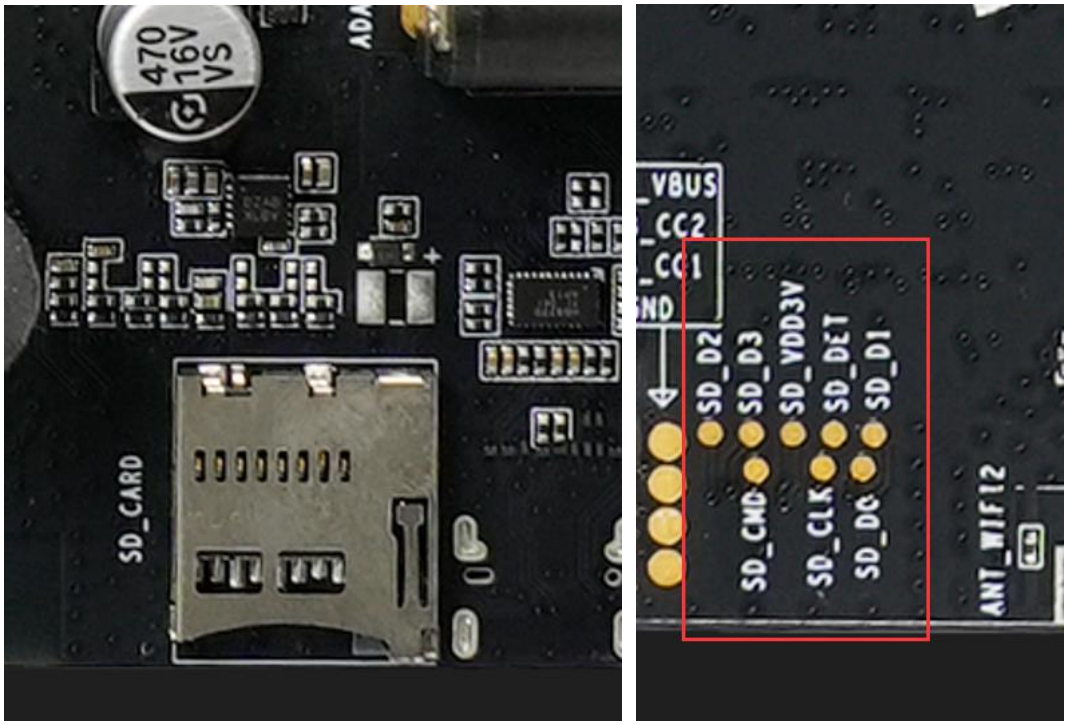



**Figure 17: Pin Assignment of SD Card Connector (J0903)**

## 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.

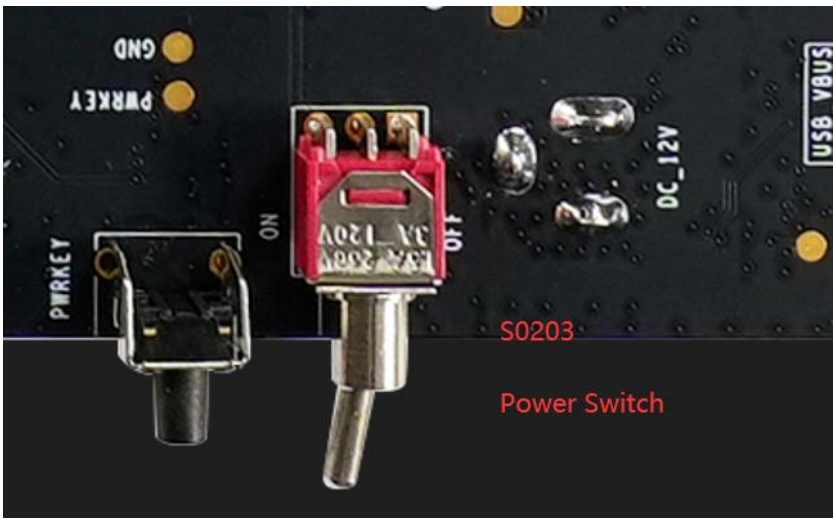



**Figure 18: Power Switch (S0203)**

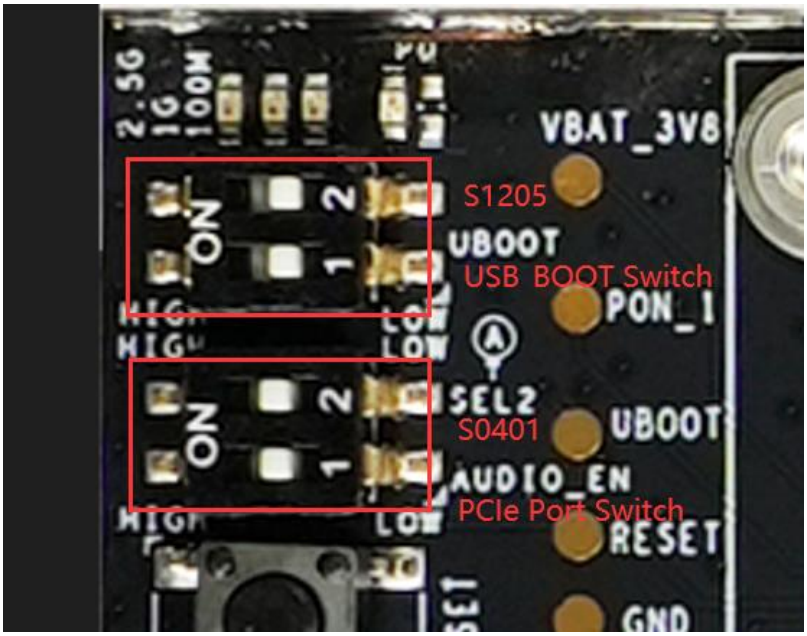



**Figure 19: USB_BOOT Switch (S1205) and PCIe Port Switch (S0401)**

**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) |

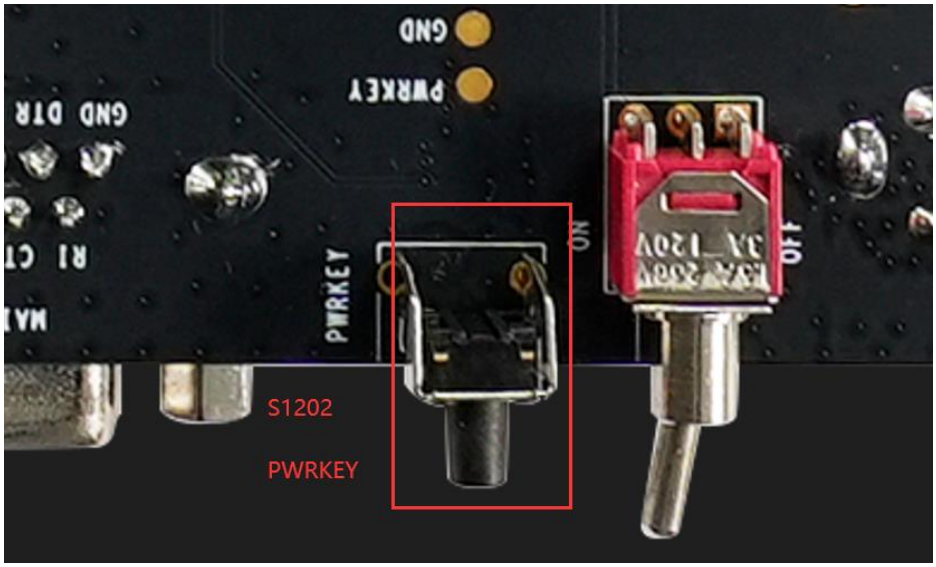



**Figure 20: PWRKEY Button (S1202)**

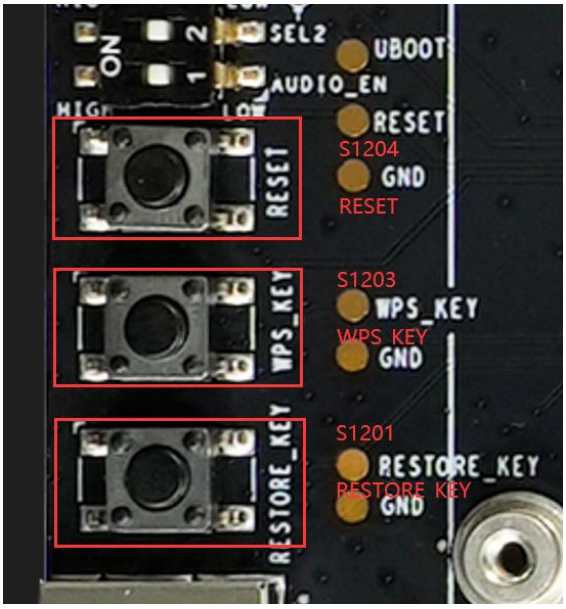



**Figure 21: RESET/WPS_KEY/RESTORE_KEY Buttons (S1204/S1203/S1201)**

**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.

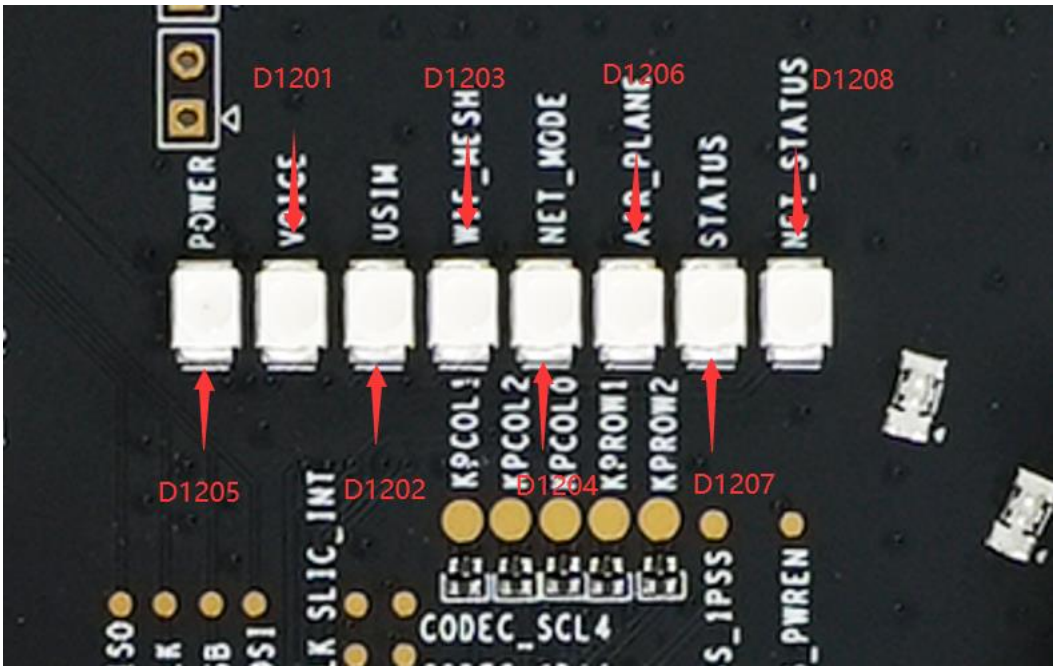



**Figure 22: Module Status Indicators**




**Figure 23: 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.<br>LED on: VBAT ON<br>LED off: VBAT OFF |
| D1206 | Indicates the module's flight mode. |
| D1207 | Module's operation status indicator, indicating whether the module is turned 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 you 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).

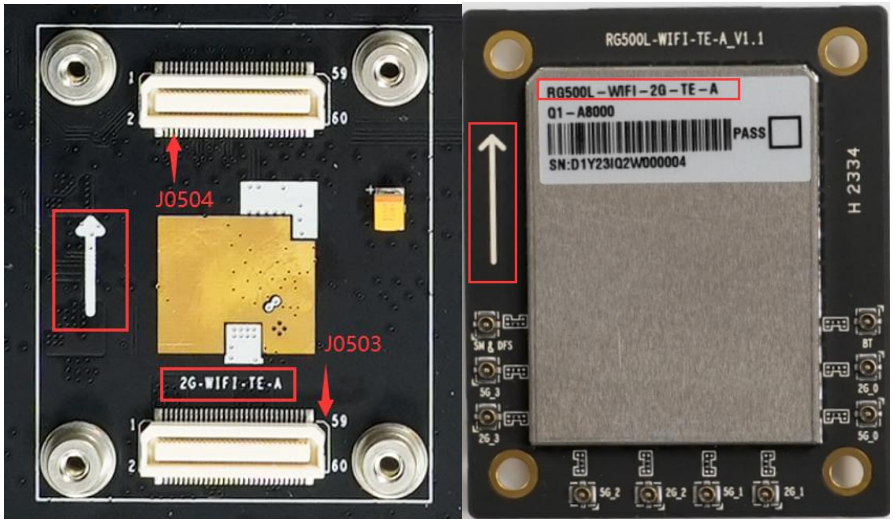



**Figure 24: Connection Between 2.4G Wi-Fi TE-A and EVB**

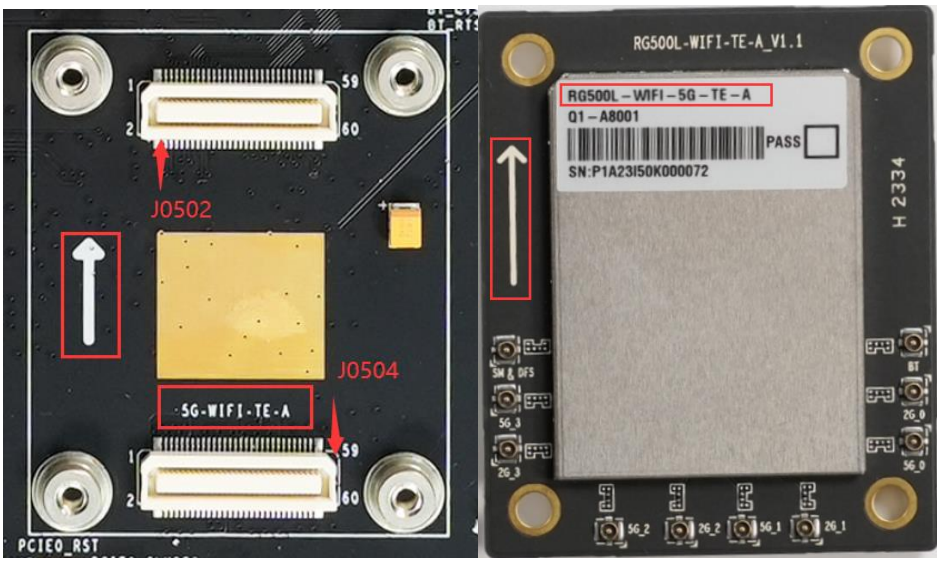



**Figure 25: Connection Between 5G Wi-Fi TE-A and EVB**

## 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.

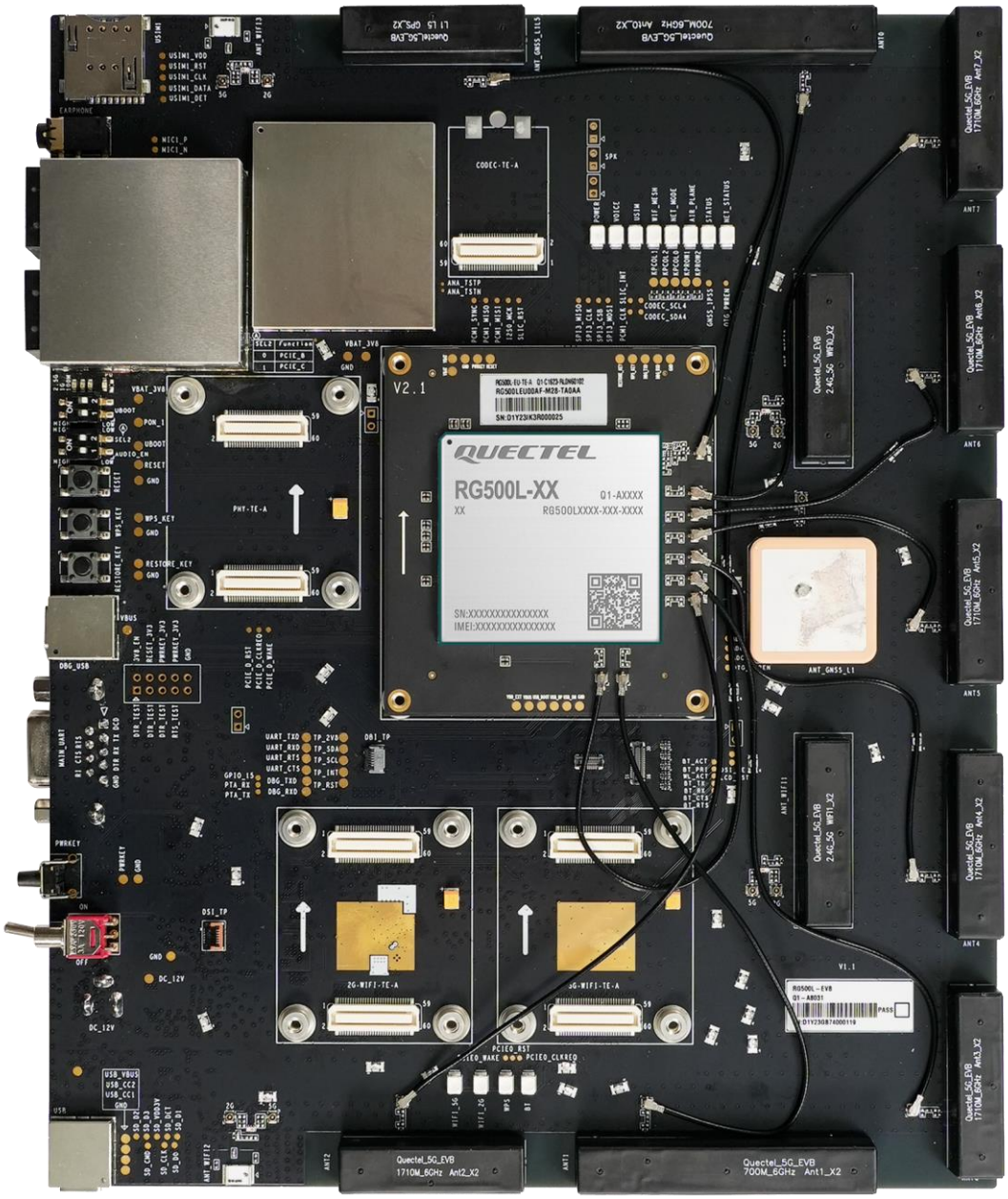



**Figure 26: Cellular/GNSS Antenna Interfaces**



Figure 27: Wi-Fi Antenna Interfaces (AX1800)



Figure 28: Wi-Fi Antenna Interfaces (AX3600)




**Figure 29: Wi-Fi Antenna Interfaces (AX3000)**

# 4 Operation Procedures

This chapter introduces how to use the RG500L EVB for the testing and evaluation of Quectel applicable modules.

## 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 turned 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 [2]***. The USB port numbers can be viewed in Device Manager of the PC after the USB driver is installed, as shown below.




**Figure 30: 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 [3]***.

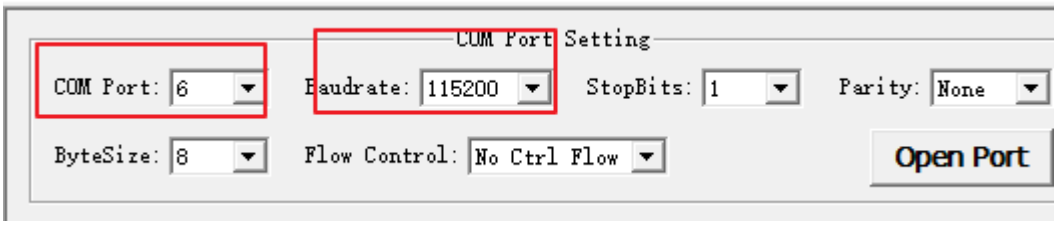



**Figure 31: COM Port Setting Field on QCOM (USB AT Port Connection)**

## 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 [4]*** 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 [4]*** for details about the use of QFlash.




**Figure 32: USB Port Loaded on PC Device Management**

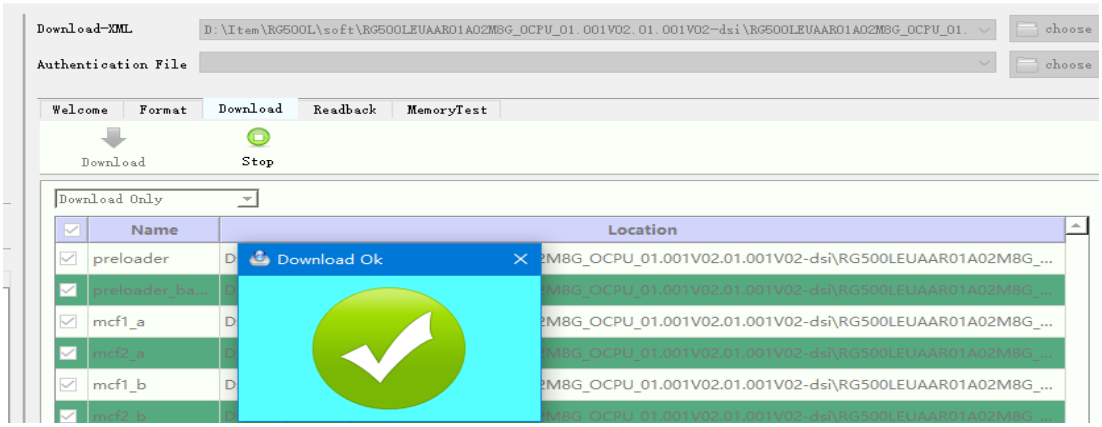



**Figure 33: Firmware Download OK**

## 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 turned off.

# 5 Appendix References

**Table 8: Related Documents**

| Document Name |
|---|
| [1] Quectel_List_of_EVB_Applicable_Modules |
| [2] Quectel_LTE&5G_Windows_USB_Driver_Installation_Guide |
| [3] Quectel_QCOM_User_Guide |
| [4] 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 |