RTA001-EV EVB

User Guide

5G Module Series

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	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 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
-	2022-06-20	Murray YIN	Creation of the document
1.0.0	2022-06-24	Murray YIN	First official release
1.1	2022-09-02	Murray YIN	1. Updated the way of presenting applicable modules (Chapter 1). 2. Added the information about accessory assembly (Chapter 3.1). 3. Updated the description of AP TE-A installation (Chapter 4.4).
1.2.0	2023-12-18	Darie HUANG/ Yao XU/ Mandy WANG/ Jonathan WANG/ Wini LI/ Silvia ZHU/ Louis HUANG	Preliminary: 1. Updated the top and bottom views of RTA001-EV EVB (Figure 1 and 2). 2. Add a new chapter of QuecOpen and standard solution matching (Chapter 5.6 & chapter 5.7).

Contents

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1 Introduction

This user guide describes the application details of the RTA001-EV EVB (Evaluation Board), which is an assistant tool for you to develop applications and test basic functionalities of Qualcomm 5G module series. For details about the modules that this EVB applies to, see ***document [1]***.

2 Product Overview

2.1. Top and Bottom Views

The size of RTA001-EV EVB is 235 mm × 190 mm, and the top and bottom views are as shown below:

Figure 1: Top View

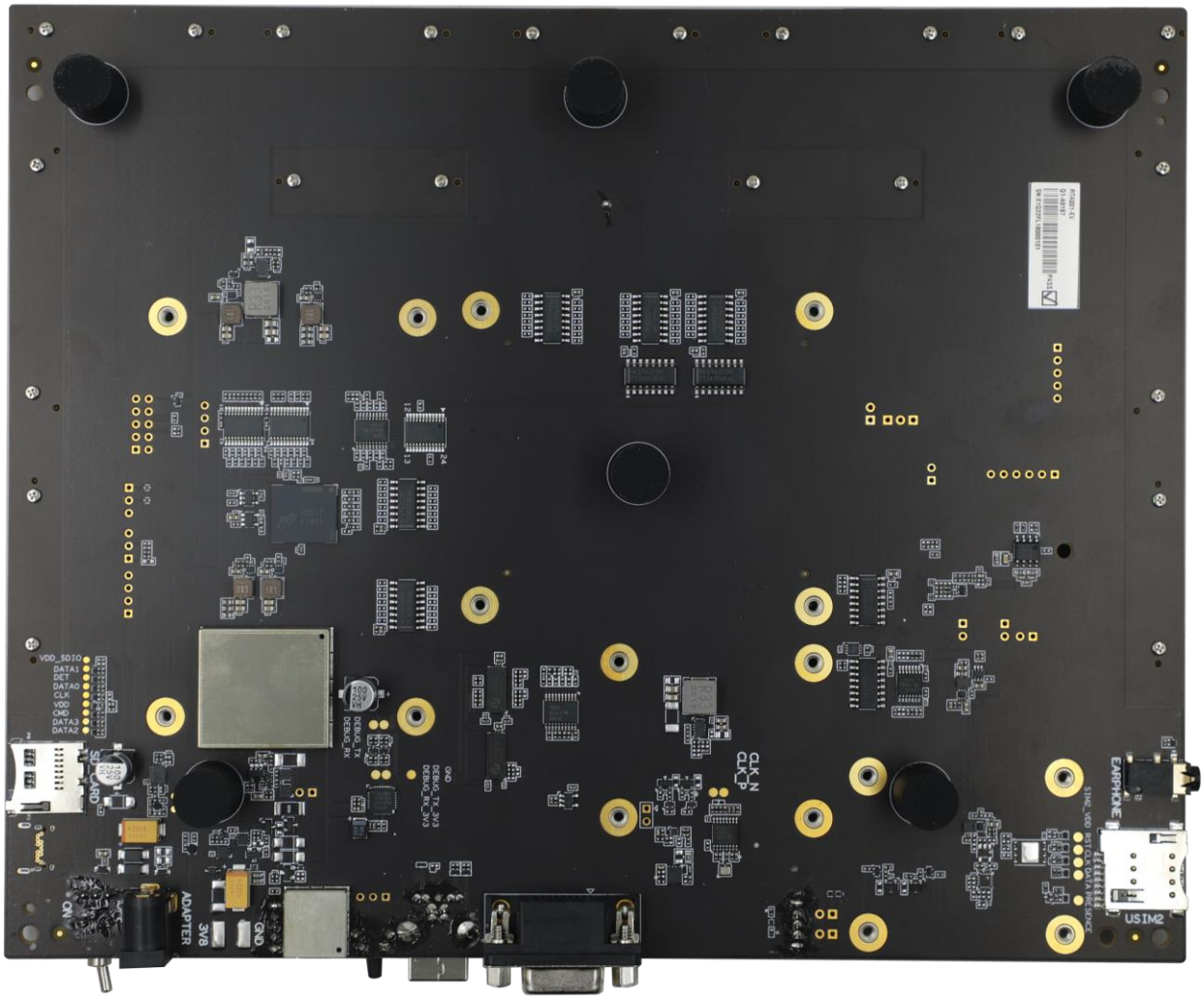

Figure 2: Bottom View

2.2. Component Placement of RTA001-EV EVB

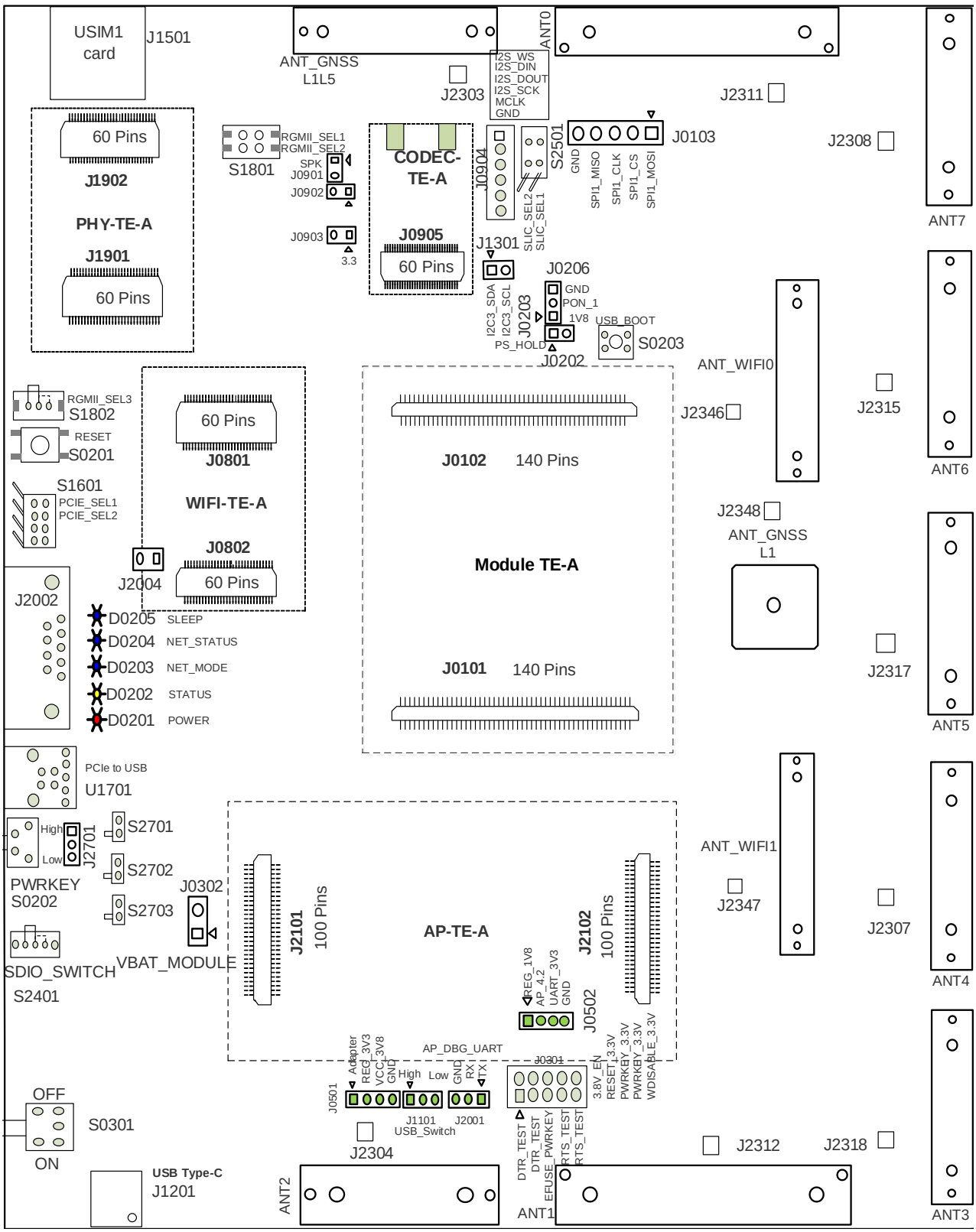

Figure 3: Top View for Component Placement

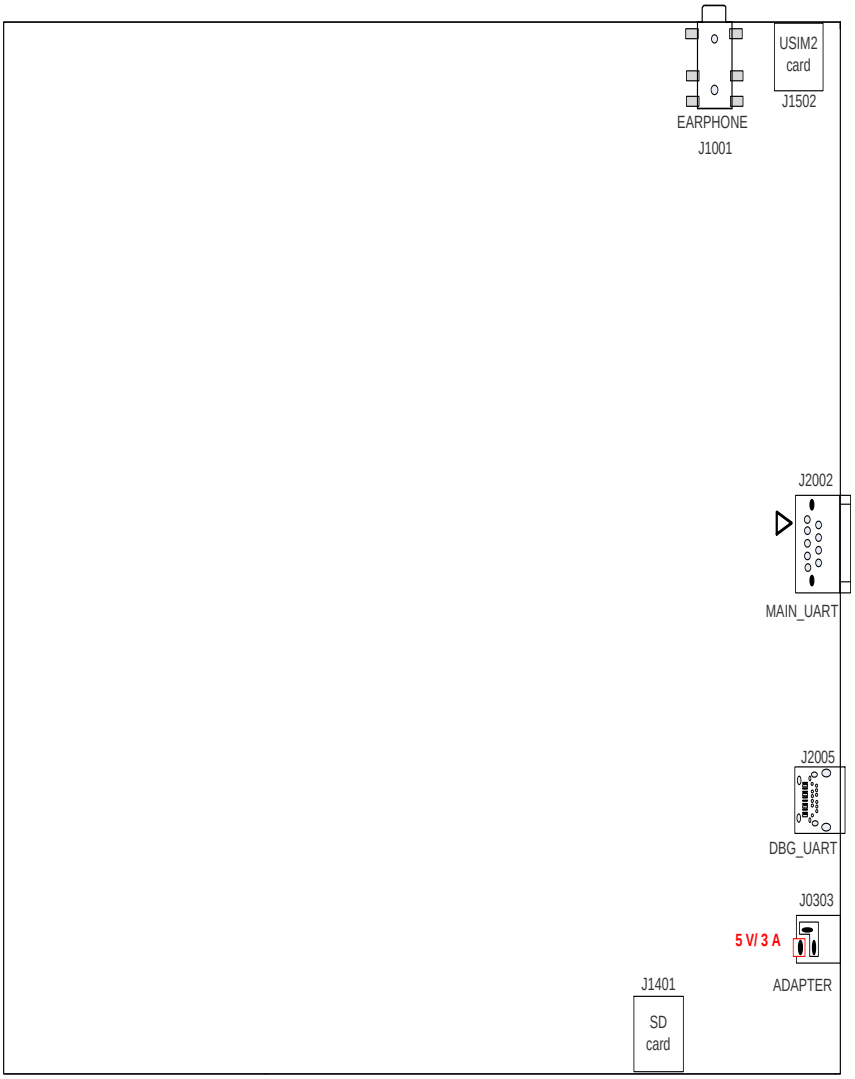

Figure 4: Bottom View for Component Placement

Table 1: Components and Functions

Component	RefDes.	Description
Power supply	J0303	● The power jack on the EVB ● Typical supply voltage: 5 V/ 3 A
Power switch	S0301	VBAT on/off control
PWRKEY	S0202	● Power keypad (button) ● Turn on/off the module
PON	J0203	Auto-power on control
USB_BOOT	S0203	Forced download control
RESET	S0201	● Reset button

		● Reset the module
USB interface	J1201	● USB Type-C interface ● Support USB 3.0/3.1 and USB 2.0
PCIe-to-USB interface	U1701	PCIe-to-USB interface, disabled by default
PCIe configuration switch	S1601	Configure the communication between the module and different devices via PCIe signals
SDIO configuration switch	S2401	Switch between SD card and eMMC
RGMII configuration switch	S1801, S1802	Configure RGMII
Codec configuration switch	S2501	Configure Codec
Wi-Fi configuration switch	S2701	Configure Wi-Fi
Wi-Fi clock signal configuration switch	S2702	Select to provide clock signal to Wi-Fi or AP
Wi-Fi sleep clock signal configuration switch	S2703	Select to provide a sleep clock signal to Wi-Fi or AP
Audio interfaces	J0905	● Codec board TE-A connector ● Support ALC5616 TE-A and TLV320AIC3104 TE-A boards
	J0901	Designed for loudspeaker
	J1001	Audio jack for earphone
(U)SIM card interfaces	J1501	Support dual (U)SIM cards: 1.8 V and 2.95 V
	J1502	
SD card interface	J1401	SD card connector
Main UART	J2002	● Used for data communication ● Default baud rate: 115200 bps
Debug UART	J2005	● Used for debugging ● Default baud rate: 115200 bps
Status indicators	D0201	Power supply on/off indicator, indicating whether the module's power supply is on or off. On: VBAT on Off: VBAT off
	D0202	Module operation status indicator, indicating whether the module is turned on. On: the module is turned on Off: the module is turned off
	D0203	Network registration mode indicator, indicating the module's NET_MODE status.

	D0204	Network activity status indicator, indicating the module's NET_STATUS status.
	D0205	Sleep mode indicator, indicating the module's SLEEP status.
Module TE-A interface	J0101, J0102	Module TE-A connectors
PHY TE-A interface	J1901, J1902	● PHY TE-A connectors ● Support AR8035 and so on
Wi-Fi TE-A interface	J0801, J0802	Wi-Fi TE-A connectors
AP TE-A interface	J2101, J2102	● AP TE-A connectors ● Support IPQ8074A TE-A and QPS615 TE-A
Antenna interfaces	J2303, J2304, J2307, J2308, J2311, J2312, J2315, J2317, J2318, J2346, J2347, J2348	Antenna connectors

3 Kit Accessories

3.1. Accessory Assembly

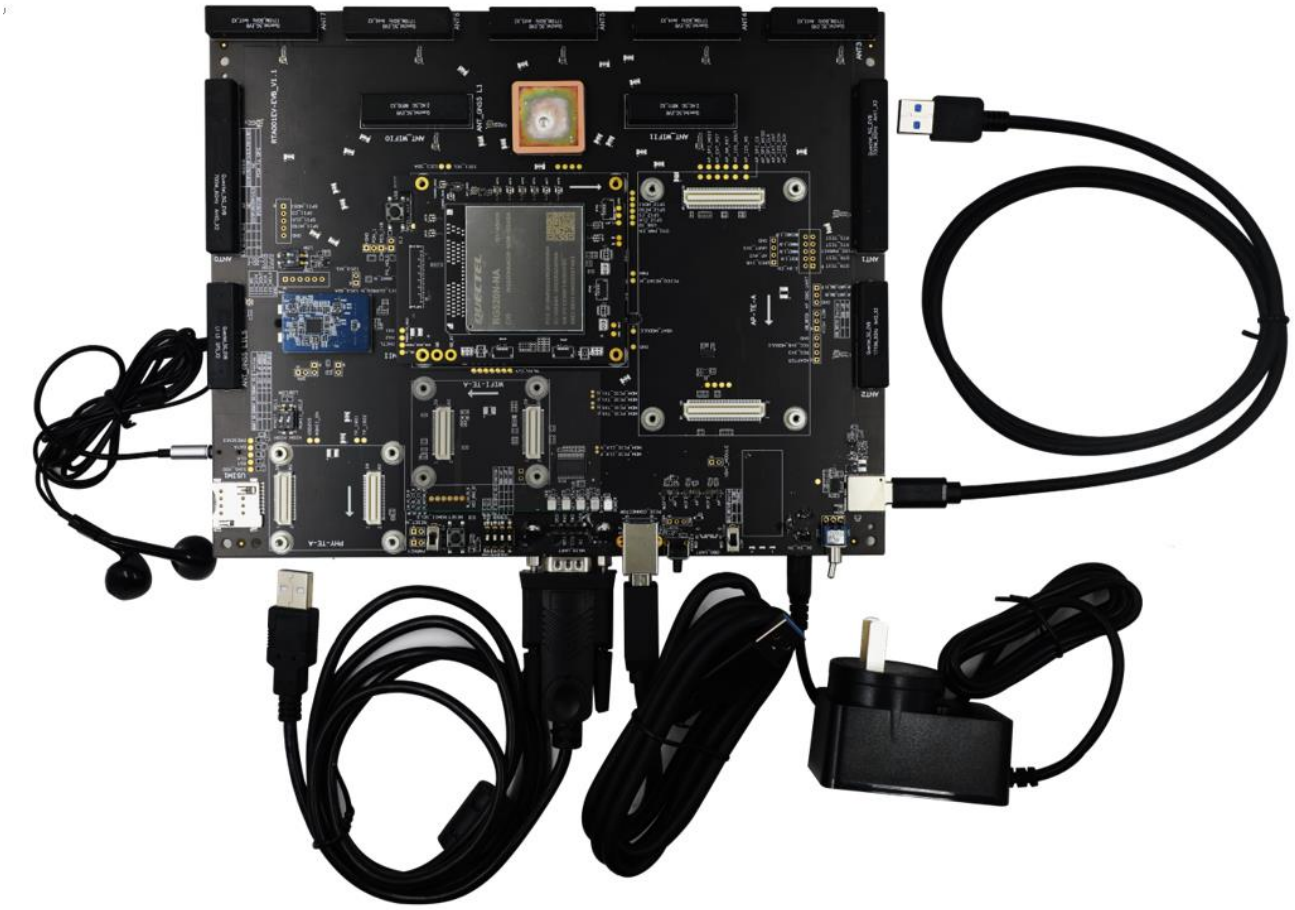

Figure 5: RTA001-EV EVB and Accessory Assembly
(5G Module TE-A Needs to be Applied for Separately)

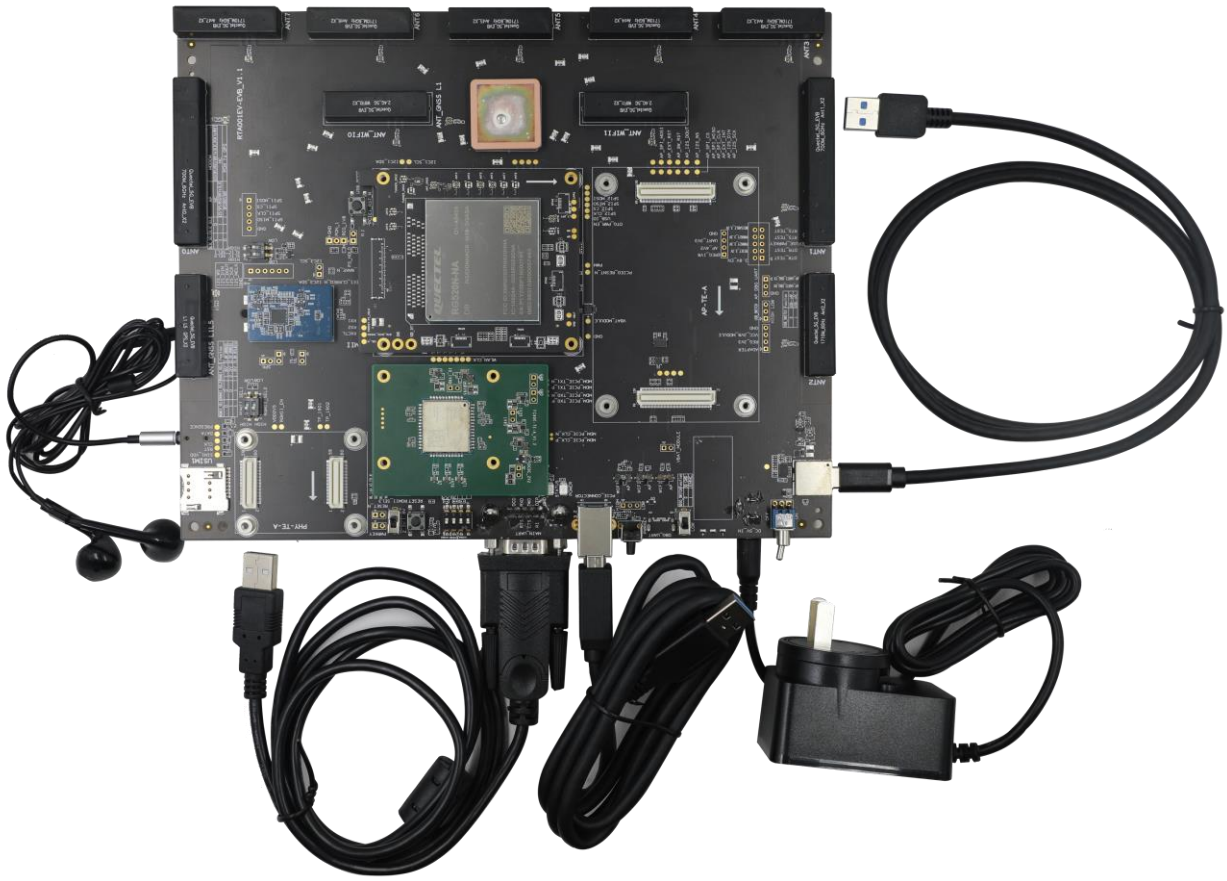

Figure 6: RTA001-EV EVB with Wi-Fi TE-A Direct Connection Matching Diagram (FC64E TE-A Needs to be Applied for Separately)

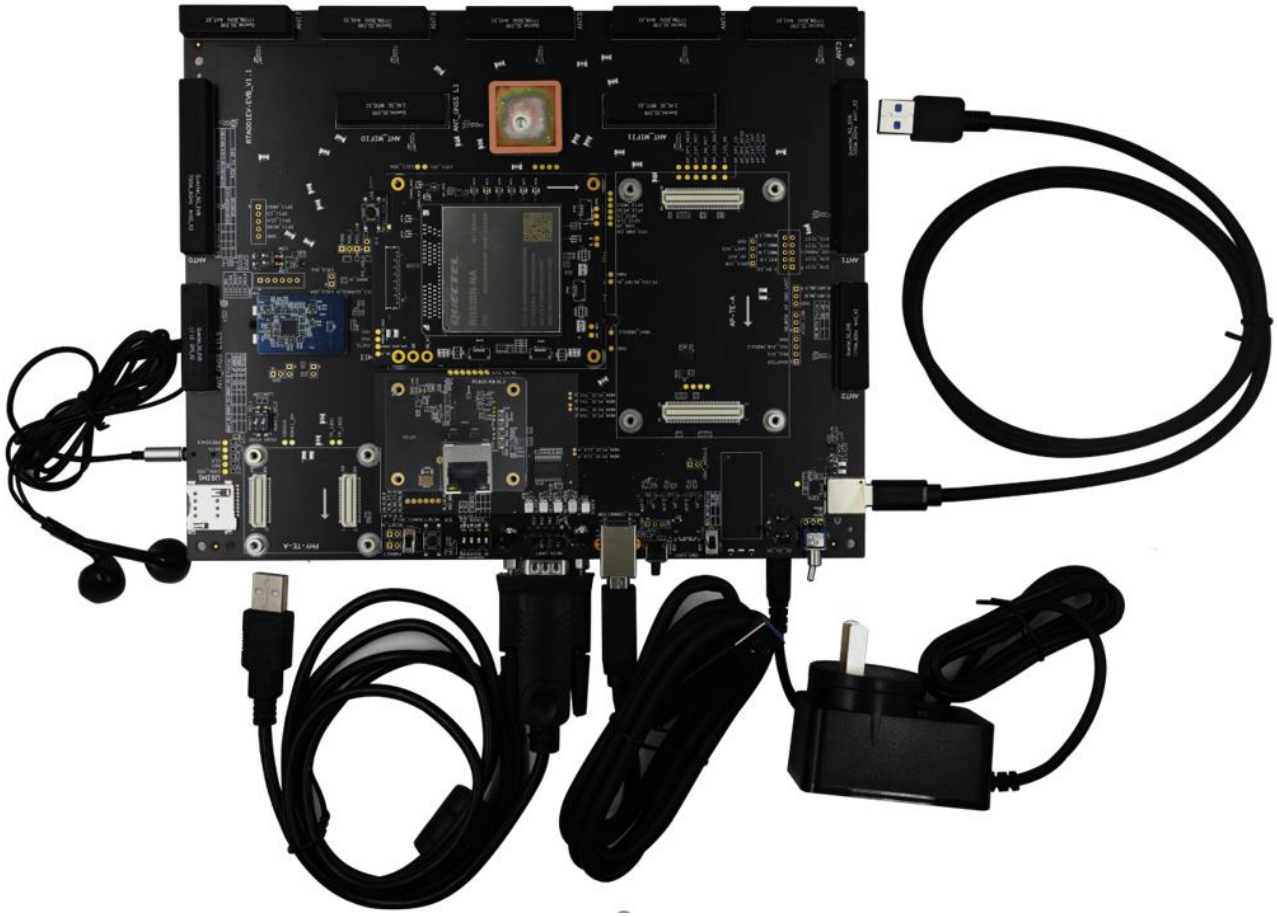

Figure 7: RTA001-EV EVB with PHY TE-A Direct Connection Matching Diagram (RTL8125 TE-A is Used as Example)

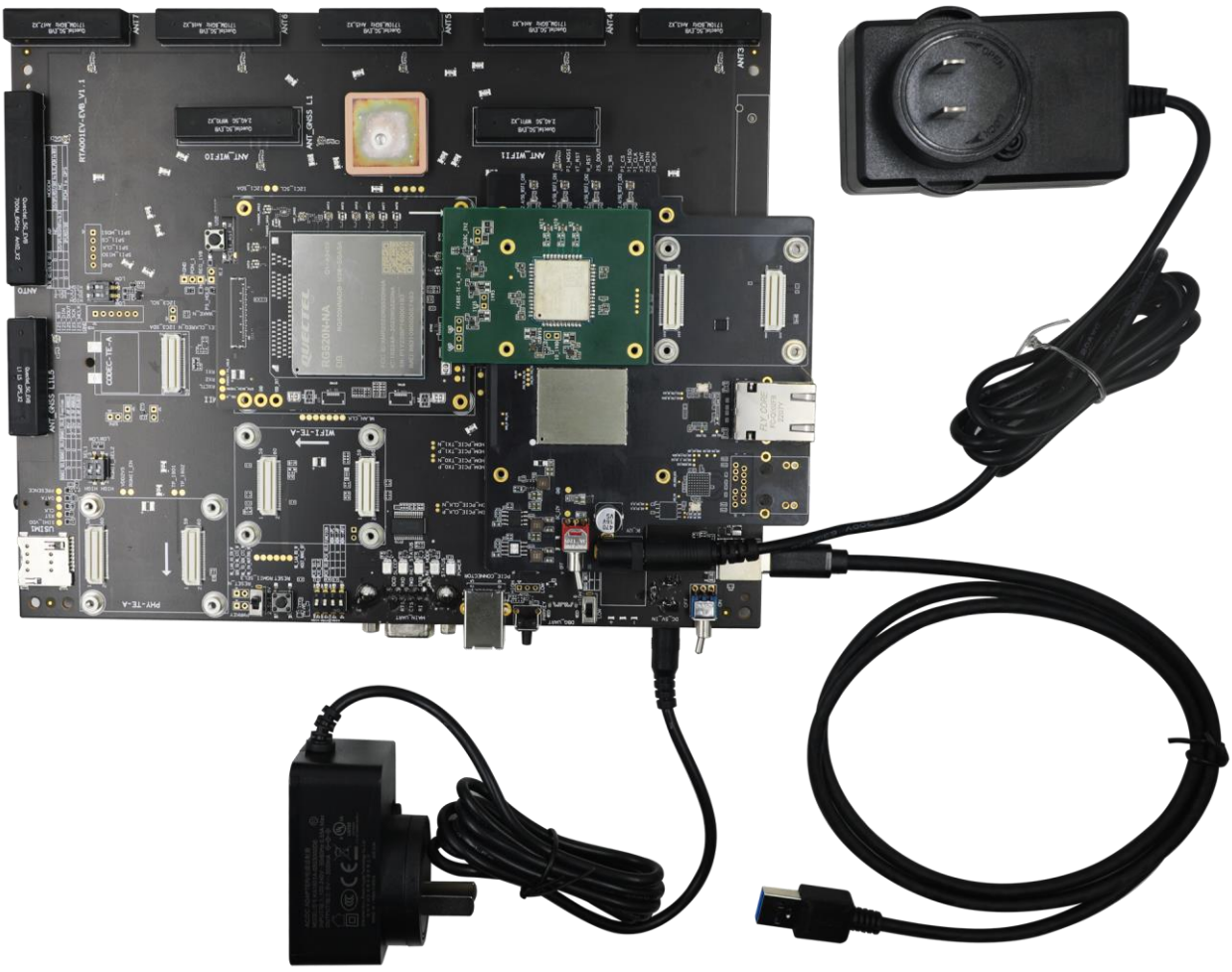

Figure 8: RTA001-EV EVB with QPS615 Optional Matching Diagram

3.2. List of Accessories

All accessories of the RTA001-EV EVB kit are listed below. Please contact the supplier if there is something missing.

Table 2: List of Standard Accessories

Item	Description	Quantity (pcs)
Cables	USB to RS-232 converter cable	1
	USB Type-A to Type-B converter cable	1
	USB Type-C cable	1
	RF cables	9
Antennas	Wi-Fi antenna	2
	Cellular antenna	8
	GNSS antenna (passive)	2
Audio	Earphone	1
USB driver	Module's related documents, tools & drivers, etc.	1
Codec TE-A	ALC5616, TLV320AIC3104	2
Screws	Fasten screw	8
Instruction sheet	EVB instruction sheet	1
PCIe-to-USB adapter	PCIe signal is transferred through USB 3.0 connector. It is not used by default.	1
Bolts and nuts	Used for assembling the EVB	4 pairs
Power adapter	5 V/ 3 A	1

Table 3: List of Optional Accessories

Item	Description	Quantity (pcs)
QPS615 TE-A	Match with Quectel 5G module, such as RG520N series module	1
Power adapter	12 V/ 3 A Power adapter (used to power QPS615 TE-A)	1
Wi-Fi TE-A	The specific model is determined according to your needs, such as FC64E TE-A	1
PHY TE-A	The specific model is determined according to your needs, such as RTL8125 TE-A	1

NOTE

For devices not included in the RTA001-EV KIT, please contact the Quectel Sale Application separately if needed.

4 Application Interfaces

This chapter describes the hardware interfaces of the RTA001-EV EVB, as listed below:

- Power supply
- Module TE-A interface
- PHY TE-A interface
- Wi-Fi TE-A interface
- AP TE-A interface
- USB interface
- Audio interfaces
  - Codec board connector
  - Analog audio interfaces
    - Loudspeaker interface
    - Earphone interface
- (U)SIM card interfaces
- SD card interface
- UART interfaces
- PCIe-to-USB interface
- Switches & buttons
- Status indicators
- Antenna interfaces

4.1. Power Supply

RTA001-EV EVB can be powered by an external power adapter through the power jack.

Table 4: Description of Power Supply

RefDes.	Description
J0303	DC power supply: 4.5–5.5 V Typical supply voltage: 5 V/ 3 A

The following two figures display a simplified power supply block diagram and the power supply interface of RTA001-EV EVB.

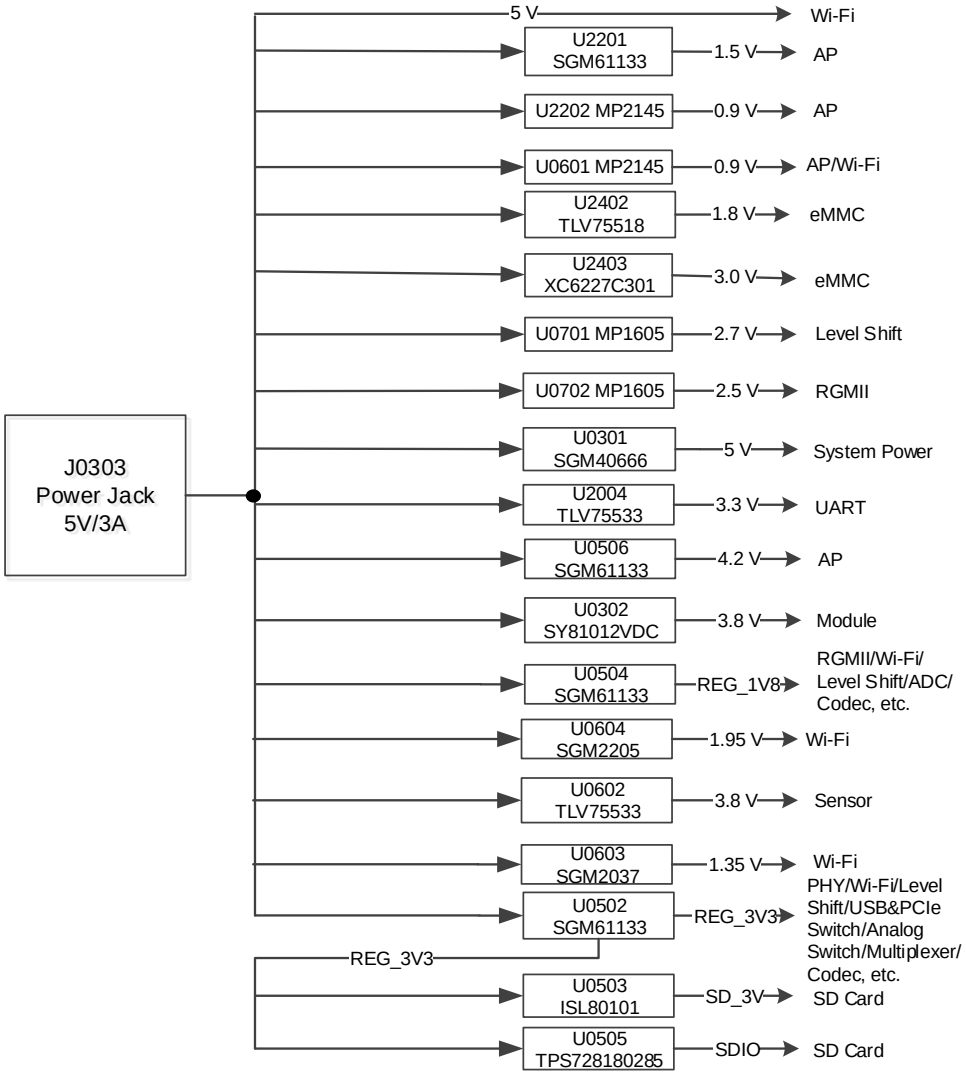

Figure 9: Block Diagram of EVB Power Supply

Figure 10: EVB Power Supply Interface

4.2. Module TE-A Interface

The TE-A interface is mounted onto and connected to the EVB via BTB connectors J0101 and J0102 (insert as indicated by the arrow to prevent reverse insertion).

Table 5: Description of Module TE-A Interface

RefDes.	Description
J0101	Module TE-A connectors
J0102	

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

Figure 11: Connection Between Module TE-A and EVB

4.3. PHY TE-A Interface

RG5xxF and RG5xxN series (hereinafter referred to as RG5xxF/N series) modules do not support RGMII network interface. Therefore, convertion should be performed by external PHY through PCIe interface. The PHY TE-A interface on the EVB is designed for the RGMII interface of the RG5xxQ series module, and cannot be used for the PHY TE-A of PCIe interfaces. If connected, the device will be short-circuited and the EVB kit may be burnt. The PHY TE-A of the PCIe interface must be connected to the Wi-Fi TE-A interface.

4.4. Wi-Fi TE-A Interface

The Wi-Fi TE-A interface can be connected to both Wi-Fi TE-A and PHY TE-A of the PCIe interface. However, the RG5xxF/N series modules only support one set of PCIe interfaces. Therefore, if the PCIe switch (QPS615 TE-A) is not connected, either Wi-Fi TE-A or PHY TE-A (PCIe conversion) can only be connected.

The Wi-Fi TE-A is connected to the EVB via BTB connectors J0801 and J0802.

Table 6: Description of Wi-Fi TE-A Interface

RefDes.	Description
J0801	Wi-Fi TE-A connectors
J0802	

The following two figures display the connection between FC64E TE-A and EVB.

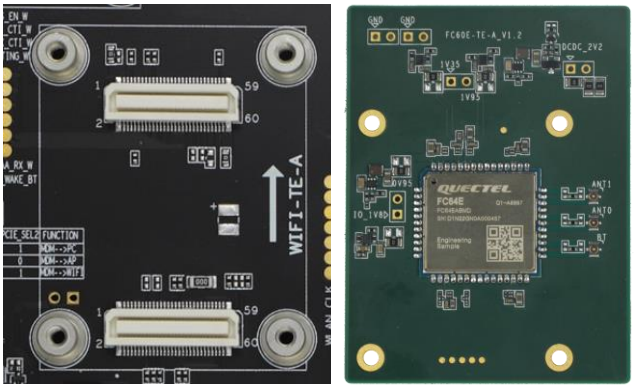

Figure 12: Connection Between FC64E TE-A and EVB

The following two figures display the connection between RTL8125 TE-A and EVB.

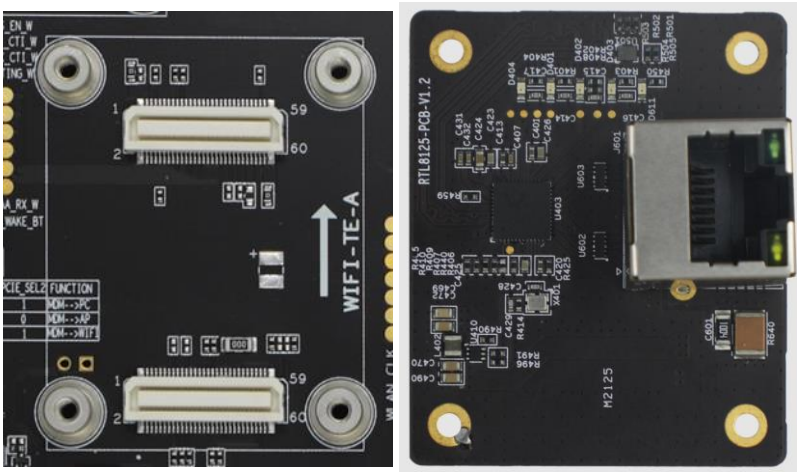

Figure 13: Connection Between RTL8125 TE-A and EVB

Table 7: Wi-Fi TE-A Configuration Switch

S2701	S2702	S2703	PCIE_SEL1	PCIE_SEL2	Function
Wi-Fi	Wi-Fi	Wi-Fi	High	High	Module → Wi-Fi

When PHY TE-A is connected, the switch configuration is the same as the above Wi-Fi TE-A.

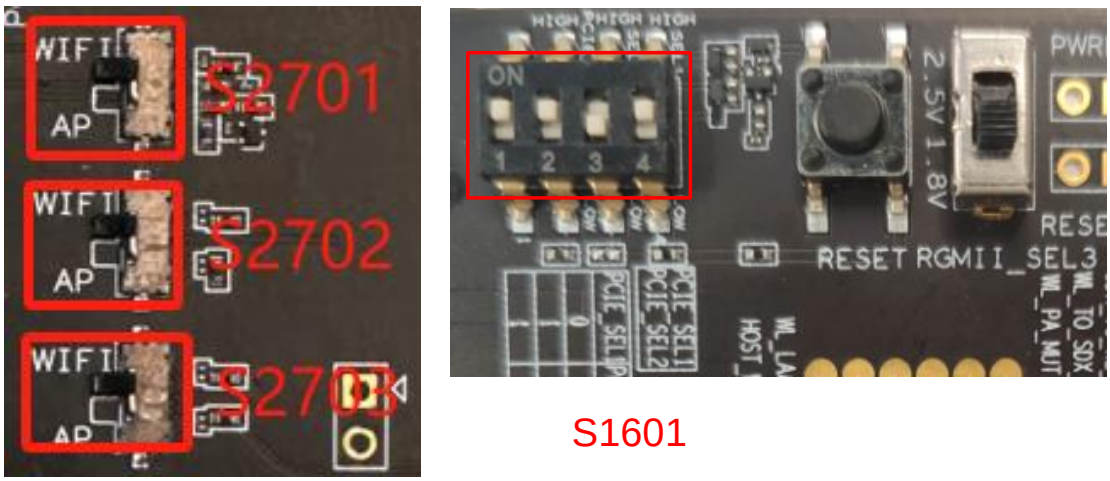

Figure 14: S2701/S2702/S2703/S1601

4.5. AP TE-A Interface

The AP TE-A interface is designed to accommodate the IPQ8074A TE-A or QPS615 TE-A (Select one of the two functions). The chapter highlights the connection of QPS615 TE-A. The AP TE-A is mounted onto and connected to the EVB via BTB connectors J2101 and J2102 (insert as indicated by the arrow to prevent reverse insertion). ANT1 and ANT2 need to be removed before installing AP TE-A because of interference. After removing ANT1 and ANT2 antennas, if you need to test network-related functions, you can replace them with external antennas.

Table 8: Description of AP TE-A Interface

RefDes.	Description
J2101	• AP TE-A connectors • Support IPQ8074A TE-A and QPS615 TE-A
J2102	

The following figures display the connection between QPS615 TE-A and EVB.

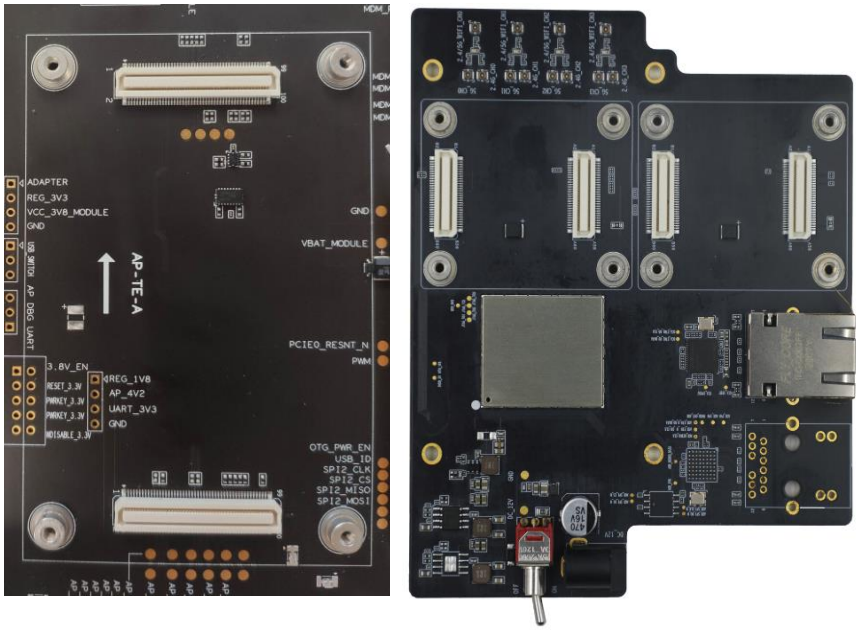

Figure 15: Connection Between QPS615 TE-A and EVB

Table 9: AP TE-A Configuration Switch

S2701	S2702	S2703	PCIE_SEL1	PCIE_SEL2	Function
Wi-Fi/AP	AP	AP	High	Low	Module → QPS615 TE-A
AP	AP	AP	High	Low	Module → IPQ8074 TE-A

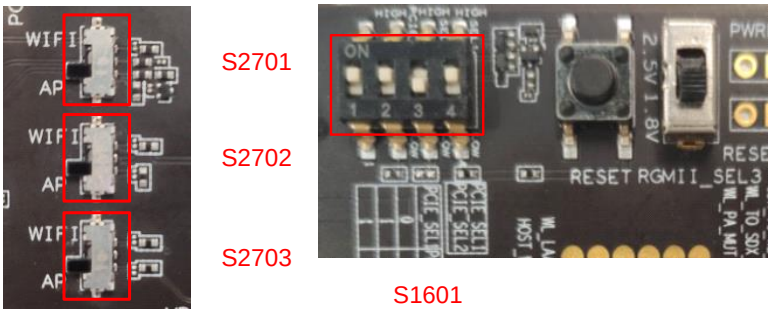

Figure 16: S2701/S2702/S2703/S1601

4.6. USB Interface

A USB Type-C connector, which complies with USB 3.0/3.1 and USB 2.0 standard, is provided. This USB interface is used for AT command communication, data transmission and firmware upgrade.

Table 10: Description of USB Interface

RefDes.	Description
J1201	● USB Type-C interface ● Support USB 3.0/3.1 and USB 2.0

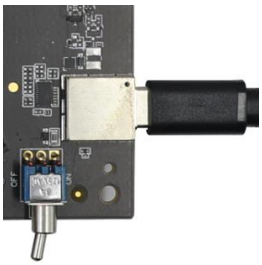

Figure 17: USB Interface Connection

4.7. Audio Interfaces

RTA001-EV EVB provides one codec board interface J0905 and two analog audio interfaces J1001 and J0901.

4.7.1. Codec Board Connector

RTA001-EV EVB supports two different codec which are named as ALC5616 and TLV320AIC3104, which can be connected with the EVB by the BTB connector J0905.

Table 11: Description of Codec Board Connector

RefDes.	Description
J0905	● Codec board TE-A connector ● Support ALC5616 TE-A and TLV320AIC3104 TE-A codec boards

The following two figures display the connection between digital audio codec TE-A and the EVB.

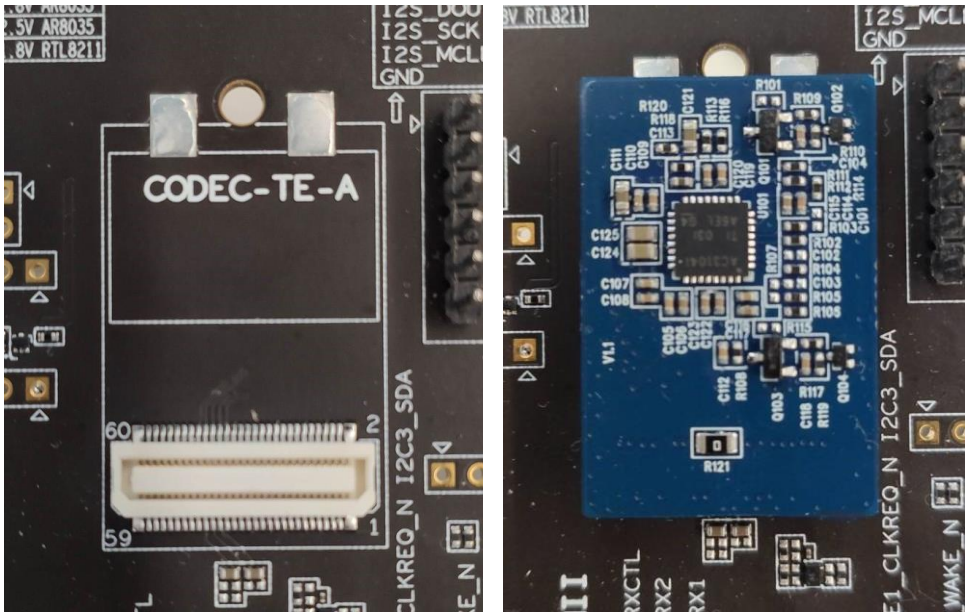

Figure 18: Connection Between Codec TE-A and EVB

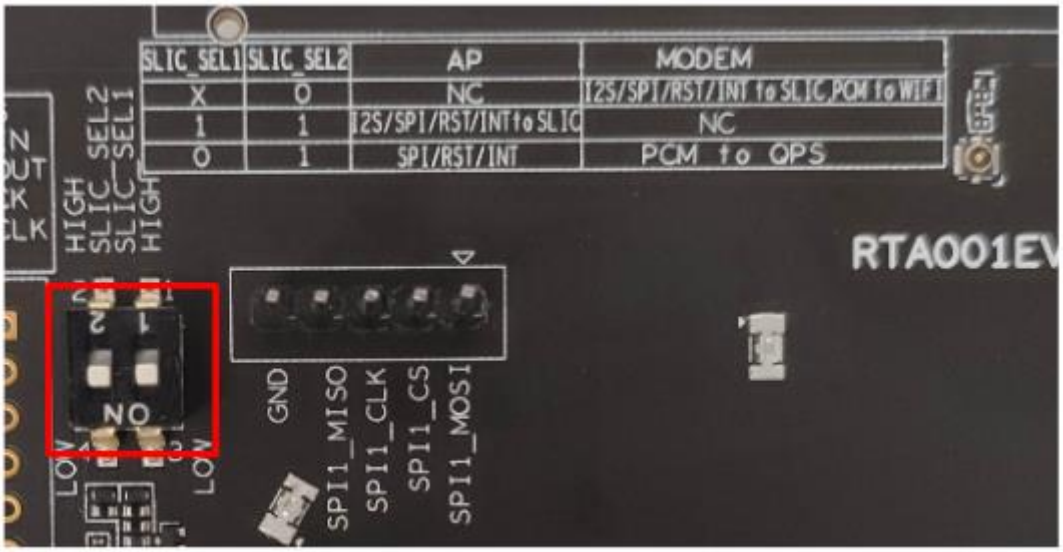

Figure 19: S2501 Switch

Table 12: TE-A Configuration Switch

SLIC_SEL1	SLIC_SEL2	AP	Modem
High/Low	Low	NC	I2S/SPI/RST/INT to SLIC, PCM to Wi-Fi
High	High	I2S/SPI/RST/INT to SLIC	NC
Low	High	SPI/RST/INT	PCM to QPS615

4.7.2. Analog Audio Interfaces

Table 13: Description of Analog Audio Interfaces

RefDes.	Description
J0901	Design for loudspeaker
J1001	Audio jack for earphone

4.7.3. Loudspeaker Interface

Audio interface J0901 is designed for loudspeaker and the following figure displays a reference design of loudspeaker with an external audio amplifier.

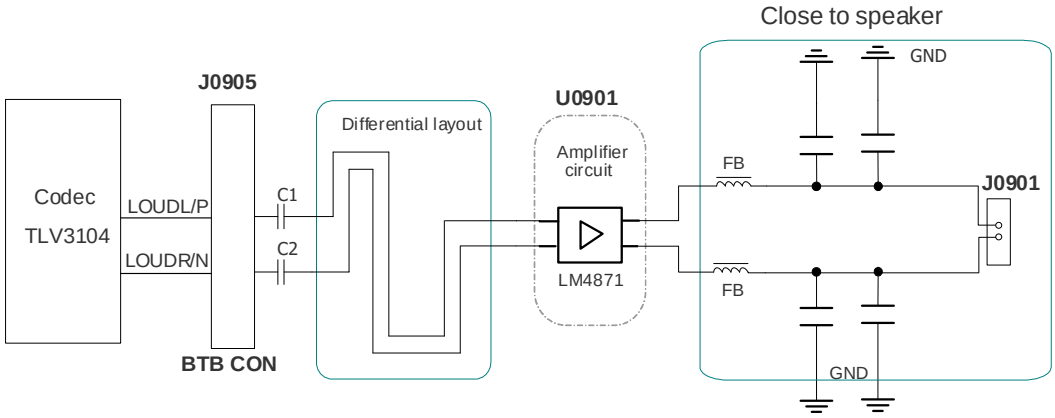

Figure 20: Reference Circuit Design for Loudspeaker Interface J0901

4.7.4. Earphone Interface

Audio interface J1001 is designed for earphone and the following figure displays a reference circuit design of earphone interface.

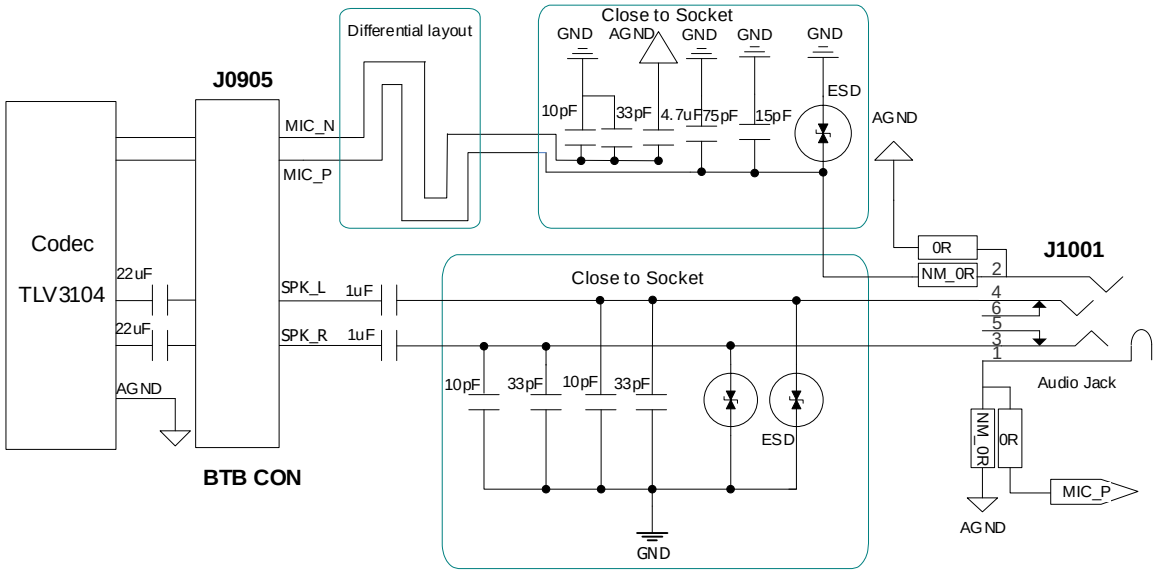

Figure 21: Reference Circuit Design for Earphone Interface J1001

The figure and table below illustrate the pin assignment and pin definition of earphone interface J1001.

Figure 22: Pin Assignment of J1001

Table 14: Pin Definition of J1001

Pin No.	Pin Name	Description
1	MIC	Microphone input
2	AGND	Dedicated GND for audio
3	SPK_R	Right channel of stereo audio output
4	SPK_L	Left channel of stereo audio output
5, 6	NC	Not connected

The following figure displays a schematic of audio plug which suits the audio jack on RTA001-EV EVB.

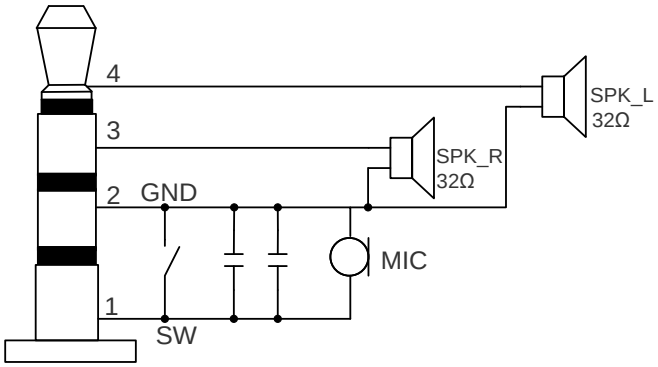

Figure 23: Schematic of Audio Plug

4.8. (U)SIM Card Interfaces

RTA001-EV EVB has two 8-pin push-push type (U)SIM card (1.8/2.95 V) connectors J1501 and J1502. The following figure displays a simplified schematic for (U)SIM card connectors J1501 and J1502.

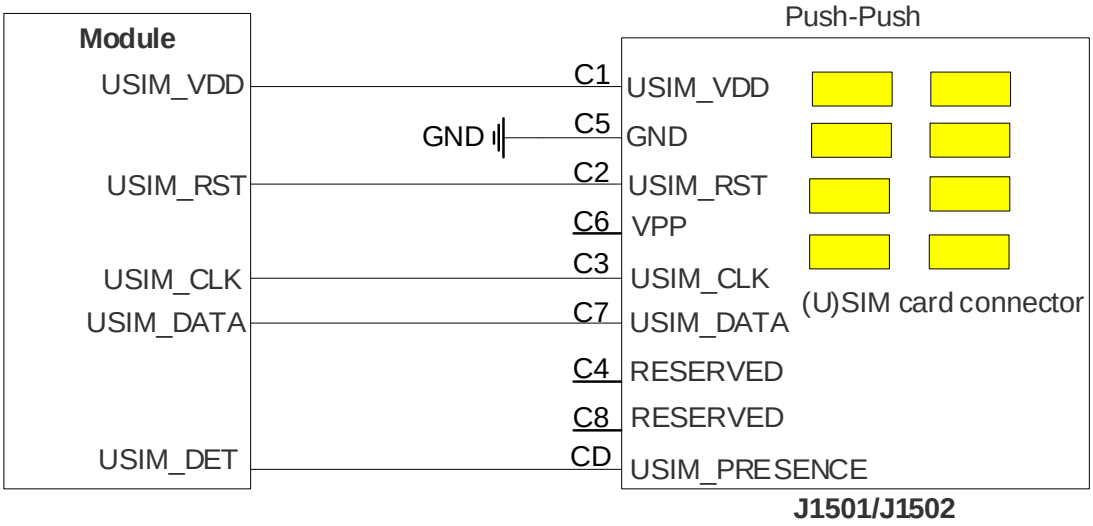

Figure 24: Simplified Schematic for (U)SIM Card Connectors

Table 15: Description of (U)SIM Card Interfaces

RefDes.	Description
J1501/J1502	Support dual (U)SIM cards: 1.8 V and 2.95 V

The figure and table below illustrate the pin assignment and definition of (U)SIM card connectors J1501 and J1502.

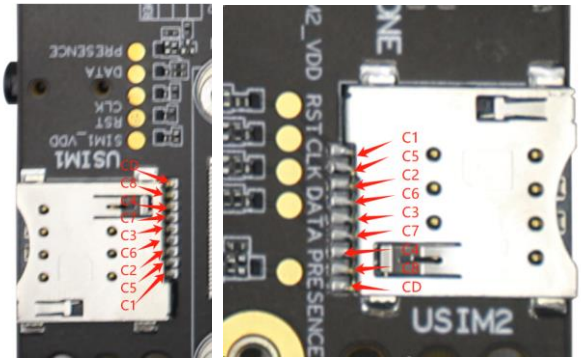

Figure 25: Pin Assignment of (U)SIM Card Connectors J1501/J1502

Table 16: Pin Definition of J1501/J1502

Pin No.	Pin Name	I/O	Function
C1	USIM_VDD	PO	(U)SIM card power supply, provided by module
C2	USIM_RST	DO	(U)SIM card reset
C3	USIM_CLK	DO	(U)SIM card clock
C4	RESERVED1	-	Not connected
C5	GND	-	Ground
C6	VPP	-	Not connected
C7	USIM_DATA	DIO	Data trace, bi-directional
C8	RESERVED2	-	Not connected
CD	USIM_PRESENCE	DI	(U)SIM card insertion detection

4.9. SD Card Interface

RTA001-EV EVB provides an SDIO interface, which can be used for connecting SD card. The following figure displays the simplified schematic for J1401.

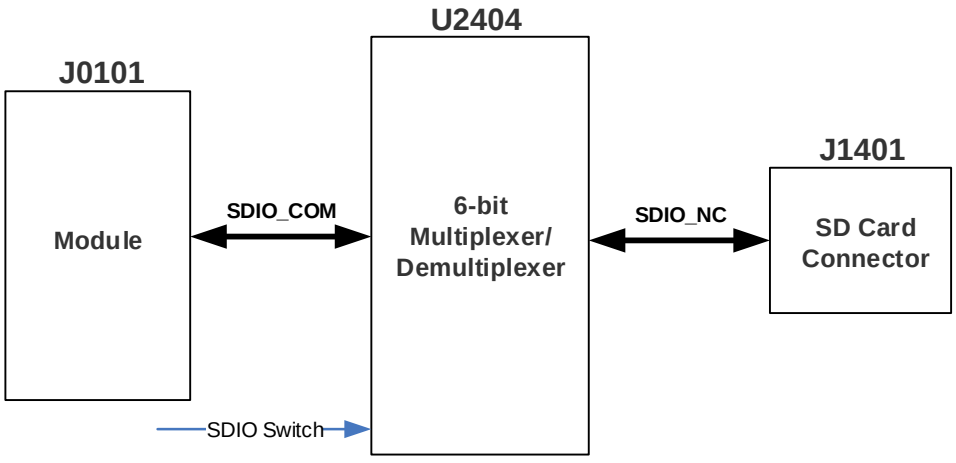

Figure 26: Simplified Schematic for J1401

Table 17: Description of SD Card Interface

RefDes.	Description
J1401	SD card connector

If SD card function needs to be used, switch the SDIO switch to low level illustrated in the figure and table below. A standard SD card can be inserted into J1401 which supports micro SD card of maximum 32 GB.

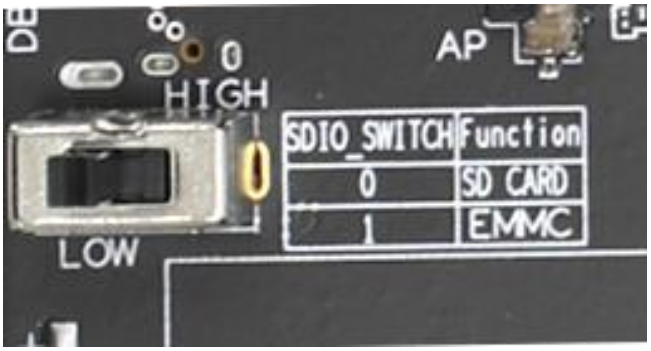

Figure 27: S2401 Switch

Table 18: SDIO Switch Function

SDIO Switch	Function
Low	Enable SD card function
High	Enable eMMC function

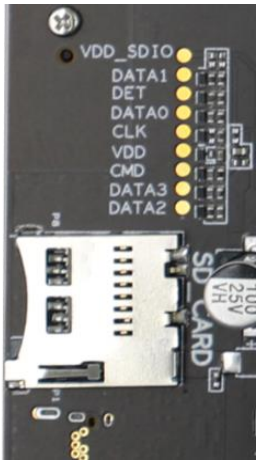

Figure 28: Pin Assignment of SD Card Connector J1401

4.10. UART Interfaces

RTA001-EV EVB provides two UART interfaces: main UART J2002 and debug UART J2005, both supporting baud rate of 115200 bps by default.

Table 19: Description of UART Interfaces

RefDes.	Description
J2002	● Main UART for data communication ● Default baud rate: 115200 bps
J2005	● Debug UART for debugging ● Default baud rate: 115200 bps

The following figure diaplays the block diagram of UART interfaces of the EVB.

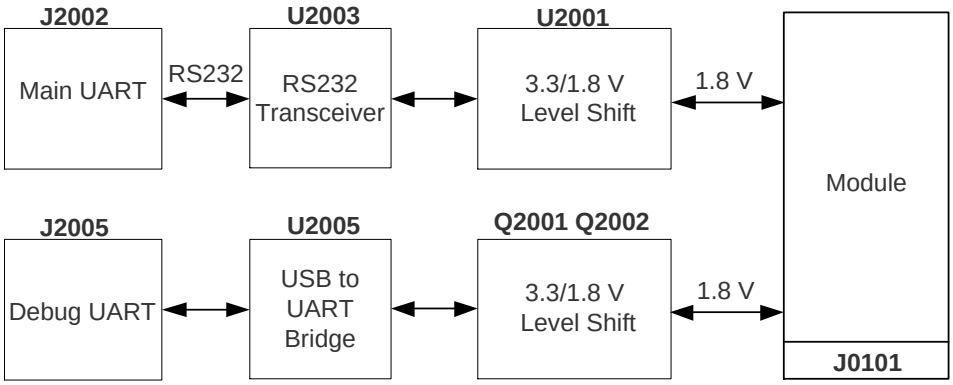

Figure 29: UART Block Diagram

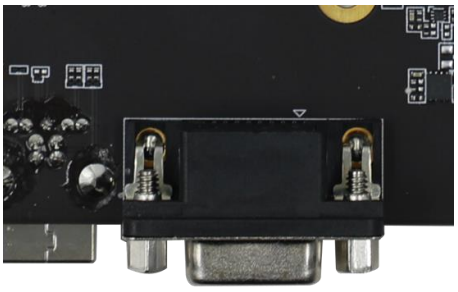

Figure 30: Main UART Interface (J2002)

Figure 31: Debug UART Interface (J2005)

4.11. PCIe-to-USB Interface

RTA001-EV EVB reserves a PCIe 3.0 signal over USB interface for testing, and this function is disabled by default. The block diagram is shown as follows.

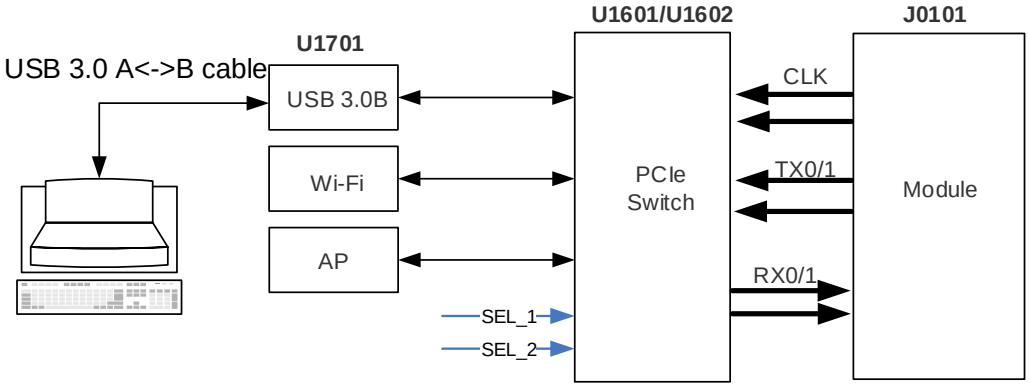

Figure 32: PCIe Block Diagram

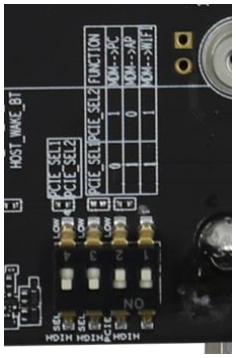

Figure 33: S1601 Switch

Table 20: Description of PCIe-to-USB Interface

RefDes.	Description
U1701	PCIe-to-USB interface, disabled by default

Table 21: PCIe Connection Truth Table

PCIE_SEL1	PCIE_SEL2	Function
0	1	Module → PC
1	0	Module → AP
1	1	Module → Wi-Fi

4.12. Switches and Buttons

RTA001-EV EVB provides nine switches (S0301, S1601, S1801, S1802, S2401, S2501, S2701, S2702 and S2703) and three buttons (S0201, S0202 and S0203), as shown in the following figures.

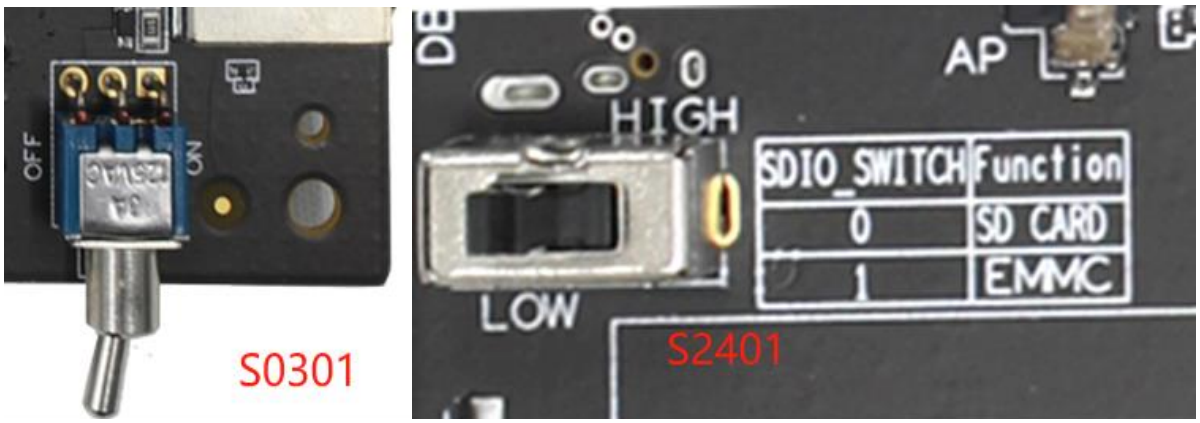

Figure 34: S0301 and S2401 Switches

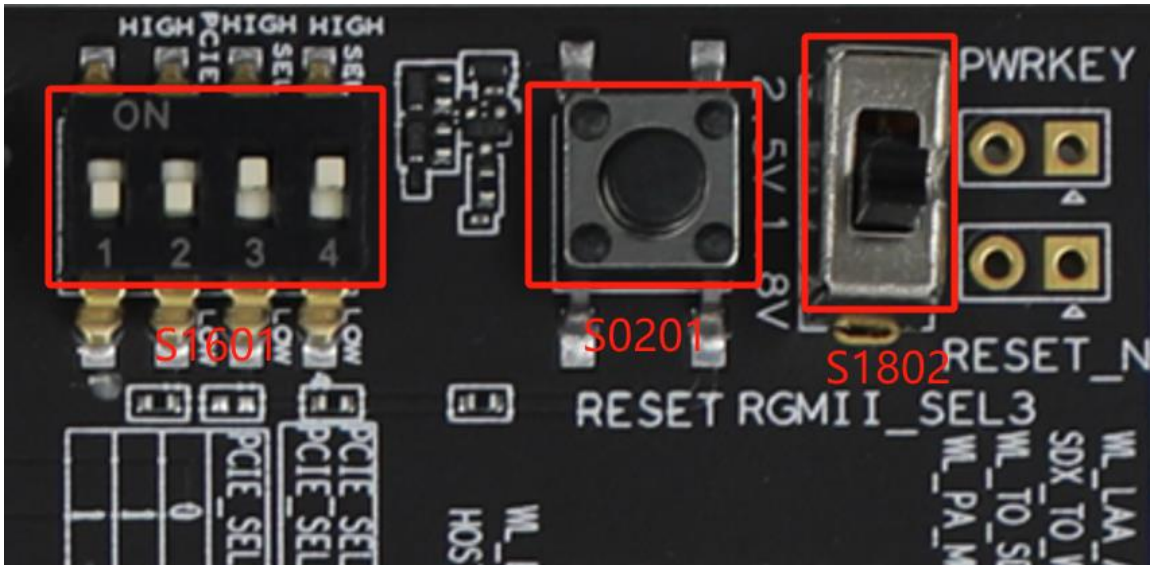

Figure 35: S1601/S1802 Switches and S0201 Button

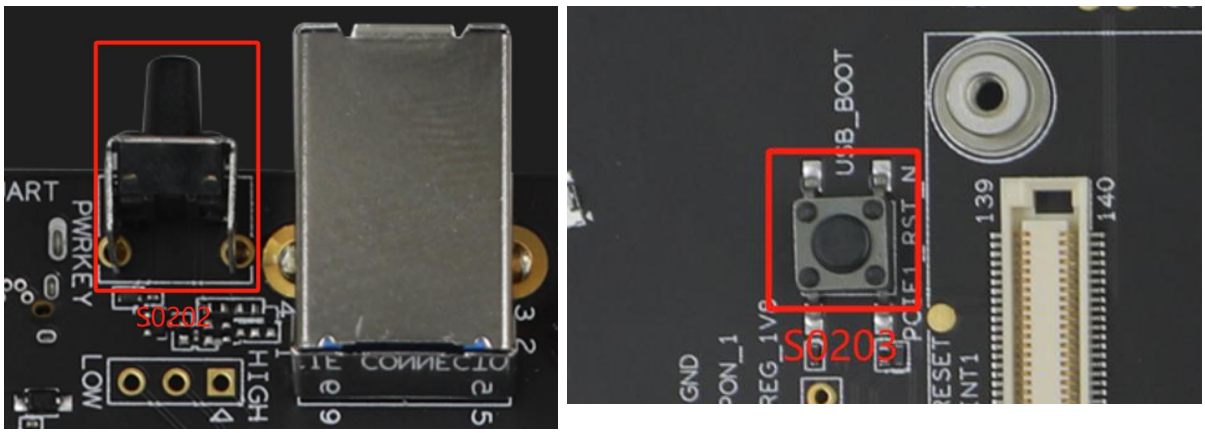

Figure 36: S0202 and S0203 Buttons

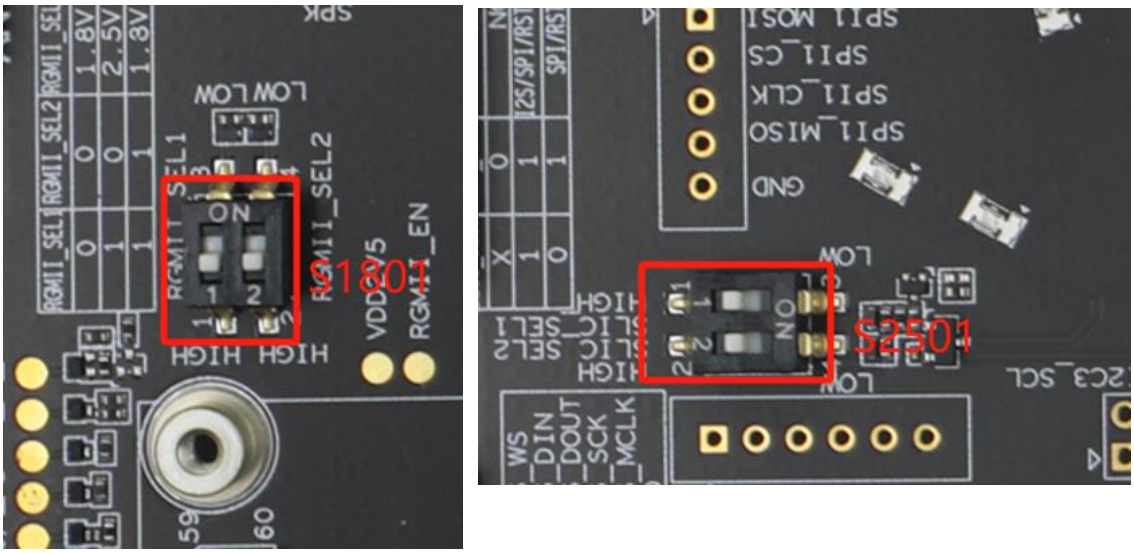

Figure 37: S1801/S2501 Switches

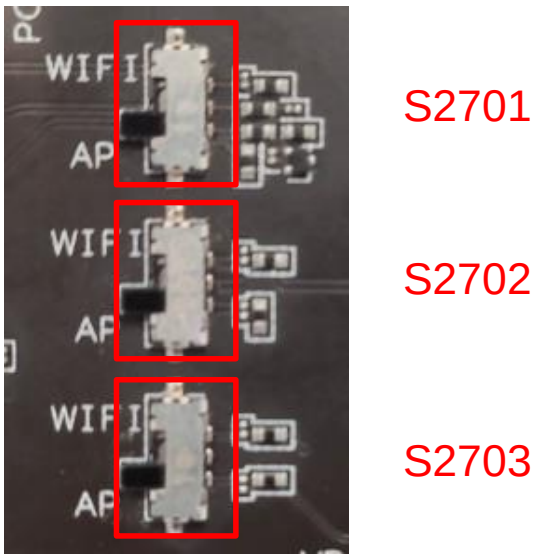

Figure 38: S2701/S2702/S2703 Switches

Table 22: Description of Switches and Buttons

Switches and Buttons	RefDes.	Description
Power switch	S0301	VBAT on/off control
PWRKEY	S0202	Power keypad to turn on/off the module
PCIe configuration switch	S1601	Configure the communication between the module and different devices via PCIe signals
RESET	S0201	Reset the module
USB_BOOT	S0203	Forced download control
RGMII configuration switch	S1801, S1802	Configure RGMII
SDIO configuration switch	S2401	Switch between SD card and eMMC
Codec configuration switch	S2501	Configure codec
Wi-Fi configuration switch	S2701, S2702, S2703	Configure Wi-Fi

4.13. Status Indicators

There are five status indication LEDs on the EVB. The following figure displays the positions of these LED indicators.

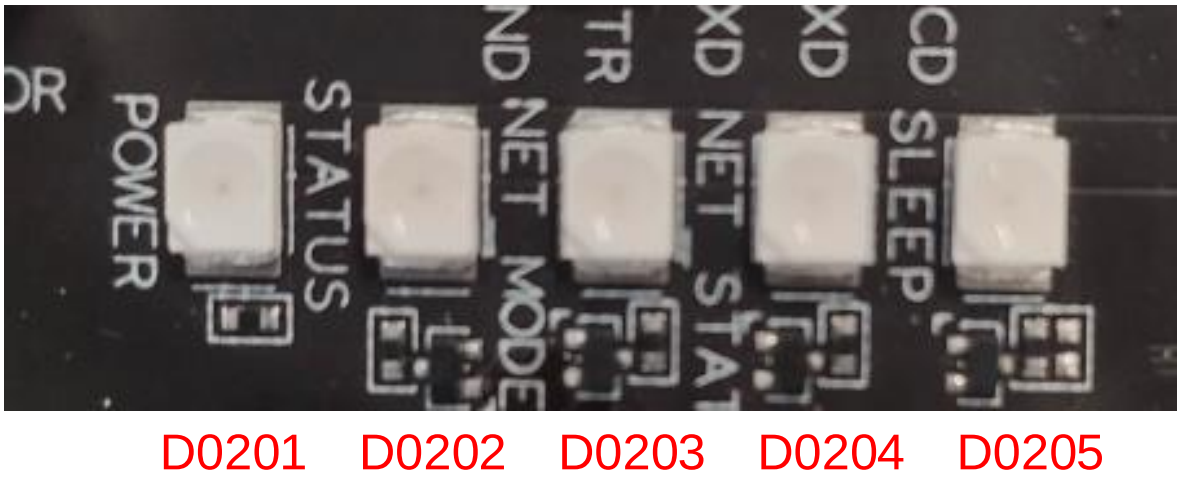

Figure 39: Status Indicators

Table 23: Description of Status Indication LEDs

RefDes.	Description
D0201	Indicates whether the module's power supply is on or off. On: VBAT on Off: VBAT off
D0202	Indicates whether the module is turned on. On: the module is turned on Off: the module is turned off
D0203	Indicates the module's NET_MODE status
D0204	Indicates the module's NET_STATUS status
D0205	Indicates the module's SLEEP status

4.14. Antenna Interfaces

RTA001-EV EVB provides twelve antenna interfaces. The following figure displays the assembly of these antenna interfaces.

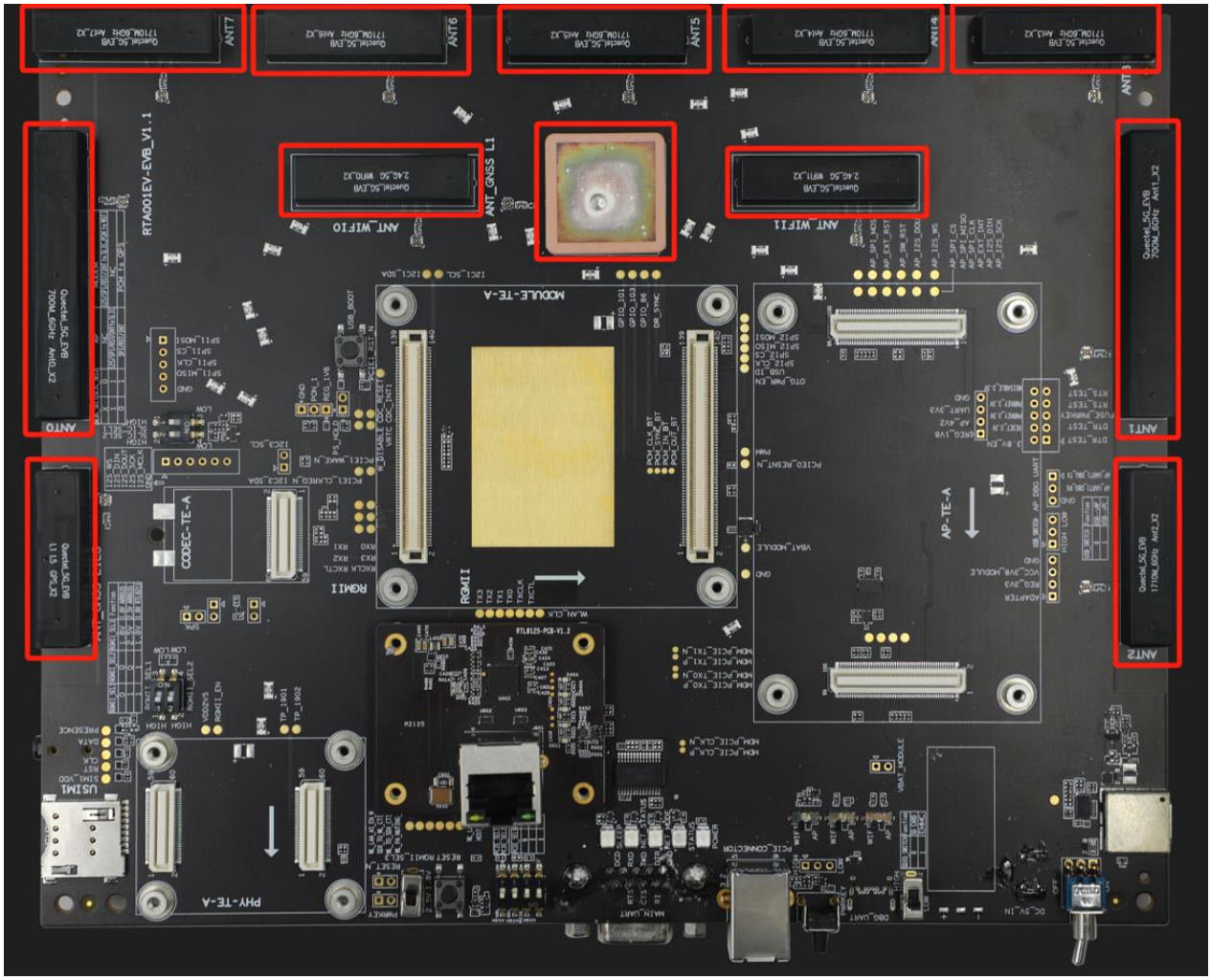

Figure 40: Antenna Interfaces

Among them, the corresponding frequency range of 8 cellular antennas is shown as below:

Table 24: Frequency Range of Cellular Antennas

Antenna No.	Frequency Range (Hz)
ANT0, ANT1	700 MHz–6 GHz
ANT2–ANT7	1.7 GHz–6 GHz

The frequency range of two GNSS antennas and two Wi-Fi antennas is shown as below:

Table 25: Frequency Range of GNSS and Wi-Fi Antennas

Antenna No.	Frequency Range (Hz)
ANT GNSS L1	GNSS L1
ANT Wi-Fi 0	2.4–5 GHz
ANT Wi-Fi 1	2.4–5 GHz
ANT GNSS L1 L5	GNSS L1 L5

Different types of modules correspond to different cellular antenna connection modes. The following table takes RG520N&RG520F series modules as an example:

Table 26: Connection Between Module and Cellular Antenna

TE-A EVB Antenna Interface / Antenna Interface / Module Type	ANT0	ANT1	ANT2	ANT3	ANT4	ANT5	ANT6	ANT7
RG520F-NA/RG520N-NA	ANT3	ANT0	-	-	ANT1	ANT2	-	-
RG520F-EU/RG520N-EU	ANT3	ANT0	ANT4 (optional)	-	ANT1	ANT2	ANT5 (optional)	-
RG520F-EB (four antennas)/ RG520N-EB (four antennas)	ANT3	ANT0	-	-	ANT1	ANT2	-	-

NOTE

Since only ANT0 and ANT1 of RTA001-EV EVB support 700 MHz–6 GHz. If you need to perform low-frequency MIMO related tests, it is recommended to connect an external wide-band antenna.

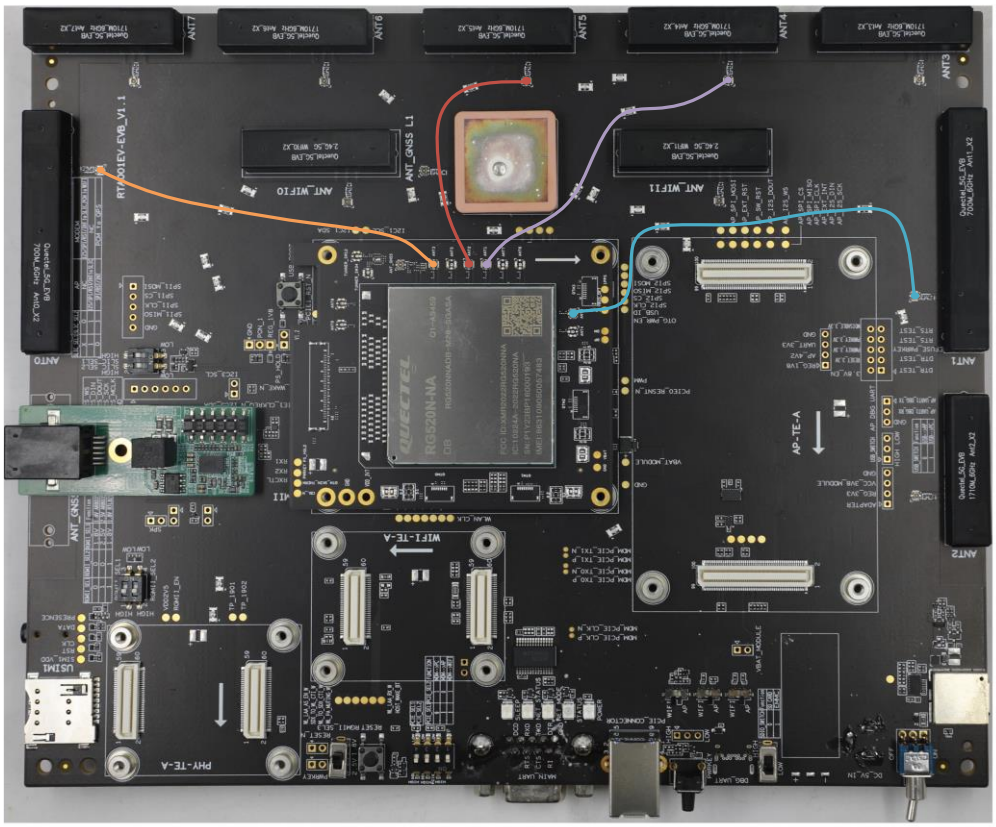

Figure 41: Four Antenna Connection

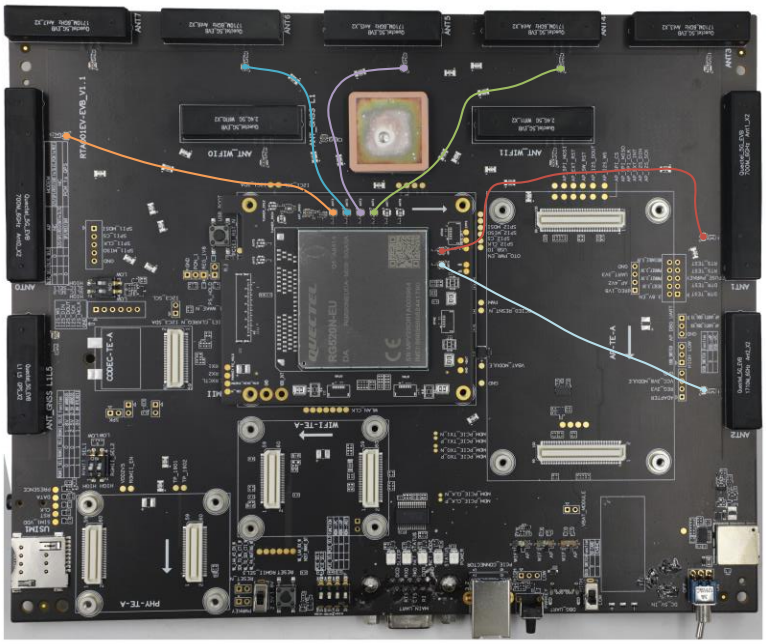

Figure 42: Six Antenna Connection

5 Operation Procedures

This chapter introduces how to use RTA001-EV EVB for testing and evaluating Quectel 5G modules. Ensure module and the EVB are correctly assembled before beginning the following procedures.

5.1. Turn On the Module

1. Connect the module TE-A to the EVB via connectors J0101 and J0102.
2. Insert a (U)SIM card into the (U)SIM1 card connector on EVB.
3. Use RF coaxial cable to connect the antennas of the module TE-A to that of EVB one by one.
4. Insert a 5 V/ 3 A power adapter and switch S0301 to ON. Then D0201 (on/off indicator of the module's power supply) will light up.
5. Press the S0202 (PWRKEY) for at least 500 ms and the module will be turned on, and D0202 (operation status indicator of the module) will light up.

5.2. 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. The module will log off from the network and save data before shutdown.
- Turn off the module with PWRKEY button (S0202). Long press PWRKEY for at least 800 ms and the module will be turned off.

5.3. Communication Via USB

1. Turn on the module according to the procedures in ***Chapter 5.1***.
2. Connect the EVB and a PC with USB cable through USB Type-C interface, and then install the USB driver on the PC. For details about USB driver installation, see ***document [2]***. The USB port can be viewed in "**Device Manager**" of the PC after the USB driver is installed, as shown below.

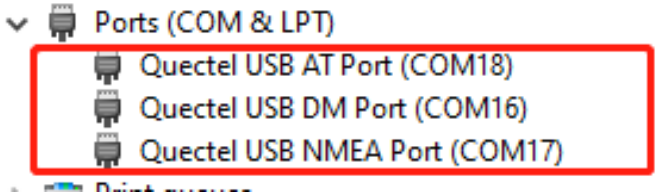

Figure 43: USB Ports

3. Install and then use QCOM provided by Quectel 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, which is shown in figure above) and set correct "**Baudrate**" (e.g. 115200 bps). For more details about QCOM using and configuration, see ***document [3]***.

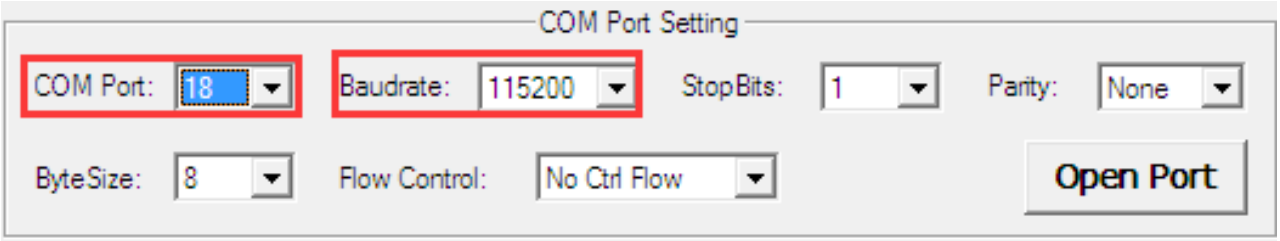

Figure 44: COM Port Setting of QCOM (USB AT Port Connection)

5.4. Firmware Upgrade

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

5.4.1. Forced Download

1. Install the firmware upgrade tool QFlash on PC.
2. Connect the EVB and the PC through USB Type-C cable.
3. Insert the DC power adapter.
4. Press the USB_BOOT button (S0203) and then turn on the module.
5. Upgrade the firmware with QFlash. See ***document [4]*** for details about the use of QFlash.

5.4.2. Normal Download

1. Turn on the module according to the procedures in ***Chapter 5.1***.
2. Wait for the USB port to be found in "**Device Manager**" of the PC.

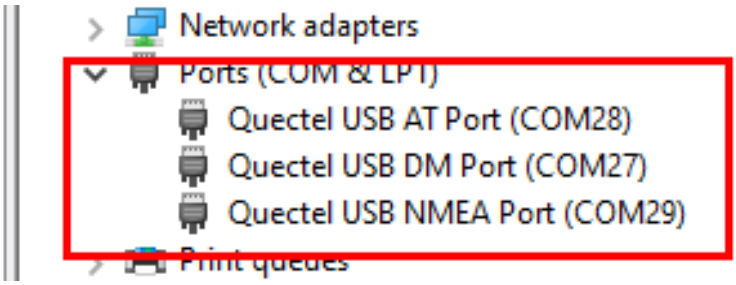

Figure 45: USB Port in PC Device Manager

3. Open QFlash and upgrade the firmware. See ***document [4]*** for detailed procedures.

5.5. Reset the Module

The reset option is only used in case of abnormality. For example, the software fails to respond for more than 5 s due to some serious problems. Long press the button S0201 (RESET) for more than 8 s, and then release it to reset the module.

5.6. QuecOpen Solution Matching

This chapter introduces a variety of matching peripheral adapter board and usage methods in the QuecOpen solution.

5.6.1. Peripheral Adapter Board Matching

Table 27: PHY Matching

PHY Type	Interface Type	Therotical Rate	Verified Rate
RTL8125B	PCIe	2.5 Gbps	DL 1.92 Gbps HT instrument
AQR113C	USXGMII (Use XFI in actual situation)	10 Gbps	DL 400 Mbps actual network DL 2.7 Gbps HT instrument UL 940 Mbps–1 Gbps HT instrument (Physical layer 1.1 Gbps)
QCA8081	SGMII	2.5 Gbps	DL 400 Mbps actual network DL 2.3 Gbps HT instrument UL 880–960 Mbps HT instrument (Physical layer 1.1 Gbps)
AQC113C	PCIe	10 Gbps	DL 400 Mbps actual network

For other supported PHY TE-A types, contact Quectel Technical Supports for details.

Table 28: TE-A Matching Model

TE-A Type	Adapter Chip Type	Comment
Wi-Fi	FC06E, FC64E	
SLIC	SI32185, LE9643	You can use **AT+QSLIC** to decide the specific SLIC type, for more information, see ***document [4]***.
Codec	ALC5616, TLV320AIC3104	

5.6.2. EVB + Wi-Fi TE-A Usage Methods

The Wi-Fi TE-A type supported by the device is related to the software version of the 5G modules, and one software version cannot be compatible with FC06E/FC64E at the same time. The specific Wi-Fi type should be decided at the beginning of the project. When RG5xxF/N series modules are configured with Wi-Fi TE-A, there are two ways to combine them. One is direct connection with PCIe, and the other is switching with QPS615. The following describes the two ways (FC64E TE-A is used as an example).

5.6.2.1 Wi-Fi TE-A Direct Connection

1) Insert FC64E TE-A module to the Wi-Fi TE-A interface on the EVB, as shown in the red frame below:

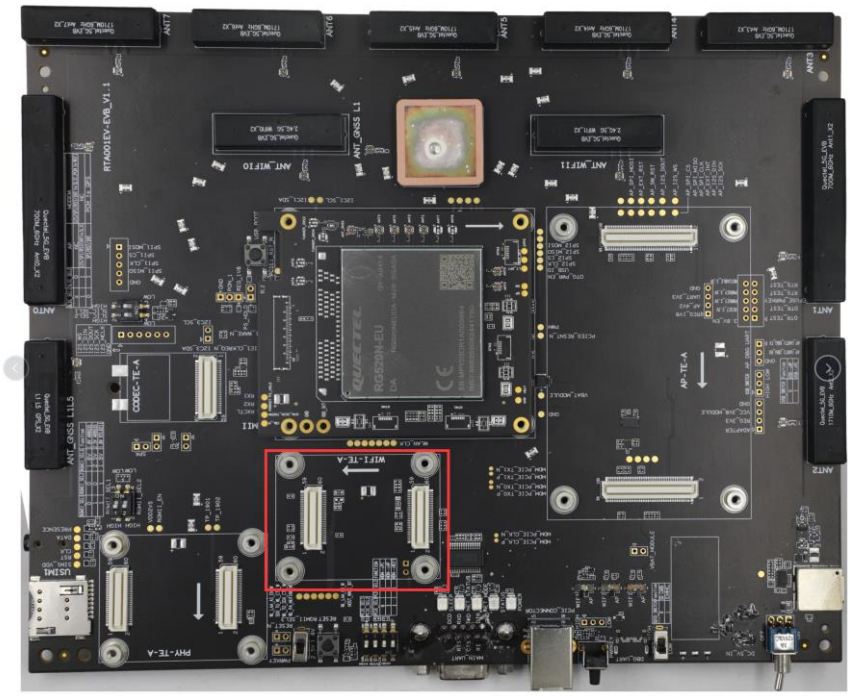

Figure 46: Wi-Fi Mark Figure

2) Flip PCIE_SEL1 and PCIE_SEL2 on the EVB to high (red frame on the left of the figure below), and flip all three AP/Wi-Fi switches to the Wi-Fi side (red frame on the right of the figure below), as shown in the following figure:

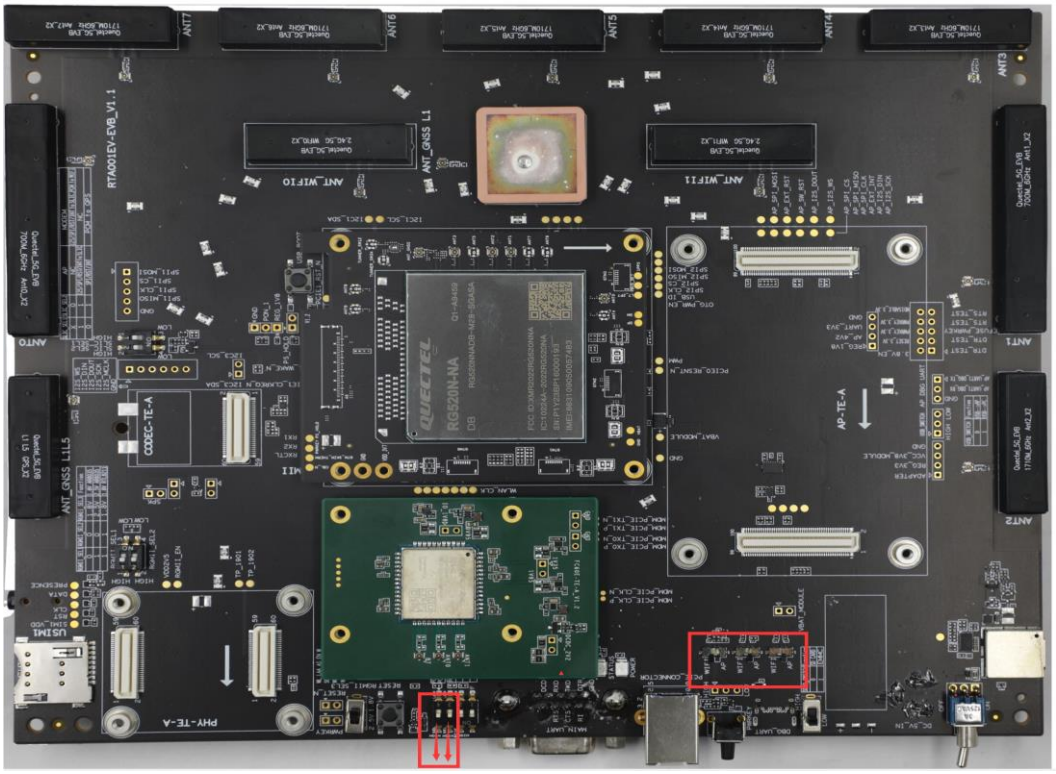

Figure 47: Wi-Fi Switch Mark Figure

3) Send **AT+QCFG="PCIE/MODE",1** to set PCIe to RC mode, which takes effect after restart.

4) After the restart, use **QCMAP** or **hostapd** to turn on the Wi-Fi function, so as to meet the requirements for terminal devices such as mobile phones to access Wi-Fi networks. For more details, see ***Chapter 4*** in ***document [5]***.

5.6.2.2 QPS615 + Wi-Fi TE-A

1) Flip PCIE_SEL1 to high and PCIE_SEL2 to low (red frame on the left of the figure below), and flip all three AP/Wi-Fi switches to the AP side (red frame on the right of the figure below), as shown in the following figure:

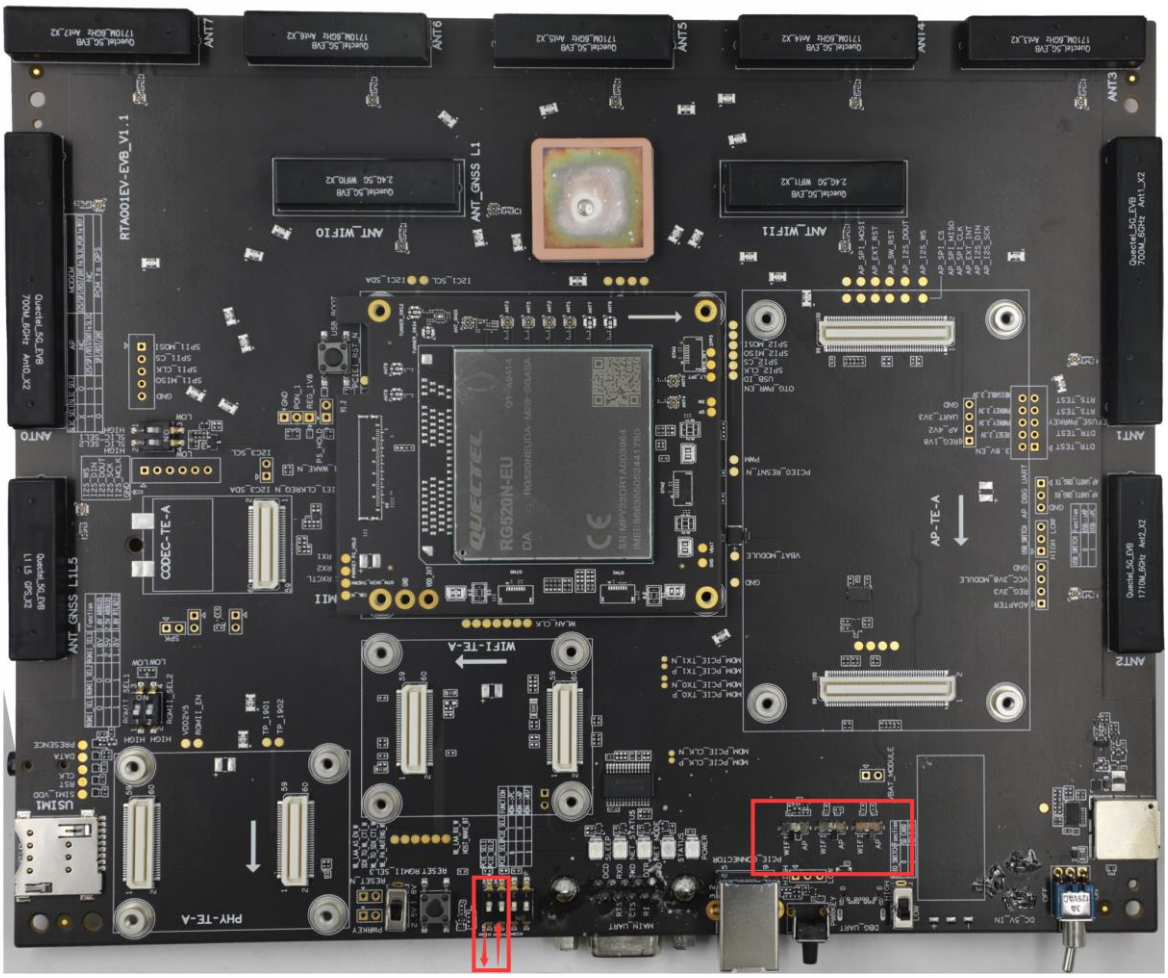

Figure 48: Wi-Fi Switch Mark Figure

2) Install QPS615 TE-A, and then continue to install FC64E TE-A on QPS615 TE-A. Note that QPS615 TE-A needs to be powered separately (12 V), as shown below:

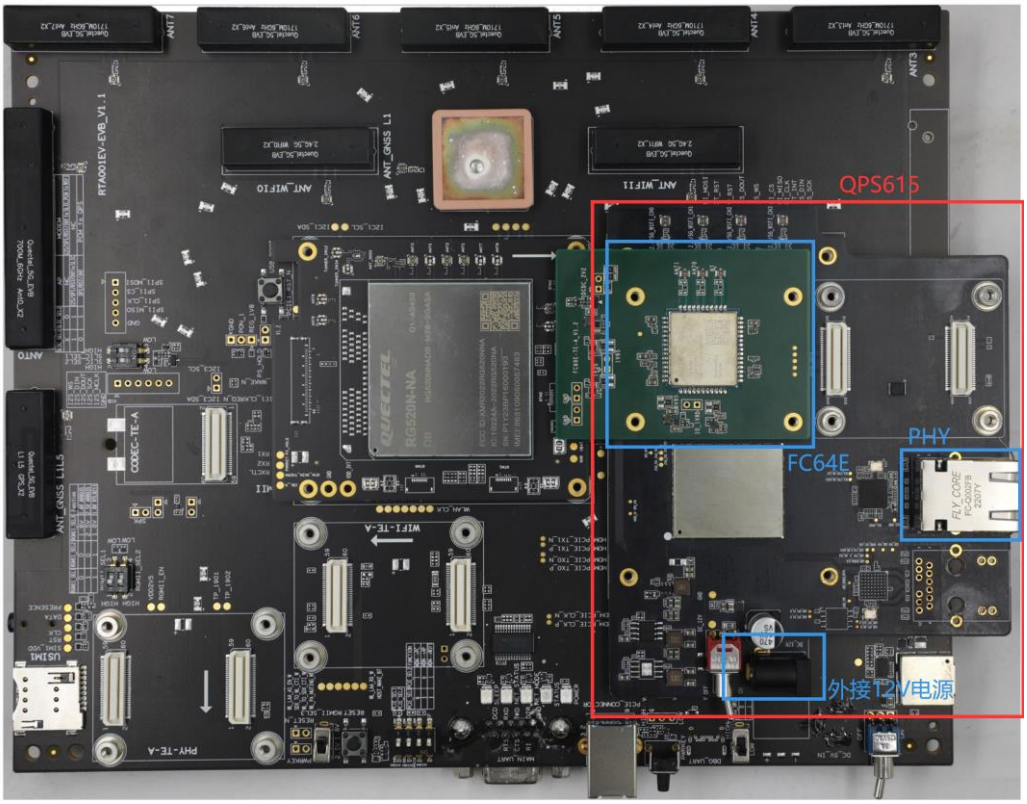

Figure 49: QPS615 Mark Figure

3) Send **AT+QCFG="PCIE/MODE",3** to set PCIe to bridging RC mode, which takes effect after restart.

4) After the restart, use **QCMAP** or **hostapd** to turn on Wi-Fi function, so as to meet the requirements for terminal devices such as mobile phones to access Wi-Fi networks. For more details, see ***Chapter 4*** in ***document [5]***.

5.6.3. EVB + PHY TE-A Usage Methods

When the RG5xxF/N series modules match with the PHY, there are also two ways to combine them. Similarly, the first is direct connection with PCIe, and the second is switching with QPS615. The following describes the two ways (RTL8125 TE-A is used as an example for direct connection with PCIe. The other method uses PHY 8081 TE-A on the QPS615 adapter board).

5.6.4. PHY TE-A Direct Connection

1) Insert RTL8125 TE-A module to the Wi-Fi TE-A interface on the EVB, as shown in the red frame below:

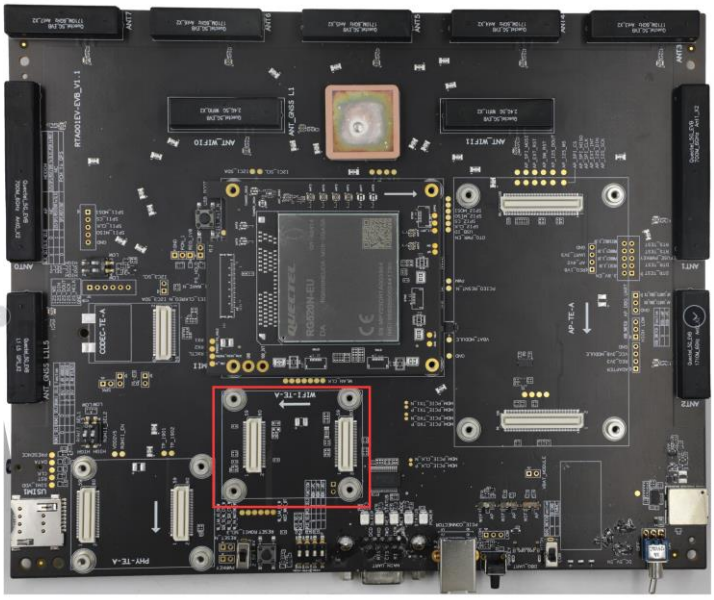

Figure 50: PHY Mark Figure

2) Flip PCIE_SEL1 and PCIE_SEL2 on the EVB to high (red frame on the left of the figure below), and flip all three AP/Wi-Fi switches to the Wi-Fi side (red frame on the right of the figure below), as shown in the following figure:

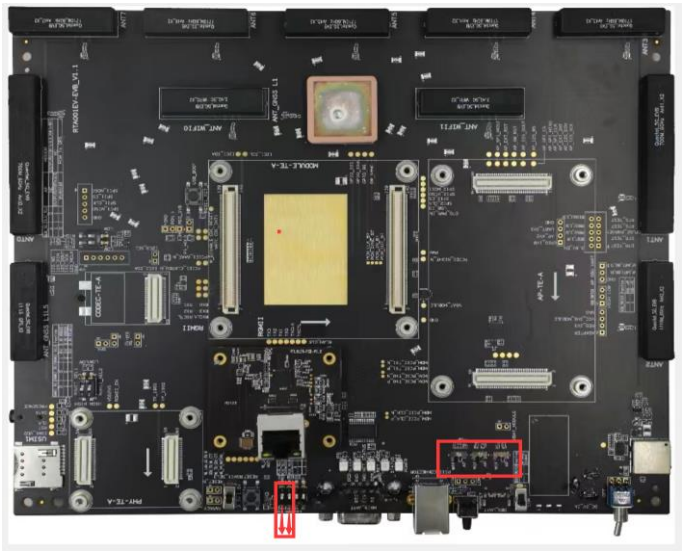

Figure 51: PHY Switch Mark Figure

3) Input the following AT command:

- **AT+QCFG="PCIE/MODE",1** to set PCIe to RC mode, which takes effect after restart.
- **AT+QCFG="data_interface",1,0** to set network interface mode of PCIe. For details, see the corresponding AT command manual.
- **AT+QETH="eth_driver","r8125",1** to open the driver of PHY 8125. For details, see the corresponding AT command manual. For other PHY, driver transplant may be needed.
- **AT+QMAPWAC=1** to set automatic dialing, 0 refers to manual dialing, 1 refers to automatic dialing.

4) After entering the above commands, the back-end device connected to PHY TE-A can automatically obtain an IP address, which means that the function is normal, as shown in the following figure:

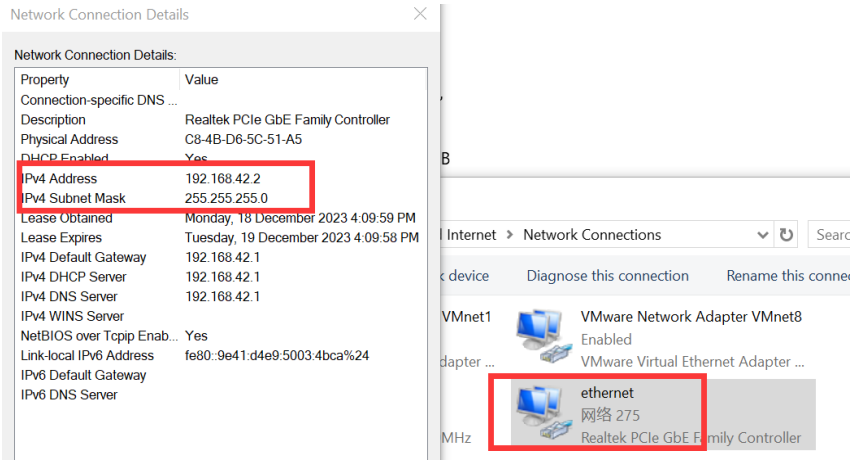

Figure 52: Computer Ethernet Parameter Diagram

5.6.5. QPS615 + PHY TE-A

1) Flip PCIE_SEL1 to high and PCIE_SEL2 to low (red frame on the left of the figure below), and flip all three AP/Wi-Fi switches to the AP side (red frame on the right of the figure below), as shown in the following figure:

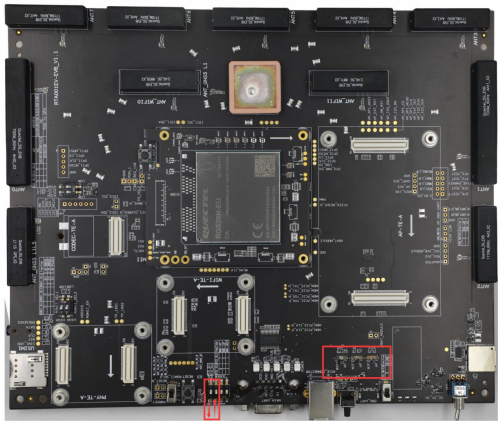

Figure 53: PHY Switch Mark Figure

2) Install QPS615 module. PHY 8081 TE-A is installed on QPS615 by default, which can be used directly (PHY with blue frame below). Note that QPS615 needs to be powered separately (12 V), as shown below:

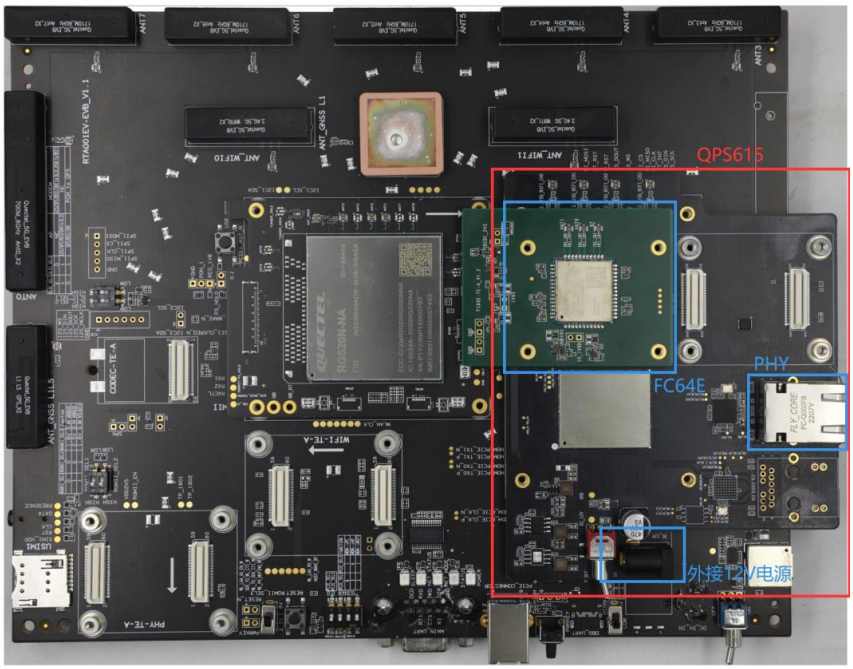

Figure 54: QPS615 Mark Figure

3) Input the following AT command:

- **AT+QCFG="PCIE/MODE",3** to set PCIe to bridging RC mode, which takes effect after the restart.
- **AT+QMAPWAC=1** to set automatic dailing. For more details, see the corresponding AT command manual.

4) After the above setting, the back-end device connected to PHY of QPS615 can automatically obtain an IP address, which means that the function is normal, as shown in the following figure:

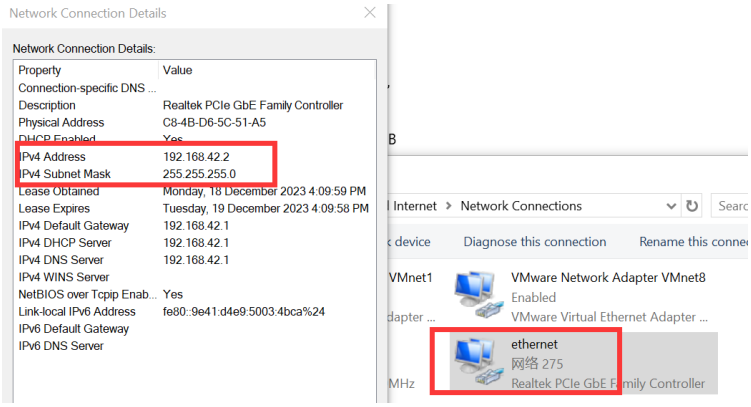

Figure 55: Computer Ethernet Parameter Diagram

5.6.6. EVB + SLIC TE-A Usage Method

Take LE9643 chip as an example (SI32185 chip test steps are the same), the overall steps are as follows:

1) Firstly, insert LE9643 TE-A to Codec TE-A interface, see the red frame in the below figure.

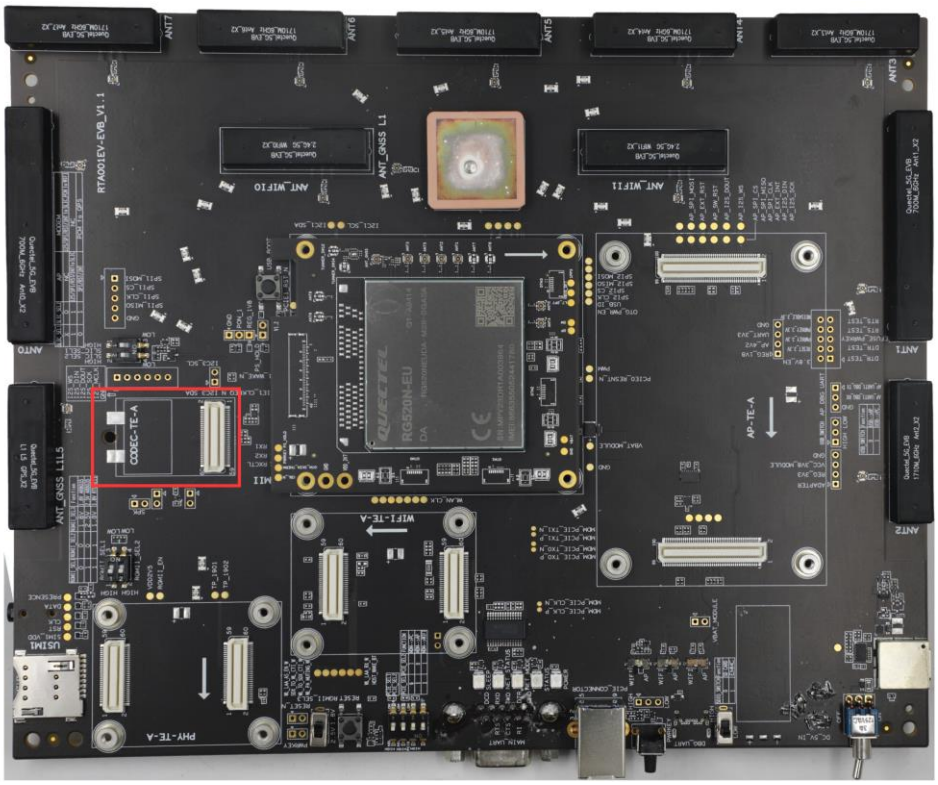

Figure 56: SLIC Mark Figure

2) After insertion, the jumper wire is needed. Refer to the silk screen, and it can be corresponding one by one. In addition, note that 5 V (the orange line at the bottom of the logic diagram) and the ground wire (the blue line in the logic diagram below) cannot be connected wrong. The device in the blue frame is connected to the phone through a telephone line, and the device in the red frame is switched to **ON**, as shown in the following figure (one for the logic diagram and one for the actual diagram):

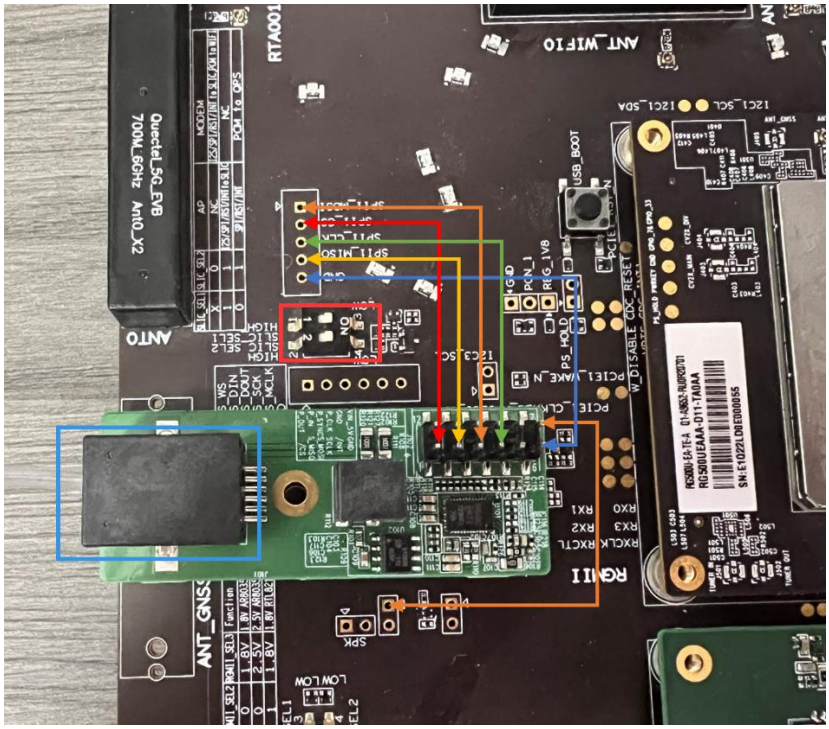

Figure 57: SLIC Connection Logic Diagram

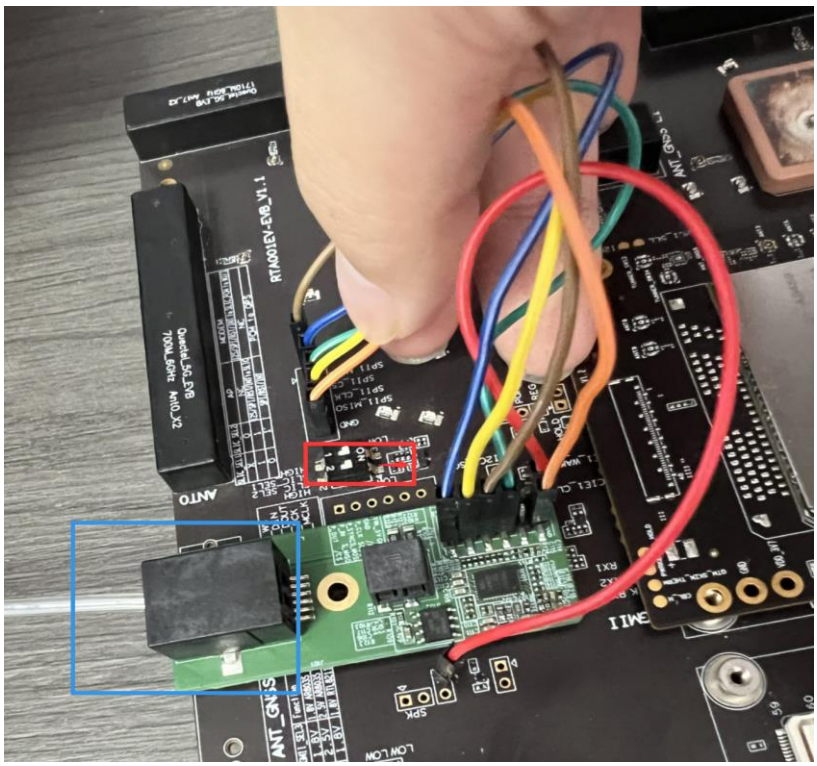

Figure 58: SLIC Actual Connection Diagram

3) Insert the SIM card into the (U)SIM1 slot, and send **AT+QSLIC=1,3** to enable the SLIC chip. When the phone is lit up, you can pick up the phone and dial up to make a call.

For **AT+QSLIC**, the second parameter "3" indicates the test case SLIC chip type LE9643. Therefore, when using other SLIC chips, pay attention to the command parameters. For more details, see ***document [6]***.

5.6.7. EVB + Codec TE-A Usage Method

Take TLV320AIC3104 chip as an example (ALC5616 test steps are the same), the overall steps are as follows:

1) Firstly, insert TLV320AIC3104 TE-A to Codec TE-A interface, see the following figure:

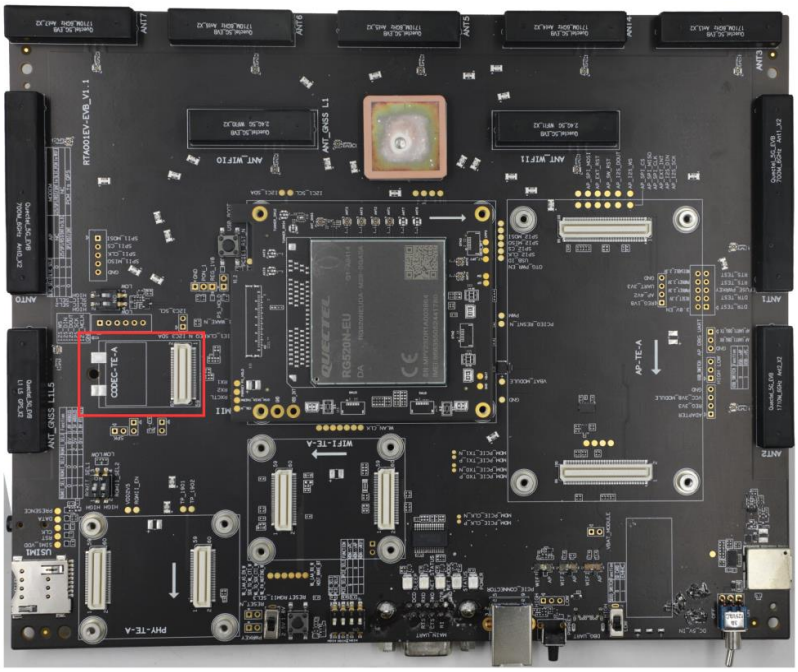

Figure 59: Codec Mark Figure

2) At the red frame, flip the switch to ON, and connect the headset to the device at the blue frame, as shown below:

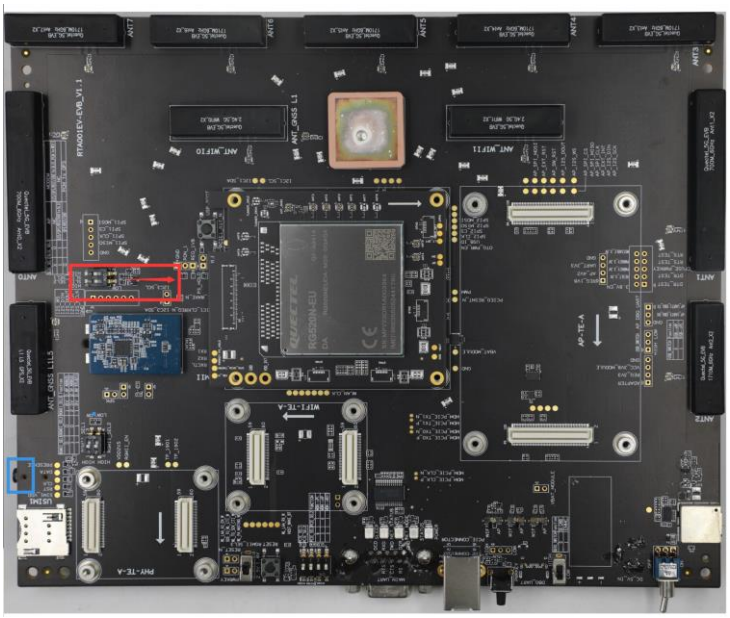

Figure 60: Codec Switch Mark Figure

3) Push wav files to the /cache/ufs path of the EVB through adb function (note that wav files are supported by default, and mp3 files need to be transplanted with additional decoding function library);

4) Use **AT+QAUDPLAY** to specify the name of the wav file to be uploaded. You can hear the audio through the headset.

For specific details of AT command, see ***document [6]***.

5.7. Standard Solution Matching

PHY TE-A and SLIC TE-A of standard solution match with Codec TE-A, and the procedures are the same as QuecOpen solution in ***Chapter 5.6***. Note that in standard solution, external Wi-Fi TE-A connection is not supported.

6 Appendix References

Table 29: Related Documents

Document Name
[1] Quectel_List_of_EVB_Applicable_Modules
[2] Quectel_Windows_USB_Driver(Q)_NDIS_Installation_Guide
[3] Quectel_QCOM_User_Guide
[4] Quectel_QFlash_User_Guide
[5] Quectel_RG520N&RG52xF&RG530F&RM520N_Series_Wi-Fi_User_Guide
[6] Quectel_RG520N&RG525F&RG5x0F&RM5x0N&RM521F_Series_AT_Commands_Manual
[7] Quectel_RG520N&RG525F&RG5x0F&RM5x0N_Audio&SLIC_User_Guide

Table 30: Terms and Abbreviations

Abbreviation	Description
AGND	Analog Ground
AP	Access Point/Application Processor
BTB	Board to Board
COM	Cluster Communication Port
DC	Direct Current
DI	Digital Input
DO	Digital Output
eMMC	embedded Multi-Media Card
EVB	Evaluation Board

GND	Ground
GNSS	Global Navigation Satellite System
I/O	Input/Output
LED	Light Emitting Diode
MIC	Microphone
MIMO	Multiple Input Multiple Output
NC	Not Connected
PC	Personal Computer
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PHY	Physical Layer
PO	Power Output
RF	Radio Frequency
SDIO	Secure Digital Input/Output
SLIC	Subscriber Line Interface Circuit
SIM	Subscriber Identity Module
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
VBAT	Voltage at Battery (Pin)
Wi-Fi	Wireless Fidelity