

5G-SOC EVB

User Guide

5G Module Series

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Quectel Wireless Solutions Co., Ltd.

Building 5, Shanghai Business Park Phase III (Area B), No.1016 Tianlin Road, Minhang District, Shanghai 200233, China

Tel: +86 21 5108 6236

Email: info@quectel.com

Or our local offices. For more information, please visit:

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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 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
-	2023-05-23	Hubery Huang/Wynna SHU	Creation of the document
1.0.0	2023-05-23	Hubery Huang/Wynna SHU	Preliminary
1.0.1	2023-07-12	Wynna SHU	Preliminary: Updated the PCB version: J0601/J0602 and J0603/J0604 exchange positions; Deleted the SDIO switch of power domain selection (S0901); Updated the top and bottom views and their component placement figures (Figure 1–4 and Table 2).

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1 Introduction

This user guide describes the application details of 5G-SOC EVB (evaluation board), which is an assistant tool for developers to develop applications and test basic functionalities of applicable modules below.

1.1. Applicable Modules

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

1.2. Special Mark

Table 1: Special Mark

Mark	Definition
*	Unless otherwise specified, when an asterisk (*) is used after a function, feature, interface, pin name, AT command, or argument, it indicates that the function, feature, interface, pin, AT command, or argument is under development and currently not supported; and the asterisk (*) after a model indicates that the sample of such model is currently unavailable.

2 Product Overview

2.1. Top and Bottom Views

The size of 5G-SOC EVB is 260 mm × 200 mm, and the top and bottom views are shown as below:

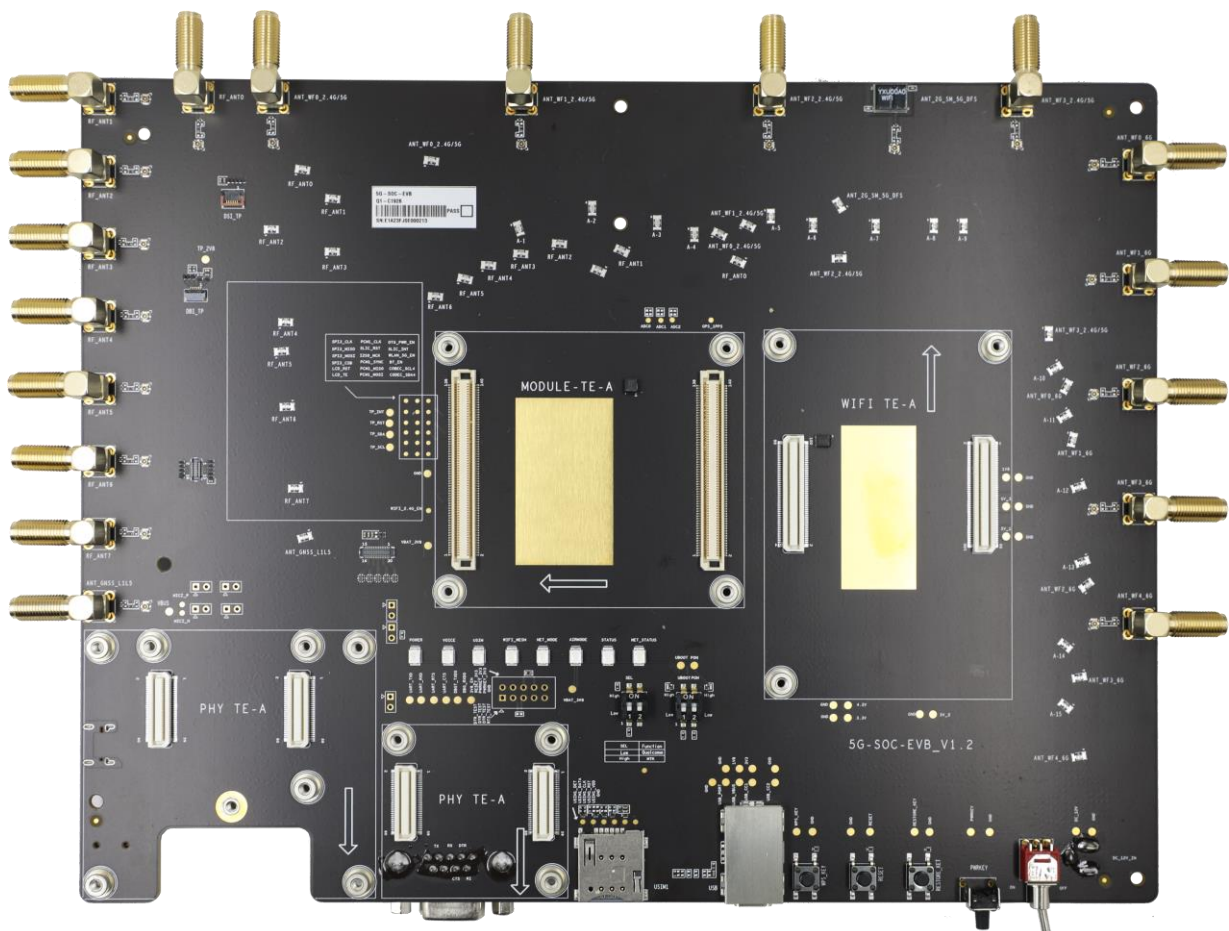


Figure 1: Top View



Figure 2: Bottom View

2.2. Component Placement

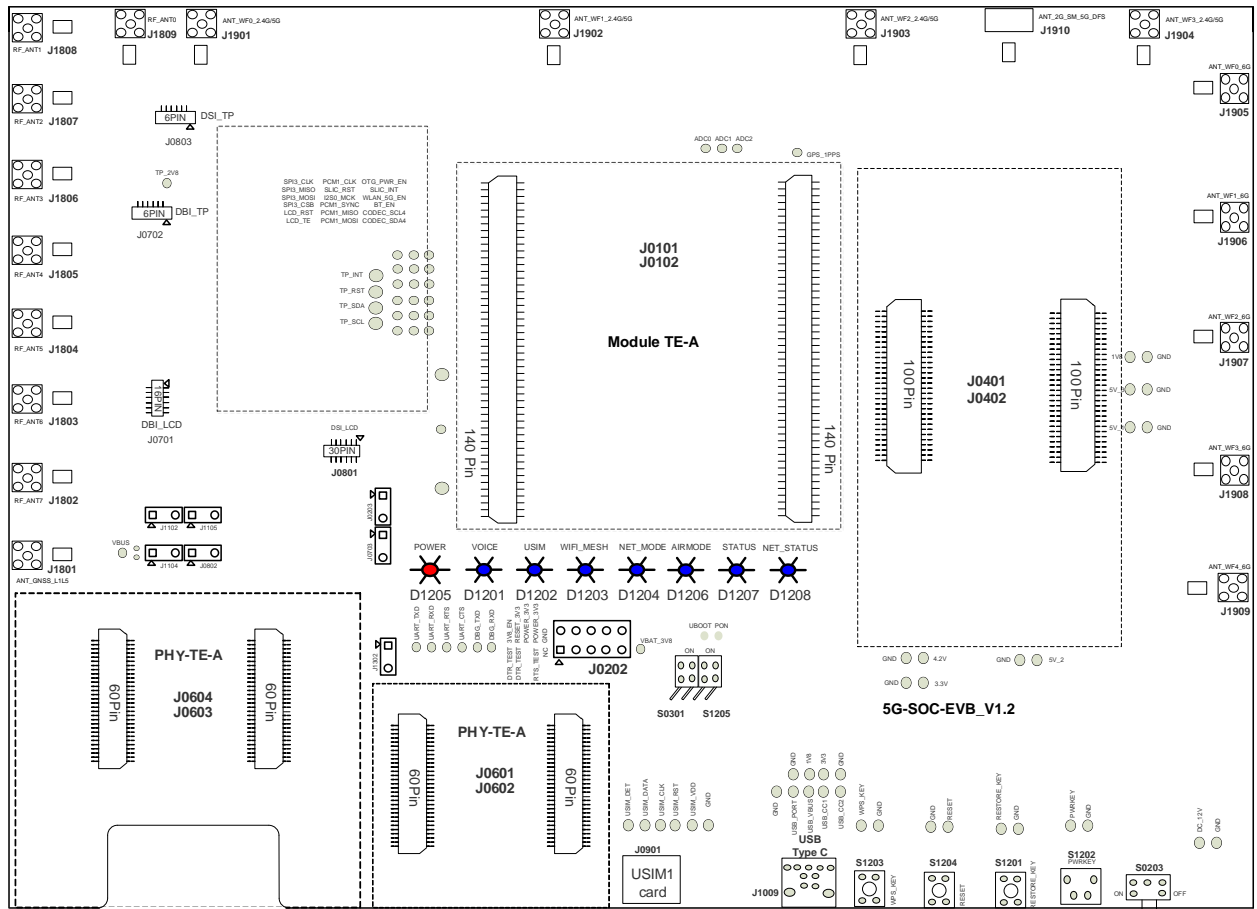


Figure 3: Top View for Component Placement

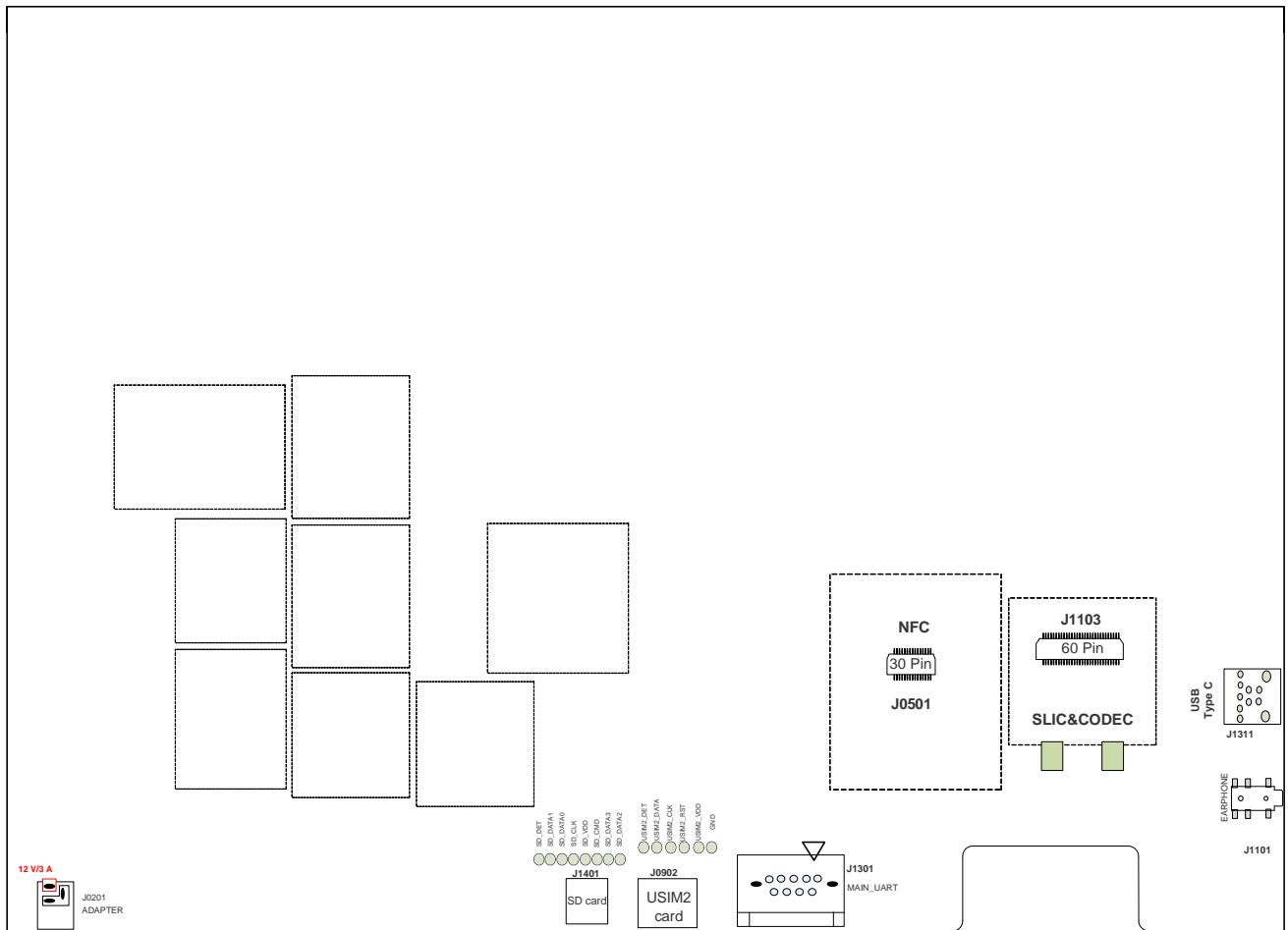


Figure 4: Bottom View for Component Placement

Table 2: Components & Functions

Component	RefDes.	Description	Implementation
Power Supply	J0201	Power jack on the EVB	<ul style="list-style-type: none"> ● DC power supply: 12 V ● Typical supply voltage: +12 V/ 3 A
Power Switch	S0203	VBAT on/off control	Switch
Restore Key	S1201	Used to restore the module	Button
WPS Key	S1203	Wi-Fi protected setup	Button
PWRKEY	S1202	<ul style="list-style-type: none"> ● Power key (push button) ● Used to turn on/off the module 	Button

PON	S1205	Used to turn on the module automatically	Switch
USB_BOOT		Used to emergency download	
RESET	S1204	<ul style="list-style-type: none"> ● Reset button (push button) ● Used to reset the module 	Button
GPIO Switch	S0301	Used to choose the GPIO according to different platforms	<ul style="list-style-type: none"> ● High: for RG650E module series ● Low: for RG620T module series
USB Interface	J1009	USB Type-C interface	Used for USB 3.1 and USB 2.0 communication
USB-to-UART Interface	J1311	Converts debug UART to USB 2.0 signal	<ul style="list-style-type: none"> ● Used to convert debug UART to USB 2.0 signal ● Baud rates should be confirmed with the platform
(U)SIM Card Interfaces	J0901	(U)SIM1 card connector	<ul style="list-style-type: none"> ● Support (U)SIM card insertion detection. ● Dual (U)SIM card supported: 1.8 V and 3.0 V
	J0902	(U)SIM2 card connector	
SD Card Interface	J1401	SD card connector	
Main UART	J1301	MAIN_UART for data transmission	<ul style="list-style-type: none"> ● Main UART ● Used for data transmission ● Default baud rate: 115200 bps
Status Indicators	D1205	Power supply on/off indicator	8 LEDs are available for signal indication
	D1207	Module operation status indicator, indicating whether the module is turned on	
	D1204	Network mode indicator, indicating NET_MODE status of the module	
	D1208	Network status indicator, indicating NET_STATUS status of the module	
	D1201	Indicate the VoIP function status	
	D1202	Indicate the (U)SIM card function status	

	D1203	Indicate the Wi-Fi mesh function status	
	D1206	Indicate the module's airplane mode	
SLIC & Codec TE-A Interface	J1103	SLIC and Codec board TE-A connector	Please refer to the module application solutions for specific models
Module TE-A Interfaces	J0101, J0102	Connect module TE-A	Support the applicable modules
Wi-Fi TE-A Interfaces	J0401, J0402	Connect Wi-Fi TE-A	Support the corresponding Wi-Fi solution for the module, please refer to the module application solutions for specific models
PHY TE-A Interfaces	J0601, J0602	Connect PHY TE-A	Support the corresponding PHY solution for the module, please refer to the module application solutions for specific models
	J0603, J0604	Connect PHY TE-A	
NFC TE-A Interface*	J0501	Connects NFC TE-A	
Antenna Interfaces	J1802, J1803, J1804, J1805, J1806, J1807, J1808, J1809	Antenna connectors	Cellular antenna connectors
	J1801		GNSS antenna connector
	J1901, J1902, J1903, J1904, J1908, J1909, J1910, J1911, J1912, J1913		Wi-Fi antenna connector

3 Kit Accessories & Assembly

3.1. Accessories Assembly

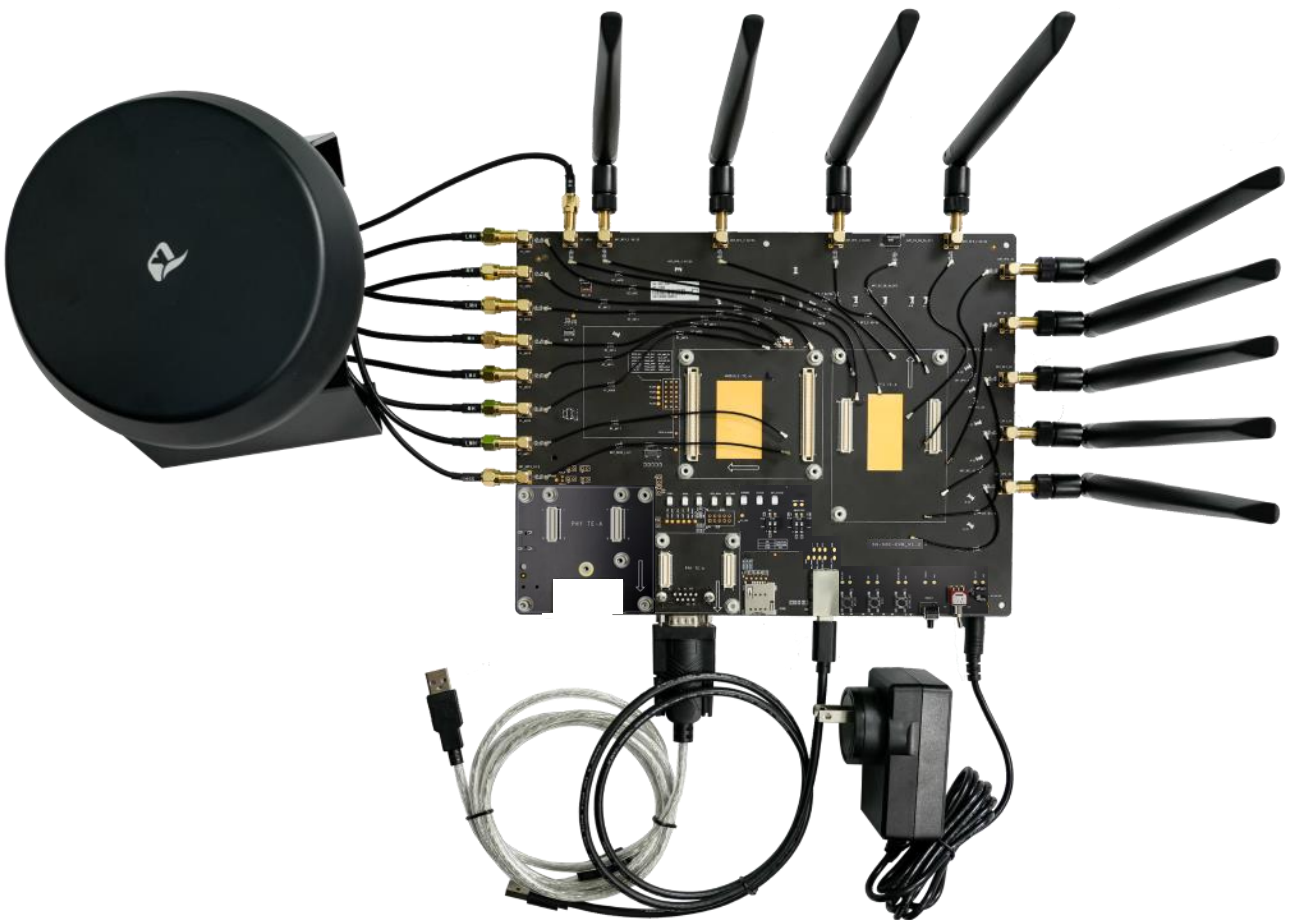


Figure 5: 5G-SOC EVB and Accessories Assembly

3.2. Accessories List

All accessories of the 5G-SOC EVB kit are listed as below. Please contact the supplier if there is something missing.



Figure 6: 5G-SOC 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
	Sub-6 GHz RF cables	8
	RF cables (GPS & Wi-Fi)	11
Antennas	Cellular antenna	8
	GNSS antenna (passive)	1
	Wi-Fi/Bluetooth antenna	10
Antenna Box	Cellular & GPS antenna	1
Audio	Earphone	1
Heatsink	<ul style="list-style-type: none"> ● Heatsink AL6063T5 Black Coating 80 mm × 79 mm ● H: 22 mm 	1

4 Application Interfaces

This chapter describes the hardware interfaces of the 5G-SOC EVB, as listed below:

- Power supply
- Module TE-A interfaces
- USB interface
- USB-to-UART interface
- (U)SIM card interfaces
- SD card interface
- UART interface
- Status LEDs
- SLIC & Codec TE-A interface
- Wi-Fi TE-A interfaces
- PHY TE-A interfaces
- NFC TE-A interface*
- Antenna Interfaces
- Switches and buttons

4.1. Power Supply

The EVB can be powered by an external power adapter through the power jack on the EVB.

Table 4: Description of Power Supply

RefDes.	Description
J0201	Power jack on the EVB

The following figures show the simplified power supply block diagram of the EVB.

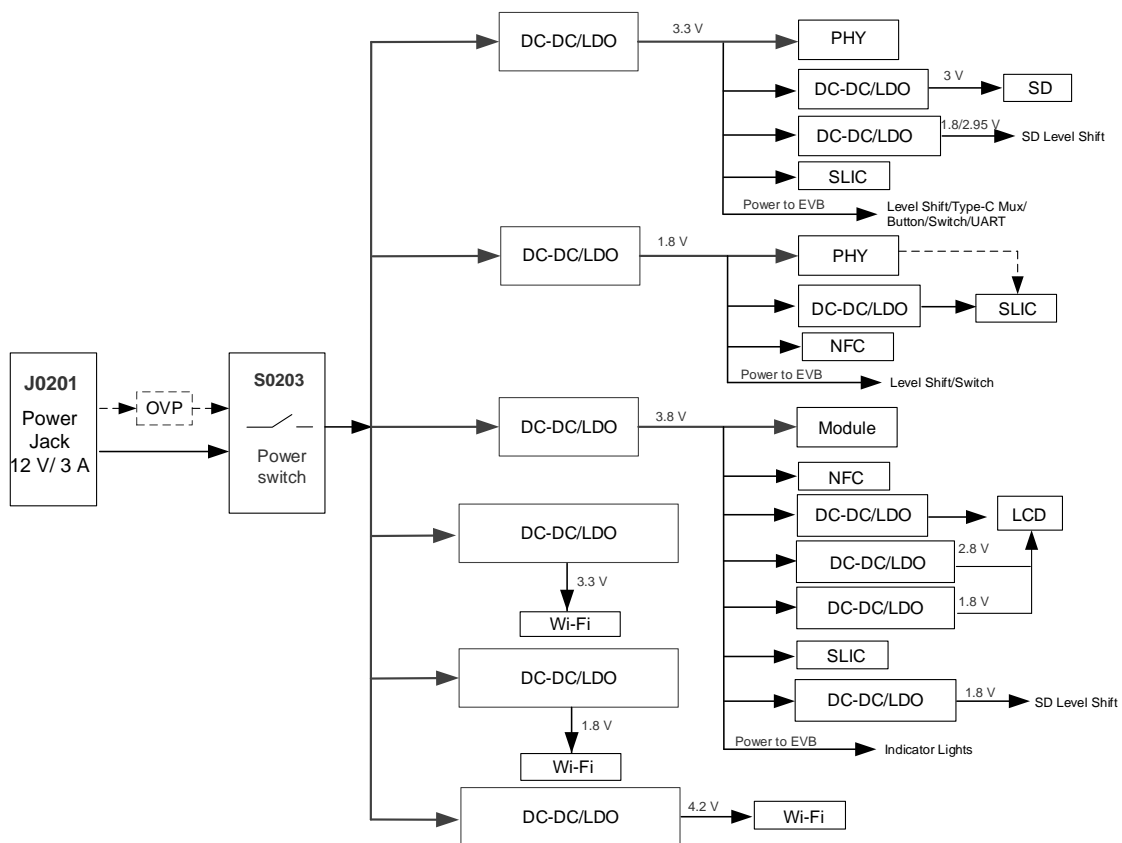


Figure 7: Block Diagram of EVB Power Supply

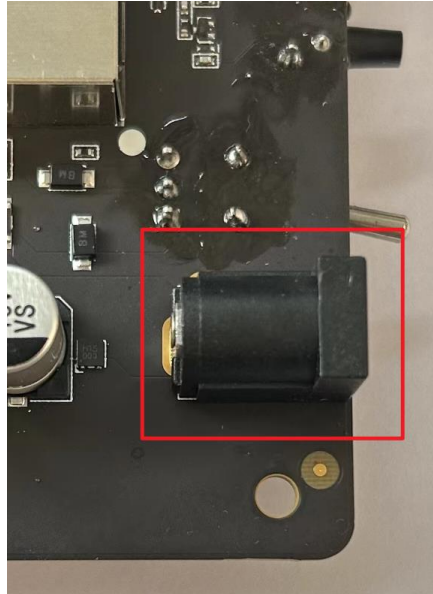


Figure 8: EVB Power Supply Interface

If the power jack is used for power supply, the power plug design of the adapter is shown as below.

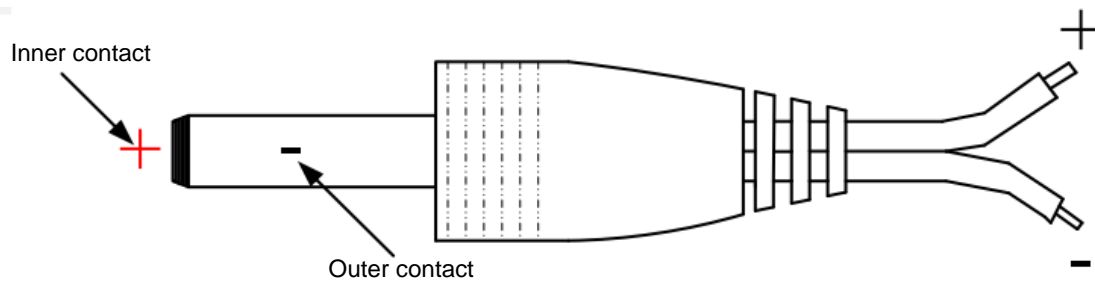


Figure 9: Power Plug Design

4.2. Module TE-A interfaces

Module TE-A interfaces are designed to accommodate the TE-A of applicable modules. The TE-A is connected to the EVB via BTB connectors. The developer will be able to test the functionalities of the modules easily (insert as indicated by the arrow to prevent reverse insertion).

Table 5: Description of M.2 Interfaces

RefDes.	Description
J0101	Connect module TE-A
J0102	

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



Figure 10: Connection Between the Module TE-A and EVB

4.3. USB Interface

The EVB provides one USB interface which complies with the USB 3.1 Gen 2 and USB 2.0 specifications and supports SuperSpeed (10 Gbps) for USB 3.1 Gen 2, high-speed (480 Mbps) and full-speed (12 Mbps) for USB 2.0, as shown in **Figure 11** and **Figure 12**. The USB interface can be used for AT command communication, data transmission, GNSS NMEA sentence output, software debugging, firmware upgrade and voice over USB.

Table 6: Description of USB Interface

RefDes.	Description
J1009	USB Type-C interface

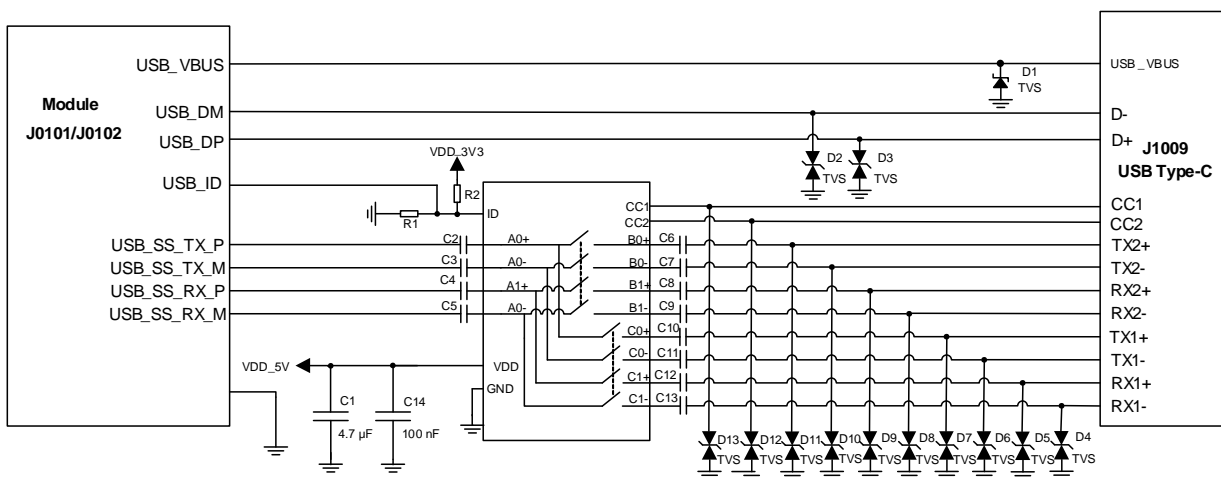


Figure 11: Connection Between Module and USB Type-C Interface

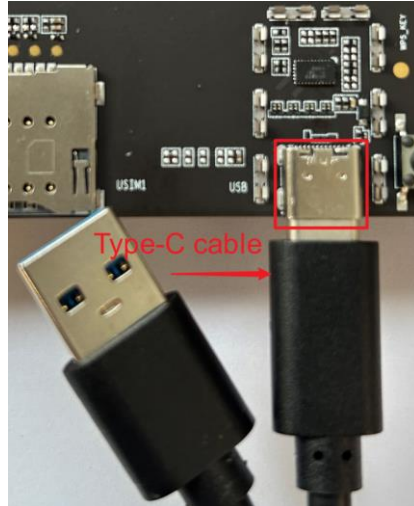


Figure 12: USB Interface Connection

4.4. USB-to-UART Interface

The EVB provides a USB-to-UART interface. This interface is used for Linux console and converting log UART signal to USB 2.0 signal for debugging.

Table 7: Description of USB-to-UART Interface

RefDes.	Description
J1311	Converts debug UART to USB 2.0 signal

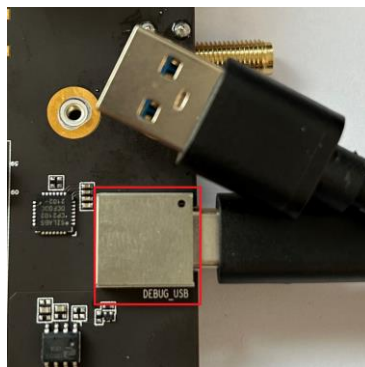


Figure 13: USB-to-UART Interface Connection

4.5. (U)SIM Card Interfaces

The EVB has two 8-pin push-push type (U)SIM card interfaces which support 1.8/3.0 V (U)SIM card.

Table 8: Description of (U)SIM Card Interfaces

RefDes.	Description
J0901	(U)SIM1 card connector
J0902	(U)SIM2 card connector

The following figure shows a simplified connector schematic for these connectors.

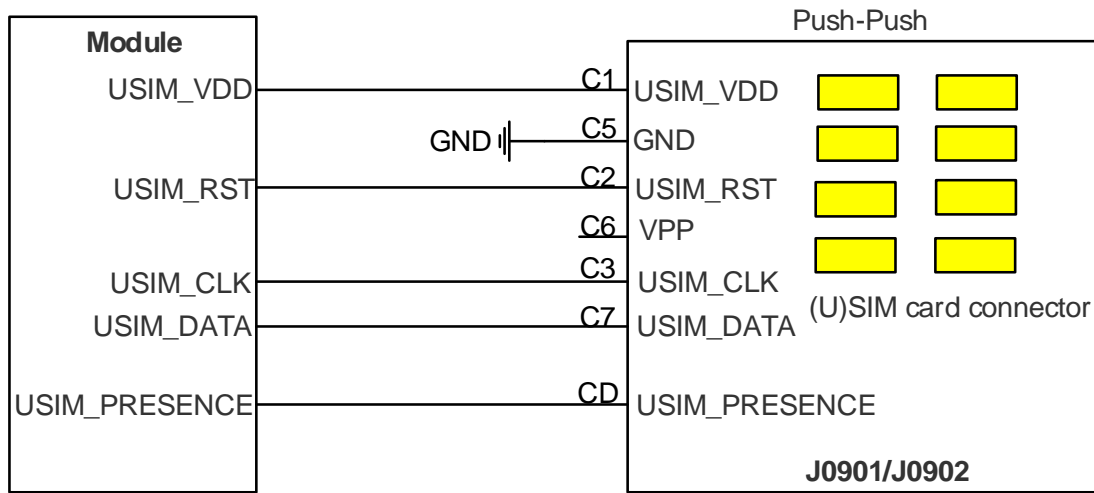


Figure 14: Simplified Connector Schematic for (U)SIM Card Connectors

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

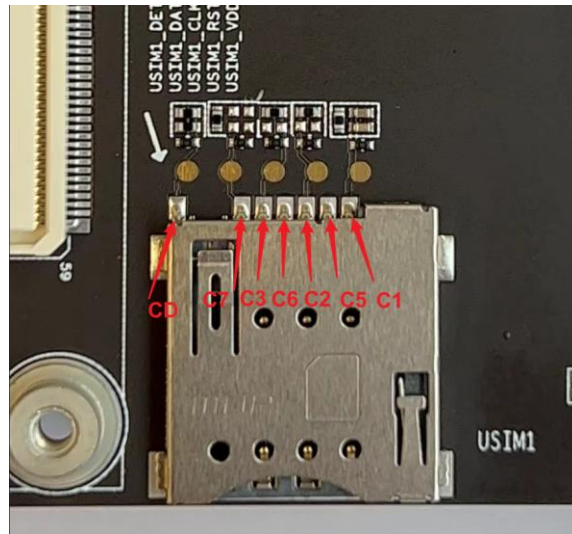


Figure 15: Pin Assignment of (U)SIM Card Connector J0901

Table 9: Pin Definition of J0901

Pin No.	Pin Name	I/O	Description
C1	USIM_VDD	PO	U(SIM) card power supply
C2	USIM_RST	DO	U(SIM) card reset
C3	USIM_CLK	DO	U(SIM) card clock
C5	GND	-	Ground
C6	VPP	-	NC
C7	USIM_DATA	DIO	Data line, bi-directional
CD	USIM_PRESENCE	DI	U(SIM) card insertion detection

4.6. SD Card Interface

The EVB provides an SD card interface, which can be used for connecting SD card.

Table 10: Description of SD Card Interface

RefDes.	Description
J1401	SD card connector

The following figure shows the simplified interface schematic for J1401.

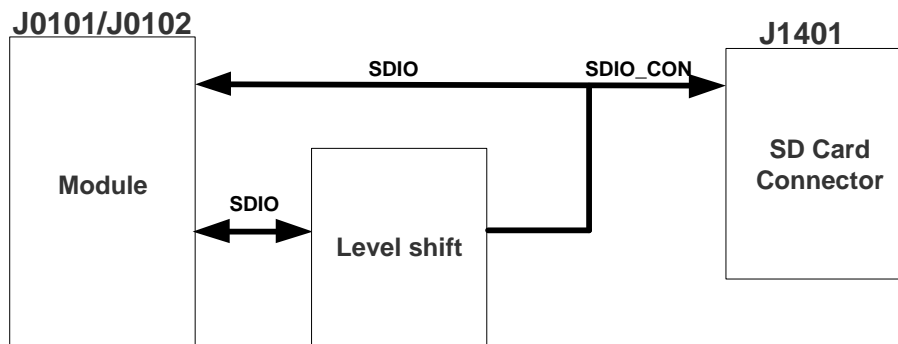


Figure 16: Simplified Interface Schematic for J1401

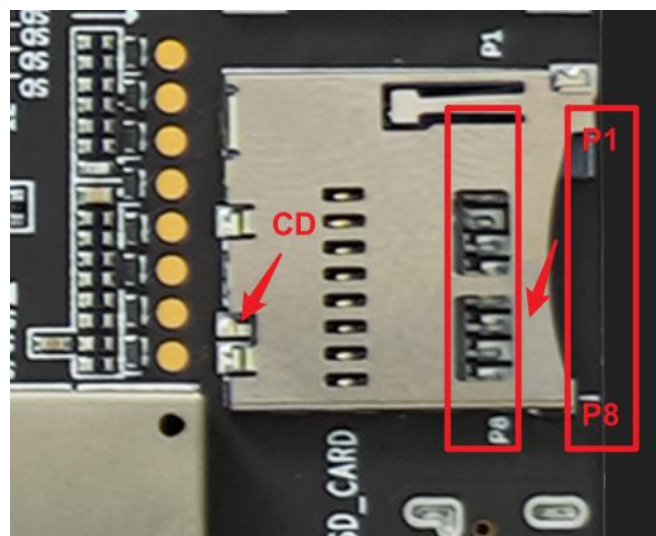


Figure 17: Pin Assignment of SD Card Interface of J1401

Table 11: Pin Assignment of J1401

J1401	Signal Name	I/O	Description
P1	SDIO_DATA2	DIO	SDIO data bit 2
P2	SDIO_DATA3	DIO	SDIO data bit 3
P3	SDIO_CMD	DIO	SDIO command
P4	VDD	PO	Supply voltage
P5	SDIO_CLK	DO	SDIO clock
P6	GND	-	Ground
P7	SDIO_DATA0	DIO	SDIO data bit 0
P8	SDIO_DATA1	DIO	SDIO data bit 1
CD	SD_DET	DI	SD card hot-plug detect

4.7. UART Interface

The EVB supports one UART interface: main UART, supporting baud rate of 115200 bps by default. The main UART interface is used for communication between the module and the host application.

Table 12: Description of UART Interface

RefDes.	Description
J1301	MAIN_UART for data transmission

The following figure shows a block diagram of UART interfaces of the EVB.

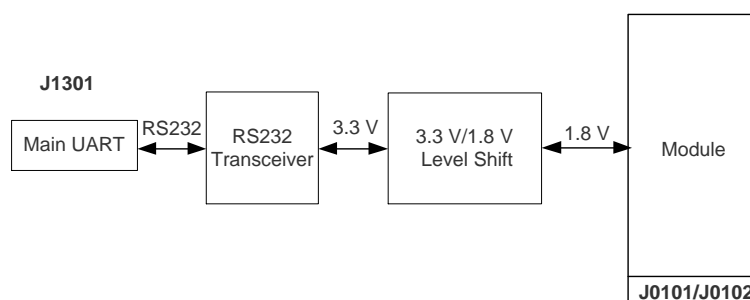


Figure 18: Main UART Block Diagram

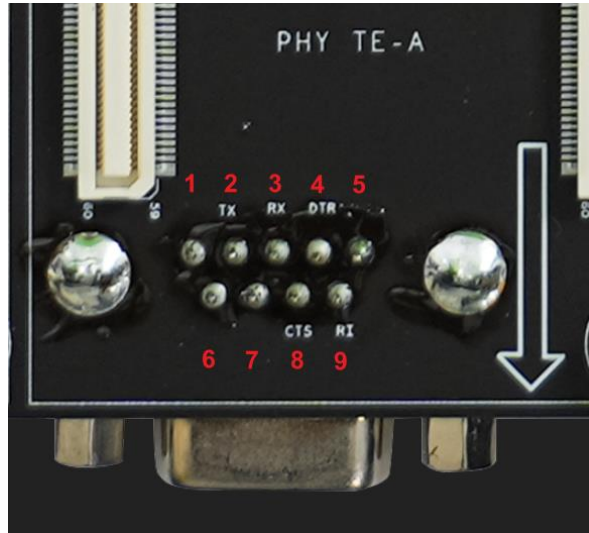


Figure 19: Main UART (J1301)

Table 13: Pin Assignment of J1301

J1301	Signal Name	I/O	Description
1	NC	-	NC
2	RS232_RXD	DI	Receive data
3	RS232_TXD	DO	Transmit data
4	NC	-	NC
5	RS232_GND	-	Ground
6	NC	-	NC
7	RS232_RTS	DI	Request to send
8	RS232_CTS	DO	Clear to send
9	NC	-	NC

4.8. Status LEDs

There are eleven status LEDs on the EVB.

Table 14: Description of Status LEDs

RefDes.	Description
D1205	Indicates power supply readiness. <ul style="list-style-type: none"> ● ON: VBAT on ● OFF: VBAT off
D1207	Indicates the operation status of the module. <ul style="list-style-type: none"> ● ON: the module is turned on ● OFF: the module is turned off
D1204	Network mode indicator, indicating whether the module has registered on 5G network.
D1208	Network status indicator, indicating NET_STATUS status of the module.
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 airplane mode.

The following figure shows the positions of these LED indicators:



Figure 20: Status LEDs

4.9. SLIC & Codec TE-A Interface

The SLIC and Codec TE-A interface is designed to accommodate the SLIC and Codec TE-A. The SLIC and Codec TE-A is mounted onto and connected to the EVB via BTB connector J1103.

Table 15: Description of SLIC & Codec TE-A Interface

RefDes.	Description
J1103	SLIC and Codec board TE-A connector

The following two figures show the connection between SLIC and Codec TE-A and EVB. Taking SI32185 and LE9643 TE-A as examples.

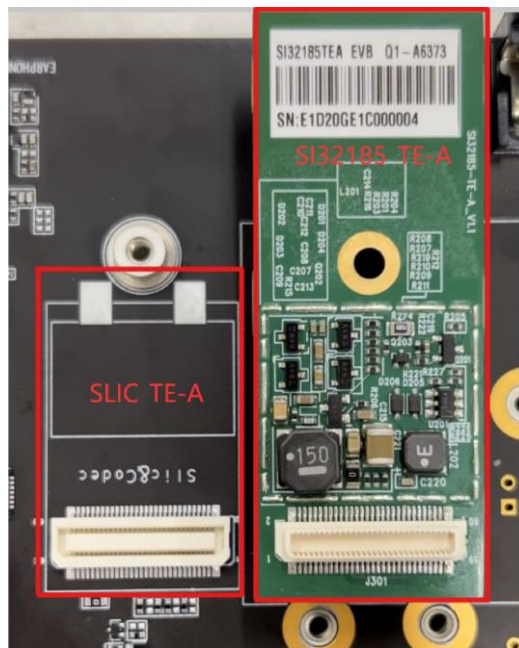


Figure 21: Connection Between SI32185 TE-A and EVB

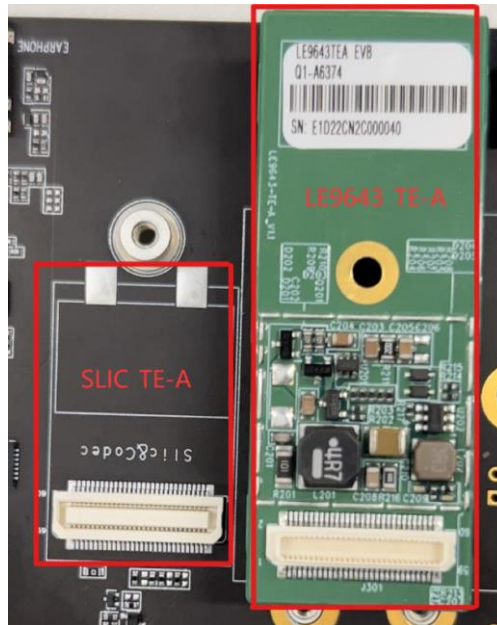


Figure 22: Connection Between LE9643 TE-A and EVB

4.10. Wi-Fi TE-A Interfaces

The Wi-Fi TE-A interface is designed to accommodate the TE-A of applicable modules. The TE-A is connected to the EVB via BTB connectors. The interface allows you to test the Wi-Fi function of the module or to develop applications with Wi-Fi function easily.

Table 16: Description of Wi-Fi TE-A Interfaces

RefDes.	Description	Matching TE-A
J0401	Connect Wi-Fi TE-A	<ul style="list-style-type: none"> ● MT6639 TE-A ● MT7919 TE-A/ MT7996 TE-A
J0402		<ul style="list-style-type: none"> ● WCN7851 TE-A ● QFW71X4 TE-A

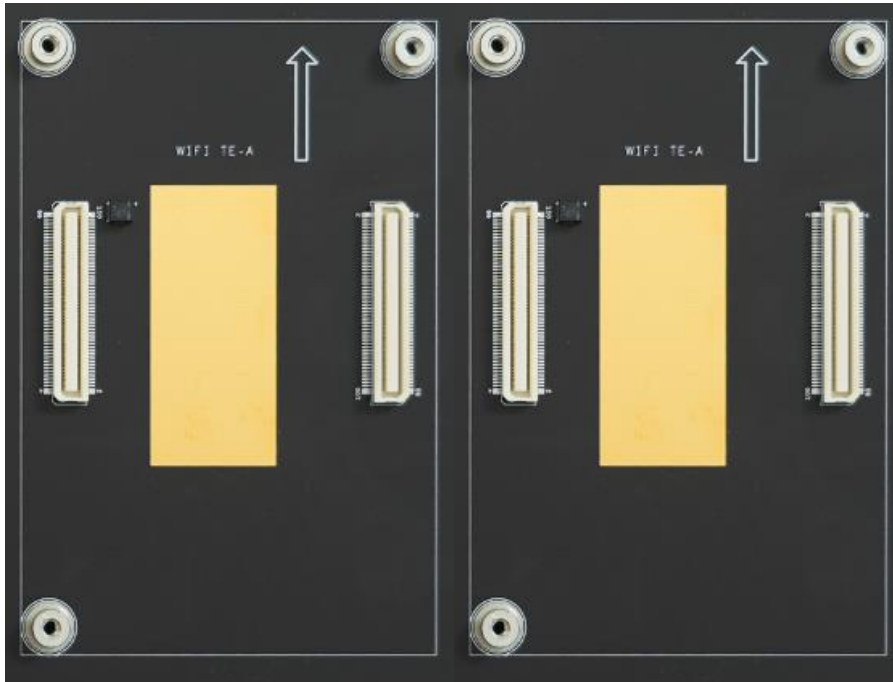


Figure 23: Connection Between MT6639 TE-A and EVB

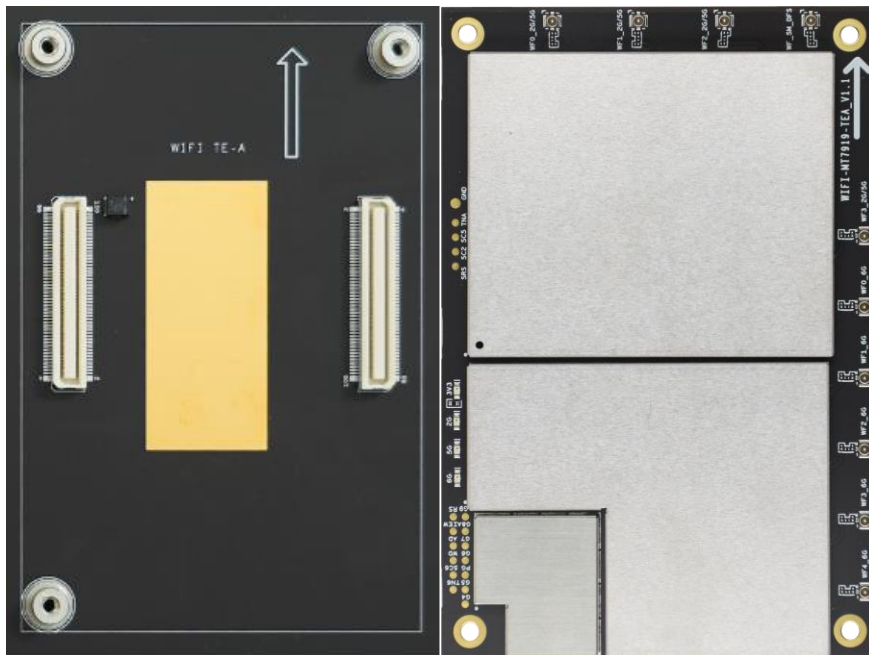


Figure 24 Connection Between MT7919 TE-A and EVB

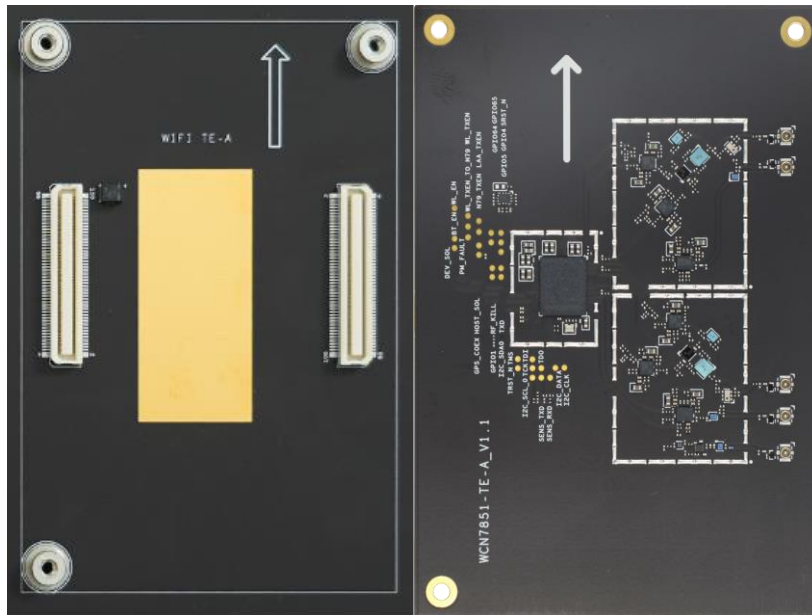


Figure 25 Connection Between WCN7851 TE-A and EVB

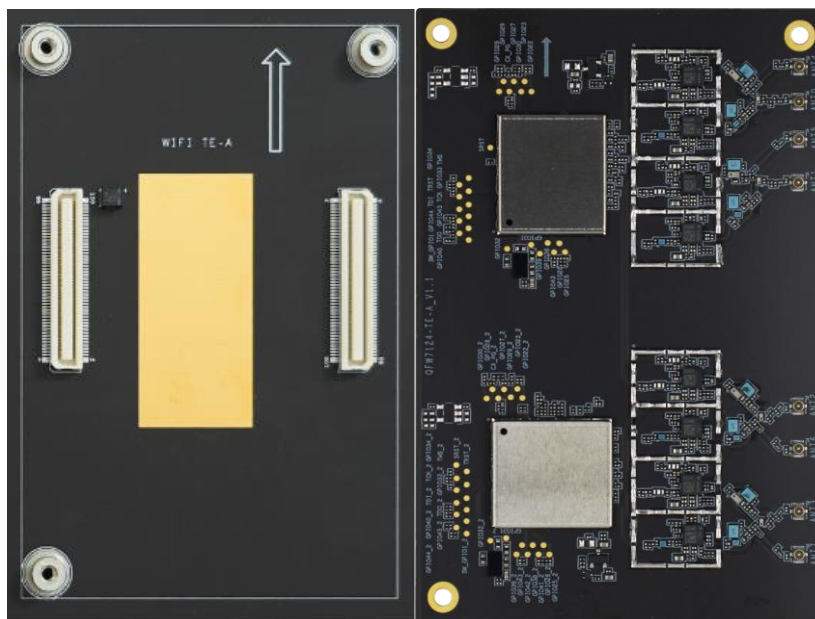


Figure 26 Connection Between QFW71X4 TE-A and EVB

NOTE

The listed matching TE-A only represents interfaces supported. Please confirm with the corresponding module for specific application solutions and debugging progress.

4.11. PHY TE-A Interfaces

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

Table 17: Description of PHY TE-A Interfaces

RefDes.	Description	Matching TE-A
J0601	Connect PHY TE-A	<ul style="list-style-type: none"> ● RTL8221B TE-A ● AQR113C TE-A
J0602		<ul style="list-style-type: none"> ● MT7531 TE-A ● QEP81X1 TE-A
J0603	Connect PHY TE-A	<ul style="list-style-type: none"> ● RTL8221B TE-A ● AQR113C TE-A
J0604		<ul style="list-style-type: none"> ● MT7531 TE-A ● QEP81X1 TE-A

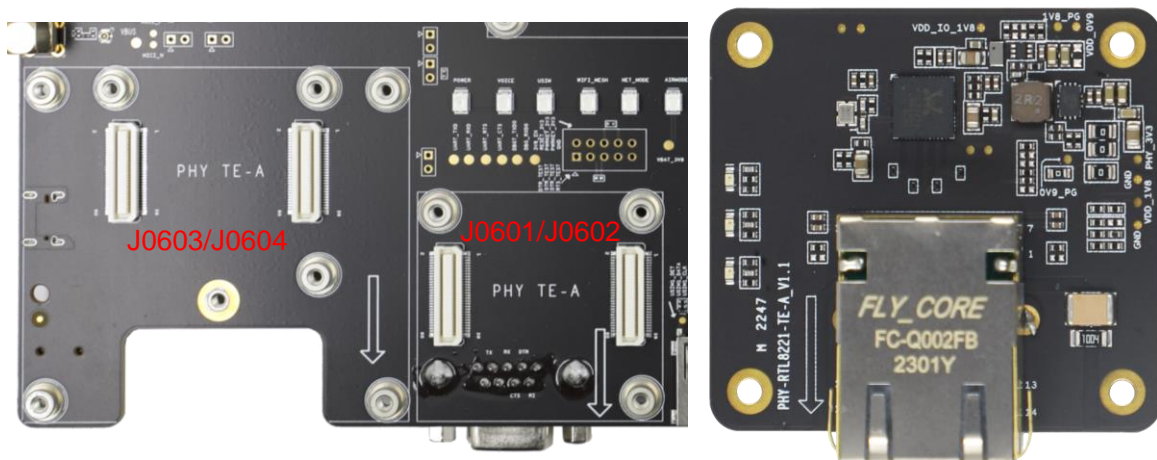


Figure 27: Connection Between RTL8221 TE-A and EVB

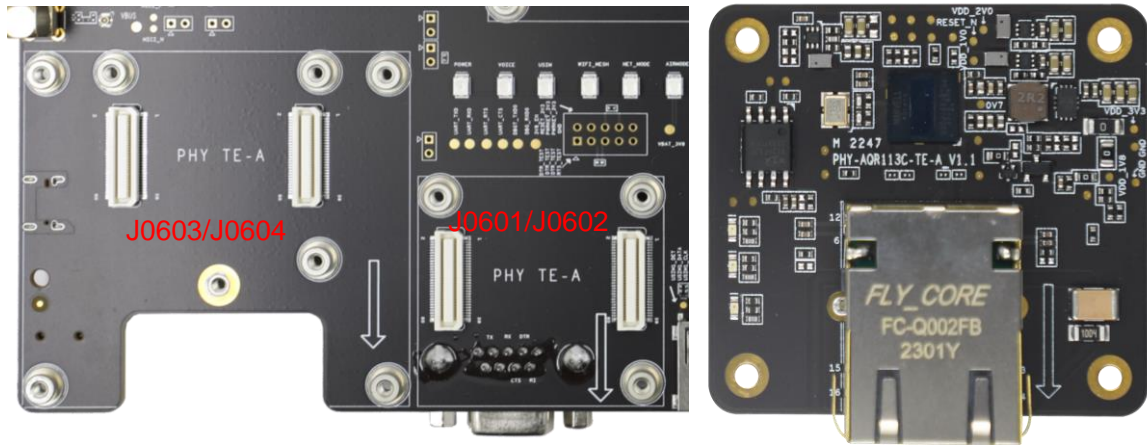


Figure 28: Connection Between AQR113C TE-A and EVB

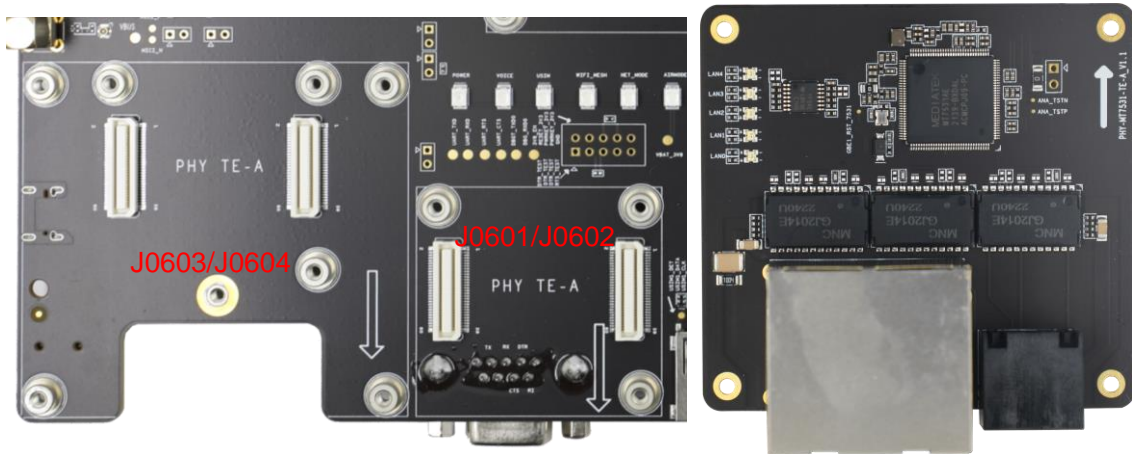


Figure 29: Connection Between MT7531 TE-A and EVB

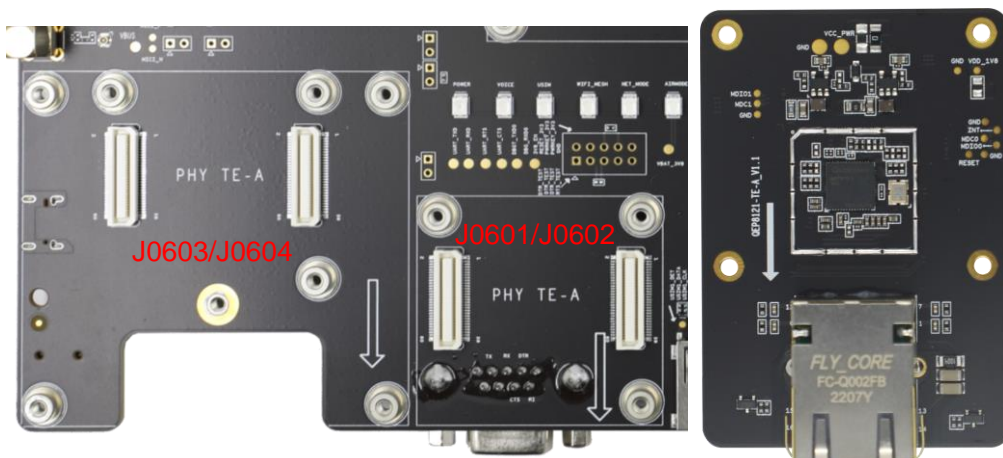


Figure 30: Connection Between QEP81X1 TE-A and EVB

NOTE

The listed matching TE-A only represents interfaces supported. Please confirm with the corresponding module for specific application solutions and debugging progress.

4.12. NFC TE-A Interface*

The NFC TE-A interface is designed to accommodate the TE-A of applicable modules. The TE-A is connected to the EVB via BTB connectors. The interface is used to test the functions of NFC.

Table 18: Description of NFC TE-A Interface

RefDes.	Description
J0501	Connects NFC TE-A

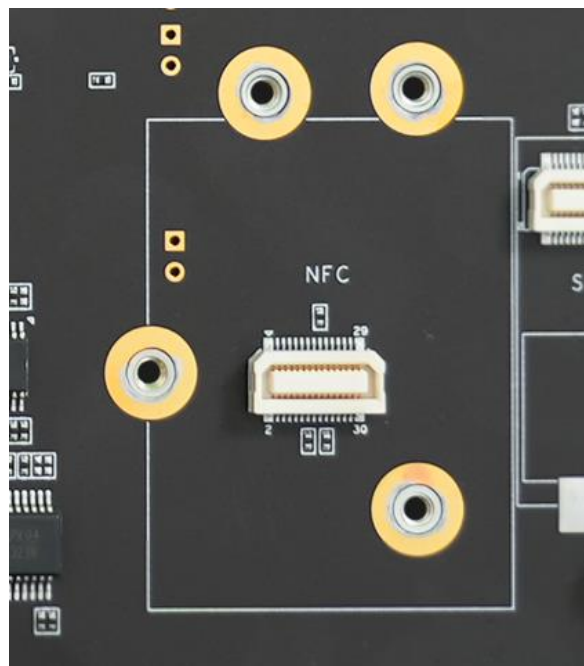


Figure 31: NFC TE-A Connector

4.13. Antenna Interfaces

The 5G-SOC EVB includes nineteen RF antenna interfaces: 8 cellular antenna interfaces, 1 GNSS antenna interfaces, and 10 Wi-Fi antenna interfaces.

Table 19: Description of Antenna Interfaces

RefDes.	Description
J1802, J1803, J1804, J1805, J1806, J1807, J1808, J1809	Cellular antenna connectors
J1801	GNSS antenna connector
J1901, J1902, J1903, J1904, J1908, J1909, J1910, J1911, J1912, J1913	Wi-Fi antenna connector

The following figure shows the assembly of these antenna interfaces:

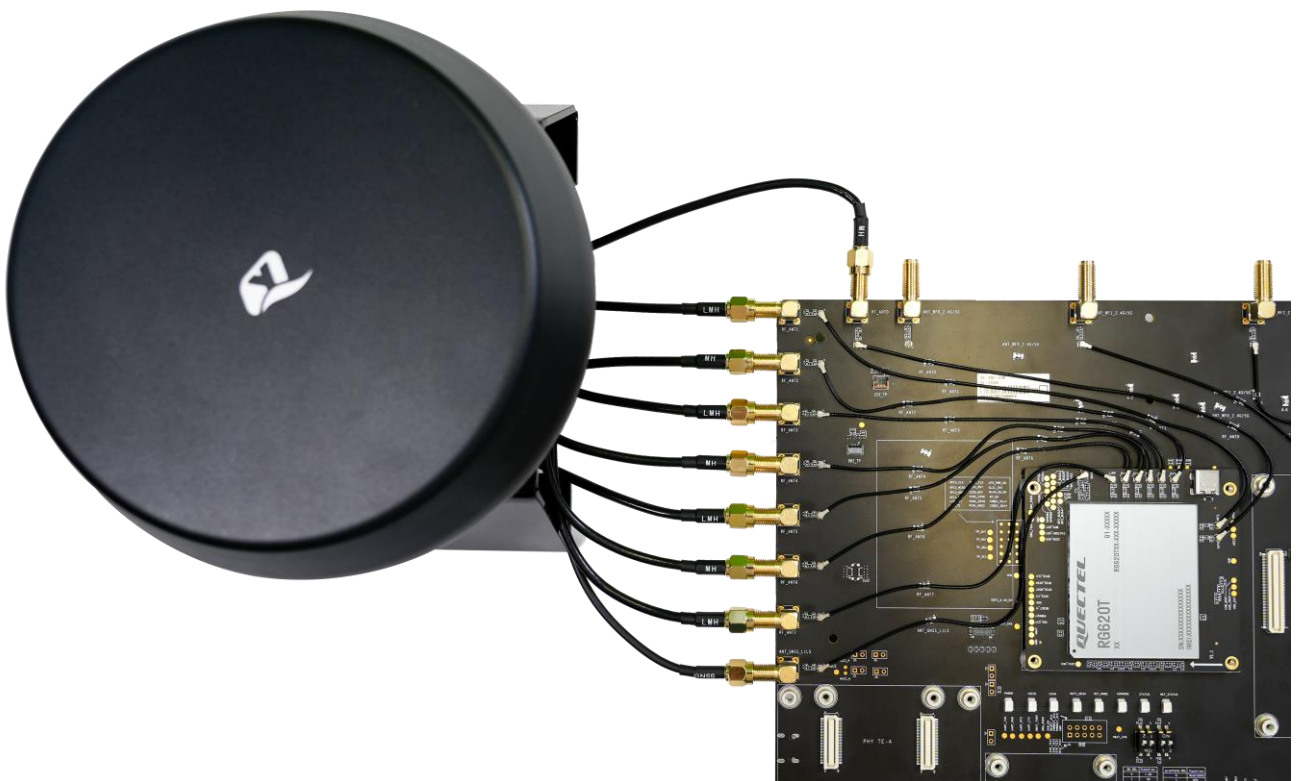


Figure 32: Module Part Antenna Interfaces



Figure 33: Wi-Fi Part Antenna Interfaces*

4.14. Switches and Buttons

The EVB includes six switches and three buttons, as shown in the following table and figures:

Table 20: Description of Switches and Buttons

RefDes.	Description
S0203	VBAT on/off control
S1202	<ul style="list-style-type: none"> ● Power key (push button) ● Used to turn on/off the module
S1204	<ul style="list-style-type: none"> ● Reset button (push button) ● Used to reset the module
S1203	Wi-Fi protected setup
S1201	Used to restore the module
S1205	<ul style="list-style-type: none"> ● USB_BOOT Signal (DIP switch) ● Used to emergency download ● PON_1 Signal (DIP switch) ● Used to turn on the module automatically
S0301	<ul style="list-style-type: none"> ● Used to choose the GPIO according to different platforms ● High: for RG650E module series ● Low: for RG620T module series

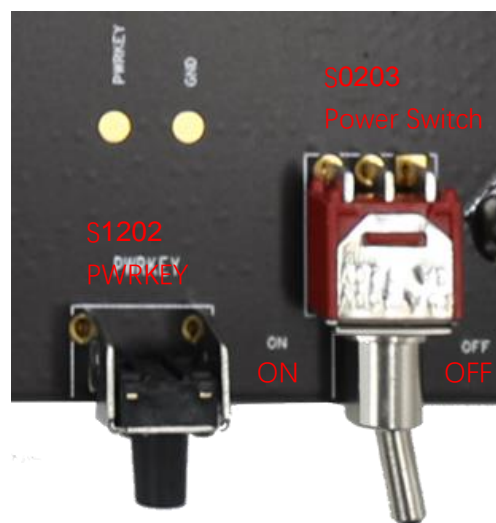


Figure 34: S0203 Switch and S1202 Button

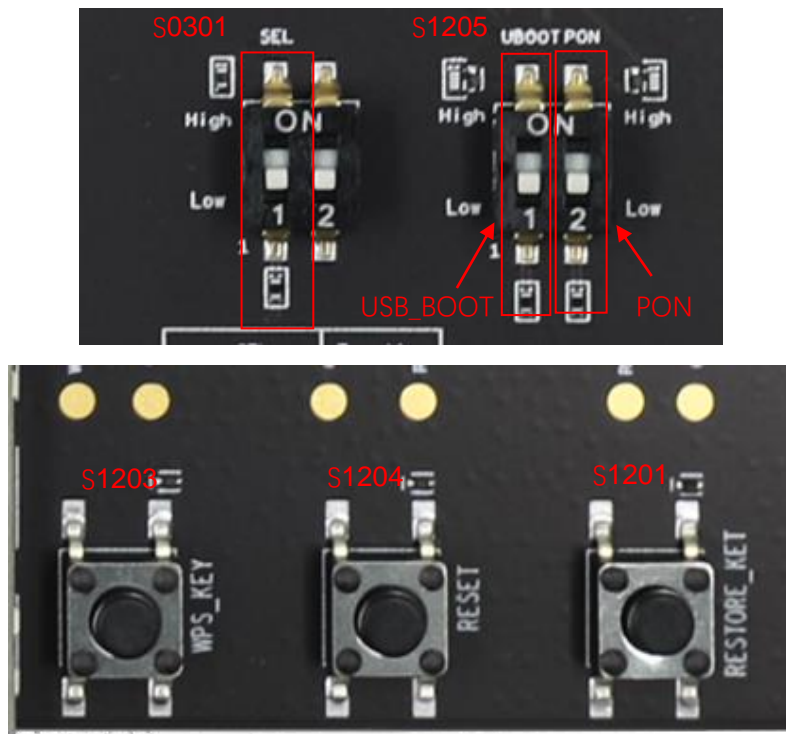


Figure 35: S1205 Switch and S0301/S1203/S1204/S1201 Buttons

5 Operation Procedures

This chapter introduces how to use the 5G-SOC EVB for testing and evaluation of applicable modules. Before the procedures below, please ensure modules and the EVB are correctly assembled.

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)SIM card connectors (J0901/J0902) on the EVB.
3. Use cellular cables 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, then switch S0203 to the “**ON**” side, the power supply of the EVB board is ready. Then D1205 (power supply on/off indicator) will light up, which indicates that the power supply for the whole EVB is ready.
5. Press the PWRKEY S1202 for at least 500 ms, then the module will be turned on and D1207 (module operation status indicator) will light up.

NOTE

The turn-on should be performed only after the EVB assembling is completed to avoid any possible damage.

5.2. Turn Off the Module

There are two methods to turn off the module.

- Turn off the module with **AT+QPOWD***. This is the best and the safest method. The module will log off from the network and save data before shutdown. When turning off the module with AT command, please keep PWRKEY at a high level after the execution of the turn-off command, otherwise, the module will be turned on again after successful turn-off.
- Turn off the module with PWRKEY button (S1202). Long press PWRKEY for at least 800 ms, then the module will be turned off.

5.3. Communication Via USB

1. Turn on the module according to the procedure in **Chapter 5.1**.
2. Connect the EVB and a PC with USB cable through USB Type-C interface, 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 when the USB driver is installed, as shown below.



Figure 36: 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 usage and configuration, see **document [3]**.

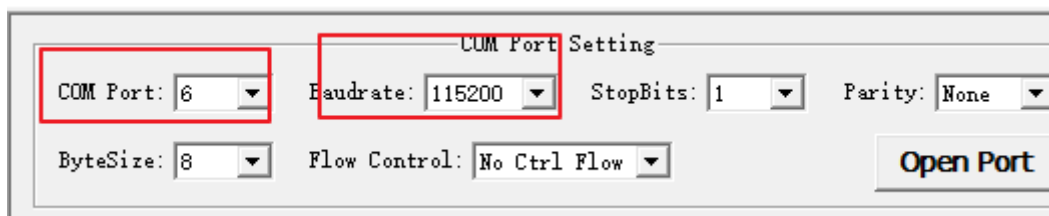


Figure 37: COM Port Setting Field on QCOM (USB AT Port Connection)

5.4. Communication Via UART Interface

1. Power supply for 5G-SOC EVB.
2. Connect the UART interface to PC with USB-to-RS232 converter cable, and install the USB-to-RS232 driver from the Driver Disk. Serial port number can be viewed through the PC Device Manager, such as below:

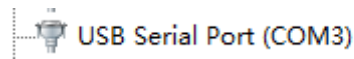


Figure 38: USB Serial Port

3. Configure AT Command Window, set correct baud rate (such as 115200 bps) and COM number which can be checked by the Device Manager on PC, then operate the module via AT commands.

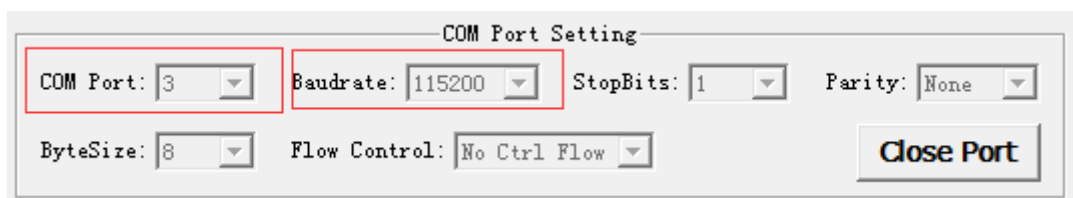


Figure 39: QCOM Configuration Under Serial Port

5.5. 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.

5.5.1. Emergency Download

1. Install the firmware upgrade tool QFlash on PC.
2. Connect the EVB and the PC through USB Type-C cable.
3. Turn the USB_BOOT DIP switch (S1205) to the "ON" side .
4. Insert the DC power adapter and turn on the module.
5. Upgrade the firmware with QFlash. See **document [4]** for details about the use of QFlash.

5.5.2. Normal Download

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

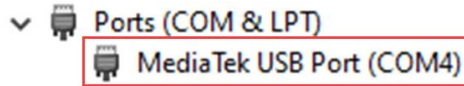


Figure 40: USB Ports in PC Device Manager

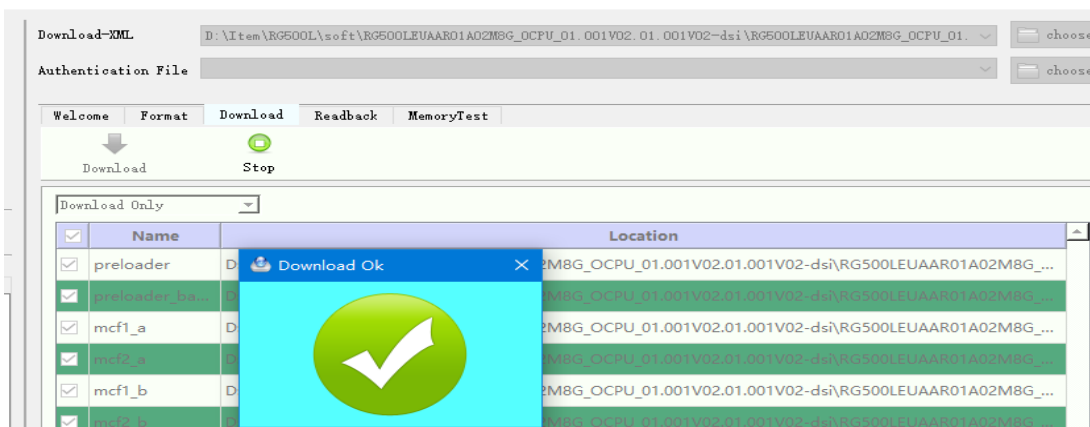


Figure 41: Firmware Download OK

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

5.6. Reset the Module

Reset is only used in case of emergency or abnormality. For example, the software fails to respond for more than 5 seconds due to some serious problems.

Press the button S1204 (RESET), and then release it to reset the module. For more details about resetting time, see the module’s hardware design. Note that this operation may cause loss of information in the memory as the module will be initialized after the resetting.

6 Appendix References

Table 21: 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 22: Terms and Abbreviations

Abbreviation	Description
AT	Attention
BTB	Board to Board
COM	Cluster Communication Port
DBI	Display Bus Interface
DC	Direct Current
DIO	Digital Input/Output
DI	Digital Input
DIP	Dual In-line Package
DO	Digital Output
DSI	Display Serial Interface
EVB	Evaluation Board
GND	Ground

GNSS	Global Navigation Satellite System
GPS	Global Positioning System
I/O	Input/Output
LED	Light Emitting Diode
LCD	Liquid Crystal Display
LDO	Low Dropout Regulator
LED	Light Emitting Diode
NFC	Near Field Communication
PC	Personal Computer
PCIe	Peripheral Component Interconnect Express
PO	Power Output
RF	Radio Frequency
SD	Secure Digital
SDIO	Secure Digital Input and Output
SLIC	Subscriber Line Interface Circuit
TP	Touch Panel
UART	Universal Asynchronous Receiver & Transmitter
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
VBAT	Voltage at Battery (Pin)
VoIP	Voice over Internet Protocol
Wi-Fi	Wireless Fidelity
WPS	Wi-Fi Protected Setup
