

5GDM0x-EV EVB

User Guide

5G Module Series

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Safety Information

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



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



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



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



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



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



In locations with explosive or potentially explosive atmospheres, obey all posted signs and turn off wireless devices such as mobile phone or other cellular terminals. Areas with explosive or potentially explosive atmospheres include 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
-	2023-02-02	Dover CAI	Creation of the document
1.0.0	2023-02-02	Dover CAI	Preliminary

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1 Introduction

This user guide describes the application details of 5GDM0x-EV EVB (evaluation board, currently includes 5GDM01-EV and 5GDM02-EV), 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 modules that this EVB applies to, 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 5GDM0x-EV EVB is 130 mm × 160 mm, and the top and bottom views are shown as below:

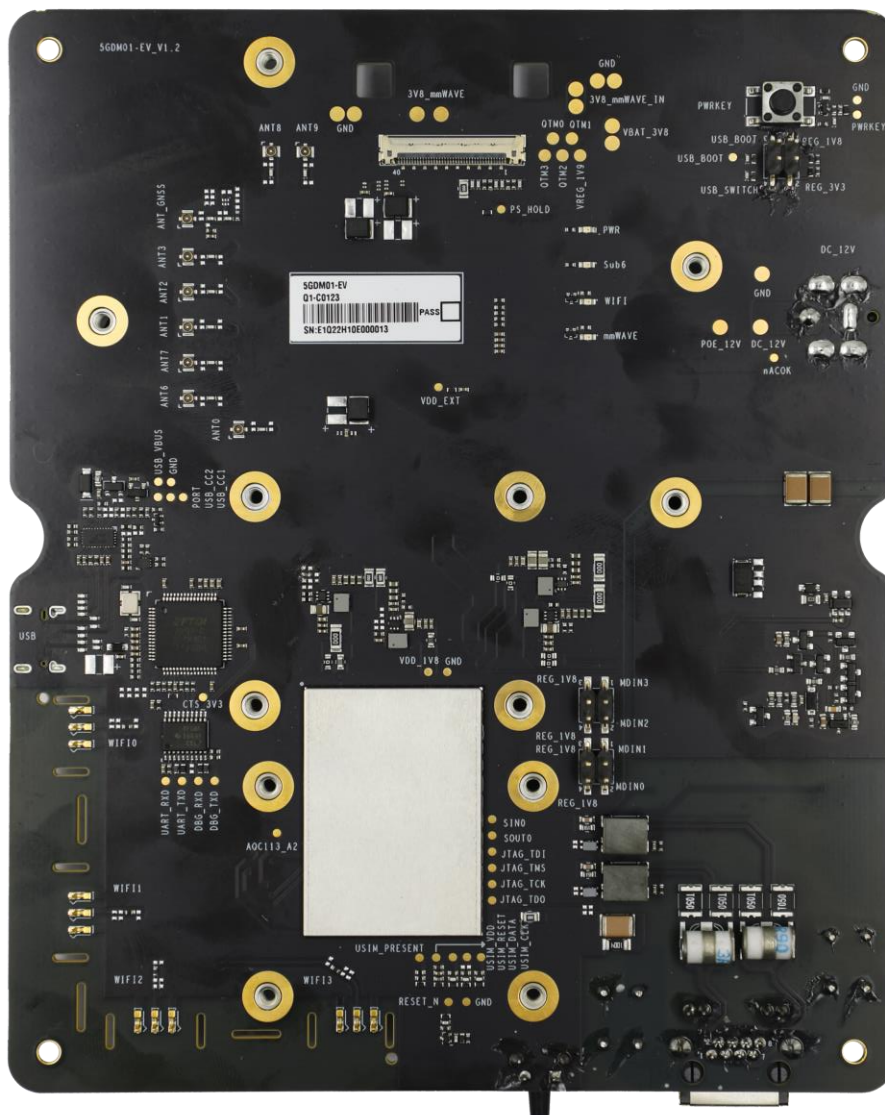


Figure 1: Top View



Figure 2: Bottom View

2.2. Component Placement

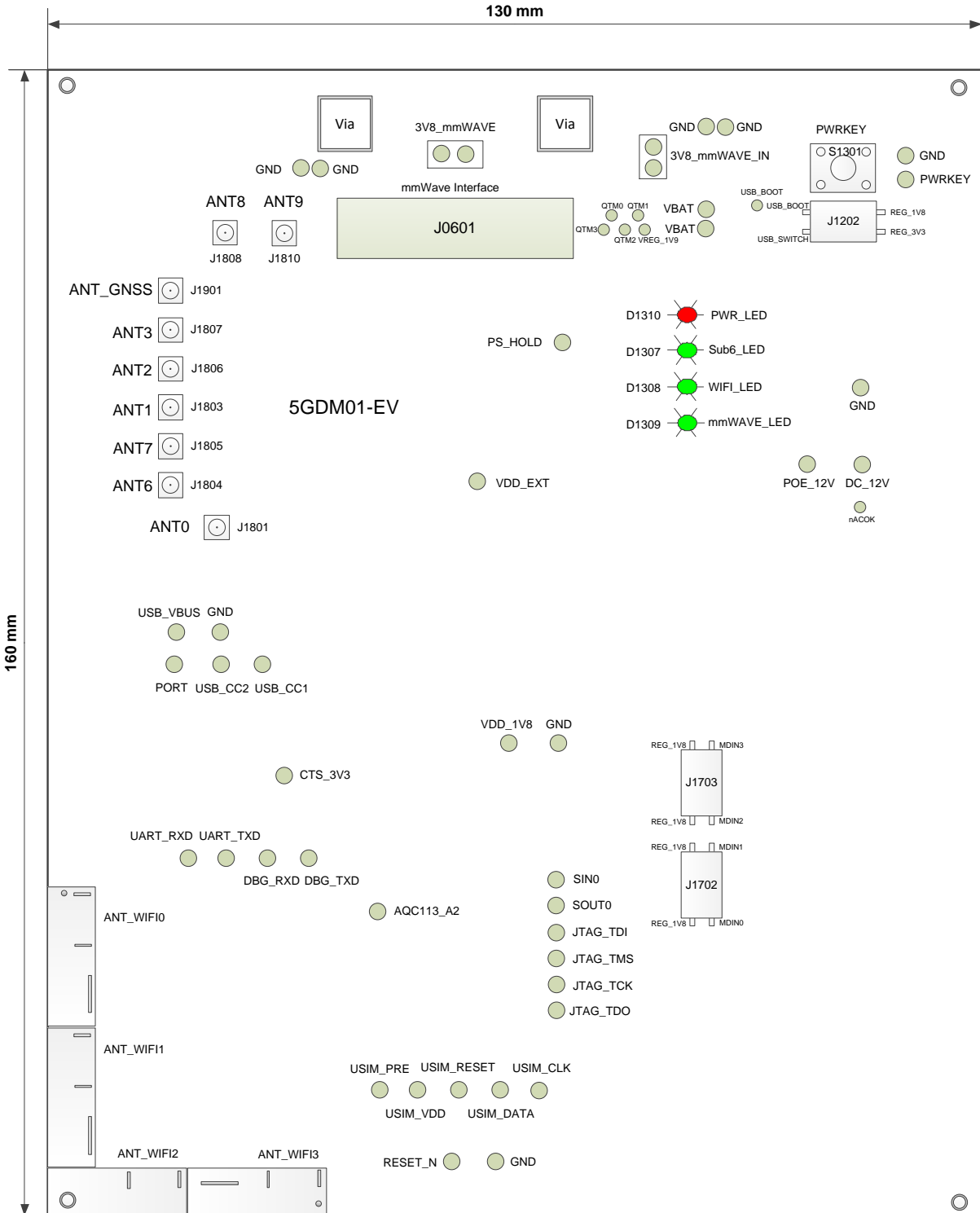


Figure 3: Top View for Component Placement

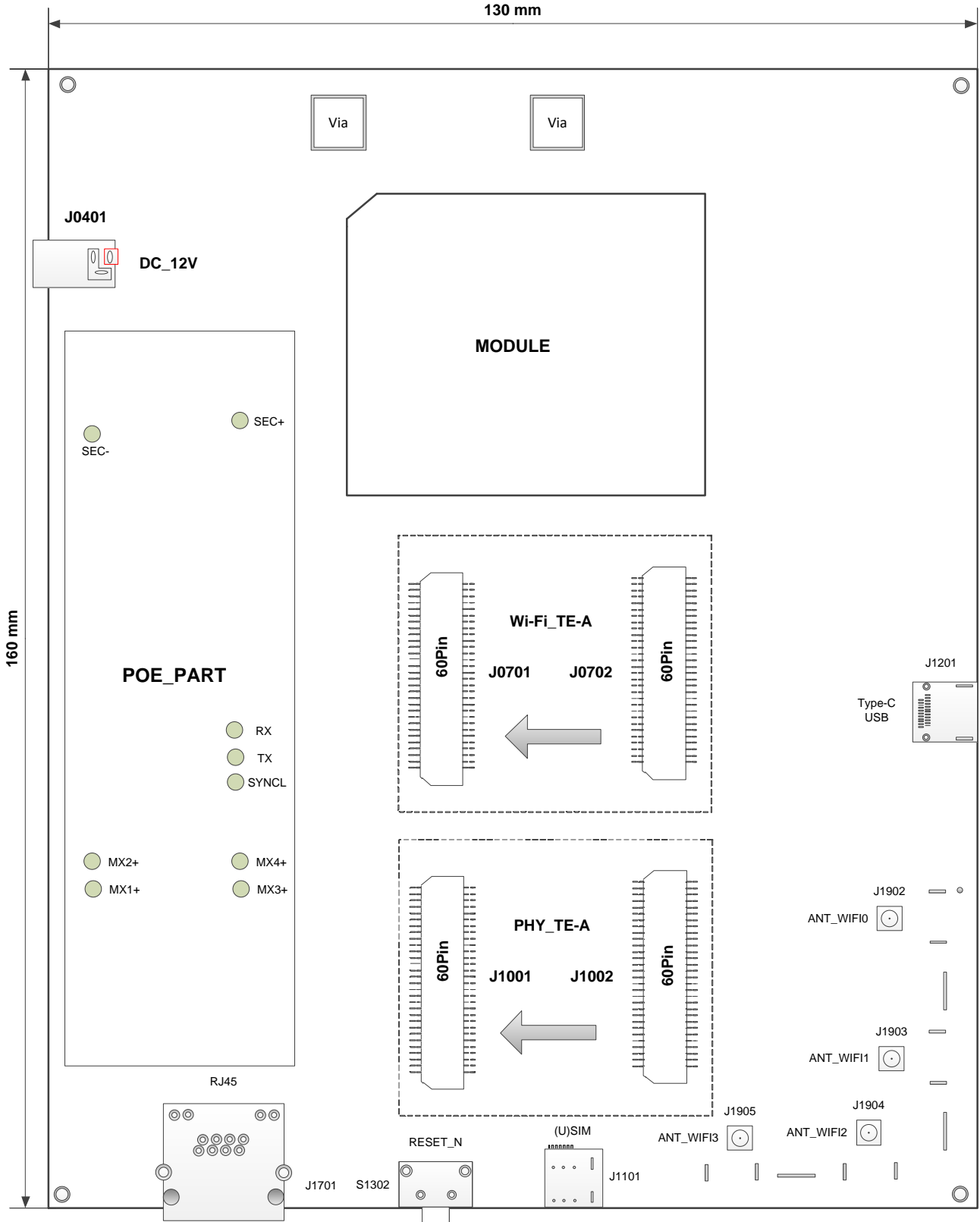


Figure 4: Bottom View for Component Placement

Table 2: Components & Functions

Components	RefDes.	Description	Implementation
Power Supply	J0401	Power jack on the EVB	<ul style="list-style-type: none"> ● DC power supply: 12–14 V ● Typical supply voltage: +12 V/ 8 A
RESET	S1302	Reset button (Push button) Used to reset the module	Reset the module
PWRKEY	S1301	Power key (push button)	<ul style="list-style-type: none"> ● Reserved ● Turn ON/OFF the module
USB Interface		USB Type-C interface	USB 3.1 and USB 2.0 communication
Debug UART	J1201	DBG_UART for debugging	Default baud rate: 115200 bps
Main UART		MAIN_UART for data communication	Default baud rate: 115200 bps
UART-to-USB	J1202	<ul style="list-style-type: none"> ● USB_SWITCH to REG_3V3: main UART, debug UART and USB 3.1 only ● USB_SWITCH not to REG_3V3: USB 2.0 and USB 3.1 	J1202 of USB_SWITCH is used to convert UART to USB 2.0 signal
USB_BOOT	J1202	Emergency download mode	J1202 of USB_BOOT is for emergency download mode when it is connected to REG_1V8.
(U)SIM Card Interface	J1101	<ul style="list-style-type: none"> ● (U)SIM card connector ● Support Nano (U)SIM card 	<ul style="list-style-type: none"> ● Support (U)SIM card insertion detection. ● (U)SIM card supported: 1.8 V and 2.95 V
LAN Interface*	J1701	Connected to PC with LAN cable	RJ45 port
Status Indicators	D1310	Power supply ON/OFF indicator	4 LEDs available for signal indication
	D1307*	Sub-6 status indicator	
	D1308*	Wi-Fi status indicator	
	D1309*	mmWave status indicator	
PHY TE-A*	J1001 J1002	PHY TE-A connector	<ul style="list-style-type: none"> ● PHY QCA8081/AQR113 supported ● Reserved
Wi-Fi TE-A*	J0701 J0702	Wi-Fi TE-A connector	<ul style="list-style-type: none"> ● Wi-Fi WCN6856 supported ● Reserved

mmWave Interface	J0601	mmWave connector	mmWave interface
Module	U0201	Module interface	Module
Wi-Fi Antenna Interfaces	J1902, J1903, J1904, J1905	Wi-Fi antenna connector	<ul style="list-style-type: none"> ● Reserved ● 4 Wi-Fi antenna connectors
Sub-6 Antenna Interfaces	J1801, J1803, J1804, J1805, J1806, J1807, J1808, J1810	Sub-6 antenna connector	8 Sub-6 antenna connectors
GNSS Antenna Interface	J1901	GNSS antenna connector	1 GNSS antenna connector

3 Kit Accessories & Assembly

3.1. Accessories Assembly

This chapter will be offered in the next version.

3.2. Accessories List

All accessories of the 5GDM0x-EV EVB kit are listed as below. Please contact the supplier if there is something missing.

Table 3: Accessories List

Items	Description	Quantity (pcs)
Power Adapter	+12 V/ 3 A power adapter	1
Cables	10 gigabit Ethernet cable	1
	USB Type-C cable	1
	RF mmWave cables	8
	Sub-6 GHz RF cables	8
	RF Wi-Fi cables	2
	GNSS cable	1
	Antennas	RF mmWave antenna
GNSS antenna (passive)		1
Wi-Fi antennas		2
Sub-6 GHz antennas		8

Driver disk	<ul style="list-style-type: none"> ● USB driver ● QUD driver and UDE driver ● Related tools for modules 	1
Memory	8 GB U-disk	1
USB Driver	Including module's related documents, tools & drivers etc.	1
PHY TE-A	Options QCA8081-TE-A/AQR113-TE-A	1
Wi-Fi TE-A	WCN6856-TE-A (Optional)	1
FPC	The power FPC transmits power and control signal from the EVB to RA530T	1
mmWave interface	RA530T	1
Adapter plug	Adapter plug type: BS	1
	Adapter plug type: EU	1
	Adapter plug type: US	1
	Adapter plug type: CN	1
Screws	Used to fasten TE-A on the EVB	20
Bolts & Nuts	Bolts and nuts for assembling the EVB	4
Instruction Sheet	A sheet of paper giving instructions for EVB connection, details of EVB accessories, etc.	1

4 Application Interfaces

This chapter describes the hardware interfaces of the 5GDM0x-EV EVB, as listed below:

- Power supply
- USB interface
- (U)SIM card interface
- LAN interface*
- Status indicators
- Module interface
- PHY TE-A interfaces*
- Wi-Fi TE-A interfaces*
- mmWave TE-A interface
- Antenna Interfaces
- Switch
- Buttons
- Test points

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
J0401	Power jack on the EVB

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

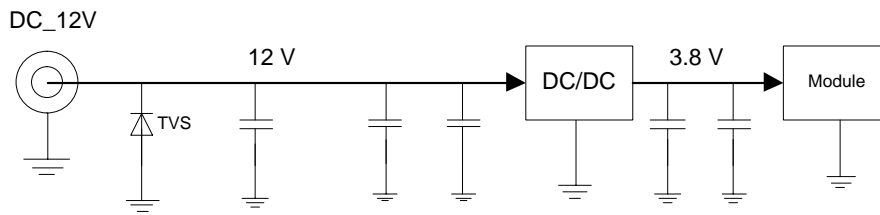


Figure 5: Block Diagram of EVB Power Supply

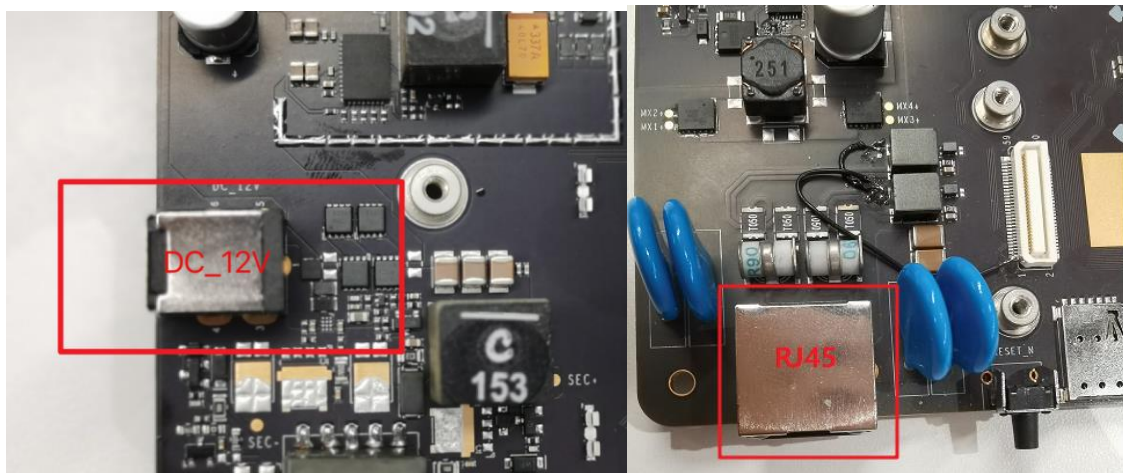


Figure 6: EVB Power Supply Interface

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

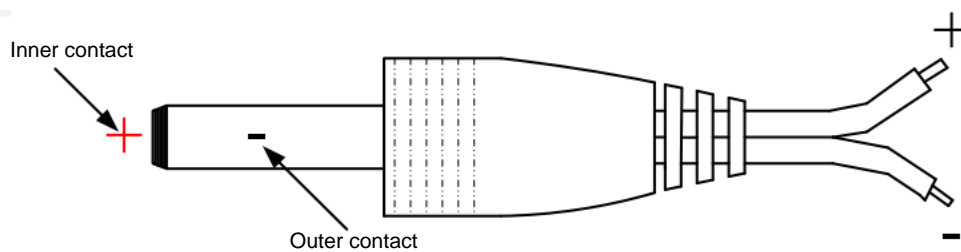


Figure 7: Power Plug Design

4.2. USB Interface

The EVB provides a USB 3.1/2.0 Type-C interface and supports SuperSpeed (10 Gbps) high-speed (480 Mbps) and full-speed (12 Mbps) for connection with a host device, as shown in **Figure 8** and **Figure 9**. This USB interface is used for AT command communication, data transmission, GNSS NMEA sentences output, software debugging and firmware upgrade.

Table 5: Description of USB Interface

RefDes.	Description
J1201	<ul style="list-style-type: none"> • USB Type-C interface, used for USB 3.1 and USB 2.0 communication • Debug UART for debugging • Main UART for data communication

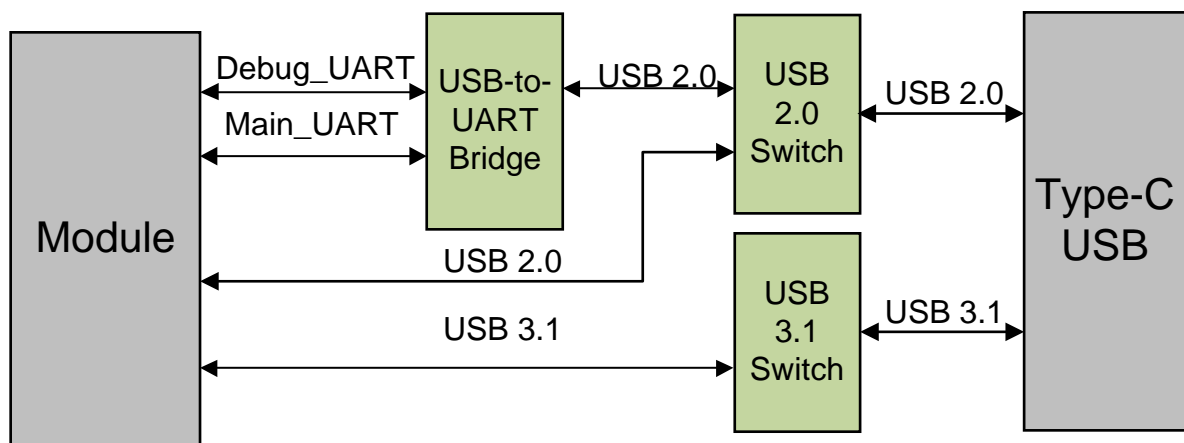


Figure 8: Connection Between Module and USB Type-C Interface

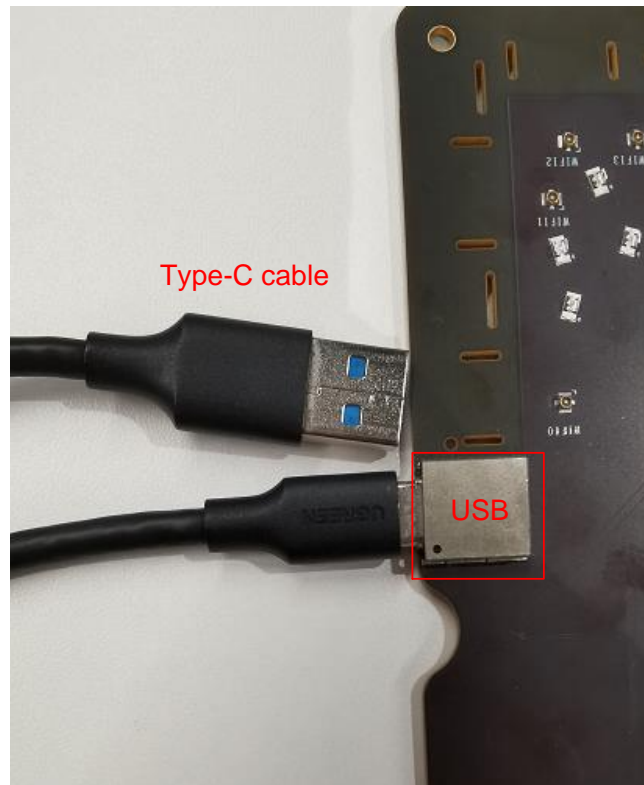


Figure 9: USB Interface Connection

- When J1202 of USB_SWITCH is connected to REG_3V3, USB is connected to main UART, debug UART and USB 3.1 only.
- When J1202 of USB_SWITCH is not connected to REG_3V3, USB is connected to USB 2.0 and USB 3.1.

Table 6: USB 2.0 and UART Configuration Switch

USB_SWITCH (J1202)	Function
USB_SWITCH not to REG_3V3	USB 2.0 and USB 3.1→ USB
USB_SWITCH to REG_3V3	Main UART, debug UART and USB 3.1 only→USB

4.3. (U)SIM Card Interface

The EVB has a 7-pin push-push type (U)SIM card (1.8/2.95 V) interfaces which support 1.8/2.95 V (U)SIM card.

Table 7: Description of (U)SIM Card Interfaces

RefDes.	Description
J1101	(U)SIM card connector

The following figure shows a simplified connector schematic for this connector.

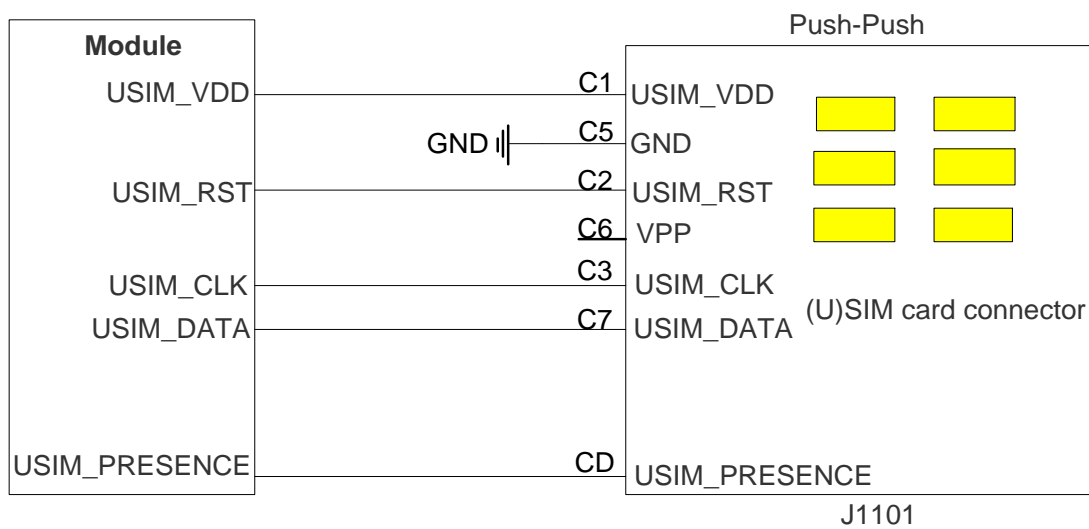


Figure 10: Simplified Connector Schematic for (U)SIM Card Connector

The figure and table below illustrate the pin assignment and definition of (U)SIM card connector J1101.

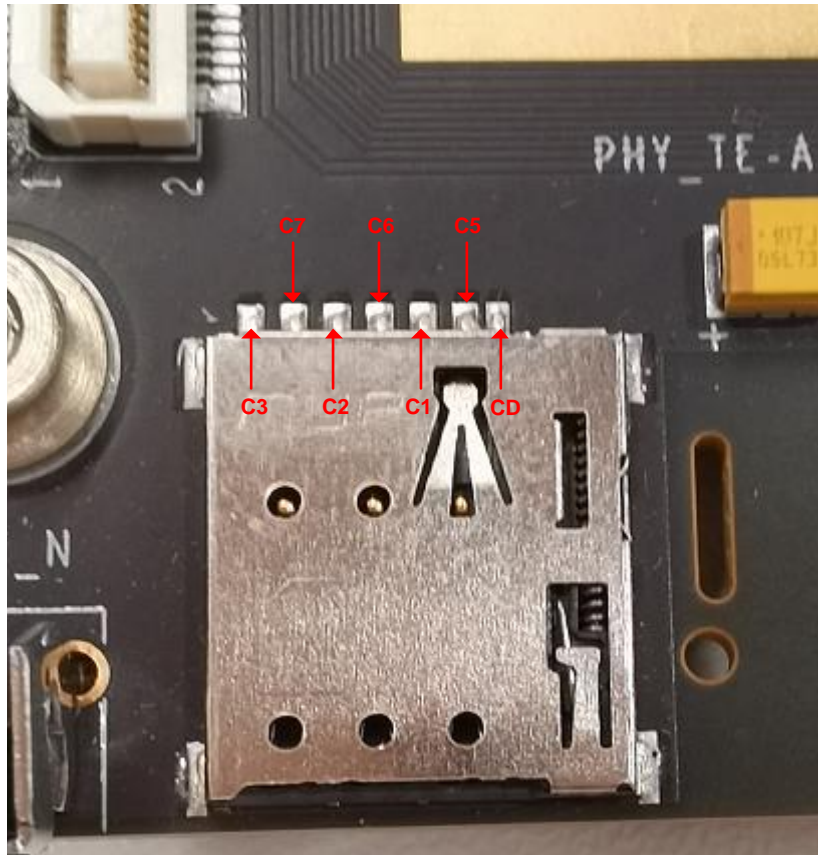


Figure 11: Pin Assignment of (U)SIM Card Connector J1101

Table 8: Pin Definition of J1101

Pin No.	Pin Name	I/O	Description
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
C5	GND	-	Ground
C6	VPP	-	NC
C7	USIM_DATA	DIO	Data line, bi-directional
CD	USIM_PRESENCE	DI	U(SIM) card insertion detection

4.4. LAN Interface*

The EVB provides a LAN interface to connect with PC. The following figure shows the location of the LAN connector.

Table 9: Description of LAN Interface

RefDes.	Description
J1701	Connected to PC with LAN cable

Users can set the RG530F series to PCIe RC mode through LAN interface. Automatic dialing can be realized by AT commands.

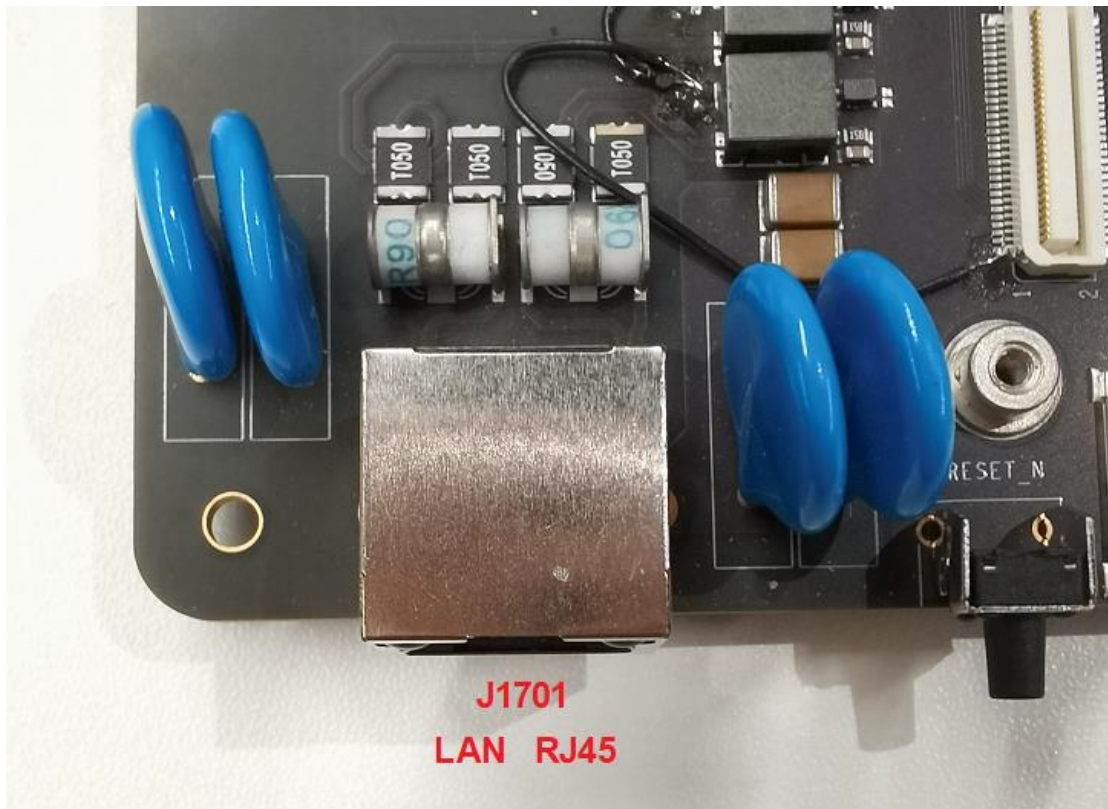


Figure 12: LAN Interface (J1701)

4.5. Status Indicators

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

Table 10: Description of Status Indication LEDs

RefDes.	Description
D1310	Indicates whether the power supply for module is ready. <ul style="list-style-type: none"> ● ON: VBAT ON ● OFF: VBAT OFF
D1307*	Indicates the module's network registration mode. <ul style="list-style-type: none"> ● ON: registered in Sub-6 network ● OFF: others
D1308*	Indicates the status of Wi-Fi. <ul style="list-style-type: none"> ● ON: Wi-Fi is turned ON ● OFF: Wi-Fi is turned OFF
D1309*	Indicates the status of mmWave. <ul style="list-style-type: none"> ● ON: mmWave is turned ON ● OFF: mmWave is turned OFF

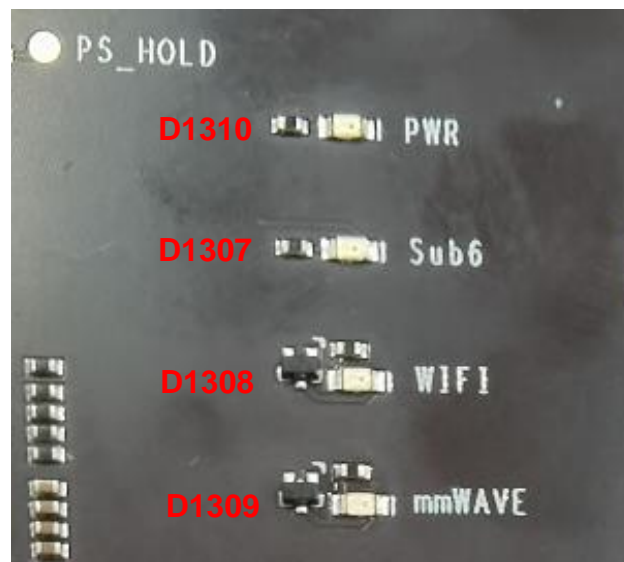


Figure 13: Status Indicators

4.6. Module Interface

Module interface is designed to on board of applicable modules. The developer will be able to test the functionalities of the modules easily.

Table 11: Description of Module Interface

RefDes.	Description
U0201	Module interface

The following figure shows the module on the EVB board.



Figure 14: Module Interface on the EVB board

4.7. PHY TE-A Interfaces*

The PHY TE-A interface is designed to accommodate the PHY TE-A (QCA8081 TE-A/AQR113 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 12: Description of PHY TE-A Interfaces

RefDes.	Description
J1001	PHY TE-A connectors
J1002	

The following two figures display the connection between QCA8081 TE-A and EVB.

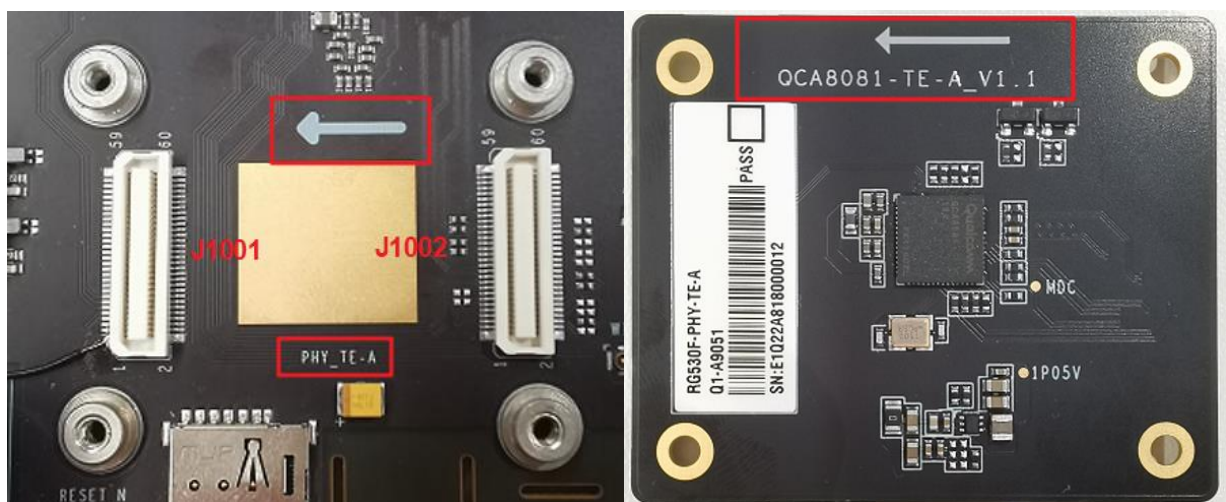


Figure 15: Connection Between QCA8081 TE-A and EVB

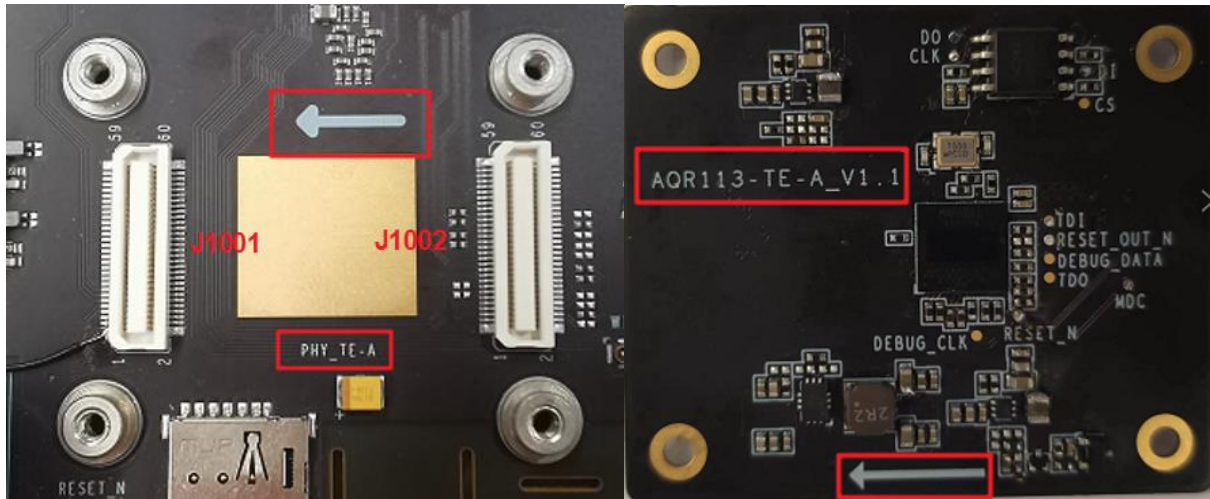


Figure 16: Connection Between AQR113 TE-A and EVB

4.8. Wi-Fi TE-A Interfaces*

The Wi-Fi TE-A interface is designed to accommodate Wi-Fi TE-A. 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 13: Description of Wi-Fi TE-A Interfaces

RefDes.	Description
J0701	Wi-Fi TE-A connectors
J0702	

The following two figures show the connection between WCN6856 TE-A and EVB.

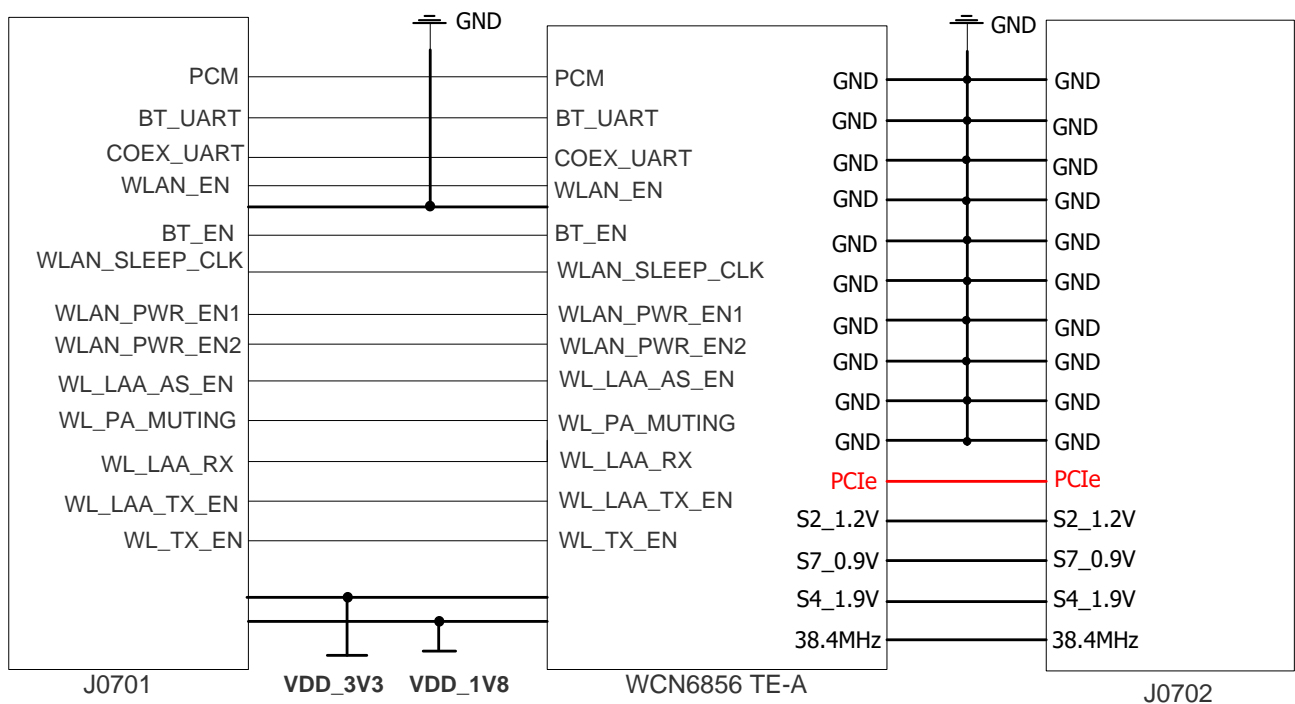


Figure 17: Simplified WCN6856 TE-A Interface Schematic

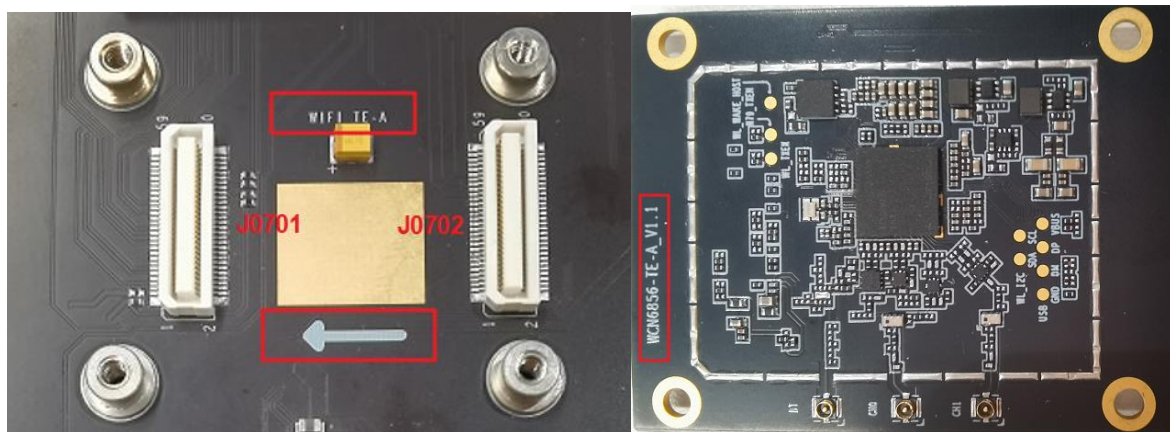


Figure 18: Connection Between WCN6856 TE-A and EVB

4.9. mmWave interface

The mmWave interface is connected to the EVB via connector and flexible flat cable. The antennas are connected from module to mmWave interface. The interface allows developers to test the mmWave function of the module or to develop applications with mmWave function easily.

Table 14: Description of mmWave Interface

RefDes.	Description
J0601	mmWave interface

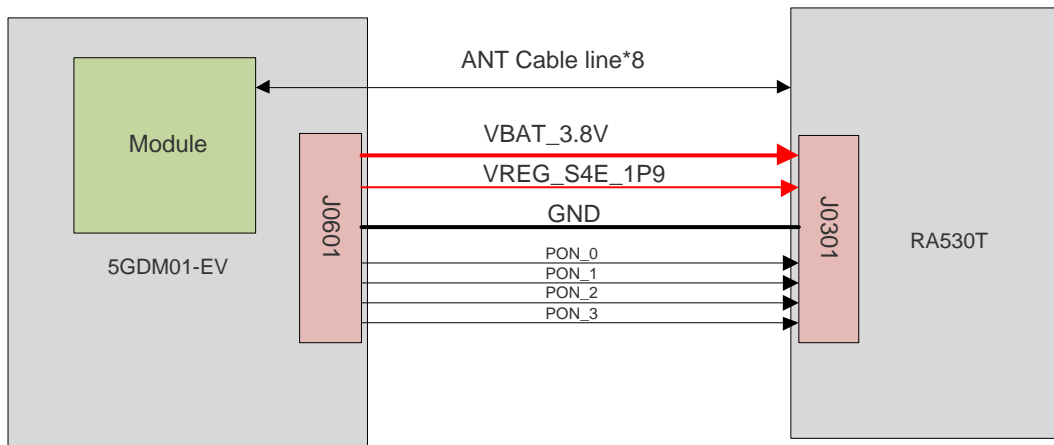


Figure 19: Simplified mmWave Interface Schematic

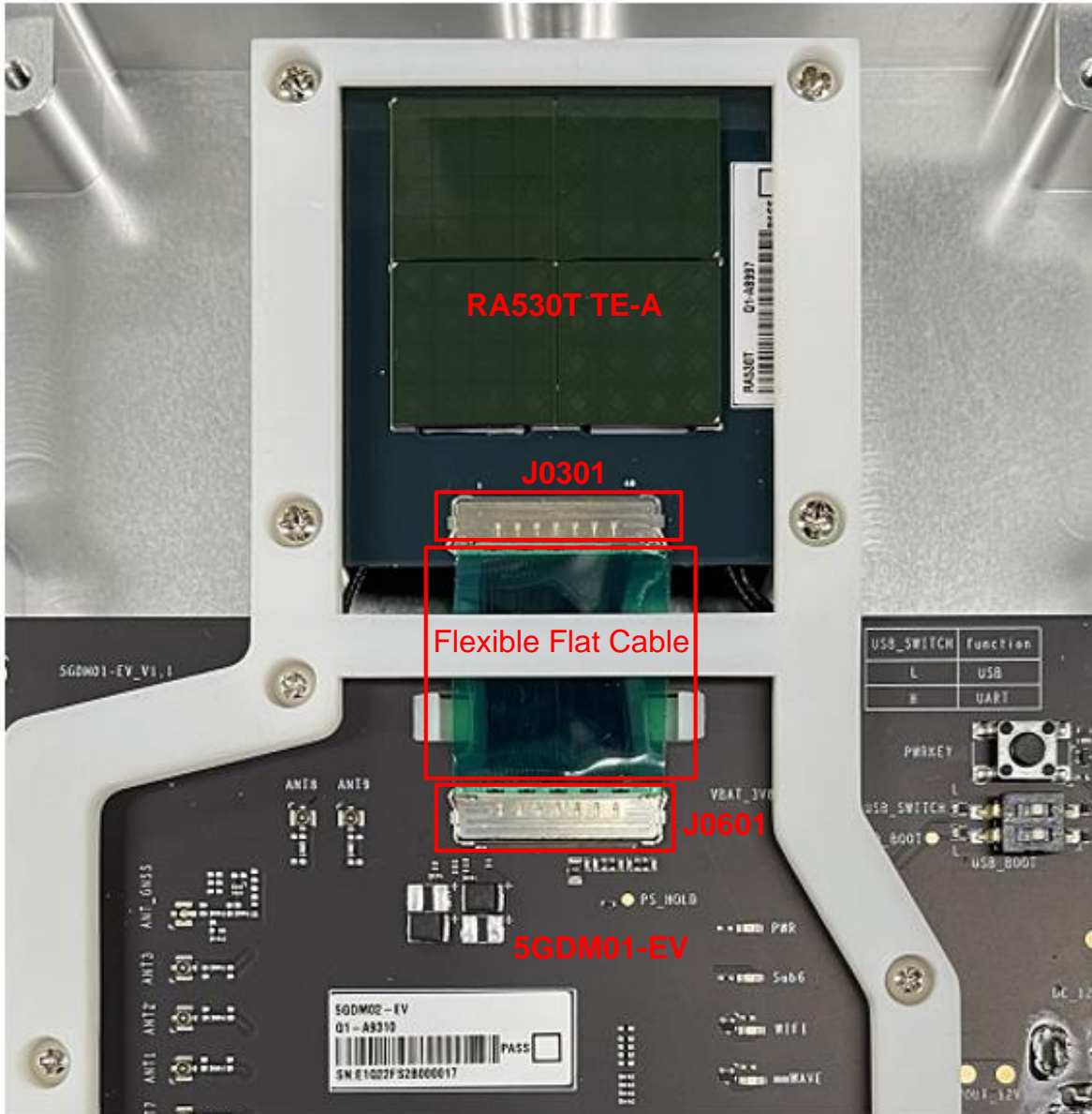


Figure 20: Connection Between RA530T and EVB

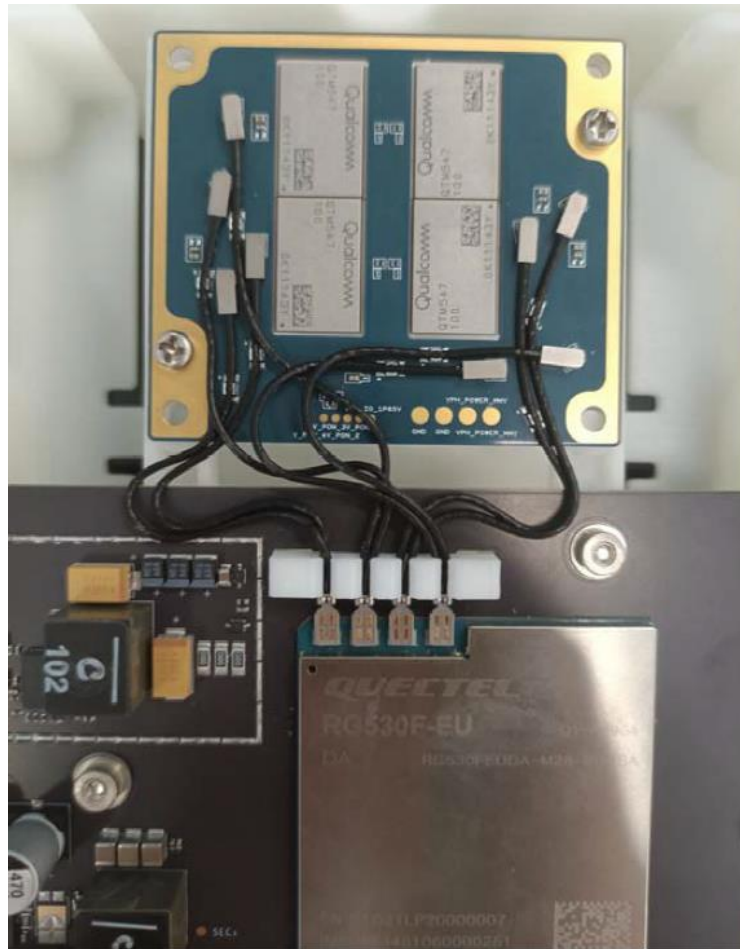


Figure 21: Antenna Connection Between RA530T and Module

4.10. Antenna Interfaces

The EVB includes three type antenna interfaces: Wi-Fi antennas, Sub-6 antennas, GNSS antenna.

Table 15: Wi-Fi, Sub-6 and GNSS Antenna Interfaces

Antenna Types	RefDes.	Description
Wi-Fi Antenna Interfaces	J1902, J1903, J1904, J1905	<ul style="list-style-type: none"> ● Reserved ● 4 Wi-Fi antenna connectors
Sub-6 Antenna Interfaces	J1801, J1803, J1804, J1805, J1806, J1807, J1808, J1810	8 Sub-6 antenna connectors
GNSS Antenna Interface	J1901	1 GNSS antenna connector

4.11. Switch and Buttons

The EVB includes two buttons & one switch , as shown in the following table and figures:

Table 16: Description of Buttons

RefDes.	Description
S1301	<ul style="list-style-type: none"> ● Power key (push button) reserved ● Used to turn ON/OFF the module
S1302	<ul style="list-style-type: none"> ● Reset button (push button) ● Used to reset the module



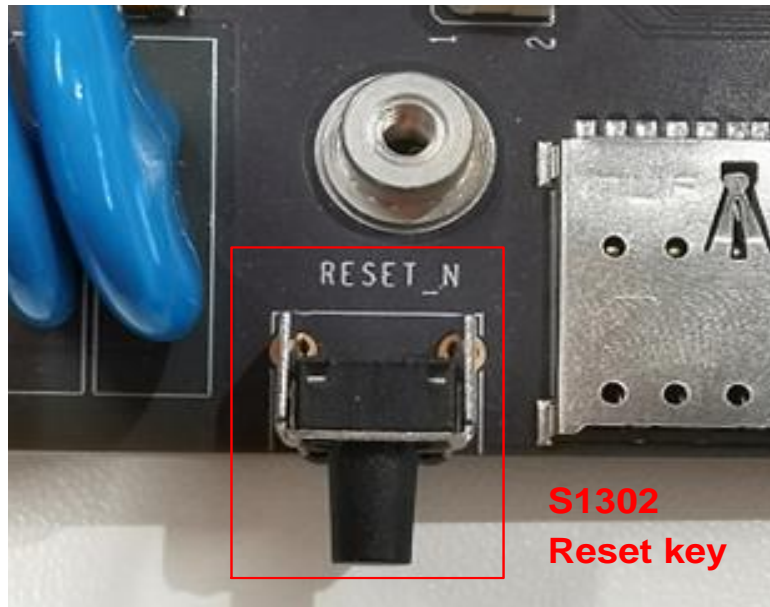


Figure 22: Power Key and Reset

Table 17: Description of Switch

RefDes.	Description
J1202	<ul style="list-style-type: none"> ● USB_SWITCH not to REG_3V3: USB 2.0 and USB 3.1 ● USB_SWITCH to REG_3V3: main UART, debug UART and USB 3.1 only ● USB_BOOT not to REG_1V8: Normal mode ● USB_BOOT to REG_1V8: Emergency download mode

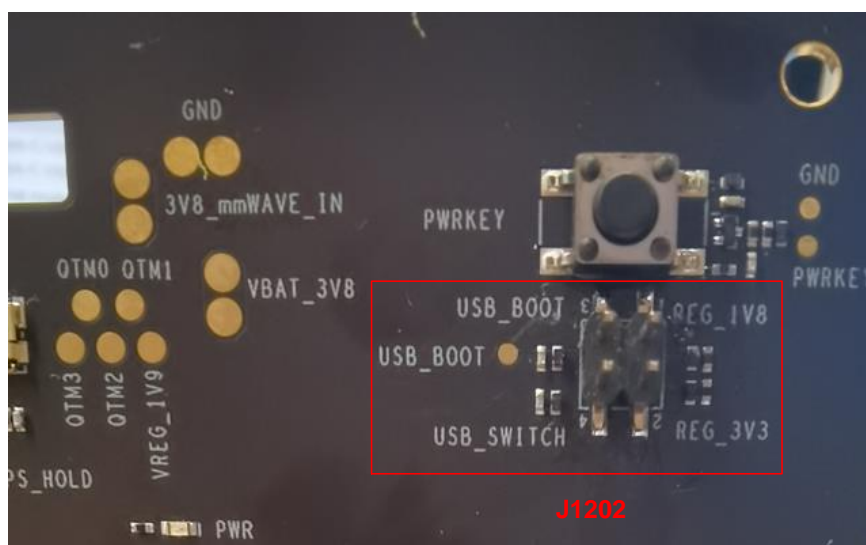


Figure 23: J1202 Switch

4.12. Test Points

The EVB provides test points which help you obtain the corresponding waveforms of some signals. The following figures show the details of all test points.

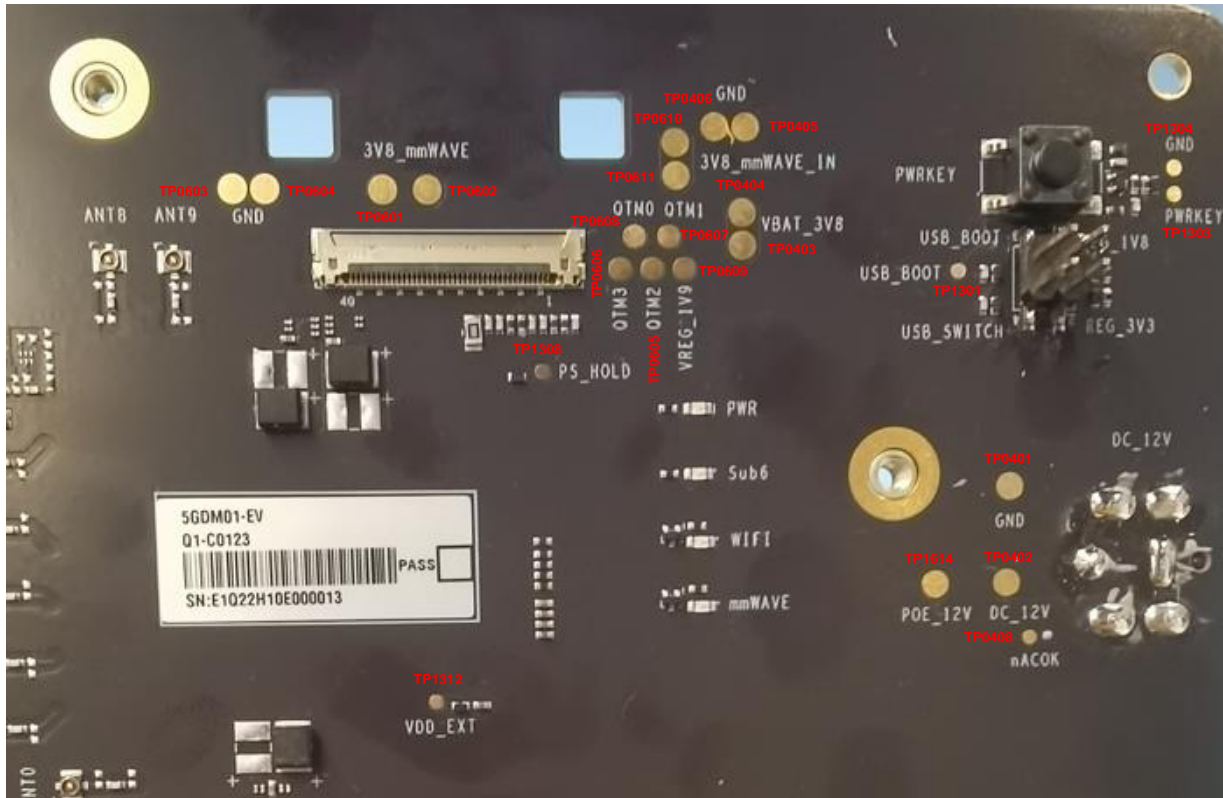


Figure 24: Test Points of Power and Power Key

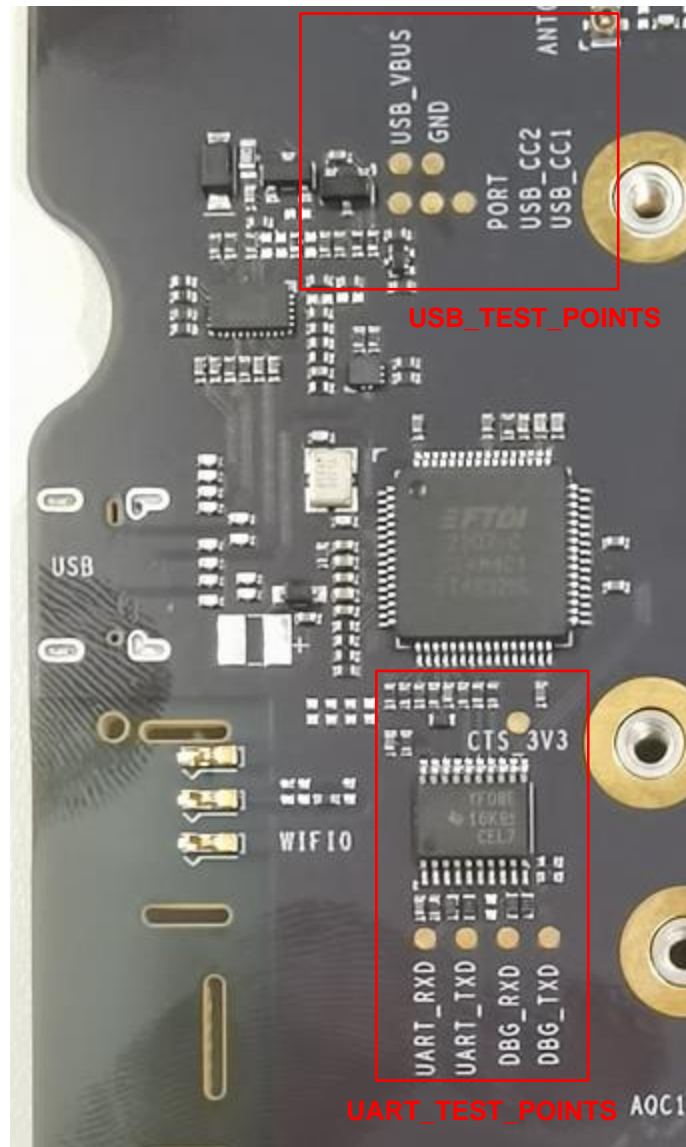


Figure 25: Test Points of USB and UART



Figure 26: Test Points of POE

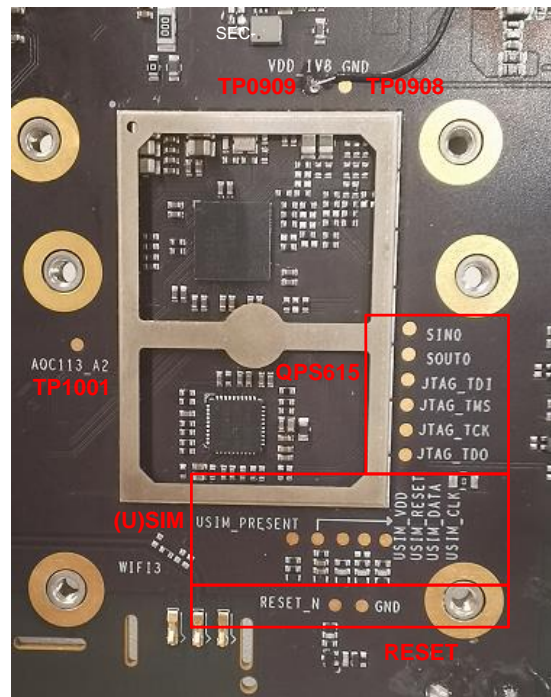


Figure 27: Test Points of QPS615 (U)SIM and Reset

Table 18: Definition of Test Points

Power and Power Key and mmWAVE		
Pin Name	Reference	Test Points Description
GND	TP0405/TP0406/TP0603 /TP0604 TP0401/ TP1304/TP1306/	Ground
VBAT_3V8	TP0403/TP0404	3.8 V power supply
USB_BOOT	TP1301	Emergency download
DC_12V	TP0402	DC 12 V OUT
POE_12V	TP1614	POE 12 V OUT
PS_HOLD	TP1308	PS HOLD of the module
VDD_EXT	TP1312	VDD_EXT 1.8 V of the module
PWRKEY	TP1303	Turn ON/OFF test points
3V8_mmWAVE	TP0601/TP0602/TP0610 /TP0611	mmWAVE 3.8 V power test points
VREG_1V9	TP0609	mmWAVE 1.9 V power test point
QTM0	TP0608	mmWAVE control test points
QTM1	TP0607	
QTM2	TP0605	
QTM3	TP0606	
nACOK	TP0408	Test point for debugging
USB and UART		
Pin Name	Reference	Test Points Description
PORT	TP1201	PORT pin of USB 3.0 switch
USB_VBUS	TP1204	VBUS of the USB 5 V
GND	TP1203	Ground
USB_CC1	TP1202	CC1 pin of the USB

USB_CC2	TP1205	CC2 pin of the USB
CTS_3V3	TP1406	CTS pin is 3.3 V
UART_RXD	TP1402	The RXD of the main UART 1.8 V
UART_TXD	TP1401	The TXD of the main UART 1.8 V
DBG_RXD	TP1404	The RXD of the debug UART 1.8 V
DBG_TXD	TP1403	The TXD of the debug UART 1.8 V

POE

Pin Name	Reference	Test Points Description
SEC-	TP1603	SEC- of the POE Transformer-
SEC+	TP1602	SEC+ of the POE Transformer+
RX	TP1617	RXD of the POE IC
TX	TP1618	TXD of the POE IC
SYNCL	TP1620	SYNCL of the POE IC
MX1+	TP1704	MX1+ is the Voltage of the MDIA
MX2+	TP1703	MX2+ is the Voltage of the MDIB
MX3+	TP1702	MX3+ is the Voltage of the MDIC
MX4+	TP1701	MX4+ is the Voltage of the MDID

QPS615 USIM and Reset

Pin Name	Reference	Test Points Description
VDD_1V8	TP0909	1.8 V LDO out of the QPS615
GND	TP0908/TP1306	Ground
AQC113_A2	TP1001	The led2 out of AQC113 (Reserved)
SIN0	TP0906	SIN0 of QPS615 (Reserved)
SOUT0	TP0907	SOUT0 of QPS615 (Reserved)
JTAG_TDI	TP0902	JTAG of QPS615

JTAG_TMS	TP0905	
JTAG_TCK	TP0904	
JTAG_TDO	TP0903	
USIM_PRESENT	TP1101	Hot plug of the (U)SIM
USIM_VDD	TP1105	VDD of the (U)SIM
USIM_RESET	TP1104	Reset of the (U)SIM
USIM_DATA	TP1102	Data of the (U)SIM
USIM_CLK	TP1103	CLK of the (U)SIM
RESET_N	TP1305	Reset key of the module

5 Operation Procedures

This chapter introduces how to use the 5GDM0x-EV 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. Insert a (U)SIM card into the (U)SIM card connector (J1101) on the EVB.
2. Use cellular cables to connect antennas to the EVB.
3. Connect the EVB to a 12 V/ 8 A power, or use LAN cable to connect PSE. Then D1310 (ON/OFF indicator of the module’s power supply) will light up, which indicates that the power supply for the whole EVB is ready. The EVB will turn on automatically.

NOTE

The module and the EVB will turn on automatically when the power adapter is connected. The PWRKEY is invalid and currently reserved only.

5.2. 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.

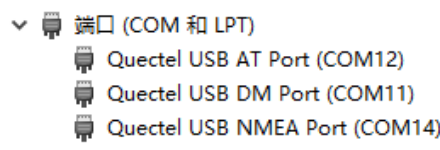


Figure 28: USB Ports

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 [2]**.

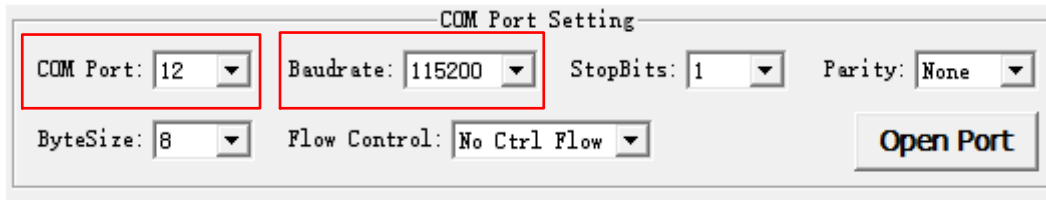


Figure 29: COM Port Setting Field on QCOM (USB AT Port Connection)

5.3. Communication via USB Interface of UART and USB 3.1 only

1. Power up 5GDM0x-EV.
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:

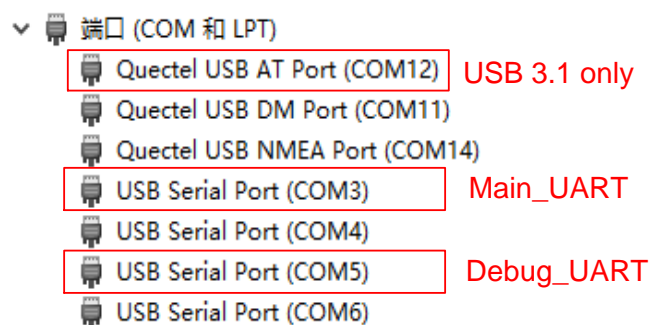


Figure 30: USB UART and USB 3.1 Only Port

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.

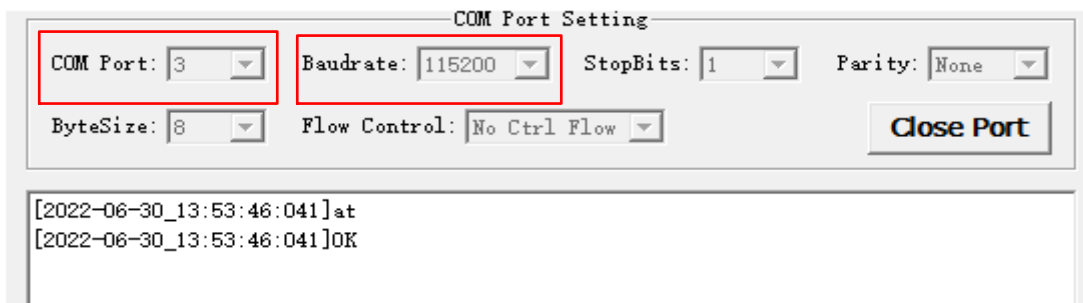


Figure 31: QCOM Configuration Under Main UART Port

4. 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 the Debug UART will output log.

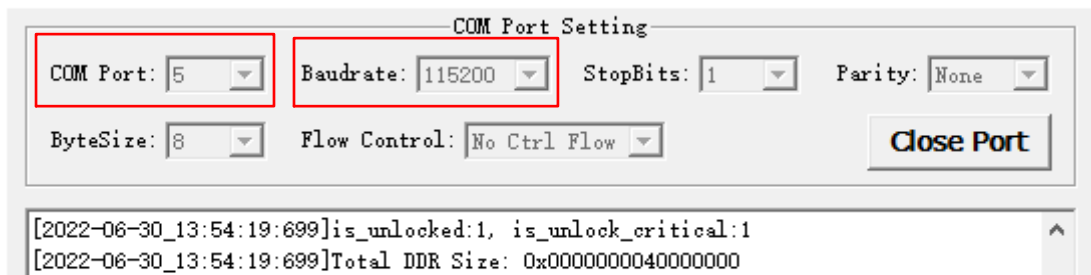


Figure 32: QCOM Configuration Under Debug UART Port

5.4. Firmware Upgrade

Firmware of the module is upgraded via USB 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.

5.4.1. Emergency Download

1. Install the firmware upgrade tool QFIL on PC.
2. Connect the EVB and the PC through USB Type-C cable.
3. Connect USB_BOOT to REG_1V8 of J1202 by 2.54 pitch jumper cap.
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 QFIL.

5.4.2. 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.

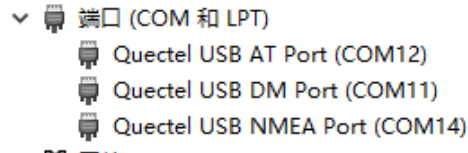


Figure 33: USB Ports in PC Device Manager

3. Open QFIL and upgrade the firmware.

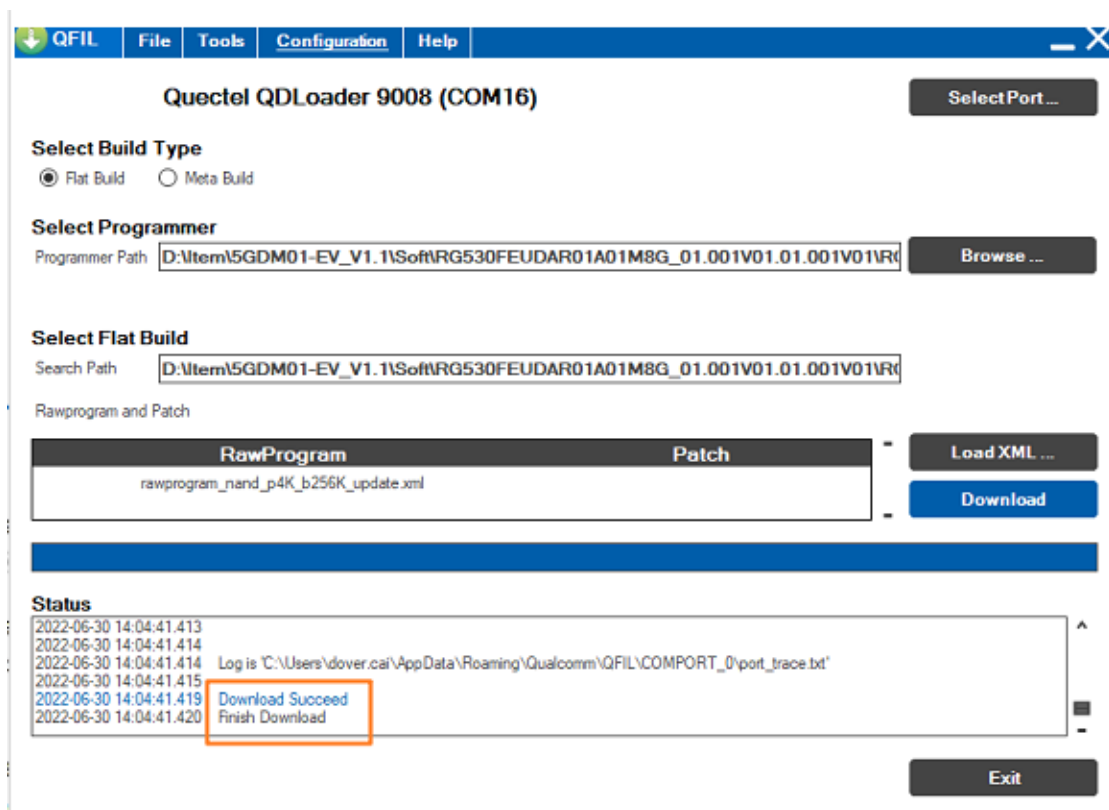


Figure 34: Firmware Download

5.5. 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 S1302 for at least 500 ms and then release it to reset the module. Please 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 19: 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

Table 20: Terms and Abbreviations

Abbreviation	Description
BTB	Board to Board
COM	Cluster Communication Port
DC	Direct Current
DI	Digital Input
DO	Digital Output
EV	Evaluation board
EVB	Evaluation Board
FPC	Flexible Printed Circuit
GND	Ground
GNSS	Global Navigation Satellite System
I/O	Input/Output
JTAG	Joint Test Action Group

LED	Light Emitting Diode
LAN	Local Area Network
mmWave	Millimeter wave
NC	Not Connected
OVP	Over Voltage Protection
PC	Personal Computer
PCB	Printed Circuit Board
PHY	Physical Layer
PO	Power Output
POE	Power Over Ethernet
PSE	Power Sourcing Equipment
RF	Radio Frequency
RJ	Register Jack
SIM	Subscriber Identity Module
UART	Universal Asynchronous Receiver & Transmitter
UDE	Unified Development Environment
USB	Universal Serial Bus
USIM	Universal Subscriber Identity Module
VBAT	Voltage at Battery (Pin)
Wi-Fi	Wireless Fidelity
