

EPXX EVB User Guide

LTE-A Module Series

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History

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1 Introduction

This document describes how to use EPXX EVB (Evaluation Board). It is an assistant tool for engineers to develop and test Quectel EP06 module.

1.1. Safety Information

The following safety precautions must be observed during all phases of the operation, such as usage, service or repair of any cellular terminal or mobile incorporating EP06 module. Manufacturers of the cellular terminal should send the following safety information to users and operating personnel, and incorporate these guidelines into all manuals supplied with the product. If not so, Quectel assumes no liability for the customers' failure to comply with these precautions.



Full attention must be given 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. You must comply with laws and regulations restricting the use of wireless devices while driving.



Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden, so as to prevent interference with communication systems. Consult the airline staff about the use of wireless devices on boarding the aircraft, if your device offers an Airplane Mode which must be enabled prior to boarding an aircraft.



Switch off your wireless device when in hospitals, clinics or other health care facilities. These requests are designed to prevent possible interference with sensitive medical equipment.



Cellular terminals or mobiles operating over radio frequency signal and cellular network cannot be guaranteed to connect in all conditions, for example no mobile fee or with an invalid (U)SIM card. While you are in this condition and need emergent help, please remember using emergency call. In order to make or receive a call, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.



Your cellular terminal or mobile contains a transmitter and receiver. When it is ON, it receives and transmits radio frequency energy. RF interference can occur if it is used close to TV set, radio, computer or other electric equipment.



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

2 General Overview

Quectel supplies EPXX EVB for designers to develop applications based on Quectel EP06 module. This EVB can test basic functionalities of the module.

2.1. Key Features

The following table describes the detailed features of EPXX EVB.

Table 1: Key Features of EPXX EVB

Features	Implementation
Power Supply	<ul style="list-style-type: none"> ● DC power supply: 4.5V~5.5V, typically: 5.0V ● VBAT: 3.3V for J204
Mini PCIe Interface	<ul style="list-style-type: none"> ● Support Quectel EP06 module
(U)SIM Interfaces	<ul style="list-style-type: none"> ● Support (U)SIM card: 3.0V and 1.8V ● Include two (U)SIM interfaces
Audio Interfaces	<ul style="list-style-type: none"> ● One digital audio codec board interface Support TI TLV320AIC3104 codec board ● Two analog interfaces used for earphone and handset
USB Interfaces	<ul style="list-style-type: none"> ● USB Type-C (USB 2.0 & USB 3.0)
Switch and Button	<ul style="list-style-type: none"> ● Power switch (S201) for VBAT ON/OFF control ● Reset button (S101) for resetting EP06 module
Physical Characteristics	<ul style="list-style-type: none"> ● Size: 122.0mm × 100.0mm

2.2. Interface Overview

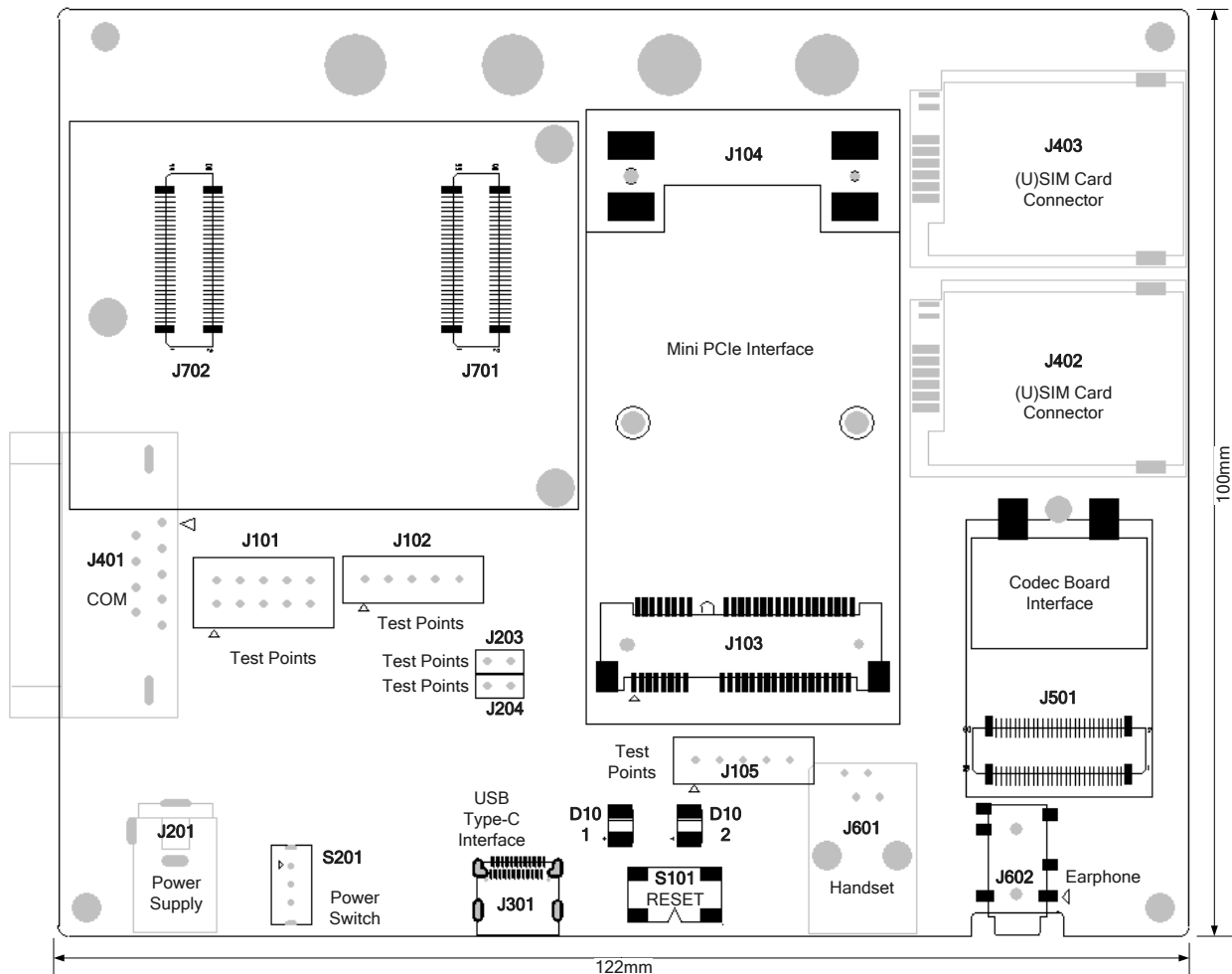


Figure 1: EPXX EVB Interface Overview

Table 2: Interfaces of EPXX EVB

Interface	Reference No.	Description
Power Supply	J201 (bottom side)	The power jack on the EVB Typical supply voltage: +5V
	J301	USB Type-C interface Typical supply voltage: +5V
Power Switch	S201	VBAT ON/OFF control
RESET	S101	Reset button (push button) Used to reset the EP06 module

USB Type-C	J301	USB device interface Can also be used to supply power for EVB
Audio	J501	Codec board interface
	J601 (bottom side)	Used for handset Used to test the analog audio function of EP06 module
	J602	Used for earphone Used to test the analog audio function of EP06 module
(U)SIM	J402 (bottom side)	U(SIM) card connector 1
	J403 (bottom side)	U(SIM) card connector 2
COM	J401 (bottom side)	Main/debug UART port
Status Indicators	D101, D102	D101 (VBAT ON/OFF indicator) is used to indicate whether the power supply for EG06 module is ready. D102 (power ON/OFF indicator) is used to indicate whether EG06 module is powered on.
Mini PCIe	J103, J104	Mini PCIe Express connectors of EP06 module
Test Points	J101, J102, J105, J203, J204	Test pins

2.3. Top View of EVB

The top view of EPXX EVB is shown as following figure.

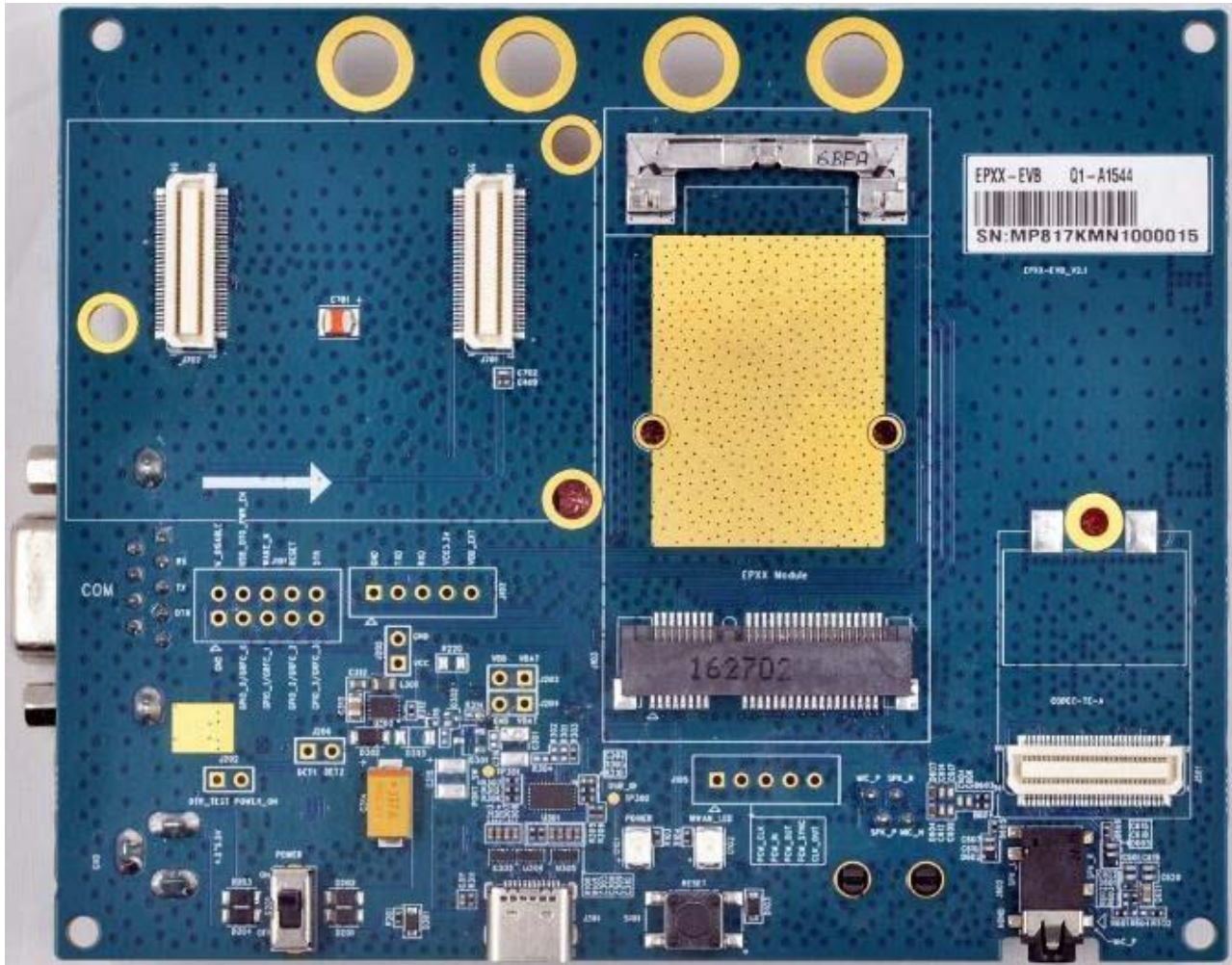


Figure 2: EPXX EVB Top View

2.4. Bottom View of EVB

The bottom view of the EPXX EVB is shown as following figure.

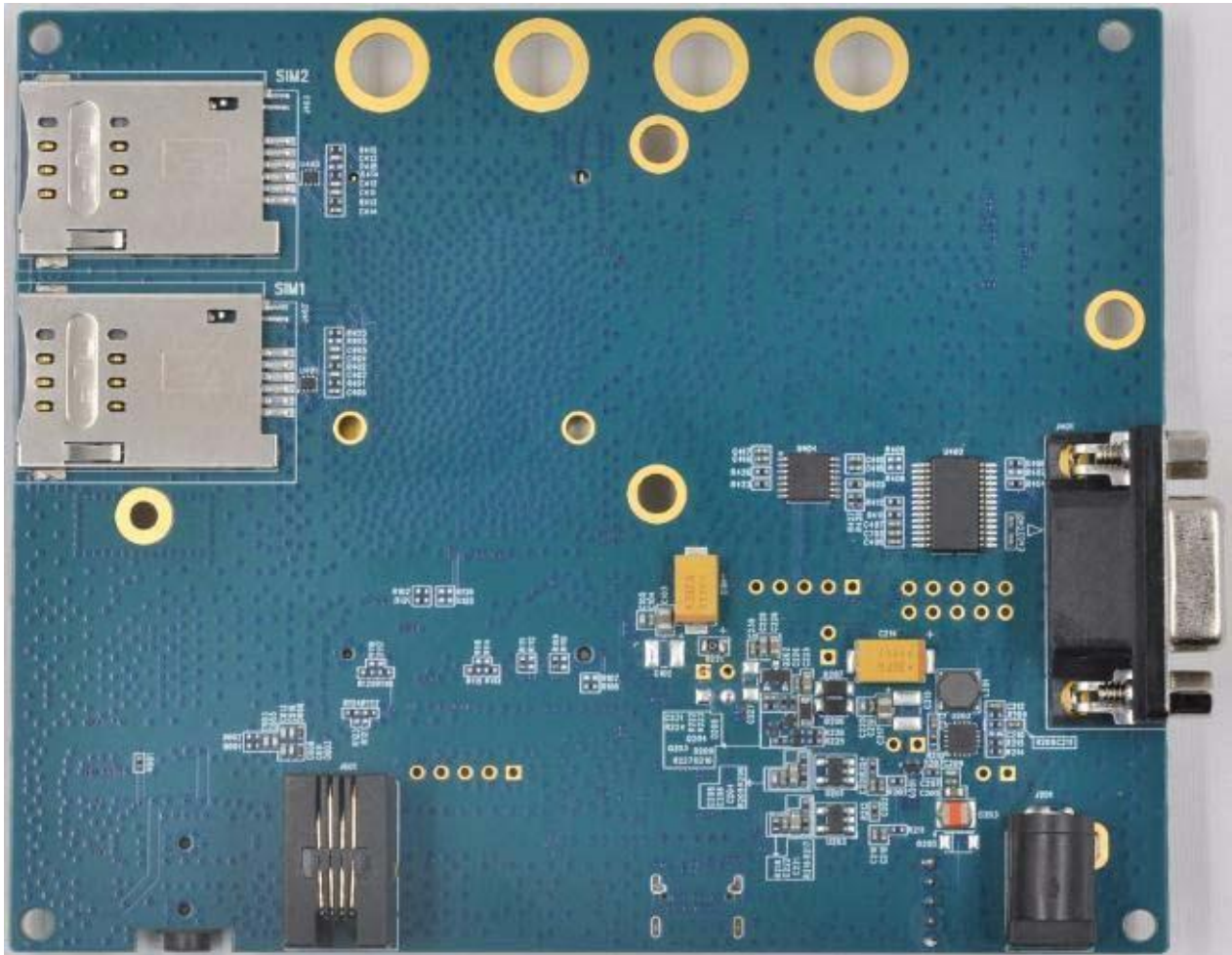


Figure 3: EPXX EVB Bottom View

2.5. EVB Kit Accessories

All accessories of the EPXX EVB kit are listed as below.



Figure 4: EVB Kit Accessories

Table 3: Accessories List

Items	Description	Quantity
Cables	USB to UART converter cable	1
	USB Type-C cable	1
	RF cables	3
Antennas	Main Antennas	2
	GNSS antenna (passive)	1

Audio	Earphone	1
Disks	USB 2.0 to RS-232 driver and USB driver disk	2
Codec Boards	TLV320AIC3104 codec board	1
Others	Bolts and coupling nuts for assembling EVB	4 for each type
Instruction Sheet	A sheet of paper giving instructions for EVB connection, details of EVB accessories, etc.	1

NOTE

The main antenna can also be used for diversity reception.

3 EVB Kit Accessories Assembly

The following figure shows the EVB kit accessories assembly.



Figure 5: EPXX EVB Kit Accessories Assembly

4 Interface Application

This chapter describes the hardware interfaces of EPXX EVB, shown as follows:

- Power interface
- Mini PCIe interface
- USB interface
- Audio interfaces
- (U)SIM card interfaces

It also provides information about button, switch, status indicators and test points to help customers use the EPXX EVB.

4.1. Power Interface (J201/J301)

The EPXX EVB can be powered by an external power adapter through connecting with the power jack (J201) or USB Type-C receptacle (J301) on the EVB. The power adapter connects to a step-down converter which can provide the supply voltage (VBAT) required for operating the EVB and the module.

The following two figures show the simplified power supply schematic and the power interface of the EPXX EVB.

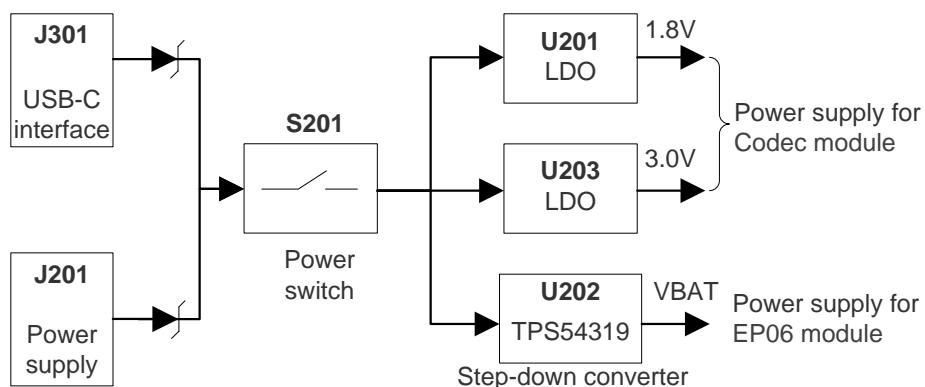


Figure 6: Power Supply for EPXX EVB

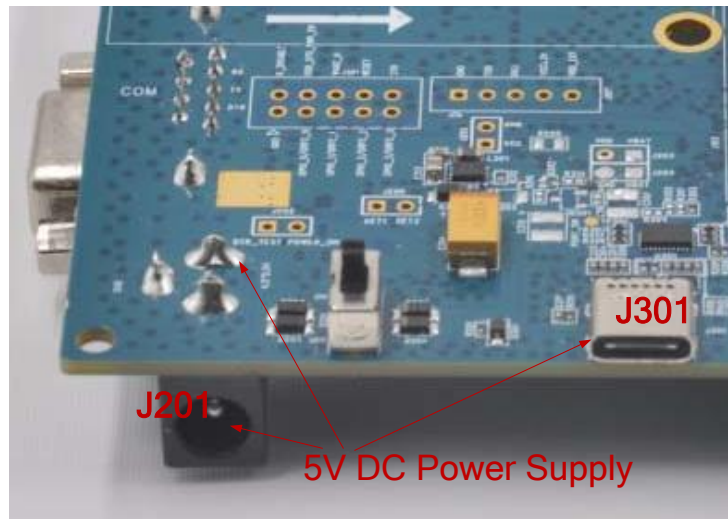


Figure 7: Power Interface

Before connecting the power supply, customers have to select a proper DC power adapter to supply power for the EPXX EVB, and the power plug design of the adapter is shown as below.

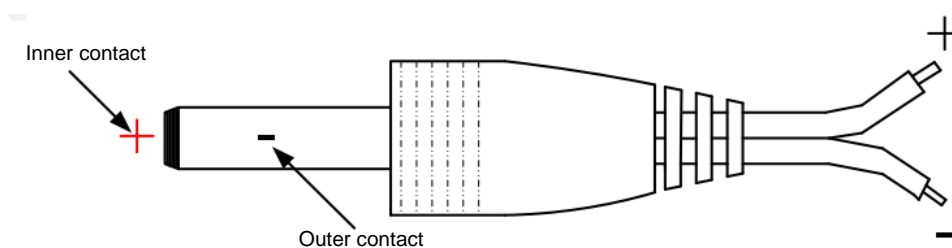


Figure 8: Power Plug Design

4.2. Mini PCIe Interface (J103/J104)

The Mini PCIe interface is designed to accommodate the EP06 module. EP06 module is connected to the EVB via Mini PCIe connectors J103 and J104 connectors. The interface allows customers to easily test the functionalities of EP06 module or to develop applications based on the module.

The following figure shows the connection between EP06 and EVB.

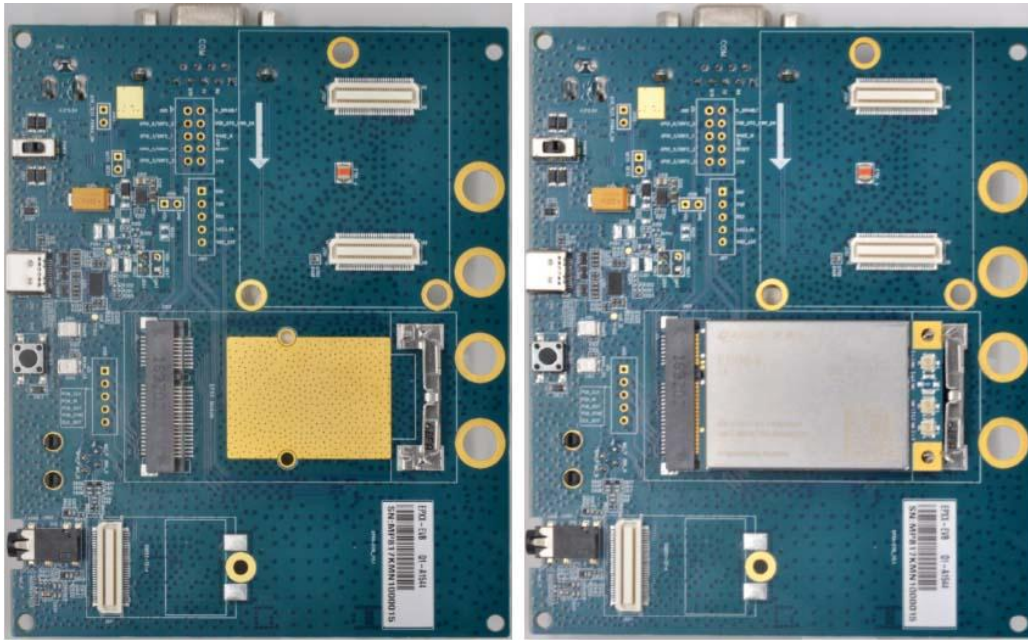


Figure 9: Connection between EP06 and EVB

4.3. USB Interface (J301)

Quectel EP06 module supports a USB interface, which complies with USB 2.0 and USB 3.0 specifications. USB 2.0 interface supports high speed (480Mbps) and full speed (12Mbps) modes, and the data rate of USB 3.0 interface is up to 5Gbps. This interface is used for AT command communication, data transmission, GNSS NMEA output, software debugging, firmware upgrade and voice over USB*.

The EPXX EVB provides a USB Type-C interface J301 for connection with a host device. The USB data lines D+ and D- are connected directly to the EP06 module. The CC1 and CC2 lines can be used for Type-C configuration channel signals. The VBUS lines can be used for USB connection detection and EVB power supply.

Table 4: Pin Assignment of J301

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
GND	TX1+	TX1-	VBUS	CC1	D+	D-	SBU1	VBUS	RX2-	RX2+	GND
GND	RX1+	RX1-	VBUS	SBU2	D-	D+	CC2	VBUS	TX2-	TX2+	GND
B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1

The following figure is a reference circuit design for the USB Type-C device interface.

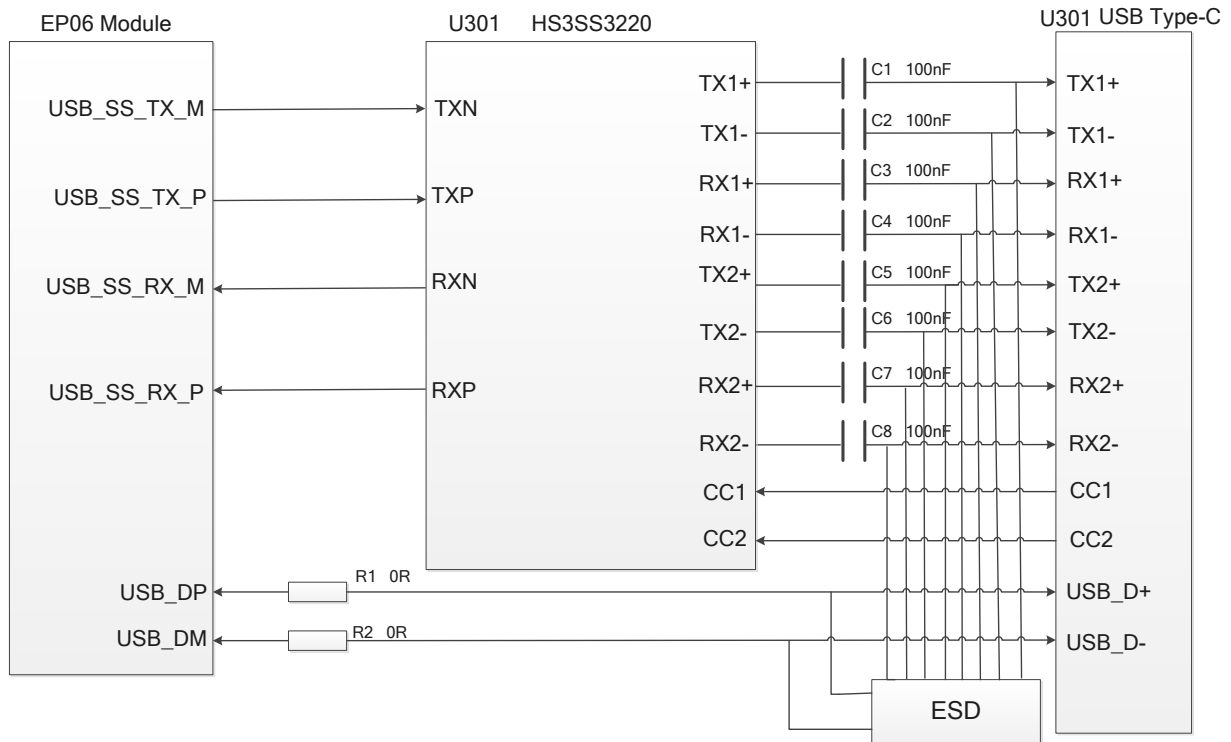


Figure 10: USB Type-C Interface Circuit

NOTE

“*” means under development.

4.4. Audio Interfaces

Quectel EPXX EVB provides one digital audio codec board interface (PCM) J501 and two analog audio interfaces J601 and J602. This chapter gives a detailed introduction on these audio interfaces.

4.4.1. Digital Audio Codec Board Interface (J501)

The EPXX EVB supports the external digital audio codec of TLV320AIC3104. The codec circuit is assembled on an independent small board which can be interconnected with EVB by the BTB connector J501.

The following figure shows a reference circuit design for the connection between digital audio codec board and EVB.

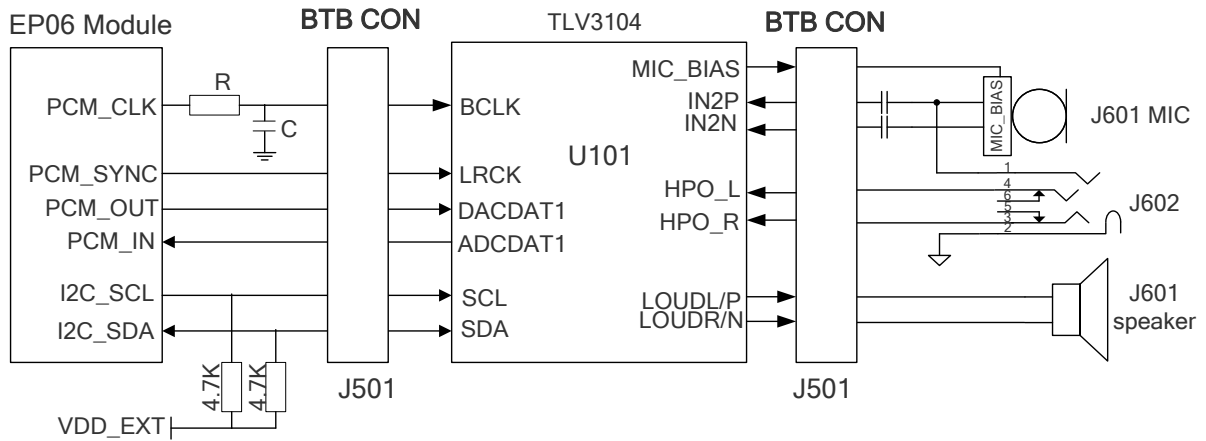


Figure 11: Reference Design for Connection between Codec Board and EVB

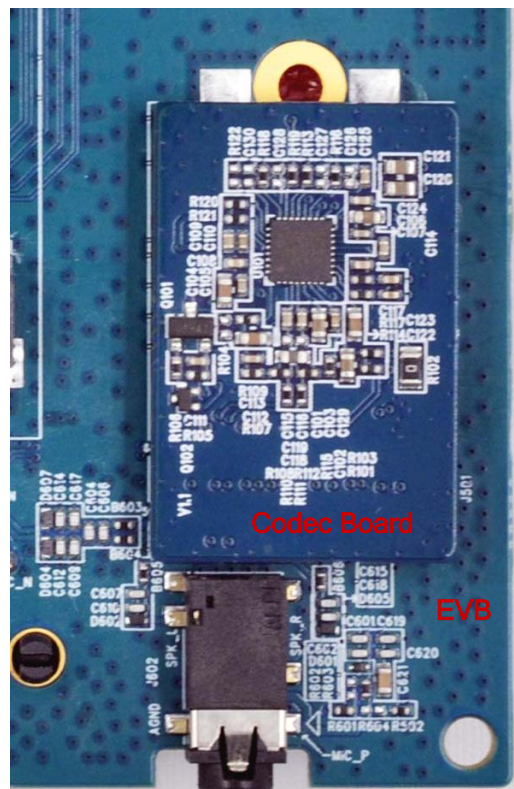


Figure 12: Connection between Codec Board and EVB

4.4.2. Analog Audio Codec Board Interface (J601/J602)

4.4.2.1. Handset Interface (J601)

Audio interface J601 is designed for handsets. A reference circuit design for handset interfaces J601 is shown below.

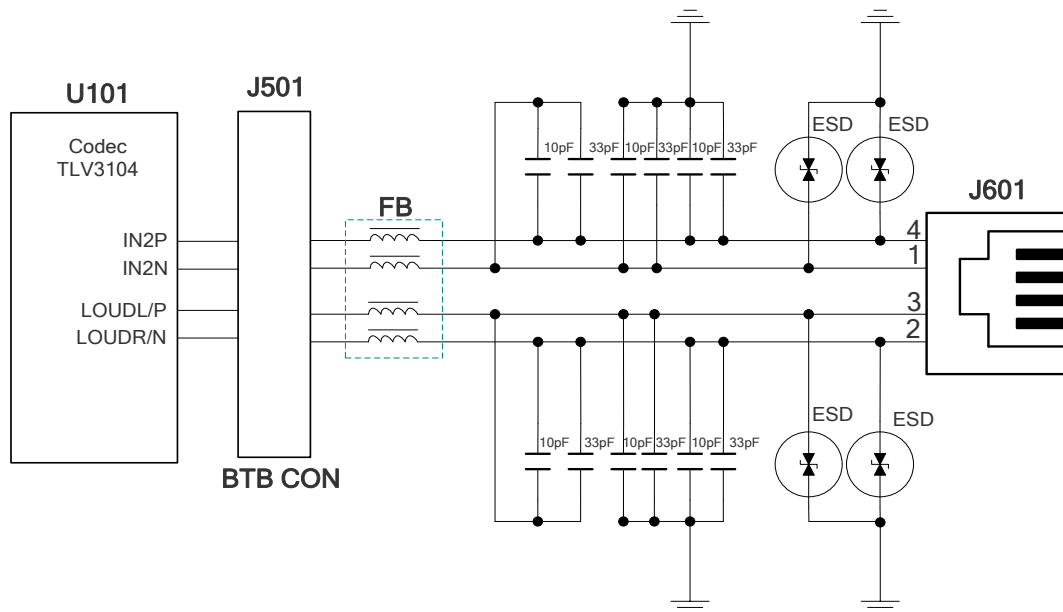


Figure 13: Reference Circuit Design for Handset Interface J601

The figure and table below illustrate the pin assignment and pin definition of handset interface J601.

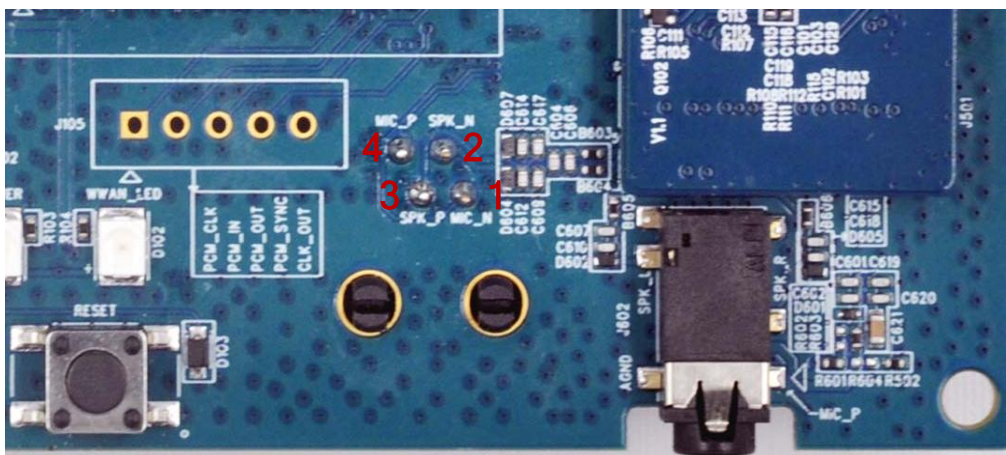


Figure 14: Pin Assignments of J601

Table 5: Pin Definition of J601

Pin No.	Pin Name	Function
1	MIC_N	Negative microphone input
2	SPK_N	Negative loud speaker output
3	SPK_P	Positive loud speaker output
4	MIC_P	Positive microphone input

4.4.2.2. Earphone Interface (J602)

Audio interface J602 is designed for earphones. A reference circuit designs for interfaces is shown as following figure.

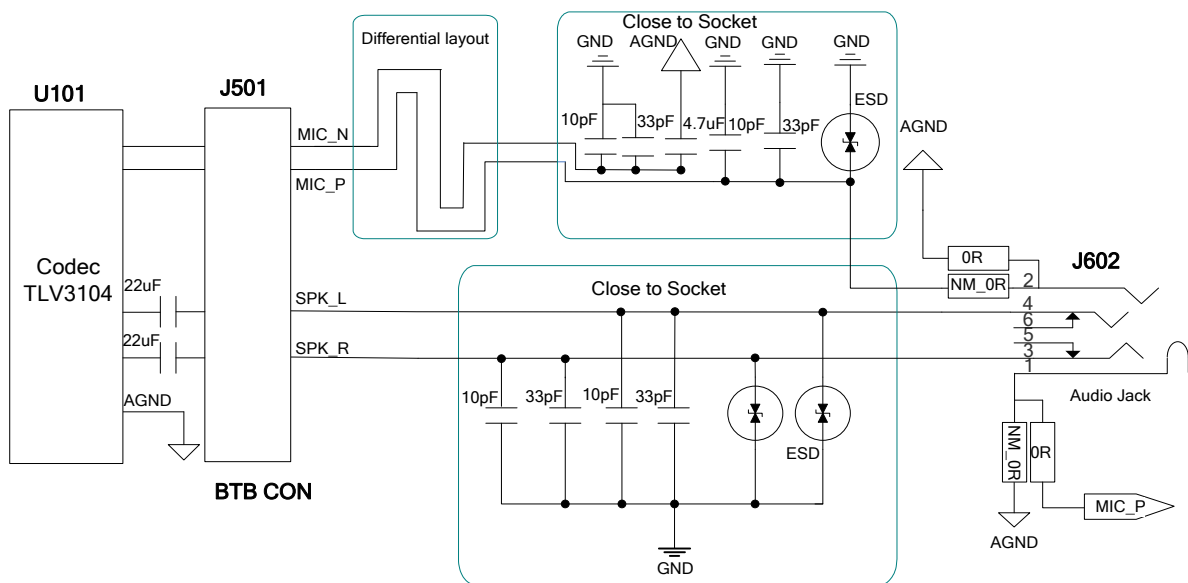


Figure 15: Reference Circuit Design for Earphone Interface J602

The figure and table below illustrate the pin assignment and pin definition of earphone interface J602.

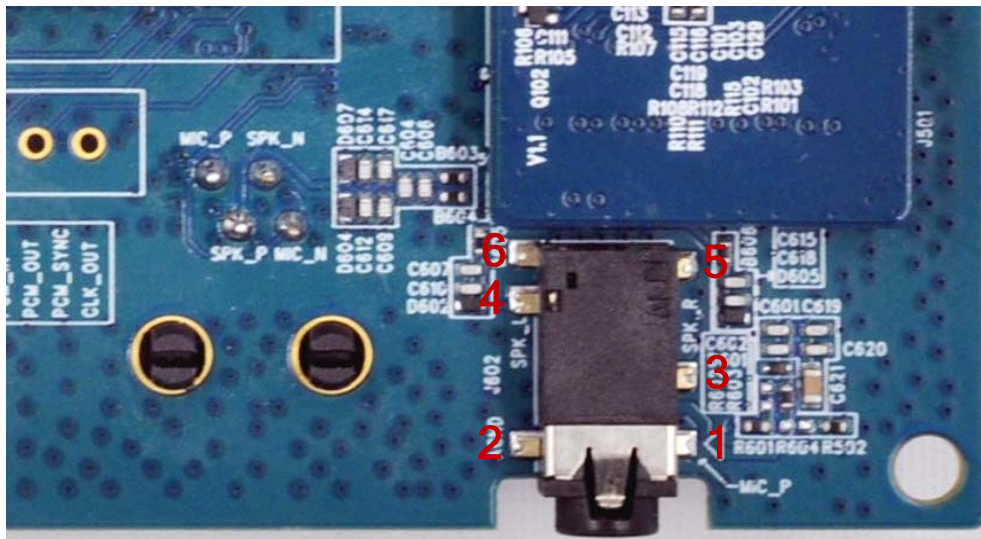


Figure 16: Pin Assignments of J602

Table 6: Pin Definition of J602

Pin No.	Pin Name	Description
1	MIC_P	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 shows the sketch design of audio plug which suits for the audio jack on EPXX EVB.

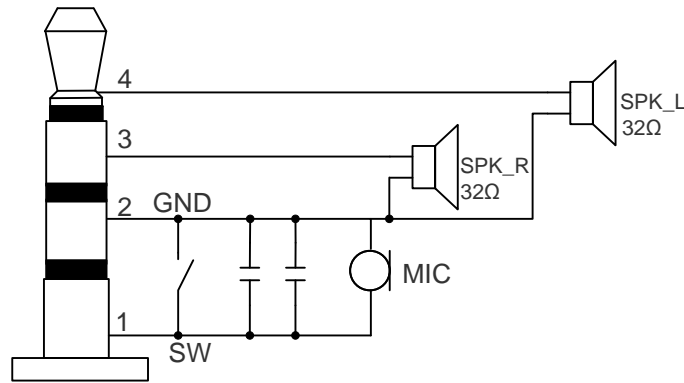


Figure 17: Sketch of Audio Plug

4.5. (U)SIM Interfaces (J402/J403)

The EPXX EVB has two 6-pin push-push type (U)SIM card (3.0V or 1.8V) connectors J402 and J403. The following figure shows the simplified interface schematic for J402, and that of J403 is identical.

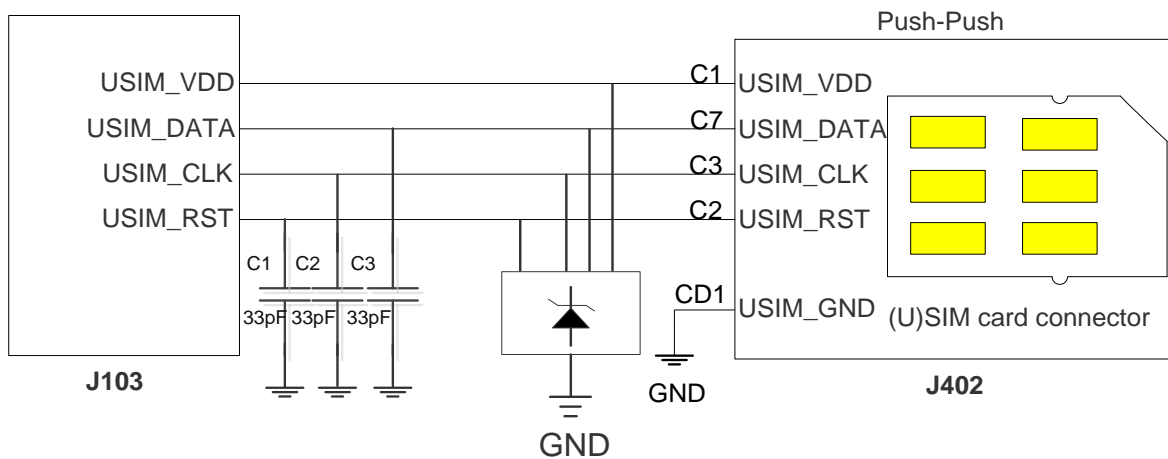


Figure 18: Simplified Interface Schematic for (U)SIM Card Connector J402

The figure and table below show the pin assignment and pin definition of J402, and that of J403 is identical.

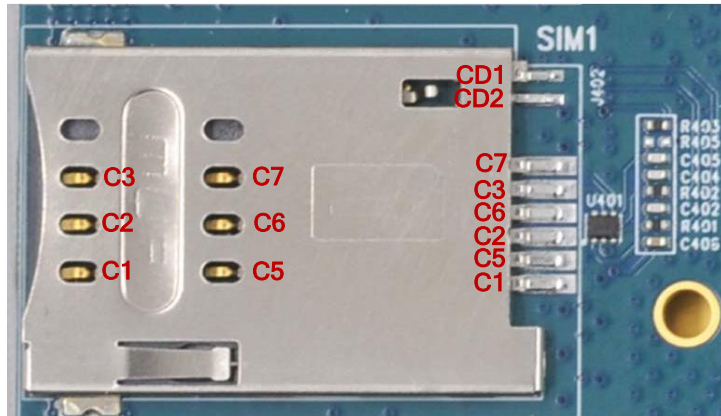


Figure 19: Pin Assignments of J402

Table 7: Pin Definition of J402

Pin No.	Signal Name	I/O	Function
C1	USIM_VDD	PO	(U)SIM card power supply, provided by EPXX EVB
C2	USIM_RST	DO	(U)SIM card reset
C3	USIM_CLK	DO	(U)SIM card clock
C5	GND	/	Ground
C6	VPP	/	Not connected
C7	USIM_DATA	IO	Data line, bi-directional
CD1	GND	/	(U)SIM card insertion detection
CD2	NC	/	(U)SIM card insertion detection

4.6. Switch and Button

The EPXX EVB includes one switch (S201) and one button (S101), as shown in the following figure.

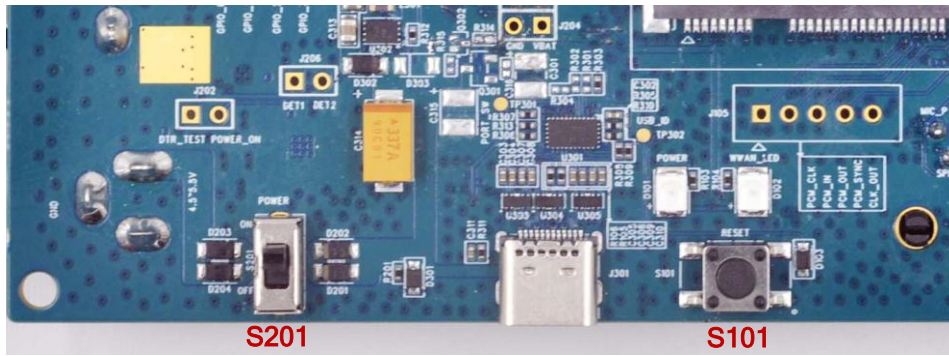


Figure 20: S201 Switch and S101 Button

Table 8: Description of Switch and Button

Reference No.	Description
S201	VBAT ON/OFF control
S101	Used to reset the EP06 module

4.7. Status Indicators

The EPXX EVB comprises two status indicators (D101 and D102). The following figure shows the location of these LED indicators.

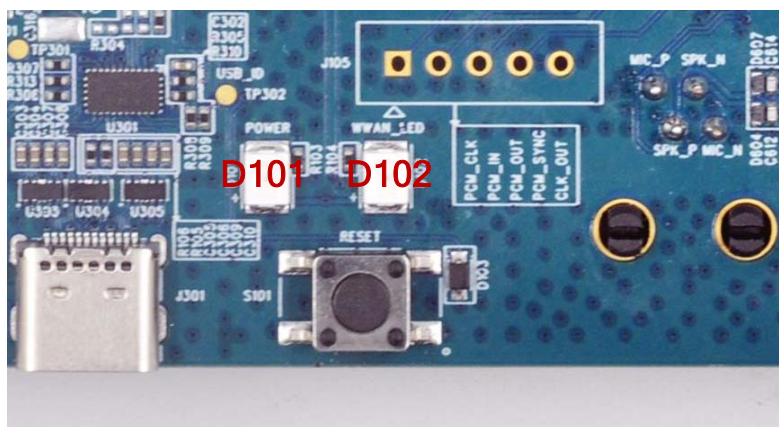


Figure 21: Status Indicators

Table 9: Description of Status Indicators

Reference No.	Description
D101	Power ON/OFF indicator for EP06 module Bright: the module is powered on Extinct: the power is powered off
D102	Network status indicator for EP06 module

4.8. Test Points

The EPXX EVB provides a series of test points. They can help customers to obtain the corresponding waveform of some signals. The following figures show test points J101, J102, J203 and J204.

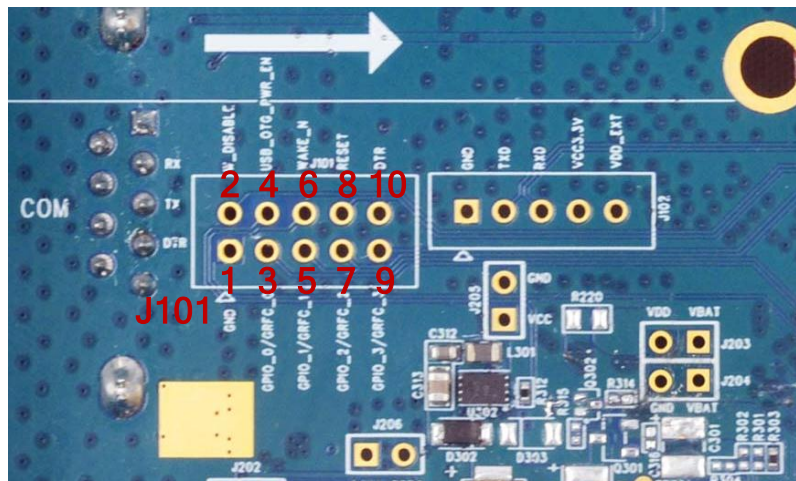


Figure 22: Test Points J101

Table 10: Pin Definition of J101

J101 Pin No.	Pin Name	Description
1	GND	Ground
2	W_DISABLE	Airplane mode control
3	GRFC_0	External switch control for multiple antennas
4	USB_OTG_PWR_EN	Control USB OTG power

5	GRFC_1	External switch control for multiple antennas
6	WAKE_N	Output signal, used to wake up the module
7	GRFC_2	External switch control for multiple antennas
8	RESET	Output signal, RESET test pin, used to reset the module
9	GRFC_3	External switch control for multiple antenna
10	DTR	Data terminal ready test pins

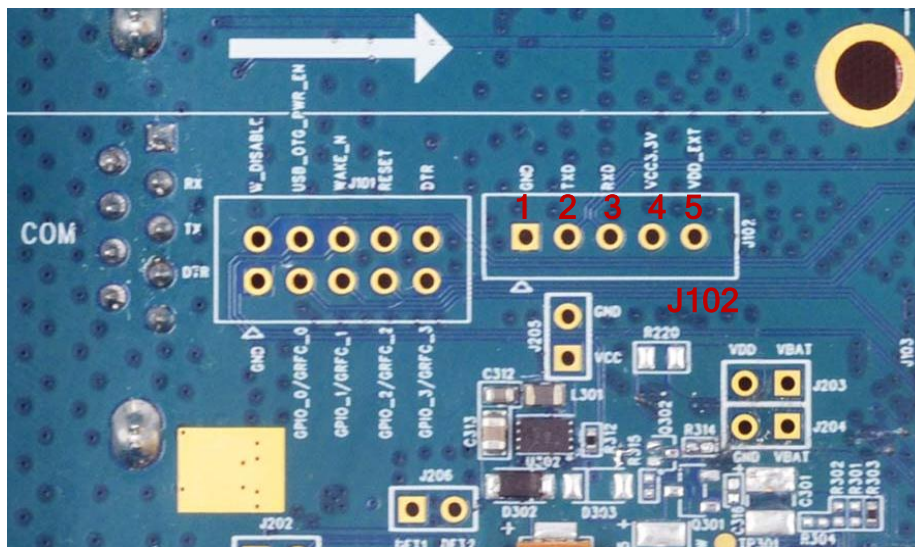


Figure 23: Test Point J102

Table 11: Pin Definition of J102

J102 Pin No.	Pin Name	Description
1	GND	Ground
2	TXD	Connected directly to voltage translator
3	RXD	Connected directly to voltage translator
4	VCC_3.3V	3.3V power from U202 chip
5	VDD_EXT	1.8V reference voltage output

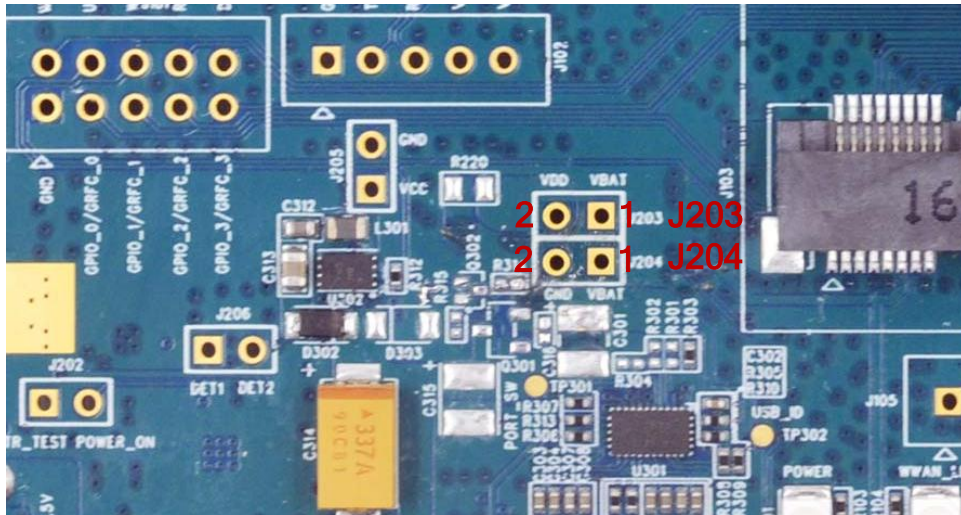


Figure 24: Test Points J203 and J204

Table 12: Pin Definition of J203 and J204

J203 Pin No.	Pin Name	Description
1	VBAT	Power supply for EP06 module
2	VCC	3.0V power supply from U202 chip
J204 Pin No.	Pin Name	Description
1	VBAT	Power supply for EP06 module
2	GND	Ground

5 Operation Procedures Illustration

This chapter introduces how to use the EPXX EVB for testing and evaluation of Quectel EP06 module.

5.1. Power on EP06 Module

1. Connect the EP06 to the connectors (J103 and J104) on EVB.
2. Insert a (U)SIM card into the (U)SIM card connector (J402) on EVB, and connect the antennas to EP06.
3. Connect the EVB to a 5V power adapter, or connect the EVB to PC via USB Type-C cable.
4. Switch S201 (Power switch) to **ON** state, then D101 (VBAT ON/OFF indicator) and D102 (Network status indicator) will be light up, which indicates the EP06 module has been powered on.

5.2. Communication Via USB Interface

1. Power on the EP06 module according to the procedures mentioned in **Chapter 5.1**.
2. Connect the EVB and the PC with USB Type-C cable through USB interface, and then run the driver disk on PC to install the USB driver. The USB port numbers can be viewed through the PC Device Manager, shown as following figure.



Figure 25: USB Ports

3. Install and then use the QCOM tool provided by Quectel to realize the communication between the EP06 module and the PC. The following figure shows the Port Setting field on QCOM: select correct “COM port” (USB AT Port which is shown in above figure) and set correct “Baudrate” (such as 115200bps). For more details about QCOM tool usage and configuration, please refer to **document [2]**.

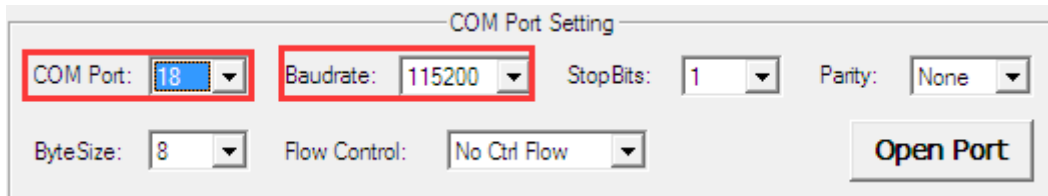


Figure 26: COM Port Setting Field on QCOM

5.3. Firmware Upgrade

Firmware of EP06 module is upgraded via USB port by default, please follow the procedures below to upgrade firmware.

1. Install and open the firmware upgrade tool QFlash on PC and then power on the EP06 module according to the procedures mentioned in **Chapter 5.1**.
2. Click the “COM Port” dropdown list and select the USB DM port.
3. Click the “Load FW Files” button to choose the firmware package.
4. Click the “Start” button to upgrade the firmware.

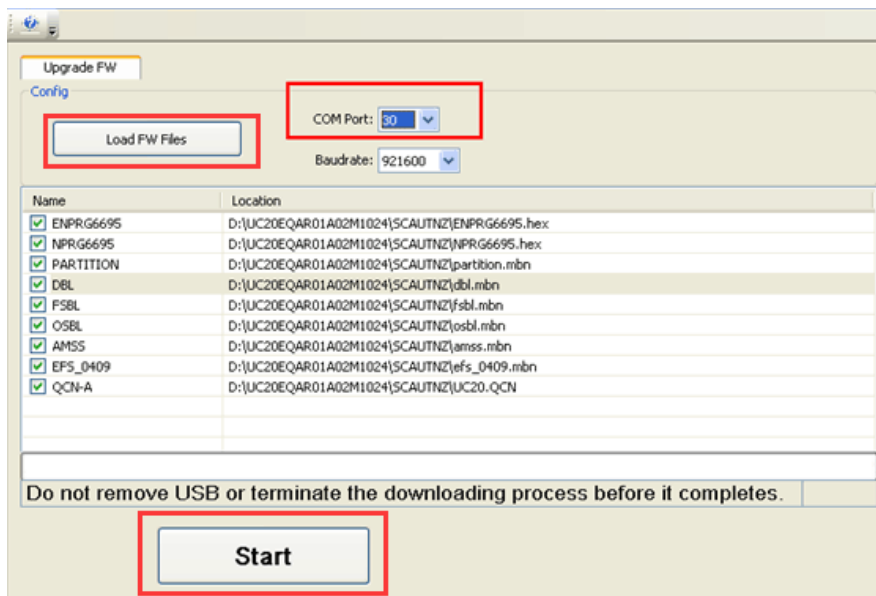


Figure 27: QFlash Configurations for Firmware Upgrade

5.4. Reset EP06 Module

The emergency reset option is only used in case of emergency. For example, the software does not respond for more than 5s due to some serious problems.

Press the button S101 (Reset button) for more than 200ms then release it to reset EP06 module. However, this operation may cause the loss of information stored in the memory as the reset module has been initialized.

5.5. Power off EP06 Module

Switching S201 (Power switch) to OFF status will shut down the EP06 module.

6 Appendix A References

Table 13: Related Documents

SN	Document Name	Remark
[1]	Quectel_EP06_Hardware_Design	EP06 hardware design
[2]	Quectel_QCOM_User_Guide	User guide for QCOM tool

Table 14: Terms and Abbreviations

Abbreviation	Description
AGND	Analogue Ground
BTB	Board to Board
COM	Cluster Communication Port
DC	Direct Current
DI	Digital Input
DO	Digital Output
EVb	Evaluation Board
GND	Ground
GNSS	Global Navigation Satellite System
I/O	Input/Output
LED	Light Emitting Diode
LTE-A	Long Term Evolution Advanced
MIC	Microphone
NC	Not Connected

PC	Private Computer
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PO	Power Output
RF	Radio Frequency
SD	Secure Digital
SIM	Subscriber Identity Module
UART	Universal Asynchronous Receiver & Transmitter
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
(U)SIM	(Universal) Subscriber Identity Module
VBAT	Voltage of Battery
