UMTS&LTE EVB

User Guide

UMTS/HSPA/LTE Module Series

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About the Document

History

Revision	Date	Author	Description
1.0	2015-03-03	Huik LI	Initial
1.1	2015-06-10	Radom XIANG	Deleted +5V adapter parts in EVB accessories
2.0	2017-01-12	Allen WANG	1. Added applicable modules of the EVB: EC25, EC21, EC20 R2.0, FC20 series and EG95 2. Added the description of UMTS&LTE TE-A interface (Chapter 4.2) 3. Added the description of Wi-Fi & Ethernet TE-A interface (Chapter 4.3) 4. Added the description of digital audio codec board interface (Chapter 4.5.1) 5. Added the description of SD card interface (Chapter 4.7) 6. Added a Wi-Fi antenna and two codec boards into EVB accessories 7. Added procedures for power on/off Wi-Fi modules in Chapter 5
2.1	2017-12-27	Eden LIU/ Lyndon LIU	Added the following applicable modules of the EVB: AG35, AF20, BG96, EG91 and EC20 R2.1.

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1 Introduction

This document describes how to use the evaluation board of UMTS&LTE modules and Wi-Fi modules. It is an assistant tool for engineers to develop and test Quectel UMTS, LTE and Wi-Fi modules.

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 UMTS&LTE and Wi-Fi modules. 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 customer's 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.
SOS	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 USIM/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 UMTS&LTE EVB for designers to develop applications based on Quectel UMTS&LTE modules and Wi-Fi modules. This EVB can test basic functionalities of these modules.

2.1. Applicable Modules

UMTS&LTE EVB is applicable to the following module models.

UMTS&LTE modules

- UC20
- UGxx 1)
- EC2x 2)
- EG9x 3)
- AG35
- BG96

Wi-Fi Modules

- FC20 series 4)
- AF20

NOTES

1. 1) UGxx contains UG95 and UG96.
2. 2) EC2x contains EC25, EC21, EC20, EC20 R2.0 and EC20 R2.1.
3. 3) EG9x contains EG91 and EG95.
4. 4) FC20 series (hereinafter FC20 simply) includes both FC20 and FC20-N.

2.2. Key Features

The following table describes the detailed features of UMTS&LTE EVB.

Table 1: Key Features

Features	Implementation
Power Supply	DC supply: 4.5~5.5V, typical 5V VBAT: 3.8V for J103
UMTS&LTE TE-A Interface	Support UMTS&LTE modules: UC20/UGxx/EC2x/EG9x/AG35/BG96
Wi-Fi & Ethernet TE-A Interface	Support Wi-Fi modules: FC20/AF20
SD Interface	Support SD card
(U)SIM Interface	Support (U)SIM card insertion detection Support (U)SIM card: 3.0V and 1.8V
Audio Interfaces	● One digital audio codec board interface Support Realteck ALC5616 and TI TLV320AIC3104 codec boards ● Three analog interfaces used for loudspeaker, earphone and handset
UART Interfaces	Two UART interfaces: ● COM1: serial interface for data communication Max baud rate: 460800bps; ● COM2: serial interface for debug purpose Default baud rate: 115200bps
USB Interface	USB 2.0
Signal Indication	5 LEDs are available for signal indication
Button and Switches	Power Switch (S201), PWRKEY (S302), RESET (S303), PWRDWN_N (S301), BT Function Switch (S901)
Physical Characteristics	Size: 146.4mm × 115.0mm

2.3. Interface Overview

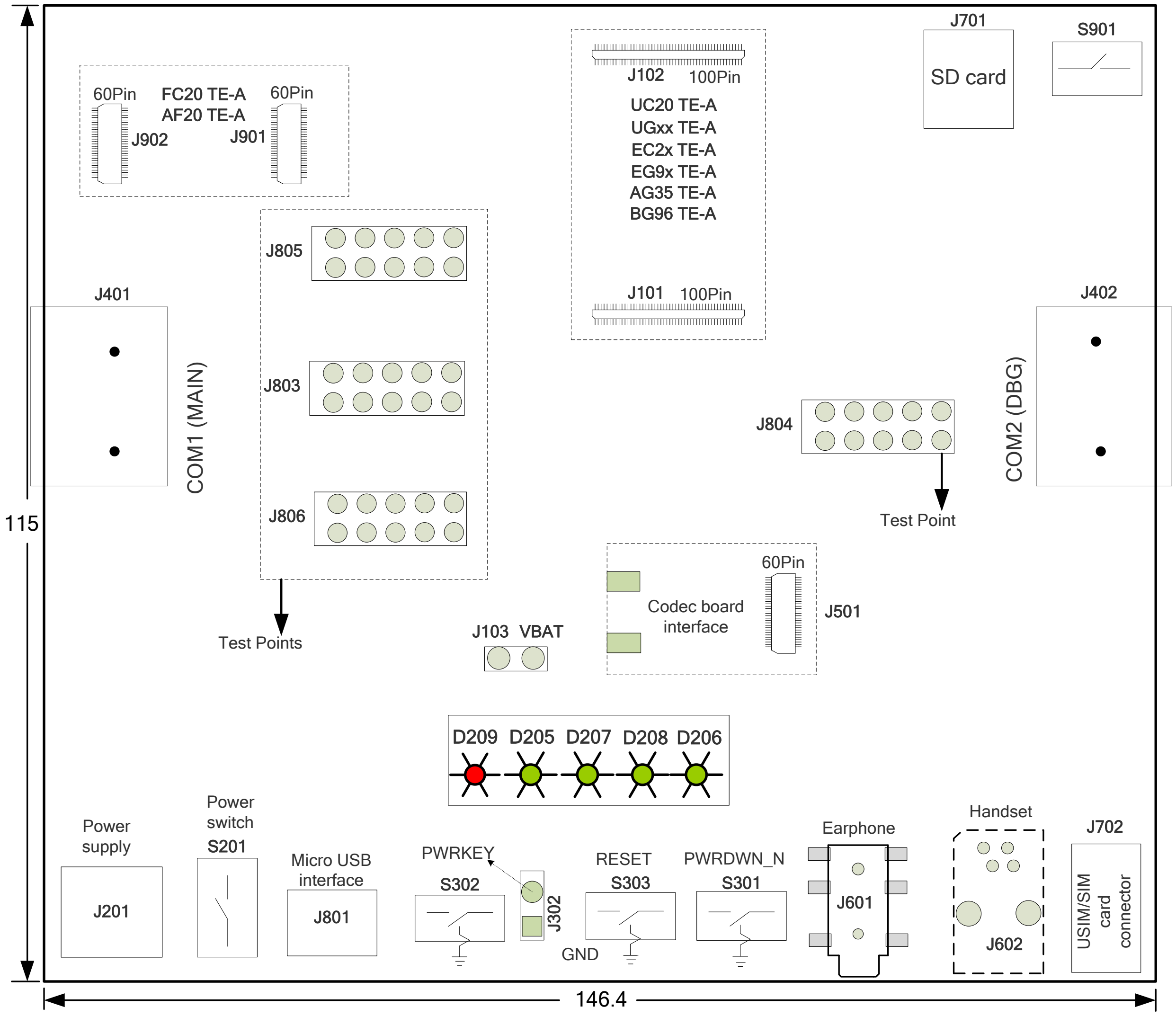

J701
SD card
S901
60Pin
FC20 TE-A
AF20 TE-A
60Pin
J902
J901
J102
100Pin
UC20 TE-A
UGxx TE-A
EC2x TE-A
EG9x TE-A
AG35 TE-A
BG96 TE-A
J805
J401
J101
100Pin
J402
J803
COM1 (MAIN)
J804
COM2 (DBG)
115
J806
Test Point
60Pin
Codec board
interface
J501
Test Points
J103 VBAT
D209
D205
D207
D208
D206
Power
switch
Power
supply
S201
Handset
Earphone
J702
Micro USB
interface
PWRKEY
RESET
PWRDWN_N
J201
S302
S303
S301
J601
J801
J302
USIM/SIM
card
connector
J602
GND
146.4

Figure 1: UMTS&LTE EVB Interface Overview (Unit: mm)

Table 2: Interfaces of UMTS&LTE EVB

Interface	Reference No.	Description
Power Supply [1)]	J201 (bottom side)	The power jack on the EVB Typical supply voltage: +5V
	J801	Micro-USB interface Typical supply voltage: +5V
Power Switch	S201	VBAT ON/OFF control

PWRKEY	S302	Power key (push button) Used to turn on/off UC20/EC2x/EG9x/AG35/BG96 modules, or turn on UGxx modules only
	J302	Jumper wire Used to connect PWRKEY to GND
PWRDWN_N	S301	Used to turn off UGxx modules only
RESET	S303	Reset button (push button) Used to reset UMTS&LTE modules
BT Function Switch	S901	Switched to the left: connect BT interface (UART, PCM) of Wi-Fi modules to the PCM interface of EC2x/AG35 modules, for testing the BT function of Wi-Fi modules. Switched to the right: connect the main UART and codec board interfaces on EVB to UMTS&LTE modules, for testing the modules' main UART functions, and the codec's PCM function.
Micro USB	J801	USB device interface
Audio	J501	Codec board interface
	J603	Used for loudspeaker Used to test the analog audio function of UMTS&LTE modules
	J601	Used for earphone Used to test the analog audio function of UMTS&LTE modules
	J602 (bottom side)	Used for handset Used to test the analog audio function of UMTS&LTE modules
(U)SIM	J702	(U)SIM card connector
COM1	J401 (bottom side)	Main UART port
COM2	J402 (bottom side)	Debug UART port
Status Indication LEDs	D209, D205, D207, D208, D206	D209 (VBAT ON/OFF indicator) is used to indicate whether the power supply for UMTS&LTE modules is ready. D205 (power ON/OFF indicator) is used to indicate whether UMTS&LTE modules are powered on. D207 (sleep status indicator) is used to indicate whether UMTS&LTE modules are in sleep mode. D208 and D206 (network status indicator) are used to indicate the network status of UMTS&LTE modules.
TE-A Interfaces	J101, J102	Connectors of UMTS&LTE TE-A
	J901, J902	Connectors of Wi-Fi & Ethernet TE-A
SD Card	J701	SD card connector

VBAT	J103	Jumper wire Used for VBAT voltage test
Test Points	J803, J804, J805, J806	Test pins

NOTE

1) The power supply information in above table is for UMTS&LTE modules. For the detailed information of power supply for Wi-Fi modules, please refer to ***Chapter 4.1*** and ***Chapter 4.3***.

2.4. Top View of EVB

The top view of the UMTS&LTE EVB is shown as following figure.

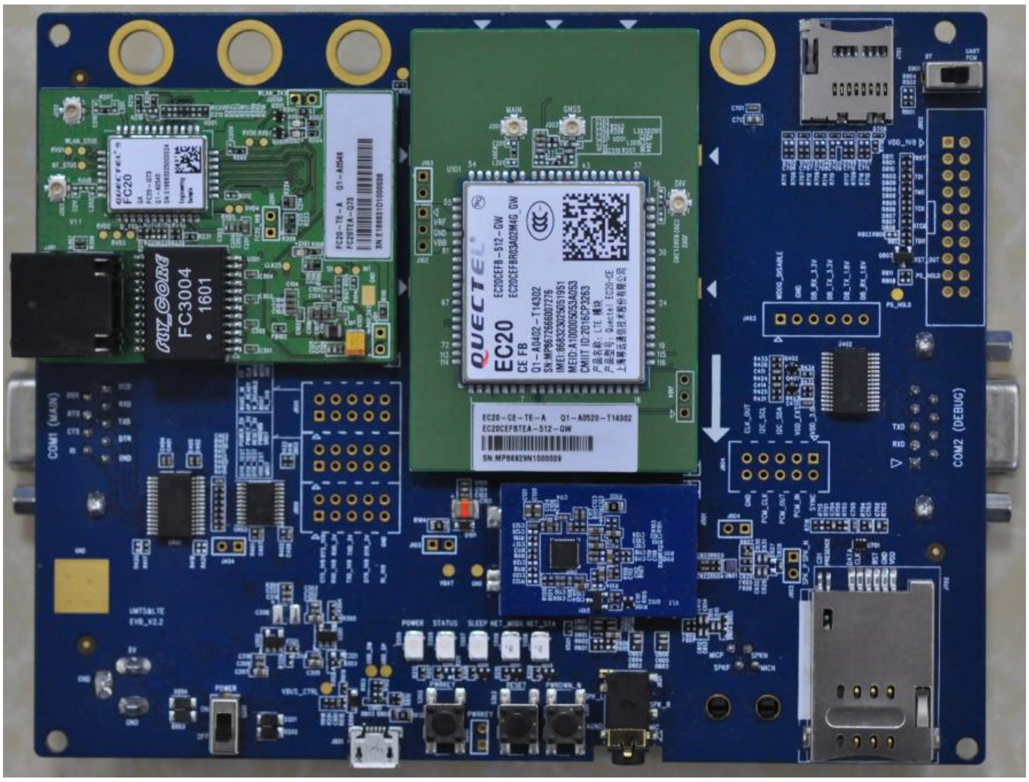

FC20
EC20
FC3004
1601
COM1 (MAIN)
COM2 (DEBUG)
POWER
STATUS

Figure 2: UMTS&LTE EVB Top View

2.5. EVB Kit Accessories

All accessories of the UMTS&LTE EVB kit are listed as below.

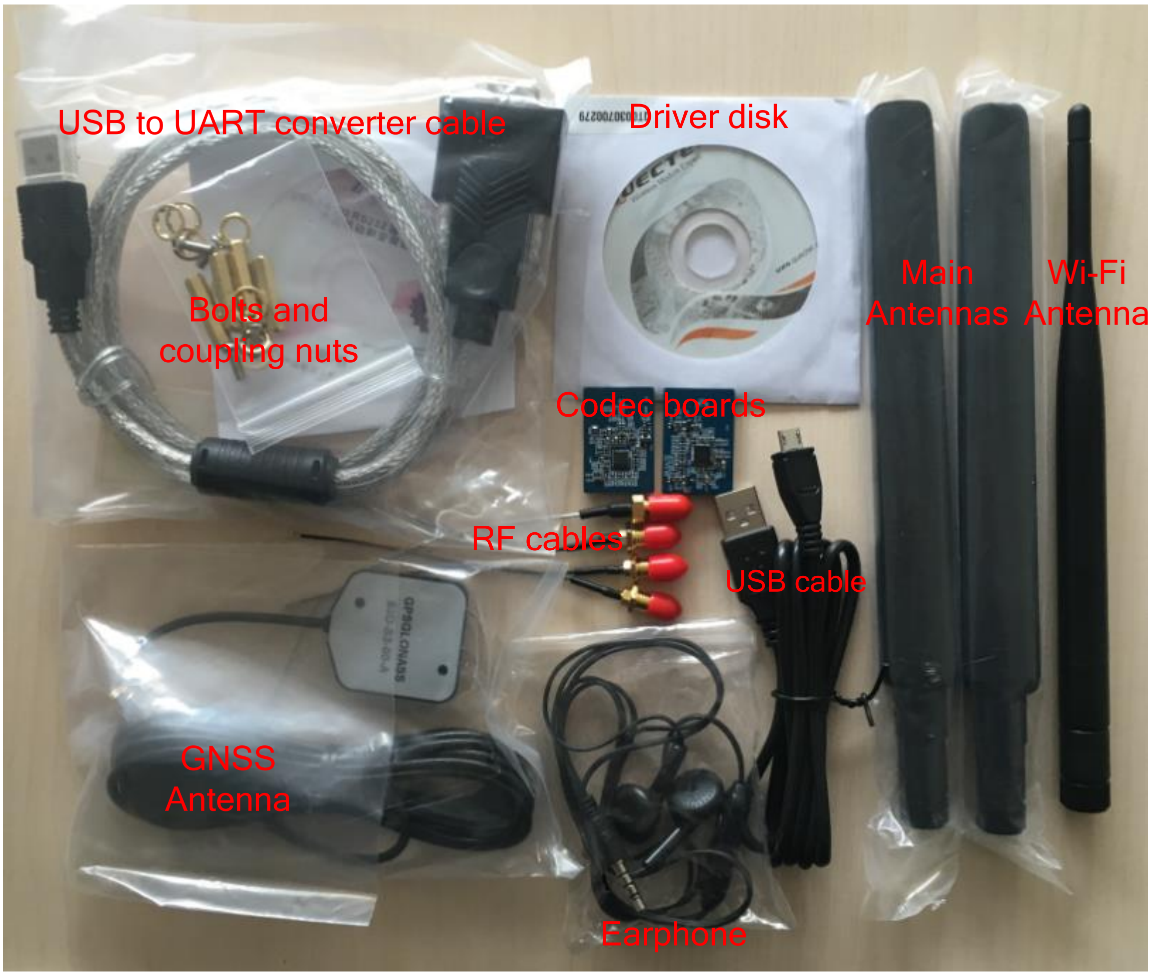

USB to UART converter cable
Driver disk
Main Antennas
Wi-Fi Antenna
Bolts and coupling nuts
Codec boards
RF cables
USB cable
GNSS Antenna
Earphone

Figure 3: EVB Kit Accessories

Table 3: Accessories List

Items	Description	Quantity
Cables	USB to UART converter cable	1
	USB cable	1
	RF cable	4
Antennas	Main antenna	2

	GNSS antenna (passive)	1
	Wi-Fi antenna	1
Audio	Earphone	1
Disk	USB 2.0 to RS232 driver and USB driver disk	1
Codec Boards	ALC5616 and TLV320AIC3104	2
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.

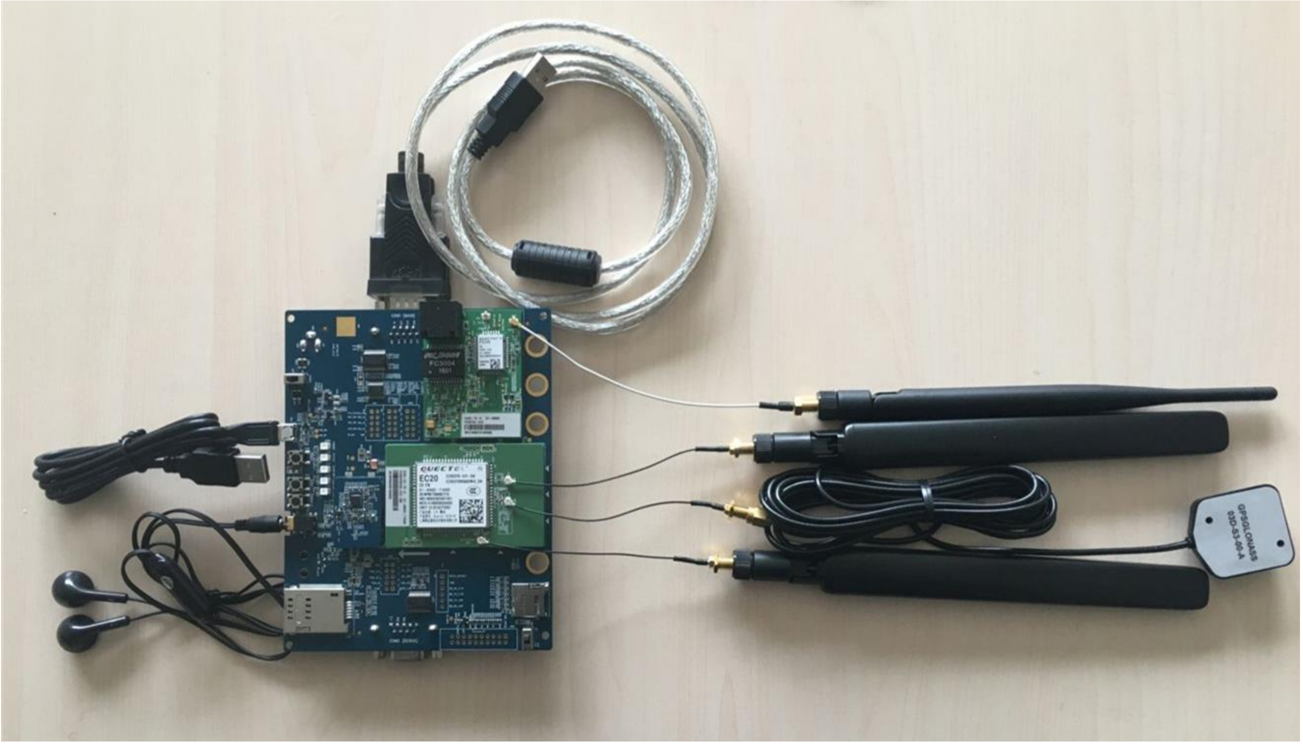


Figure 4: UMTS&LTE EVB Kit Assembly

4 Interface Applications

This chapter describes the hardware interfaces of UMTS&LTE EVB, shown as follows:

- Power interface
- UMTS&LTE TE-A interface
- Wi-Fi & Ethernet TE-A interface
- USB interface
- Audio interfaces
- (U)SIM interface
- SD card interface
- UART interfaces

It also provides information about the buttons, switch, status indication LEDs and test points to help customers use the UMTS&LTE EVB.

4.1. Power Interface (J201/J801)

The UMTS&LTE EVB can be powered by an external power adapter through connecting with the power jack (J201) or USB receptacle (J801) 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 Quectel UMTS&LTE EVB.

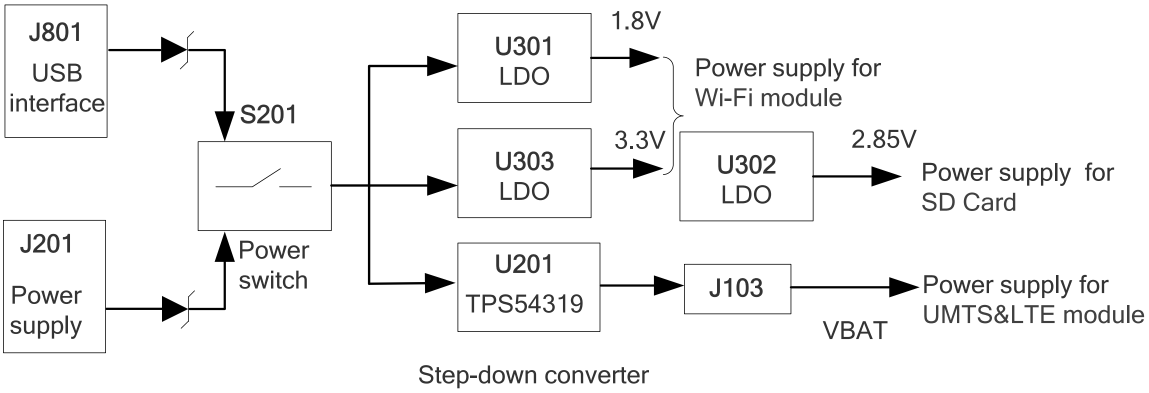

J801
USB
interface
S201
J201
Power
supply
Power
switch
U301
LDO
1.8V
Power supply for
Wi-Fi module
U303
LDO
3.3V
U302
LDO
2.85V
Power supply for
SD Card
U201
TPS54319
J103
VBAT
Power supply for
UMTS&LTE module
Step-down converter

Figure 5: Power Supply for UMTS&LTE EVB

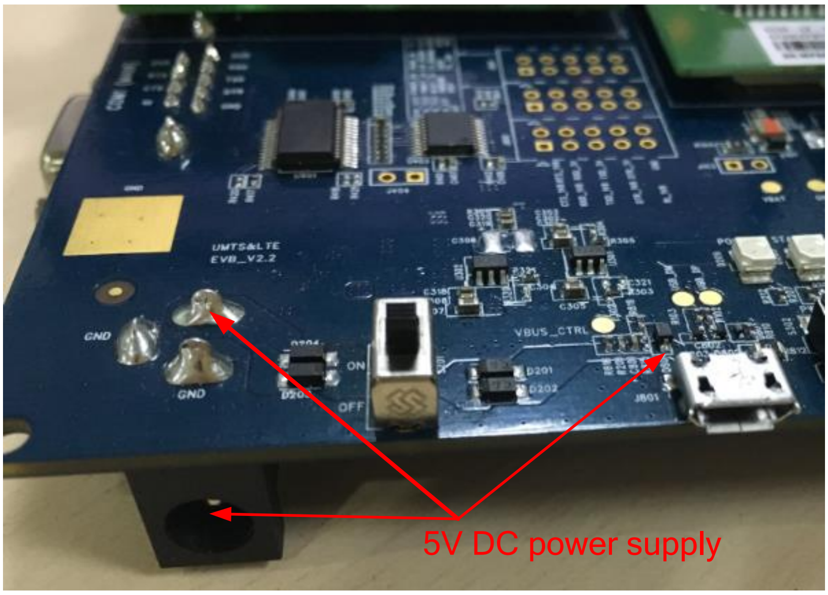

5V DC power supply
UMTS&LTE
EVB_V2.2
GND
GND
ON
OFF
VBUS_CTRL

Figure 6: Power Interfaces

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

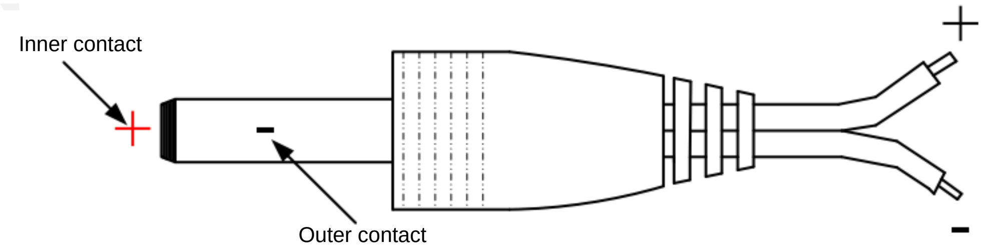

Inner contact
+
-
Outer contact
+
-

Figure 7: Power Plug Design

4.2. UMTS&LTE TE-A Interface

The UMTS&LTE TE-A interface is designed to accommodate the TE-A of UMTS&LTE (UC20/UGxx/EC2x/EG9x/AG35/BG96) modules. The TE-A is connected to the EVB via BTB connectors J101 and J102. The interface allows customers to easily test the functionalities of UMTS&LTE modules or to develop applications based on them.

The following figure shows the connection between UMTS&LTE TE-A and EVB.

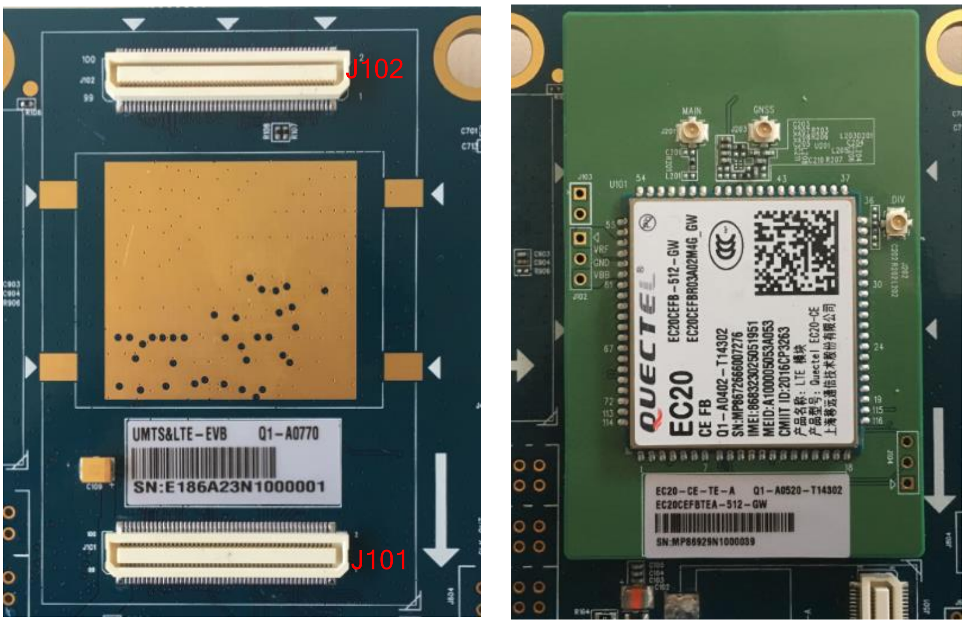


Figure 8: Connection between UMTS&LTE TE-A and EVB

4.3. Wi-Fi & Ethernet TE-A Interface

The Wi-Fi & Ethernet TE-A interface is designed to accommodate the TE-A of Wi-Fi (FC20/AF20) modules. The TE-A is connected to the EVB via BTB connectors J901 and J902. The interface allows customers to easily test the Wi-Fi function of EC2x/AG35 modules or to develop applications with Wi-Fi function.

The following two figures show the connection between FC20-TE-A /AF20-TE-A and EVB.

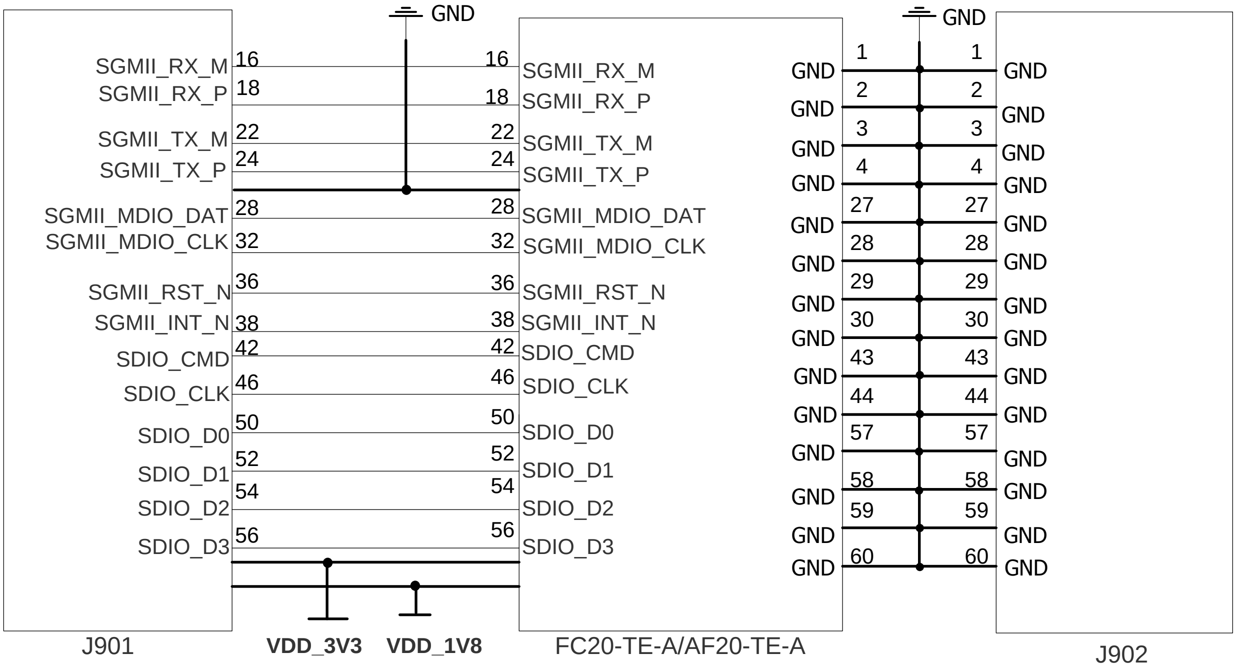

GND
SGMII_RX_M 16
SGMII_RX_P 18
SGMII_TX_M 22
SGMII_TX_P 24
SGMII_MDIO_DAT 28
SGMII_MDIO_CLK 32
SGMII_RST_N 36
SGMII_INT_N 38
SDIO_CMD 42
SDIO_CLK 46
SDIO_D0 50
SDIO_D1 52
SDIO_D2 54
SDIO_D3 56
16 SGMII_RX_M
18 SGMII_RX_P
22 SGMII_TX_M
24 SGMII_TX_P
28 SGMII_MDIO_DAT
32 SGMII_MDIO_CLK
36 SGMII_RST_N
38 SGMII_INT_N
42 SDIO_CMD
46 SDIO_CLK
50 SDIO_D0
52 SDIO_D1
54 SDIO_D2
56 SDIO_D3
GND 1 1 GND
GND 2 2 GND
GND 3 3 GND
GND 4 4 GND
GND 27 27 GND
GND 28 28 GND
GND 29 29 GND
GND 30 30 GND
GND 43 43 GND
GND 44 44 GND
GND 57 57 GND
GND 58 58 GND
GND 59 59 GND
GND 60 60 GND
J901
VDD_3V3
VDD_1V8
FC20-TE-A/AF20-TE-A
J902

Figure 9: Simplified FC20-TE-A/AF20-TE-A Interface Schematic

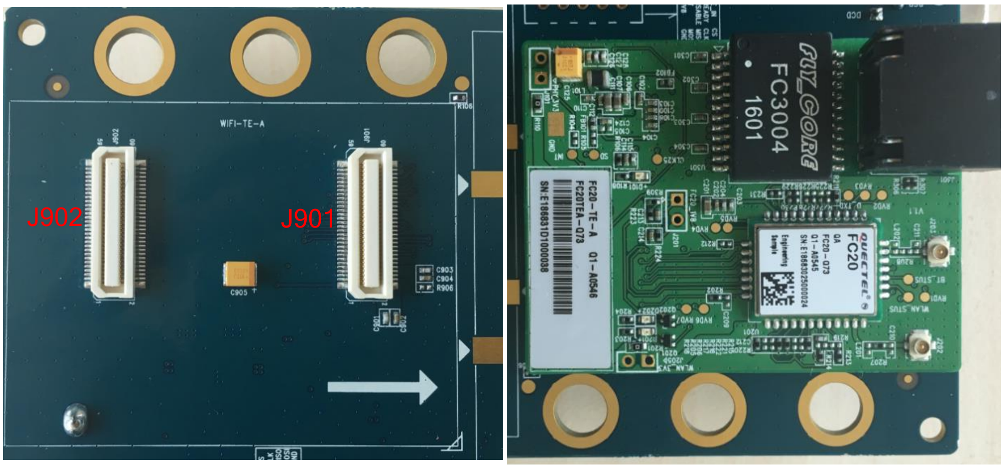

WIFI-TE-A
J902
J901
FC3004
1601
FC20-TE-A
FC20

Figure 10: Connection between FC20-TE-A and EVB

4.4. USB Interface (J801)

Quectel UMTS&LTE modules provide a USB interface which complies with USB 2.0 standard and supports high-speed (480Mbps), full-speed (12Mbps) and low-speed (1.5Mbps) modes. The interface is used for AT command communication, data transmission, firmware upgrade and GNSS NEMA output.

The UMTS&LTE EVB provides a Micro-USB interface J801 for connection with a host device. The USB data lines USB_DP and USB_DM are connected directly to the module. The USB_VBUS line can be used for USB connection detection and EVB power supply.

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

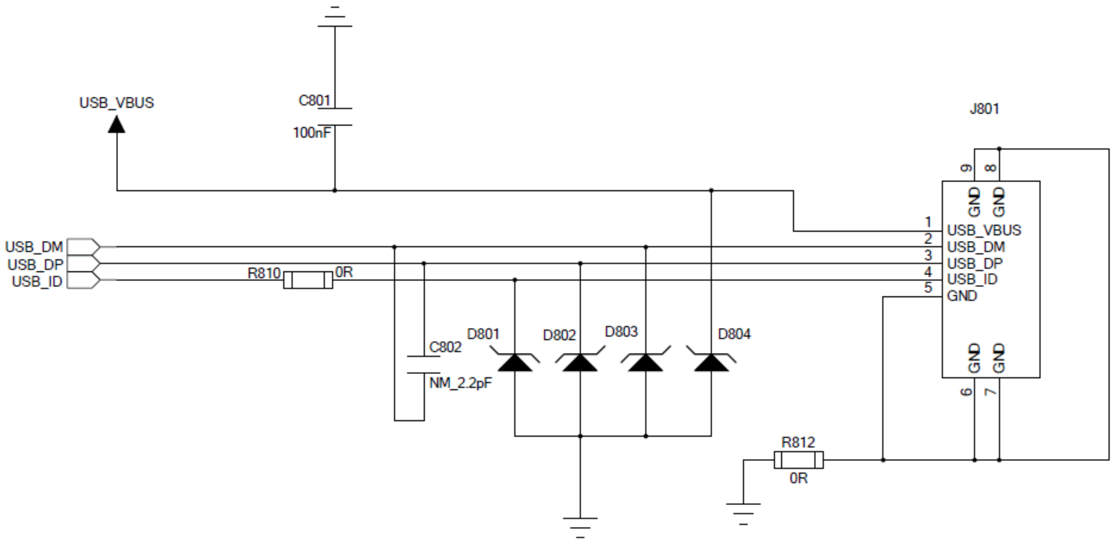

USB_VBUS
C801
100nF
J801
9
8
GND
GND
1
2
3
4
5
USB_VBUS
USB_DM
USB_DP
USB_ID
GND
USB_DM
USB_DP
USB_ID
R810
0R
C802
NM_2.2pF
D801
D802
D803
D804
GND
GND
6
7
R812
0R

Figure 11: Reference Circuit Design for USB Device Interface

Table 4: Pin Definition of J801

Pin No.	Pin Name	Function
1	USB_VBUS	Used for USB connection detection and EVB power supply
2	USB_DM	USB serial differential bus (minus)
3	USB_DP	USB serial differential bus (positive)
4	USB_ID	USB ID bus for host or device
5	GND	GND for USB interface

4.5. Audio Interfaces

Quectel UMTS&LTE EVB provides one digital audio codec board interface (PCM) J501 and three analog audio interfaces J601, J602 and J603. This chapter gives a detailed introduction on these audio interfaces.

4.5.1. Digital Audio Codec Board Interface (J501)

The UMTS&LTE EVB supports two different kinds of external digital audio codecs named ALC5616 and TLV320AIC3104. The codec circuit is assembled on an independent small board which can be interconnected with EVB by the BTB connector J501.

Customers can select different codecs according to their own application demands, and also can use AT command to switch between codecs. Two examples are provided below. For more details, please refer to ***document [5]*** or ***document [6]***.

- **AT+QDAI=3**: switch codec from TLV320AIC3104 to ALC5616
- **AT+QDAI=5**: switch codec from ALC5616 to TLV320AIC3104

The following figure show a reference design for the connection between digital audio codec boards and the EVB.

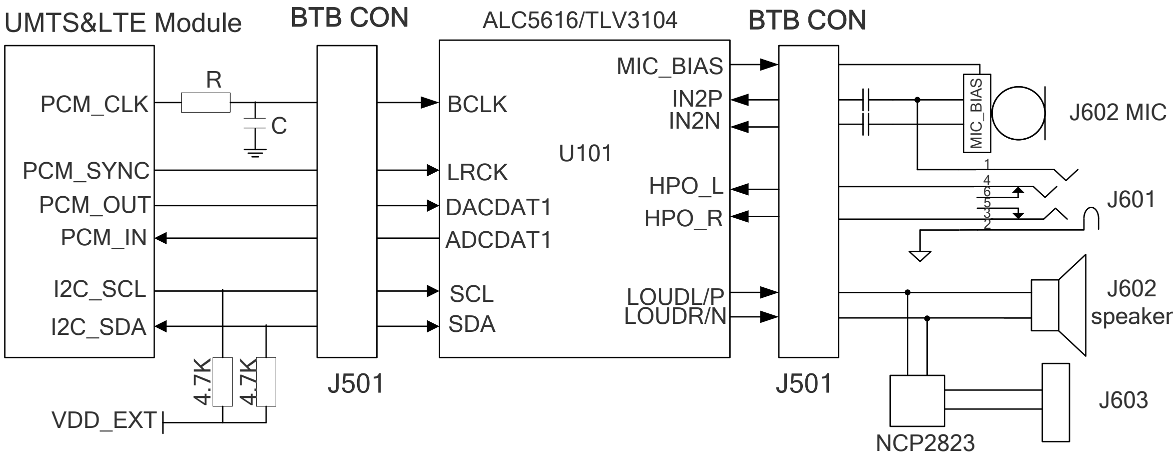

UMTS&LTE Module
BTB CON
ALC5616/TLV3104
BTB CON
PCM_CLK
R
C
PCM_SYNC
PCM_OUT
PCM_IN
I2C_SCL
I2C_SDA
4.7K
4.7K
VDD_EXT
J501
BCLK
LRCK
DACDAT1
ADCDAT1
SCL
SDA
U101
MIC_BIAS
IN2P
IN2N
HPO_L
HPO_R
LOUDL/P
LOUDR/N
J501
MIC_BIAS
J602 MIC
J601
J602
speaker
J603
NCP2823

Figure 12: Reference Design for Connection between Codec Board and EVB

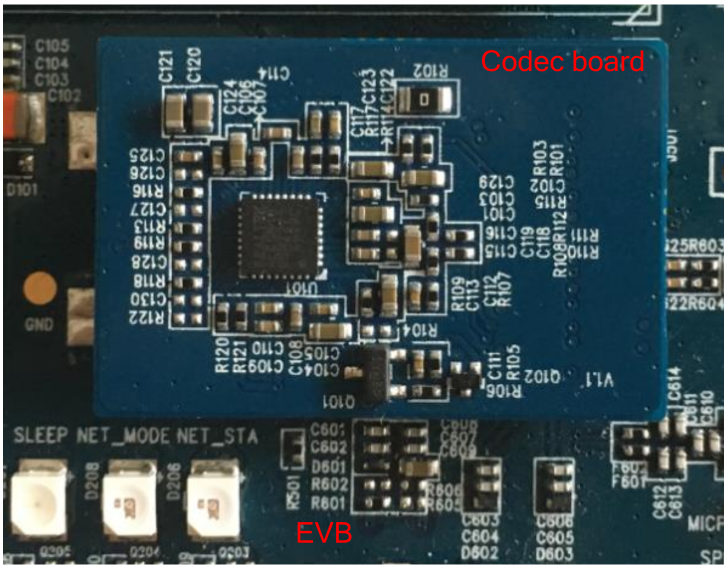

Codec board
EVB

Figure 13: Connection between Codec Board and EVB

4.5.2. Analog Audio Interfaces (J603/J601/J602)

4.5.2.1. Loudspeaker Interface (J603)

Audio interface J603 is designed for loudspeakers and the following figure shows a reference design of loudspeaker with an external Class-D audio amplifier.

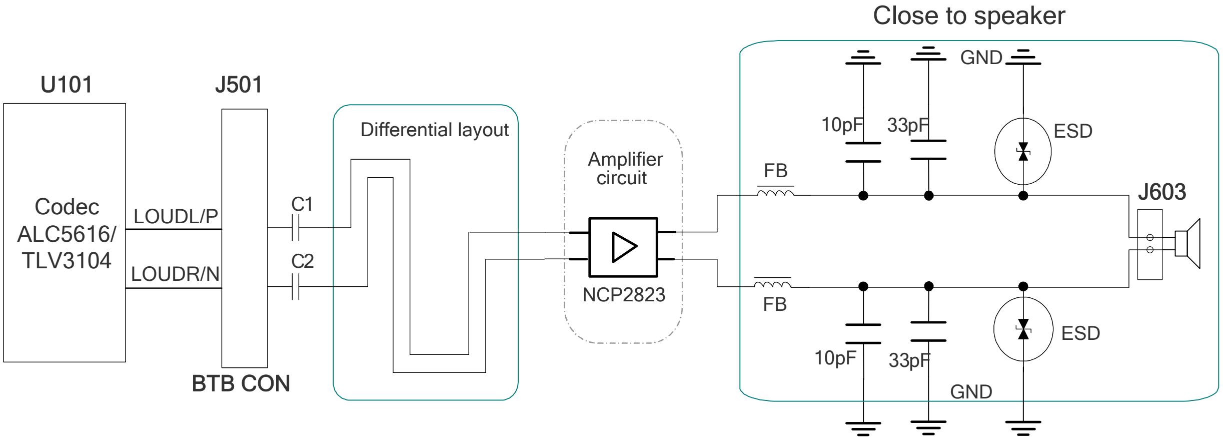

Close to speaker
U101
J501
Codec
ALC5616/
TLV3104
LOUDL/P
LOUDR/N
C1
C2
BTB CON
Differential layout
Amplifier
circuit
NCP2823
FB
FB
10pF
33pF
10pF
33pF
GND
GND
ESD
ESD
J603

Figure 14: Reference Circuit Design for Loudspeaker Interface J603

4.5.2.2. Earphone Interface (J601)

Audio interface J601 is designed for earphones. A reference circuit design for the interface is shown as following figure.

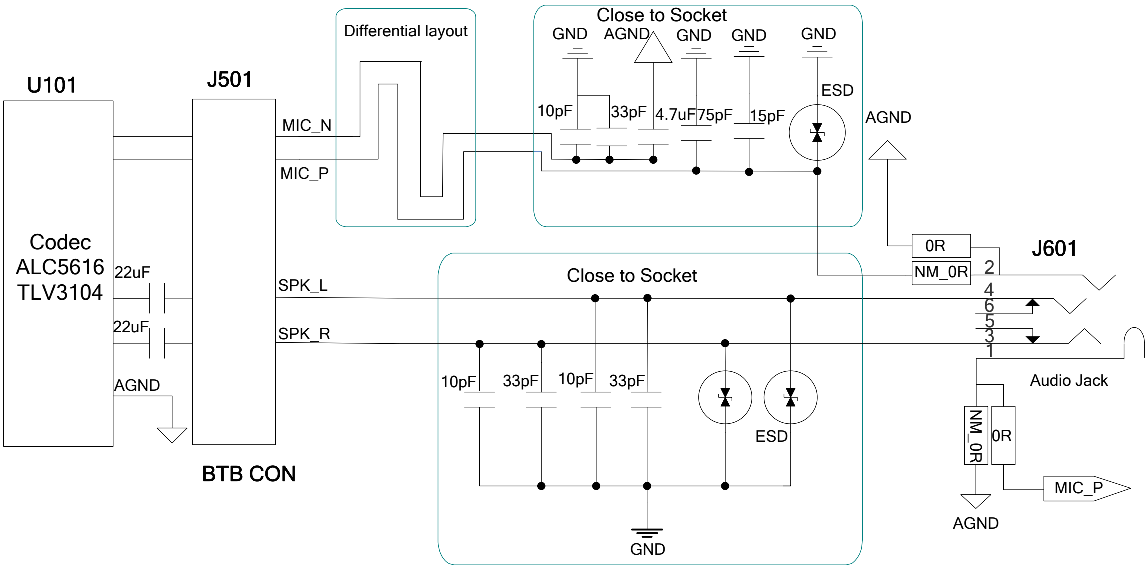

U101
J501
Codec
ALC5616
TLV3104
22uF
22uF
AGND
BTB CON
MIC_N
MIC_P
SPK_L
SPK_R
Differential layout
Close to Socket
GND
AGND
GND
GND
GND
ESD
10pF
33pF
4.7uF
75pF
15pF
AGND
0R
NM_0R
J601
2
4
6
5
3
1
Audio Jack
Close to Socket
10pF
33pF
10pF
33pF
ESD
GND
NM_0R
0R
MIC_P
AGND

Figure 15: Reference Circuit Design for Earphone Interface J601

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

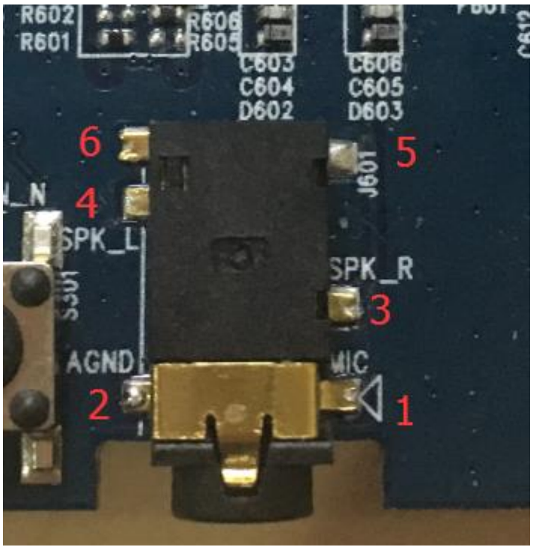

R602
R601
R606
R605
C603
C604
D602
C606
C605
D603
6
5
_N
4
J601
SPK_L
S301
SPK_R
3
AGND
MIC
2
1

Figure 16: Pin Assignment of J601

Table 5: Pin Definition of J601

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 shows the sketch design of audio plug which suits for the audio jack on UMTS&LTE EVB.

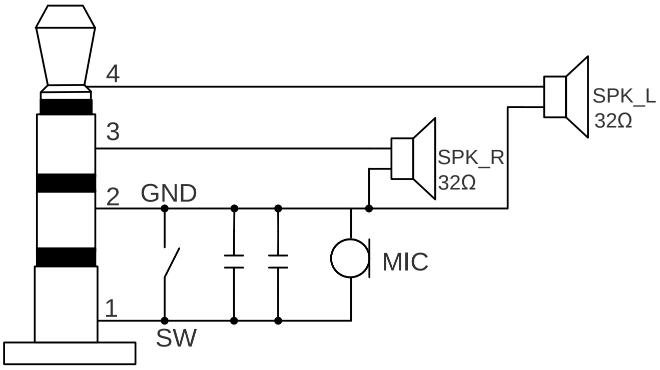


Figure 17: Sketch of Audio Plug

4.5.2.3. Handset Interface (J602)

Audio interface J602 is designed for handsets. A reference circuit design for handset interfaces J602 is shown below.

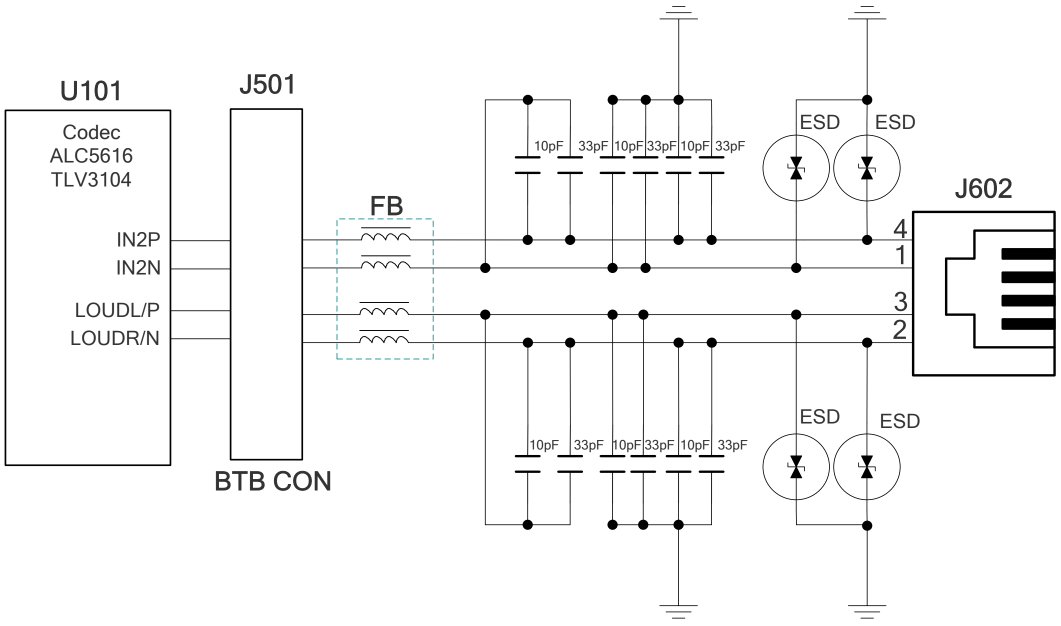

U101
Codec
ALC5616
TLV3104
IN2P
IN2N
LOUDL/P
LOUDR/N
J501
BTB CON
FB
10pF
33pF
10pF
33pF
10pF
33pF
ESD
ESD
J602
4
1
3
2
ESD
ESD
10pF
33pF
10pF
33pF
10pF
33pF

Figure 18: Reference Circuit Design for Handset Interface J602

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

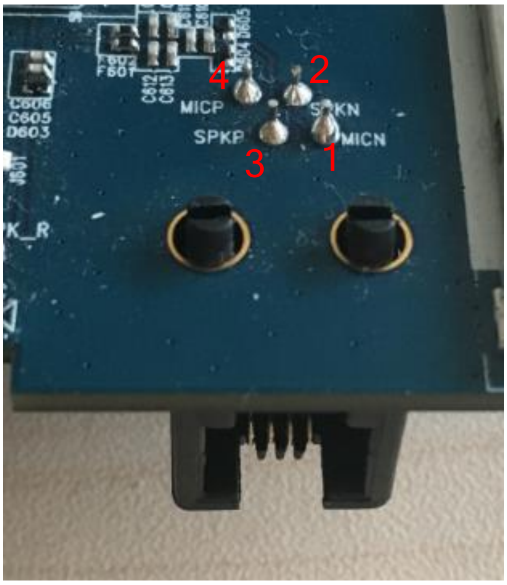

4
2
MICP
SPKN
SPKP
MICN
3
1

Figure 19: Pin Assignment of J602

Table 6: Pin Definition of J602

Pin No.	Pin Name	Function
1	MICN	Negative microphone input
2	SPKN	Negative loudspeaker output
3	SPKP	Positive loudspeaker output
4	MICP	Positive microphone input

4.6. (U)SIM Interface (J702)

The UMTS&LTE EVB has a 6-pin push-push type (U)SIM card (3V or 1.8V) connector J702. The following figure shows the simplified interface schematic for J702.

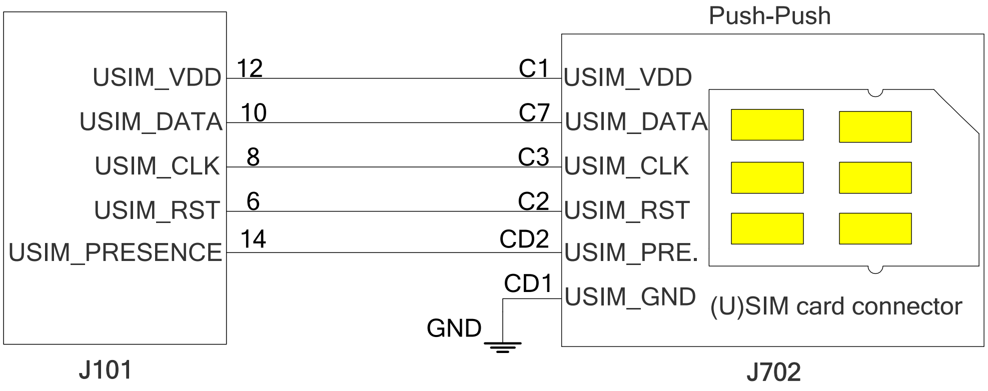

USIM_VDD
USIM_DATA
USIM_CLK
USIM_RST
USIM_PRESENCE
12
10
8
6
14
J101
Push-Push
C1
C7
C3
C2
CD2
CD1
GND
USIM_VDD
USIM_DATA
USIM_CLK
USIM_RST
USIM_PRE.
USIM_GND
(U)SIM card connector
J702

Figure 20: Simplified Interface Schematic for (U)SIM Card Connector J702

The figure and table below illustrate the pin assignment and pin definition of J702.

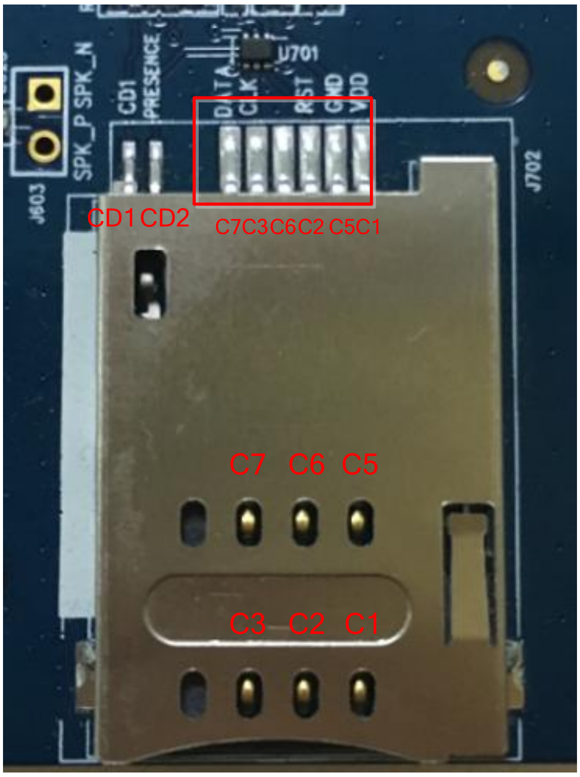

U701
SPK_N
SPK_P
J603
CD1
PRESENCE
DATA
CLK
RST
GND
VDD
J702
CD1 CD2
C7C3C6C2 C5C1
C7 C6 C5
C3 C2 C1

Figure 21: Pin Assignment of J702

Table 7: Pin Definition of J702

Pin No.	Signal Name	I/O	Function
C1	USIM_VDD	PO	U(SIM) card power supply, provided by UMTS&LTE 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	I/O	Data line, bi-directional
CD1	GND	GND	U(SIM) card insertion detection
CD2	USIM_PRESENCE	I	U(SIM) card insertion detection. Support low level detection.

4.7. SD Card Interface (J701)

The UMTS&LTE EVB provides an SD card interface that supports maximally 32GB micro SD card. With the SD card interface, customers can easily enhance the memory capacity of modules.

The following figure shows the simplified interface schematic for J701.

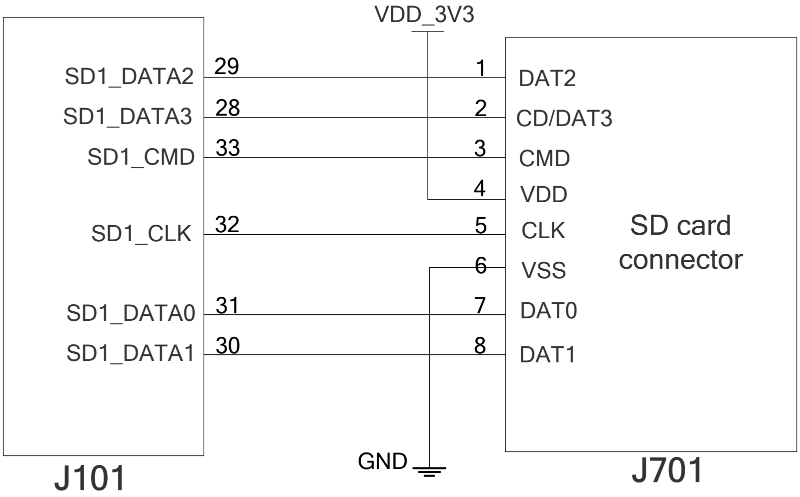

VDD_3V3
SD1_DATA2
SD1_DATA3
SD1_CMD
SD1_CLK
SD1_DATA0
SD1_DATA1
29
28
33
32
31
30
1
2
3
4
5
6
7
8
DAT2
CD/DAT3
CMD
VDD
CLK
VSS
DAT0
DAT1
SD card connector
GND
J101
J701

Figure 22: Simplified Interface Schematic for SD Card Interface J701

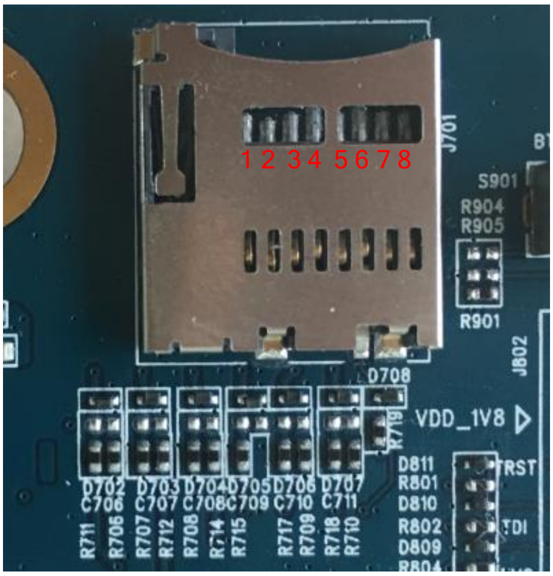

1 2 3 4 5 6 7 8
J701

Figure 23: Pin Assignments of J701

4.8. UART Interfaces (J401/J402)

The UMTS&LTE EVB offers two UART interfaces: COM1 (main UART port J401 and J402) and COM2 (debug UART port).

COM1 of UMTS&LTE EVB is intended for communication between the module and the host application. It can be used for data transmission and AT command communication.

COM2 supports 115200bps baud rate by default. It can be used for Linux console and log output.

The following figure shows the block diagram of UART on UMTS&LTE EVB.

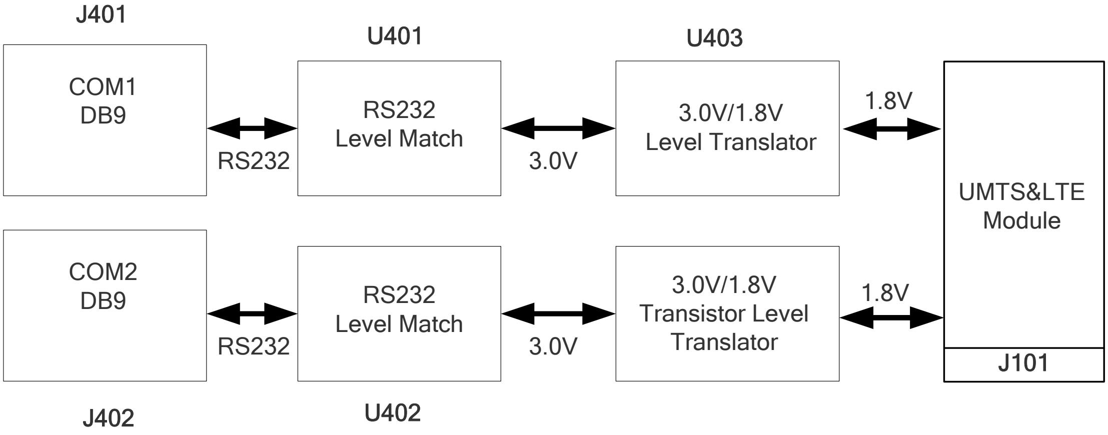

J401
COM1
DB9
RS232
U401
RS232
Level Match
3.0V
U403
3.0V/1.8V
Level Translator
1.8V
UMTS&LTE
Module
J101
COM2
DB9
RS232
RS232
Level Match
3.0V
3.0V/1.8V
Transistor Level
Translator
1.8V
J402
U402

Figure 24: UART Block Diagram

The following figures and tables show the pin assignment and pin definition of J401 and J402.

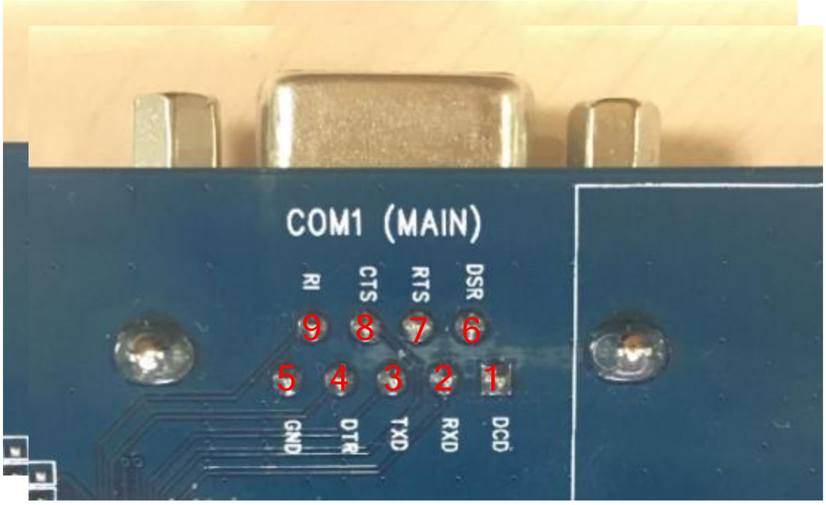

COM1 (MAIN)
RI
CTS
RTS
DSR
9
8
7
6
5
4
3
2
1
GND
DTR
TXD
RXD
DCD

Figure 25: Pin Assignment of J401

Table 8: Pin Definition of J401

Pin No.	Signal Name	I/O	Description
1	RS232_DCD	DO	Data carrier detection
2	RS232_RXD	DI	Receive data
3	RS232_TXD	DO	Transmit data
4	RS232_DTR	DI	Data terminal ready
5	RS232_GND	/	GND
6	NC	/	Not connected
7	RS232_RTS	DI	Request to send
8	RS232_CTS	DO	Clear to send
9	RS232_RI	DO	Ring indicator

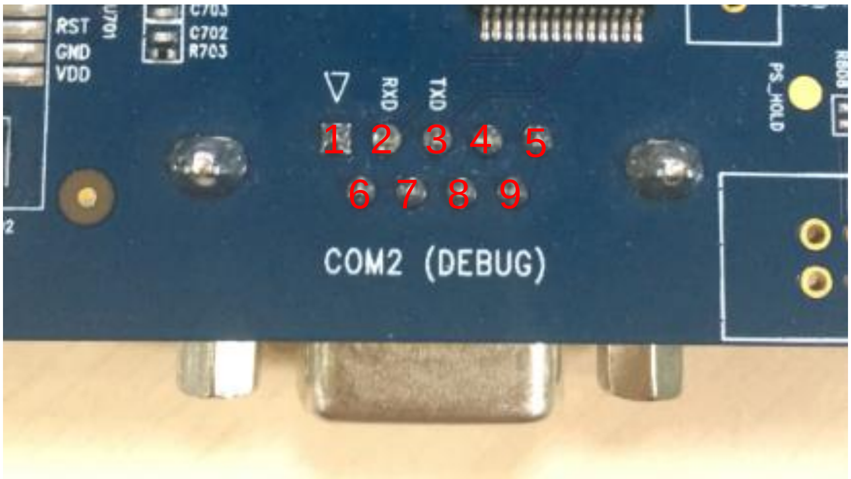

RST
GND
VDD
U701
C703
C702
R703
RXD
TXD
1
2
3
4
5
6
7
8
9
COM2 (DEBUG)
PS_HOLD
R808

Figure 26: Pin Assignment of J402

Table 9: Pin Definition of J402

Pin No.	Signal Name	I/O	Description
2	RS232_RXD	DI	Receive Data
3	RS232_TXD	DO	Transmit data

4.9. Switches and Buttons

The UMTS&LTE EVB includes two switches (S201 and S901) and three buttons (S301, S302 and S303), as shown in the following figures.

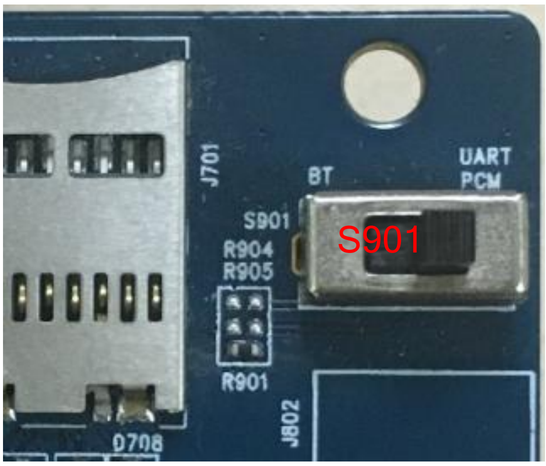

J701
BT
UART
PCM
S901
R904
R905
S901
R901
J802
D708

Figure 27: S901 Switch

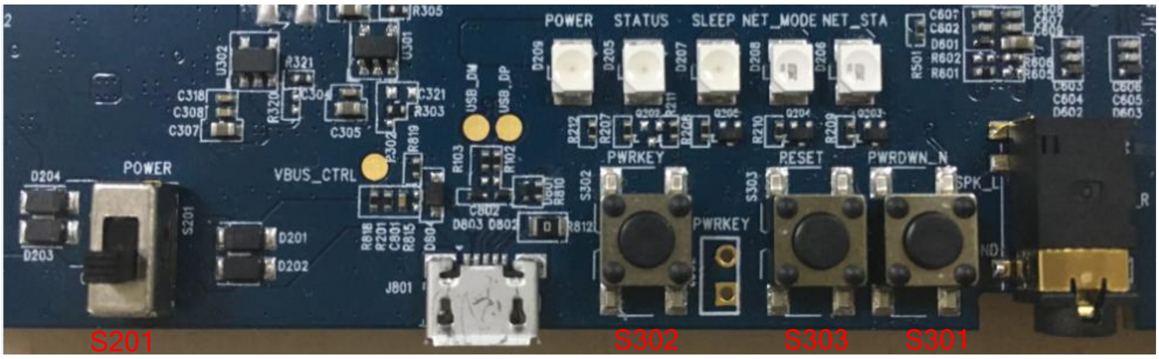

POWER
STATUS
SLEEP
NET_MODE
NET_STA
POWER
VBUS_CTRL
PWRKEY
RESET
PWRDWN_N
PWRKEY
J801
S201
S302
S303
S301

Figure 28: S201 Switch and S301/S302/S303 Buttons

Table 10: Description of Switches and Buttons

Reference No.	Description
S201	VBAT ON/OFF control
S901	Switched to the left: connect BT interface (UART, PCM) of Wi-Fi modules to the PCM interface of EC2x/AG35 modules, for testing the BT function of Wi-Fi modules.

	Switched to the right: connect the main UART and codec board interfaces on EVB to UMTS&LTE module, for testing the module's main UART functions, and the codec‘s PCM function.
S302	Used to turn on/off UC20/EC2x/EG9x/AG35/BG96 modules, or turn on UGxx modules only
S303	Used to reset UMTS&LTE modules
S301	Used to turn off UGxx modules only

4.10. Status Indication LEDs

The UMTS&LTE EVB comprises five status indication LEDs (D209, D205, D207, D208 and D206). The following figure shows the positions of these LED indicators.

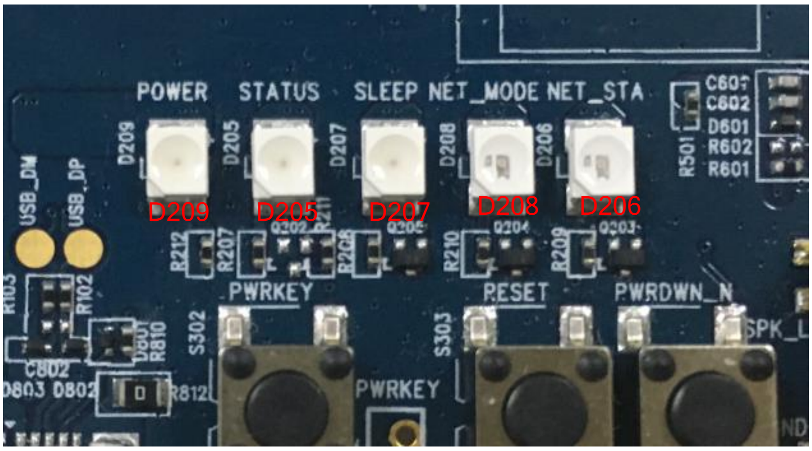


Figure 29: Status Indication LEDs

Table 11: Description of Status Indication LEDs

Reference No.	Description
D209	VBAT ON/OFF indicator. Indicates whether the power supply for UMTS&LTE modules is ready. Bright: VBAT ON Extinct: VBAT OFF
D205	Power ON/OFF indicator. Indicates the operation status of UMTS&LTE modules. Bright: the module is powered on Extinct: the module is powered off
D207	Sleep status indicator. Indicates the sleep status of UMTS&LTE modules.

	Bright: the module is in sleep mode Extinct: the module is not in sleep mode
D208, D206	Network status indicator. Indicates the network status of UMTS&LTE modules. For detailed information please refer to ***document [2]***.

4.11. Test Points

The UMTS&LTE EVB provides a series of test points. They can help customers to obtain the corresponding waveform of some signals. The following two figures show test points J803, J804, J805 and J806.

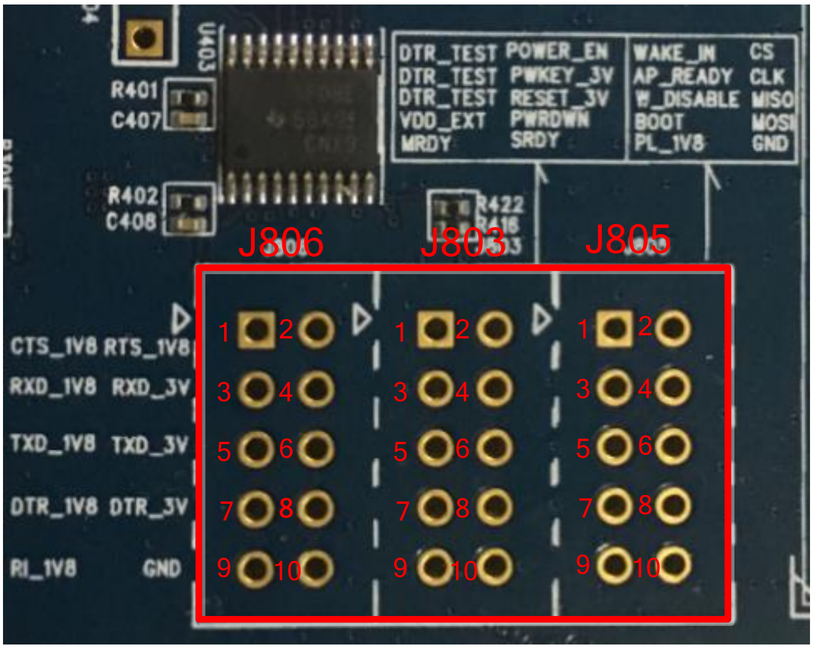

U403
R401
C407
R402
C408
R422
DTR_TEST POWER_EN
DTR_TEST PWKEY_3V
DTR_TEST RESET_3V
VDD_EXT PWRDWN
MRDY SRDY
WAKE_IN CS
AP_READY CLK
W_DISABLE MISO
BOOT MOSI
PL_1V8 GND
J806
J803
J805
CTS_1V8 RTS_1V8
RXD_1V8 RXD_3V
TXD_1V8 TXD_3V
DTR_1V8 DTR_3V
RI_1V8 GND
1 2
3 4
5 6
7 8
9 10

Figure 30: Test Points J803, J805 and J806

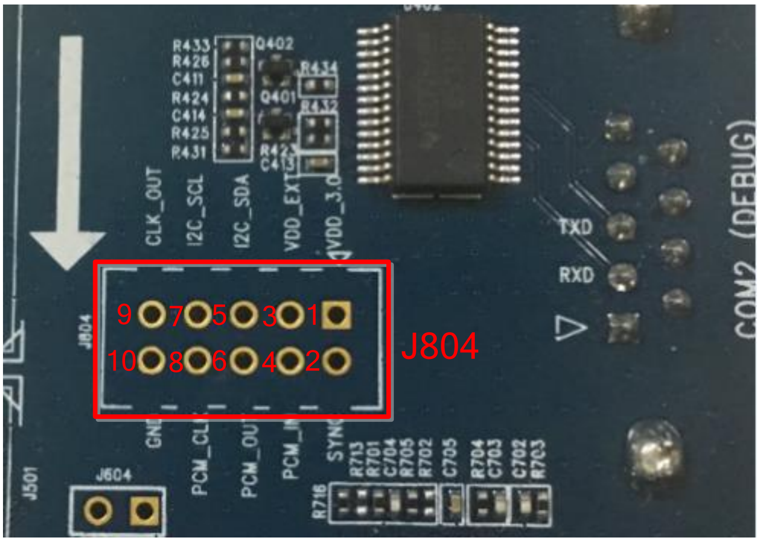

R433
R426
C411
R424
C414
R425
R431
Q402
Q401
R434
R432
R423
C413
CLK_OUT
I2C_SCL
I2C_SDA
VDD_EXT
VDD_3.0V
TXD
RXD
COM2 (DEBUG)
J804
9
7
5
3
1
10
8
6
4
2
J804
GND
PCM_CLK
PCM_OUT
PCM_IN
SYNC
J501
J604
R716
R713
R701
C704
R705
R702
C705
R704
C703
C702
R703

Figure 31: Test Point J804

Table 12: Pin Definition of J803, J804, J805 and J806

J803		
Pin No.	**Pin Name**	**Description**
1, 3, 5	DTR_TEST	Data terminal ready test pins
2	POWER_EN	VBAT enable pin
4	PWRKEY_3.0V	PWRKEY_3.0V test pin
6	RESET_3.0V	RESET_3.0V test pin
7	VDD_EXT	Connected directly to VDD_EXT of UMTS&LTE modules
8	POWER_OFF_3.0V	Used to power off UGxx modules
9	SPI_MRDY	RESERVED
10	SPI_SRDY	RESERVED
J804		
Pin No.	**Pin Name**	**Description**
1	VDD_3.0V	3.0V power supply from U302
2	PCM_SYNC	Connected directly to PCM_SYNC of UMTS&LTE modules

3	VDD_1V8	1.8V power supply from U301
4	PCM_IN	Connected directly to PCM_IN of UMTS&LTE modules
5	I2C_SDA	Connected directly to I2C_SDA of UMTS&LTE modules
6	PCM_OUT	Connected directly to PCM_OUT of UMTS&LTE modules
7	I2C_SCL	Connected directly to I2C_SCL of UMTS&LTE modules
8	PCM_CLK	Connected directly to PCM_CLK of UMTS&LTE modules
9	CLK_OUT	RESERVED
10	GND	Ground
J805		
Pin No.	**Pin Name**	**Description**
1	WAKE_IN	Connected directly to WAKE_IN of UMTS&LTE modules
2	SPI_CS_N	Connected directly to SPI_CS_N of UMTS&LTE modules
3	AP_READY	Connected directly to AP_READY of UMTS&LTE modules
4	SPI_CLK	Connected directly to SPI_CLK of UMTS&LTE modules
5	W_DISABLE_N	Connected directly to W_DISABLE# of UMTS&LTE modules
6	SPI_MISO	Connected directly to SPI_MISO of UMTS&LTE modules
7	USB_BOOT	Connected directly to USB_BOOT of UMTS&LTE modules
8	SPI_MOSI	Connected directly to SPI_MOSI of UMTS&LTE modules
9	VDD_1.8V	Connected to VDD_1.8V via a resistor
10	GND	Ground
J806		
Pin No.	**Pin Name**	**Description**
1	CTS_1.8V_UART	Connected directly to voltage translator
2	RTS_1.8V_UART	Connected directly to voltage translator
3	RXD_1.8V_UART	Connected directly to voltage translator

4	RXD_3.0V	Connected directly to voltage translator
5	TXD_1.8V_UART	Connected directly to voltage translator
6	TXD_3.0	Connected directly to voltage translator
7	DTR_1.8V	Connected directly to DTR of UMTS&LTE modules
8	DTR_3.0V	Connected directly to voltage translator
9	RI_1.8V	Connected directly to RI of UMTS&LTE modules
10	GND	Ground

5 Operation Procedures Illustration

This chapter introduces how to use the UMTS&LTE EVB for testing and evaluation of Quectel UMTS&LTE modules and Wi-Fi modules.

5.1. Power on UMTS&LTE and Wi-Fi Modules

- **Power on UMTS&LTE modules**

1. Connect the UMTS&LTE TE-A to the EVB via connectors J101 and J102.

2. Insert a (U)SIM card into the (U)SIM card connector on EVB, and connect the antennas to UMTS&LTE TE-A.

3. Connect the EVB to a 5V power adapter, or connect the EVB to PC via USB cable.

4. Switch S201 (Power Switch) to **ON** state, then D209 (VBAT ON/OFF indicator) will light up. Press the S302 (PWRKEY) for at least 100ms, then the UMTS&LTE module will be powered on and D205 (power ON/OFF indicator) will light up.

- **Power on Wi-Fi modules**

1. Make sure the EC2x/AG35 module is powered on, if there is a need to test the Wi-Fi function of them.

2. Connect the TE-A of Wi-Fi modules to the EVB via connectors J901 and J902, and then connect the Wi-Fi antenna to the TE-A.

3. Connect the TE-A to PC via an Ethernet cable.

4. Send **AT+QWIFI=1** command to EC2x/AG35 module to enable power supply for Wi-Fi modules. For more details, please refer to ***document [3]*** or ***document [4]***. Before sending the command, please make sure the EVB has been connected to PC via USB cable.

The following table shows the UMTS&LTE modules' network status which are indicated via D206 and D208.

Table 13: Indication of D206 and D208

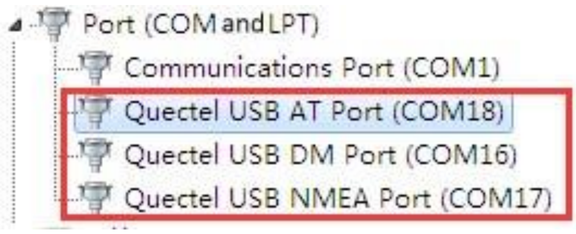
Status Indication LEDs	State	Network Status
D206 NET_STATUS	Flicker slowly (200ms ON/1800ms OFF)	Network searching
	Flicker slowly (1800ms ON/200ms OFF)	Idle mode
	Flicker slowly (125ms ON/125ms OFF)	Data is being transferred over 2G/3G/4G networks
	Always ON	Voice calling
D208 NET_MODE	Always ON	Registered on 3G network successfully (UC20/UGxx) Registered on 4G network successfully (EC2x/EG95/AG35/BG96)
	Always OFF	Others

5.2. Communication Via USB or UART Interface

5.2.1. Communication via USB Interface

1. Power on the UMTS&LTE module according to the procedures mentioned in ***Chapter 5.1***.

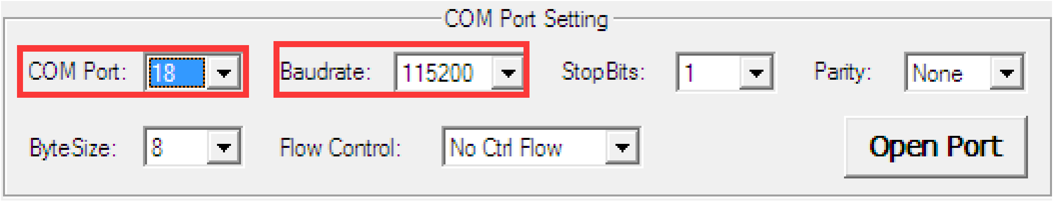
2. Connect the EVB and the PC with USB cable through USB interface, and then run the driver disk on PC to install the USB driver. For details about USB driver installation, please refer to ***document [1]***. The USB port numbers can be viewed through the PC Device Manager, as shown below.



Port (COM and LPT)
- Communications Port (COM1)
- Quectel USB AT Port (COM18)
- Quectel USB DM Port (COM16)
- Quectel USB NMEA Port (COM17)

Figure 32: USB Ports

3. Install and then use the QCOM tool provided by Quectel to realize the communication between the UMTS&LTE module and the PC. The following figure shows the COM 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 [7]***.


COM Port Setting

COM Port: 18
Baudrate: 115200
StopBits: 1
Parity: None
ByteSize: 8
Flow Control: No Ctrl Flow

Figure 33: COM Port Setting Field on QCOM (USB AT Port Connection)

5.2.2. Communication via UART Interface

1. Run the driver disk on PC to install the USB-to-RS232 driver.

2. Connect the main UART interface of module to PC with the USB-to-UART converter cable (USB-to-RS232 cable), and the USB serial port number can be viewed through the PC Device Manager, as shown below.

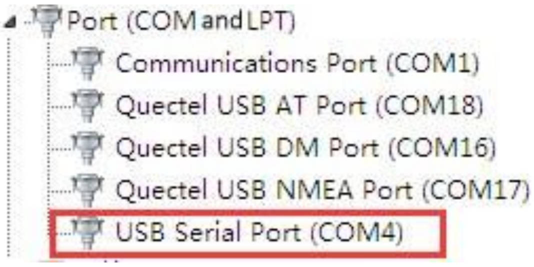
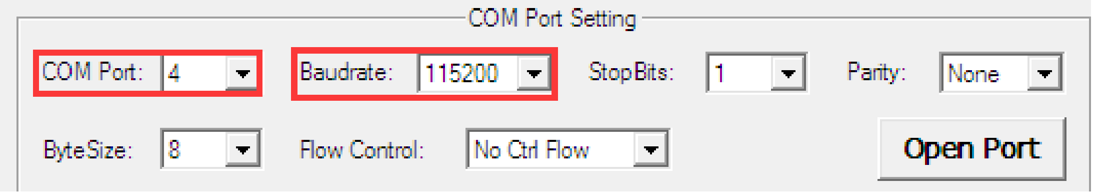

Port (COM and LPT)
Communications Port (COM1)
Quectel USB AT Port (COM18)
Quectel USB DM Port (COM16)
Quectel USB NMEA Port (COM17)
USB Serial Port (COM4)

Figure 34: USB Serial Port

3. Install and then use the QCOM tool provided by Quectel to realize the communication between the UMTS&LTE module and the PC. The following figure shows the COM Port Setting field on QCOM: select correct "**COM port**" (USB Serial Port) and set correct "**Baudrate**" (such as 115200bps). For more details about QCOM tool usage and configuration, please refer to ***document [7]***.


COM Port Setting

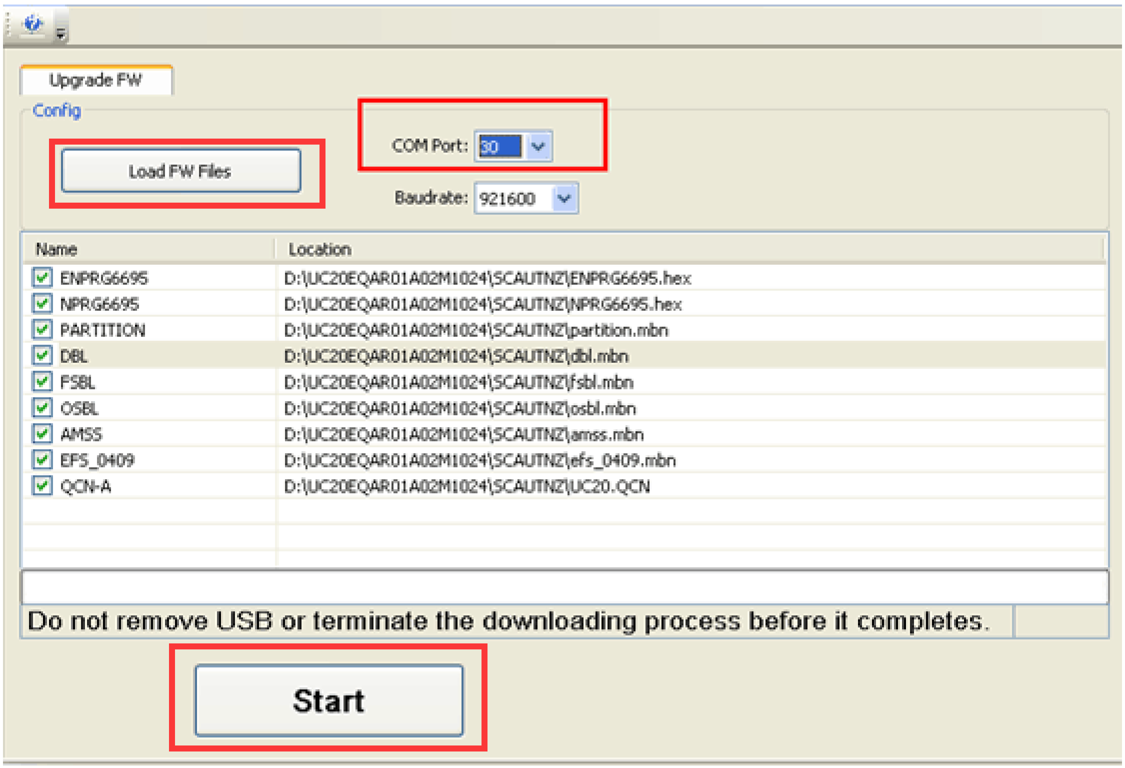
COM Port: 4
Baudrate: 115200
StopBits: 1
Parity: None
ByteSize: 8
Flow Control: No Ctrl Flow

Figure 35: COM Port Setting Field on QCOM (USB Serial Port Connection)

5.3. Firmware Upgrade

Quectel UMTS&LTE modules upgrade firmware 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 UMTS&LTE modules 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.



COM Port: 30
Baudrate: 921600

Name	Location
☑ ENPRG6695	D:\UC20EQAR01A02M1024\SCAUTNZ\ENPRG6695.hex
☑ NPRG6695	D:\UC20EQAR01A02M1024\SCAUTNZ\NPRG6695.hex
☑ PARTITION	D:\UC20EQAR01A02M1024\SCAUTNZ\partition.mbn
☑ DBL	D:\UC20EQAR01A02M1024\SCAUTNZ\dbl.mbn
☑ FSBL	D:\UC20EQAR01A02M1024\SCAUTNZ\fsbl.mbn
☑ OSBL	D:\UC20EQAR01A02M1024\SCAUTNZ\osbl.mbn
☑ AMSS	D:\UC20EQAR01A02M1024\SCAUTNZ\amss.mbn
☑ EFS_0409	D:\UC20EQAR01A02M1024\SCAUTNZ\efs_0409.mbn
☑ QCN-A	D:\UC20EQAR01A02M1024\SCAUTNZ\UC20.QCN

Do not remove USB or terminate the downloading process before it completes.

Figure 36: Configurations for Firmware Upgrade

5.4. Reset UMTS&LTE Modules

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 S303 (RESET) for more than 150ms then release it to reset UMTS&LTE modules. However, this may causes the loss of information stored in the memory as the reset module has been initialized.

5.5. Power off UMTS&LTE and Wi-Fi Modules

- **Power off UMTS&LTE modules**

There are two ways to power off UMTS&LTE modules.

One way is to execute AT command **AT+QPOWD**. This is the best and the safest way. The module will log off from the network and save data before shutdown, but it will be powered on again after shutdown. For more details about the AT command, please refer to ***document [5]*** or ***document [6]***.

The other way to power off the module is to press down S302/S301 button (S302 for UC20/EC2x/EG9x/AG35/BG96 modules, and S301 for UGxx modules) for at least 0.6s.

- **Power off Wi-Fi modules**

AT+QWIFI=0 command can be used to power off Wi-Fi modules. For more details, please refer to ***document [3]*** or ***document [4]***.

6 Appendix A References

Table 14: Related Documents

SN	Document Name	Remark
[1]	Quectel_xx_Windows_USB_Drivers_Installation_Guide	Respective Windows USB drivers installation guide for UC20, UGxx and LTE (EC2x, EG9x, AG35 and BG96) modules
[2]	Quectel_xx_Hardware_Design	Respective hardware design for UC20, UG95, UG96, EC25, EC21, EC20, EC20 R2.0, EC20 R2.1, AG35 and BG96 modules
[3]	Quectel_FC20_Series_Hardware_Design	FC20 series hardware design
[4]	Quectel_AF20_Hardware_Design	AF20 hardware design
[5]	Quectel_WCDMA_UGxx_AT_Commands_Manual	AT commands manual for Quectel WCDMA UGxx modules
[6]	Quectel_xx_AT_Commands_Manual	Respective AT commands manual for UC20, EC25&EC21, EC20, EC20 R2.0, EC20 R2.1, AG35 and BG96 modules
[7]	Quectel_QCOM_User_Guide	User guide for QCOM tool

Table 15: Terms and Abbreviations

Abbreviation	Description
AGND	Analogue Ground
COM	Cluster Communication Port
BTB	Board to Board
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	Long Term Evolution
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
USIM	Universal Subscriber Identity Module
VBAT	Voltage of Battery