FC20 EVB Kit User Guide

WIFI&BT Module

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About the Document

History

Revision	Date	Author	Description
1.0	2016-08-30	Power JIN	Initial

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1 Introduction

This document describes the evaluation board of Quectel's FC20 module. The FC20 evaluation board is an assisted system integrator for developing and evaluating products based on Quectel Wireless 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 module. Manufacturers of the cellular terminal should send the following safety information to users and operating personnel and to incorporate these guidelines into all manuals supplied with the product. If not so, Quectel does not take on any liability for customer 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 mobie while driving (even with a handsfree kit) cause distraction and can lead to an accident. You must comply with laws and regulations restrcting the use of wireless devices while driving.
	Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Consult the airline staff about the use of wireless devices on boarding the aircraft, if your device offers a Fight Mode which must be enabled prior to boarding an aircraft.
	Switch off your wireless device when in hospitals or clinics or other health care facilities. These requests are desinged to prevent possible interference with sentitive medical equipment.
	Cellular terminals or mobiles operate over radio frequency signal and cellular network and cannot be guaranteed to connect in all conditions, for example no mobile fee or an invalid USIM card. While you are in this condition and need emergent help, Please Remember using emergency call. In order to make or receive 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 potencially explosive atmospheres, obey all posted signs to turn off wireless devices such as your phone or other cellular terminals. Areas with potencially exposive atmospheres including 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.

2 General Overview

Quectel supplies FC20-EVB kit for testing FC20 module. This EVB can test basic functionalities of the module.

2.1. Key Features

Table 1: Features

Features	Implementation
Power Supply	DC supply: 4.5~5.5V, typically 5V VBAT：3.8V @J103
USIM Interface	Support USIM/SIM cards: 3.0V and 1.8V
UART Interface	COM-serial interface for data communication (default 115200bps) Max. baud rate : 460800bps
USB Interface	USB 2.0
Signal Indication	5 LEDs are available for signal indication
Physical Characteristics	Size: 14.64 × 11.5cm

2.2. System Overview

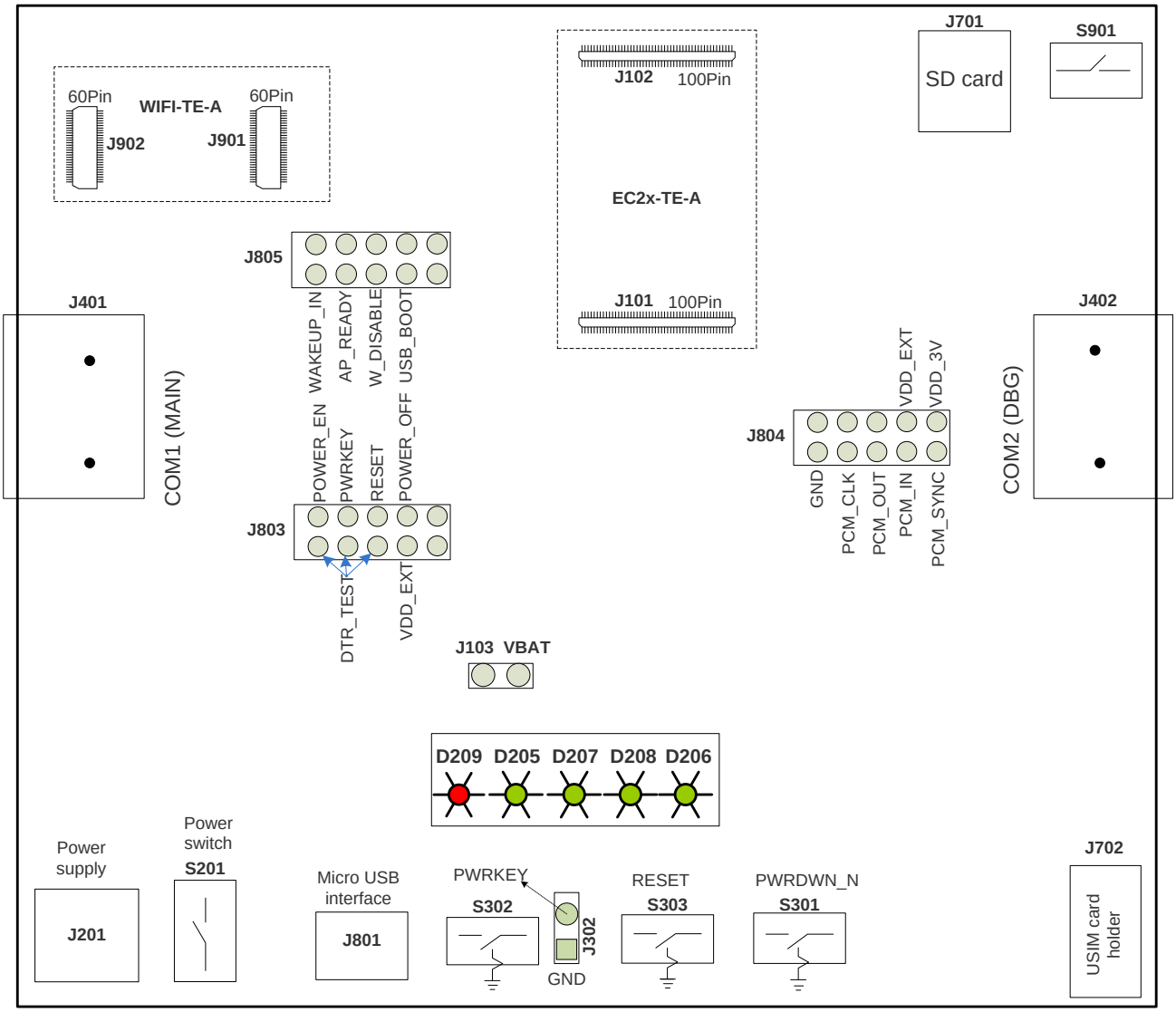

Figure 1: System Overview

NOTE

EC2x includes EC25, EC21 and EC20 R2.0.

2.3. Interface Overview

Table 2: Interfaces of FC20 EVB

Interface	Reference Number	Description
Power Supply	J201	The power jack on the EVB board. Supply voltage typically +5V
Power Switch	S201	Switch 5V power supply ON/OFF
PWRKEY	S302	PWRKEY push button It's used to turn on/off the EC2x module.
	J302	Jumper is used to connect PWRKEY to GND.
RESET	S303	Reset push button It's used to reset the EC2x and FC20 modules.
PWRDWN_N	S301	It's only used to turn off UGxx series module[1)]
SWITCH	S901	If switch to GND, PCM and UART interfaces will be connected between E2x and FC20. If switch to VDD_1V8, UART interface of EC2x will connect the Main UART interface J401.
Micro USB	J801	USB device interface
USIM	J702	USIM card holder
COM1	J401 (bottom side)	Main UART port
COM2	J402 (bottom side)	Debug UART port
SD	J701	SD card port
LEDs	D209	VBAT ON/OFF indicator
	D205	Indicate EC2x operating status
	D206	Indicate EC2x network activity status
	D208	Indicate EC2x network registration mode
	D207	Indicate EC2x sleep status
Connector	J101,J102	Connect to EC2x-TE-A
	J901,J902	Connect to FC20-TE-A

VBAT	J103	Jumper used for VBAT voltage test
Test Points	J803, J804 J805	These are test pins

NOTE

[1] Only UGxx series modules have this function, including UG95, UG96 and UG35. Please refer to Quectel module hardware design for more details.

Table 3: Antenna Interface of FC20-TE-A

WLAN ANT	J202	FC20 WIFI antenna connector

Table 4: Antenna Interfaces of EC2X-TE-A

MAIN ANT	J201	EC2x main antenna connector
GNSS ANT	J203	EC2x GNSS antenna connector
DIV ANT	J202	EC2x diversity antenna connector

2.4. EVB View

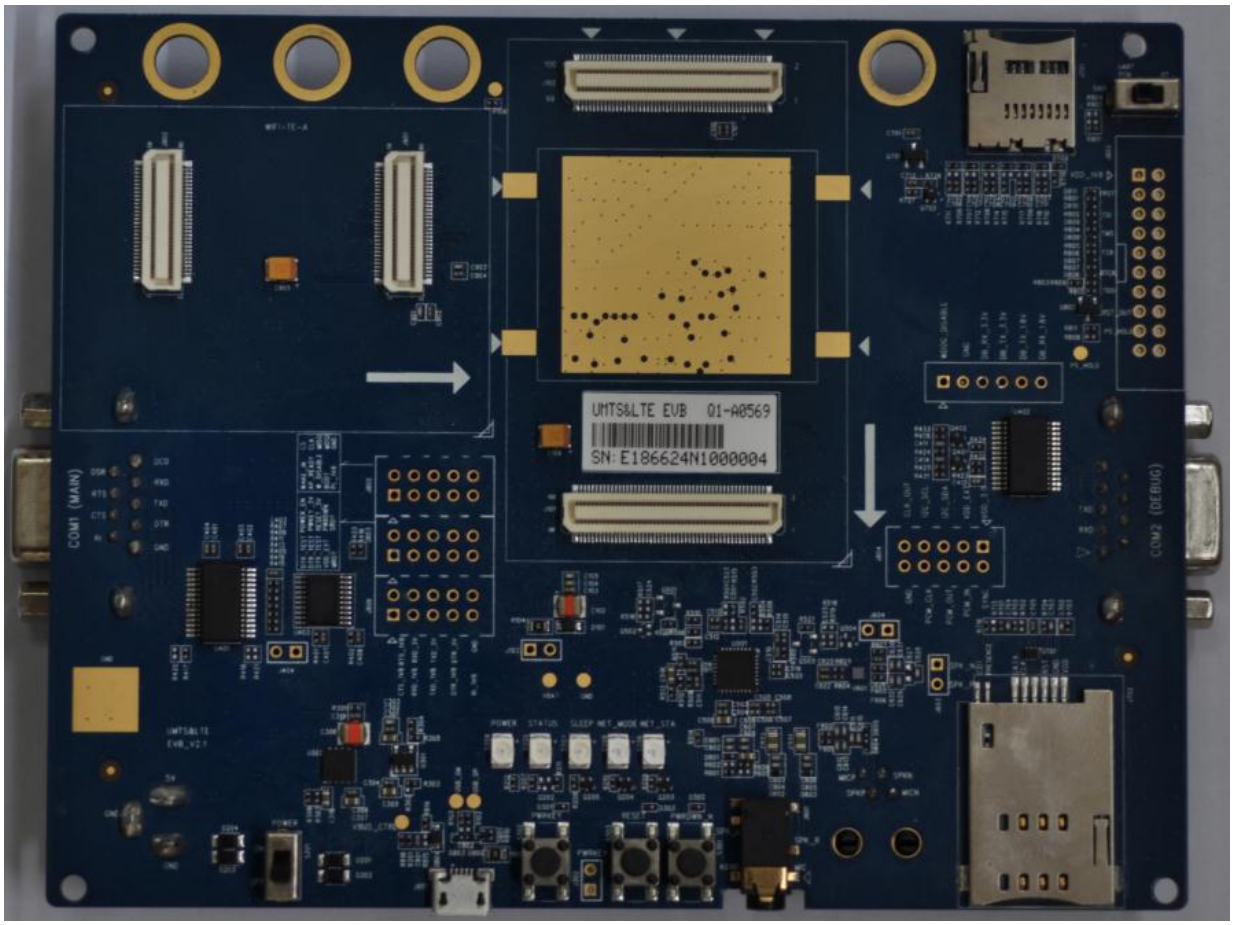

Figure 2: EVB Top View

2.5. EVB Accessories

All the items of EVB kit are listed in Table 5 and Figure 3 as below. Please contact the supplier if there is something missing.

Table 5: Accessories List

Items	Description	Quantity
EC2x-TE-A	EC2x-TE-A_V1.2	1
FC20-TE-A	FC20-TE-A_V1.1	1
Power Supply	5V DC switching adaptor	1
Cables	USB to UART converter cable	1
	USB cable	1
	RF Cable	4
Antennas	WIFI Antenna	1
	RF Antenna	2
	GNSS Antenna (passive)	1
Disk	USB2.0 to RS232 driver and USB driver disk	1
Other	Bolts and nuts for fixing EVB	1

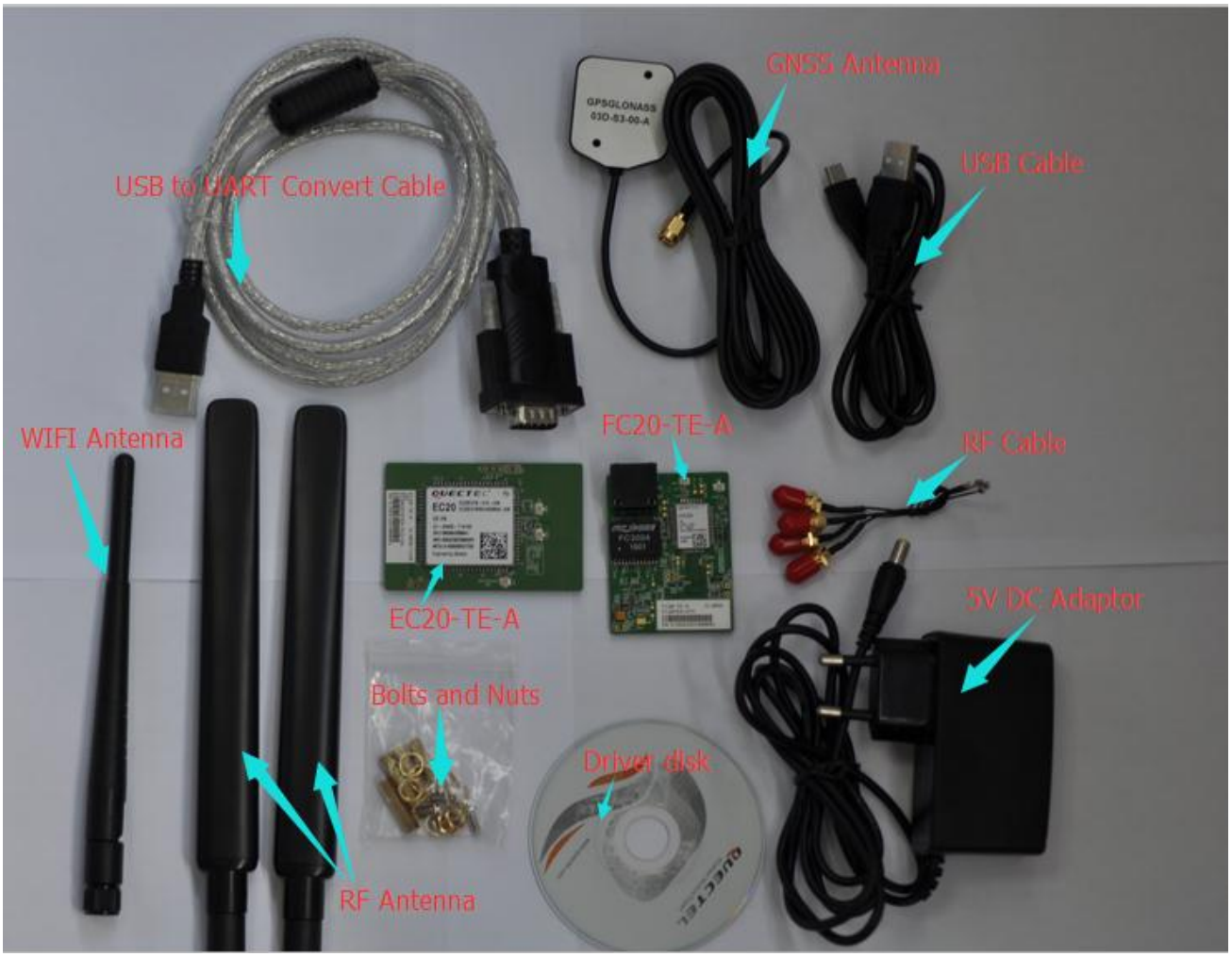

Figure 3: EVB Accessories

NOTE

The RF antenna can be used as main or diversity reception.

3 Interface Application

This chapter describes the hardware interfaces of FC20 EVB, shown as follows:

- Power interface
- USB interface
- SD interface
- USIM card interface
- UART interface

It also provides information about LEDs, buttons and test points to help you to use the FC20 EVB.

3.1. Power Interface

The power supply of FC20 EVB could come from the external input which is connected with power jack. The power jack connects LDOs which can provide VBAT、VDD_3V、VDD_1V8 and VDD_3V3 for operating the EVB and FC20 module.

Figure 4 shows the simplified power supply schematic and Figure 5 shows the power interface of FC20 EVB.

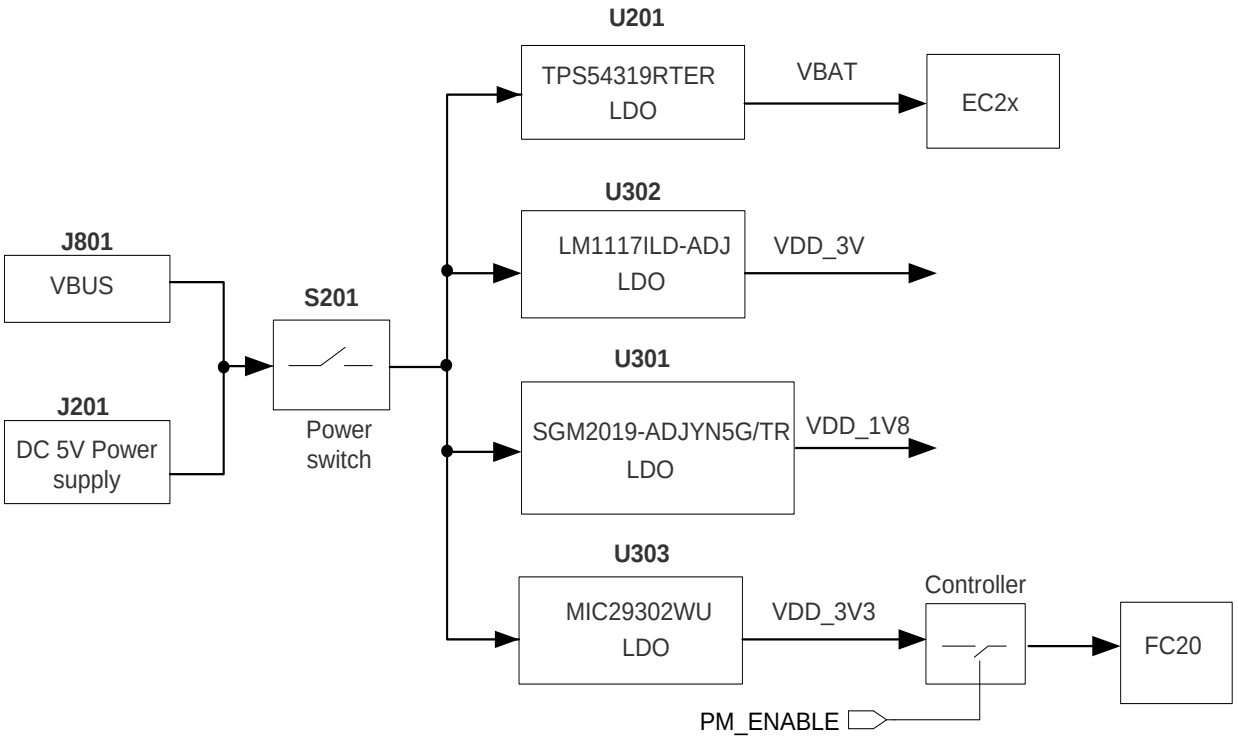

Figure 4: Simplified Power Supply Schematic

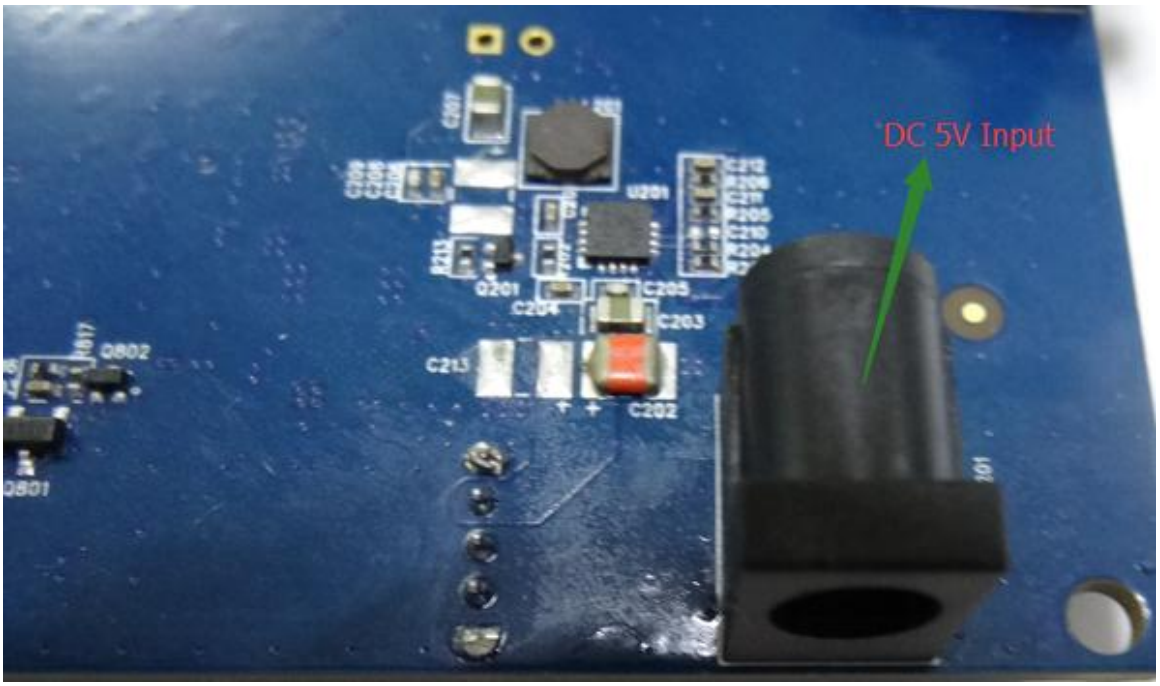

Figure 5: Power Interface

You need to use the right DC adapter provided by Quectel, shown as Figure 6.

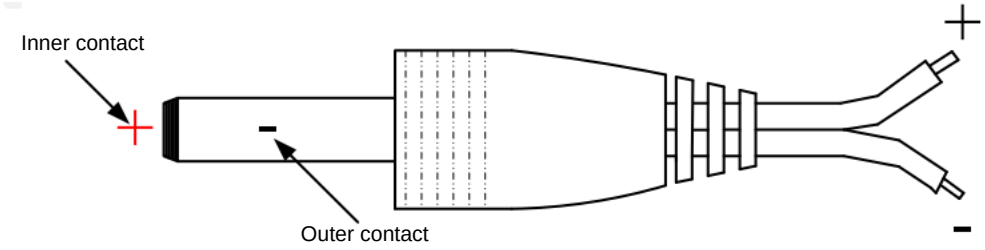

Figure 6: Power Plug

3.2. USB Device Interface

EC2x module provides an USB 2.0 interface which complies with USB 2.0 standard and supports high-speed (480Mbps) and full-speed (12Mbps). It is used for AT command, data transmission, GNSS NMEA sentences output, software debug and firmware upgrade.

FC20 EVB provides a Micro-USB receptacle J801 to connect a host device. The USB data lines USB_DP and USB_DM are connected to the EC2x module of EC2x-TE-A.

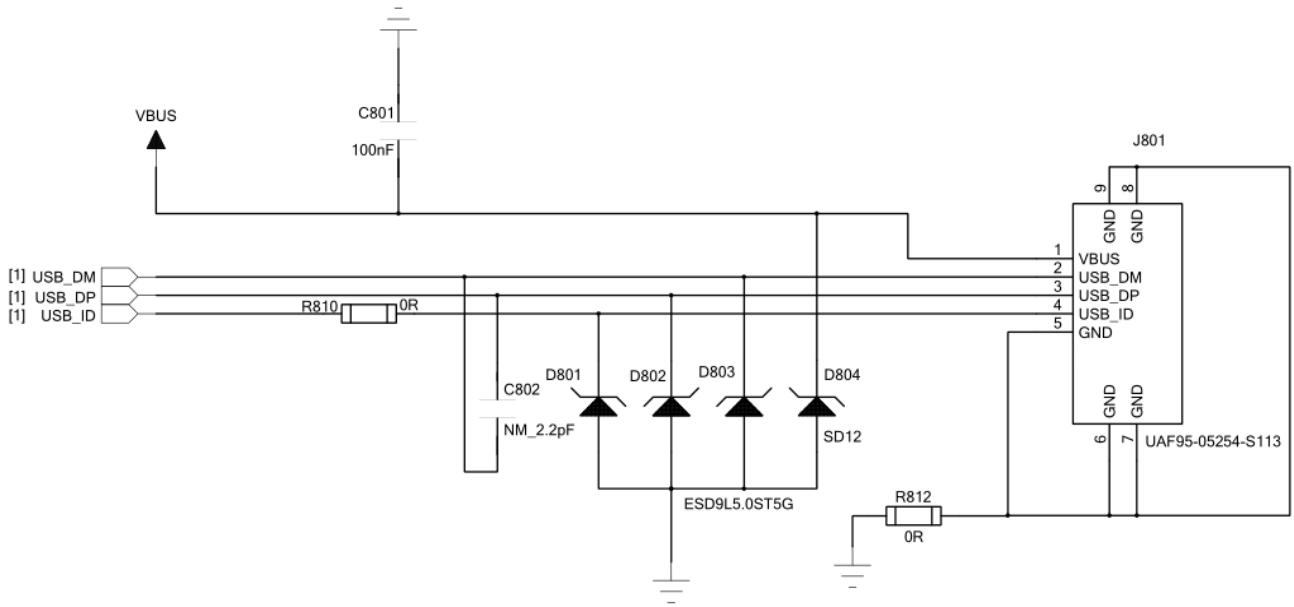

Figure 7: Circuit of USB Interface

Table 5: Pin Assignment of USB Device Interface

J801 Pin	Pin Name	Description
1	USB_VBUS	This pin is used for USB detection
2	USB_DM	USB serial differential bus (minus)
3	USB_DP	USB serial differential bus (positive)
4	USB_ID	Reserved
5	GND	GND for USB interface

3.3. SD Interface

The FC20 EVB has a SD card interface J701, and the SD card interface connects the EC2x module U101 of EC2x-TE-A. Figure 8 shows the simplified interface schematic for J701.

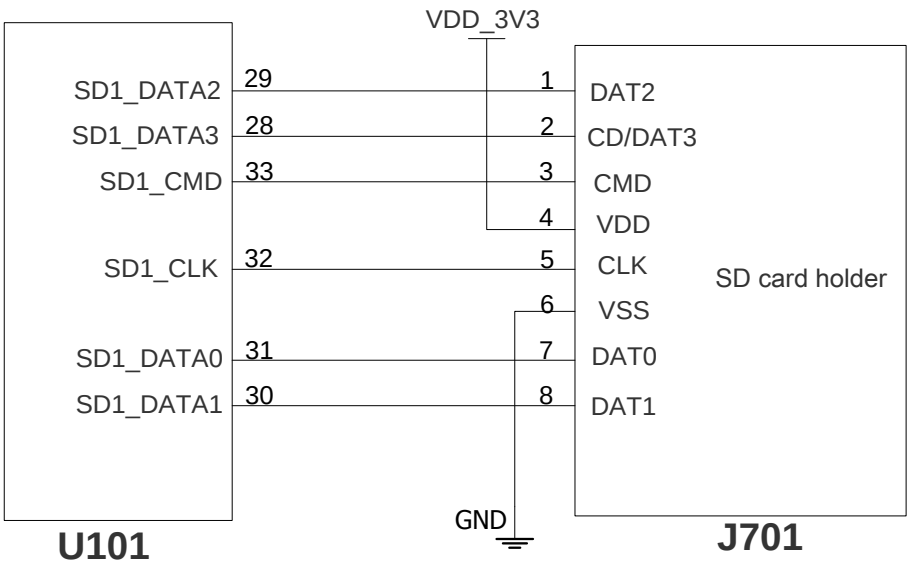

Figure 8: Simplified Schematic of SD Card Interface

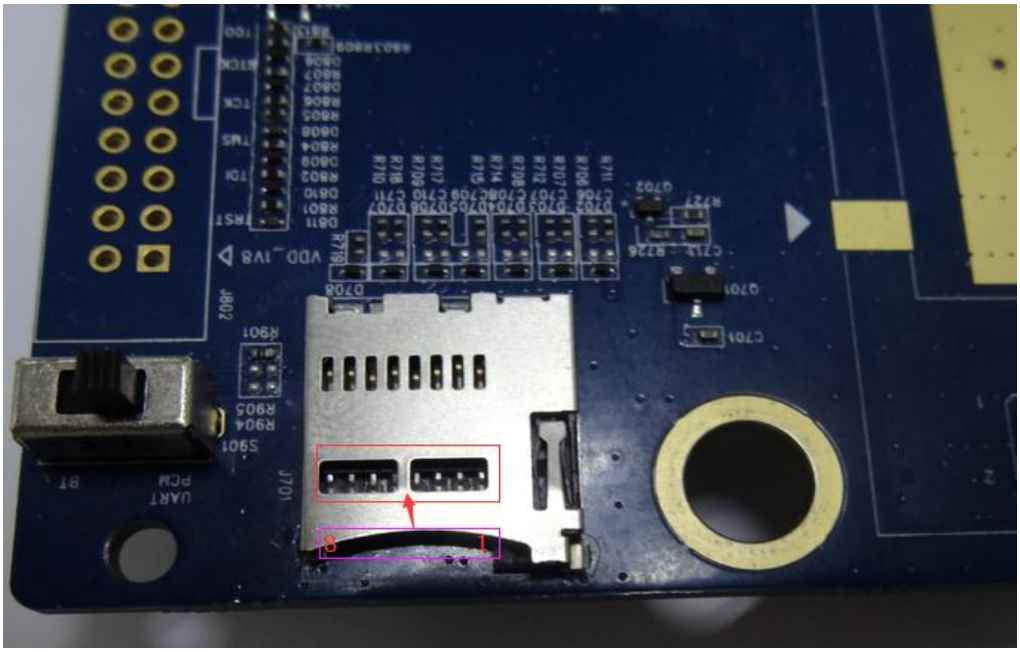

Figure 9: Pins Assignment of SD Card Holder

Table 6: Pin Assignment of SD Card Holder

J701 Pin	Signal Name	I/O	Description
1	DATA2	IO	Data line 2
2	CD/DATA3	IO	Card detect/data line 3
3	CMD	IO	Command/response
4	VDD	P	Supply voltage
5	CLK	DI	Clock
6	VSS	GND	Ground
7	DATA0	IO	Data line 0
8	DATA1	IO	Data line 1

NOTE

The SD card detection function of EC2x module is under development.

3.4. USIM Card Interface

The FC20 EVB has a USIM card interface. A suitable USIM card (3V or 1.8V) is required before starting the EC2x module. Figure 10 shows the simplified interface schematic for J702.

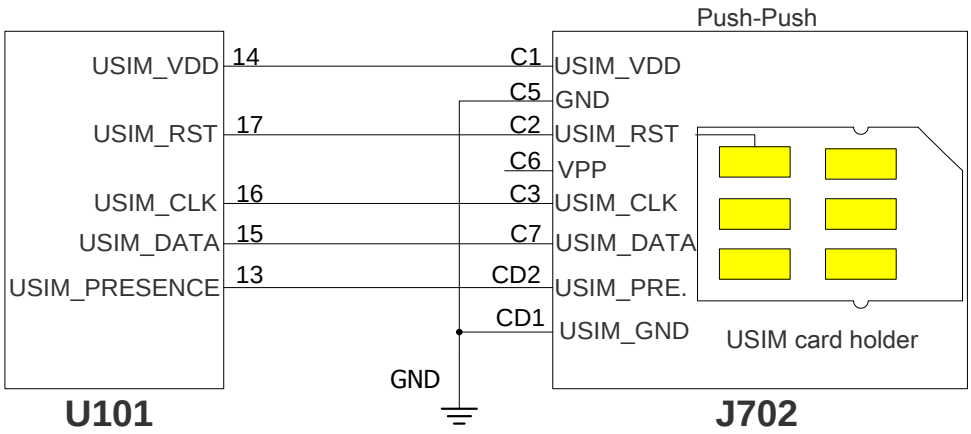

Figure 10: Simplified USIM Card Interface Schematic

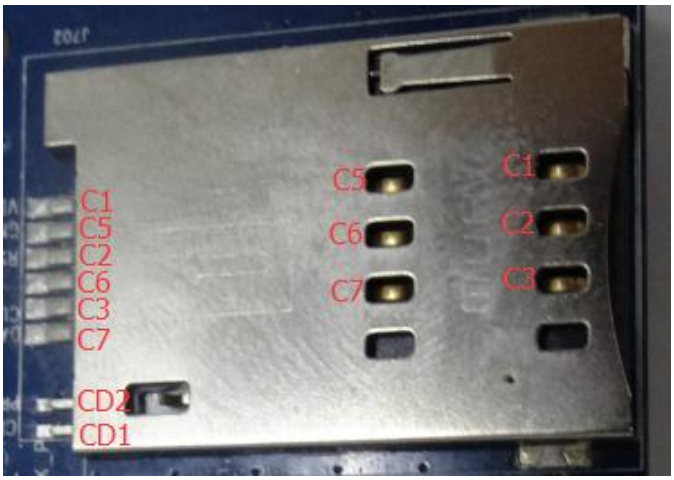

Figure 11: Pins Assignment of USIM Card Holder

Table 7: Pin Assignment of USIM Card Holder

J702 Pin	Signal Name	I/O	Description
C1	USIM_VDD	O	USIM/SIM card power
C2	USIM_RST	O	USIM/SIM card reset
C3	USIM_CLK	O	USIM/SIM card clock

C5	GND	/	Ground
C6	VPP	/	Not connected
C7	USIM_DATA	I/O	Data line, bi-directional
CD1	GND	GND	USIM card detection
CD2	USIM_PRESENCE	I	USIM card detection

NOTE

EC2x supports USIM card hot-plugging via the USIM_PRESENCE pin. It supports low level and high level detection, and it is disabled by default.

3.5. UART Interface

FC20 EVB offers two UART interfaces: main UART interface J401 and debug UART interface J402. The following shows the different features.

3.5.1. Main UART Interface

Main UART interface supports 9600, 19200, 38400, 57600, 115200, 230400, 460800bps baud rate, and the default is 115200bps. The Main UART interface is intended for the communication between the module and the host application. This interface can be used for data transmission and AT communication.

The following figure shows Main UART block diagram on FC20 EVB.

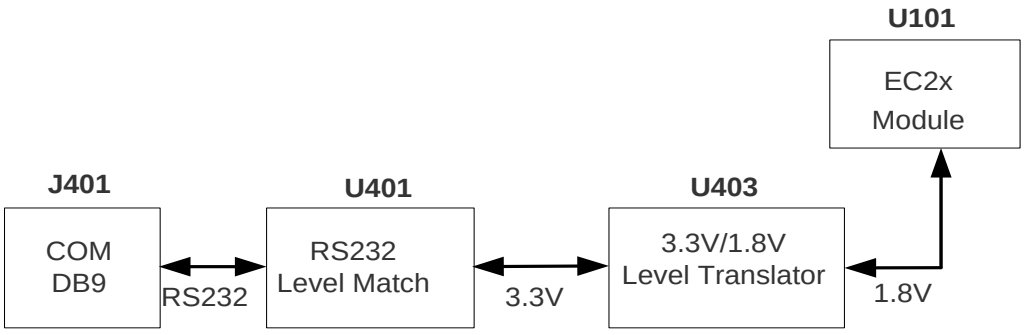

Figure 12: Main UART Block Diagram

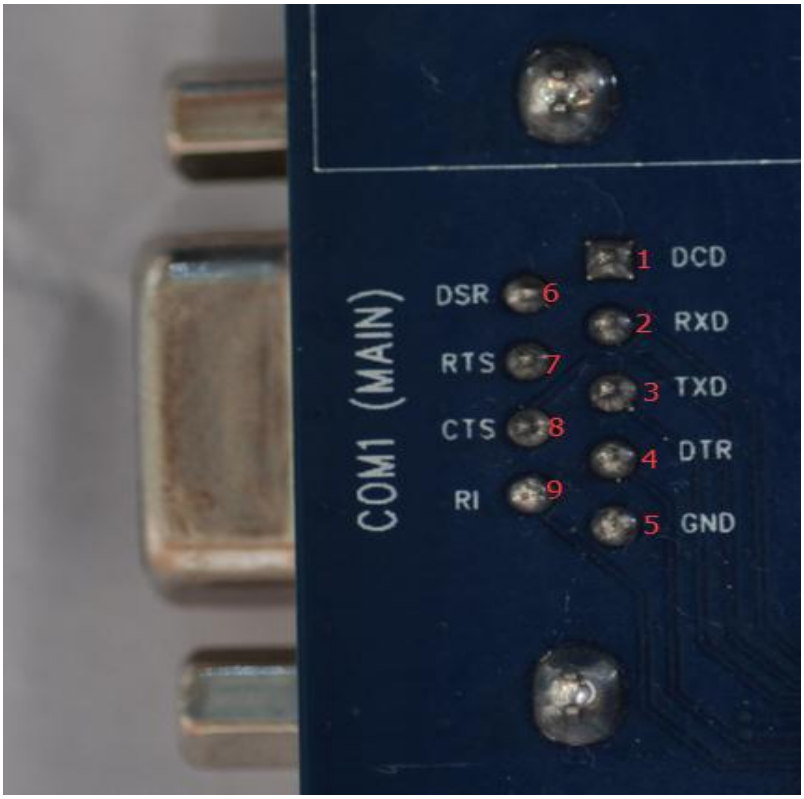

Figure 13: Main UART Port (J401)

Table 8: Pin Assignment of Main UART interface

J401 Pin	Signal Name	I/O	Description
1	DCD	I	Data carrier detect
2	RS232_RXD	I	Receive data
3	RS232_TXD	O	Transmit data
4	RS232_DTR	I	Data terminal ready
5	RS232_GND	/	GND
6	NC	/	NC
7	RS232_RTS	I	Request to send
8	RS232_CTS	O	Clear to send
9	RI	O	Ring indicator

3.5.2. Debug UART Port

Debug UART interface supports 115200bps baud rate. It can be used for Linux console and log output.

Table 9: Pin Assignment of Debug UART Interface

J402 Pin	Signal Name	I/O	Description
2	DBG_RXD	I	Receive data
3	DBG_TXD	O	Transmit data
5	GND	/	GND

3.6. Switch and Buttons

FC20 EVB comprises three buttons (S301/S302/S303) and one switch (S201). Figure 14 shows the switch and buttons.

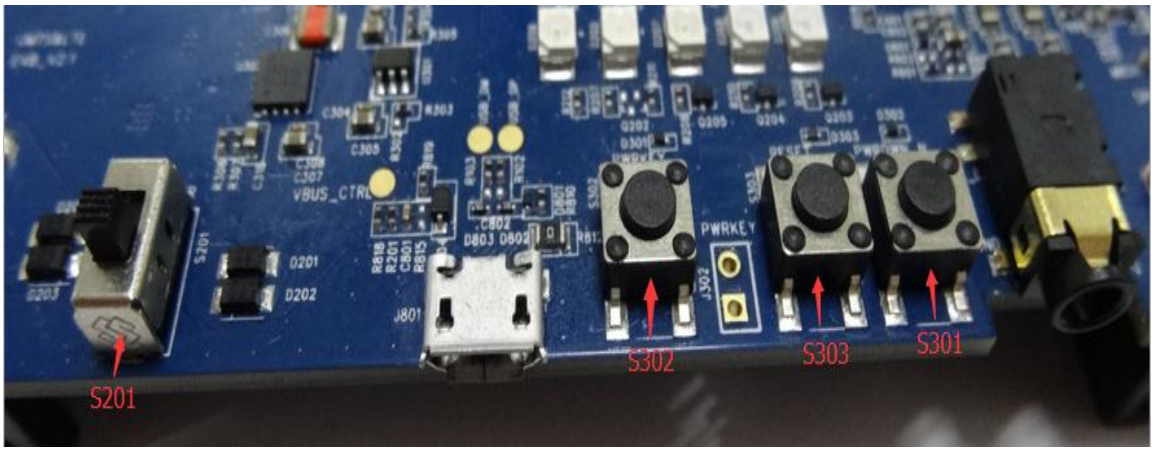

Figure 14: Switch and Buttons

Table 10: Description of Switch and Buttons

Reference	Description
S201	Control power supply VBAT ON/OFF
S302	It is used to turn on/off the EC2x module

S303	It is used to reset the EC2x and FC20 modules
S301	It is used to turn off the UGxx series module

3.7. Status LEDs

FC20 EVB comprises five status LEDs (D209, D205, D207, D208, D206). Figure 15 shows the position of LEDs.

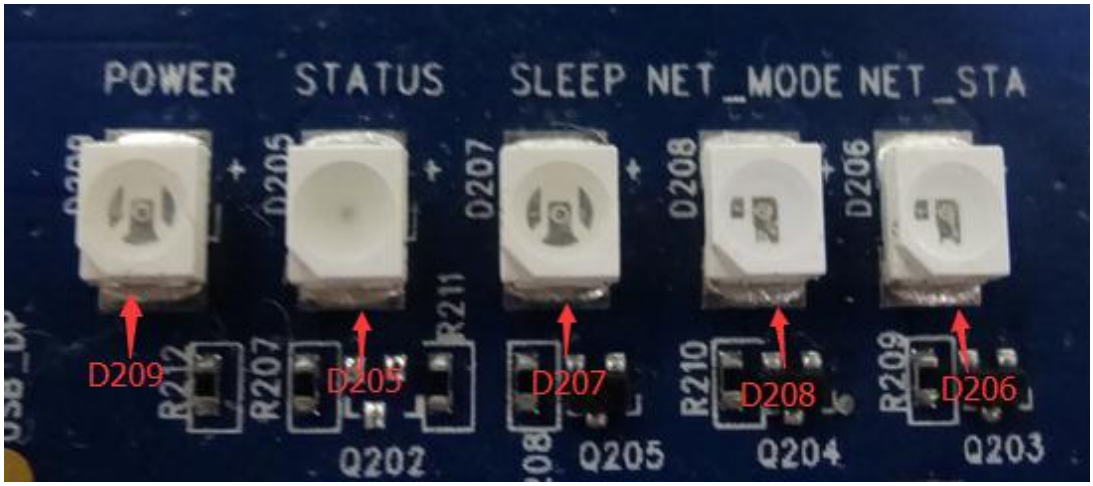

Figure 15: Status LEDs

Table 11: Description of Status LEDs

Reference	Description
D209	Indicate the power supply for module is ready. Bright: VBAT ON Extinct: VBAT OFF
D205	Indicate the EC2x module operation status. Bright: module turns on Extinct: module turns off
D208	Indicate EC2x network registration mode. Bright: Registered in LTE network Extinct: Others
D206	Indicate EC2x network activity status. Flicker slowly (200ms High/1800ms Low): Network searching Flicker slowly (1800ms High/200ms Low): Idle

	Flicker quickly (125ms High/125ms Low): Data transfer is ongoing Bright: Voice calling
D207	Indicate EC2x sleep status. Bright: module enters into sleep status Extinct: module is out of sleep status

3.8. Test Points

J803,J804 and J805are internally used.

Table 12: Pin Assignment of Test Points

J803 Pin	Pin Name	Description
1	DTR_TEST	If DTR_TEST and POWER_EN short connect, VBAT can be controlled to turn on/off by DTR in main port.
2	POWER_EN	
3	DTR_TEST	If DTR_TEST and PWRKEY_3.0V short connect, PWRKEY of EC2x module can be controlled to turn on/off by DTR in main port.
4	PWRKEY_3.0V	
5	DTR_TEST	If DTR_TEST and RESET_3.0V short connect, it can be used to reset the EC2x and FC20 modules by DTR in main port.
6	RESET_3.0V	
7	VDD_EXT	1.8V power supply from EC2x
8	POWER_OFF_3.0V	RESERVED
9	SPI_MRDY	RESERVED
10	SPI_SRDY	RESERVED
J804 Pin	**Pin Name**	**Description**
1	VDD_3V	3.0V power supply from U302
2	PCM_SYNC	Connected to EC2x or FC20’s PCM_SYNC controlled by the switch S901
3	VDD_1V8	1.8V power supply from U301
4	PCM_IN	Connected to EC2x or FC20’s PCM_IN controlled by the switch S901

5	I2C_SDA	RESERVED
6	PCM_OUT	Connected to EC2x or FC20's PCM_OUT controlled by the switch S901
7	I2C_SCL	RESERVED
8	PCM_CLK	Connected to EC2x or FC20's PCM_CLK controlled by the switch S901
9	CLK_OUT	RESERVED
10	GND	GND

J805 Pin	**Pin Name**	**Description**
1	WAKEUP_IN	Connected to EC2x's WAKEUP_IN
2	SPI_CS_N	RESERVED
3	AP_READY	Connected to EC2x module's AP_READY
4	SPI_CLK	RESERVED
5	DISABLE_N	Connected to EC2x module's DISABLE_N
6	SPI_MISO	RESERVED
7	USB_BOOT	Connected to EC2x module's USB_BOOT
8	SPI_MOSI	RESERVED
9	VDD_1V8	1.8V power supply from U301
10	GND	GND

4 Operation

4.1. Power On

1. Mount a SIM Card and antennas, then insert the 5V power adapter and pull S201 to ON state. D209 will be light.
2. Press the S302 (PWRKEY) for about 1s. The EC2x module will be in the power-on mode and D205 (STATUS) will be light.
3. Waiting about 15s, D206 (NET_STATUS) will be light. Then execute AT command **AT+QWIFI=1** to enable power supply for WIFI, and FC20 will be powered on.

The module's working state can be judged by D206 and D208, please refer to Table 11 for more detail.

4.2. Power Off

There are several ways to power off EC2x and FC20 modules.

One way is to execute AT command **AT+QPOWD**. It is the best and safest approach. It logs off the network and saves data before it is shut down. Please refer to ***document [3]*** for details about the AT command of **AT+QPOWD**.

The other way is to press down S302 for at least 0.6s, then the module will be shut down.

If you want to power off FC20 only, execute AT command **AT+QWIFI=0**. It saves data and then shut down the WIFI power.

4.3. Reset

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

Press the key S303 for time between 150ms and 460ms, then release it to reset EC2x module. This may cause the loss of information stored in the memory since the reset is initialization.

NOTE

After resetting EC2x, execute AT command **AT+QWIFI=1** to enable WIFI power supply, then FC20 will be powered on.

4.4. Communication Mode

4.4.1. Communication via USB Interface

1. Power on the FC20 EVB.
2. Connect EVB and PC with USB cable through USB interface, and install USB driver from the Driver Disk. USB port number can be viewed through the PC device manager, such as below.

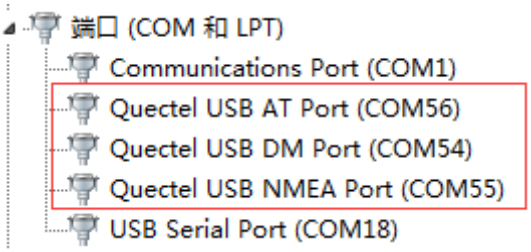

Figure 16: USB Port

3. Configure AT Command Window, correct port and operate the module via AT commands.

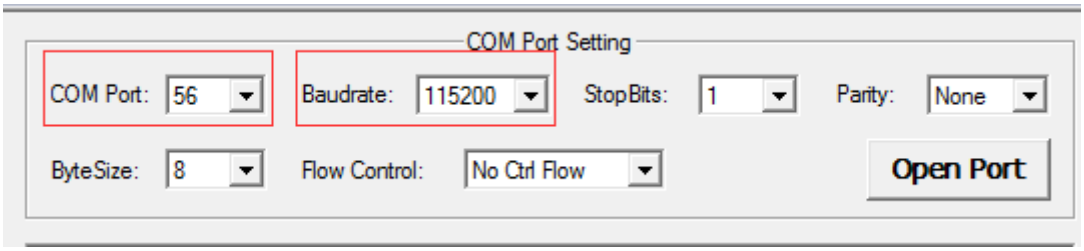

Figure 17: QCOM configuration under USB Port

4.4.2. Communication via Main UART Interface

1. Power on the FC20 EVB.
2. Connect the Main 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 18: Serial Port

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

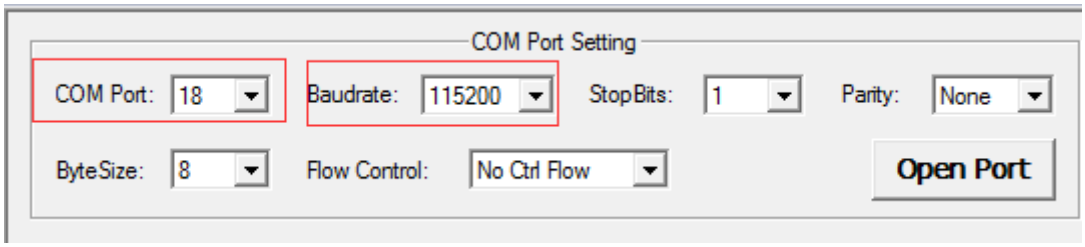

Figure 19: QCOM configuration under Serial Port

4.5. Firmware Upgrade

FC20 and EC2x modules are upgraded via USB port by default. Please follow the procedures below to upgrade firmware.

1. Open the firmware upgrade tool "**QFlash**" in the PC and power on the FC20 EVB.
2. Click the "**COM Port"** dropdown list and select the USB DM port.
3. Click the "**Load FW Files**" button to choose the firmware document package.
4. Click the "**Start**" button to upgrade the firmware.

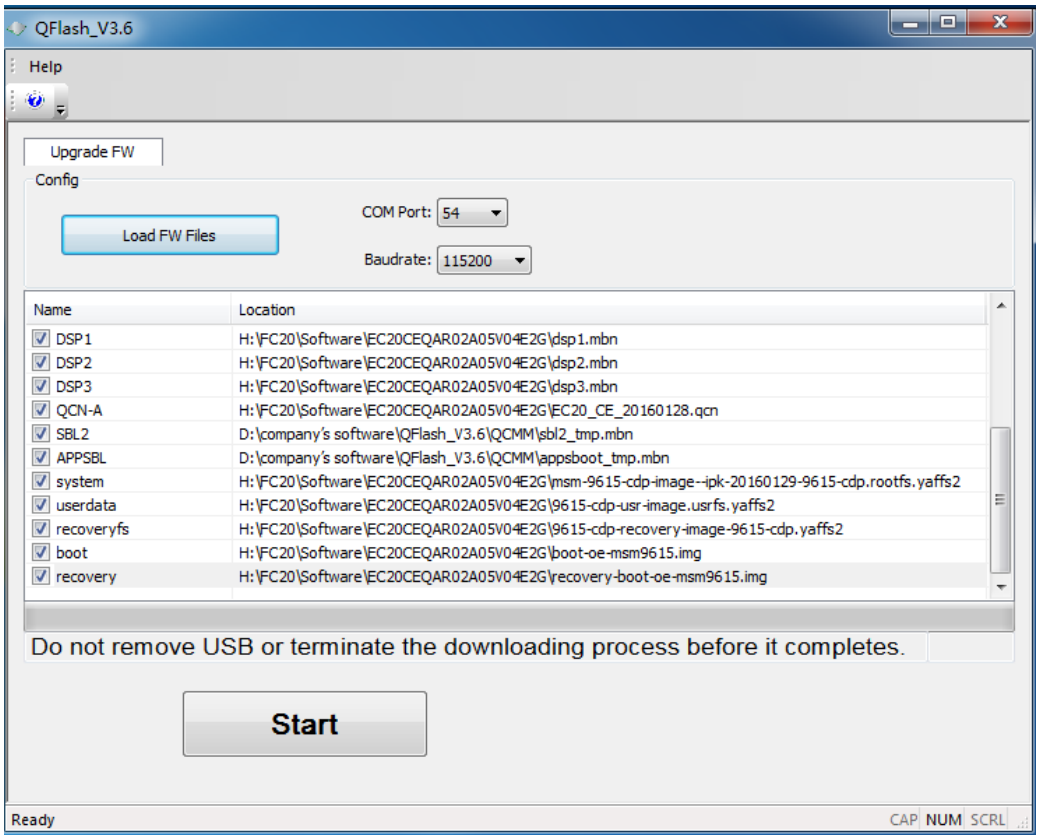

Figure 20: Update Firmware

5 Accessories Assembly

Figure 21: FC20 EVB and Accessories Equipment

6 Appendix Reference

Table 13: Related Documents

SN	Document Name	Remark
[1]	Quectel_EC2x_Hardware_Design	EC2x Hardware Design
[2]	Quectel_FC20_Hardware_Design	FC20 Hardware Design
[3]	Quectel_EC2x_AT_Commands_Manual	EC2x AT Commands Manual