Smart EVB User Guide

LTE Module Series

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About the Document

History

Revision	Date	Author	Description
1.0	2016-09-30	Vae LIU	Initial

Contents

Table Index

Figure Index

1 Introduction

This document describes the evaluation board of Quectel SC20 Smart module series. The Smart evaluation board is an assistant system integrator for developing and evaluating products based on Quectel Smart 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 Quectel 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 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 desinged 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 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 Smart EVB kit for testing basic functionalities on Smart modules.

2.1. Key Features

Smart EVB offers the following features:

- Two USIM interfaces
- Two UART interfaces
- Multiple audio interface
- USB interface
- Keypads and LED indication lights

Table 1: Features of Smart EVB

Features	Implementation
Power Supply	● USB supply voltage: 4.75~6.0V; typical supply voltage: 5.0V ● VBAT supply voltage: 3.5~4.3V; typical supply voltage: 3.8V
USIM Interfaces	● Support card detection ● Support USIM/SIM cards: 3.0V and 1.8V
Audio Interface	● Analog interface used for loud speaker, microphone, earphone and handset
UART Interfaces	● Two UART interfaces: Main UART for data transmission Debug UART for debugging ● Max. baud rate: 460800bps
USB Interface	● USB 2.0, support high speed and OTG function
Signal Indication	● 4 LEDs are available for signal indication
Buttons	● 9 buttons
Switches	● 4 switches
Physical Characteristics	● Size: 24cm × 18cm

2.2. Interface Overview
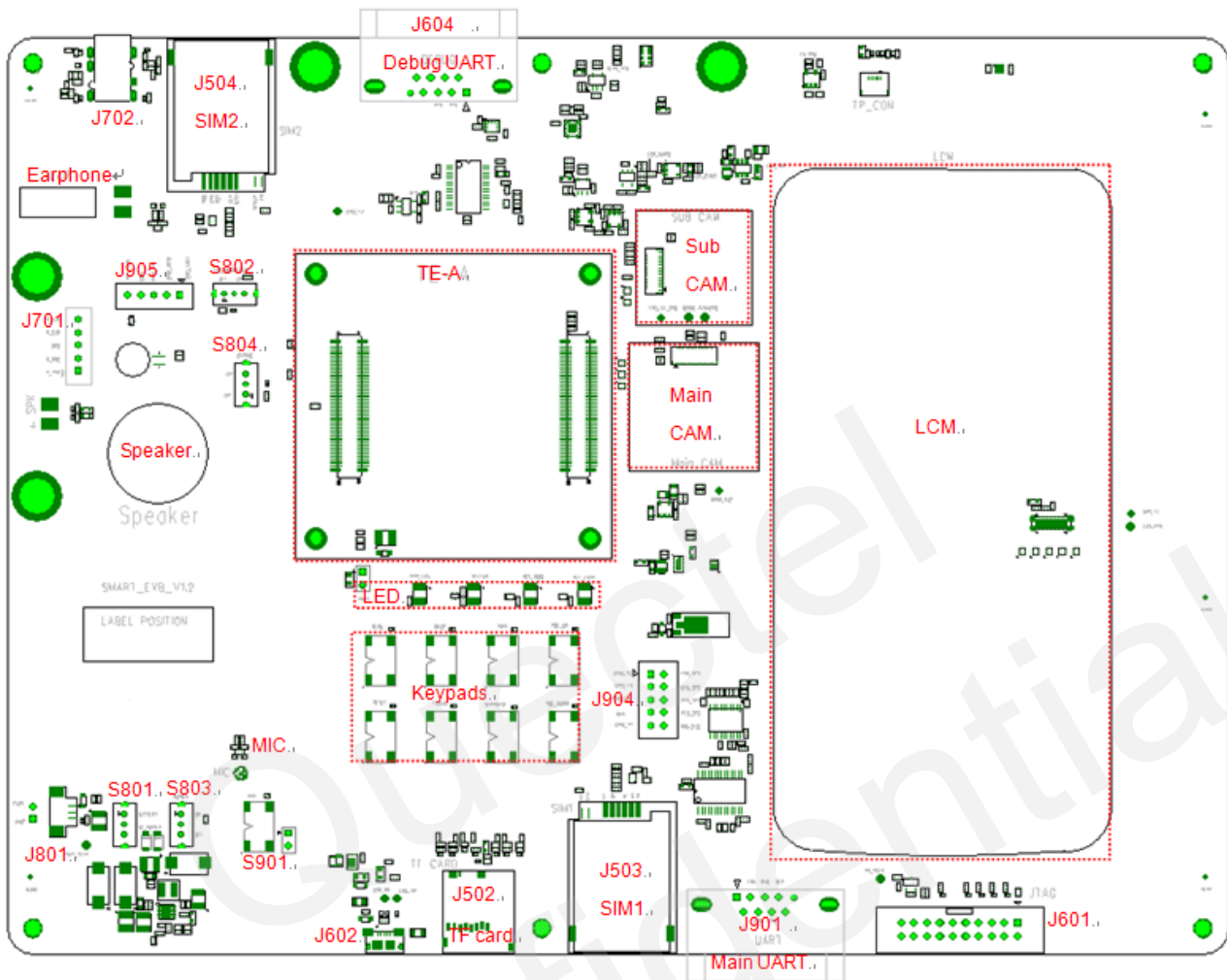
Figure 1: Interface Overview

Table 2: Interfaces of Smart EVB

Interface	Reference Number	Description
VBAT	J801	Connector used for battery
Power Switch	S801	Switch for battery and DC_POWER
	S803	Control power ON/OFF
PWRKEY	S901	PWRKEY push button It's used to turn on/off the module.
	J903	Jumper is used to connect PWRKEY to GND

RESET	S908	Reset push button. It's used to reset the module.
Micro USB	J602	USB device interface USB_VBUS supply voltage: +5.0V
Audio	Speaker	Loud speaker
	Earphone	Earphone
	MIC	Microphone
	J702	Headset
USIM	J503	Main USIM card holder
	J504	Sub USIM card holder
UART	J901	Main UART port
	J604	Debug UART port
LEDs	D805, D806, D807, D808	D805 and D807 indicate network registration mode of the module. D806 indicates the power ON/OFF status. D808 indicates operation status of the module.
TE-A	J101, J102	TE-A module connector

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│  NOTE   │
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Some of these functions may not be supported on some modules. For details, please refer to relative module reference designs and hardware designs.

2.3. EVB View

Figure 2: EVB Top View

2.4. EVB Accessories

All the items of EVB kit are listed in table and figure below. Please contact the supplier if there is something missing.

Table 3: Accessories List

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

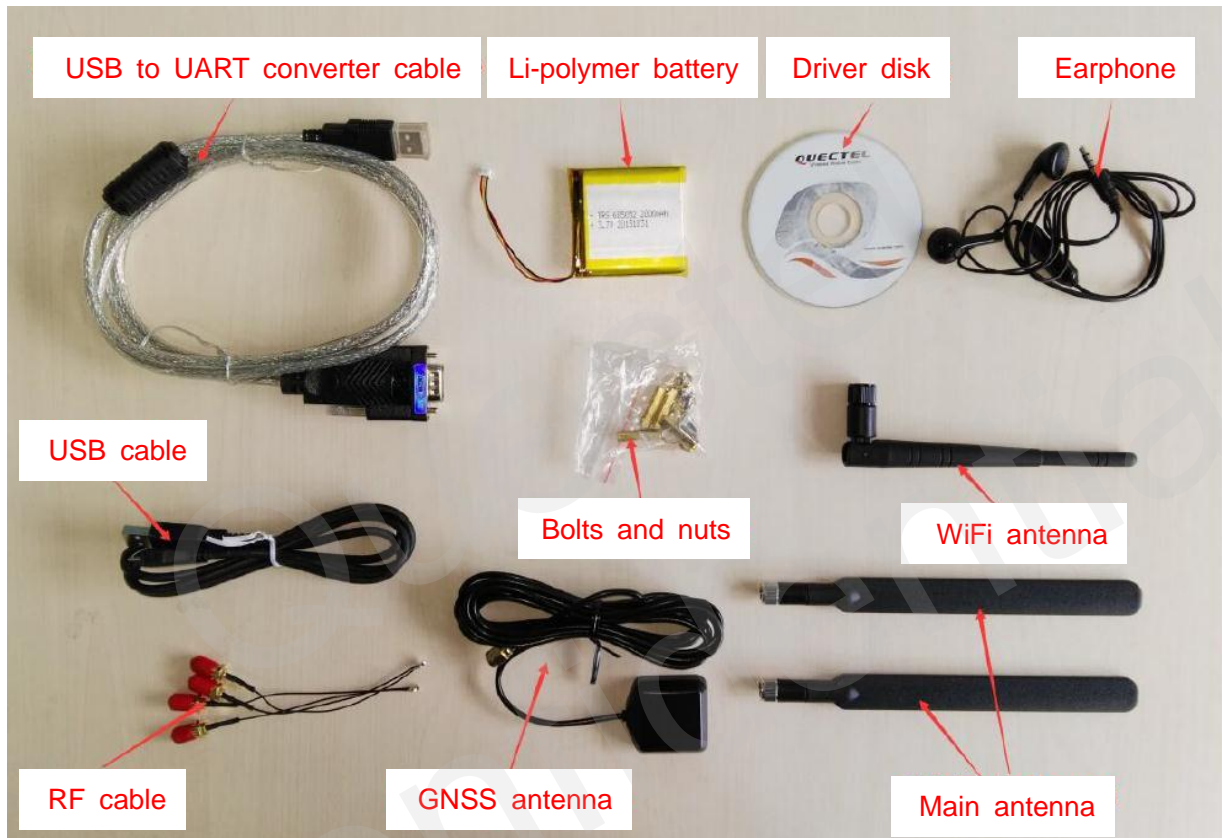|	GNSS antenna (passive)	1
Audio	Earphone	1
Disk	USB2.0 to RS232 driver and USB driver disk	1
Battery	Li-polymer battery	1
Other	Bolts and nuts for fixing EVB	1

Figure 3: EVB Accessories

NOTE

The main antenna can also be used for diversity reception.

3 Interface Application

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

- Power interface
- USB interface
- Audio interface
- USIM card interfaces
- UART interfaces

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

3.1. Power Interface

The power supply of Smart EVB could come from the external input which is connected with USB receptacle. The USB receptacle is connected with a step-down converter to provide the supply voltage (VBAT) required for operating the module.

The following figures show the simplified power supply schematic and the power interface of Smart EVB.
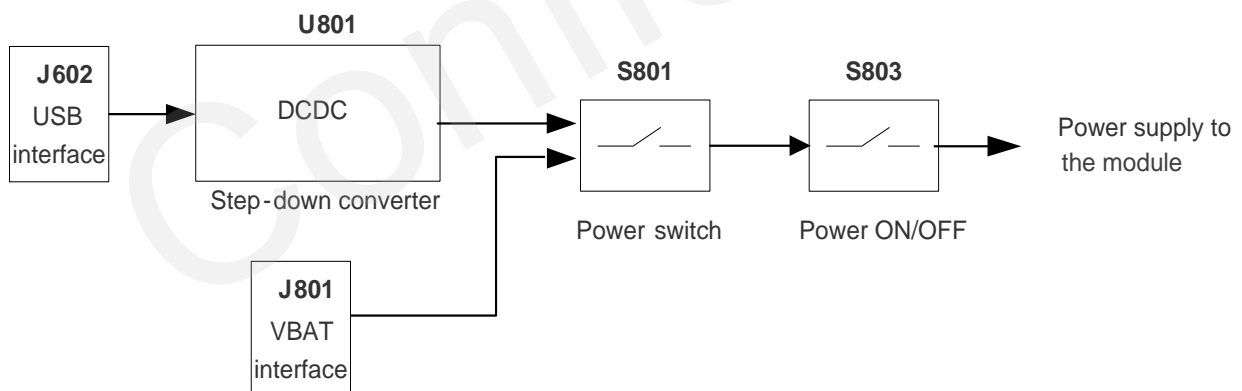
Figure 4: Simplified Power Supply Schematic
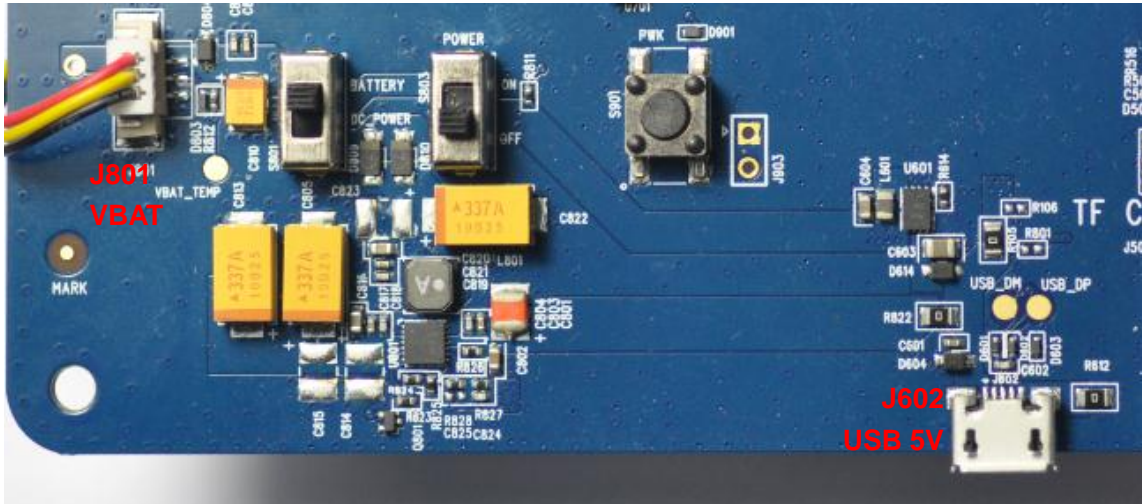
Figure 5: Power Interface

3.2. USB Device Interface

The Smart EVB provides a USB 2.0 interface which complies with USB 2.0 standard and supports OTG function. It is used for AT command communication, data transmission, firmware upgrade and GNSS NEMA output.

Meanwhile, Smart EVB provides a micro-USB receptacle J602 to connect with a host device. The USB_DP and USB_DM data lines are connected directly to the module. The schematic of the USB interface is shown in the following figure and the pin assignment of the J602 is listed in the table below.

Figure 6: USB Interface Circuit

Table 4: Pin Assignment of USB Device Interface J602

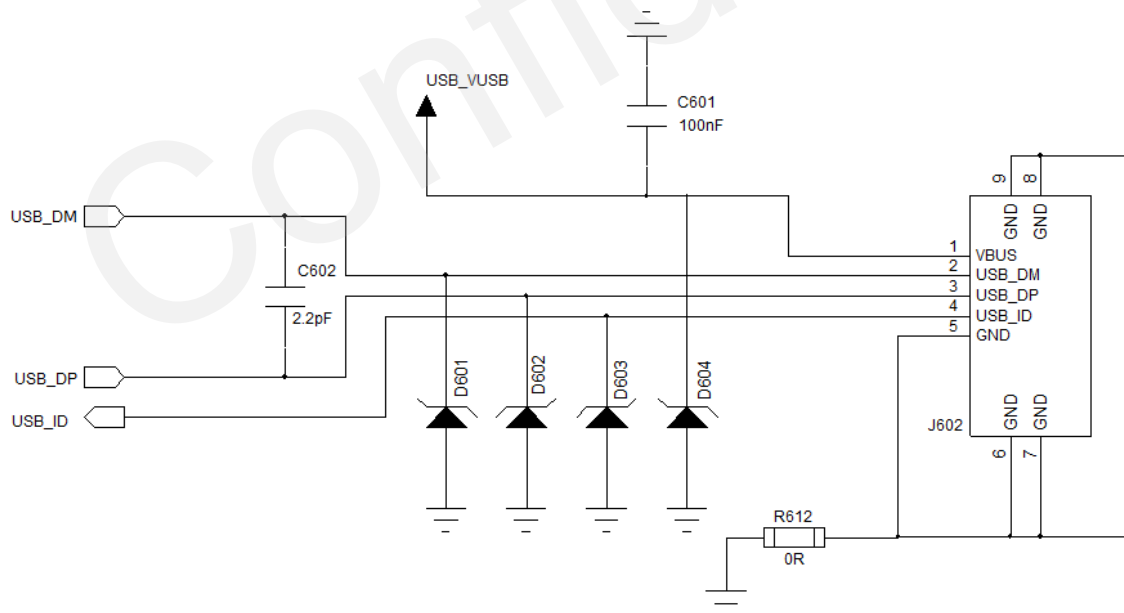| J602	Pin Name	Function
1	USB_VBUS	This pin is used for USB detection and power supply.
2	USB_DM	USB serial differential bus (minus)
3	USB_DP	USB serial differential bus (positive)
4	USB_ID	USB serial ID signal
5	GND	GND for USB interface

3.3. Audio Interface

Smart module provides a digital audio interface (PCM). The analog interface J702 on the Smart EVB is used for loud speaker, earphone and microphone.

3.3.1. Loud Speaker

Loud speaker is soldered via TP701 and TP702. The following figure shows the loud speaker circuit.
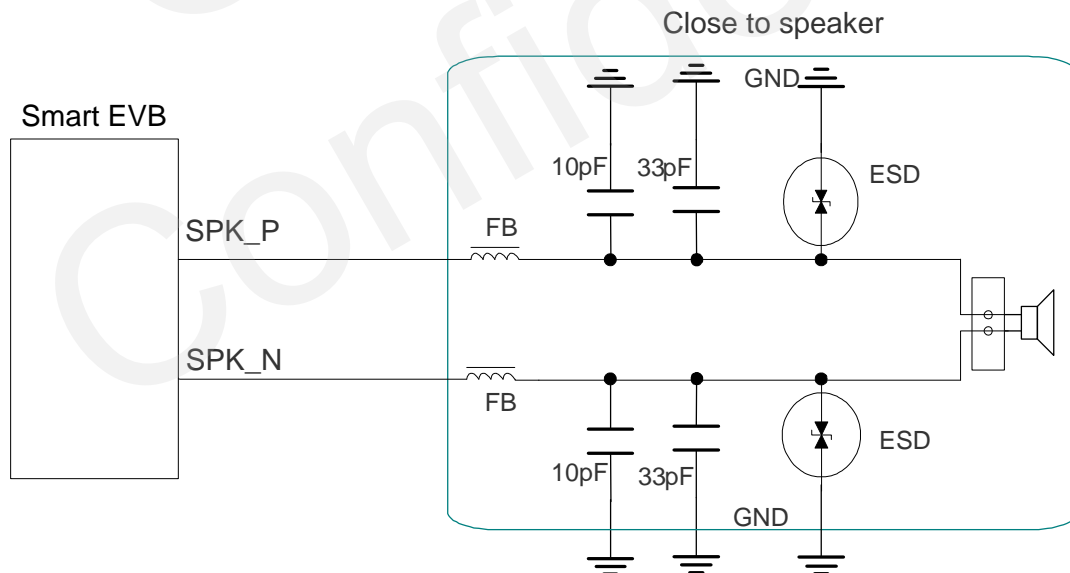
Figure 7: Loud Speaker Circuit

3.3.2. Earphone

An earphone can be used in audio interface J702. The following figures and table show the circuit of J702 audio interface for earphone and pin assignment of J702.
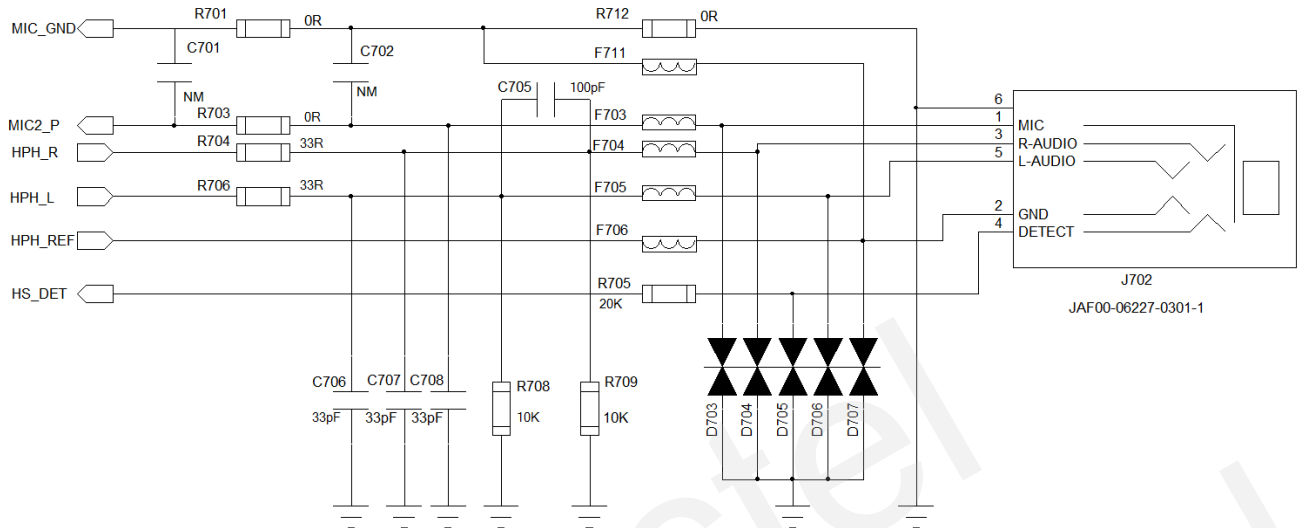
Figure 8: Earphone Circuit
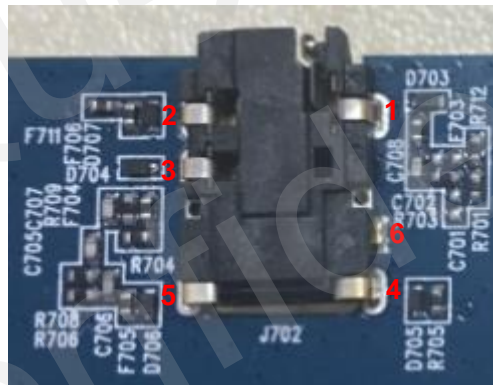
Figure 9: Pin Assignment of J702

Table 5: Pin Assignment of J702

J404	Pin Name	Function
1	MIC	Positive microphone input
2	GND	Dedicated GND for audio
3	R-AUDIO	Earphone right channel

4	DETECT	Earphone detection
5	L-AUDIO	Earphone left channel
6	GND	Dedicated GND for audio

The following figure shows the sketch of audio jack which matches the Smart EVB.
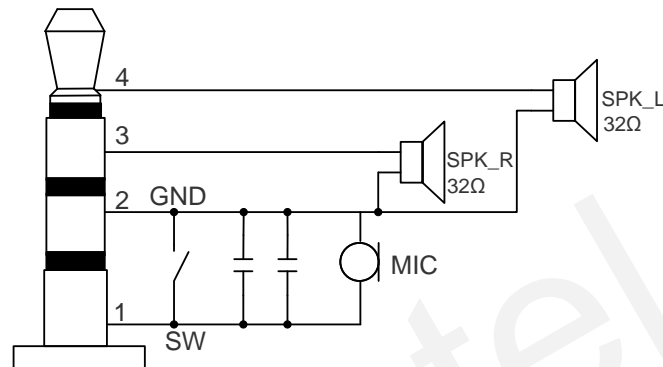
Figure 10: The Sketch of Audio Jack

3.3.3. MIC and Speaker

SMT U701 MIC is used for microphone and speaker is soldered on TP703 and TP704. The following figure shows the schematic of the MIC and Speaker.

Figure 11: MIC and Speaker Circuit

3.4. USIM Card Interfaces

The Smart EVB has two USIM card interfaces. A suitable USIM card (3V or 1.8V) is required to start the Smart module. The following figure and table show the simplified interface schematic and pin assignment of J503.

Figure 12: Schematic of Simplified USIM Card Interfaces
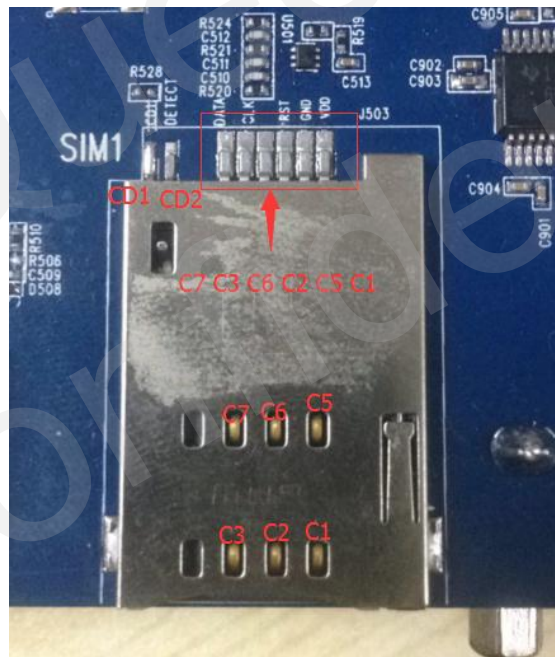
Figure 13: Pins Assignment of USIM Card Holder

Table 6: Pin Assignment of USIM Card

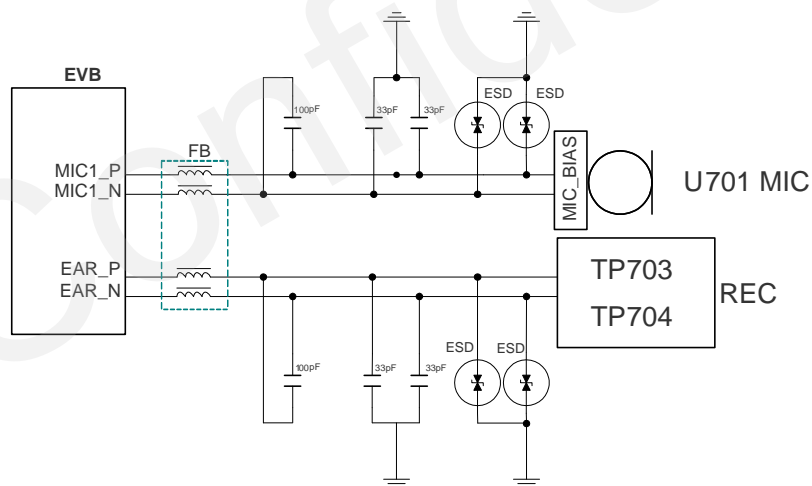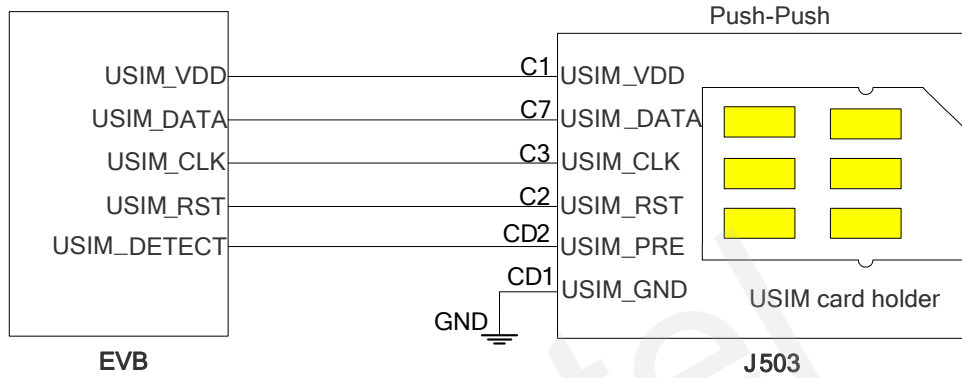| No.	Pin Name	I/O	Function
C1	USIM_VDD	O	USIM/SIM card power
C2	USIM_RST	O	USIM/SIM card reset
C3	USIM_CLK	O	USIM/SIM card clock
C5	GND		Ground
C6	VPP		Not connected
C7	USIM_DATA	I/O	Data line, bi-directional
CD1	GND	GND	USIM card detection
CD2	USIM_PRESENCE	I	USIM card detection

NOTE

Pin assignment of J504 is the same as that of J503.

3.5. UART Interfaces

Smart EVB offers two UART interfaces, which are main UART port (J901) and debug UART port (J604). The UART interface J901 is intended for the communication between the module and the host application. This interface can be used for data transmission and AT command communication. And the debug UART interface is used for debugging.

The following figure and table show the UART block diagram on Smart EVB and pin assignment of J901.
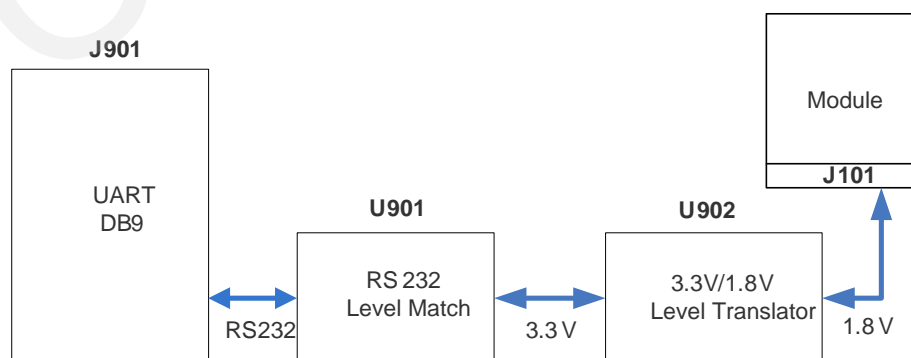
Figure 14: UART Block Diagram
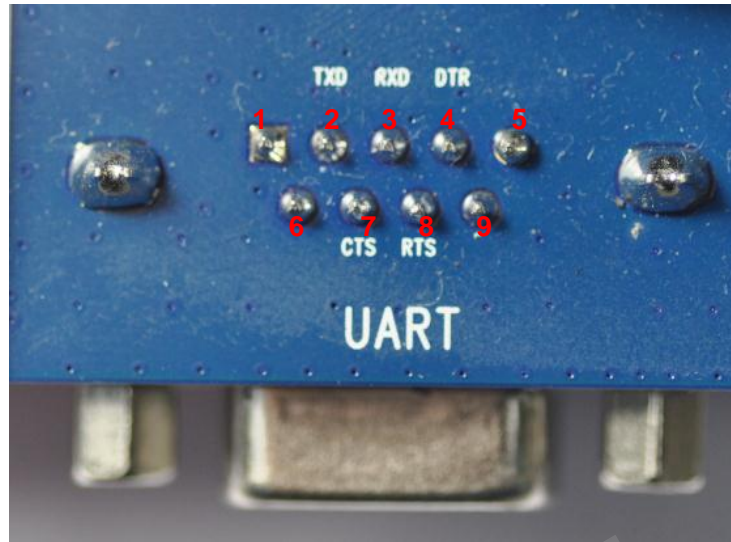
Figure 15: Main UART Port (J901)

Table 7: Pin Assignment of J901

J401	Pin Name	I/O	Description
1			Not connected
2	RS232_TXD	I	Transmit data
3	RS232_RXD	O	Receive data
4			Not connected
5	RS232_GND		Ground
6			Not connected
7	RS232_CTS	I	Clear to send
8	RS232_RTS	O	Request to send
9			Not connected

3.6. Switches and Buttons

Smart EVB comprises nine buttons (S901/S902/S903/S904/S905/S906/S907/S908/S909) and four switches (S801/S802/S803/S804). Description of switches and buttons is shown as below.
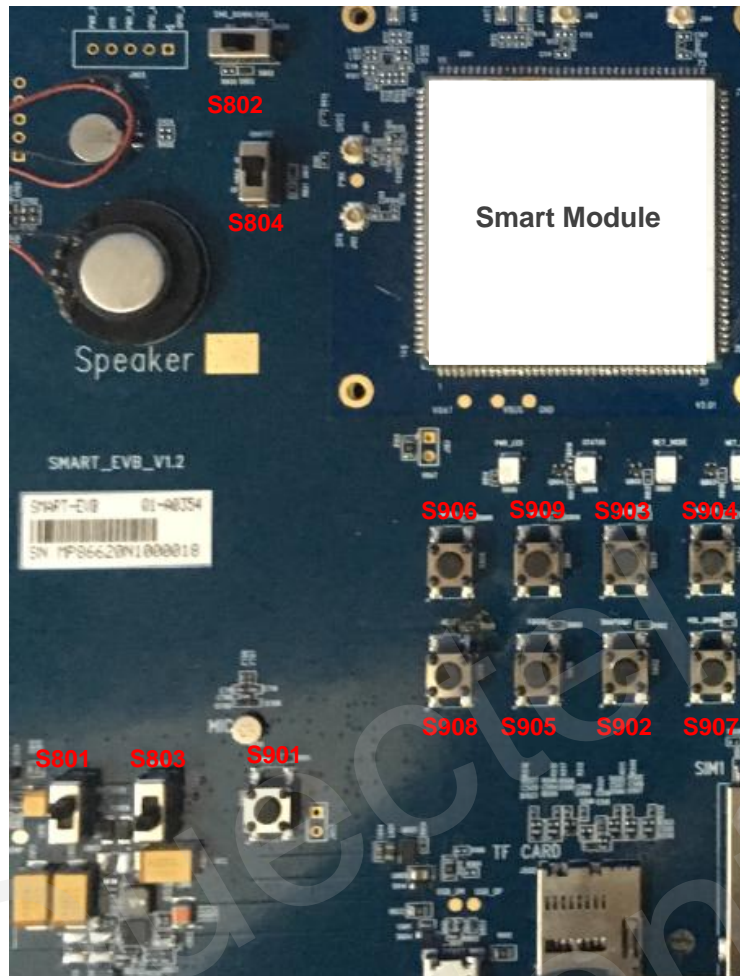
Figure 16: Switches and Buttons

Table 8: Description of Switches and Buttons

Items	Description
S801	Switch for battery power supply or DC power supply
S802	Enter into USB boot mode
S803	EVB power switch
S804	Battery charge ON/OFF
S901	Power on button
S902	Snapshot button
S903	HOME button

S904	Volume up button
S905	Focus button
S906	Menu button
S907	Volume down button
S908	Reset button
S909	Back button

NOTE

Some of these functions may not be supported on some modules. For details, please refer to relative module reference designs and hardware designs.

3.7. Status LEDs

There are several LED status indication lights (D805, D806, D807 and D808) on Smart EVB, shown as below.

Figure 17: Status LEDs

Table 9: Description of Status LEDs

Items	Description
D806	Indicate the power supply status for the module Light on: VBAT ON Light off: VBAT OFF

D808	Indicate the module operation status Light on: module is powered on Light off: module is powered down	
D805, D807	Indicate the module network registration mode The indication varies in different modules. For details, please refer to relative module hardware designs.	

3.8. Test Points

J904 is used for test. The following figure and table show the details.
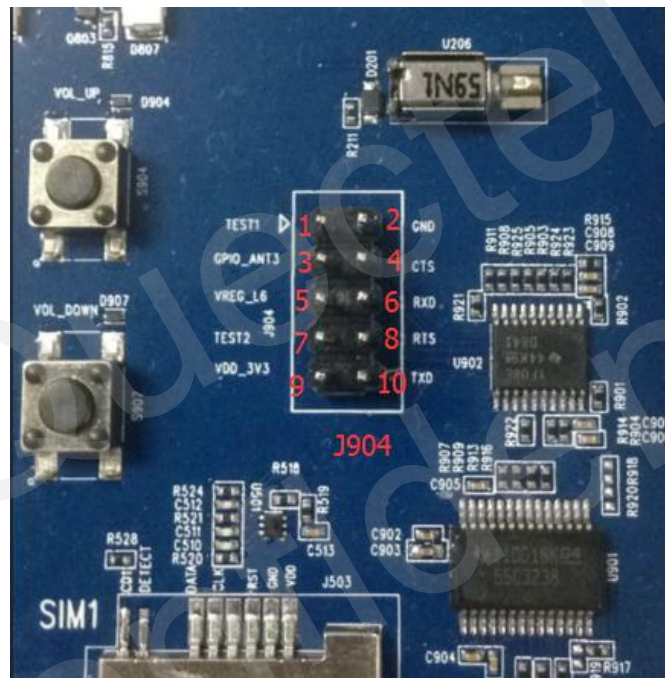
Figure 18: Pins Assignment of J904

Table 10: Details of Test Points

J904	Pin Name	Description
1	GPIO_68	GPIO68 of the module
2	VDD_3V3	3.3V power supply of EVB
3	GPIO_69	GPIO69 of the module

4	CTS_3.0V	3.2V CTS signal
5	VREG_L5	L5 power supply of the module
6	RXD_3.3V	3.3V RXD signal
7	GND	Ground
8	RTS_3.3V	3.3V RTS signal
9	GPIO_14	GPIO14 of the module
10	TXD_3.3V	3.3V TXD signal

4 Operation Procedure

This chapter introduces how to use the Smart EVB for testing and evaluation Quectel Smart modules.

4.1. Power ON

1. Connect the Smart module to the connector J101 and J102 on smart EVB.

2. Install battery on J801 and switch S801 to BATTERY state. Or charge with USB cable and pull S801 to DC_POWER state.

3. Pull S803 to ON state and D806 will be lighted.

4. Press the S901 (PWRKEY) for at least 2s. The module will be in power-on mode and D808 (STATUS) will be lighted.

5. LCM display starts to work. And wait for the module to be full booted.

4.2. Power OFF

There are two ways to power off the module. One way is to operate via the system. The steps are shown as follows.

1. Press S901 (PWRKEY) for at least 1s under power on state, and then LCM will display a menu as shown in the following figure.
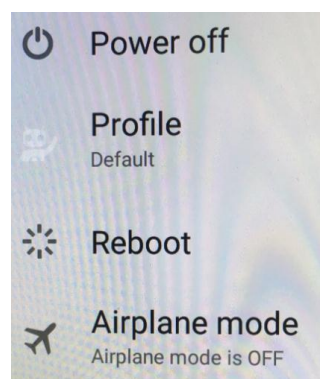

Figure 19: Menu on LCM

2. Choose "**Power off**".

3. Module will be powered off after D808 (STATUS) light is off.

Another way is to press down S901 (PWRKEY) until the module is shut down.

4.3. Reset

Pressing S908 key then releasing it can reset the module. This may cause loss of information stored in the memory since the module has been initialized after reset.

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

4.4. Communication Via USB or UART Interface

4.4.1. Communication via USB Interface

1. Power on the module.

2. Connect EVB and PC with USB cable through USB interface and install USB driver from the Driver Disk.

3. Open QCOM tool and configure AT Command window, then select correct port and operate the module by AT commands.

4.4.2. Communication via UART Interface

1. Power on the module.

2. Connect the UART interface to PC with USB-to-RS232 converter cable and install the driver from the Driver Disk.

3. Open QCOM tool and configure AT Command window, then set correct baud rate (such as 115200bps) to operate the module by AT commands.

NOTE

The port can be checked by the Device Manager on PC.

4.5. Firmware Upgrade

Firmware can be upgraded via USB port (default), please follow the procedures below to upgrade firmware.

1. Open the firmware upgrade tool "**QEIL**" on the PC and power on the module.
2. Click the "**SelectPort**" dropdown list and select the USB port.
3. Select "**Flat Build**" from "**Select Build Type**".
4. Select software to load files from "**Select Programmer**".
5. Choose load content to load XML from "**Select Build**".
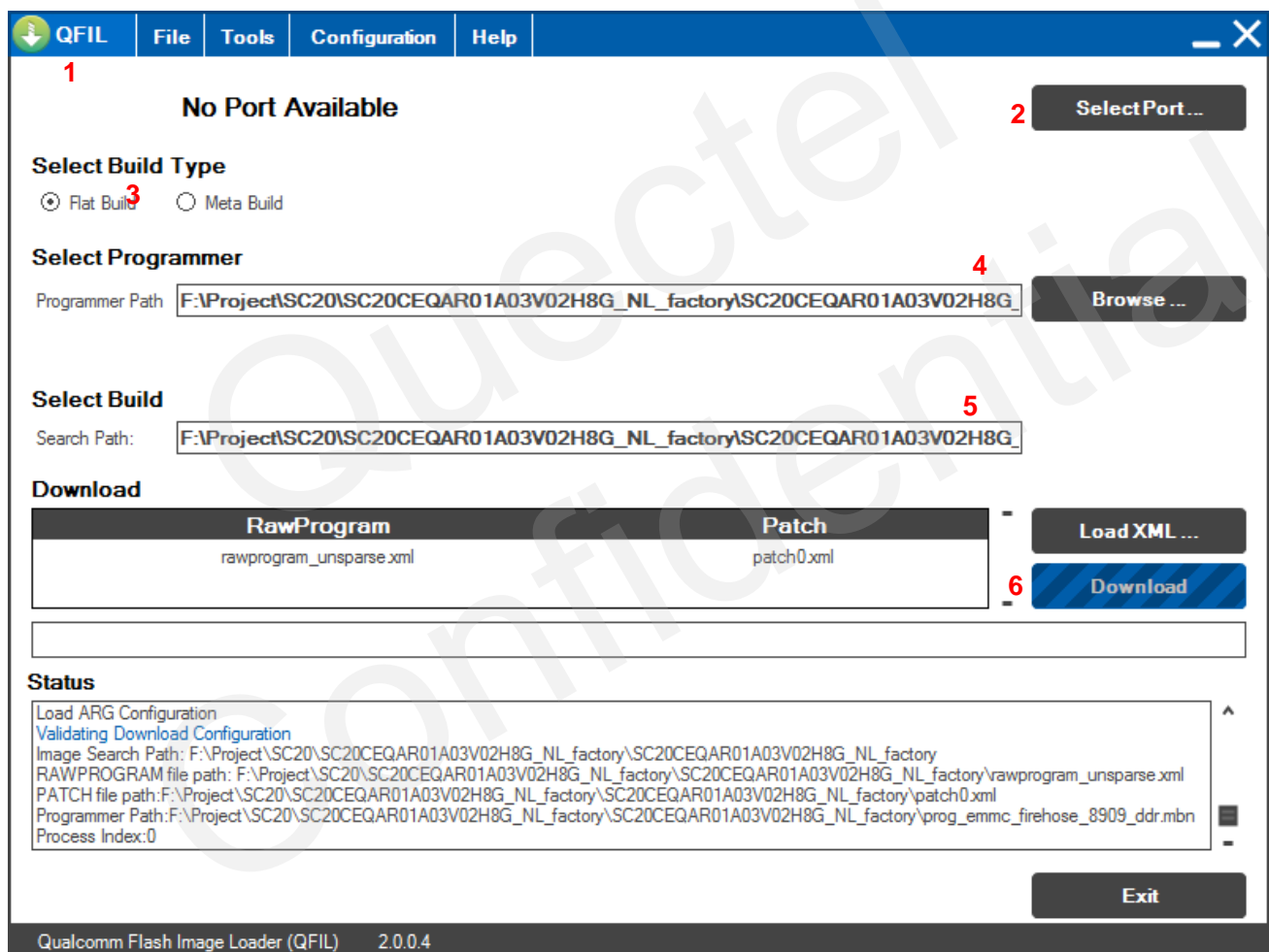6. Click "**Download**" to upgrade the firmware.

Figure 20: Select the USB Port to Update Firmware

5 EVB Accessories Assembly

Figure 21: Smart EVB and Accessories Assembly

6 Appendix A Reference

Table 11: Related Documents

SN	Document name	Remark
[1]	Quectel_SC20_Hardware_Design	SC20 Hardware Design
[2]	Quectel_QCOM_User_Guide	QCOM User Guide

Table 12: Terms and Abbreviations

Abbreviation	Description
EVB	Evaluation Board
OTG	On-The-Go
PC	Personal Computer
SIM	Subscriber Identity Module
USIM	Universal Subscriber Identity Module

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