M80

Quectel Cellular Engine

EVB User Guide

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0. Revision history

Revision	Date	Author	Description of change
1.0	2012-02-10	Ray XU	Initial
1.1	2012-03-23	Ray XU	Optimized some pictures.
1.2	2012-05-29	Ray XU	Corrected the errors in Section 3.6.2.

1. Introduction

This document defines and specifies the usage of M80 EVB. Customers can get useful information about M80 EVB from this document.

1.0. Related documents

Table 1: Related documents

SN	Document name	Remark
[1]	M80_ATC	M80 AT commands sets
[2]	GSM_UART_AN	GSM UART application notes
[3]	M80_HD	M80 Hardware design
[4]	Firmware_Upgrade_Tool_Lite_GS2_UGD	Firmware upgrade tool lite GS2 user guide
[5]	GSM_DUAL_UART_AN	GSM Dual UART application notes
[6]	PCM_AN	PCM application notes
[7]	M80_Charging_AN	M80 charging application notes

1.1. Safety precautions

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 M80 module. Manufacturers of the cellular terminal are advised to convey 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.

When in a hospital or other health care facility, observe the restrictions on the use of mobile. Switch the cellular terminal or mobile off. Medical equipment may be sensitive to RF energy interference.

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. Forget to think much of these instructions may influence the flight safety or offend against local legal action, or both.

Do not operate the cellular terminal or mobile in the presence of flammable gas or fume. Switch off the cellular terminal when you are near petrol station, fuel depot, chemical plant or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmosphere can constitute a safety hazard.

Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV set, radio, computer or other electric equipment.

Road safety comes first! Do not use a hand-held cellular terminal or mobile while driving a vehicle, unless it is securely mounted in a holder for hands-free operation. Before making a call with a hand-held terminal or mobile, park the vehicle.

GSM cellular terminals or mobiles operate using radio frequency signal and cellular network. Because of this, the connection cannot be guaranteed in all conditions, for example no mobile fee or 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 calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.

Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call.

Also, some networks require that a valid SIM card be properly inserted in cellular terminal or mobile.

2. EVB kit

2.1. EVB top and bottom view

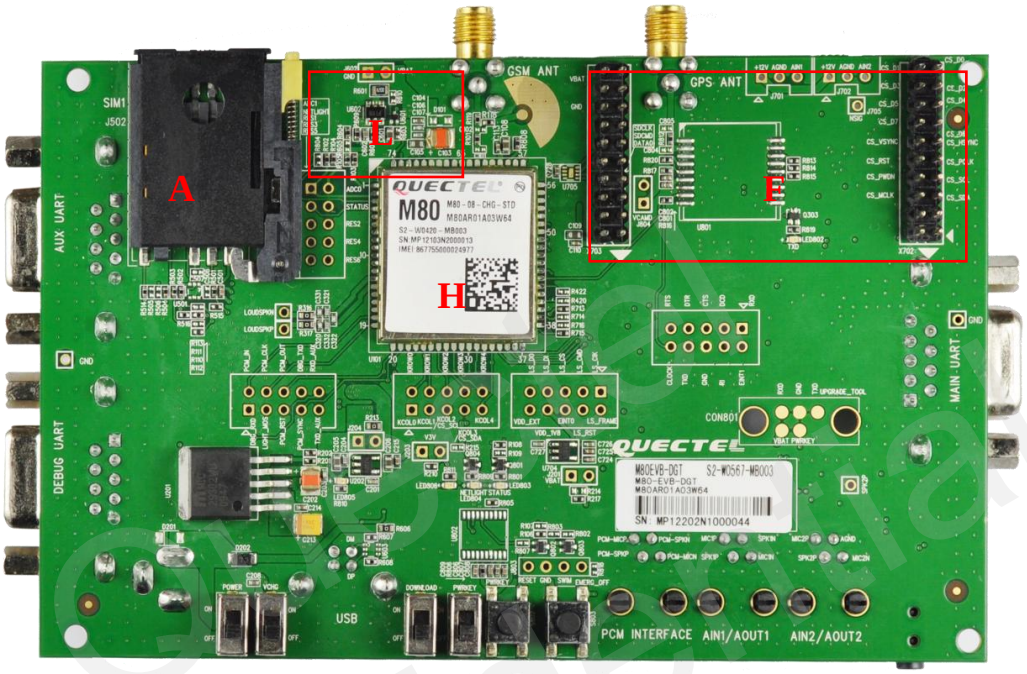

Figure 1: EVB top view

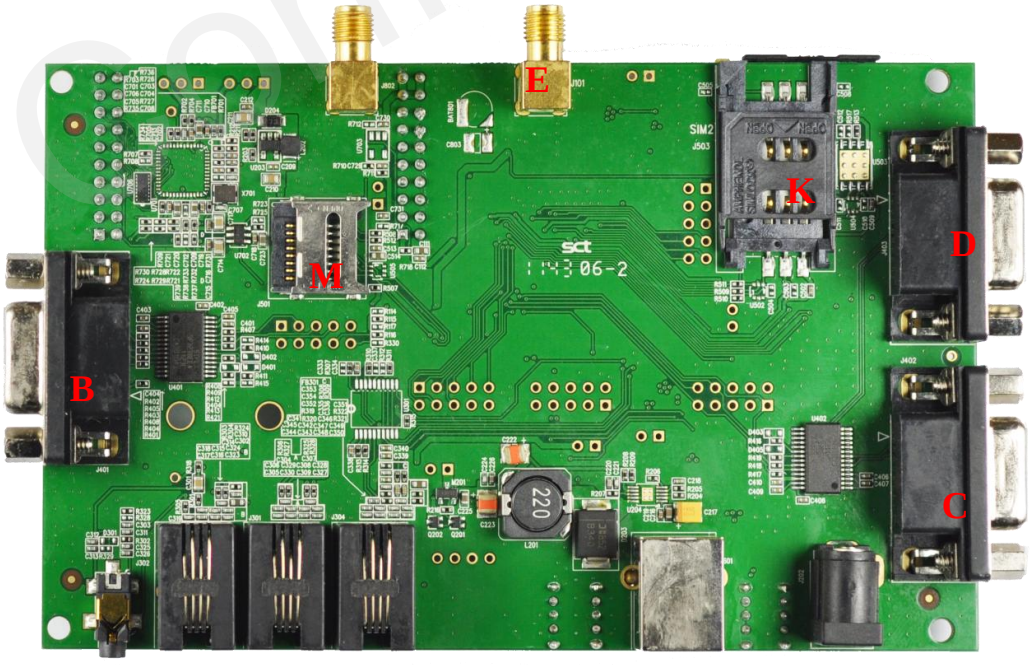

Figure 2: EVB bottom view

A: SIM1 card cassette
B: Main UART port
C: Debug UART port
D: Auxiliary UART port
E: GSM RF connector
F: Camera interface
H: M80 module
K: SIM2 card cassette
L: Charging part
M: SD card cassette

2.2. EVB Accessories

Figure 3: Accessories introduction

A: USB to UART converter cable
B: USB cable
C: Earphone
D: 5V DC adapter
E: Bolts and nuts for fixing module and EVB
F: Antenna
G: RF cable
H: Driver C

3. Application

3.1. Power

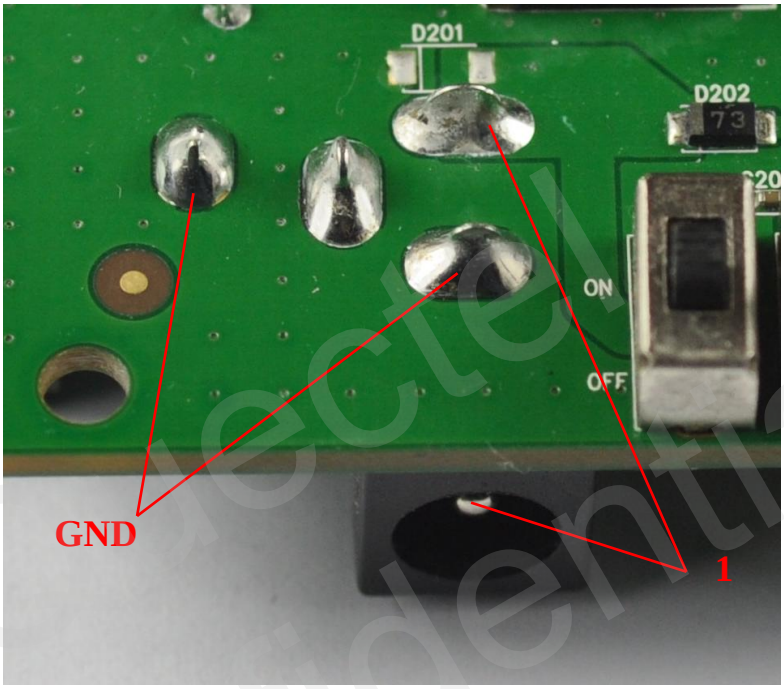

Figure 4: Adapter interface

Table 2: Pin of adapter interface

Pin	Signal	I/O	Description	
1	Adapter input	I	5V/2A DC source input	

3.1.1. LDO

M80 EVB uses LDO to supply power for the module. The schematic of the LDO is shown as below. In order to measure the VBAT voltage, adjust VBAT which is fed from the customer device, or test module, M80 EVB reserves a test point.

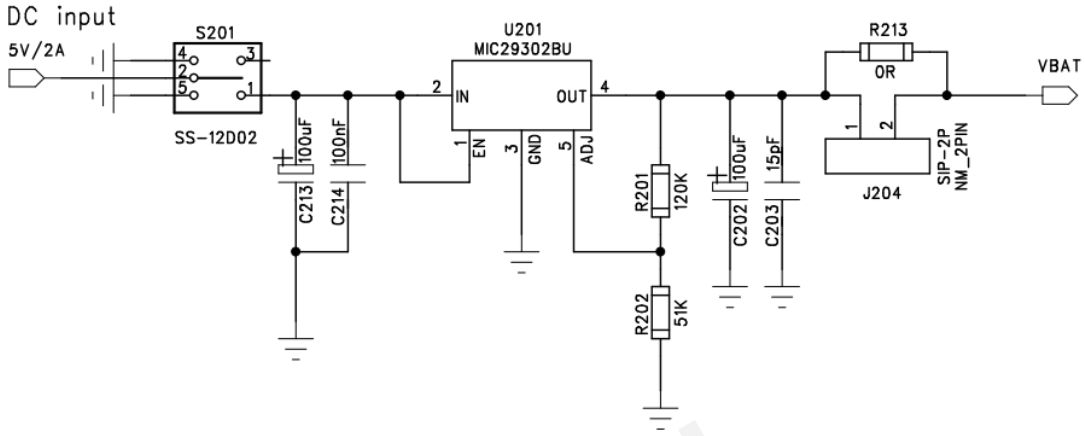

Figure 5: LDO circuit

3.1.2. Test point

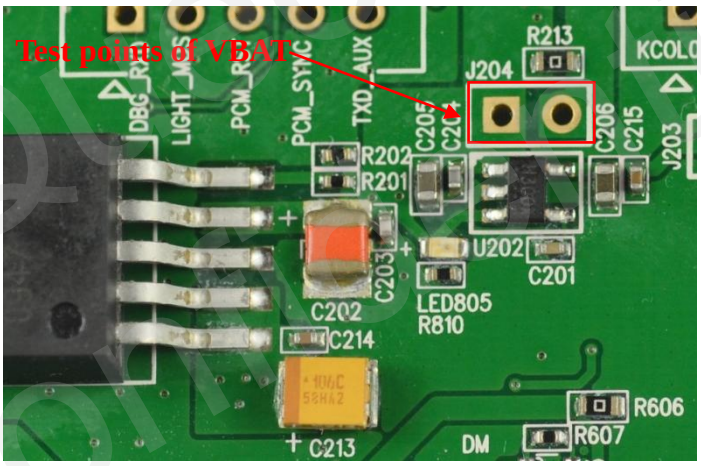

Figure 6: Test point of VBAT

3.2. Charging

Charging circuit has been illustrated in M80 EVB board. The components involving charging function have been assembled. The charging circuit is shown as below. For more information about charging, Please refer to ***document [7].***

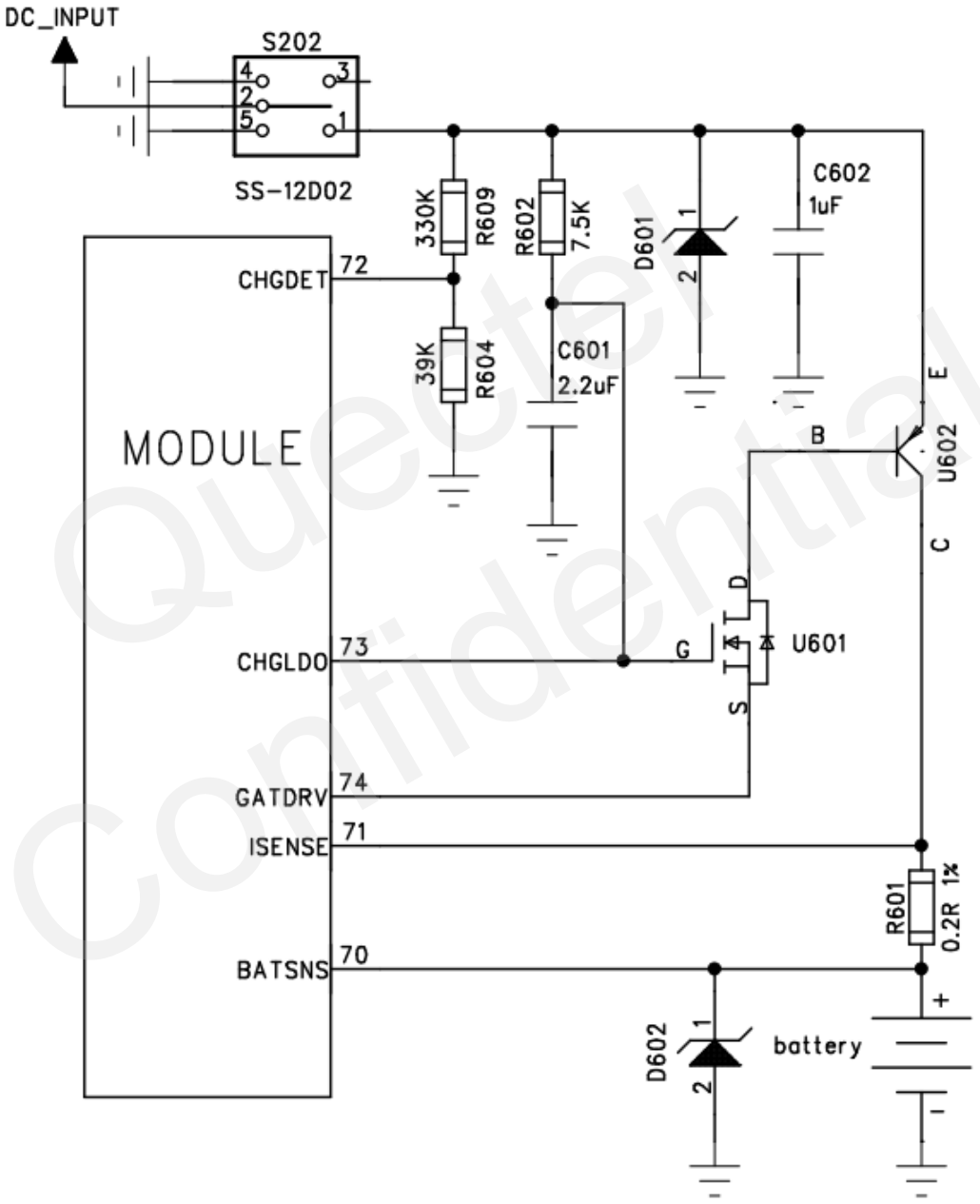

Figure 7: Charging circuit

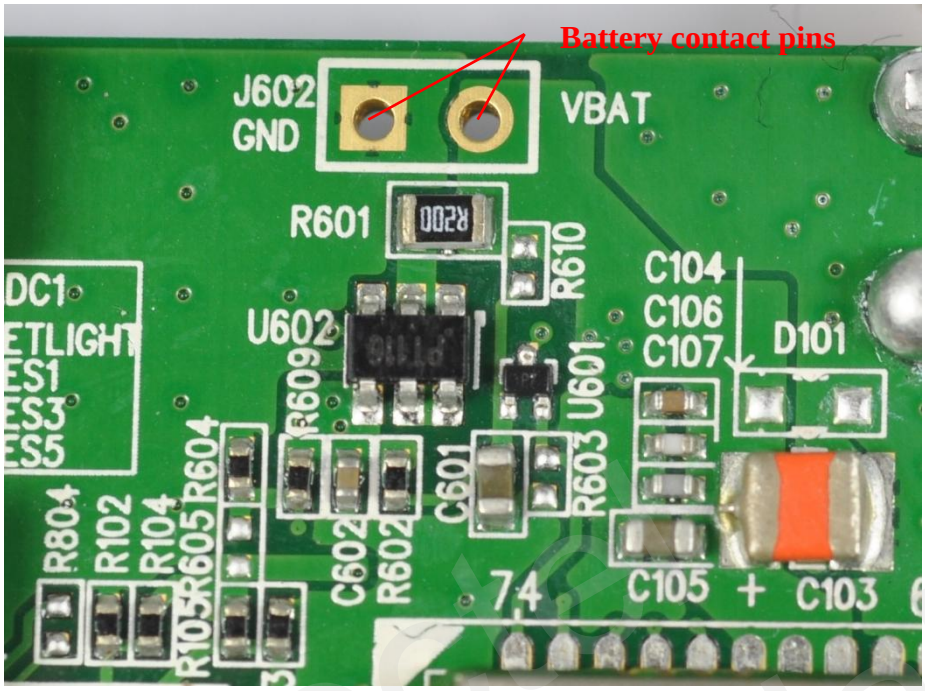

Figure 8: Charging part

3.3. Audio

Five patterns of audio have been designed in M80 EVB for the customer choice. There are AIN1/AOUT1, AIN2/AOUT2, earphone, loudspeaker and PCM interface. In this chapter, we will introduce these audios in details.

3.3.1. Handset

AIN1/AOUT1, AIN2/AOUT2 are designed in the handset. The block diagram of AIN1/AOUT1 and AIN2/AOUT2 is shown as below and some details are concealed. If you want to get more information, please refer to ***document [3]***.

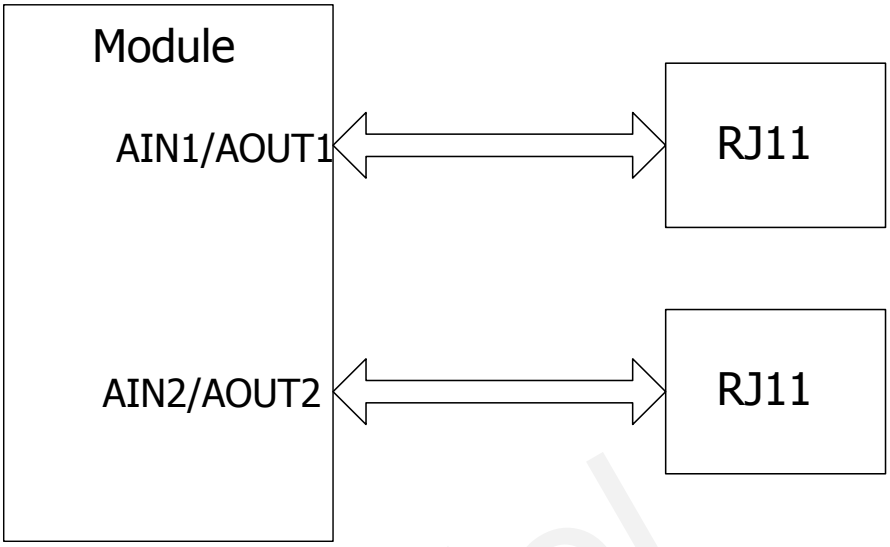

Figure 9: Block diagram of AIN1/AOUT1&AIN2/AOUT2

The RJ11 interface is shown as below. The pins of RJ11 are shown in the following table.

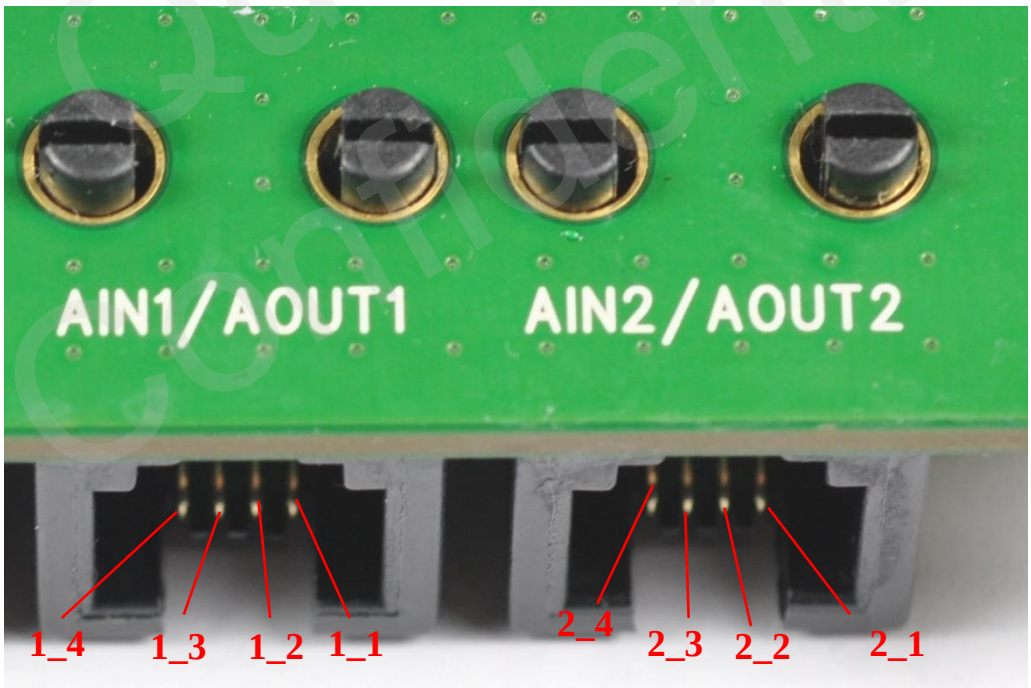

Figure 10: Pins of AIN1/AOUT1&AIN2/AOUT2

Table 3: Pins of AIN2/AOUT2

Pin	Signal	I/O	Description	Note
2_1	MIC2N	I	Negative microphone input	
2_2	AGND		AGND of audio circuits	

2_3	SPK2P	O	Positive receiver output	
2_4	MIC2P	I	Positive microphone input	

Table 4: Pins of AIN1/AOUT1

Pin	Signal	I/O	Description	Note
1_1	MIC1N	I	Negative microphone input	
1_2	SPK1N	O	Negative receiver output	
1_3	SPK1P	O	Positive receiver output	
1_4	MIC1P	I	Positive microphone input	

The handset which suits for the M80 EVB is different from the common handset and Quectel does not provide this handset. The following picture illustrates a connection between RJ11 and the handset. Customer can refer to the following picture to make a handset which suits for the M80 EVB.

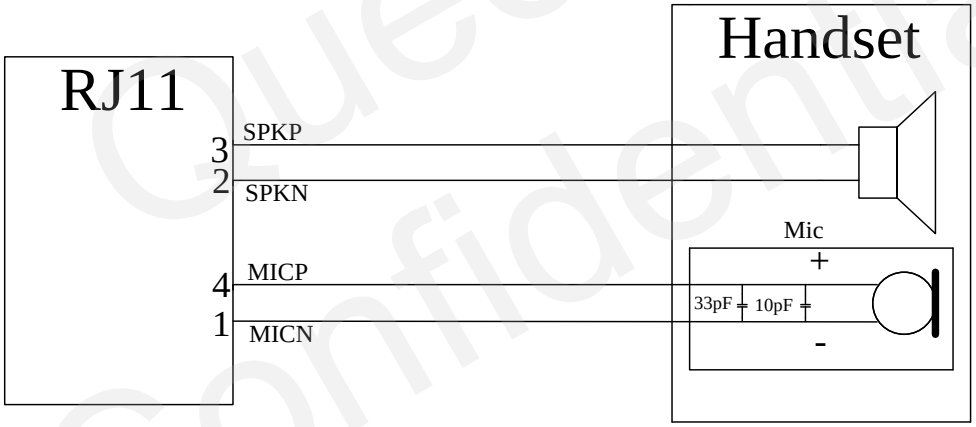

Figure 11: Connection between handset and RJ11

3.3.2. Earphone

AIN2/AOUT2 can be also designed as earphone. The schematic is shown as below. ADC0 and EINT are used for earphone detection, ADC0 and EINT can be selected from the module.

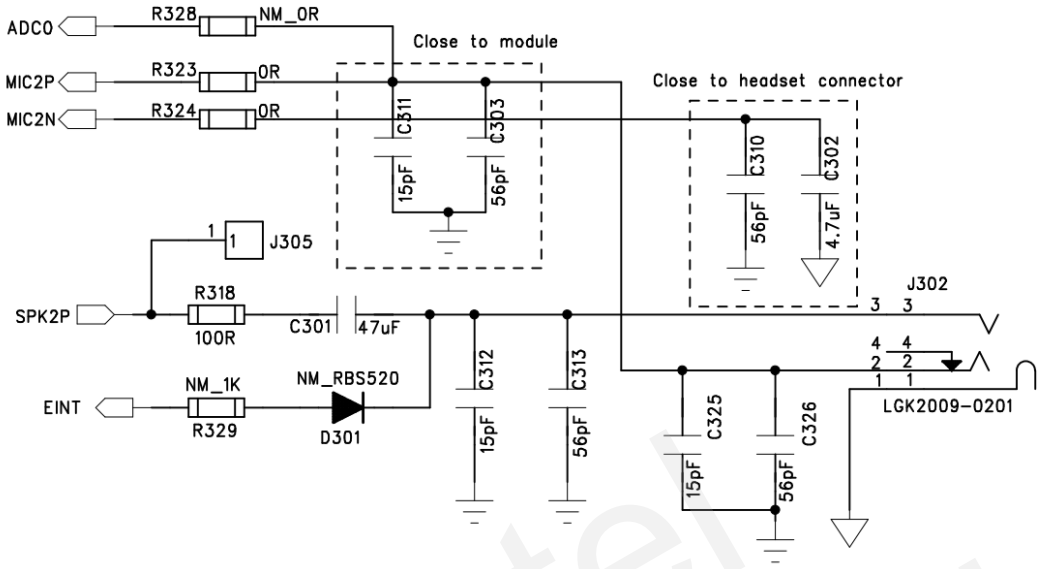

Figure 12: Earphone circuit

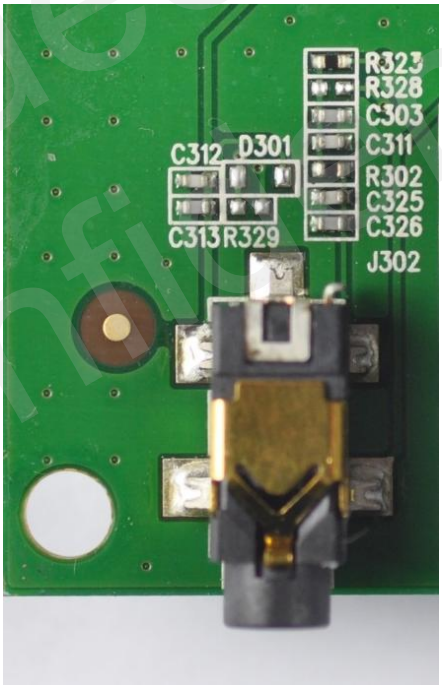

Figure 13: Earphone interface

3.3.3. Loud speaker

M80 module has embedded a class AB amplifier. It can drive up to 800mW speaker. In this case, the customer can get good audio performance and eliminate an amplifier simultaneously. The test points are shown as below.

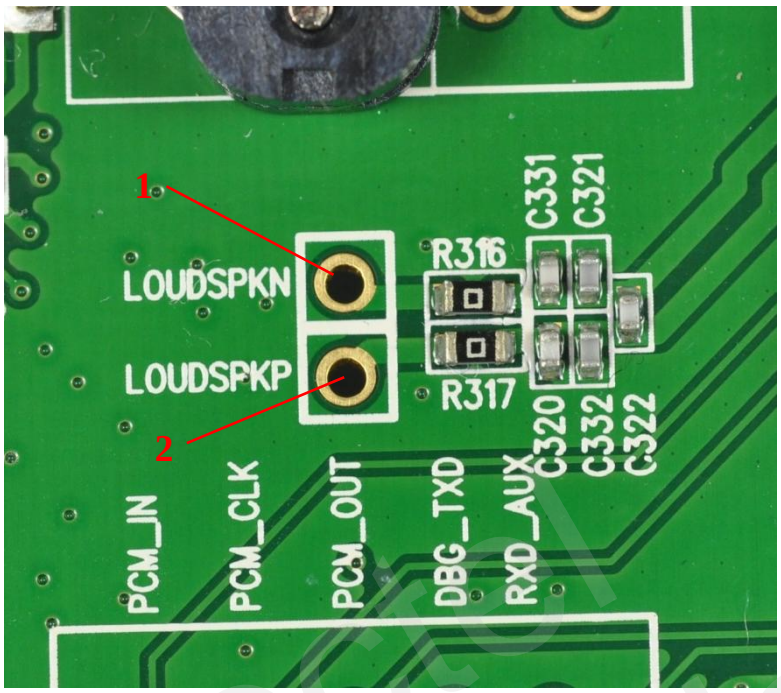

Figure 14: Test points of loud speaker

Table 5: Test points of loud speaker

Pin	Signal	I/O	Description	Note
1	LOUDSPKN	O	Negative loud speaker output	
2	LOUDSPKP	O	Positive loud speaker output	

3.3.4. PCM interface

M80 supports PCM interface. An audio codec, W681360, is used in the EVB board. The audio codec transforms between analog signal and digital signal. For more information, please refer to ***document [6]***.

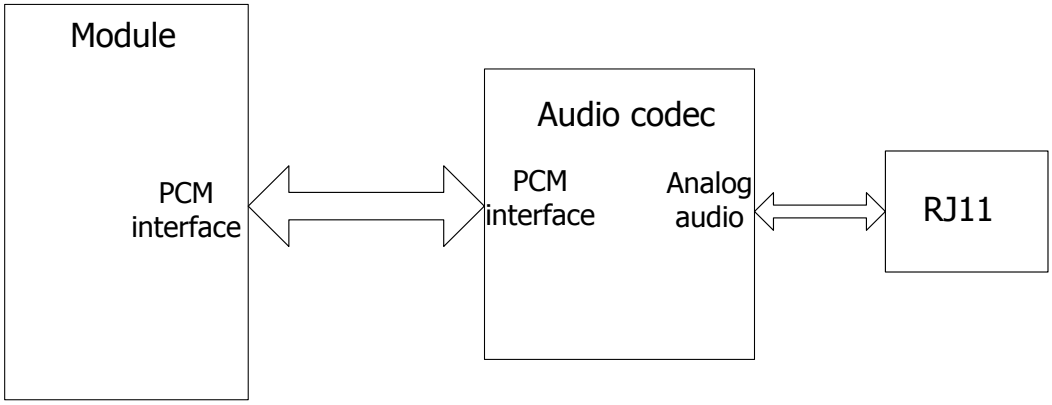

Figure 15: Block diagram of PCM

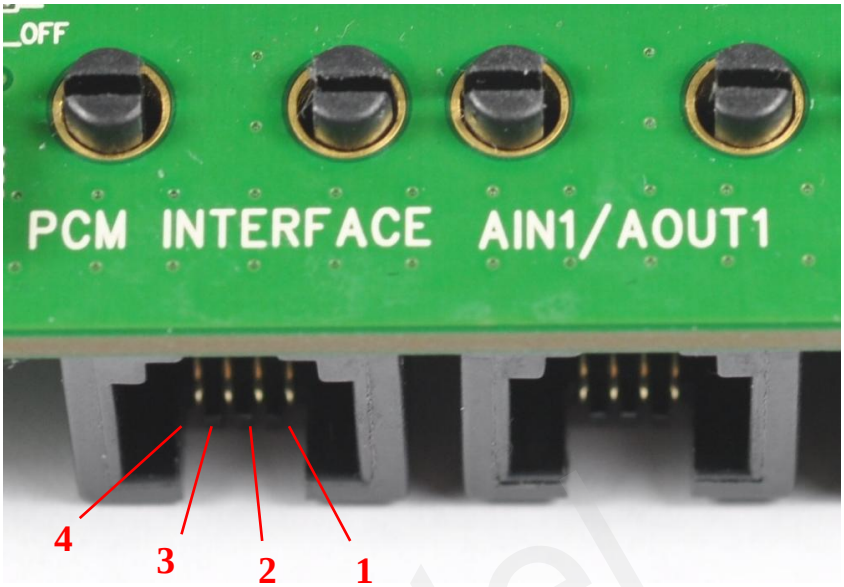

Figure 16: Pins of PCM interface

Table 6: Pins of PCM channel

Pin	Signal	I/O	Description	Note
1	MICN	I	Negative microphone input	
2	SPKN	O	Negative receiver output	
3	SPKP	O	Positive receiver output	
4	MICP	I	Positive microphone input	

The test points of PCM interface have been reserved as below. Customer can measure PCM signal using these test points.

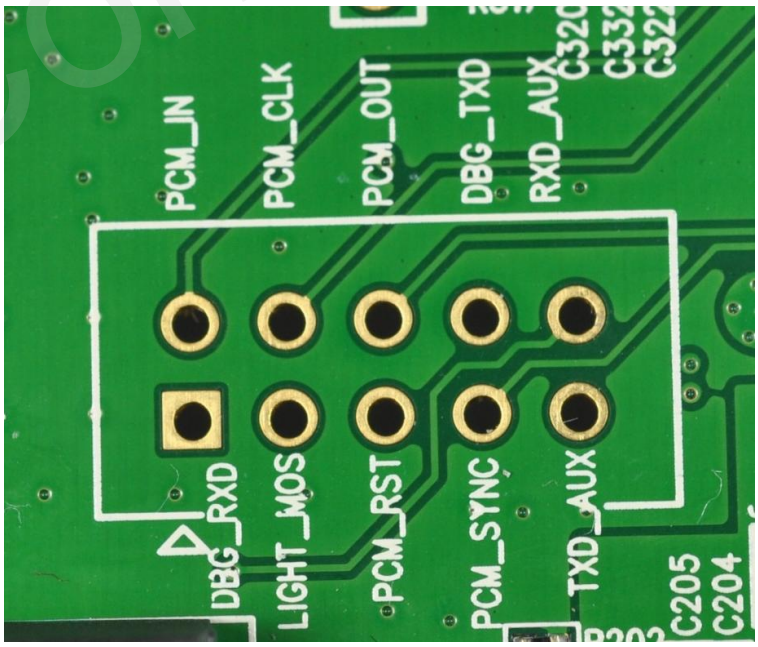

Figure 17: Test points of PCM interface

Note: W681360 is not assembled in the EVB board. If you want to use this function, please assemble this component located at U301.

3.4. SIM Card

M80 provides dual SIM card interface.

3.4.1. SIM1 card interface

Figure 18 and 19 shows the schematic of SIM1 card and the pins assignment of SIM1 card respectively. SIM1 cassette has adopted an EINT to detect the SIM card.

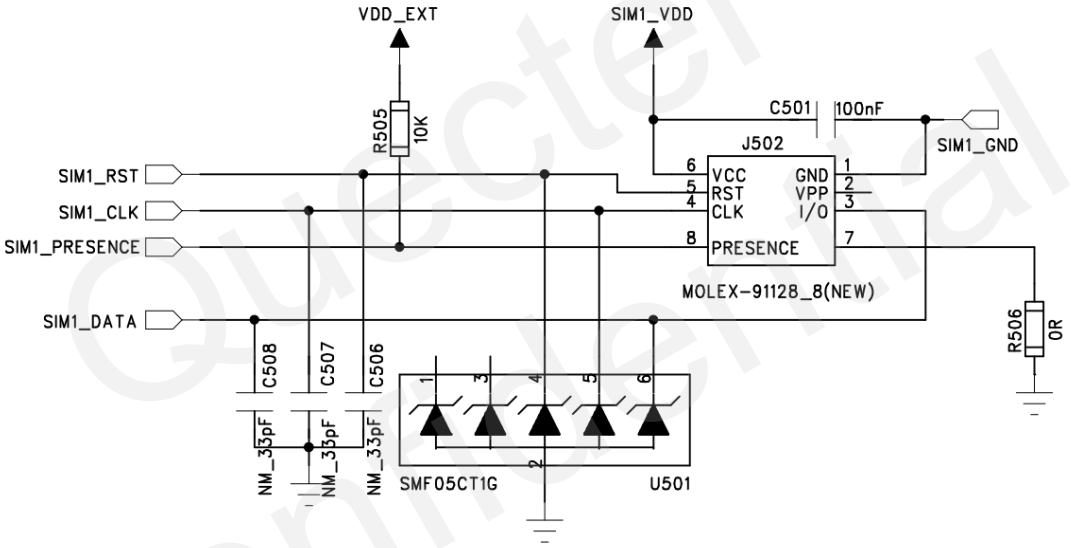

Figure 18: Circuit of SIM1 card

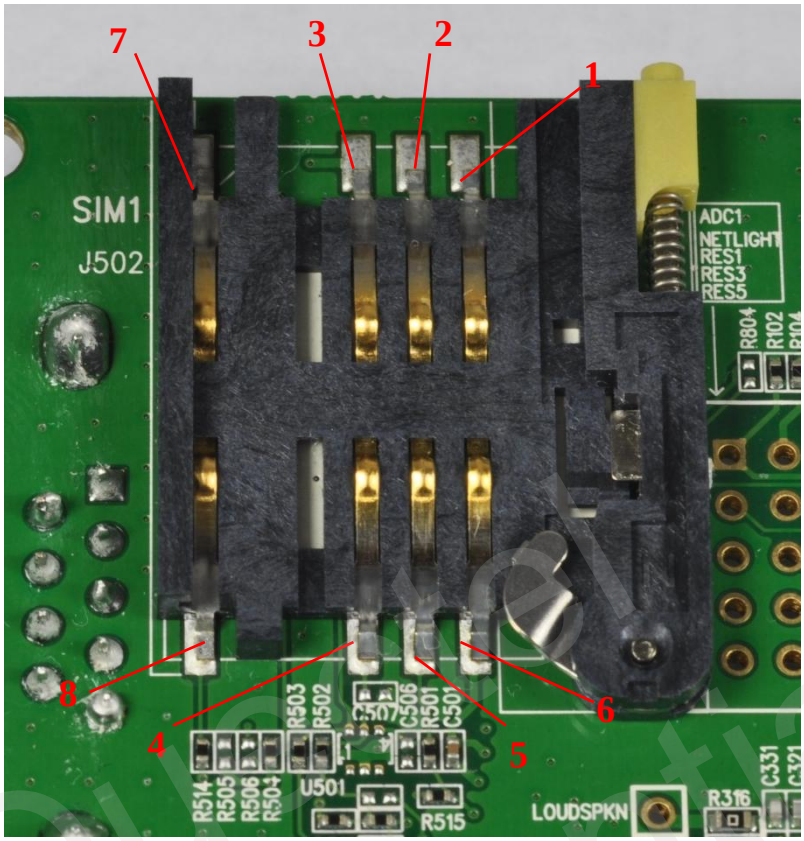

Figure 19: Pins of SIM1 card cassette

Table 7: Pins of SIM card interface

Pin	Signal	I/O	Description	Note
1	GND		GND	
2	VPP		Not connected	
3	SIM1_DATA	I/O	SIM1 card data I/O	
4	SIM1_CLK	O	SIM1 card clock	
5	SIM1_RST	O	SIM1 card reset	
6	SIM1_VDD	O	SIM1 power	
7			Pulled down to GND with external circuit. When the SIM card is inserted, pin 7 is connected to pin 8.	
8	SIM1_PRESENCE	I	SIM1 Card detect	

3.4.2. SIM2 card interface

In order to be compatible with further application, M80 reserves an SIM IC and SIM2 cassette in the EVB board. The schematic of SIM IC is same as SIM2 card. The SIM2 card interface does not support SIM card detection. The following picture shows the schematic and test points.

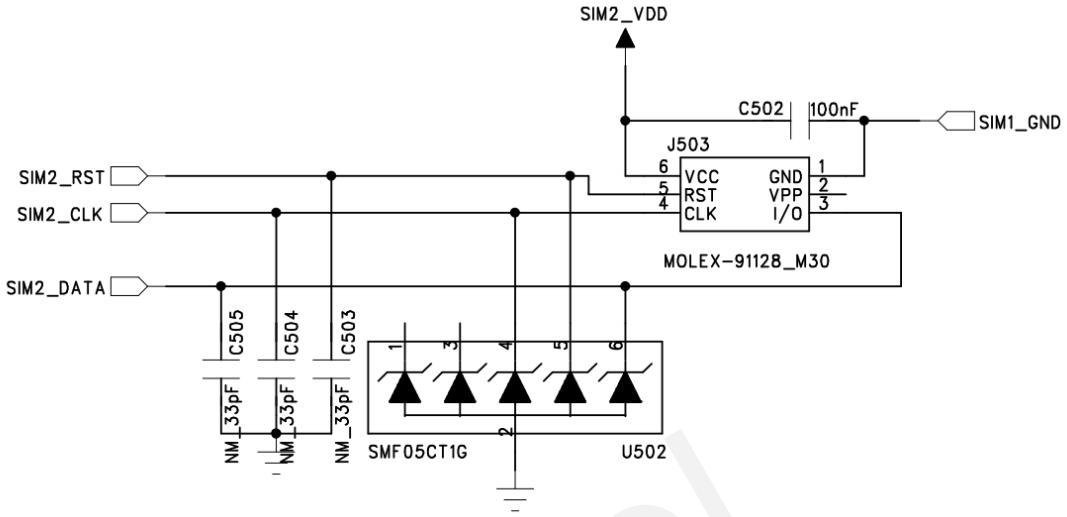

Figure 20: Circuit of SIM2 card

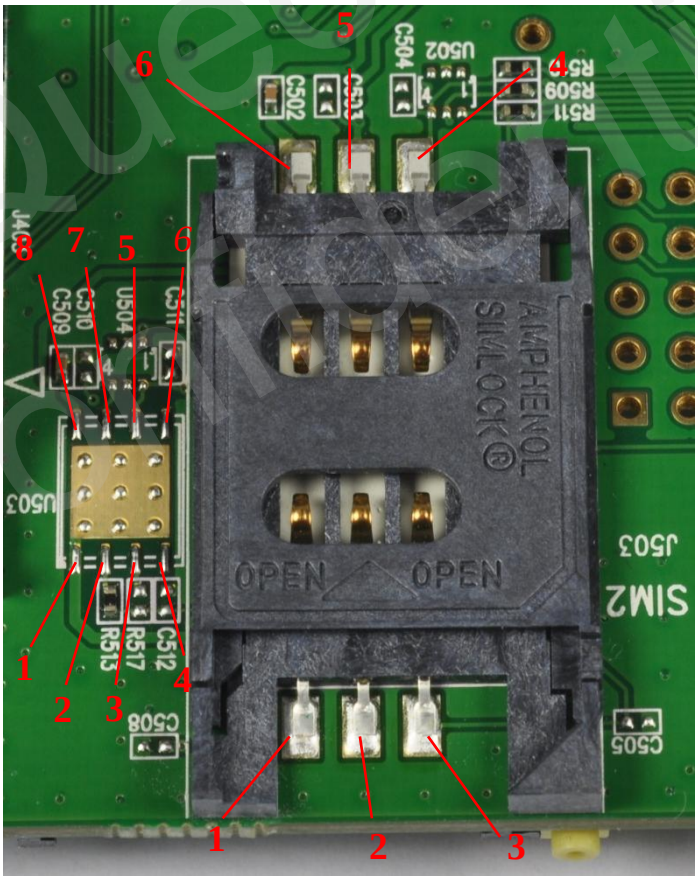

Figure 21: Pins of SIM2 card cassette and SIM IC

Table 8: Pins of SIM2 card interface

Pin	Signal	I/O	Description	Note
1	GND		Ground	
2	VPP		Not connected	
3	SIM2_DATA	I/O	SIM2 card data I/O	
4	SIM2_CLK	O	SIM2 card clock	
5	SIM2_RST	O	SIM2 card reset	
6	SIM2_VDD	O	SIM2 card power	

Table 9: Pins of SIM IC interface

Pin	Signal	I/O	Description	Note
1	GND		Ground	
2	SIM2_DATA	I/O	SIM2 card data I/O	
3	NC		Not connected	
4	NC		Not connected	
5	NC		Not connected	
6	SIM2_CLK	O	SIM2 card clock	
7	SIM2_RST	O	SIM2 card reset	
8	SIM2_VDD	O	SIM2 card power	

3.5. Antenna

In order to be compatible with different antenna connectors, M80 EVB reserves two antenna ports for the customer's choice. The circuit and antenna connector are shown as below.

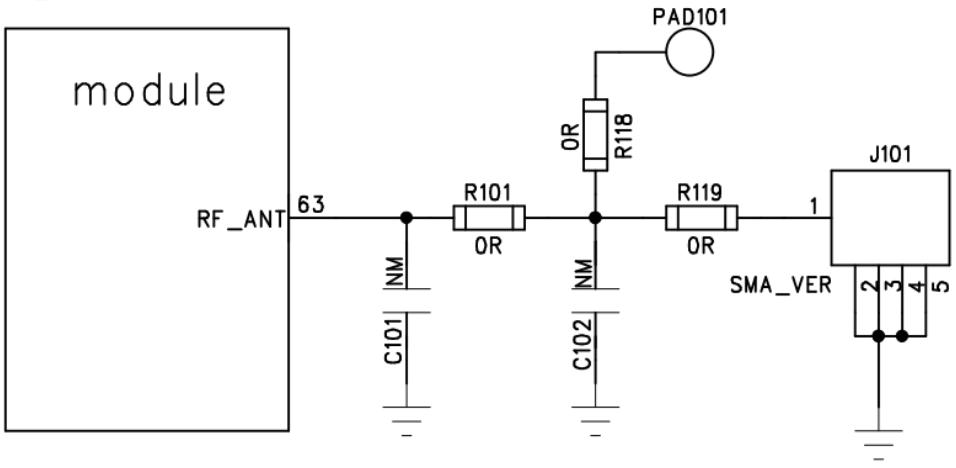

Figure 22: Antenna circuit

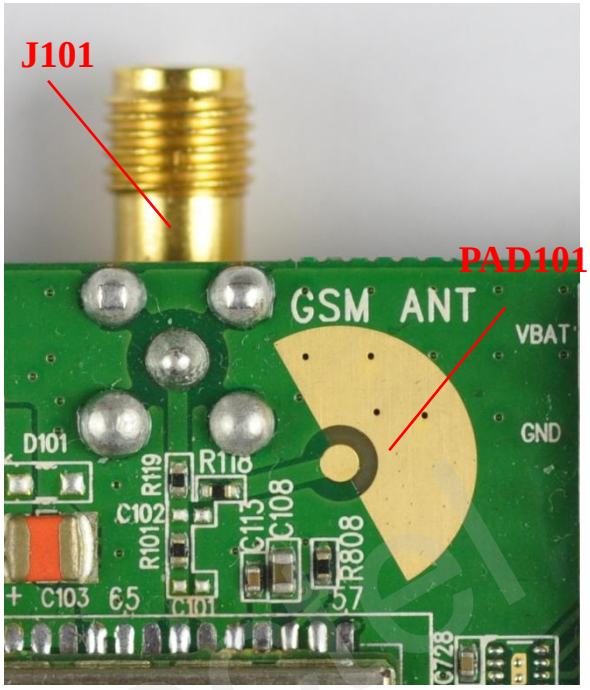

Figure 23: Antenna interface

3.6. Communication

M80 provides multi type communication ports, such as main UART, Auxiliary UART, Debug UART and USB port.

3.6.1. Main UART

When using main UART port communicates data between PC and the module, a RS_232 level shifter must be inserted between them, since this UART port do not support the RS_232 level, while supports the CMOS level only. The following picture is the reference design of RS-232 level shifter. The main UART can be used for AT command, GPRS data, CSD FAX, etc. Multiplexing function is supported on the main UART Port as well. For the design circuit of main Port, please refer to ***document [2].*** For more details about communication with UART, please refer to ***chapter 5.4.1***.

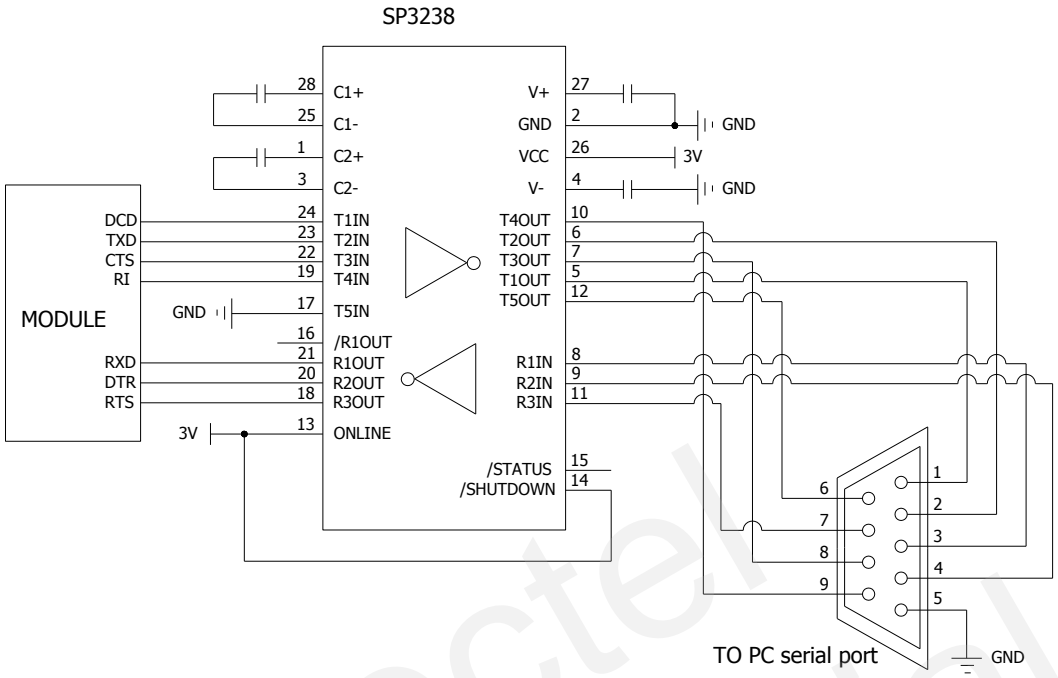

Figure 24: Level match circuit

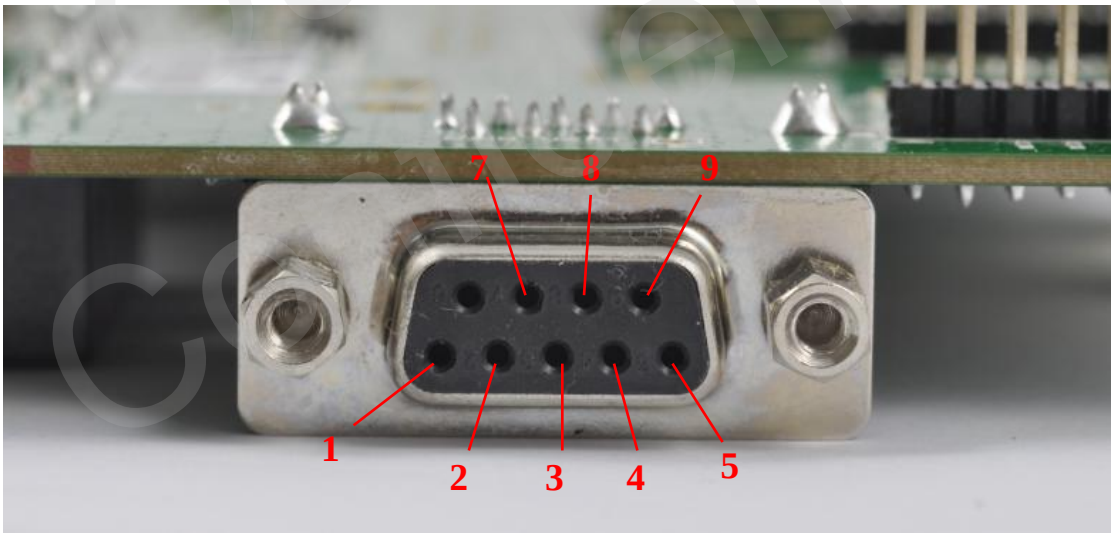

Figure 25: Pins of main UART

Table 10: Pins of Serial port

Pin	Signal	I/O	Description	Note
1	DCD	O	Data carrier detection	
2	TXD	O	Transmit data	
3	RXD	I	Receive data	
4	DTR	I	Data terminal ready	
5	GND		Ground	

7	RTS	I	Request to send	
8	CTS	O	Clear to send	
9	RI	O	Ring indicator	

Note: The above pins are RS232 voltage level.

The TTL level of UART signal can be test through test points below. Customer can use these test points to verify the design between customer device and the module.

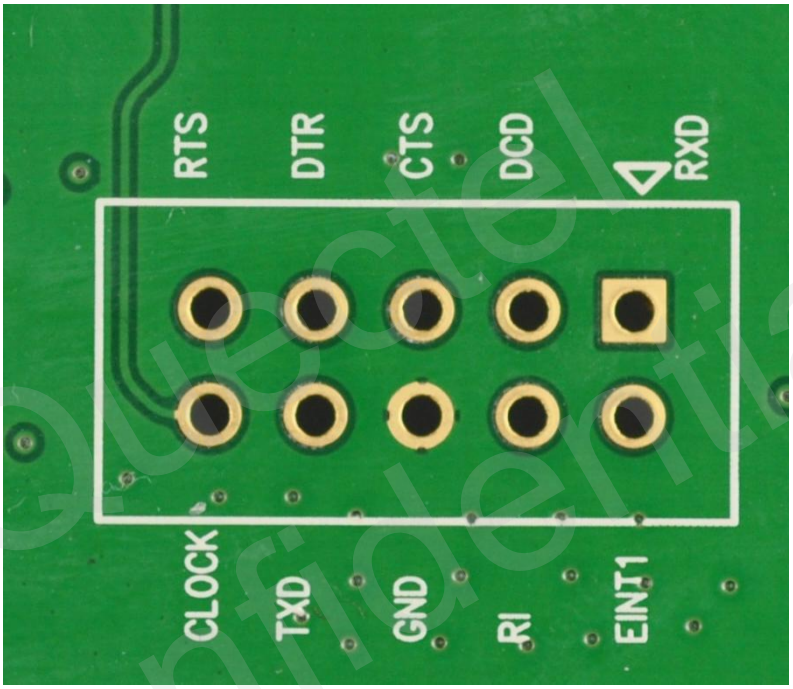

Figure 26: Test points of main port

The main port can be used for upgrading software. The PWRKEY pin must be pulled down before the software upgrade. For more details about downloading software with UART, please refer to ***chapter 5.5.1***.

3.6.2. Auxiliary UART and Debug UART

When Auxiliary UART port and Debug Port are used to communicate data between PC and the module, a RS_232 level shifter must be inserted between them. The reference design is same as the main port. Auxiliary UART port is used for AT command only since it does not support GPRS data, CSD FAX, and Multiplexing function, etc. Debug Port is only used for software debugging and its baud rate must be configured as 460800bps. For the circuit design of Auxiliary UART port and Debug Port, please refer to ***document [3]*** and ***document [5].***

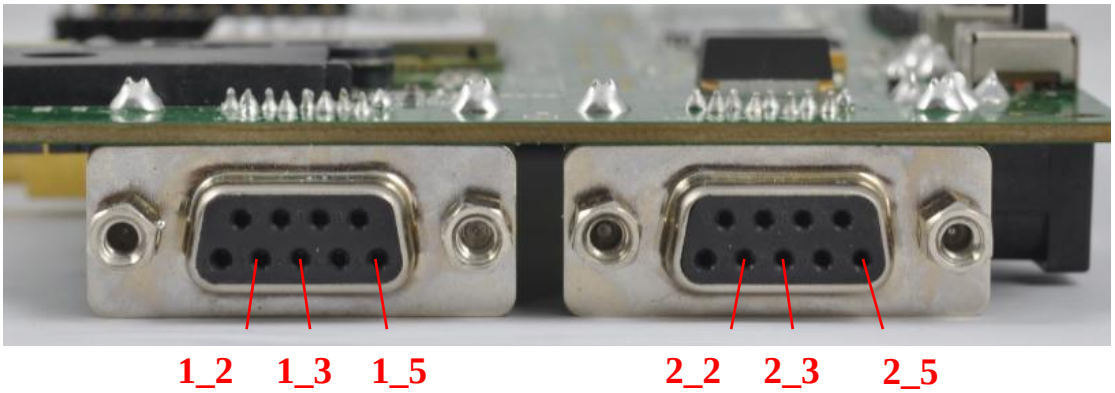

Figure 27: Auxiliary UART port and Debug Port

Table 11: Pins of Auxiliary UART

Pin	Signal	I/O	Description	Note
1_2	TXD_AUX	O	Transmit data	
1_3	RXD_AUX	I	Receive data	
1_5	GND		Ground	

Note: The above pins are RS232 voltage level.

Table 12: Pins of debug UART

Pin	Signal	I/O	Description	Note
2_2	DBG_TXD	O	Transmit data	
2_3	DBG_RXD	I	Receive data	
2_5	GND		Ground	

Note: The above pins are RS232 voltage level.

The TTL level of UART signal can be test through the test points below. Customer can use these test points to verify the design between customer device and the module.

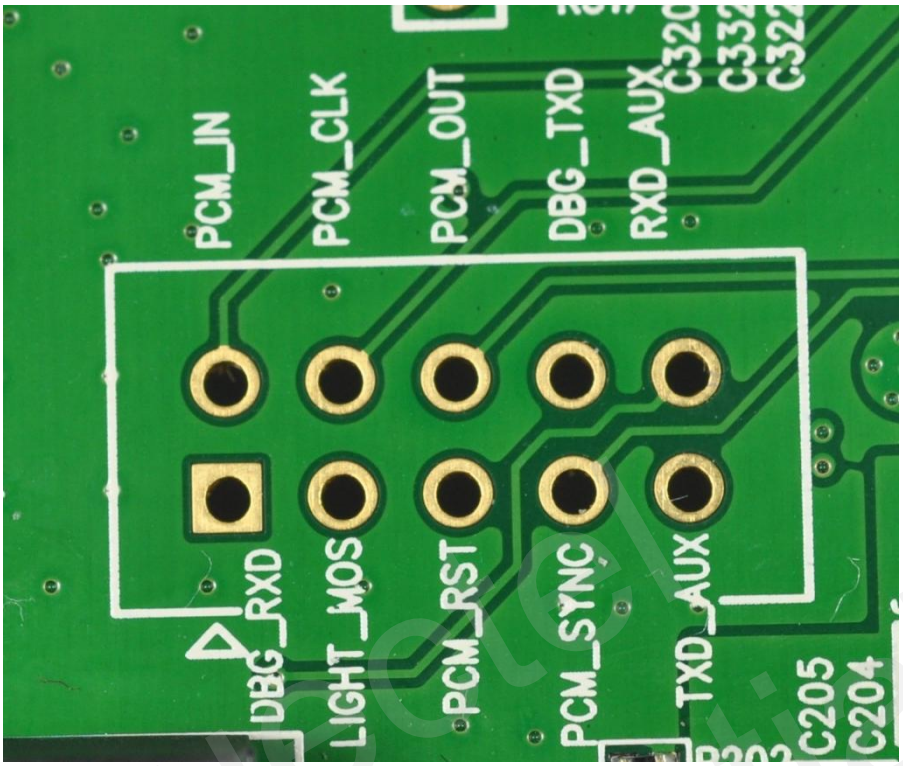

Figure 28: Test points of Auxiliary and Debug port

3.6.3. USB

USB interface supports downloading software and should cooperate with DOWNLOAD pin. The following picture is the example of connection. For more details about downloading software with USB cable, please refer to ***chapter 5.5.2***.

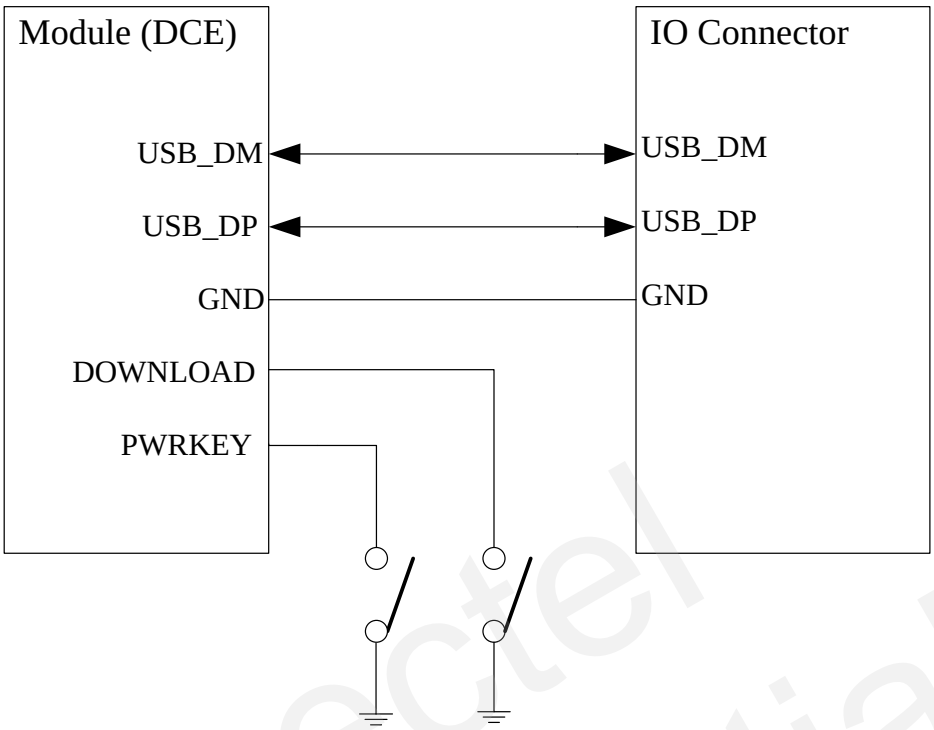

Figure 29: Connection of upgrading software

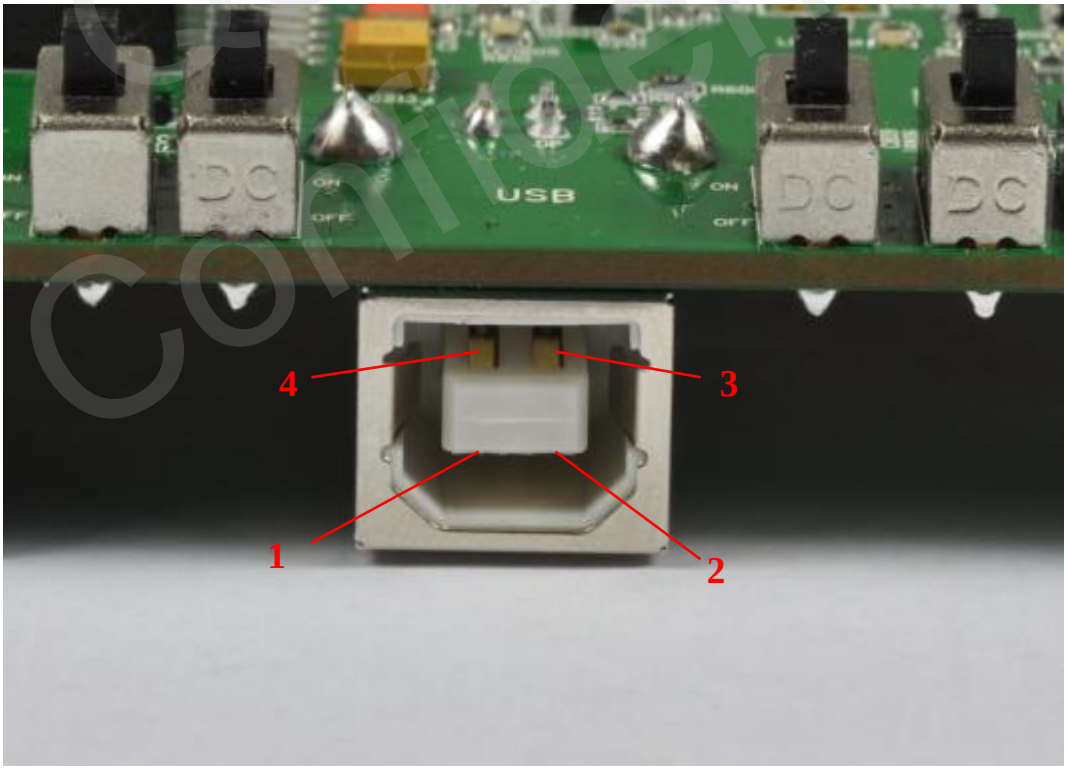

Figure 30: USB interface

Table 13: Pins of Serial port

Pin	Signal	I/O	Description	Note
1	VUSB	I	USB power	
2	USB_DM	I/O	USB data negative	
3	USB_DP	I/O	USB data positive	
4	GND		Ground	

3.7. SD card

The module provides SD card interface, whose maximum capacity is up to 32GB. M80 EVB reserves an SD card socket in the board. The pin definition and reference design are shown as below.

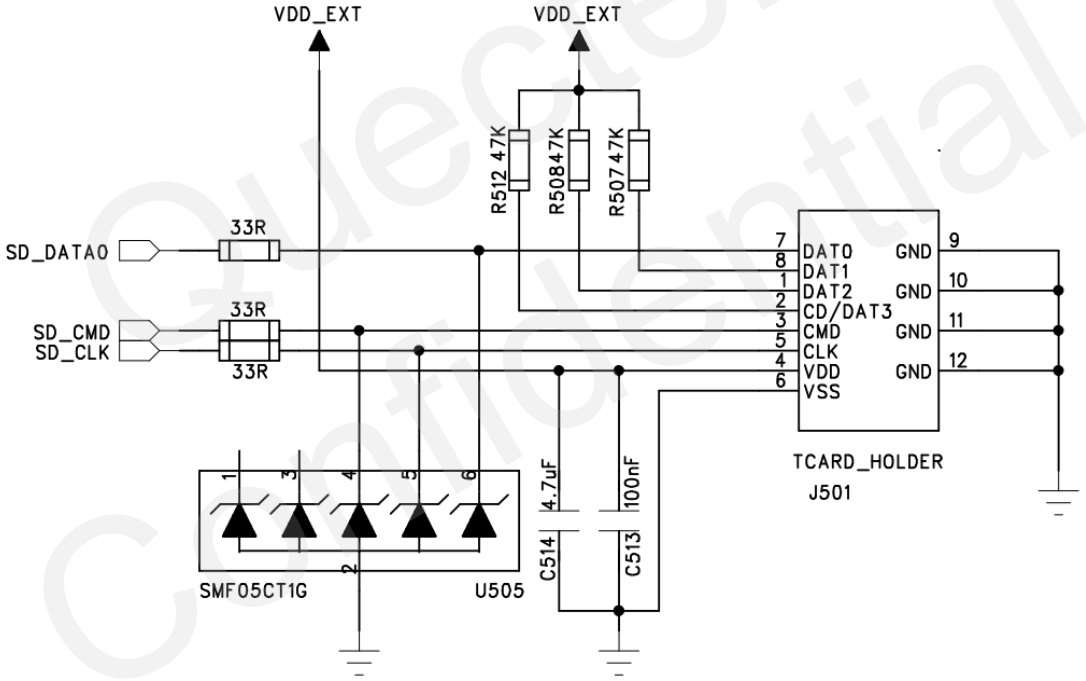

Figure 31: Micro SD card circuit

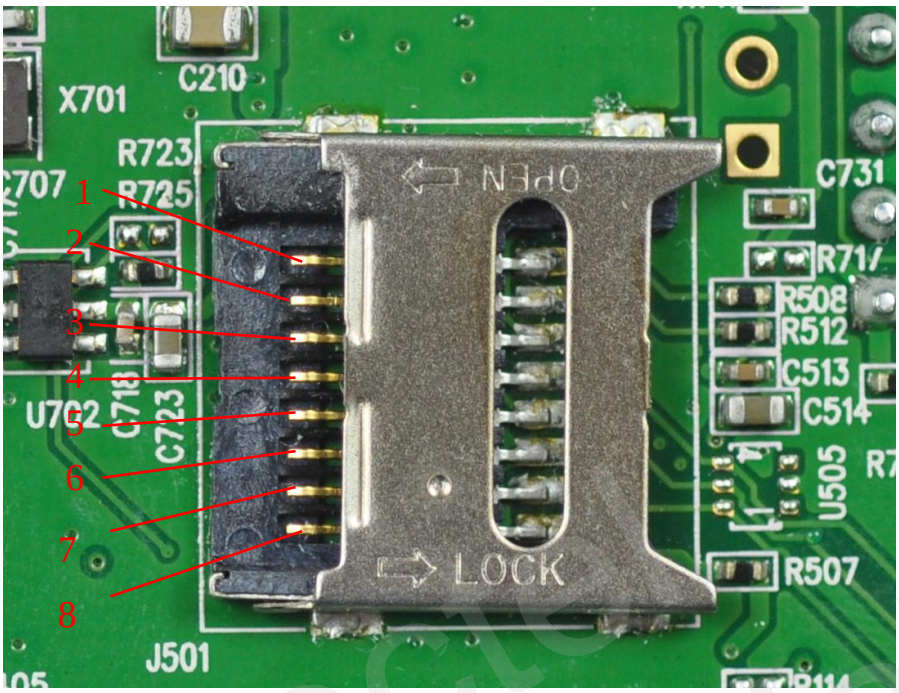

Figure 32: Pins of micro SD socket

Table 14: Pins of micro SD card socket

Pin	Signal	I/O	Description	Note
1	DATA2	I/O	Data output/ input signal line of SD card	
2	DATA3	I/O	Data output / input signal line of SD card	
3	CMD	O	Command signal of SD card output	
4	VDD		Power of SD card	
5	CLK	O	Clock signal of SD card output	
6	GND		Ground	
7	DATA0	I/O	Data output/input signal line of SD card	
8	DATA1	I/O	Data output/input signal line of SD card	

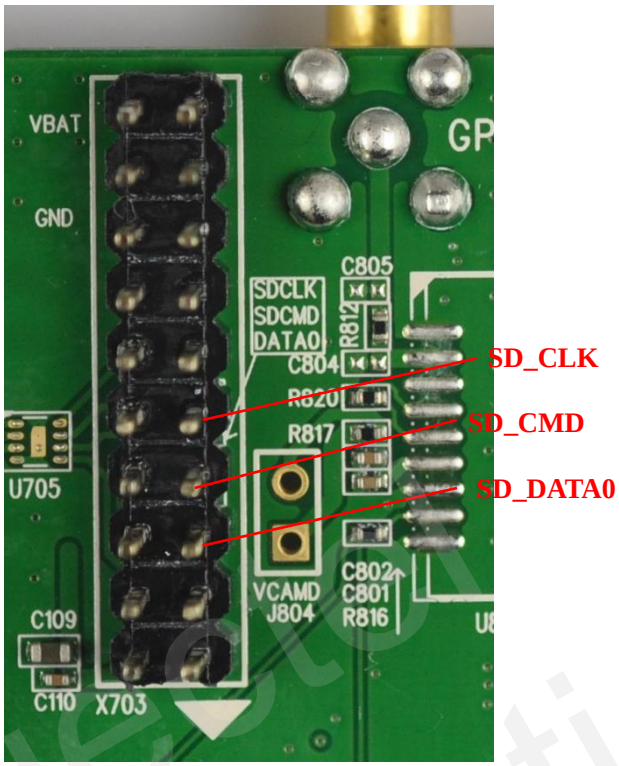

Figure 33: Test points of SD card

3.8. Camera

M80 EVB provides two types of camera interface: analog camera and digital camera.

3.8.1. Analog camera

M80 EVB provides analog camera function. The analog camera of the M80 EVB should employ an AK8856 IC which converts the analog video to digital video, also should add a boost converter when there is no 12V voltage in the board. The following picture is the block diagram. For more information about the detail design circuit, please refer to EVB circuit involving this part. The test point of analog camera is shown as below.

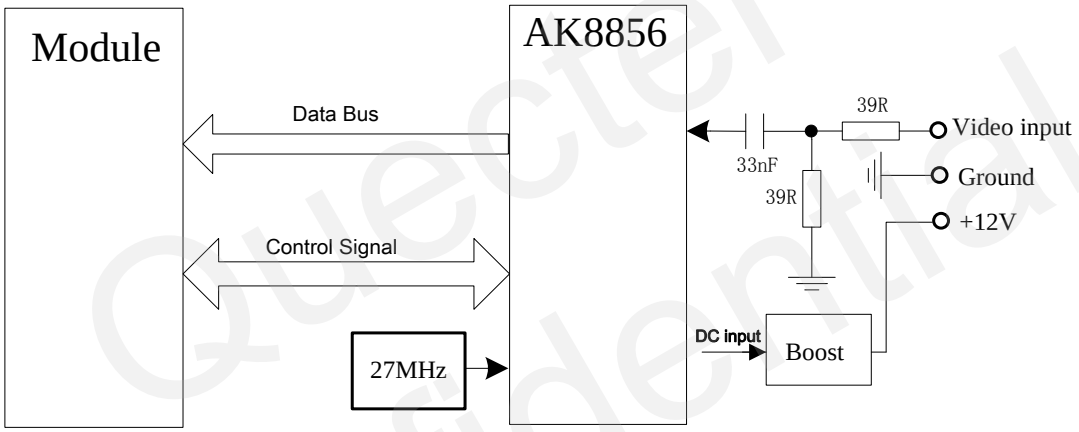

Figure 34: Block diagram of analog camera

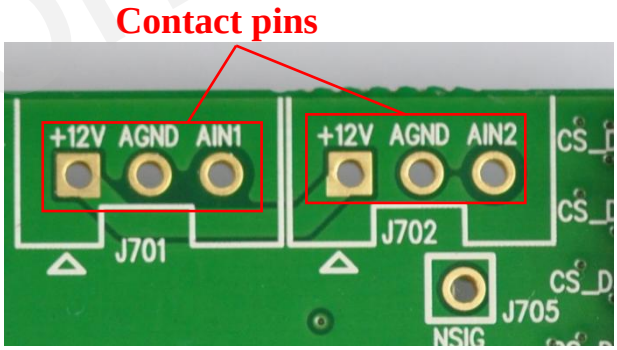

Figure 35: Test points of analog camera

The following picture is the sample of analog camera. Customer can connect the analog camera to EVB through contact pins. For more details about the analog camera, please contact the vendor of the analog camera or Quectel.

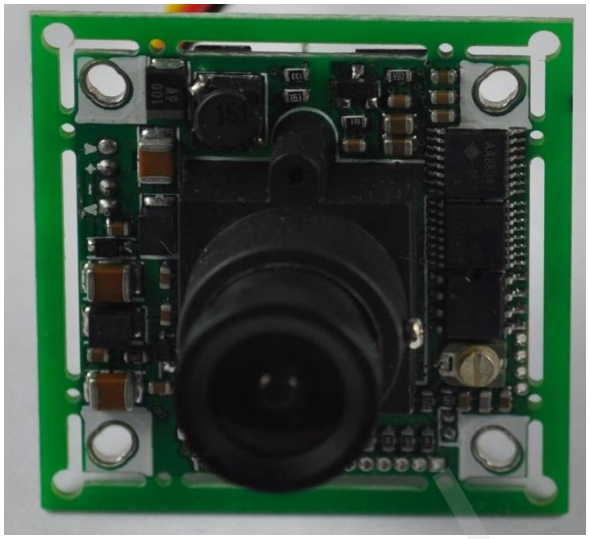

Figure 36: Analog camera

3.8.2. Digital camera

M80 EVB provides parallel digital camera interface. The maximum supported pixel is 0.3M.

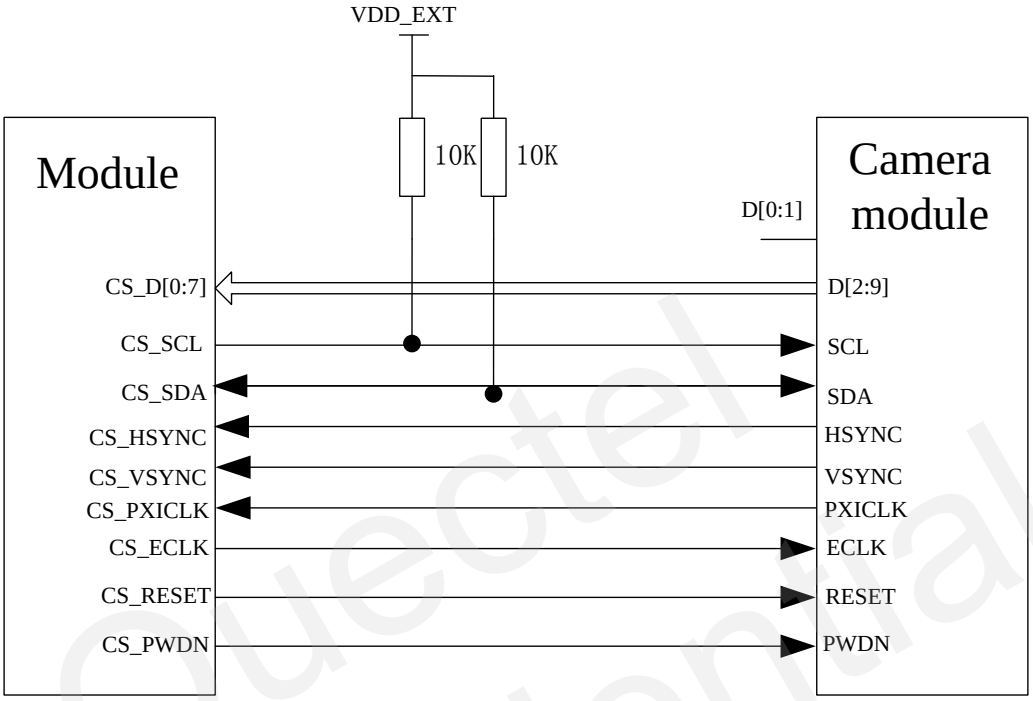

Figure 37: Connection of digital camera

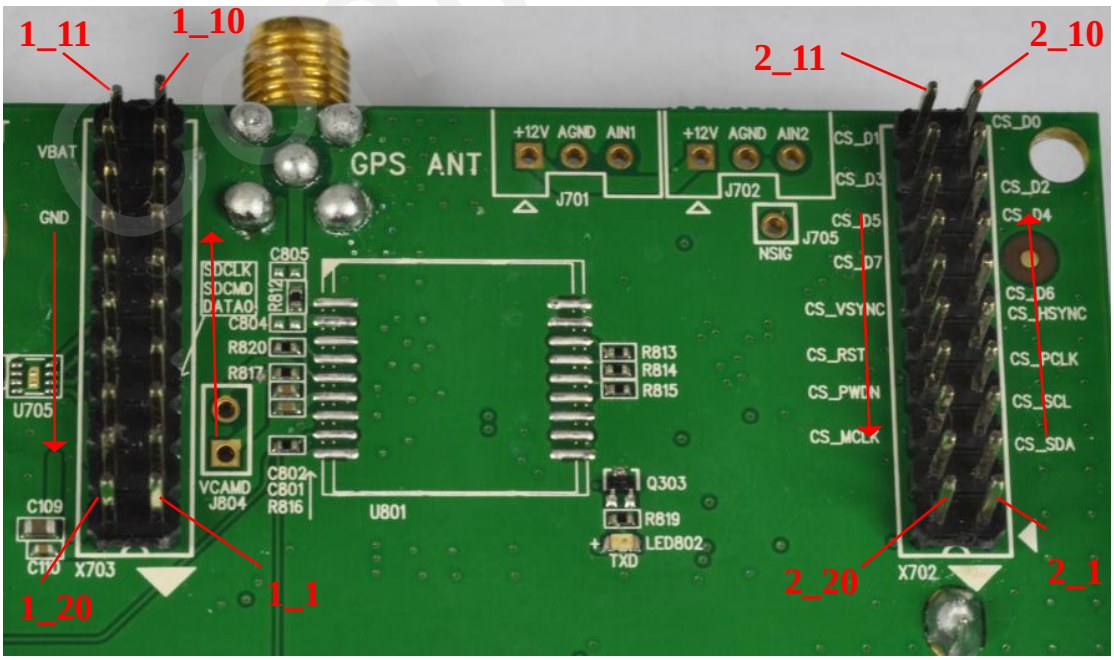

Figure 38: Contact pins of digital camera

Table 15: Contact pins of digital camera

Pin	Signal	Pin	Signal
1_1	VCAMA	2_1	NC
1_2	NC	2_2	NC
1_3	SD_DATA0	2_3	CAM_SDA
1_4	SD_CMD	2_4	CAM_SCL
1_5	SD_CLK	2_5	CAM_PCLK
1_6	NC	2_6	CAM_HSYNC
1_7	GND	2_7	CAM_DATA6
1_8	GND	2_8	CAM_DATA4
1_9	VBAT	2_9	CAM_DATA2
1_10	VBAT	2_10	CAM_DATA0
1_11	VBAT	2_11	CAM_DATA1
1_12	VBAT	2_12	CAM_DATA3
1_13	GND	2_13	CAM_DATA5
1_14	GND	2_14	CAM_DATA7
1_15	NC	2_15	CAM_VSYNC
1_16	NC	2_16	CAM_RST
1_17	NC	2_17	CAM_PWDN
1_18	NC	2_18	CAM_MCLK
1_19	NC	2_19	NC
1_20	VCAMD	2_20	NC

To cooperate with the digital camera in M80 EVB board, M33-EVB-TE-V1.01 board should be added. The following board is the sample. M33-EVB-TE-V1.01 board supplies abundant connectors for different camera sensors. For more details, please contact Quectel.

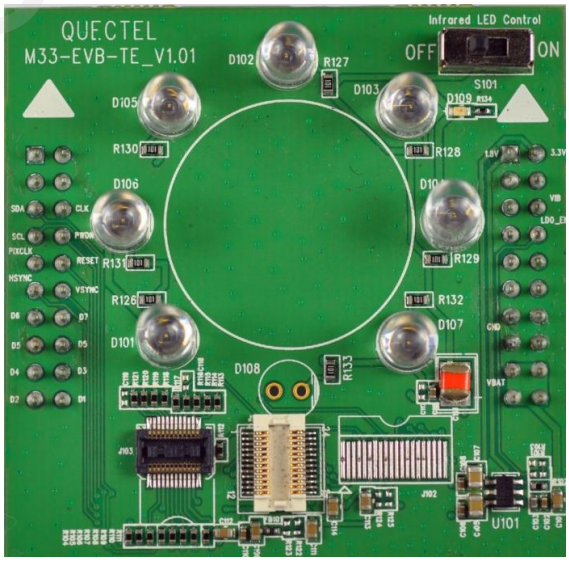

Figure 39: Board of digital camera

3.9. Switches and buttons

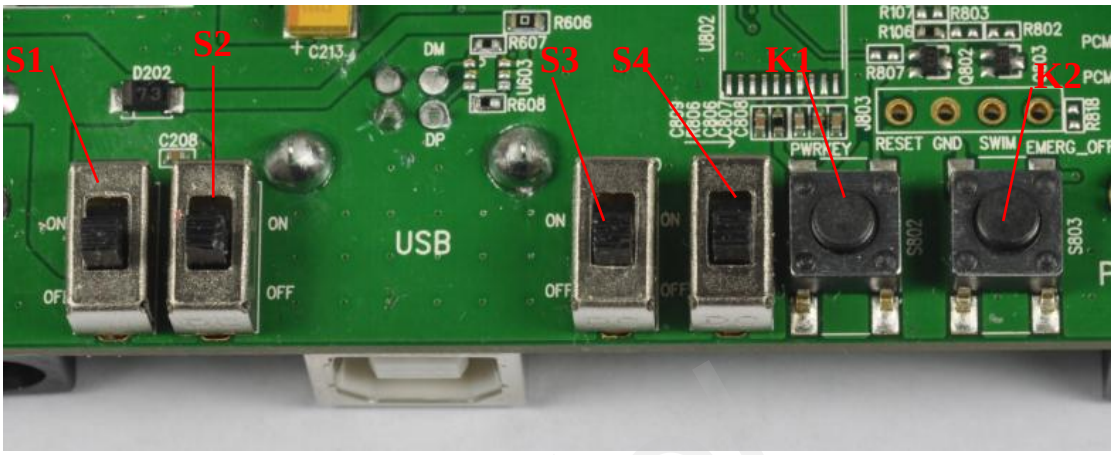

Figure 40: Switches and buttons

Table 16: Switches and buttons

Part	Name	I/O	Description	Note
S1	VBAT	I	Control power supply via adaptor	
S2	VCHG	I	Control charging if module has charging function	
S3	DOWNLOAD	I	Pulled to “ON” when downloading firmware via USB	
S4	PWRKEY	I	Pulled to “ON” when downloading firmware via UART or USB	
K1	PWRKEY	I	Turn on/off the module	
K2	EMERG_OFF	I	Emergency button for shutting down the module	

3.10. LED indicator

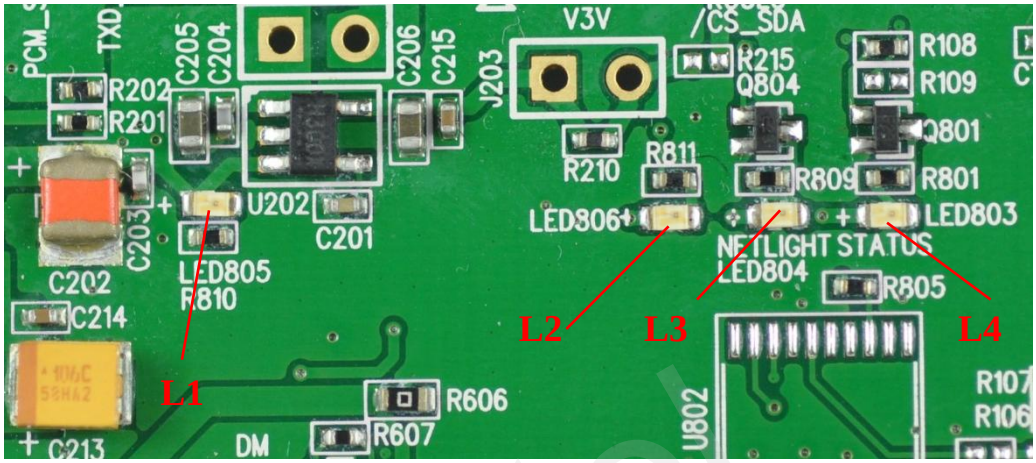

Figure 41: LED indicator

Table 17: LED indicator

Part	Name	I/O	Description	Note
L1	VBAT ON/OFF indicator	O	Bright: VBAT ON Extinct: VBAT OFF	
L2	RESERVED			
L3	GSM_NET status indicator	O	Blinking at a certain frequency according to various GSM network status	
L4	Module status indicator	O	Indicate module's operating status	

3.11. LCD

M80 provides serial LCD interface including both four lines mode and three lines mode. The maximum resolution is up to 240 x 320. The EVB board reserves the test points for the measurement of signal.

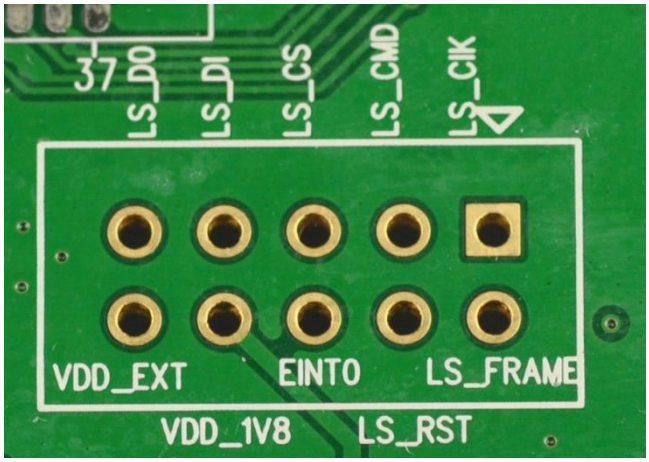

Figure 42: Test points of LCD

3.13. Keyboard

M80 provide s 5*5 matrix keyboard. The following figure shows the test points.

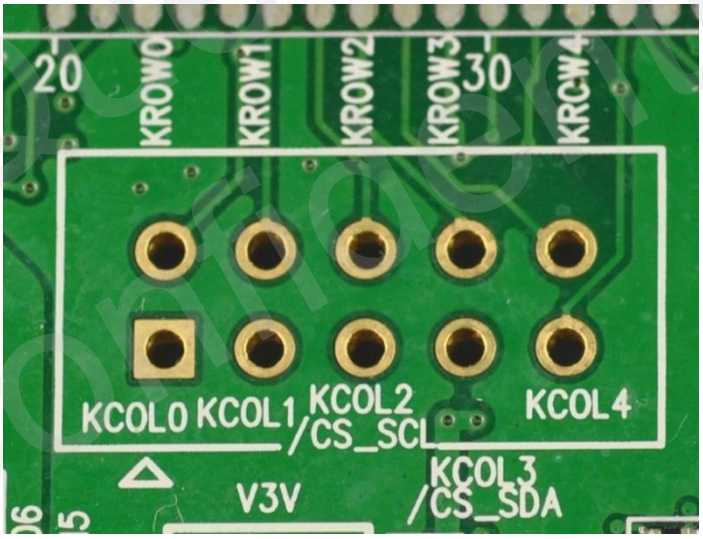

Figure 43: Test points of keyboard

3.14. ADC

M80 provides two ADC channel. The test points and circuit are shown as below.

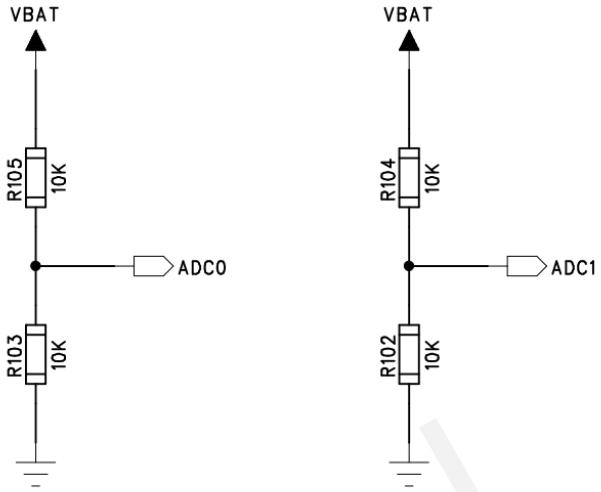

Figure 44: Circuit of ADC

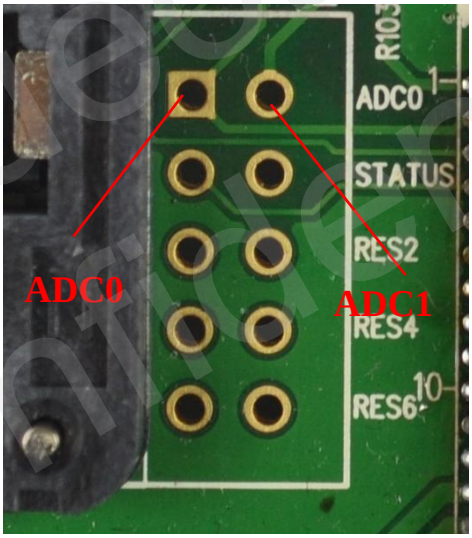

Figure 45: Test points of ADC

4. EVB accessories assembly

Generally, the EVB and its accessories are equipped as below.

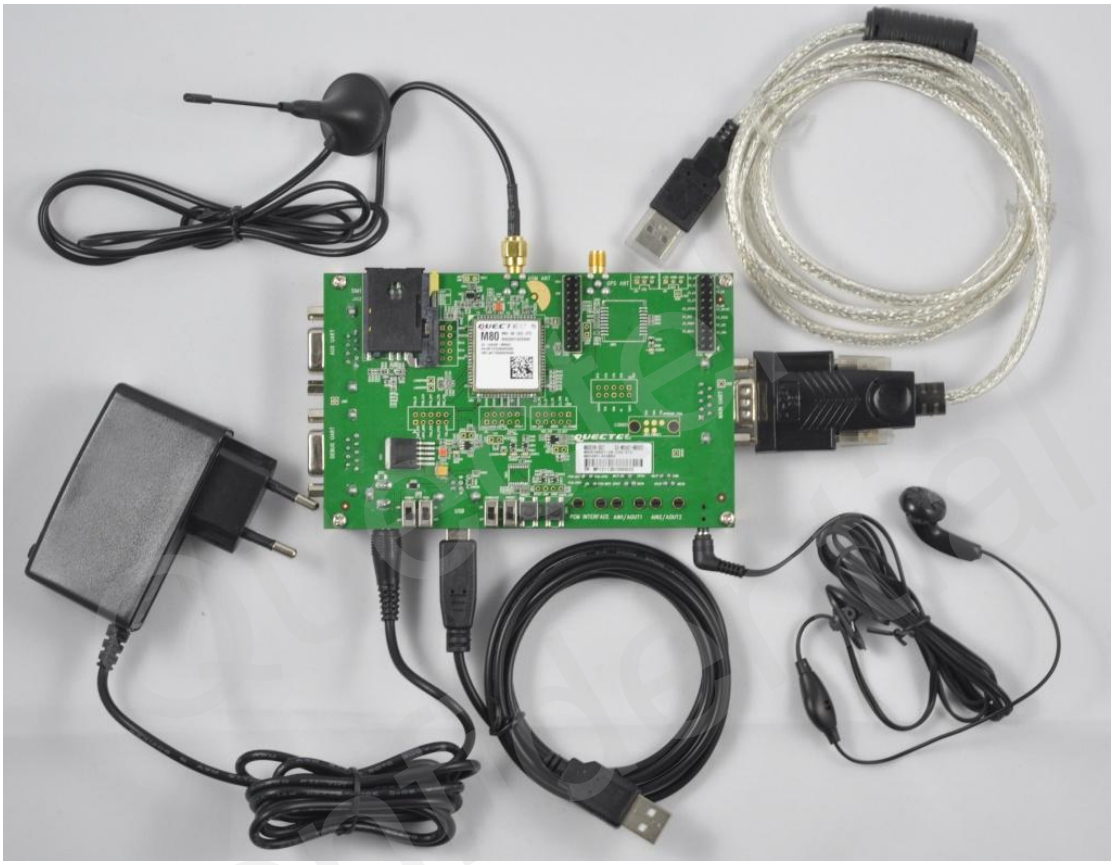

Figure 46: EVB and accessories equipment

5. Illustration

5.1. Turn on the module

1. Insert the plug of the 5V power adapter.
2. Switch S1 to ON state, Switch S2 to OFF state, Switch S3 to OFF state, and Switch S4 to OFF state. The LED L1 on the EVB will be bright.
3. Press the K1 button (PWRKEY) for about 1 second. The LED L4 will be light and indicates the module is in the working mode. When L4 is bright, the module begins running. Otherwise, please check the circuit.
4. The LED L2 will be blinking at a certain frequency. The GSM working status of the module can be judged by this LED.

Please refer to ***document [3]*** for the detailed network status indication.

5.2. Turn off the module

Press the PWRKEY button for about 1 second, the module will be turned off.

5.3. Emergency off

Press the EMERG_OFF button for more than 0.2 seconds, the module will be shut down immediately. After that, the module can be restarted by pressing the PWRKEY button. Please note that this operation is harmful to the whole module system and should only be done in emergency such as failing to turn off the module through the PWRKEY button.

5.4. Communicate with the module

5.4.1. UART

1. Insert the plug of the 5V power adapter.
2. Connect PC and EVB correctly with USB to UART cable.
3. Open the HyperTerminal (AT command window) on PC. The location of the HyperTerminal in windows XP is: START →program →accessory →communication →HyperTerminal. Set appropriate Baud Rate (such as 115200 bps) and COM number which can be checked by the Device Manager on PC.
4. Connect an antenna to M80-EVB with an RF cable.
5. Insert SIM card into the SIM1 card socket.

6. Insert earphone or handset into audio interface.
   For Power On operation**,** please refer to ***chapter5.1***.

7. After waiting for 2~3 seconds, customer should first input "AT" or "at" string once or more until receiving "OK" from the module in the HyperTerminal. The module is set to autobauding mode in default configuration. This operation is to synchronize the baud rate between the computer and the module.
8. Input AT command and the module will execute its corresponding function.

Customer can refer to ***document [1]*** for the details of AT commands. For instance, when inputting "ATD112;" an emergency call is established.

5.4.2. Auxiliary UART

Quectel module provides two **UART** ports for achieving Dual **UART**.
"AT+QEAUART=1" which is sent via main **UART** is used to enable Auxiliary **UART**. Please restart the module after executing the command. For more details, please refer to ***document [1]***.

5.5. Firmware upgrade

5.5.1. Main UART

1. Insert the plug of the 5V power adapter.
2. Connect PC and EVB correctly with USB to UART cable.
3. Start the Firmware Upgrade Tool in the PC and choose right COM port.
4. Press the START button in the Firmware Upgrade Tool.
5. Switch the S4 and S1 in the EVB to ON state

After these steps, the firmware refreshing process will be proceeding. For more details, please *refer to* ***document [4]***.

5.6. Charging

The battery can be charged in both ghost mode and charging mode. About the difference between them, you can refer to the ***document [7]***.

5.6.1. Ghost mode

1. Connect the battery to the battery contact pin.
2. Insert the plug of the 5V power adapter.
3. Switch S1 to OFF state, Switch S2 to ON state, Switch S3 to OFF state, and Switch S4 to

OFF state.

4. Monitor the VBAT voltage and charging state via “AT+CBC”.

5.6.2 Charging mode

1. Connect the battery to the battery contact pin.
2. Insert the plug of the 5V power adapter.
3. Switch S1 to ON state, Switch S2 to OFF state, Switch S3 to OFF state, and Switch S4 to OFF state. The LED L1 on the EVB will be bright.
4. Press the K1 button (PWRKEY) for about 1 second. The LED L4 will be light and indicates the module is in the working mode. When L4 is bright, the module begins running.
5. Switch S2 to ON state to start the module.
6. Monitor the VBAT voltage and charging state via “AT+CBC”.

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