# M20

## Quectel Cellular Engine

**EVB User Guide**

M20_EVB_UGD_V1.02
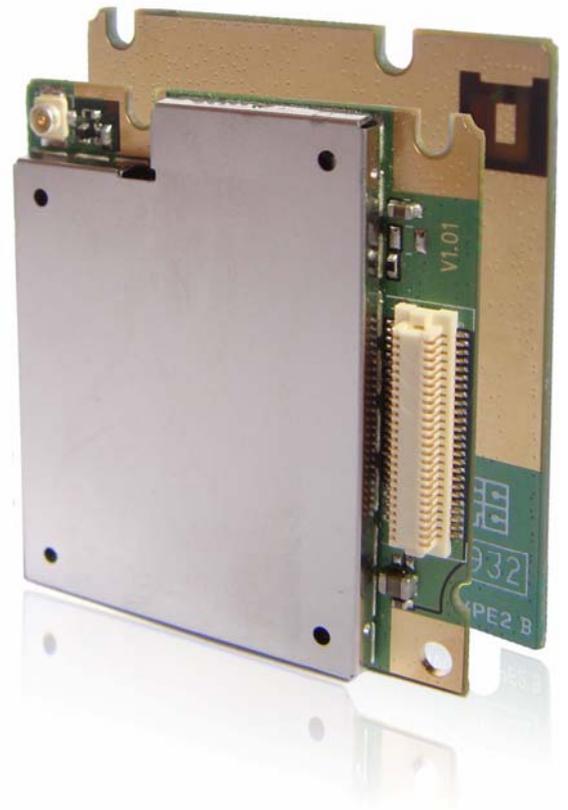
| Document Title | M20 EVB User Guide |
|---|---|
| Version | 1.02 |
| Date | 2009-11-12 |
| Status | Release |
| Document Control ID | M20_EVB_UGD_V1.02 |

**General Notes**

Quectel offers this information as a service to its customers, to support application and engineering efforts that use the products designed by Quectel. The information provided is based upon requirements specifically provided for Quectel by the customers. Quectel has not undertaken any independent search for additional relevant information, including any information that may be in the customer's possession. Furthermore, system validation of this product designed by Quectel within a larger electronic system remains the responsibility of the customer or the customer's system integrator. All specifications supplied herein are subject to change.

**Copyright**

This document contains proprietary technical information which is the property of Quectel Limited, copying of this document and giving it to others and the using or communication of the contents thereof, are forbidden without express authority. Offenders are liable to the payment of damages. All rights reserved in the event of grant of a patent or the registration of a utility model or design. All specification supplied herein are subject to change without notice at any time.

*Copyright © Quectel Wireless Solutions Co., Ltd. 2009*

# Contents

# Table Index

# Figure Index

## 0. Revision history

| Revision | Date | Author | Description of change |
|----------|------|--------|------------------------|
| 1.00 | 2009-09-05 | Tracy ZHANG | Initial |
| 1.01 | 2009-09-29 | Tracy ZHANG | Modified chapter number and title of Chapter 6 |
| 1.02 | 2009-11-12 | Yong AN | The baud rate of the module is set to autobauding. |

# 1. Introduction

This document defines and specifies the usage of M20 EVB.

## 1.1. Related documents

**Table 1: Related documents**

| SN | Document name | Remark |
|----|---------------|--------|
| [1] | M20_ATC | AT commands set |
| [2] | GSM_UART_AN | GSM UART port application notes |
| [3] | M20_HD | Hardware design |
| [4] | Upgrade_FW_Tools_UGD | User guide of firmware upgrade tools |

## 1.2. Safety caution

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 M20 module. Manufactures 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.

When in a hospital or other health care facility, observe the restrictions about the use of mobile. Switch the cellular terminal or mobile off. Medical equipment may be sensitive to not operate normally for 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 lead to 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 over radio frequency signal and cellular network and cannot be guaranteed to connect 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 call, 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 introduction

### 2.1. EVB top and bottom view
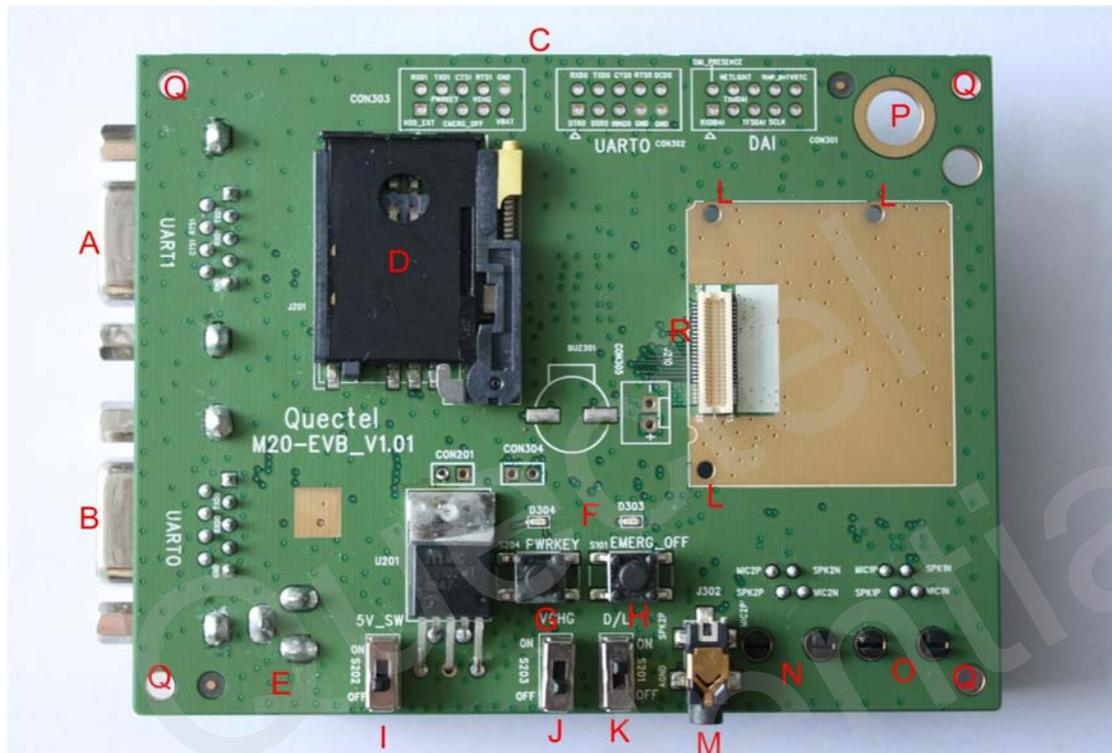


**Figure 1: EVB top view**
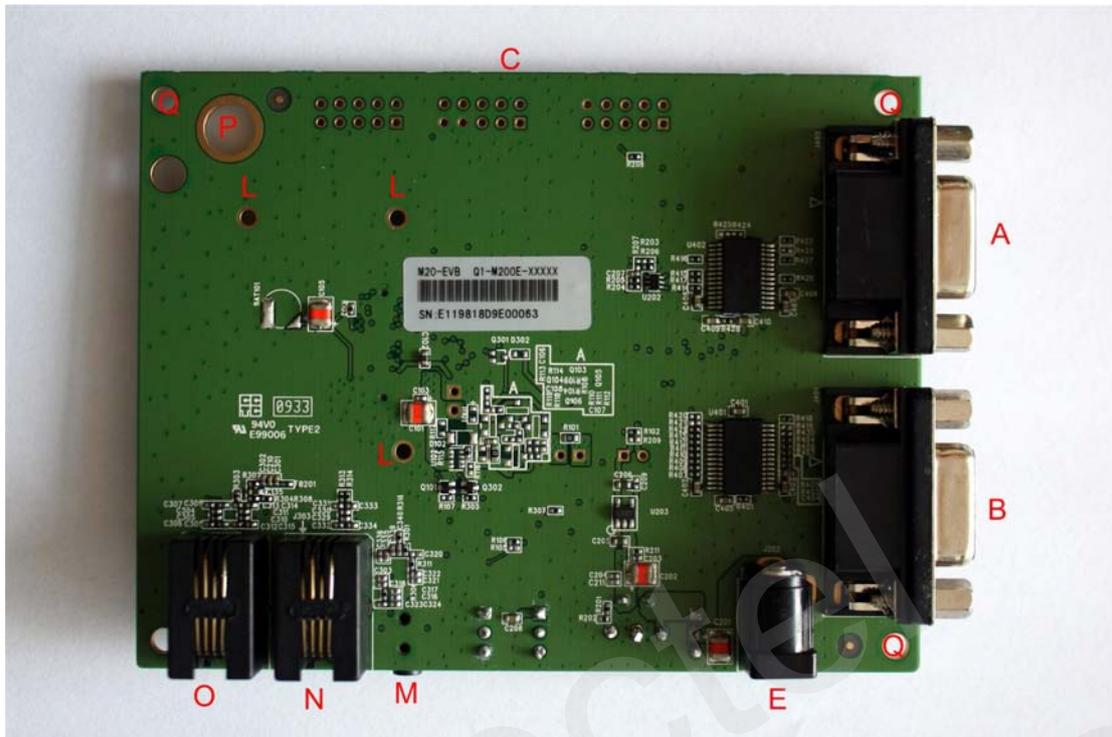
**Figure 2: EVB bottom view**

A:   Serial port 1
B:   Serial port 0
C:   Test points
D:   SIM card socket
E:   Power adapter interface
F:   Module operating status indication LEDs
G:   PWRKEY button
H:   EMERG_OFF button
I:   5V switch
J:   VCHG switch
K:   Download switch
L:   Screw holes for fixing the M20 module
M:   Headset socket
N:   Handset socket of audio channel 2
O:   Handset socket of audio channel 1
P:   Antenna connector fixing hole
Q:   Screw holes for EVB placement
R:   Connector for M20 module

## 2.2. EVB accessory
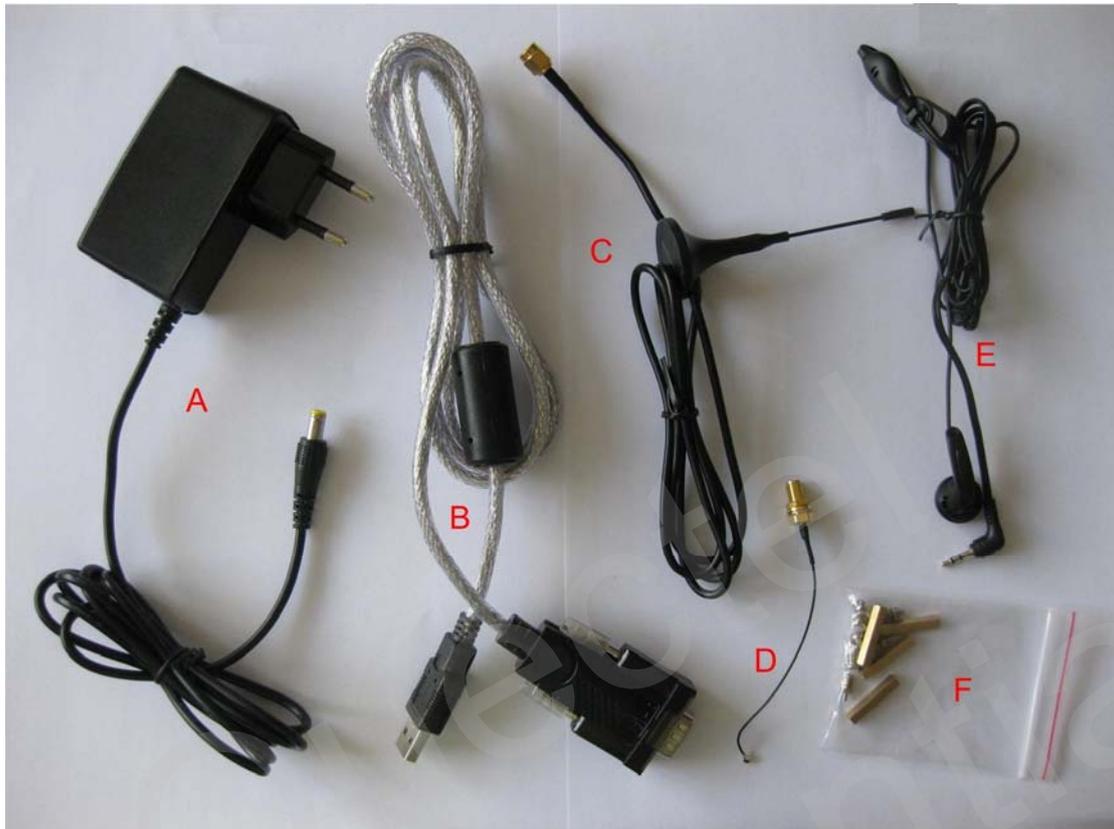


**Figure 3: Accessory introduction**

A:   5V DC switching adapter

B:   USB to UART converter cable

C:   Quad-band GSM antenna

D:   RF cable

E:   Headset

F:   Bolts and nuts for fixing module in EVB

# 3. Interface application

## 3.1. Power interface
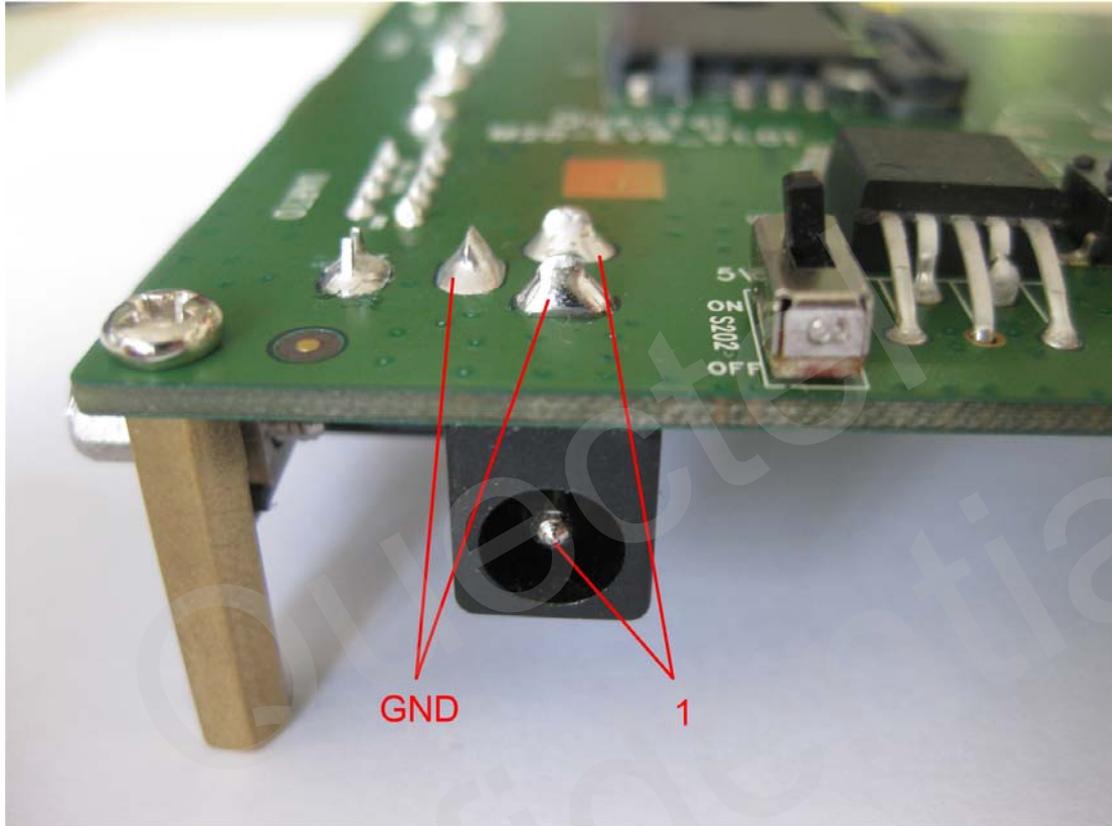


**Figure 4: Power interface**

**Table 2: Pin of power interface**

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

The inner pin of the connector of power supply is positive. Customer should use the adapter which is provided by Quectel for testing M20 module.

## 3.2. Audio interface
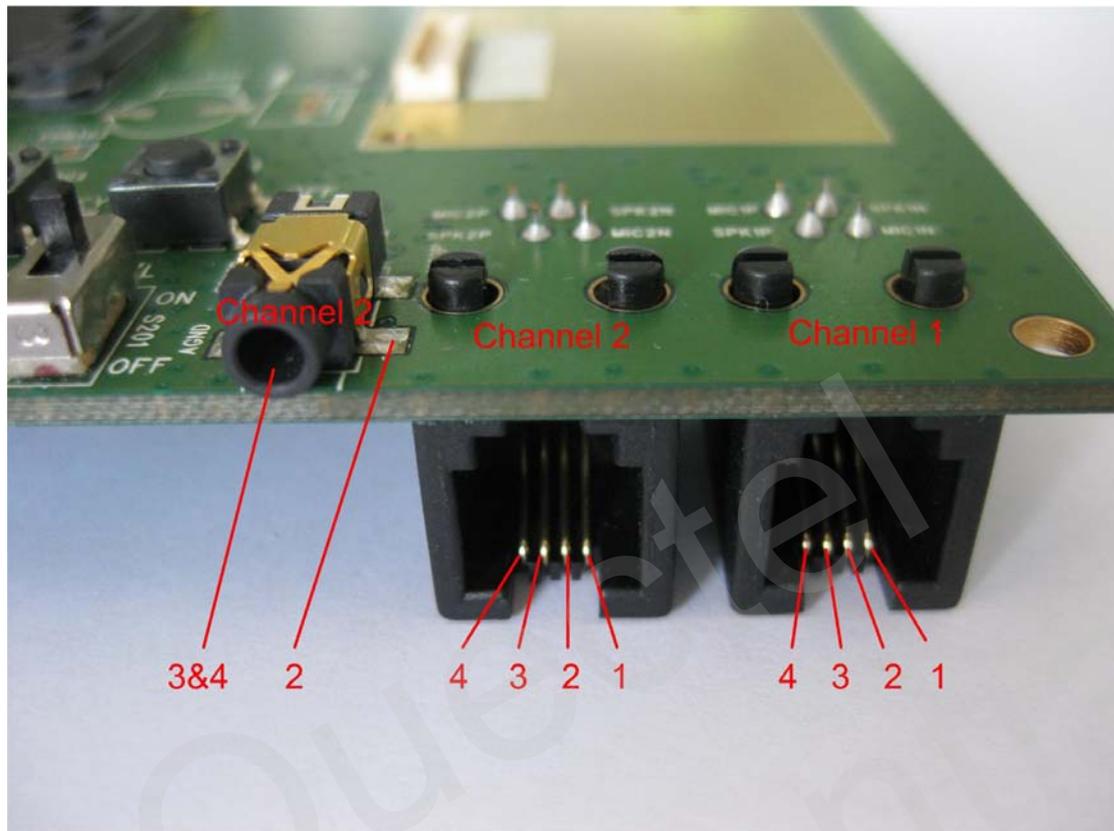


**Figure 5: Audio interface**

**Table 3: Pins of audio channel 1**

| Pin | Signal | I/O | Description |
|-----|--------|-----|-------------|
| 1 | MIC1N | I | Negative microphone input |
| 2 | SPK1N | O | Negative receiver output |
| 3 | SPK1P | O | Positive receiver output |
| 4 | MIC1P | I | Positive microphone input |

**Table 4: Pins of audio channel 2**

| Pin | Signal | I/O | Description |
|-----|--------|-----|-------------|
| 1 | MIC2N | I | Negative microphone input |
| 2 | AGND | | AGND of audio circuits |
| 3 | SPK2P | O | Positive receiver output |
| 4 | MIC2P | I | Positive microphone input |

A headset or handset can be used in audio channel 2. The headset is included in the EVB kit from Quectel, while a suitable desktop phone handset can be selected by customer according to the definition of signal in Table 4.

## 3.3. SIM card interface
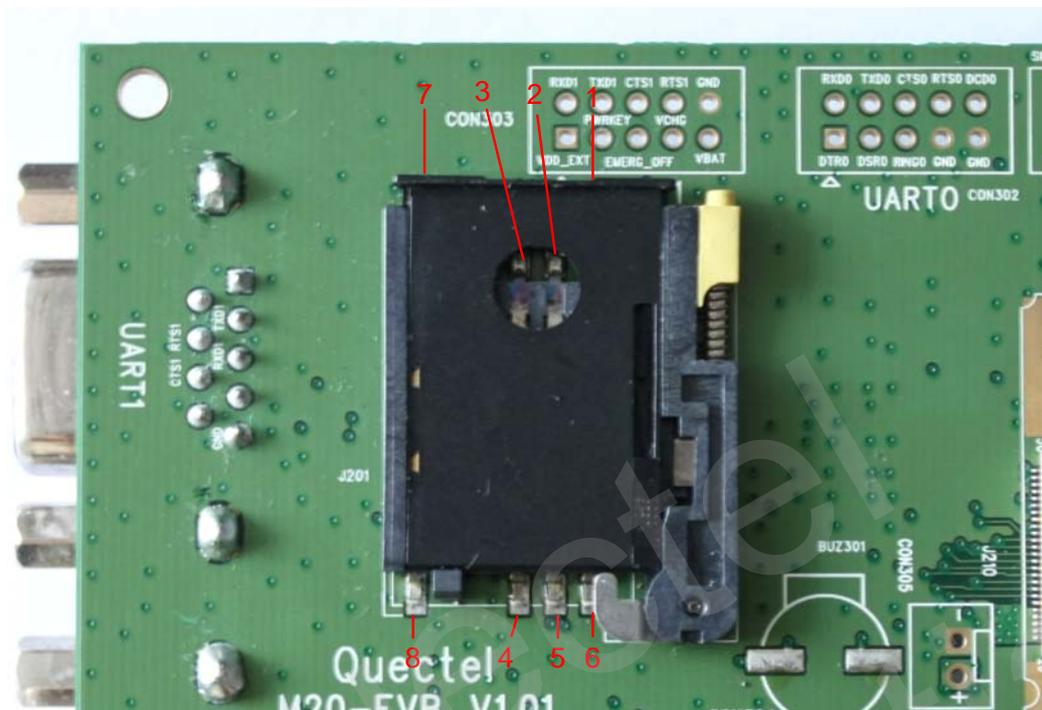


**Figure 6: SIM card interface**

**Table 5: Pins of SIM card interface**

| Pin | Signal | I/O | Description |
|-----|--------|-----|-------------|
| 1 | SIM_GND | | Ground |
| 2 | VPP | | Not connected |
| 3 | SIM_DATA | I/O | SIM card data I/O |
| 4 | SIM_CLK | O | SIM card clock |
| 5 | SIM_RST | O | SIM card reset |
| 6 | SIM_VDD | O | SIM card power output |
| 7 | SIM_DETECT | | Pulled up to VDD_EXT |
| 8 | SIM_PRESENCE | I | SIM card detection |

In Figure 6, the pin SIM_PRESENCE is used to detect whether the tray of the Molex SIM socket, which is used for holding SIM card, is present in the card socket. When the tray is inserted in the socket, the pin 8 is connected to the pin7, so SIM_PRESENCE is at high level. For more details, please refer to *Document [3]*

## 3.4. Antenna interface
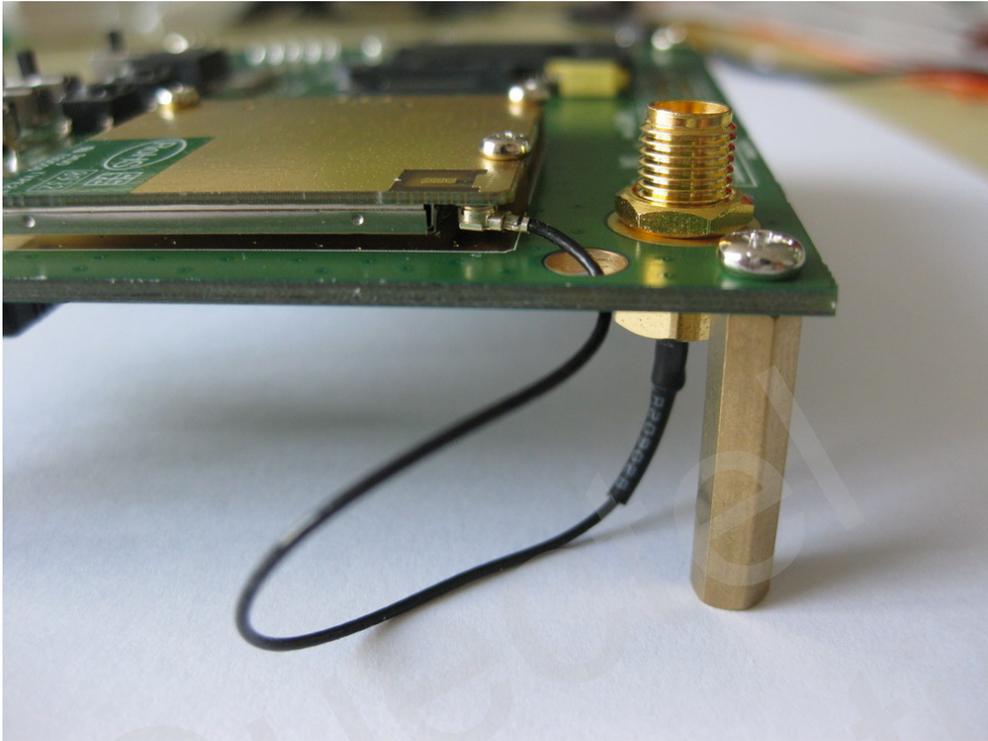


**Figure 7: RF interface**
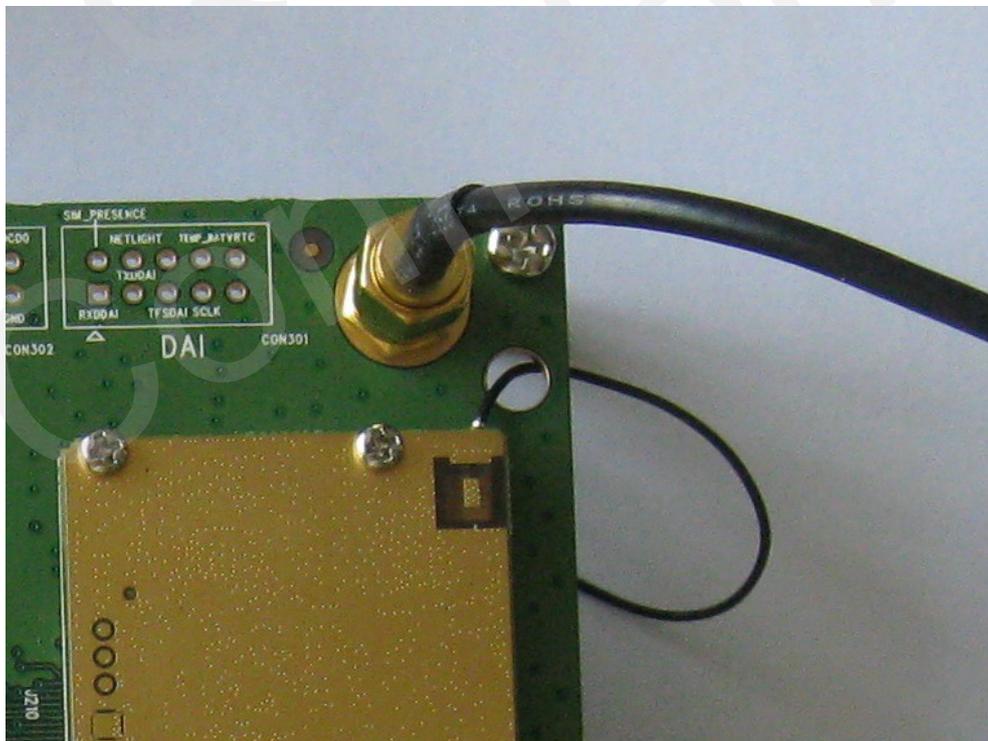


**Figure 8: Antenna installation**

## 3.5. Serial ports
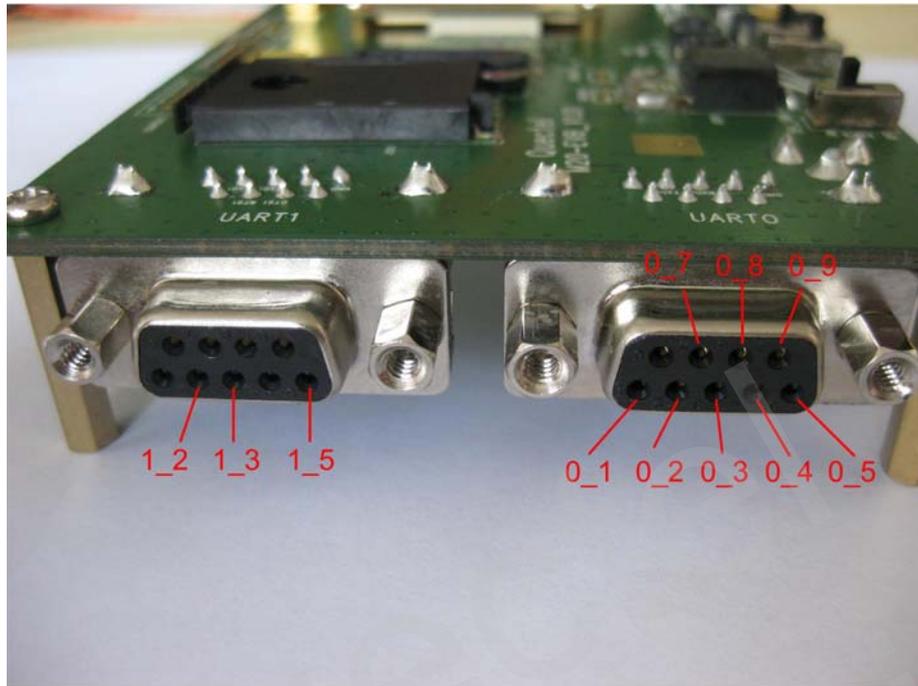


**Figure 9: Serial port 0& Serial port 1**

**Table 6: Pins of Serial Port 0**

| Pin | Signal | I/O | Description |
|-----|--------|-----|-------------|
| 0_1 | DCD0 | O | Data carrier detection |
| 0_2 | TXD0 | O | Transmit data |
| 0_3 | RXD0 | I | Receive data |
| 0_4 | DTR0 | I | Data terminal ready |
| 0_5 | GND | | GND |
| 0_7 | RTS0 | I | Request to send |
| 0_8 | CTS0 | O | Clear to send |
| 0_9 | RI0 | O | Ring indicator |

The voltage level of these signals has been shifted to RS-232 level, so it can be directly connect to PC by USB to UART converter cable. This port is used for AT command, GPRS data, CSD FAX, multiplexing function and firmware upgrade.

**Table 7: Pins of Serial Port 1**

| Pin | Signal | I/O | Description |
|-----|--------|-----|-------------|
| 1_2 | TXD1 | O | Transmit data |
| 1_3 | RXD1 | I | Receive data |
| 1_5 | GND | | GND |

Customer can debug software through Serial Port 1, which is not for AT command, GPRS service, CSD call or FAX call.

## 3.6. Switches and buttons
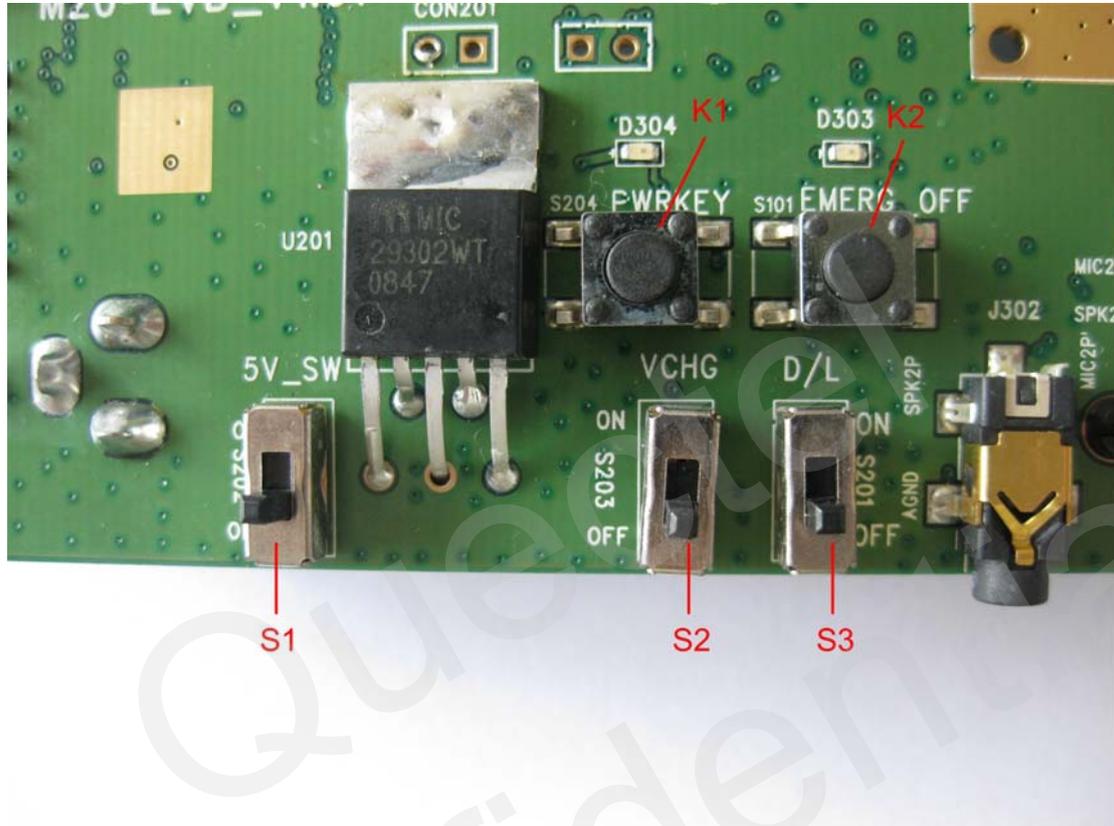


**Figure 10: Switches and buttons**

**Table 8: Switches and buttons**

| Part | Name | I/O | Description |
|------|------|-----|-------------|
| S1 | 5V_SW | I | Control power supply from adaptor |
| S2 | VCHG | I | Control charge to a Li-ion battery by the module. |
| S3 | D/L | I | Place to ON when downloading firmware |
| K1 | PWRKEY | I | Turn on/off the module |
| K2 | EMERG_OFF | I | Shutdown the module in emergency. Hardware power off operation. |

## 3.7. Operating status LED
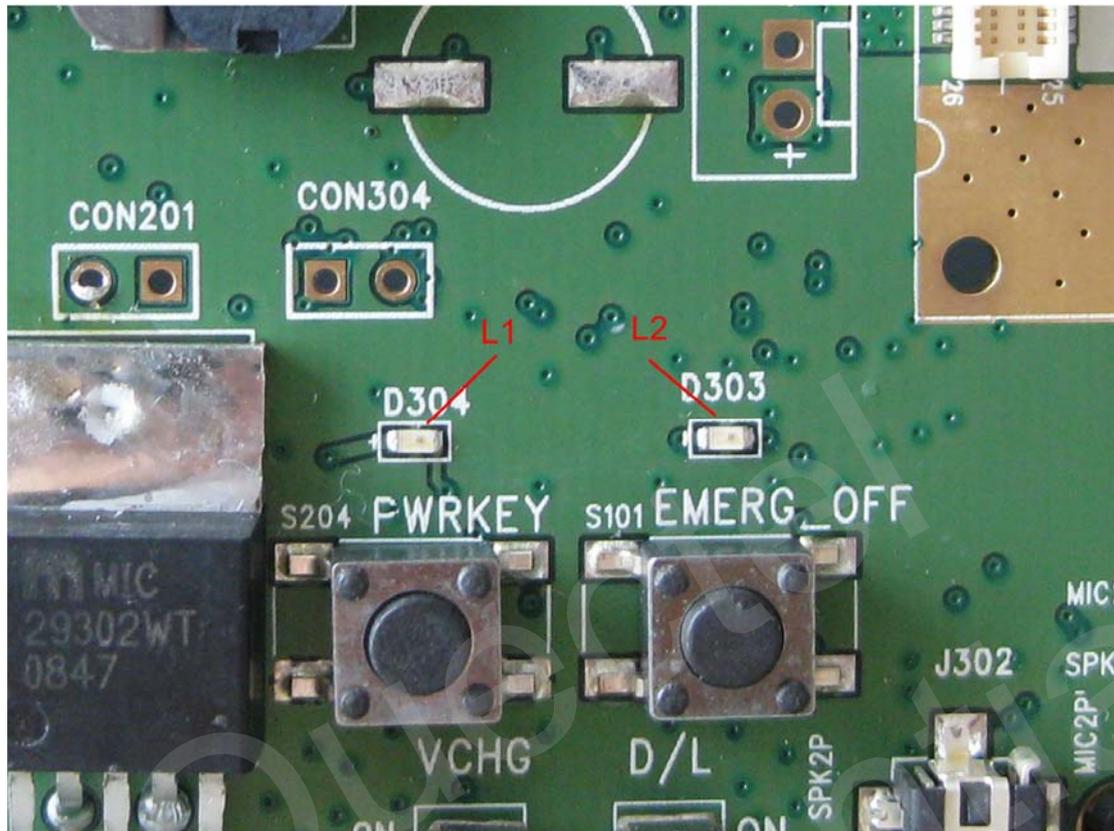


**Figure 11: Operating status indication LED**

**Table 9: Operating status indication LED**

| Part | Name | I/O | Description |
|------|------|-----|-------------|
| L1 | 5V ON/OFF indicator | O | On: VBAT ON<br>Off: VBAT OFF |
| L2 | GSM_NET status indicator | O | Blinking differently to indicate various GSM network status |

## 3.8. Test points
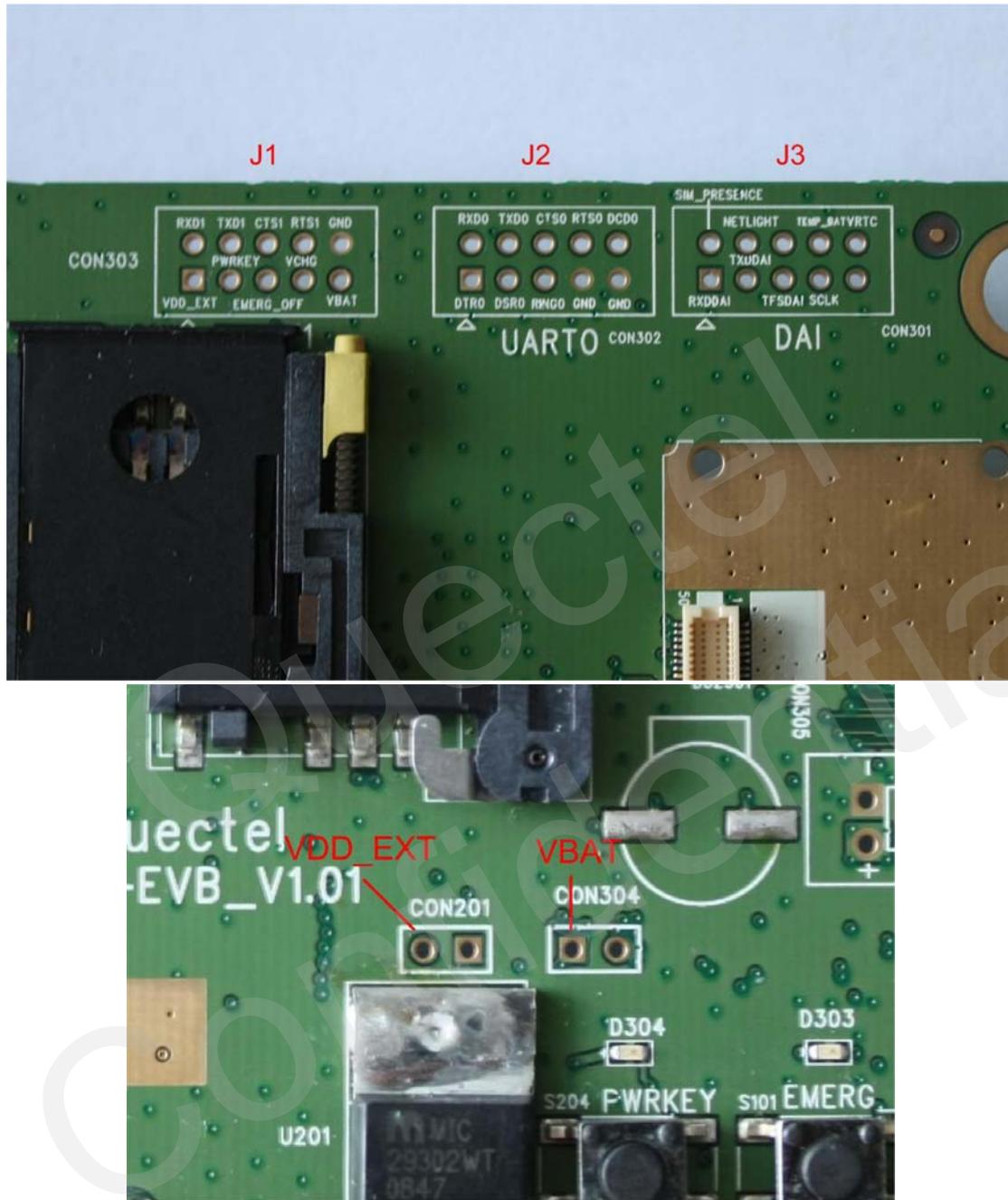


**Figure 12: Test points overview**

### 3.8.1    J1 test points



**Figure 13: J1 test points**

**Table 10: Pins of J1**

| Pin | Signal | I/O | Description |
|-----|--------|-----|-------------|
| 1 | VDD_EXT | O | Supply 2.8V voltage for external circuit |
| 2 | RXD1 | I | Receive data of Serial Port 1 |
| 3 | PWRKEY | I | Turn on/off the module |
| 4 | TXD1 | O | Transmit data of Serial Port 1 |
| 5 | EMERG_OFF | I | Shutdown the power in case of emergency |
| 6 | CTS1 | O | Clear to send of Serial Port 1 |
| 7 | VCHG | I | Voltage input for the charge circuit |
| 8 | RTS1 | I | Request to send of Serial Port1 |
| 9 | VBAT | I | Power supply for module |
| 10 | GND |  | Digital ground |

### 3.8.2    J2 test points
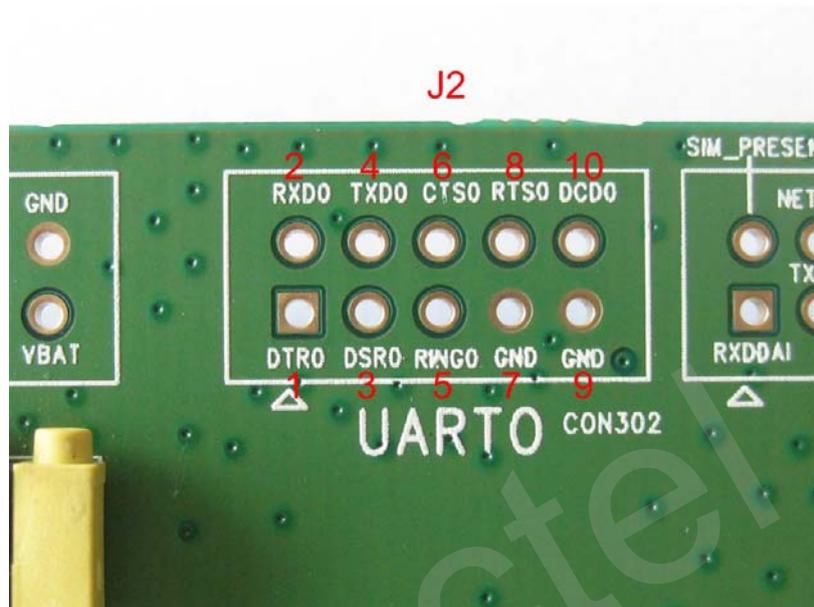


**Figure 14: J2 test points**

**Table 11: Pins of J2**

| Pin | Signal | I/O | Description |
|-----|--------|-----|-------------|
| 1 | DTR0 | I | Data terminal ready of Serial Port 0 |
| 2 | RXD0 | I | Receive data of Serial Port 0 |
| 3 | Reserve | | |
| 4 | TXD0 | O | Transmit data of Serial Port 0 |
| 5 | RI0 | O | Ring indicator of Serial Port 0 |
| 6 | CTS0 | O | Clear to send of Serial Port 0 |
| 7 | GND | | Digital ground |
| 8 | RTS0 | I | Request to send of Serial Port 0 |
| 9 | GND | | Digital ground |
| 10 | DCD0 | O | Data carrier detection of Serial Port 0 |

### 3.8.3  J3 test points
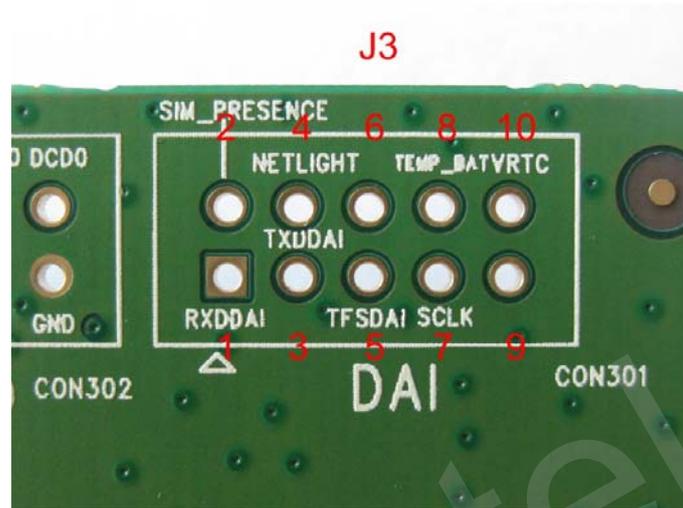


**Figure 15: J3 test points**

**Table 12: Pins of J3**

| Pin | Signal | I/O | Description |
|-----|--------|-----|-------------|
| 1 | RXDDAI | I | Receive digital audio data |
| 2 | SIM_PRESENCE | I | SIM card detection |
| 3 | TXDDAI | O | Transmit digital audio data |
| 4 | NETLIGHT | O | Network status indication |
| 5 | TFSDAI | O | Frame synchronization |
| 6 | Reserve | | |
| 7 | SCLK | O | Serial bit clock |
| 8 | ADC1 | I | ADC input |
| 9 | Reserve | | |
| 10 | VRTC | I/O | Module RTC |

### 3.8.4    VDD_EXT and VBAT test points
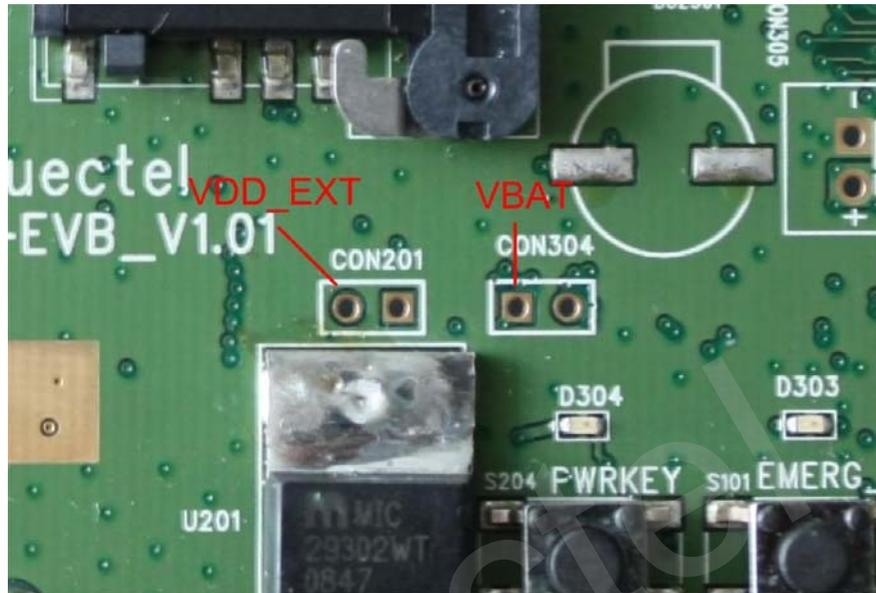


**Figure 16: VDD_EXT and VBAT test points**

Customer can test two test points to judge whether the power supply to the module or the VDD_EXT voltage from the module is correct or not.

# 4. EVB assembly

The EVB and its accessories are assembled as shown in Figure 17.



**Figure 17: Assembled EVB and accessories**
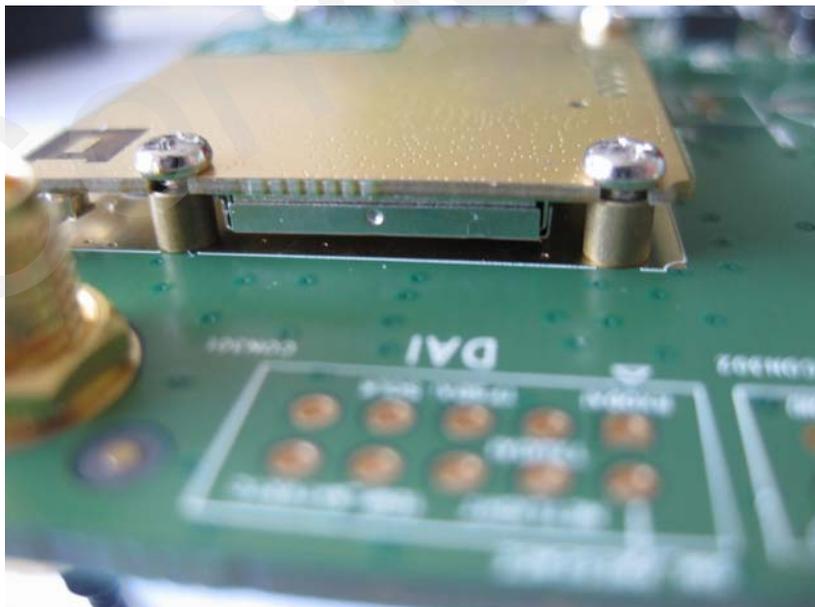


**Figure 18: Bolts to support EVB**

# 5. Illustration

## 5.1. Power on operations

(1) Connect the M20 module to the 50-pin connector on the M20 EVB. Put Switch S1 to **ON** state. Put Switch S2 to **OFF** position and Switch S3 to **OFF** position. Plug in 5V DC adapter. The LED L1 on the EVB will be bright.

(2) Press the PWRKEY button for more than 2 seconds, and the module will begin to run. The blinking mode of the LED L2 indicates the status of the module.

## 5.2. Communicate with the module

(1) Connect the Serial Port 0 on EVB to PC's USB port with the USB to UART converter cable.

(2) Open the HyperTerminal (AT command window) in the 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 port number which can be checked by the Device Manager in the PC.

(3) Connect an antenna to the M20 with an RF cable.

(4) Insert SIM card into the SIM card socket.

(5) Insert earphone or handset into audio interface.

(6) Power on the module by pressing PWRKEY button.

(7) After waiting for 2~3 seconds, customer should firstly 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 details of AT commands. For instance, typing "ATD112;" will make a call to the emergency number 112.

## 5.3. Firmware upgrade

(1) Start the Firmware Upgrade Tool in the PC.

(2) Press the **START** button in the Firmware Upgrade Tool.

(3) Switch the S3 and S1 in the EVB to **ON** state as shown in Figure 19.

After these steps, the firmware refreshing process will be proceeding. For more details, please refer to *Document [4]*.
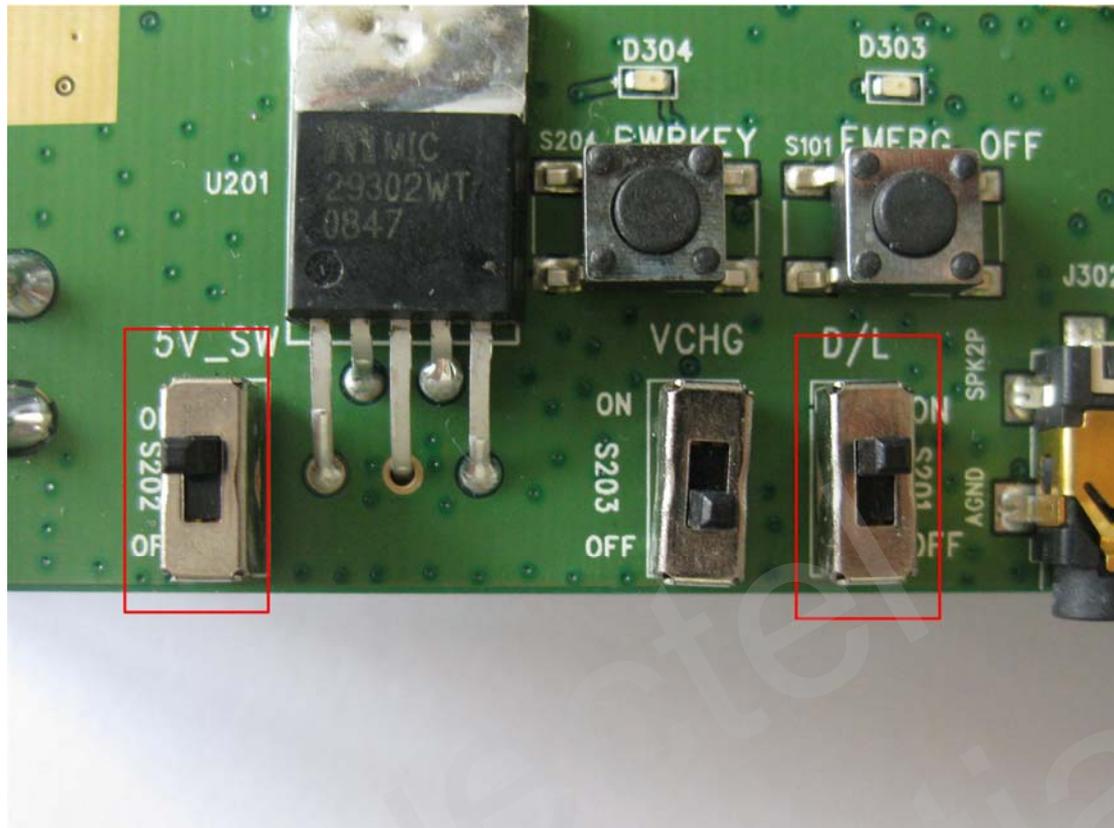
**Figure 19: Switches state for firmware upgrade**

## 5.4. Turn off

Pressing the PWRKEY button for about 1 second will turn off the module.

## 5.5. Emergency off

Pressing the EMERG_OFF button for more than 0.1 second will shutdown the module immediately. After this operation, the module can be restarted by pressing the PWRKEY button. Please note that the 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.

## 6. 50 PIN assignment of B2B connector
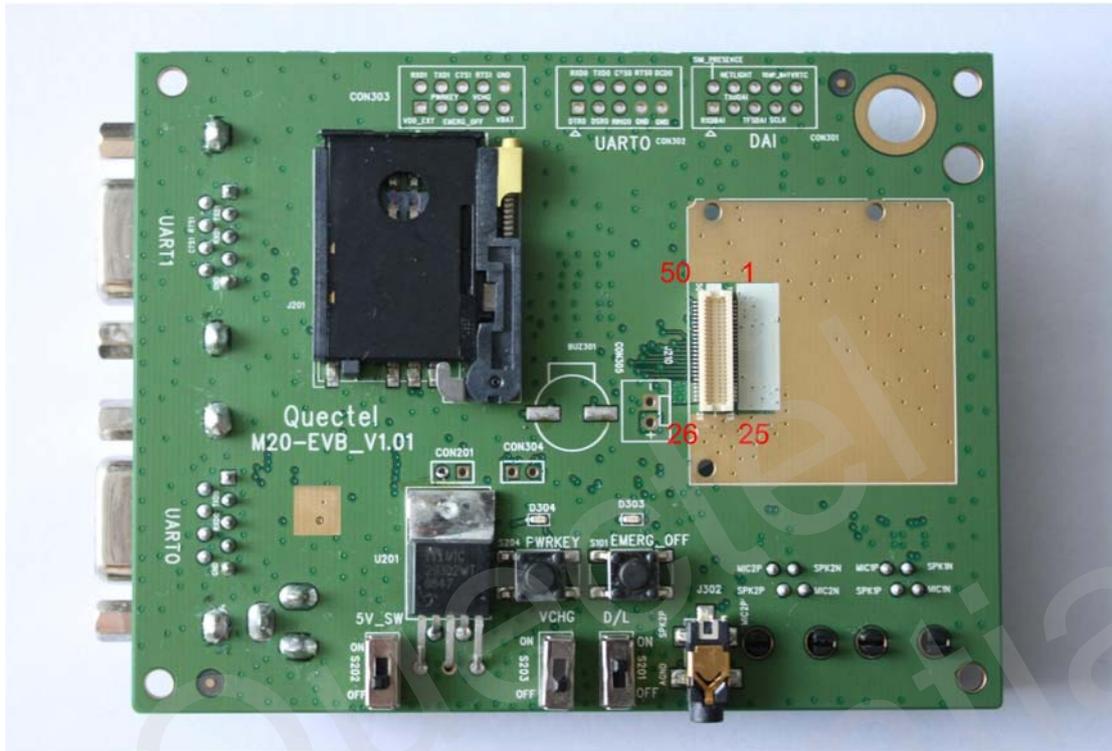


**Figure 20: B2B connector of EVB**

**Table 13: Pin definition of B2B connector**

| PIN NO. | PIN NAME | I/O | PIN NO. | PIN NAME | I/O |
|---------|----------|-----|---------|----------|-----|
| 1 | SIM_CLK | O | 50 | AGND | |
| 2 | SIM_VDD | O | 49 | SPK2P | O |
| 3 | SIM_DATA | I/O | 48 | SPK1P | O |
| 4 | SIM_RST | O | 47 | SPK1N | O |
| 5 | SIM_PRESENCE | I | 46 | MIC2N | I |
| 6 | SIM_GND | | 45 | MIC2P | I |
| 7 | RXDDAI | I | 44 | MIC1P | I |
| 8 | TFSDAI | O | 43 | MIC1N | I |
| 9 | SCLK | O | 42 | AGND | |
| 10 | TXDDAI | O | 41 | PWRKEY | I |
| 11 | Reserve | O | 40 | EMERG_OFF | I |
| 12 | ADC1 | I | 39 | DCD0 | O |
| 13 | NETLIGHT | I/O | 38 | CTS1 | O |
| 14 | TXD1 | O | 37 | CTS0 | O |

| 15 | TXD0 | O | 36 | RTS1 | I |
|----|------|---|----|------|---|
| 16 | RXD1 | I | 35 | DTR0 | I |
| 17 | RXD0 | I | 34 | RTS0 | I |
| 18 | VRTC | I/O | 33 | Reserve | |
| 19 | VCHG | I | 32 | RI0 | O |
| 20 | Reserve | O | 31 | VDD_EXT | O |
| 21 | GND | | 30 | VBAT | I |
| 22 | GND | | 29 | VBAT | I |
| 23 | GND | | 28 | VBAT | I |
| 24 | GND | | 27 | VBAT | I |
| 25 | GND | | 26 | VBAT | I |