



# SIM6600-eM2

## User Manual

LTE Module

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|                        |                         |
|------------------------|-------------------------|
| <b>Document Title:</b> | SIM6600-eM2 User Manual |
| <b>Version:</b>        | V1.01                   |
| <b>Date:</b>           | 2023-09-20              |
| <b>Status:</b>         | Released                |

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# 1 Introduction

This document describes the electronic specifications, RF specifications, interfaces, mechanical characteristics and testing results of the SIMCom M.2 card. With the help of this document and other software application notes/user guides, users can understand and use SIM6600-eM2 to design and develop mobile and laptop applications quickly.

## 1.1 Product Outline

Aimed at the global market, SIM6600-eM2 supports WCDMA, LTE-TDD and LTE-FDD, support DL 2CA . The supported radio frequency bands are described in the table1.

**Table 1: SIM6600-eM2 frequency bands**

| Standard        | Frequency bands                                                                                                                                                                                                                                                                                                                                                                                                        |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>WCDMA</b>    | B1/B2//B4/B5/B8                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>LTE(TDD)</b> | B34/B38/B39/B40/B41                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>LTE(FDD)</b> | B1/B2/B3/B4/B5/B7/B8/B12/B13/B17/B18/B19/B20/B25/B26/B28/B29/B30/B66/B71                                                                                                                                                                                                                                                                                                                                               |
| <b>2CA (DL)</b> | B1+B1/B3/5/7/8/18/19/20/26/28/40;<br>B2+B2/4/5/12/13/17/28/29/66/71;<br>B3+B3/5/7/8/19/20/28/40;<br>B4+B4/5/12/13/17/28/29/71;<br>B5+B5/7/30/40/66;<br>B7+B7/8/20/28;<br>B8+B38/40/41;<br>B12+B30/66;<br>B13+B66; B20+B38;<br>B25+B25/26; B26+B41;<br>B28+B41; B29+B30/66;<br>B40+B40;<br>B41+B41;<br>B66+B66/71;<br>1C; 2C; 3C; 5B; 7C; 8B; 38C; 40C; 41C; 66C<br>(Note: B29 is only for secondary component carrier) |
| <b>2CA (UL)</b> | 3C; 5B; 7C; 38C; 40C; 41C; 66C                                                                                                                                                                                                                                                                                                                                                                                         |

With a physical dimension of 30.0\*42.0\*2.3 mm, SIM6600-eM2 can meet PCI Express M.2 Specification, and can meet almost any space requirement in users' applications.

With M.2 Type 3042-S3-B, SIM6600-eM2 had almost all common interface integrated, such as USB2.0, UIM card, digital audio(I2S or PCM), UART, I2C, GPIOs, MAIN ANT and DIV ANT , etc.

With all the interfaces, SIM6600-eM2 can also be utilized in the industrial handheld, machine-to-machine laptop application and especially the router/CPE.

## 1.2 Hardware Block Diagram

The block diagram of SIM6600-eM2 is shown as below:

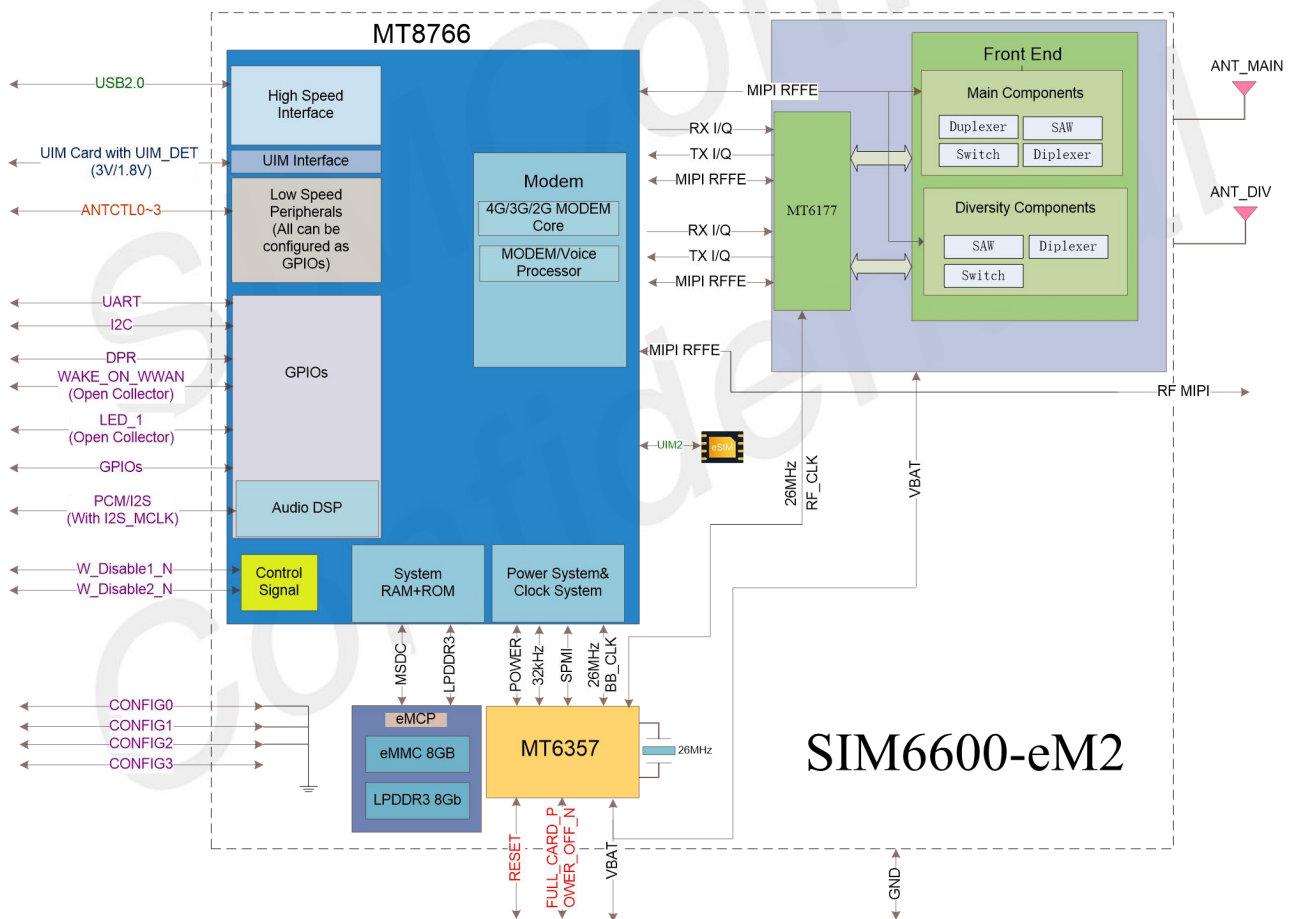


Figure 1: SIM6600-eM2 block diagram

## 1.3 Functional Overview

Table 2: General features

| Feature                      | Implementation                                                                                                                                                                                                                                                                                                                                                                                                                             |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Power supply                 | VBAT:3.135~4.4V<br>Typical supply voltage: 3.7V                                                                                                                                                                                                                                                                                                                                                                                            |
| Power consumption            | Current in sleep mode : TBD                                                                                                                                                                                                                                                                                                                                                                                                                |
| Radio frequency bands        | Please refer to the table 1                                                                                                                                                                                                                                                                                                                                                                                                                |
| Transmitting power           | WCDMA power class: 3 (0.25W)<br>LTE power class: 3 (0.25W)                                                                                                                                                                                                                                                                                                                                                                                 |
| Data Transmission Throughput | UMTS R99 speed: 384 kbps DL/UL<br>HSPA+: 11.5 Mbps(UL), 42 Mbps(DL)<br>FDD-LTE :Max 300Mbps (DL Category7), 150Mbps (UL Category 13)<br>TDD-LTE :Max 200Mbps (DL Category7), 84Mbps (UL Category 13)                                                                                                                                                                                                                                       |
| Antenna                      | WCDMA/LTE main antenna.<br>WCDMA/LTE diversity antenna                                                                                                                                                                                                                                                                                                                                                                                     |
| SMS                          | MT, MO, CB, Text and PDU mode<br>SMS storage: USIM card or ME(default)<br>Transmission of SMS alternatively over CS or PS.                                                                                                                                                                                                                                                                                                                 |
| USIM interface               | Support identity card: 1.8V/ 3V                                                                                                                                                                                                                                                                                                                                                                                                            |
| USIM application toolkit     | Support SAT class 3, GSM 11.14 Release 98<br>Support USAT                                                                                                                                                                                                                                                                                                                                                                                  |
| Phonebook management         | Support phonebook types: DC,MC,RC,SM,ME,FD,ON,LD,EN                                                                                                                                                                                                                                                                                                                                                                                        |
| Digital Audio feature        | One I2S interface with dedicated main-clock for primary digital audio, the I2S also can be configured as PCM <ul style="list-style-type: none"> <li>● Half Rate (ETS 06.20)</li> <li>● Full Rate (ETS 06.10)</li> <li>● MCLK frequency: 12.288MHz (default)</li> <li>● Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80)</li> <li>● WCDMA AMR-NB</li> <li>● VoLTE AMR-WB</li> <li>● Echo Cancellation</li> <li>● Noise Suppression</li> </ul> |
| UART interface               | UART: <ul style="list-style-type: none"> <li>● Baud rate: 300bps to 921600bps(default:115200bps)</li> <li>● Can be used as the AT commands or data stream channel</li> <li>● Multiplex ability according to GSM 07.10 Multiplexer Protocol</li> <li>● Could be configured as GPIOs.</li> </ul>                                                                                                                                             |
| I2C interface                | I2C: <ul style="list-style-type: none"> <li>● Apply to the "I2C Specification, version 3.0"</li> <li>● Clock up to 400Kbps</li> </ul>                                                                                                                                                                                                                                                                                                      |

|                                 |                                                                                                                     |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------|
| <b>USB</b>                      | USB2.0: high speed interface, support USB operations at low-speed and full-speed, which refer to USB1.0 and USB1.1. |
| <b>Firmware upgrade</b>         | Firmware upgrade over USB interface or FOTA                                                                         |
| <b>Physical characteristics</b> | Size:30*42*2.3mm<br>Weight:TBD                                                                                      |
| <b>Temperature range</b>        | Operation temperature: -25°C to +70°C                                                                               |

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## 2 Package Information

### 2.1 Pin Assignment Overview

All functions of the M.2 card will be provided through 75 (including 8 notch pins) pads that will be connected to the customers' platform. The following figure is the pin assignment of the card.

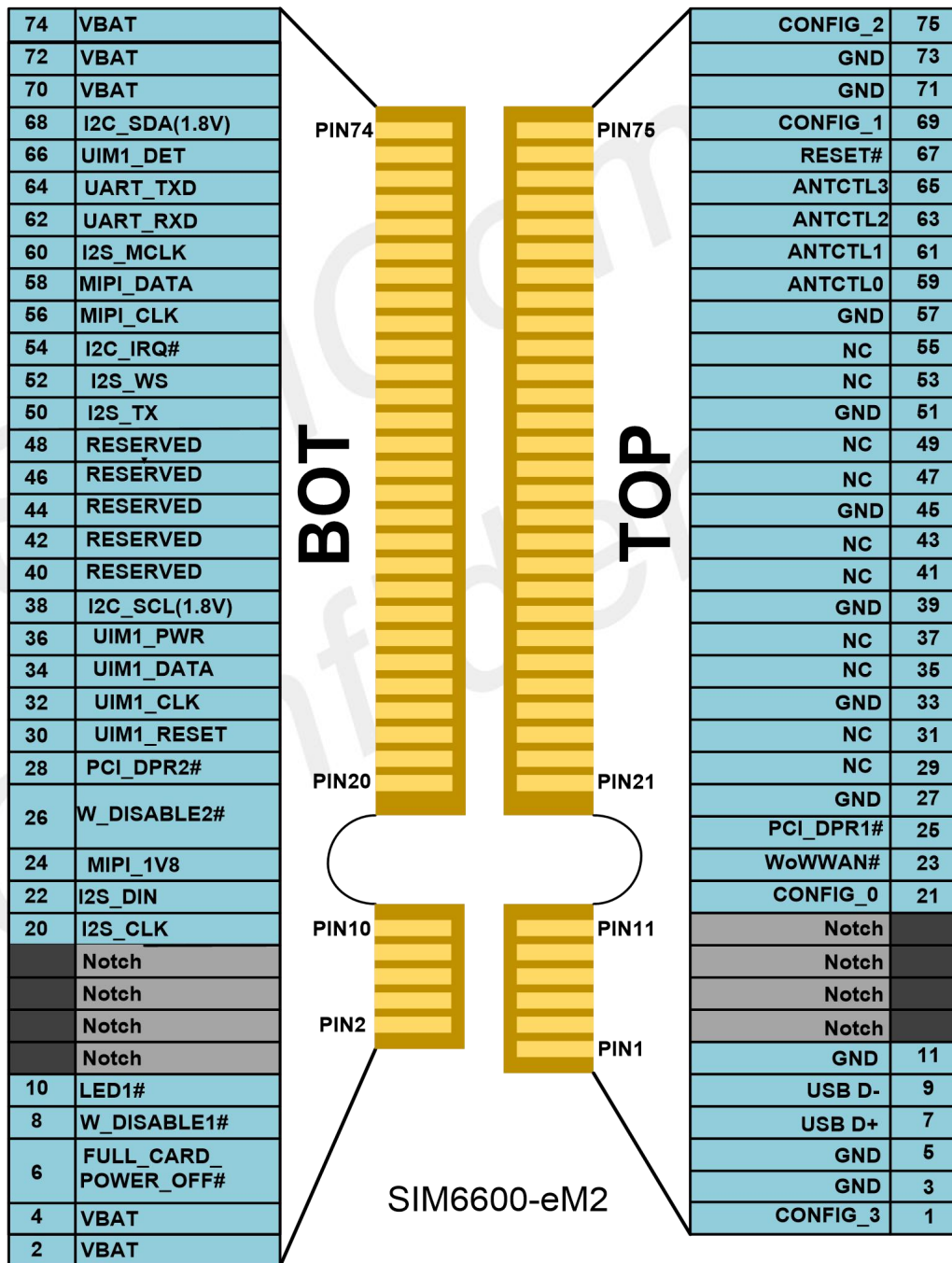


Figure 2: Pin assignment

## 2.2 Pin Description

Table 3: IO parameters definition

| Pin type | Description                         |
|----------|-------------------------------------|
| PI       | Power input                         |
| PO       | Power output                        |
| AI       | Analog input                        |
| AIO      | Analog input/output                 |
| DIO      | Bidirectional digital input /output |
| DI       | Digital input                       |
| DO       | Digital output                      |
| DOH      | Digital output with high level      |
| DOL      | Digital output with low level       |
| PU       | Pull up                             |
| PD       | Pull down                           |
| OD       | Open Drain                          |

Table 4: IO parameters definition

| Voltage domain | Parameter             | Min   | Typ  | Max   |
|----------------|-----------------------|-------|------|-------|
| P3             | VDD_P3=1.8V DVDD18    |       |      |       |
|                | VOH High level output | 1.35V | -    | 1.8V  |
|                | VOL Low level output  | 0V    | -    | 0.4V  |
|                | VIH High level input  | 1.2V  | 1.8V | 2.1V  |
|                | VIL Low level input   | -0.3V | -    | 0.63V |
| P4             | VDD_P4=1.8V           |       |      |       |
|                | VOH High level output | 1.4V  | -    | 1.8V  |
|                | VOL Low level output  | -     | 0V   | 0.22V |
|                | VIH High level input  | 1.4V  | 1.8V | -     |
|                | VIL Low level input   | -     | 0V   | 0.27V |
|                | VDD_P4=3.0V           |       |      |       |
|                | VOH High level output | 2.7V  | 3.0V | 3.1V  |
|                | VOL Low level output  | -     | 0V   | 0.36V |
|                | VIH High level input  | 2.0V  | -    | 3.15V |
|                | VIL Low level input   | -     | 0V   | 0.4V  |

**Table 5: Pin description**

| Pin name             | Pin No.                        |    | Electrical Description | Description                                                       | Comment                                                                                             |
|----------------------|--------------------------------|----|------------------------|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| Power supply         |                                |    |                        |                                                                   |                                                                                                     |
| VBAT                 | 2,4,70,72,74                   |    | PI                     | M,2 card power supply, voltage range: 3.135 ~ 4.4V, typical 3.7V. | User should connect these pins together.                                                            |
| GND                  | 3,5,11,27,33,39,45,51,57,71,73 |    |                        | Ground                                                            |                                                                                                     |
| System Control       |                                |    |                        |                                                                   |                                                                                                     |
| FULL_CARD_POWER_OFF# | 6                              |    | DI,PD                  | H: WWAN powers on.<br>L: WWAN go to sleep mode.                   | It's internally pulled to Low.<br>It's 3.3V tolerant but can be driven by either 1.8V or 3.3V GPIO. |
| Reset#               | 67                             | P3 | DI,PU                  | System reset control input, active low.                           | RESET_N has been pulled up to 1.8V via resistor internally.                                         |
| W_DISABLE1#          | 8                              |    | DI                     | WWAN RF Disable, active low.                                      | It's 3.3V tolerant but can be driven by either 1.8V or 3.3V GPIO.                                   |
| W_DISABLE2#          | 26                             |    | DI                     | GNSS disable, active low.Reserved.                                | It's 3.3V tolerant but can be driven by either 1.8V or 3.3V GPIO.                                   |
| WoWWAN#              | 23                             |    | OD                     | Wake on the host.Active low.                                      |                                                                                                     |
| Configuration pins   |                                |    |                        |                                                                   |                                                                                                     |
| CONFIG0              | 21                             |    | GND                    | Connect to ground                                                 | SIM6600-eM2 module is configured as the WWAN USB2.0 interface type.                                 |
| CONFIG1              | 69                             |    | GND                    | Connect to ground                                                 |                                                                                                     |
| CONFIG2              | 75                             |    | GND                    | Connect to ground                                                 |                                                                                                     |
| CONFIG3              | 1                              |    | NC                     | Not connected                                                     |                                                                                                     |
| USB2.0               |                                |    |                        |                                                                   |                                                                                                     |
| USB_D+               | 7                              |    | AIO                    | Positive line of the differential, bi-directional USB signal.     | Main communication interface.<br>USB2.0 data rate up to 480Mbps.                                    |
| USB D-               | 9                              |    | AIO                    | Negative line of the differential, bi-directional USB signal.     |                                                                                                     |
| UIM interface        |                                |    |                        |                                                                   |                                                                                                     |
| UIM1_PWR             | 36                             |    | PO                     | Power supply for UIM1 card.                                       | 1.8V/3.0V voltage domain,all lines                                                                  |
| UIM1_DATA            | 34                             | P4 | DIO                    | UIM1 Card data I/O, which no need reserve Pull up                 |                                                                                                     |

|            |    |    |    |                       |                   |
|------------|----|----|----|-----------------------|-------------------|
|            |    |    |    | resistor to UIM1_PWR. | of UIM interface  |
| UIM1_CLK   | 32 | P4 | DO | UIM1 clock signal.    | should be         |
| UIM1_RESET | 30 | P4 | DO | UIM1 Reset control.   | protected against |
| UIM1_DET   | 66 | P3 | DI | UIM1 card detect.     | ESD.              |
| RESERVED   | 48 |    |    |                       | If unused, please |
| RESERVED   | 42 |    |    |                       | keep open.        |
| RESERVED   | 44 |    |    |                       |                   |
| RESERVED   | 46 |    |    |                       |                   |
| RESERVED   | 40 |    |    |                       |                   |

### Antenna control interface\*

|           |    |    |     |                                        |                                                      |
|-----------|----|----|-----|----------------------------------------|------------------------------------------------------|
| ANTCTL0   | 59 | P3 | DO  | Antenna tuner control 0                | 1.8V voltage domain.<br>If unused, please keep open. |
| ANTCTL1   | 61 | P3 | DO  | Antenna tuner control 1                |                                                      |
| ANTCTL2   | 63 | P3 | DO  | Antenna tuner control 2                |                                                      |
| ANTCTL3   | 65 | P3 | DO  | Antenna tuner control 3                |                                                      |
| MIPI_DATA | 58 | P3 | DIO | MIPI interface tunable ANT, MIPI data  |                                                      |
| MIPI_CLK  | 56 | P3 | DO  | MIPI interface tunable ANT, MIPI clock |                                                      |
| MIPI_1V8  | 24 | P3 | PO  | 1.8V power output for antenna tuner    |                                                      |

### I2S interface\*

|                      |    |    |    |                                                                    |                                                    |
|----------------------|----|----|----|--------------------------------------------------------------------|----------------------------------------------------|
| I2S_CLK              | 20 | P3 | DI | I2S serial clock,Reserved                                          | 1.8V voltage domain.<br>If unused, keep them open. |
| I2S_RX               | 22 | P3 | DO | I2S Serial receive data,Reserved                                   |                                                    |
| I2S_TX/ANT_TUNER_CFG | 50 | P3 | DO | I2S Serial transmit data,can mux as ANT_TUNER_CFG or GPIO,reserved |                                                    |
| I2S_WS               | 52 | P3 | DO | I2S word alignment/select,Reserved                                 |                                                    |
| I2S_MCLK             | 60 | P3 | DO | I2S main clock,Reserved                                            |                                                    |

### I2C interface

|          |    |    |     |                                       |                                                                                 |
|----------|----|----|-----|---------------------------------------|---------------------------------------------------------------------------------|
| I2C_SDA  | 68 | P3 | DIO | I2C data signal                       | 1.8V voltage domain.Internal pulled up to 1.8V.<br>If unused, please keep open. |
| I2C_SCL  | 38 | P3 | DO  | I2C clock signal                      |                                                                                 |
| I2C_IRQ# | 54 | P3 | DI  | I2C interrupt request,can mux as GPIO |                                                                                 |

### UART interface

|          |    |    |  |                                     |                      |
|----------|----|----|--|-------------------------------------|----------------------|
| UART_RXD | 62 | P3 |  | UART receive data,can mux as GPIO.  | 1.8V voltage domain. |
| UART_TXD | 64 | P3 |  | UART transmit data,can mux as GPIO. |                      |

### Other pins

|       |    |  |    |  |            |
|-------|----|--|----|--|------------|
| LED1# | 10 |  | OD |  | The module |
|-------|----|--|----|--|------------|

|              |                                               |  |    |                                                           |                                                                            |
|--------------|-----------------------------------------------|--|----|-----------------------------------------------------------|----------------------------------------------------------------------------|
|              |                                               |  |    |                                                           | status indicator<br>via LED devices<br>Active low                          |
| PCI_DPR1#*   | 25                                            |  | DI | Dynamic power reduction -<br>Body SAR<br>control signal1# |                                                                            |
| PCI_DPR2#*   | 28                                            |  | DI | Dynamic power reduction -<br>Body SAR<br>control signal2# | It's 3.3V tolerant<br>but can be driven<br>by either 1.8V or<br>3.3V GPIO. |
| <b>NC</b>    |                                               |  |    |                                                           |                                                                            |
| NC           | 29,31,<br>35,37,<br>41,43,<br>47,49,<br>53,55 |  |    | NC                                                        | NC pins,please<br>keep open.                                               |
| <b>Notch</b> |                                               |  |    |                                                           |                                                                            |
| Notch        | 12,13,<br>14,15,<br>16,17,<br>18,19           |  |    | Notch                                                     |                                                                            |

**NOTE**

“\*” means under development.

## 2.3 Mechanical Information

The following figure shows the package outline drawing of the M.2 card.

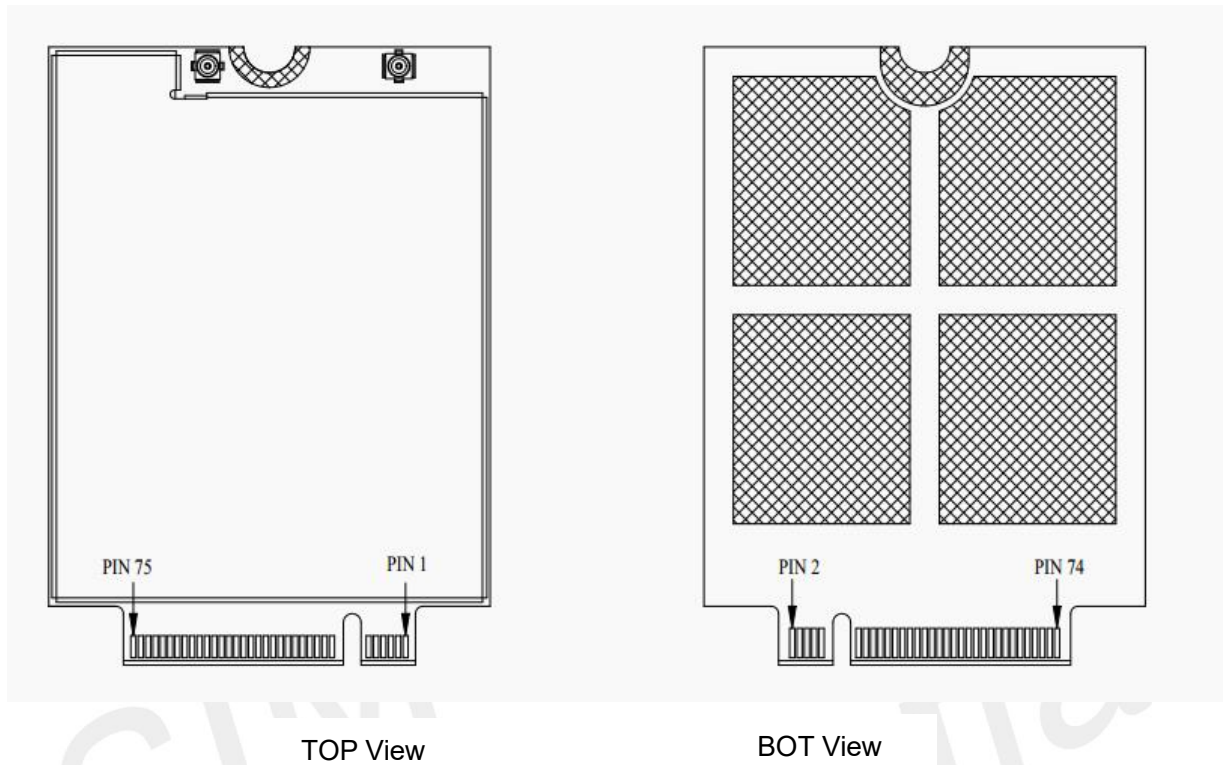


Figure 3: Pin out diagram

## 2.4 Package Dimensions

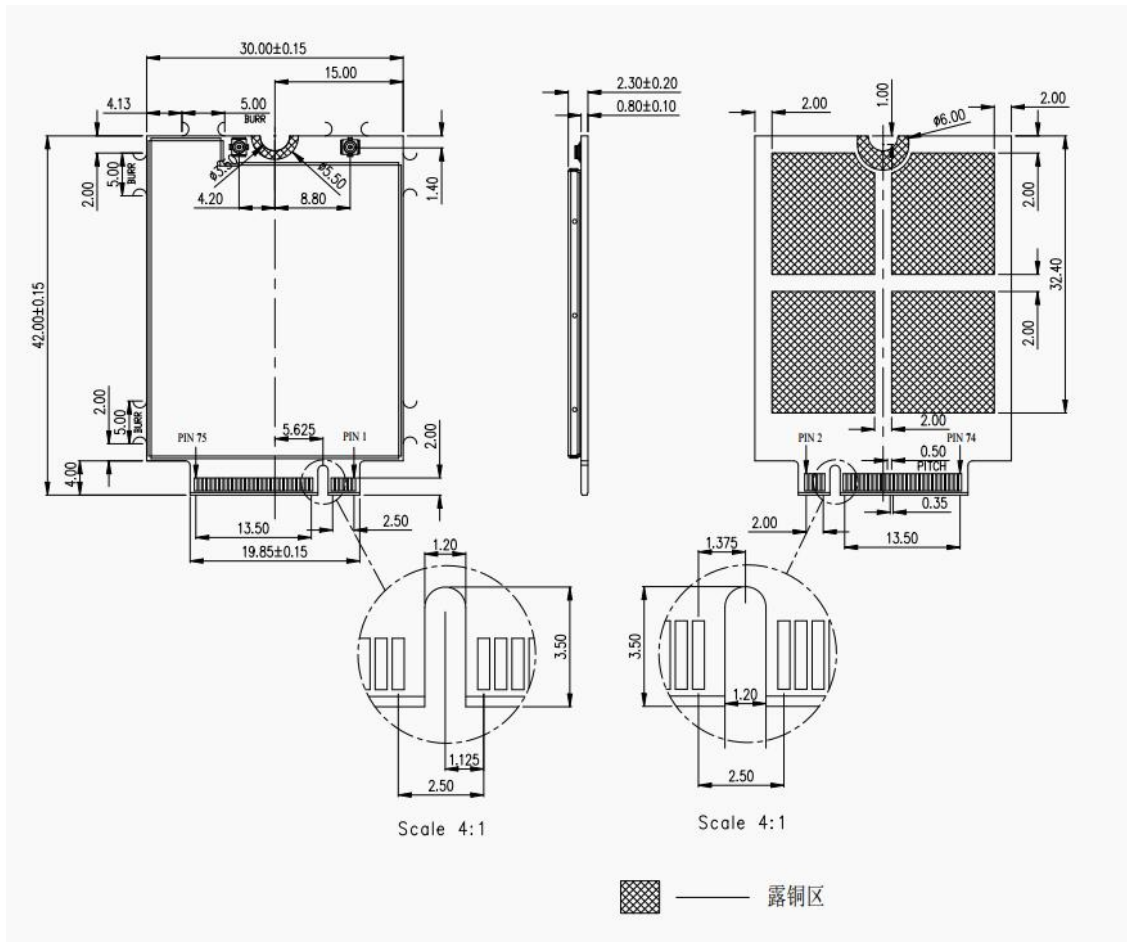


Figure 4: Dimensions of SIM6600-eM2 (Unit: mm)

## 3 Interface Application

### 3.1 Power Supply

The recommended power supply of SIM6600-eM2 is 3.7V and the voltage ranges from 3.135 V to 4.4 V. The SIM6600-eM2 has 5 power pins and 11 Ground pins, to ensure the SIM6600-eM2 card works normally, all the pins must be connected. The connector pin is defined to support 500mA current per pin continuously.

Table 6: VBAT pins electronic characteristic

| Symbol                             | Description                               | Min.  | Typ. | Max. | Unit |
|------------------------------------|-------------------------------------------|-------|------|------|------|
| <b>VBAT</b>                        | Module power voltage                      | 3.135 | 3.7  | 4.4  | V    |
| <b>I<sub>VBAT(peak)</sub></b>      | Module power peak current in normal mode. | -     | -    | 1    | A    |
| <b>I<sub>VBAT(power-off)</sub></b> | Module power current in power off mode.   | -     | 50   | -    | uA   |

#### 3.1.1 Power Supply Design Guide

Make sure that the voltage on the VBAT pins will never drop below 3.135V, even during a transmit event, when current consumption may rise up to 1.0A. If the voltage drops below 3.135V, the module will be powered off automatically.

#### NOTE

Be sure the power supply for VBAT pins can support more than 1.0A, using a total of more than 100uF capacitors is recommended, in order to avoid the voltage drop to lower than 3.135V.

Some multi-layer ceramic chip (MLCC) capacitors (0.1/1uF) with low ESR in high frequency band can be used for EMC.

These capacitors should be put as close as possible to VBAT pads. Also, users should keep VBAT trace on circuit board wider than 1.0 mm to minimize PCB trace impedance. The following figure shows the recommended circuit.

If the VBAT generated by a switch mode power supply, it is suggested to add a bead to suppress the

Interference. Recommend part of FB101 is BLM21PG300SN1D or MPZ2012S221A.

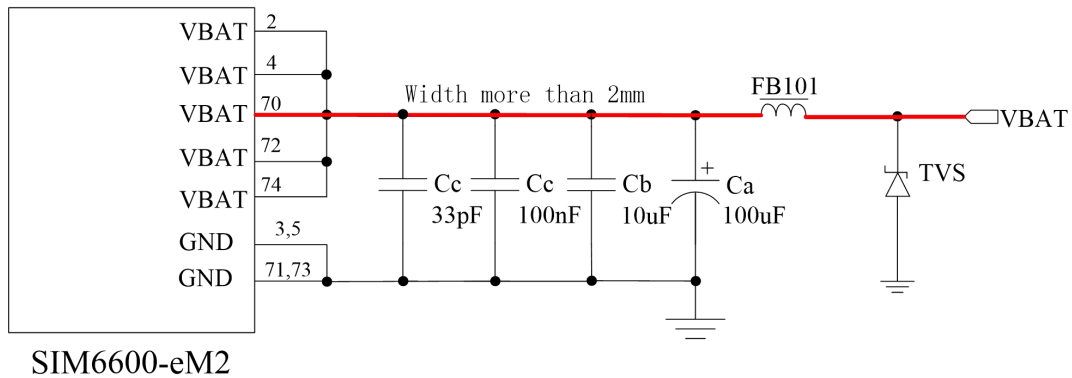


Figure 5: Power supply application circuit

**NOTE**

1. The test condition: The voltage of power supply for VBAT is 3.7V, Ca is 100  $\mu$ F tantalum capacitor (ESR=0.7 $\Omega$ ).
2. PIN3,5,71,73 are the main return current path of module, these pins should be coppered by a ground plane to main ground.
3. All other GND pins also need connect to ground.

In addition, in order to guard for over voltage protection, it is suggested to use a TVS diode to protect the M.2 card. TVS diode should be placed near VBAT pins.

**Table 7: Recommended TVS diode list**

| No. | Manufacturer | Part Number | VRWM | Package    |
|-----|--------------|-------------|------|------------|
| 1   | JCET         | ESDBW5V0A1  | 5V   | DFN1006-2L |
| 2   | WAYON        | WS05DPF-B   | 5V   | DFN1006-2L |
| 3   | WILL         | ESD5611N    | 5V   | DFN1006-2L |
| 4   | WILL         | ESD56151W05 | 5V   | SOD-323    |

### 3.1.2 Recommended Power Supply Circuit

It is recommended that a switching mode power supply or a linear regulator power supply is used. It is important to make sure that all the components used in the power supply circuit can resist the current which could be more than 1A.

The following figure shows the linear regulator reference circuit with 5V input and 3.7V output.

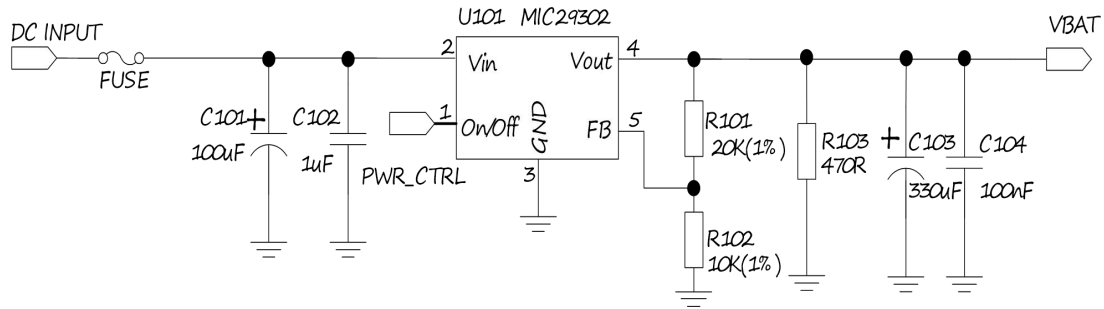


Figure 6: Linear regulator reference circuit

If there is a high dropout between input and VBAT, or the efficiency is extremely important, then a switching mode power supply will be preferable. The following figure shows the switching mode power supply reference circuit with 12V input and 3.7V output.

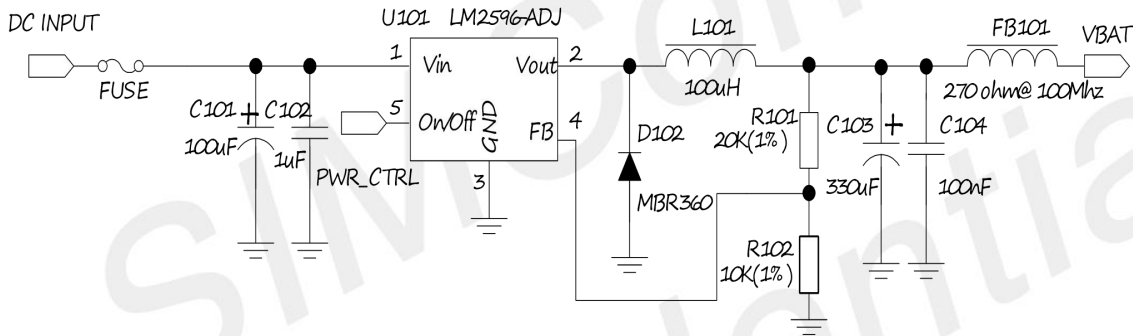


Figure 7: Switching mode power supply reference circuit

#### NOTE

1. The Switching Mode power supply solution for VBAT must be chosen carefully against Electro Magnetic Interference and ripple current from depraving RF performance.
2. PWR\_CTRL must connect to host in case that the module system crash.

## 3.2 FULL\_CARD\_POWER\_OFF#

Module can be powered on by pulling the FULL\_CARD\_POWER\_OFF# pin up to high level through GPIO.

FULL\_CARD\_POWER\_OFF# signal is an active low input signal and will turn the module on when asserted high ( $\geq 1.7$  V) and module will disconnect usb and go to sleep mode when asserted low ( $\leq 0.2$  V). This pin is 3.3V tolerant and can be driven by either 1.8V or 3.3V GPIO .

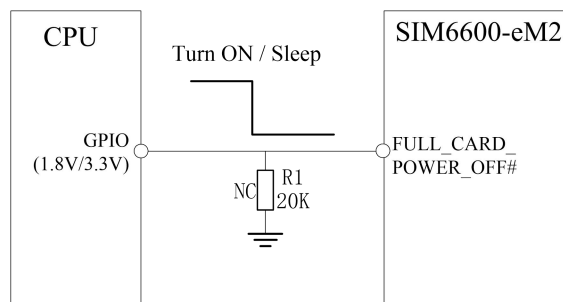


Figure 8: Reference power on/sleep circuit

**NOTE**

Note: Module could be automatically power on by connecting FULL\_CARD\_POWER\_OFF# pin to 3.3V power via 0R resistor directly.

### 3.2.1 Power on

The power-on scenarios are illustrated in the following figure.

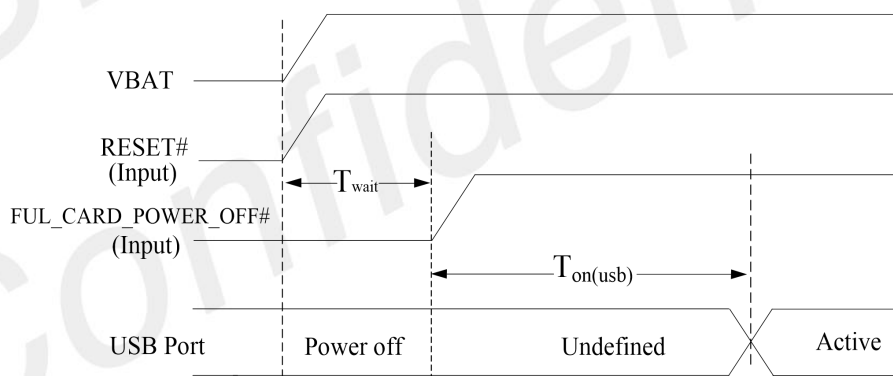


Figure 9: Power on timing sequence

Table 8: Power on timing and electronic characteristic

| Symbol        | Parameter                                             | Min. | Typ. | Max. | Unit |
|---------------|-------------------------------------------------------|------|------|------|------|
| $T_{wait}$    | The time which is used to wait the VBAT to be stable. | TBD  | -    | -    | ms   |
| $T_{on(usb)}$ | The time from power-on issue to USB port ready        | -    | TBD  | -    | s    |
| $V_{IH}$      | Input high level voltage on FUL_CARD_POWER_OFF# pin   | 1.0  | 1.8  | 4.4  | V    |
| $V_{IL}$      | Input low level voltage on FUL_CARD_POWER_OFF# pin    | -0.3 | 0    | 0.2  | V    |

### 3.2.2 Power off

The following methods can be used to power off the card.

- Method 1: Power off Module by AT command .
- Method 2: over-voltage or under-voltage automatic power off.
- Method 3: over-temperature or under-temperature automatic power off.

#### NOTE

- 1.The over-temperature and over-voltage function is disable by default.
2. If the temperature is outside the range of -25~+75℃, some warning will be reported via AT port. If the temperature is outside the range of -40~+85℃, Module will be powered off automatically.(if the function is enabled).
- 3.The power off AT command is being developed.

These procedures will make the M.2 card disconnect from the network and allow the software to enter a safe state, and save data before the card be powered off completely.

### 3.2.3 Sleep mode

When FULL\_CARD\_POWER\_OFF# is pulled down,module will go to sleep mode,system will save power. Pulling down the FULL\_CARD\_POWER\_OFF# pin is illustrated in the following figure.

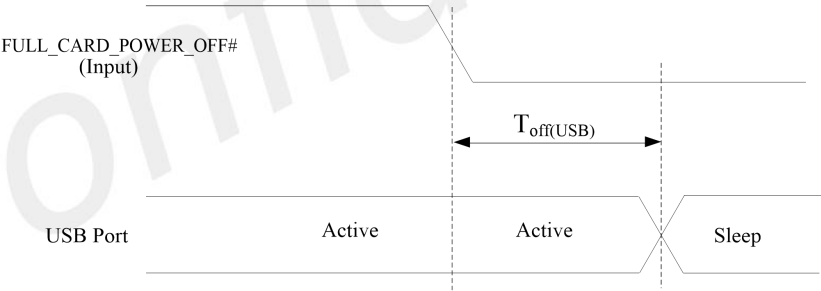


Figure 10: Sleep timing sequence

Table 9: Sleep timing and electronic characteristic

| Symbol                | Parameter                                   | Time value |      |      | Unit |
|-----------------------|---------------------------------------------|------------|------|------|------|
|                       |                                             | Min.       | Typ. | Max. |      |
| T <sub>off(usb)</sub> | The time from sleep issue to USB disconnect | -          | TBD  | -    | s    |

### 3.3 Reset Function

Module can be reset by pulling the RESET# pin down to low level.

#### NOTE

This function is only used as an emergency reset, when power off AT command have lost efficacy.

The RESET# pin has been pulled up with a resistor to 1.8V internally, so it does not need to be pulled up externally. It is strongly recommended to put a 100pF capacitor and an ESD protection diode close to the RESET# pin. Please refer to the following figure for the recommended reference circuit.

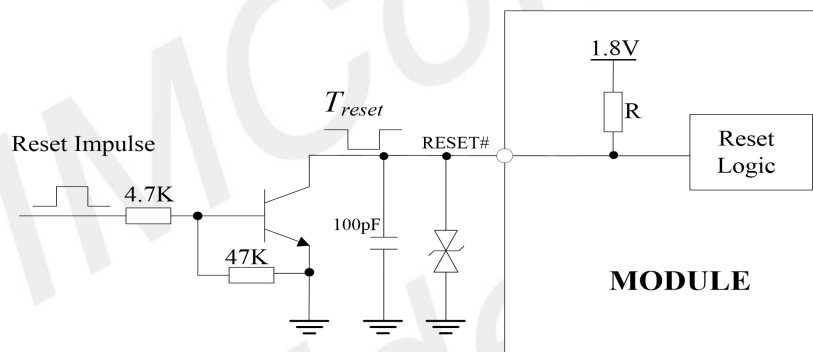


Figure 11: Reference reset circuit

Table 10: RESET pin electronic characteristic

| Symbol      | Description                                                      | Min. | Typ. | Max. | Unit |
|-------------|------------------------------------------------------------------|------|------|------|------|
| $T_{reset}$ | The active low level impulse time on RESET_N pin to reset Module | -    | 50   | -    | ms   |
| $V_{IH}$    | Input high level voltage                                         | 1.2  | 1.8  | 2.1  | V    |
| $V_{IL}$    | Input low level voltage                                          | -0.3 | 0    | 0.4  | V    |

### 3.4 UART interface

Module provides a 2-wire UART (universal asynchronous serial transmission) interface as DCE (Data Communication Equipment). AT commands and data transmission can be performed through UART interface.

The following figures show the reference design.

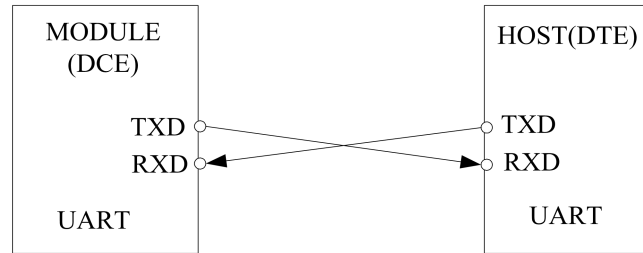


Figure 12: UART modem

The Module UART is 1.8V voltage interface. If user's UART application circuit is 3.3V voltage interface, the level shifter circuits should be used for voltage matching. The TXB0102RGYR provided by Texas Instruments is recommended. The following figure shows the voltage matching reference design.

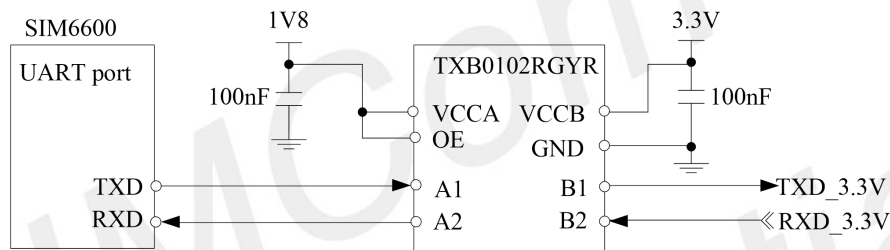


Figure 13: Reference circuit of level shift

#### NOTE

Module supports the following baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600. The default band rate is 115200bps.

## 3.5 I2C Interface

Module provides an I2C interface compatible with I2C specification, version 3.0, with clock rate up to 400 kbps. Its operation voltage is 1.8V.

The following figure shows the I2C bus reference design.

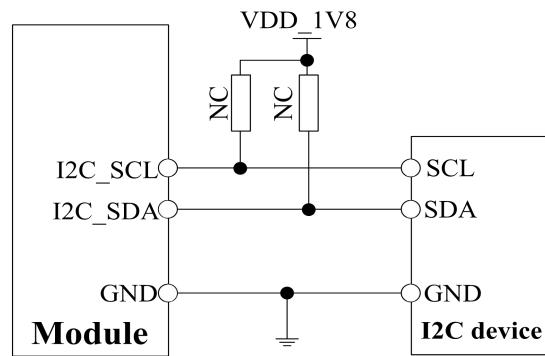


Figure 14: I2C reference circuit

**NOTE**

SDA and SCL have pull-up resistors in Module, 2 external pull up resistors are reserved.

### 3.6 WoWWAN#

The WoWWAN# pin is an open drain signal which can be used as an interrupt signal to the host. Normally it will keep high logic level until certain conditions such as receiving SMS, voice call (CSD, video) or URC reporting, then WoWWAN# will change to low logic level to inform the host (client PC), the pulse time is 1 second.

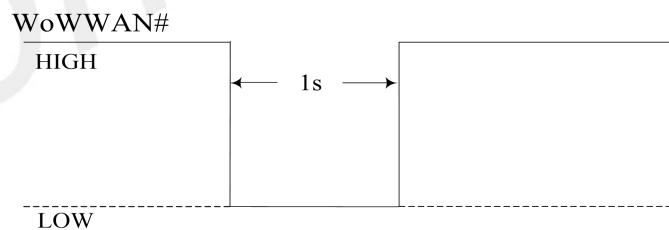


Figure 15: WOWWAN# behaviour (SMS and URC report)

WAKE\_ON\_WWAN Reference circuit is recommended in the following figure.

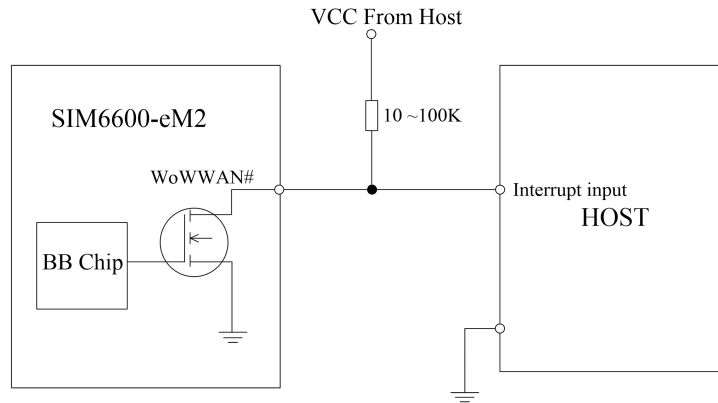


Figure 16: WOWWAN# reference circuit

### 3.7 USB2.0 Interface

SIM6600-eM2 supports one USB2.0 interface. The module supports three USB speeds: low-speed (1.5Mbps), full-speed (12Mbps) and high-speed (480Mbps).

#### NOTE

1. The USB\_D- and USB\_D+ nets must be traced by 90Ohm+/-10% differential impedance.
2. USB NOT support OTG function and USB charging function.

Module is used as a USB device by default. When FULL\_CARD\_POWER\_OFF# is pulled down, USB will disconnect, module will go to sleep mode which can reduce power consumption. Pull high the FULL\_CARD\_POWER\_OFF#, USB will reconnection.

The reference schematic is as following:

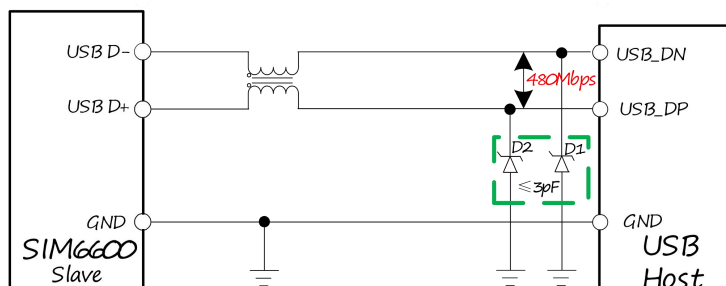


Figure 17: USB reference circuit

Because of the high bit rate on USB bus, more attention should be paid to the influence of the junction capacitance of the ESD component on USB data lines.

Typically, for the USB2.0 signals (USB D- and USB D+), the capacitance should not be more than 3pF. It is recommended to use an ESD protection component such as ESD9M5.0ST5G provided by On Semiconductor ([www.onsemi.com](http://www.onsemi.com)).

### 3.8 UIM Interface

Module supports both 1.8V and 3.0V UIM Cards.

Table 11: UIM electronic characteristic in 1.8V mode (UIM-PWR=1.8V)

| Symbol          | Parameter                 | Min.          | Typ. | Max.         | Unit |
|-----------------|---------------------------|---------------|------|--------------|------|
| UIM-PWR         | LDO power output voltage  | 1.75          | 1.8  | 1.95         | V    |
| V <sub>IH</sub> | High-level input voltage  | 0.65*UIM-PWR  | -    | UIM-PWR +0.3 | V    |
| V <sub>IL</sub> | Low-level input voltage   | -0.3          | 0    | 0.35*UIM-PWR | V    |
| V <sub>OH</sub> | High-level output voltage | UIM-PWR -0.45 | -    | UIM-PWR      | V    |
| V <sub>OL</sub> | Low-level output voltage  | 0             | 0    | 0.45         | V    |

Table 12: UIM electronic characteristic 3.0V mode (UIM-PWR=2.85V)

| Symbol          | Parameter                 | Min.          | Typ. | Max.         | Unit |
|-----------------|---------------------------|---------------|------|--------------|------|
| UIM-PWR         | LDO power output voltage  | 2.75          | 2.85 | 3.05         | V    |
| V <sub>IH</sub> | High-level input voltage  | 0.65*UIM-PWR  | -    | UIM-PWR +0.3 | V    |
| V <sub>IL</sub> | Low-level input voltage   | -0.3          | 0    | 0.25*UIM-PWR | V    |
| V <sub>OH</sub> | High-level output voltage | UIM-PWR -0.45 | -    | UIM-PWR      | V    |
| V <sub>OL</sub> | Low-level output voltage  | 0             | 0    | 0.45         | V    |

### 3.8.1 USIM Application Guide

It is recommended to use an ESD protection component such as ESDA6V1-5W6 produced by ST ([www.st.com](http://www.st.com)) or SMF12C produced by ON SEMI ([www.onsemi.com](http://www.onsemi.com)). Note that the USIM peripheral circuit should be close to the USIM card socket. The following figure shows the 6-pin SIM card holder reference circuit.

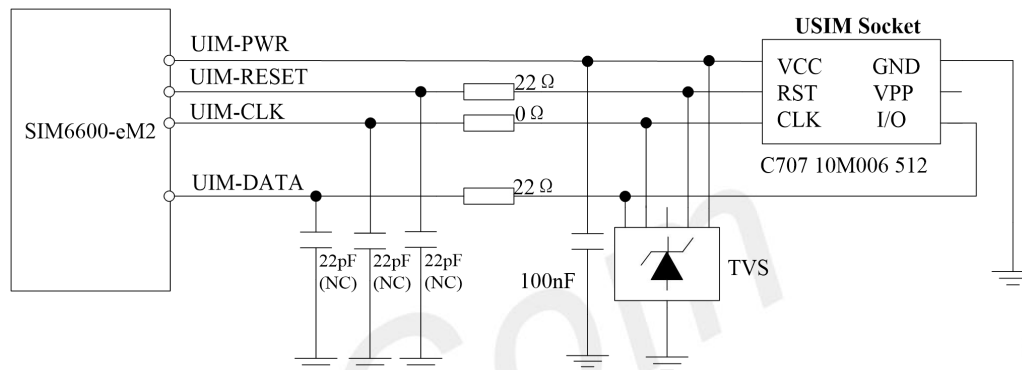


Figure 18: USIM interface reference circuit

The SIM Detect pin is used for detection of the UIM card hot plug in. User can select the 8-pin UIM card holder to implement UIM card detection function.

The following figure shows the 8-pin SIM card holder reference circuit.

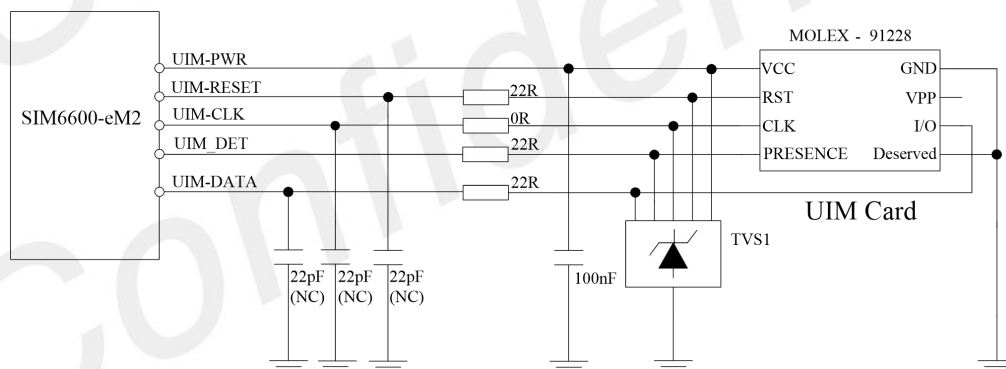


Figure 19: UIM interface reference circuit with UIM\_DET

If the UIM card detection function is not used, user can keep the SIM Detect pin open.

### 3.8.2 USIM layout guide

SIM card circuit is susceptible, the interference may cause the SIM card failures or some other situations, so it is strongly recommended to follow these guidelines while designing:

- Make sure that the SIM card holder should be far away from the antenna while in PCB layout.
- SIM traces should keep away from RF lines, VBAT and high-speed signal lines.

- The traces should be as short as possible.
- Keep SIM holder's GND connect to main ground directly.
- Shielding the SIM card signal by ground.
- Recommended to place a 0.1~1uF capacitor on UIM-PWR line and keep close to the holder.
- The rise/fall time of UIM-CLK should not be more than 40ns.
- Add some TVS and the parasitic capacitance should not exceed 60pF.

### 3.9 I2S Interface\*

Module provides an I2S interface for external codec, which comply with the requirements in the Phillips I2S Bus Specifications.

#### NOTE

“\*” means the I2S function is under developing.

### 3.10 DPR\*

DPR (Dynamic Power Reduction) signal is used by SIM6600-eM2 to assist in meeting regulatory SAR (Specific Absorption Rate) requirements for RF exposure. The signal is provided by a host system proximity sensor to the wireless device to provide an input trigger causing a reduction in the radio transmit output power. The module have 2 DPR pins.

User can use AT command to active this function, if do not need this function, this pin can be keep floating.

**Table 13: DPR interface**

| Pin no | Pin Name  | Pin status | Function                                             |
|--------|-----------|------------|------------------------------------------------------|
| 25     | PCI_DPR1# | Low        | Max transmitting power will be reduced               |
|        |           | High       | Max transmitting power will not be reduced (default) |
| 28     | PCI_DPR2# | Low        | Max transmitting power will be reduced               |
|        |           | High       | Max transmitting power will not be reduced (default) |

#### NOTE

“\*” means the DPR function is under developing.

### 3.11 CONFIG Pins

These signals provide the means to indicate the specific configuration of the module. SIM6600-eM2 is configured as WWAN-USB2.0.

**Table 14: CONFIG Pins**

| Pin no | Pin Name | Description                  |
|--------|----------|------------------------------|
| 21     | CONFIG_0 | Connected to GND internally. |
| 69     | CONFIG_1 | Connected to GND internally. |
| 75     | CONFIG_2 | Connected to GND internally. |
| 1      | CONFIG_3 | No Connect internally.       |

In the M.2 specification, the 4 pins are defined as below:

**Table 15: Config interface**

| Config_0<br>(Pin 21) | Config_1<br>(Pin 69) | Config_2<br>(Pin 75) | Config_3<br>(Pin 1) | Module type and<br>Main host interface | Comments       |
|----------------------|----------------------|----------------------|---------------------|----------------------------------------|----------------|
| GND                  | GND                  | GND                  | NC                  | WWAN – USB 2.0                         | Vender defined |

### 3.12 LED1#

LED1# is open drain output and is used to allow SIM6600-eM2 to provide network status via LED which will be provided by the host.

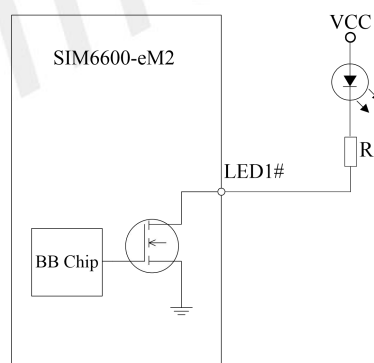


Figure 20: LED1# reference circuit

#### NOTE

The value of the resistor named “R” depends on the LED characteristic.

**Table 16: LED1# pin status**

| NETLIGHT pin status | Module status                                        |
|---------------------|------------------------------------------------------|
| Always On           | Searching Network; Call Connect(include VOLTE,SRLTE) |
| 200ms ON, 200ms OFF | Data Transmit; 4G registered;                        |
| 800ms ON, 800ms OFF | 3G registered network                                |
| OFF                 | Power off ;Sleep                                     |

### 3.13 W\_DISABLE1#

The W\_DISABLE1# pin controls SIM6600-eM2 to enter or exit the flight mode, when the W\_DISABLE1# signal is asserted to low level, all RF functions would be disabled. When the W\_DISABLE1# signal is not asserted, the RF function will be active if it was not disabled by other means such as software.

Its reference circuit is shown in the following figure.

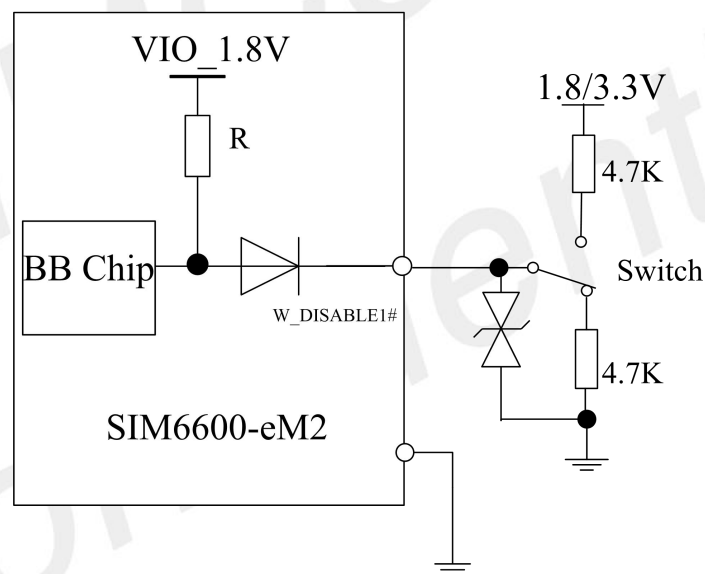


Figure 21: Flight mode switch reference circuit

W\_DISABLE1# pin status as below:

**Table 17: FLIGHT MODE pin status**

| FLIGHTMODE pin status | Module operation          |
|-----------------------|---------------------------|
| Input Low Level       | Flight Mode: RF is closed |
| Input High Level      | RF is working             |

### 3.14 ANTCTRL interface

ANTCTL[0:3] are used for tunable antenna control and should be routed to an appropriate antenna control circuitry.

The following table are the definitions for antenn control interfaces.

**Table 18: Definition of antenna control interface**

| Pin Name | Pin No. | Electrical Description | Description            | Comments                |
|----------|---------|------------------------|------------------------|-------------------------|
| ANTCTL0  | 59      | DO                     | Antenna tuner control0 |                         |
| ANTCTL1  | 61      | DO                     | Antenna tuner control1 | 1.8V voltage domain.If  |
| ANTCTL2  | 58      | DO                     | Antenna tuner control2 | unused,please keep open |
| ANTCTL3  | 56      | DO                     | Antenna tuner control3 |                         |

#### NOTE

This function is under development,for details please contact SIMCom support teams.

### 3.15 W\_DISABLE2#

The W\_DISABLE2# pin controls SIM6600-eM2 to disable the GNSS function.When the W\_DISABLE2# signal is pulled to low level, the GNSS function would be disabled. SIM6600-eM2 have no GNSS function,this pin is reserved.

## 4 Antenna Interfaces

SIM6600-eM2 provides a main antenna interface, a diversity antenna interface . The antenna ports have an RF impedance of 50Ω.

### 4.1 Operating Frequency

Table 19: SIM6600-eM2 Operating frequencies

| WCDMA Band | Uplink (UL)    | Downlink (DL)  | Duplex Mode |
|------------|----------------|----------------|-------------|
| WCDMA B1   | 1920 ~1980 MHz | 2110 ~2170 MHz | FDD         |
| WCDMA B2   | 1850 ~1910 MHz | 1930 ~1990 MHz | FDD         |
| WCDMA B4   | 1710 ~1755 MHz | 2110 ~2155 MHz | FDD         |
| WCDMA B5   | 824 ~849 MHz   | 869 ~894MHz    | FDD         |
| WCDMA B8   | 880 ~915 MHz   | 925 ~960 MHz   | FDD         |
| LTE B1     | 1920 ~1980 MHz | 2110 ~2170 MHz | FDD         |
| LTE B2     | 1850 ~1910 MHz | 1930 ~1990 MHz | FDD         |
| LTE B3     | 1710 ~1785 MHz | 1805 ~1880 MHz | FDD         |
| LTE B4     | 1710 ~1755 MHz | 2110 ~2155 MHz | FDD         |
| LTE B5     | 824 ~849 MHz   | 869 ~894MHz    | FDD         |
| LTE B7     | 2500~2570MHz   | 2620~2690MHz   | FDD         |
| LTE B8     | 880 ~915 MHz   | 925 ~960 MHz   | FDD         |
| LTE B12    | 699 ~716 MHz   | 729 ~746 MHz   | FDD         |
| LTE B13    | 777 ~787 MHz   | 746 ~756 MHz   | FDD         |
| LTE B17    | 704 ~716 MHz   | 734 ~746 MHz   | FDD         |
| LTE B18    | 815 ~830 MHz   | 860 ~875 MHz   | FDD         |
| LTE B19    | 830 ~845 MHz   | 875 ~890 MHz   | FDD         |
| LTE B20    | 832~862MHz     | 791~ 821MHz    | FDD         |
| LTE B25    | 1850 ~1915 MHz | 1930 ~1995 MHz | FDD         |
| LTE B26    | 814 ~849 MHz   | 859 ~894 MHz   | FDD         |
| LTE B28    | 703~748MHz     | 758~803MHz     | FDD         |
| LTE B29    | N/A            | 717 ~728 MHz   | FDD         |
| LTE B30    | 2305 ~2315 MHz | 2350 ~2360 MHz | FDD         |
| LTE B66    | 1710 ~1780 MHz | 2110 ~2200 MHz | FDD         |
| LTE B71    | 663 ~698 MHz   | 617 ~652 MHz   | FDD         |
| LTE B34    | 2010 ~2025 MHz | 2010 ~2025 MHz | TDD         |
| LTE B38    | 2570 ~2620 MHz | 2570 ~2620 MHz | TDD         |
| LTE B39    | 1880 ~1920 MHz | 1880 ~1920 MHz | TDD         |
| LTE B40    | 2300 ~2400 MHz | 2300 ~2400 MHz | TDD         |

|                |                |                |     |
|----------------|----------------|----------------|-----|
| <b>LTE B41</b> | 2496 ~2690 MHz | 2496 ~2670 MHz | TDD |
|----------------|----------------|----------------|-----|

**NOTE**

LTE-FDD B29 supports Rx only and is only for secondary component carrier.

## 4.2 Antenna Installation

### 4.2.1 Antenna Requirements

The following table shows the requirements on main antenna and Diversity antenna.

**Table 20:WCDMA/LTE antenna**

| Passive                            | Recommended standard |
|------------------------------------|----------------------|
| Direction                          | Omni directional     |
| Gain                               | > -3dBi (Avg)        |
| Input impedance                    | 50 $\Omega$          |
| Efficiency                         | > 30 %               |
| VSWR                               | < 2                  |
| Cable insertion Loss <1GHz         | <1dB                 |
| Cable insertion Loss 1GHz~2.2GHz   | <1.5dB               |
| Cable insertion Loss 2.3GHz~2.7GHz | <2dB                 |

### 4.2.2 Recommended RF Connector for Antenna Installation

When choosing antennas, user should pay attentions to the connector on antenna which should match with the connector on the module.

The standard 2x2 mm size RF receptacle connectors have been used on SIM6600-eM2. The dimension of the connector on SIM6600-eM2 is 2.0\*2.0\*0.6mm.

Shows the RF connector dimension in the following figure:

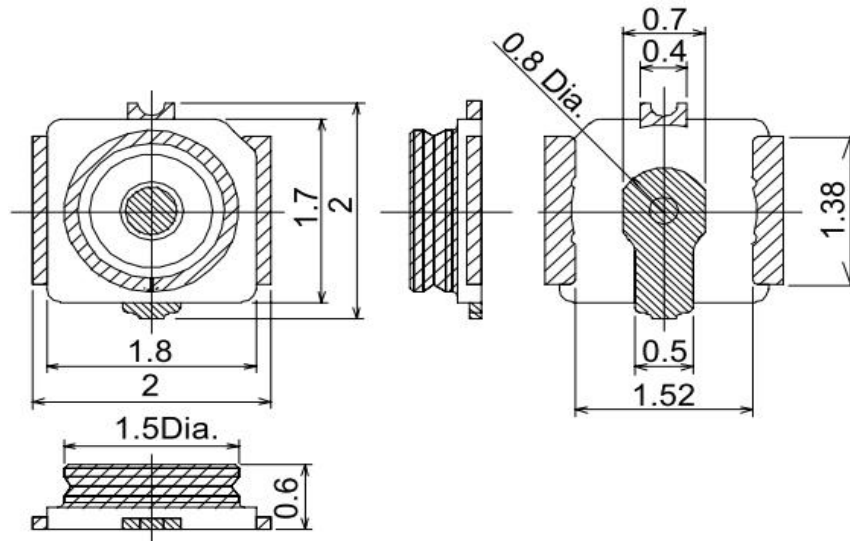


FIGURE1. Construction

Scale: Free  
Tolerances Unless  
Otherwise Specified:  $\pm 0.2$   
Unit: mm

Figure 22: Antenna connector

The major specifications of the RF connector as below:

Table 21: the major specifications of the RF connector

| Item                                                         | Specification                                                           |
|--------------------------------------------------------------|-------------------------------------------------------------------------|
| Nominal Frequency Range                                      | DC to 6 GHz                                                             |
| Nominal Impedance                                            | 50 $\Omega$                                                             |
| Temperature Rating                                           | -40 $^{\circ}$ C to + 85 $^{\circ}$ C                                   |
| Initial Contact Resistance<br>(without conductor resistance) | Center contact 20.0m $\Omega$ max.<br>Outer contact 20.0m $\Omega$ max. |
| Voltage Standing Wave Ratio (V.S.W.R.)                       | Meet the requirements of<br>1.3max.(DC~3GHz)<br>1.45max.(3GHz~6GHz)     |

There are two kinds of coaxial cables mating the RF connector in the SIM6600-eM2, SIMCom recommend use Murata and SUZHOU KELI, and the Part Number is MXFR32HP1000 of the Murata and KLC-2058 of the KELI.

## 5 Electrical Specifications

### 5.1 Absolute maximum ratings

Absolute maximum rating for digital and analog pins of Module are listed in the following table:

Table 22: Absolute maximum ratings

| Parameter                                    | Min. | Typ. | Max. | Unit |
|----------------------------------------------|------|------|------|------|
| Voltage at VBAT pins                         | -0.3 | -    | 4.7  | V    |
| Voltage at digital pins (GPIO,I2C,UART, I2S) | -0.3 | -    | 2.1  | V    |
| Voltage at digital pins (UIM)                | -0.3 | -    | 3.05 | V    |
| Voltage at FULL_CARD_POWER_OFF#              | -0.3 | -    | 4.7  |      |
| Voltage at RESET#                            | -0.3 | -    | 2.1  |      |

### 5.2 Operating conditions

Table 23: Recommended operating ratings

| Parameter       | Min.  | Typ. | Max. | Unit |
|-----------------|-------|------|------|------|
| Voltage at VBAT | 3.135 | 3.7  | 4.4  | V    |

Table 24: 1.8V Digital I/O characteristics\*

| Parameter       | Description                                        | Min. | Typ. | Max. | Unit |
|-----------------|----------------------------------------------------|------|------|------|------|
| V <sub>IH</sub> | High-level input voltage                           | 1.17 | 1.8  | 2.1  | V    |
| V <sub>IL</sub> | Low-level input voltage                            | -0.3 | 0    | 0.63 | V    |
| V <sub>OH</sub> | High-level output voltage                          | 1.35 | -    | 1.8  | V    |
| V <sub>OL</sub> | Low-level output voltage                           | 0    | -    | 0.45 | V    |
| I <sub>OH</sub> | High-level output current(no pull down resistor)   | -    | TBD  | -    | mA   |
| I <sub>OL</sub> | Low-level output current(no pull up resistor)      | -    | TBD  | -    | mA   |
| I <sub>IH</sub> | Input high leakage current (no pull down resistor) | -    | -    | TBD  | uA   |
| I <sub>IL</sub> | Input low leakage current(no pull up resistor)     | TBD  | -    | -    | uA   |

#### NOTE

These parameters are for digital interface pins, such as UART, I2C, I2S, RESET#, ANTCTL and GPIOs (DPR, SIM DETECT).

The operating temperature of Module is listed in the following table.

**Table 25:Operating temperature**

| Parameter                                    | Min. | Typ. | Max. | Unit |
|----------------------------------------------|------|------|------|------|
| Normal operation temperature(3GPP compliant) | -25  | 25   | 70   | °C   |
| Extended operation temperature*              | TBD  | TBD  | TBD  | °C   |
| Storage temperature                          | -40  | 25   | 80   | °C   |

**NOTE**

Module is able to make and receive voice calls, data calls, SMS and make UMTX/LTE traffic in extended operation temperature. The performance will be reduced slightly from the 3GPP specifications if the temperature is outside the normal operating temperature range and still within the extreme operating temperature range.

## 5.3 Operating Mode

### 5.3.1 Operating Mode Definition

The table below summarizes the various operating modes of Module product.

**Table 26: Operating mode Definition\***

| Mode             | Function                                                                                                                                                                                                                              |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Normal operation | UMTS/LTE Sleep<br>Pull down the FULL_CARD_POWER_OFF# pin,set the module to a sleep mode. In this case, the current consumption of module will be reduced to a very low level and the module can still receive paging message and SMS. |
|                  | UMTS/LTE Idle<br>Software is active. Module is registered to the network, and the Module is ready to communicate.                                                                                                                     |
|                  | UMTS/LTE Talk<br>Connection between two subscribers is in progress. In this case, the power consumption depends on network settings such as DTX off/on,                                                                               |

|                    |                                   |                                                                                                                                                                                                                                                                                              |
|--------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                    |                                   | FR/EFR/HR, hopping sequences, and antenna.                                                                                                                                                                                                                                                   |
|                    | <b>UMTS/LTE Standby</b>           | Module is ready for data transmission, but no data is currently sent or received. In this case, power consumption depends on network settings.                                                                                                                                               |
|                    | <b>UMTS/LTE Data transmission</b> | There is data transmission in progress. In this case, power consumption is related to network settings (e.g. power control level); uplink/downlink data rates, etc.                                                                                                                          |
| <b>Flight mode</b> |                                   | Pulling down the W_disable1# pin can be used to set the Module to flight mode without removing the power supply. In this mode, the RF part of the Module will not work, but the serial port and USB port are still accessible. The power consumption in this mode is lower than normal mode. |
| <b>Power off</b>   |                                   | Module will go into power off mode by sending the AT command "AT+CPOF" , then pull down the FULL_CARD_POWER_OFF# pin, normally. In this mode the power management unit shuts down the power supply, and software is not active. The serial port and USB are is not accessible.               |

**NOTE**

These AT Command is under development,for details please contact SIMCom support teams.

### 5.3.2 Sleep mode

In sleep mode, the current consumption of Module will be reduced to a very low level, and Module can still receive paging message and SMS.

Several hardware and software conditions must be satisfied in order to let Module enter into sleep mode:

1. UART condition
2. USB condition
3. Software condition

**NOTE**

Before designing, pay attention to how to realize sleeping/waking function.

## 5.4 Current Consumption

The current consumption is listed in the table below.

**Table 27:**Current consumption on VBAT Pins (VBAT=3.7V)

| UMTS sleep mode                                    |                                   |       |                 |
|----------------------------------------------------|-----------------------------------|-------|-----------------|
| WCDMA supply current<br>(without USB connection)   | Sleep mode @DRX=9 Typical: TBD mA |       |                 |
|                                                    | Idle mode@DRX=9 Typical: 49.4 mA  |       |                 |
| LTE sleep mode                                     |                                   |       |                 |
| LTE FDD supply current<br>(without USB connection) | Sleep mode Typical: TBD mA        |       |                 |
|                                                    | Idle mode Typical:48.7 mA         |       |                 |
| LTE TDD supply current<br>(without USB connection) | Sleep mode Typical: TBD mA        |       |                 |
|                                                    | Idle mode Typical:49.5 mA         |       |                 |
| UMTS Talk                                          |                                   |       |                 |
| WCDMA B1                                           | @Power 23dBm Typical: 668mA       |       |                 |
| WCDMA B2                                           | @Power 23dBm Typical: 585 mA      |       |                 |
| WCDMA B4                                           | @Power 23dBm Typical: 622 mA      |       |                 |
| WCDMA B5                                           | @Power 23dBm Typical: 580 mA      |       |                 |
| WCDMA B8                                           | @Power 23dBm Typical: 575 mA      |       |                 |
| HSDPA data                                         |                                   |       |                 |
| WCDMA B1                                           | @Power 23dBm Typical: 668 mA      |       |                 |
| WCDMA B2                                           | @Power 23dBm Typical: 585 mA      |       |                 |
| WCDMA B4                                           | @Power 23dBm Typical: 622 mA      |       |                 |
| WCDMA B5                                           | @Power 23dBm Typical: 580 mA      |       |                 |
| WCDMA B8                                           | @Power 23dBm Typical: 575 mA      |       |                 |
| LTE data                                           |                                   |       |                 |
| LTE-FDD B1                                         | @5MHz                             | 23dBm | Typical: 766 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 776 mA |
|                                                    | @20MHz                            | 23dBm | Typical: 781 mA |
| LTE-FDD B2                                         | @5MHz                             | 23dBm | Typical: 644 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 634 mA |
|                                                    | @20MHz                            | 23dBm | Typical: 635 mA |
| LTE-FDD B3                                         | @5MHz                             | 23dBm | Typical: 699 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 701 mA |
|                                                    | @20MHz                            | 23dBm | Typical: 703 mA |
| LTE-FDD B4                                         | @5MHz                             | 23dBm | Typical: 644 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 647 mA |
|                                                    | @20MHz                            | 23dBm | Typical: 653 mA |
| LTE-FDD B5                                         | @5MHz                             | 23dBm | Typical: 630 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 635 mA |
| LTE-FDD B7                                         | @5MHz                             | 23dBm | Typical: 740 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 766 mA |
|                                                    | @20MHz                            | 23dBm | Typical: 763 mA |
| LTE-FDD B8                                         | @5MHz                             | 23dBm | Typical: 709 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 724 mA |
| LTE-FDD B12                                        | @5MHz                             | 23dBm | Typical: 603 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 610 mA |
| LTE-FDD B13                                        | @5MHz                             | 23dBm | Typical: 745 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 736 mA |
| LTE-FDD B17                                        | @5MHz                             | 23dBm | Typical: 612 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 617 mA |
| LTE-FDD B18                                        | @5MHz                             | 23dBm | Typical: 662 mA |
|                                                    | @10MHz                            | 23dBm | Typical: 686 mA |

|             |        |       |                 |
|-------------|--------|-------|-----------------|
| LTE-FDD B19 | @5MHz  | 23dBm | Typical: 619 mA |
|             | @10MHz | 23dBm | Typical: 635 mA |
| LTE-FDD B20 | @5MHz  | 23dBm | Typical: 683 mA |
|             | @10MHz | 23dBm | Typical: 677 mA |
|             | @20MHz | 23dBm | Typical: 697 mA |
| LTE-FDD B25 | @5MHz  | 23dBm | Typical: 655 mA |
|             | @10MHz | 23dBm | Typical: 654 mA |
|             | @20MHz | 23dBm | Typical: 653 mA |
| LTE-FDD B26 | @5MHz  | 23dBm | Typical: 636 mA |
|             | @10MHz | 23dBm | Typical: 638 mA |
| LTE-FDD B28 | @5MHz  | 23dBm | Typical: 624 mA |
|             | @10MHz | 23dBm | Typical: 626 mA |
|             | @20MHz | 23dBm | Typical: 625 mA |
| LTE-FDD B29 | N/A    |       |                 |
| LTE-FDD B30 | @5MHz  | 23dBm | Typical: 685 mA |
|             | @10MHz | 23dBm | Typical: 681 mA |
| LTE-FDD B66 | @5MHz  | 23dBm | Typical: 657 mA |
|             | @10MHz | 23dBm | Typical: 665 mA |
|             | @20MHz | 23dBm | Typical: 654 mA |
| LTE-FDD B71 | @5MHz  | 23dBm | Typical: 711 mA |
|             | @10MHz | 23dBm | Typical: 702 mA |
| LTE-TDD B34 | @5MHz  | 23dBm | Typical: 533 mA |
|             | @10MHz | 23dBm | Typical: 573 mA |
| LTE-TDD B38 | @5MHz  | 23dBm | Typical: 549 mA |
|             | @10MHz | 23dBm | Typical: 606 mA |
|             | @20MHz | 23dBm | Typical: 591 mA |
| LTE-TDD B39 | @5MHz  | 23dBm | Typical: 581 mA |
|             | @10MHz | 23dBm | Typical: 615 mA |
|             | @20MHz | 23dBm | Typical: 550 mA |
| LTE-TDD B40 | @5MHz  | 23dBm | Typical: 730 mA |
|             | @10MHz | 23dBm | Typical: 758 mA |
|             | @20MHz | 23dBm | Typical: 744 mA |
| LTE-TDD B41 | @5MHz  | 23dBm | Typical: 600 mA |
|             | @10MHz | 23dBm | Typical: 593 mA |
|             | @20MHz | 23dBm | Typical: 577 mA |

## 5.5 RF Output Power

The following table shows the RF output power of SIM6600-eM2 module.

**Table 28: Conducted Output Power**

| Frequency     | Max                | Min      |
|---------------|--------------------|----------|
| WCDMA Bands   | 23dBm + 2/-2dB     | < -50dBm |
| LTE-FDD Bands | 23dBm + 1.5/-1.5dB | < -40dBm |
| LTE-TDD Bands | 23dBm + 1.5/-1.5dB | < -40dBm |

## 5.6 Conducted Receive Sensitivity

The following tables show conducted RF receiving sensitivity of SIM6600-eM2 module.

**Table 29:SIM6600-eM2 Conducted RF Receiving Sensitivity**

| Frequency        | Primary (Typ.) | Diversity (Typ.) |
|------------------|----------------|------------------|
| WCDMA B1         | -110.5         | NA               |
| WCDMA B2         | -111           | NA               |
| WCDMA B4         | -112           | NA               |
| WCDMA B5         | -112           | NA               |
| WCDMA B8         | -110.5         | NA               |
| LTE-FDD B1(10M)  | -97            | -97.6            |
| LTE-FDD B2(10M)  | -98            | -98.4            |
| LTE-FDD B3(10M)  | -98.5          | -98              |
| LTE-FDD B4(10M)  | -98.5          | -97.2            |
| LTE-FDD B5(10M)  | -97.5          | -98              |
| LTE-FDD B7(10M)  | -97.5          | -98.2            |
| LTE-FDD B8(10M)  | -97.5          | -98              |
| LTE-FDD B12(10M) | -99            | -98.1            |
| LTE-FDD B13(10M) | -98.5          | -99.1            |
| LTE-FDD B17(10M) | -99            | -99.3            |
| LTE-FDD B18(10M) | -97.5          | -99              |
| LTE-FDD B19(10M) | -98            | -98.2            |
| LTE-FDD B20(10M) | -98.5          | -99.2            |
| LTE-FDD B25(10M) | -98.5          | -98.2            |
| LTE-FDD B26(10M) | -98            | -98.8            |
| LTE-FDD B28(10M) | -98            | -99              |
| LTE-FDD B29(10M) | -98.3          | -98.3            |
| LTE-FDD B30(10M) | -98            | -98.8            |
| LTE-FDD B66(10M) | -98.8          | -97.5            |
| LTE-FDD B71(10M) | -98.5          | -99              |
| LTE-FDD B34(10M) | -98.5          | -98.6            |
| LTE-FDD B38(10M) | -98.5          | -98.6            |
| LTE-FDD B39(10M) | -98.5          | -98.9            |
| LTE-FDD B40(10M) | -98            | -97.6            |
| LTE-FDD B41(10M) | -97.5          | -97.1            |

**NOTE**

The data in above table are gotten at static condition.  
Per 3GPP specification.

## 5.7 ESD

Module is sensitive to ESD in the process of storage, transporting, and assembling. When Module is mounted on the users' mother board, the ESD components should be placed beside the connectors which human body may touch, such as USIM card holder, SD card holder, audio jacks, switches, USB interface, etc. The following table shows the Module ESD measurement performance without any external ESD component.

**Table 30: The ESD performance measurement table (Temperature: 25℃, Humidity: 45%)**

| Part                 | Contact discharge | Air discharge |
|----------------------|-------------------|---------------|
| VBAT, GND            | +/-4KV            | +/-8KV        |
| Antenna port         | +/-4KV            | +/-8KV        |
| FULL_CARD_POWER_OFF# | +/-2KV            | +/-4KV        |
| USB                  | +/-2KV            | +/-4KV        |
| RESET_N              | +/-2KV            | +/-4KV        |
| UIM Card             | +/-2KV            | +/-4KV        |
| Other PADs           | +/-2KV            | +/-4KV        |

**NOTE**

When install RF antenna cable,must turn off power of the module.

## 6 Appearance

### 6.1 Top and Bottom View of Module

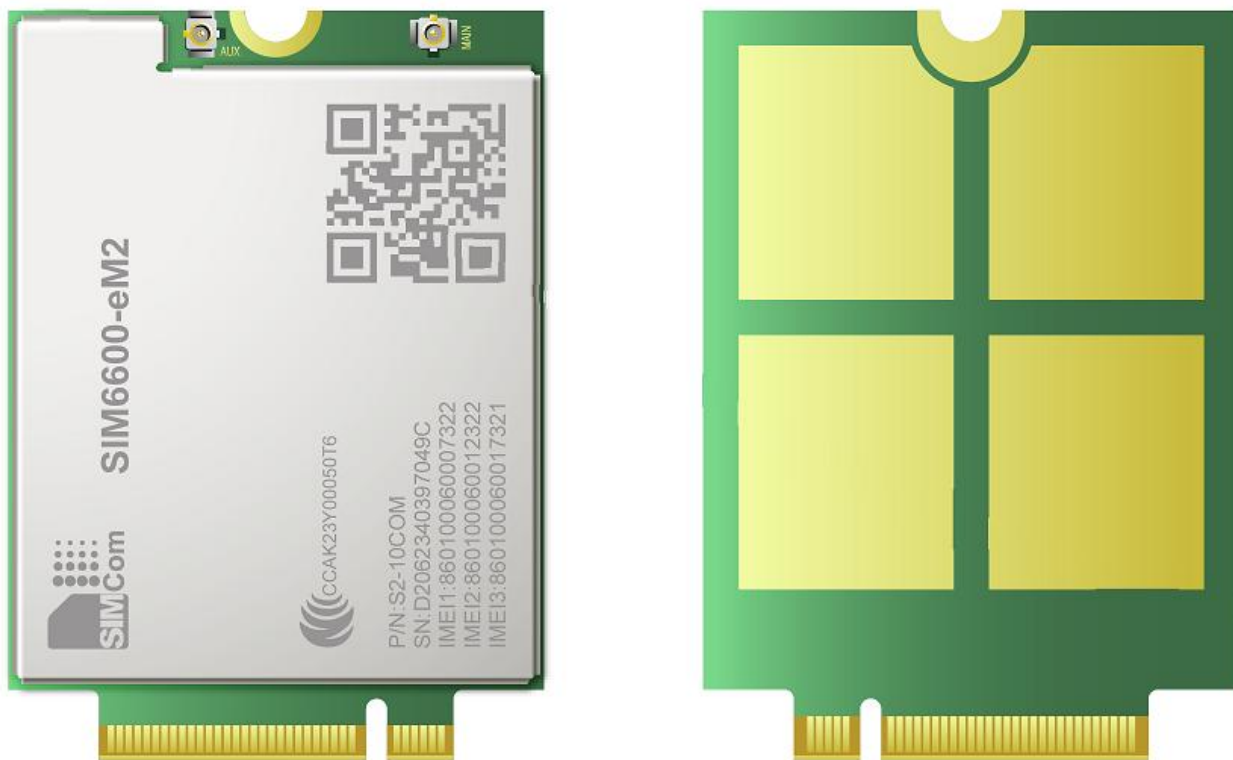


Figure 23: Top and bottom view of Module

## 6.2 Label Description Information

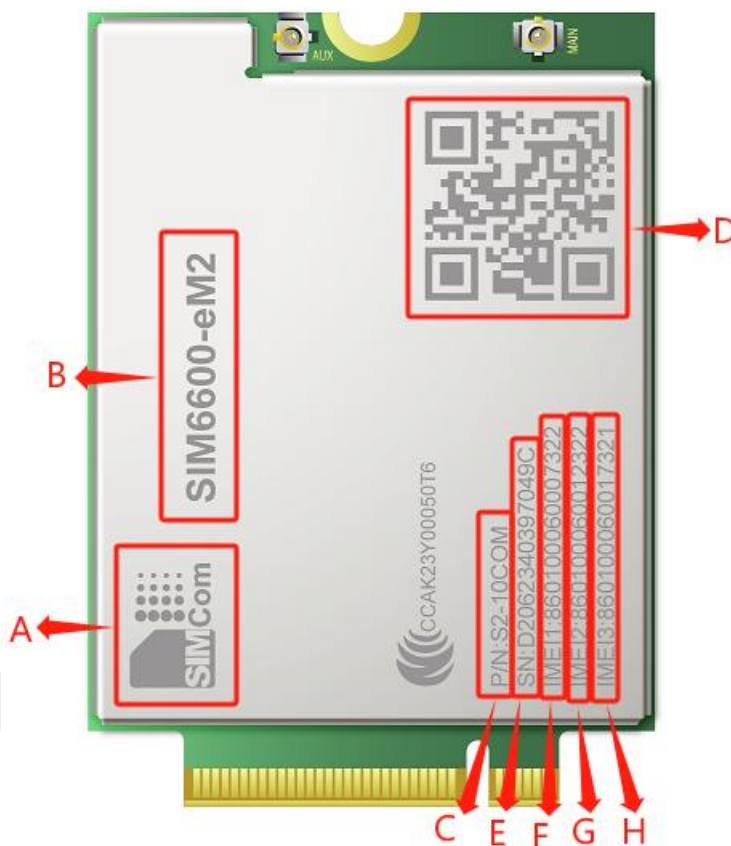


Figure 24: Label information

Table 31: The description of label information

| No. | Description                                                                                                                 |
|-----|-----------------------------------------------------------------------------------------------------------------------------|
| A   | LOGO                                                                                                                        |
| B   | Project name                                                                                                                |
| C   | Product code                                                                                                                |
| D   | QR code                                                                                                                     |
| E   | Serial number.The 5th to 8th represent the production date.For example,2340 represents production in the 40th week of 2023. |
| F   | International mobile equipment identity I                                                                                   |
| G   | International mobile equipment identity II                                                                                  |
| H   | International mobile equipment identity III                                                                                 |

### NOTE

Figure 23 and Figure 24 are the design effect diagrams of the module for reference only. The actual appearance is subject to the actual product.

## 7 Install SIM6600-eM2 to Board

The module should be install well by the connector and screw as the following figure illustration. The module Stand-off and mounting screw also serve as part of the module Electrical Ground path. The Stand-off should be connected directly to the ground plane on the platform. So that when the module is mounted and the mounting screw is screwed on to hold the module in place, this will make the electrical ground connection from the module to the platform ground plane.

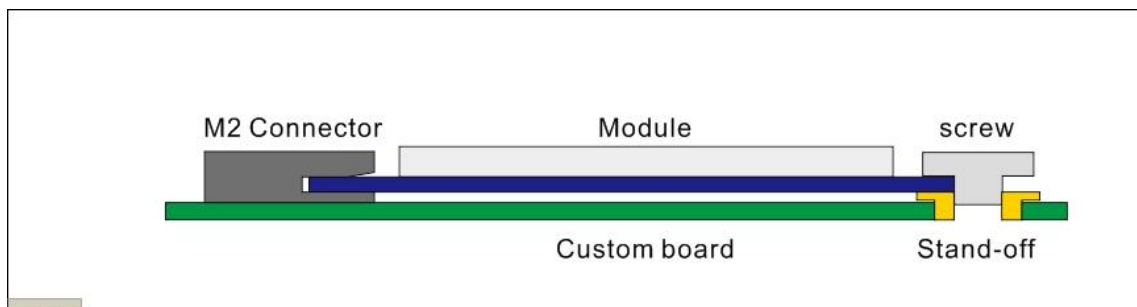


Figure 25: Equipment diagram

## 8 Thermal Design

Customer should pay attentions to the thermal design of SIM6600-eM2, for the mass data application, the module would work in max power status and last long time, the temperature of module would increase quickly, especially in high temperature environment.

Module reserved a ground plane on the bottom side for the heat dissipating, customer could conduct the heat to the large board by the silica gel, and the surface copper area on large board should be more than 900 mm<sup>2</sup>.

For better thermal performance, customer could use a heat sink device to conduct the heat to the air.

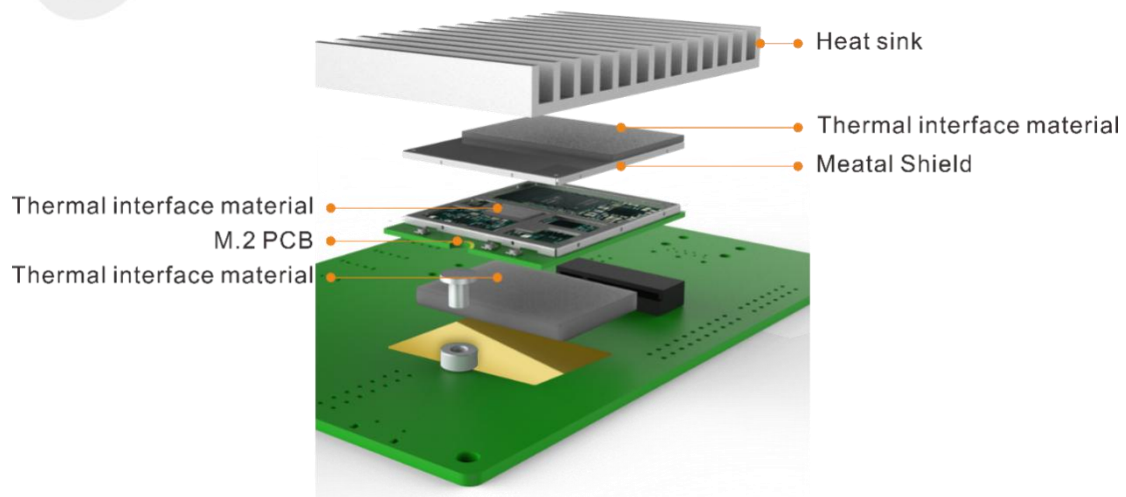


Figure 26: Thermal design diagram

Table 32: The silica gel selection guide

| Item                | Test method | Recommend value      | Unit  |
|---------------------|-------------|----------------------|-------|
| Specific Gravity    | ASTMD792    | 3.2±0.1              | g/cc  |
| Continuous use Temp | EN344       | -40~+220             | °C    |
| Volume Resistivity  | ASTMD257    | 1.0*10 <sup>11</sup> | Ω-CM  |
| Voltage Endurance   | ASTMD149    | 4                    | KV/mm |
| Flame Rating        | UL-94       | V-0                  |       |
| Conductivity        | ASTMD5470   | 8                    | w/m-k |

## 9 Packaging

Module support tray packaging.

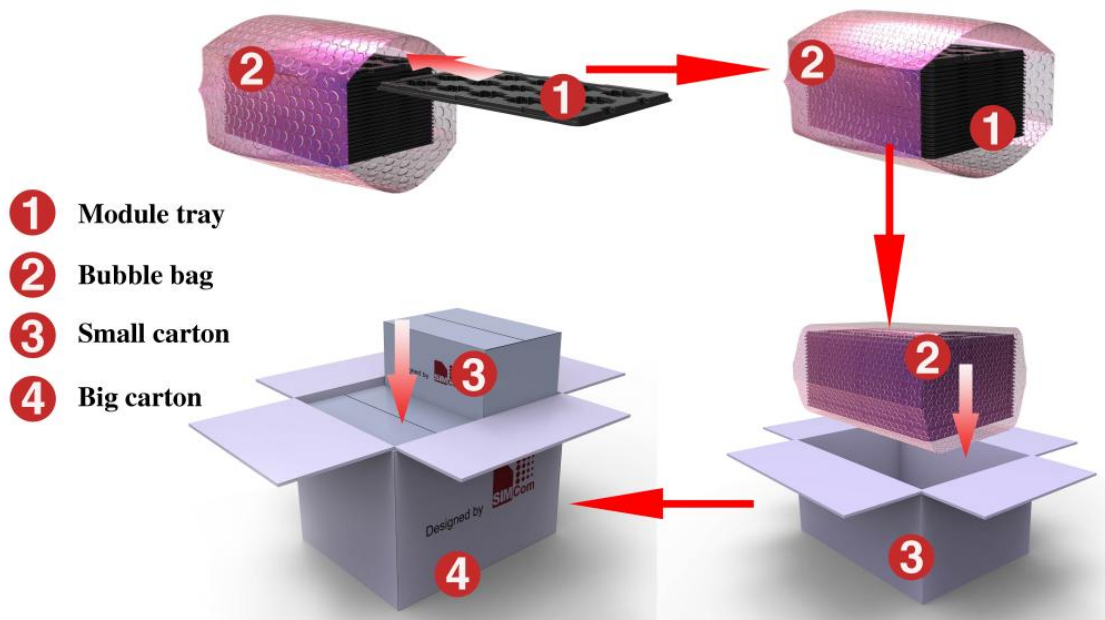


Figure 27: Packaging diagram

Module tray drawing:

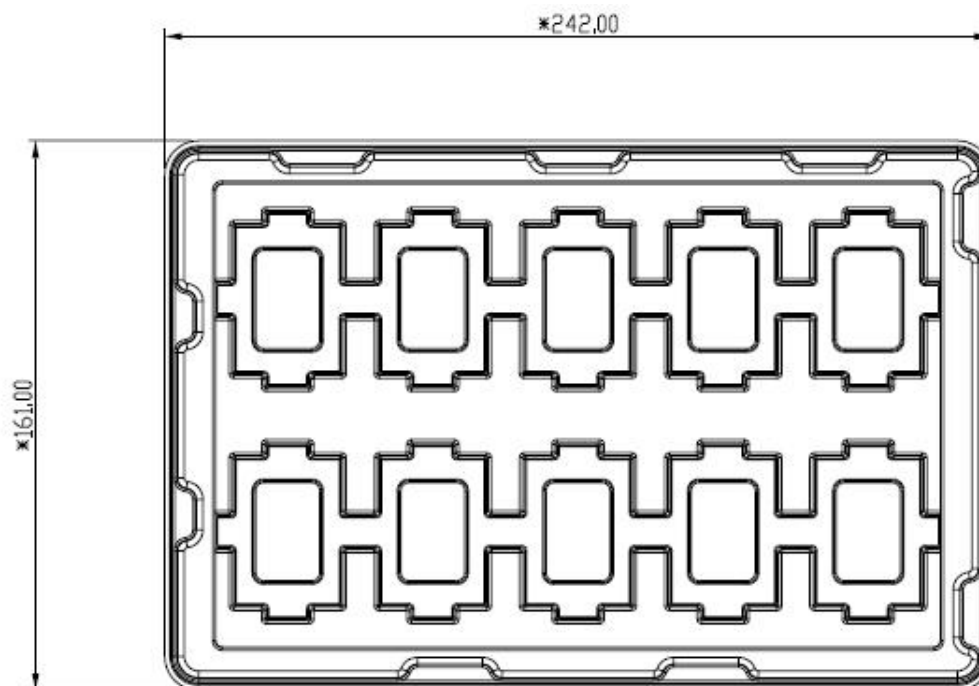


Figure 28: Tray drawing

Table 33: Tray size

| Length ( $\pm 3\text{mm}$ ) | Width ( $\pm 3\text{mm}$ ) | Number |
|-----------------------------|----------------------------|--------|
| 245.0                       | 165.0                      | 10     |

Small carton drawing:

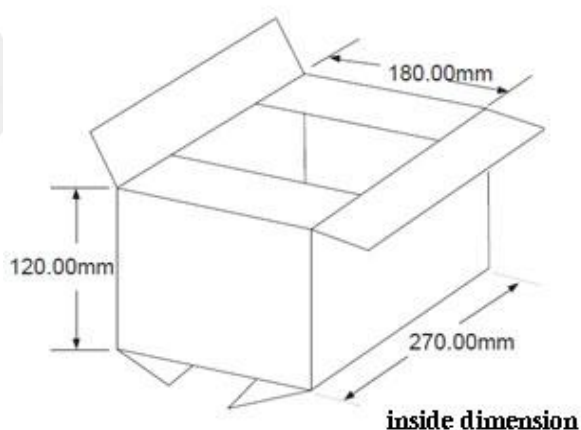


Figure 29: Small carton drawing

Table 34: Small Carton size

| Length ( $\pm 10\text{mm}$ ) | Width ( $\pm 10\text{mm}$ ) | Height ( $\pm 10\text{mm}$ ) | Number |
|------------------------------|-----------------------------|------------------------------|--------|
|------------------------------|-----------------------------|------------------------------|--------|

270

180

120

10\*20=200

Big carton drawing:

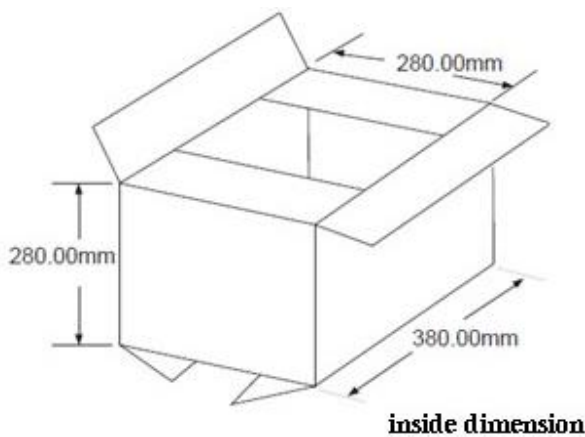


Figure 30: Big carton drawing

Table 35:Big Carton size

| Length (±10mm) | Width (±10mm) | Height (±10mm) | Number    |
|----------------|---------------|----------------|-----------|
| 380            | 280           | 280            | 200*4=800 |

## 10 Appendix

### 10.1 Coding Schemes and Maximum Net Data Rates over Air Interface

Table 36: Coding Schemes and Maximum Net Data Rates over Air Interface

| HSDPA device category | Max data rate (peak) | Modulation type |
|-----------------------|----------------------|-----------------|
| Category 1            | 1.2Mbps              | 16QAM, QPSK     |
| Category 2            | 1.2Mbps              | 16QAM, QPSK     |
| Category 3            | 1.8Mbps              | 16QAM, QPSK     |
| Category 4            | 1.8Mbps              | 16QAM, QPSK     |
| Category 5            | 3.6Mbps              | 16QAM, QPSK     |
| Category 6            | 3.6Mbps              | 16QAM, QPSK     |
| Category 7            | 7.2Mbps              | 16QAM, QPSK     |
| Category 8            | 7.2Mbps              | 16QAM, QPSK     |
| Category 9            | 10.2Mbps             | 16QAM, QPSK     |
| Category 10           | 14.4Mbps             | 16QAM, QPSK     |
| Category 11           | 0.9Mbps              | QPSK            |
| Category 12           | 1.8Mbps              | QPSK            |
| Category 13           | 17.6Mbps             | 64QAM           |
| Category 14           | 21.1Mbps             | 64QAM           |
| Category 15           | 23.4Mbps             | 16QAM           |
| Category 16           | 28Mbps               | 16QAM           |
| Category 17           | 23.4Mbps             | 64QAM           |
| Category 18           | 28Mbps               | 64QAM           |
| Category 19           | 35.5Mbps             | 64QAM           |
| Category 20           | 42Mbps               | 64QAM           |
| Category 21           | 23.4Mbps             | 16QAM           |
| Category 22           | 28Mbps               | 16QAM           |
| Category 23           | 35.5Mbps             | 64QAM           |
| Category 24           | 42.2Mbps             | 64QAM           |
| HSUPA device category | Max data rate (peak) | Modulation type |
| Category 1            | 0.96Mbps             | QPSK            |
| Category 2            | 1.92Mbps             | QPSK            |
| Category 3            | 1.92Mbps             | QPSK            |
| Category 4            | 3.84Mbps             | QPSK            |
| Category 5            | 3.84Mbps             | QPSK            |
| Category 6            | 5.76Mbps             | QPSK            |
| Category 7            | 11.5Mbps             | 16QAM           |

| <b>LTE-FDD device category<br/>(Downlink)</b> | <b>Max data rate (peak)</b> | <b>Modulation type</b>  |
|-----------------------------------------------|-----------------------------|-------------------------|
| Category 1                                    | 10Mbps                      | QPSK/16QAM/64QAM        |
| Category 2                                    | 50Mbps                      | QPSK/16QAM/64QAM        |
| Category 3                                    | 100Mbps                     | QPSK/16QAM/64QAM        |
| Category 4                                    | 150Mbps                     | QPSK/16QAM/64QAM        |
| Category 5                                    | 300Mbps                     | QPSK/16QAM/64QAM        |
| Category 6                                    | 300Mbps                     | QPSK/16QAM/64QAM        |
| Category 7                                    | 300Mbps                     | QPSK/16QAM/64QAM        |
| Category 8                                    | 300Mbps                     | QPSK/16QAM/64QAM        |
| Category 9                                    | 450Mbps                     | QPSK/16QAM/64QAM        |
| Category 10                                   | 600Mbps                     | QPSK/16QAM/64QAM        |
| Category 11                                   | 600Mbps                     | QPSK/16QAM/64QAM/256QAM |
| Category 12                                   | 600Mbps                     | QPSK/16QAM/64QAM/256QAM |
| Category 13                                   | 600Mbps                     | QPSK/16QAM/64QAM/256QAM |
| <b>LTE-FDD device category<br/>(Uplink)</b>   | <b>Max data rate (peak)</b> | <b>Modulation type</b>  |
| Category 1                                    | 5Mbps                       | QPSK/16QAM              |
| Category 2                                    | 25Mbps                      | QPSK/16QAM              |
| Category 3                                    | 50Mbps                      | QPSK/16QAM              |
| Category 4                                    | 50Mbps                      | QPSK/16QAM              |
| Category 5                                    | 75Mbps                      | QPSK/16QAM/64QAM        |
| Category 6                                    | 50Mbps                      | QPSK/16QAM              |
| Category 7                                    | 150Mbps                     | QPSK/16QAM              |

## 10.2 Related Documents

**Table 37: Related Documents**

| NO.  | Title                                  | Description                                                                                                                                                                                                                                                                                               |
|------|----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [1]  | ITU-T Draft new recommendation V.25ter | Serial asynchronous automatic dialing and control                                                                                                                                                                                                                                                         |
| [2]  | GSM 07.07                              | Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME)                                                                                                                                                                                                              |
| [3]  | GSM 07.10                              | Support GSM 07.10 multiplexing protocol                                                                                                                                                                                                                                                                   |
| [4]  | GSM 07.05                              | Digital cellular telecommunications (Phase 2+); Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE – DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)                                                                                                |
| [5]  | GSM 11.14                              | Digital cellular telecommunications system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface                                                                                                                            |
| [6]  | GSM 11.11                              | Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface                                                                                                                                                            |
| [7]  | GSM 03.38                              | Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information                                                                                                                                                                                                        |
| [8]  | GSM 11.10                              | Digital cellular telecommunications system (Phase 2) ; Mobile Station (MS) conformance specification ; Part 1: Conformance specification                                                                                                                                                                  |
| [9]  | 3GPP TS 51.010-1                       | Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification                                                                                                                                                                                                     |
| [10] | 3GPP TS 34.124                         | Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment.                                                                                                                                                                                                                         |
| [11] | 3GPP TS 34.121                         | Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment.                                                                                                                                                                                                                         |
| [12] | 3GPP TS 34.123-1                       | Technical Specification Group Radio Access Network; Terminal conformance specification; Radio transmission and reception (FDD)                                                                                                                                                                            |
| [13] | 3GPP TS 34.123-3                       | User Equipment (UE) conformance specification; Part 3: Abstract Test Suites.                                                                                                                                                                                                                              |
| [14] | EN 301 908-02 V2.2.1                   | Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000. Third Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive |
| [15] | EN 301 489-24 V1.2.1                   | Electromagnetic compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment                             |
| [16] | IEC/EN60950-1(2001)                    | Safety of information technology equipment (2000)                                                                                                                                                                                                                                                         |
| [17] | 3GPP TS 51.010-1                       | Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification                                                                                                                                                                                                     |
| [18] | GCF-CC V3.23.1                         | Global Certification Forum - Certification Criteria                                                                                                                                                                                                                                                       |
| [19] | 2002/95/EC                             | Directive of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain                                                                                                                                                                                       |

|      |                                                                    |                                                                      |
|------|--------------------------------------------------------------------|----------------------------------------------------------------------|
|      |                                                                    | hazardous substances in electrical and electronic equipment (RoHS)   |
| [20] | <b>SIM7X00<br/>Series_UART_Application<br/>Note_V1.xx</b>          | This document describes how to use UART interface of SIMCom modules. |
| [21] | <b>Antenna design guidelines<br/>for diversity receiver system</b> | Antenna design guidelines for diversity receiver system              |

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## 10.3 Terms and Abbreviations

Table 38: Terms and Abbreviations

| Abbreviation | Description                                                     |
|--------------|-----------------------------------------------------------------|
| ADC          | Analog-to-Digital Converter                                     |
| ARP          | Antenna Reference Point                                         |
| BER          | Bit Error Rate                                                  |
| BTS          | Base Transceiver Station                                        |
| CS           | Coding Scheme                                                   |
| CSD          | Circuit Switched Data                                           |
| CTS          | Clear to Send                                                   |
| DAC          | Digital-to-Analog Converter                                     |
| DRX          | Discontinuous Reception                                         |
| DSP          | Digital Signal Processor                                        |
| DTE          | Data Terminal Equipment (typically computer, terminal, printer) |
| DTR          | Data Terminal Ready                                             |
| DTX          | Discontinuous Transmission                                      |
| EFR          | Enhanced Full Rate                                              |
| EGSM         | Enhanced GSM                                                    |
| EMC          | Electromagnetic Compatibility                                   |
| ESD          | Electrostatic Discharge                                         |
| ETS          | European Telecommunication Standard                             |
| EVDO         | Evolution Data Only                                             |
| FCC          | Federal Communications Commission (U.S.)                        |
| FD           | SIM fix dialing phonebook                                       |
| FDMA         | Frequency Division Multiple Access                              |
| FR           | Full Rate                                                       |
| GMSK         | Gaussian Minimum Shift Keying                                   |
| GNSS         | Global Navigation Satellite System                              |
| GPRS         | General Packet Radio Service                                    |
| GPS          | Global Positioning System                                       |
| GSM          | Global Standard for Mobile Communications                       |
| HR           | Half Rate                                                       |
| HSPA         | High Speed Packet Access                                        |
| HSIC         | High-speed Inter-chip                                           |
| I2C          | Inter-Integrated Circuit                                        |
| IMEI         | International Mobile Equipment Identity                         |
| LTE          | Long Term Evolution                                             |
| MDIO         | Management Data Input/Output                                    |

|               |                                                             |
|---------------|-------------------------------------------------------------|
| <b>MMD</b>    | MDIO manageable device                                      |
| <b>MO</b>     | Mobile Originated                                           |
| <b>MS</b>     | Mobile Station (GSM engine), also referred to as TE         |
| <b>MT</b>     | Mobile Terminated                                           |
| <b>NMEA</b>   | National Marine Electronics Association                     |
| <b>PAP</b>    | Password Authentication Protocol                            |
| <b>PBCCH</b>  | Packet Switched Broadcast Control Channel                   |
| <b>PCB</b>    | Printed Circuit Board                                       |
| <b>PCS</b>    | Personal Communication System, also referred to as GSM 1900 |
| <b>RF</b>     | Radio Frequency                                             |
| <b>RMS</b>    | Root Mean Square (value)                                    |
| <b>RTC</b>    | Real Time Clock                                             |
| <b>SIM</b>    | Subscriber Identification Module                            |
| <b>SMS</b>    | Short Message Service                                       |
| <b>SPI</b>    | serial peripheral interface                                 |
| <b>SMPS</b>   | Switched-mode power supply                                  |
| <b>TDMA</b>   | Time Division Multiple Access                               |
| <b>TE</b>     | Terminal Equipment, also referred to as DTE                 |
| <b>TX</b>     | Transmit Direction                                          |
| <b>UART</b>   | Universal Asynchronous Receiver & Transmitter               |
| <b>VSWR</b>   | Voltage Standing Wave Ratio                                 |
| <b>SM</b>     | SIM phonebook                                               |
| <b>SGMII</b>  | Serial gigabit media independent interface                  |
| <b>NC</b>     | Not connect                                                 |
| <b>EDGE</b>   | Enhanced data rates for GSM evolution                       |
| <b>HSDPA</b>  | High Speed Downlink Packet Access                           |
| <b>HSUPA</b>  | High Speed Uplink Packet Access                             |
| <b>ZIF</b>    | Zero intermediate frequency                                 |
| <b>WCDMA</b>  | Wideband Code Division Multiple Access                      |
| <b>VCTCXO</b> | Voltage control temperature-compensated crystal oscillator  |
| <b>USIM</b>   | Universal subscriber identity module                        |
| <b>UMTS</b>   | Universal mobile telecommunications system                  |
| <b>UART</b>   | Universal asynchronous receiver transmitter                 |

## 10.4 Safety Caution

**Table 39: Safety Caution**

| Marks                                                                               | Requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive and not operate normally due to RF energy interference.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|    | 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 to prevent interference with communication systems. Forgetting to think much of these instructions may impact the flight safety, or offend local legal action, or both.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|   | Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres 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 sets, radios, computers or other electric equipment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|  | Road safety comes first! Do not use a hand-held cellular terminal or mobile when 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|  | <p>GSM cellular terminals or mobiles operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, especially with a mobile fee or an invalid SIM card. While you are in this condition and need emergent help, please remember to use emergency calls. 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.</p> <p>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.</p> <p>Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.</p> |

## FCC Caution

### § 15.19 Labeling requirements.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### § 15.21 Information to user.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

### § 15.105 Information to the user.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

KDB 996369 D03 OEM Manual v01 Requirement

### **2.2 List of applicable FCC rules**

Device compliance with FCC part 22/24/27/90

### **2.3 Summarize the specific operational use conditions**

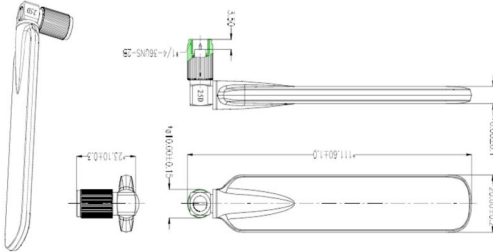
**Device only a single modular transmitter, that support WCDMA/ LTE**

### **2.4 Limited module procedures**

**Device only a single modular transmitter, single module approval**

## 2.5 Trace antenna designs

With a PIFA antenna, maximum antenna gain is 3.12dBi



## 2.6 RF exposure considerations

The device complies with FCC Part 2.1901 RF exposure evaluation with 20cm distance

## 2.7 Antennas

With a PIFA antenna, maximum antenna gain is 3.12dBi

## 2.8 Label and compliance information

The label include FCC ID: 2AJYU-8MH0012, and other compliance information statement provide in the user manual .

And the host product manufacturers that they need to provide a physical or e-label stating “Contains FCC ID: 2AJYU-8MH0012” when use this module.

## 2.9 Information on test modes and additional testing requirements

## 2.10 Additional testing, Part 15 Subpart B disclaimer