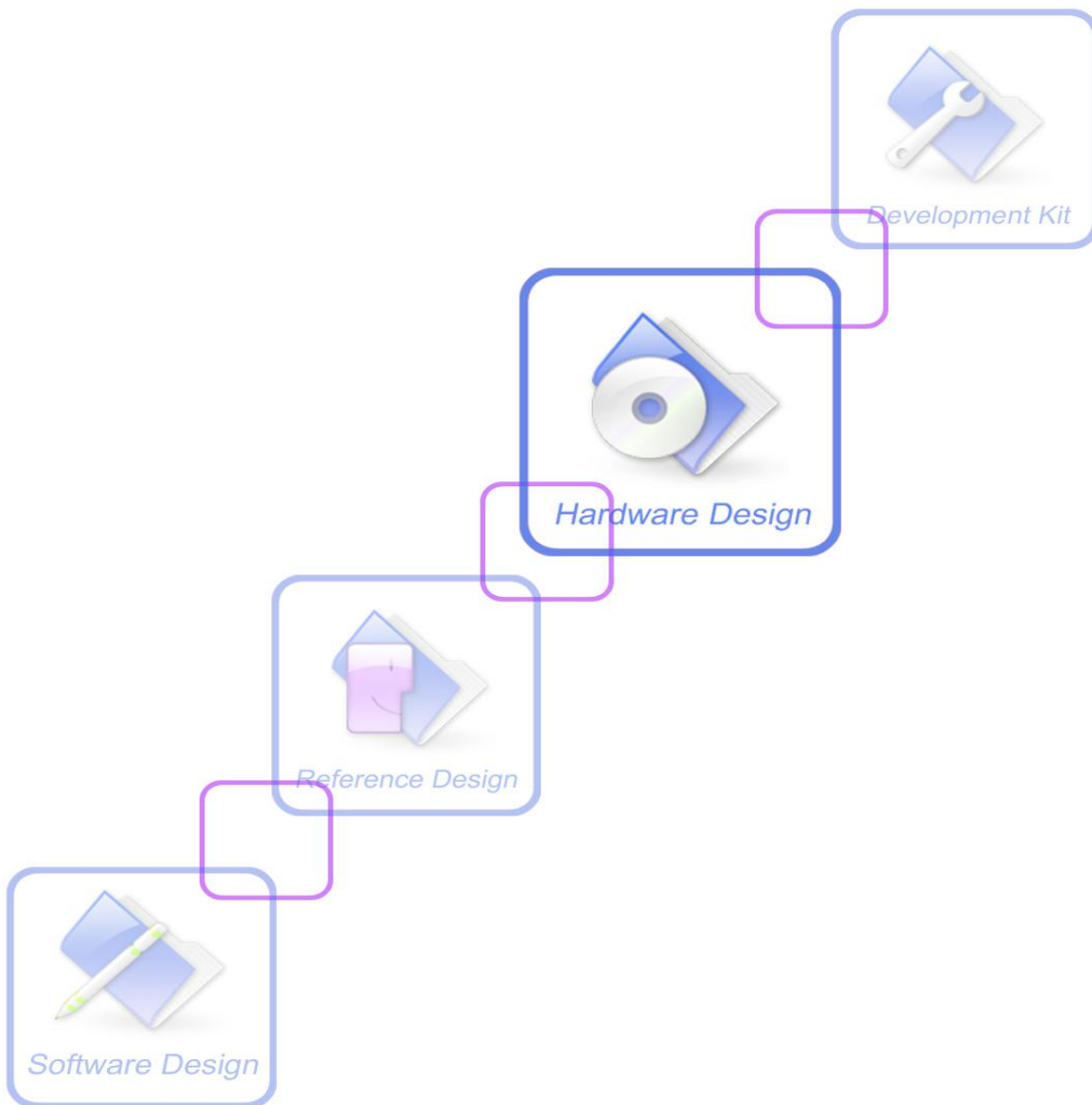




SIM7600 Series_ PCIE_ Hardware Design_ V1.03



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Version History

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|------------|---------|---|---------------------------------------|
| 2017-11-23 | 1.00 | Origin | Ma Honggang Gao Fan Yuan Shijie |
| 2018-5-23 | V1.01 | Modify Table1,table2, table20,table21,table22,table24 Add figure30 Add GNSS active antenna explain Modify figure1,29 Add PCM Interface Modify Figure 3 | Gao fan Yuan shijie |
| 2019-7-23 | V1.02 | Add SIM7600G/SIM7600G-H version information Modify ESD characteristics Add I2C comment note | Jiang xutao |
| 2022-11-03 | V1.03 | Update uart rate. | Liu Wang Rong |

1. Introduction

This document describes the electronic specifications, RF specifications, interfaces, mechanical characteristics and testing results of the SIMCom SIM7600 Series-PCIE (in the following chapter, the document only describe the SIM7600 Series-PCIE) modules. With the help of this document and other related software application notes/user guides, users can understand and use SIM7600 Series-PCIE modules to design and develop applications quickly.

1.1 Product Outline

Aimed at global market, the SIM7600 Series-PCIE modules support 4 air-interface standards including GSM, WCDMA, LTE-TDD and LTE-FDD. Users can choose the module according to the wireless network configuration. The supported radio frequency bands are described in the following table.

So far, the following models have been included, that A/A-H/V-H/E/E-H/JC-H/SA/SA-H.

Table 1: SIM7600 Series-PCIE Series Frequency Bands

| Standard | Frequency | A | A-H | V-H | E | E-H | JC-H | SA | SA-H | G | G-H |
|----------|-----------|---|-----|-----|---|-----|------|----|------|---|-----|
| GSM | 850MHz | | | | | | | ✓ | ✓ | ✓ | ✓ |
| | 900MHz | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | 1800M Hz | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | 1900M Hz | | | | | | | ✓ | ✓ | ✓ | ✓ |
| WCDMA | BAND1 | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | BAND2 | ✓ | ✓ | | | | | ✓ | ✓ | ✓ | ✓ |
| | BAND4 | | | | | | | | | ✓ | ✓ |
| | BAND5 | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | BAND6 | | | | | | | | | ✓ | ✓ |
| | BAND8 | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | BAND19 | | | | | | | | | ✓ | ✓ |
| LTE | FDD B1 | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | FDD B2 | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ |
| | FDD B3 | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | FDD B4 | ✓ | ✓ | ✓ | | | | ✓ | ✓ | ✓ | ✓ |
| | FDD B5 | | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | FDD B7 | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | FDD B8 | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | FDD B12 | ✓ | ✓ | | | | | | | ✓ | ✓ |
| | FDD B13 | | | ✓ | | | | | | ✓ | ✓ |
| | FDD B18 | | | | | | ✓ | | | ✓ | ✓ |
| | FDD B19 | | | | | | ✓ | | | ✓ | ✓ |

| | | | | | | | | | | | |
|----------|---------|------|------|------|------|------|------|------|------|------|------|
| | FDD B20 | | | | ✓ | ✓ | | | | ✓ | ✓ |
| | FDD B25 | | | | | | | | | ✓ | ✓ |
| | FDD B26 | | | | | | ✓ | | | ✓ | ✓ |
| | FDD B28 | | | | | | | ✓ | ✓ | ✓ | ✓ |
| | FDD B66 | | | | | | | | | ✓ | ✓ |
| | TDD B34 | | | | | | | | | ✓ | ✓ |
| | TDD B38 | | | | ✓ | ✓ | | | | ✓ | ✓ |
| | TDD B39 | | | | | | | | | ✓ | ✓ |
| | TDD B40 | | | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ |
| | TDD B41 | | | | ✓ | ✓ | | | | ✓ | ✓ |
| Category | | CAT1 | CAT4 | CAT4 | CAT1 | CAT4 | CAT4 | CAT1 | CAT4 | CAT1 | CAT4 |
| GNSS | | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ |

**Note: SIM7600 Series-PCIE only support digital audio feature through PCM interface. SIM7600 Series-PCIEA only support Analog audio feature through analog audio interface.*

**Note: CAT1 or CAT4 correspond to different PN numbers.*

1.2 Hardware Interface Overview

SIM7600 Series-PCIE provides various hardware interfaces via Mini PCI Express card connector.

- Power Supply
- PERST#
- W_DISABLE#
- LED_WWAN#
- WAKE#
- USB Interface
- USIM Interface
- UART Interface
- I2C Interface
- PCM Interface
- Analog Audio Interface* (Only provided on PCIEA products)

1.3 Hardware Block Diagram

The following figure is SIM7600 Series-PCIE hardware block diagram.

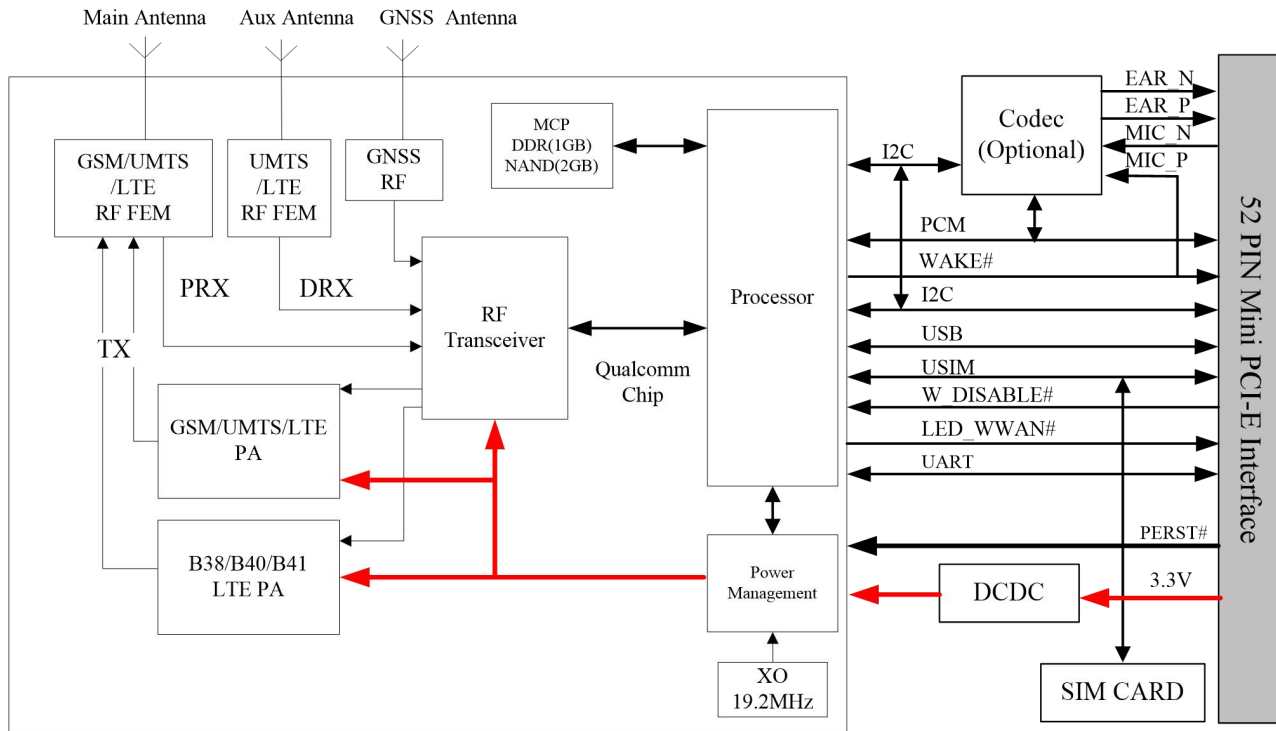


Figure 1: SIM7600 Series-PCIE Block Diagram

1.4 Functional Overview

Table 2: SIM7600 Series-PCIE Key Features

| Feature | Implementation |
|------------------------------|---|
| Power supply | Single supply voltage 3.0V~3.6V (3.3V typical) |
| Radio frequency bands | Please refer to the table 1 |
| Transmitting power | <p>GSM/GPRS power class:</p> <ul style="list-style-type: none"> --GSM850: 4 (2W) --EGSM900: 4 (2W) --DCS1800: 1 (1W) --PCS1900: 1 (1W) <p>EDGE power class:</p> <ul style="list-style-type: none"> --GSM850: E2 (0.5W) --EGSM900: E2 (0.5W) --DCS1800: E1 (0.4W) --PCS1900: E1 (0.4W) <p>UMTS power class:</p> <ul style="list-style-type: none"> --WCDMA :3 (0.25W) --LTE power class: 3 (0.25W) |
| Data Transmission Throughput | <p>GPRS multi-slot class 12</p> <p>EDGE multi-slot class 12</p> <p>UMTS R99 speed: 384 kbps DL/UL</p> <p>HSPA+: 5.76 Mbps(UL), 42 Mbps(DL)</p> <p>TD-HSDPA/HSUPA: 2.2 Mbps(UL), 2.8 Mbps(DL)</p> |

| | |
|--------------------------|---|
| | <p>LTE CAT4 : Support MIMO in DL Direction</p> <p>FDD-LTE CAT4: 150 Mbps (DL), 50 Mbps (UL)</p> <p>TDD-LTE CAT4: 130 Mbps (DL), 35 Mbps (UL)</p> <p>FDD-LTE CAT1: 10 Mbps (DL), 5 Mbps (UL)</p> <p>TDD-LTE CAT1: 8.96 Mbps (DL), 3.1 Mbps (UL)</p> |
| Antenna | <p>GSM/UMTS/LTE main antenna.</p> <p>UMTS/LTE auxiliary antenna</p> <p>GNSS antenna</p> |
| GNSS | <p>GNSS engine (GPS, GLONASS and BD)</p> <p>Protocol: NMEA</p> |
| SMS | <p>MT, MO, CB, Text and PDU mode</p> <p>SMS storage: USIM card or ME(default)</p> <p>Transmission of SMS alternatively over CS or PS</p> |
| USIM interface | Support identity card: 1.8V/ 3V |
| USIM application toolkit | <p>Support SAT class 3, GSM 11.14 Release 98</p> <p>Support USAT</p> |
| Phonebook management | Support phonebook types: SM, FD, LD, RC, ON, MC |
| Audio feature | <p><i>SIM7600 Series-PCIE product support digital audio interface.</i></p> <p>Support PCM interface. Only support PCM master mode and short frame sync, 16-bit linear data formats. Available only when audio codec chip is not mounted on PCIE board</p> <p><i>SIM7600 Series-PCIEA product support analog audio interface.</i></p> <p>One analog signal output with 32 Ω load resistance, 50mW output power, and one analog input. Available only when audio codec chip is mounted on PCIE board.</p> |
| UART interface | <p>A full modem serial port by default</p> <p>Baud rate: 300bps to 4Mbps(default:115200bps)</p> <p>Autobauding baud rate: 9600,19200,38400,57600,115200bps</p> <p>Can be used as the AT commands or data stream channel.</p> <p>Support RTS/CTS hardware handshake and software ON/OFF flow control</p> <p>Multiplex ability according to GSM 07.10 Multiplexer Protocol.</p> |
| USB | USB 2.0 high speed interface |
| Firmware upgrade | Firmware upgrade over USB interface or FOTA |
| Physical characteristics | <p>Size: 50.80*31*5.35mm</p> <p>Weight: less than 12g</p> |
| Temperature range | <p>Normal operation temperature: -30°C to +80°C</p> <p>Extended operation temperature: -40°C to +85°C*</p> <p>Storage temperature -45°C to +90°C</p> |

****Note: Module is able to make and receive voice calls, data calls, SMS and make GPRS/WCDMA/HSPA+/LTE traffic in -40°C~+85°C. The performance will reduce slightly from the 3GPP specifications if the temperature is outside of the normal operating temperature and still within the extreme operating temperature.***

2. Package Information

2.1 Pin Out Diagram

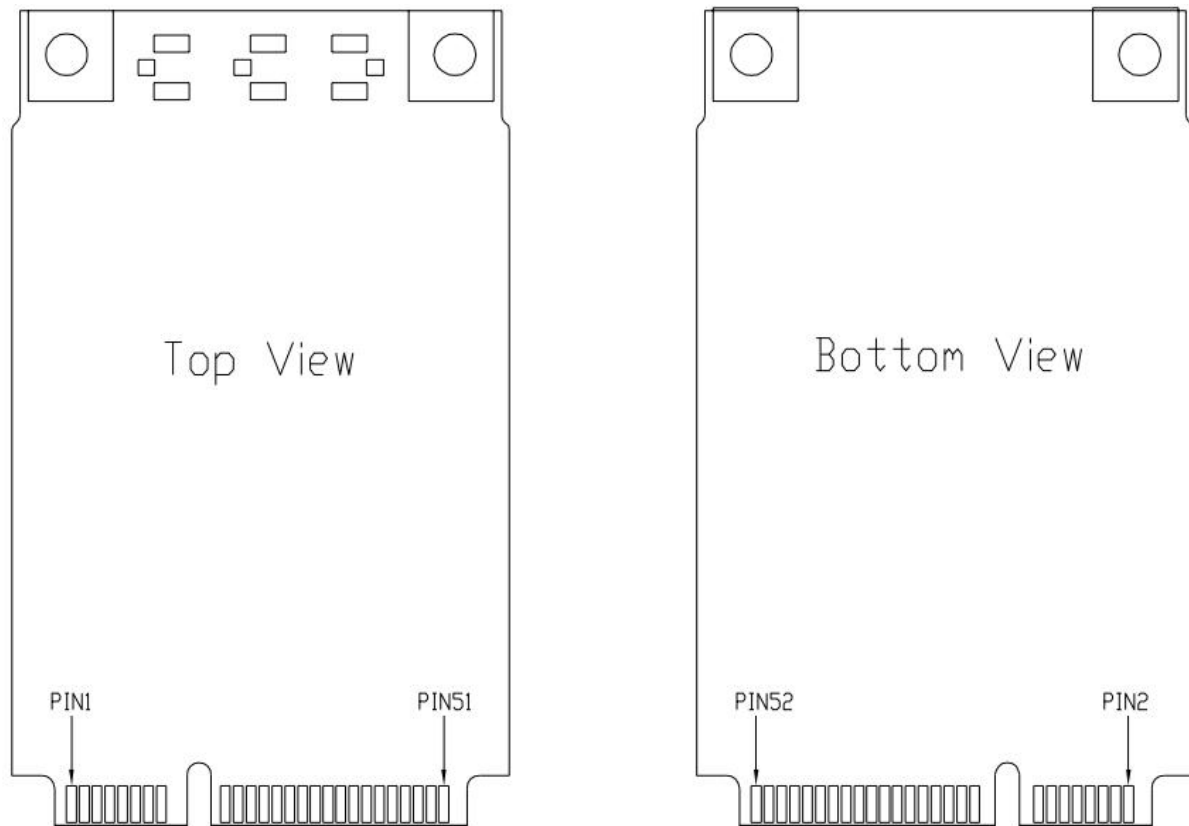


Figure 2: SIM7600 Series-PCIE Pin out Diagram

2.2 PCI Express Mini Card Connector Pin Description

Table 3: PCI Express Mini Card Connector Pin Description

| Pin name | Pin number | I/O | Description | Comment |
|---|---|-----|---|---|
| Power supply | | | | |
| VCC | 2,24,39,41,52 | I | Power supply for module | 3.3V typical |
| GND | 4,9,15,18,21, 26,27,29,34,3 5,37,40,43,50 | | Ground | - |
| Reset | | | | |
| PERST# | 22 | I | Reset input (Active low) | If unused, keep open. |
| USB 2.0 | | | | |
| USB_DP | 38 | I/O | USB 2.0 high speed port for data transfer, voice call, debug and FW download, etc. | If unused, keep open. |
| USB_DN | 36 | | | |
| USIM card interface | | | | |
| USIM_VDD | 8 | O | Power output for USIM card, its output Voltage depends on USIM card type automatically. Its output current is up to 50mA. | - |
| USIM_DATA | 10 | I/O | USIM Card data I/O, which has been pulled up via a 100KR resistor to USIM_VDD internally. Do not pull it up or down externally. | - |
| USIM_CLK | 12 | O | USIM clock. | Make sure the rise time and fall time of USIM_CLK less than 40ns; |
| USIM_RST | 14 | O | USIM Reset. | - |
| USIM_DET | 16 | I | USIM card detect. | - |
| PCM interface (Only supported at SIM7600 Series-PCIE, these are NC pins for SIM7600 Series-PCIEA product) | | | | |
| PCM_CLK | 45 | O | PCM data bit clock. | If these pins are unused, keep open. The PCM interface cannot be used, if Audio Codec chip is mounted on PCIE board. |
| PCM_OUT | 47 | O | PCM data output | |
| PCM_IN | 49 | I | PCM data input | |
| PCM_SYNC | 51 | O | PCM data frame sync signal. | |
| UART interface | | | | |
| UART_CTS | 11 | I | Clear to Send | If unused, keep open |
| UART RTS | 13 | O | Request to send | |

| | | | | |
|---------------|---------------------------------|-----|---|---|
| UART_RXD | 17 | I | Receive Data | |
| UART_TXD | 19 | O | Transmit Data | |
| UART_RI | 44 | O | Ring Indicator | |
| UART_DTR | 46 | I | DTE get ready | |
| I2C interface | | | | |
| SCL | 30 | O | I2C clock output | Pulled up inside the module; If unused, keep open 1.8V interface |
| SDA | 32 | I/O | I2C data input/output | |
| Others | | | | |
| WAKE#/MICP | 1 | I/O | SIM7600 Series-PCIE: Wake up host SIM7600 Series-PCIEA: MIC positive input | If unused, keep open. If Analog audio is available, wake up function is invalid. If Analog audio is needed, please consult our sales staff, for more information. |
| MICN | 3 | I | SIM7600 Series-PCIE: NC SIM7600 Series-PCIEA: MIC negative input | |
| EARP | 5 | O | SIM7600 Series-PCIE: NC SIM7600 Series-PCIEA: Receiver positive output | |
| EARN | 7 | O | SIM7600 Series-PCIE: NC SIM7600 Series-PCIEA: Receiver negative output | |
| W_DISABLE# | 20 | I | RF Control Input | If unused, keep open. |
| LED_WWAN# | 42 | O | Network Status Indication output | If unused, keep open. |
| NC | 6,23,25,28,31,33,45,47,48,49,51 | -- | No connection | Keep open |

2.3 Package Dimensions

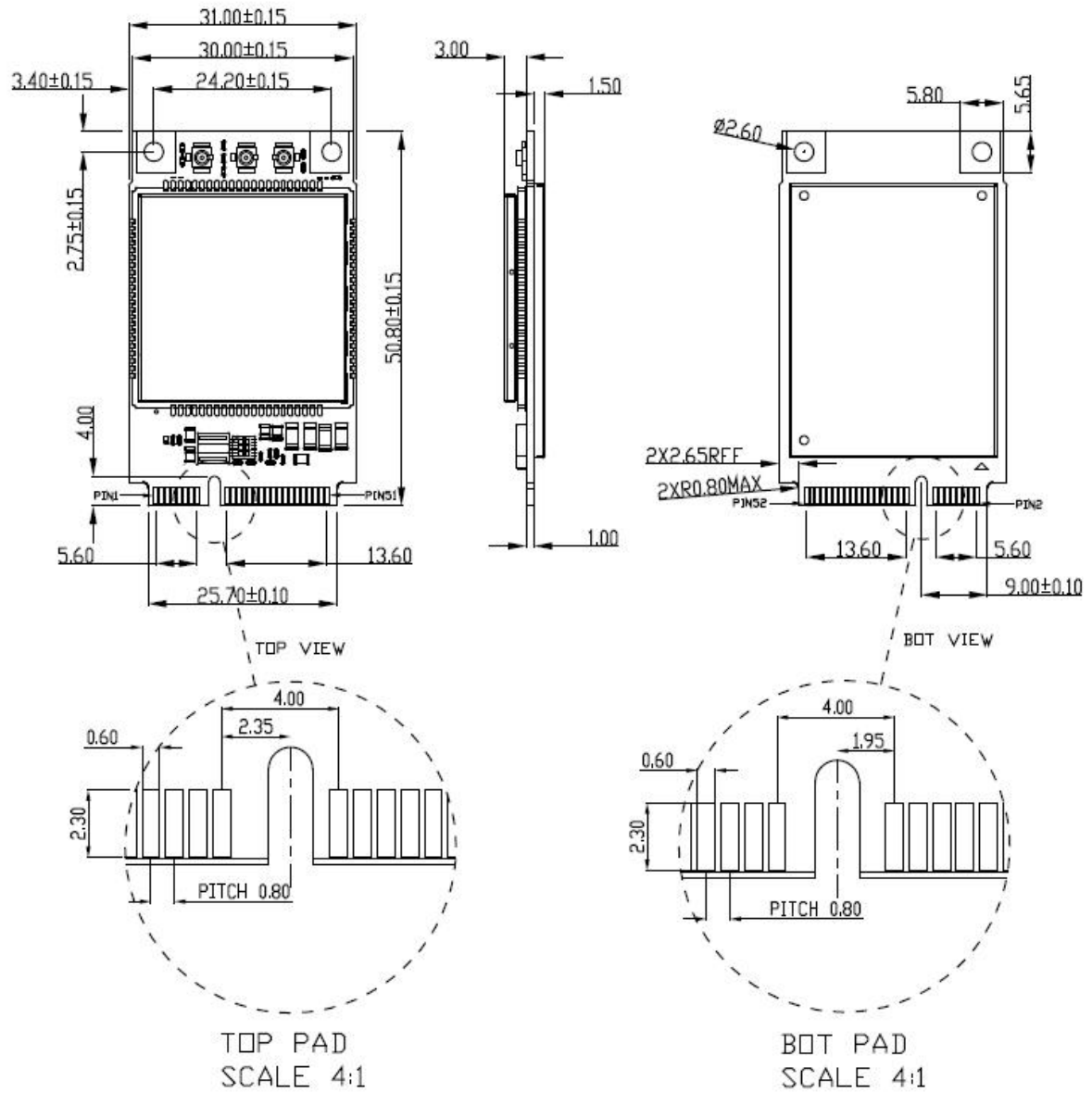


Figure 3: Dimensions of SIM7600 Series-PCIE (Unit: mm)

3. Interface Application

3.1 Power Supply

The recommended power supply voltage of SIM7600 Series-PCIE is 3.3V.

Table 4: Recommended 3.3V Power Supply Characteristics

| Symbol | Parameter | Min | Type | Max | Unit |
|----------------|---------------------------|-----|------|-----|------|
| V _o | Power supply voltage | 3.0 | 3.3 | 3.6 | V |
| I _o | Supply current capability | - | 2000 | - | mA |

3.2 PERST#

SIM7600 Series-PCIE can be reset by pulling the PERST# pin down to ground.

The PERST# pin has been pulled up with a 40Ω resistor to 1.8V internally, so there is no need to pull it up externally. It is strongly recommended to put a 100nF capacitor and an ESD protection diode close to the PERST# pin. Please refer to the following figure for the recommended reference circuit.

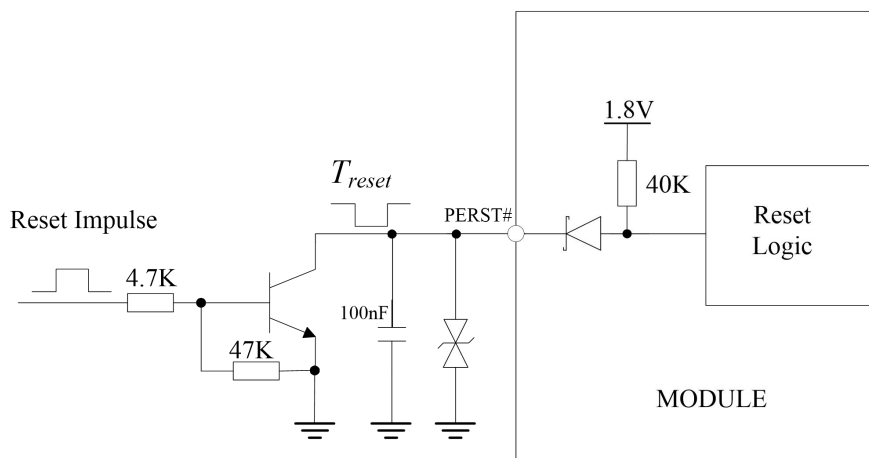


Figure 4: PERST# Reference Circuit

Table 5: PERST# Pin Electronic Characteristic

| Symbol | Description | Min. | Typ. | Max. | Unit |
|--------------------|---|------|------|------|------|
| T _{reset} | The active low level time impulse on PERST# pin to reset module | 50 | 100 | 500 | ms |
| V _{IH} | Input high level voltage | 1.17 | 1.8 | 3.6 | V |
| V _{IL} | Input low level voltage | -0.3 | 0 | 0.2 | V |

3.3 W_DISABLE#

The W_DISABLE# pin can be used to control SIM7600 Series-PCIE to enter or exit the Flight mode. In Flight mode, the RF circuit is closed to prevent interference with other equipments and minimize current consumption.

Table 6: W_DISABLE# Pin Status

| W_DISABLE# status | Module operation |
|-------------------|--|
| Input Low Level | Flight Mode: RF is closed. |
| Input High Level | The module mode depends on AT+CFUN command: AT+CFUN=1: RF is working. AT+CFUN=0: RF is closed. |

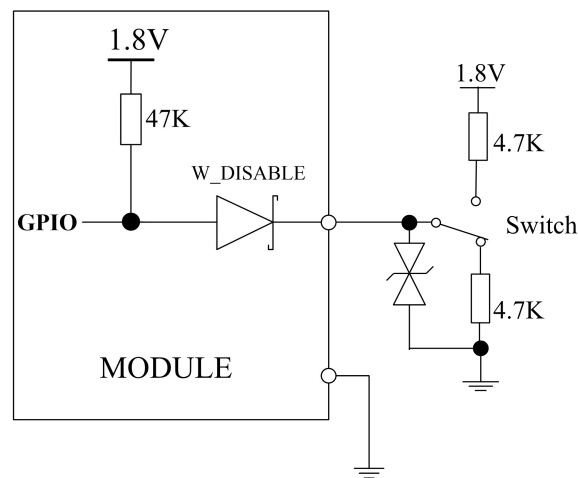


Figure 5: W_DISABLE# Reference Circuit

Table 7: W_DISABLE# Pin Electrical Characteristic

| Symbol | Parameter | Min | Type | Max | Unit |
|-----------------|--------------------------|------|------|-----|------|
| V _{IH} | High-level input voltage | 1.17 | 1.8 | 3.6 | V |
| V _{IL} | Low-level input voltage | -0.3 | 0 | 0.3 | V |

3.4 LED_WWAN#

The LED_WWAN# pin can be used to drive a network status indication LED by default. Its status is listed in the following table.

Table 8: Network Status Indication LED Status

| LED Status | Module Status |
|---------------------|--|
| Always On | Searching Network; Call Connect(include VOLTE,SRLTE) |
| 200ms ON, 200ms OFF | Data Transmit; 4G registered; |
| 800ms ON, 800ms OFF | 2G/3G registered network |
| OFF | Power off ;Sleep |

Note: NETLIGHT output low level as “OFF”, and high level as “ON”.

Reference circuit is recommended in the following figure:

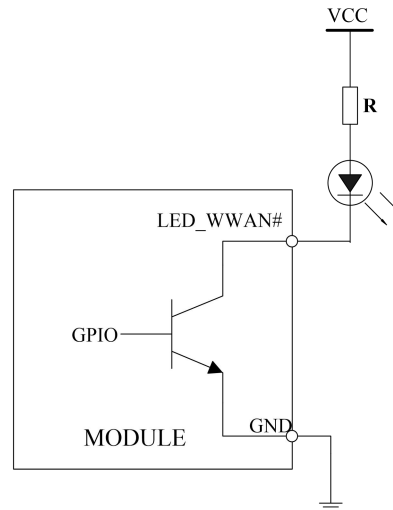


Figure 6: LED_WWAN# Reference Circuit

3.5 WAKE#

The WAKE# pin can be used as an interrupt signal to host. Normally it will keep high logic level until certain condition such as receiving SMS, voice call (CSD, video) or URC reporting, then WAKE# will change to low logic level to inform the master (client PC). It will stay low until the master clears the interrupt event with AT command.

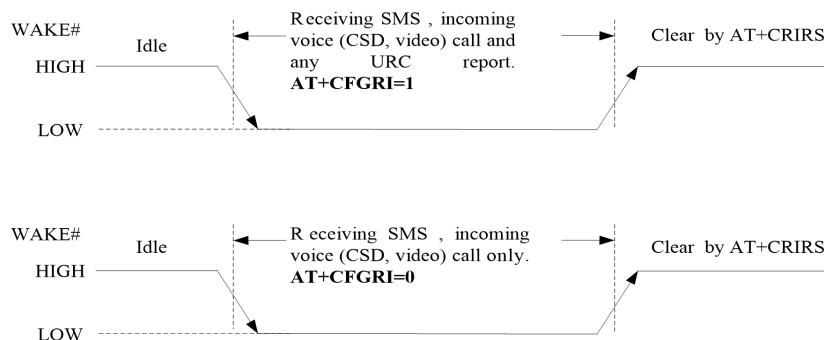


Figure 7: WAKE# behaviour

However, if the module is used as caller, the WAKE# will remain high. Please refer to the following figure.

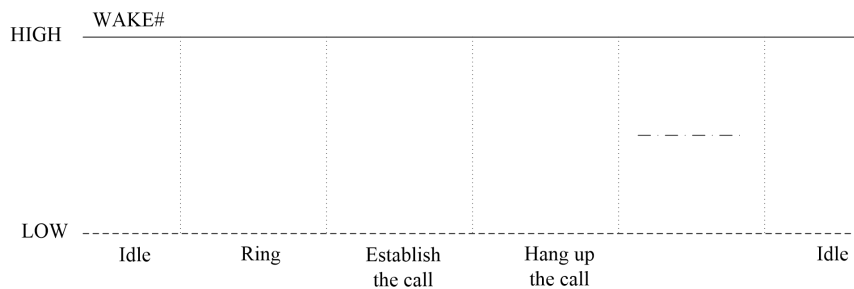


Figure 8: WAKE# behaviour as a caller

WAKE# Reference circuit is recommended in the following figure:

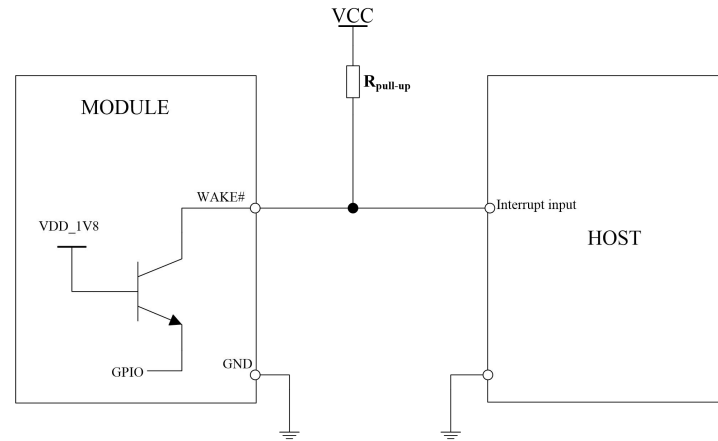


Figure 9: WAKE# Reference Circuit

Note: If Analog audio is available, WAKE# function is invalid.

3.6 USB 2.0

SIM7600 Series-PCIE is compliant with USB 2.0 specification. It supports full-speed and high-speed when acting as a peripheral device.

SIM7600 Series-PCIE can be used as a USB device. SIM7600 Series-PCIE supports the USB suspend and resume mechanism which can reduce power consumption. If there is no data transmission on the USB bus, SIM7600 Series-PCIE will enter suspend mode automatically, and will be resumed by some events such as voice call or receiving SMS, etc.

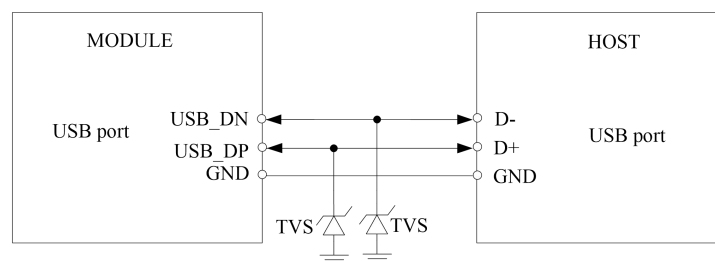


Figure 10: USB Reference Circuit

Because of the high bit rate on USB bus, please pay more attention to the influence of the junction capacitance of the ESD component on USB data lines. Typically, the capacitance should be less than 1pF. It is recommended to use an ESD protection component such as ESD9L5.0ST5G provided by On Semiconductor (www.onsemi.com).

Note;

1. The USB_DN and USB_DP nets must be traced by 90Ohm \pm 10% differential impedance.
2. The USB VBUS of the module is connected to VBAT internally, so there is no need to connect externally.
3. The SIM7600 Series-PCIE has two kinds of interface (UART and USB) to connect to host CPU. For example, on windows XP operating system, USB interface is mapped to 4 virtual ports: "SimTech HS-USB Audio 9001", "SimTech HS-USB AT port 9001", "SimTech HS-USB Diagnostics 9001", "SimTech HS-USB NMEA 9001".

3.7 USIM Interface

USIM interface complies with the GSM Phase 1 specification and the new GSM Phase 2+ specification for FAST 64 kbps USIM card. Both 1.8V and 3.0V USIM card are supported. USIM interface is powered from an internal regulator in the module.

Table 9: USIM Electronic characteristic in 1.8V mode (USIM_VDD =1.8V)

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|----------------|------|---------------|------|
| USIM_VDD | LDO power output voltage | 1.75 | 1.8 | 1.95 | V |
| V _{IH} | High-level input voltage | 0.65*USIM_VDD | - | USIM_VDD +0.3 | V |
| V _{IL} | Low-level input voltage | -0.3 | 0 | 0.35*USIM_VDD | V |
| V _{OH} | High-level output voltage | USIM_VDD -0.45 | - | USIM_VDD | V |
| V _{OL} | Low-level output voltage | 0 | 0 | 0.45 | V |

Table 10: USIM Electronic characteristic 3.0V mode (USIM_VDD =2.95V)

| Symbol | Parameter | Min. | Typ. | Max. | Unit |
|-----------------|---------------------------|----------------|------|---------------|------|
| USIM_VDD | LDO power output voltage | 2.75 | 2.95 | 3.05 | V |
| V _{IH} | High-level input voltage | 0.65*USIM_VDD | - | USIM_VDD +0.3 | V |
| V _{IL} | Low-level input voltage | -0.3 | 0 | 0.25*USIM_VDD | V |
| V _{OH} | High-level output voltage | USIM_VDD -0.45 | - | USIM_VDD | V |
| V _{OL} | Low-level output voltage | 0 | 0 | 0.45 | V |

It is recommended to use an ESD protection component such as ST (www.st.com) ESDA6V-5W6. Note that the USIM peripheral circuit should be close to the USIM card socket. For more details of AT commands about USIM, please refer to document [1].

The USIM_DET pin is used for detection of the USIM card hot plug. User can select the 8-pin USIM card holder to implement USIM card detection function.

USIM_DET has been pulled up to 1.8V inside module;

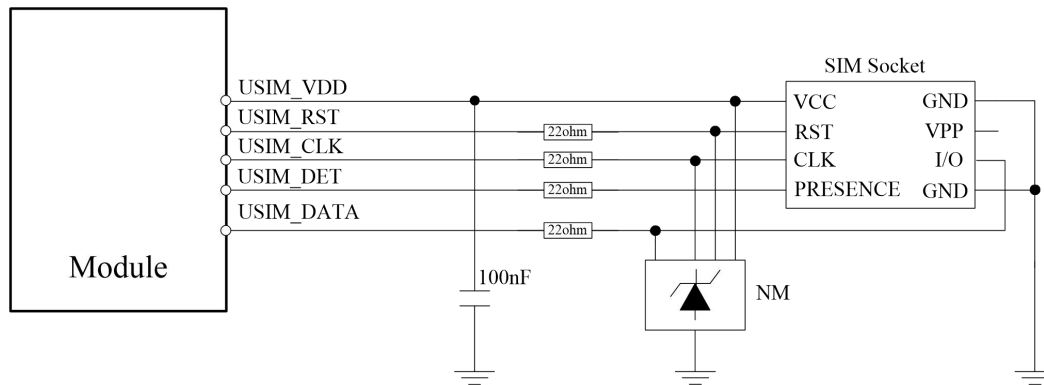


Figure 11: USIM interface reference circuit with detection function

If the USIM card detection function is not used, user can keep the USIM_DET pin open. The reference circuit of 6-pin USIM card holder is illustrated in the following figure.

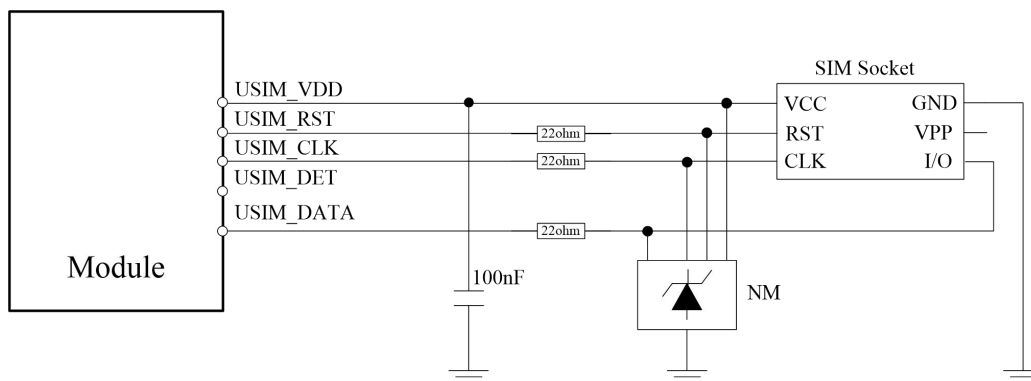


Figure 12: USIM interface reference circuit

Note: *USIM_DATA has been pulled up with a 10K Ω resistor to USIM_VDD in module. A 100nF capacitor on USIM_VDD is used to reduce interference.*

Note: *USIM_CLK is very important signal; customer must make sure the rise time and fall time of USIM_CLK less than 40ns!*

3.8 UART Interface

SIM7600 Series-PCIE provides one UART (universal asynchronous serial transmission) port. The module is as the DCE (Data Communication Equipment) and the client PC is as the DTE (Data Terminal Equipment). AT commands are entered and serial communication is performed through UART interface.

The application circuit is in the following figures.

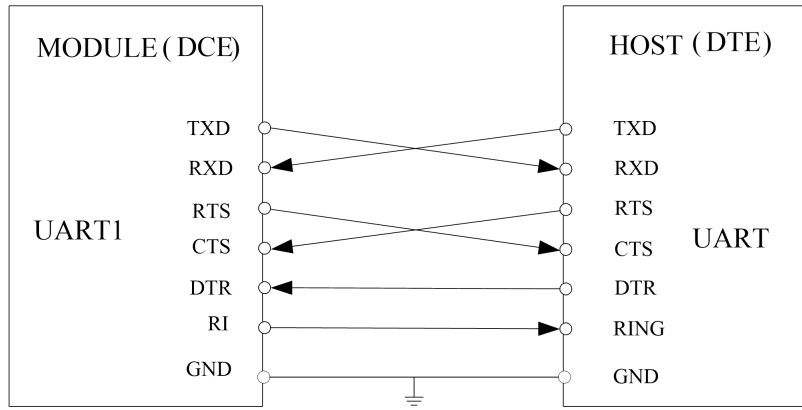


Figure 13: UART Full modem

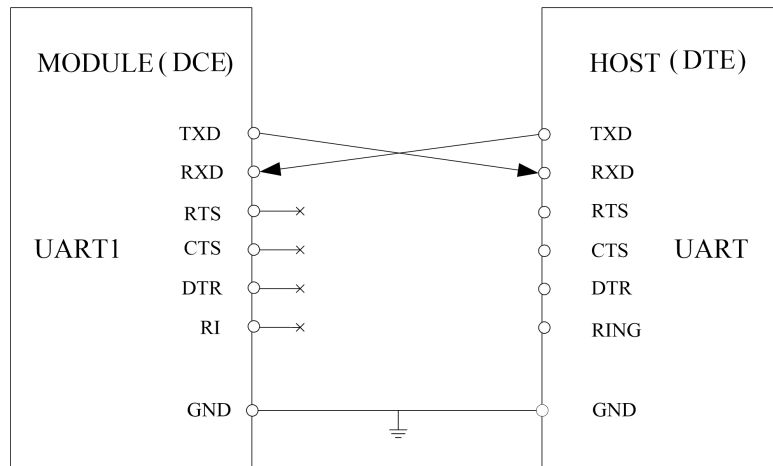


Figure 14: UART Null modem

Table 11: UART Electrical Characteristic

| Symbol | Parameter | Min | Typ | Max | Unit |
|-----------------|---------------------------|------|-----|------|------|
| V _{IH} | High-level input voltage | 1.17 | 1.8 | 2.1 | V |
| V _{IL} | Low-level input voltage | -0.3 | 0 | 0.63 | V |
| V _{OH} | High-level output voltage | 1.35 | 1.8 | 1.8 | V |
| V _{OL} | Low-level output voltage | 0 | 0 | 0.45 | V |

The SIM7600 Series-PCIE UART is 1.8V interface. A level shifter should be used if user's application is equipped with a 3.3V UART interface. The level shifter TXB0108RGYR provided by Texas Instruments is recommended. The reference design of the TXB0108RGYR is in the following figures.

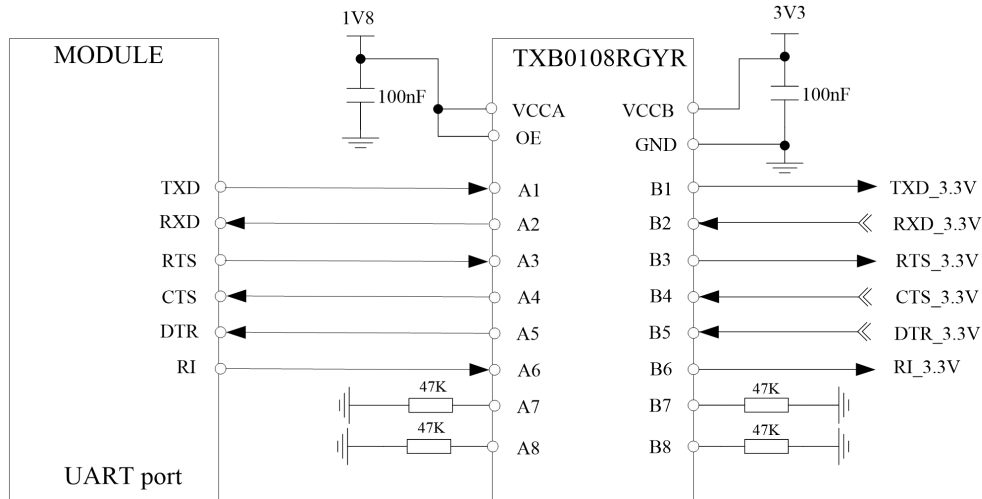


Figure 15: Reference circuit of level shift

customers can use another level shifter circuits as follow

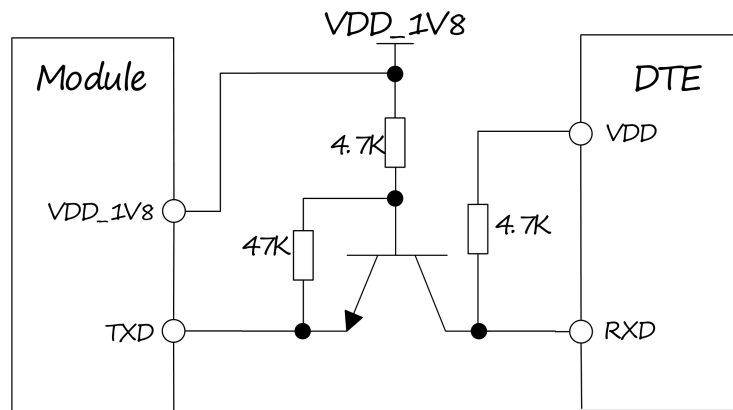


Figure 16: TX level matching circuit

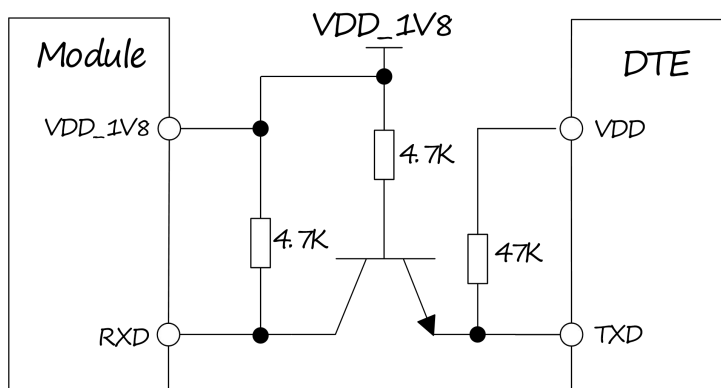


Figure 17: RX level matching circuit

To comply with RS-232-C protocol, the RS-232-C level shifter chip should be used to connect SIM7600 Series-PCIE to the RS-232-C interface. In this connection, the TTL level and RS-232-C level are converted mutually. SIMCom recommends that user uses the SP3238ECA chip with a full modem. For more information

please refers to the RS-232-C chip datasheet.

Note1: User need to use high speed transistors such as MMBT3904.

Note2: SIM7600 Series-PCIE supports the following baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 3200000, 3686400bps. Default baud rate is 115200bps.

3.9 I2C Interface

SIM7600 Series-PCIE provides I2C interface compatible with I2C specification, version 5.0, with clock rate up to 400 kbps. Its operation voltage is 1.8V.

Note: Since the I2C is connected to the audio codec chip on board, the users should choose the I2C device whose address is not the same with the audio codec (0x34). If the the audio codec chip is not mounted on board, users could ignore this.

The following figure shows the I2C bus reference design.

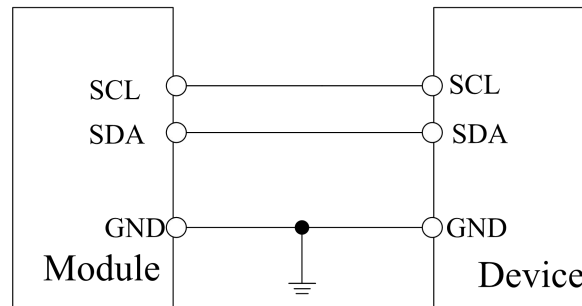


Figure 18: I2C Reference Circuit

Note: SDA and SCL are pulled up to 1.8V via 2.2K resistors in module. So external pull up resistors are not needed in application circuit. For more details about I2C AT commands please refer to document [1].

Table 12: I2C Electrical Characteristic

| Symbol | Parameter | Min | Typ | Max | Unit |
|-----------------|---------------------------|------|-----|------|------|
| V _{IH} | High-level input voltage | 1.17 | 1.8 | 2.1 | V |
| V _{IL} | Low-level input voltage | -0.3 | 0 | 0.63 | V |
| V _{OH} | High-level output voltage | 1.35 | 1.8 | 1.8 | V |
| V _{OL} | Low-level output voltage | 0 | 0 | 0.45 | V |

3.10 PCM/Analog Audio Interface

3.10.1 PCM Interface

SIM7600 Series-PCIE provides hardware PCM interface for external codec. SIM7600 Series-PCIE PCM interface can be used in short sync master mode only, and only supports 16 bits linear format.

Note: The PCM interface cannot be used if audio codec chip is mounted on PCIE board.

Table 13: PCM Specification

| Characteristics | Specification |
|-----------------------|--------------------|
| Line Interface Format | Linear(Fixed) |
| Data length | 16bits(Fixed) |
| PCM Clock/Sync Source | Master Mode(Fixed) |
| PCM Clock Rate | 2048 KHz (Fixed) |
| PCM Sync Format | Short sync(Fixed) |
| Data Ordering | MSB |

Note: PCM interface can be control by AT command. For more details please refer to document [1]

Table 14: PCM DC Characteristics

| Symbol | Parameter | Min | Type | Max | Unit |
|-----------------|---------------------------|------|------|------|------|
| V _{IH} | High-level input voltage | 1.17 | 1.8 | 2.1 | V |
| V _{IL} | Low-level input voltage | -0.3 | 0 | 0.63 | V |
| V _{OH} | High-level output voltage | 1.35 | 1.8 | 1.8 | V |
| V _{OL} | Low-level output voltage | 0 | 0 | 0.45 | V |

3.10.2 PCM timing

SIM7600 Series-PCIE supports 2.048 MHz PCM data and sync timing for 16 bits linear format codec.

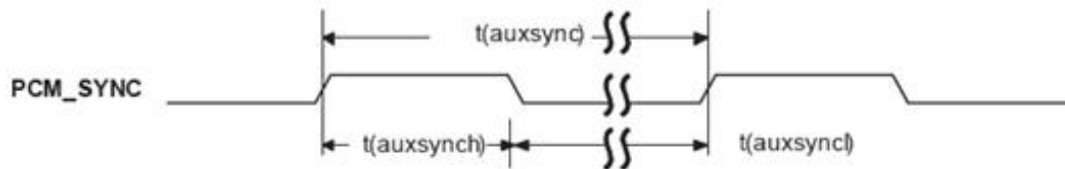


Figure 19: PCM_SYNC timing

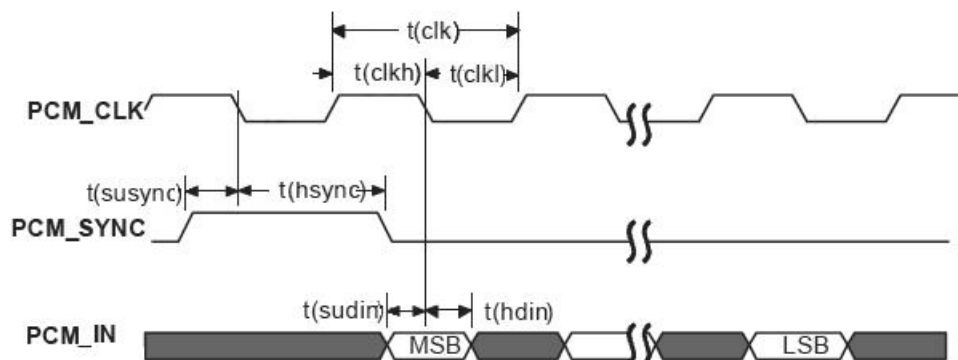


Figure 20: EXT CODEC to MODULE timing

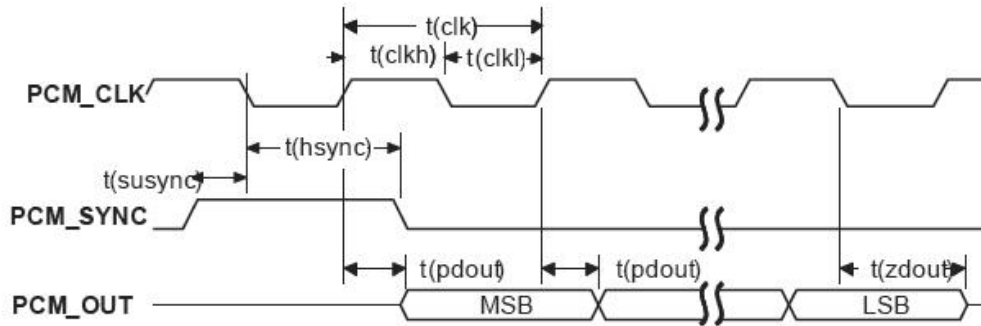


Figure 21: MODULE to EXT CODEC timing

Table 15: PCM Timing parameters

| Parameter | Description | Min. | Typ. | Max. | Unit |
|-----------------------|---|------|-------|------|------|
| T(sync) | PCM_SYNC cycle time | — | 125 | — | μs |
| T(synch) | PCM_SYNC high level time | — | 488 | — | ns |
| T(sync _l) | PCM_SYNC low level time | — | 124.5 | — | μs |
| T(clk) | PCM_CLK cycle time | — | 488 | — | ns |
| T(clkh) | PCM_CLK high level time | — | 244 | — | ns |
| T(clkl) | PCM_CLK low level time | — | 244 | — | ns |
| T(susync) | PCM_SYNC setup time high before falling edge of PCM_CLK | — | 122 | — | ns |
| T(hsync) | PCM_SYNC hold time after falling edge of PCM_CLK | — | 366 | — | ns |
| T(sudin) | PCM_IN setup time before falling edge of PCM_CLK | 60 | — | — | ns |
| T(hdin) | PCM_IN hold time after falling edge of PCM_CLK | 60 | — | — | ns |
| T(pdout) | Delay from PCM_CLK rising to PCM_OUT valid | — | — | 60 | ns |
| T(zdout) | Delay from PCM_CLK falling to PCM_OUT HIGH-Z | — | — | 60 | ns |

3.10.3 PCM Application Guide

The following figure shows the reference design of Audio codec chip NAU8810 with SIM7600 Series-PCIE.

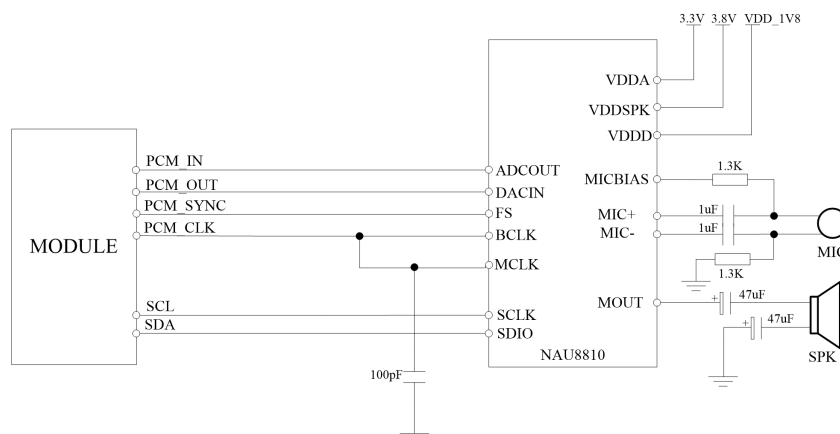


Figure 22: Audio Codec Reference Circuit

3.10.4 Analog Audio Interface

When audio codec chip is mounted on the PCIE board, SIM7600 Series-PCIEA provides one analog signal output and one analog input. MICP/N is used as microphone input; EARP/N is used as audio output. Regarding audio parameters configuration, please refer to the ATC manual.

Table 16: MIC input characteristics

| Parameter | Min | Typ | Max | Unit |
|-------------------------------------|-----|------|-----|------------|
| Mic biasing voltage | | 1.80 | | V |
| Working Current | | | 3 | mA |
| External Microphone Load Resistance | 1.2 | 2.2 | | K Ω |

Table 17: Audio output characteristics

| Parameter | Min | Typ | Max | Unit |
|-----------------|-----|-----|-----|----------|
| Load resistance | 27 | 32 | - | Ω |
| Output power | - | 50 | - | mW |

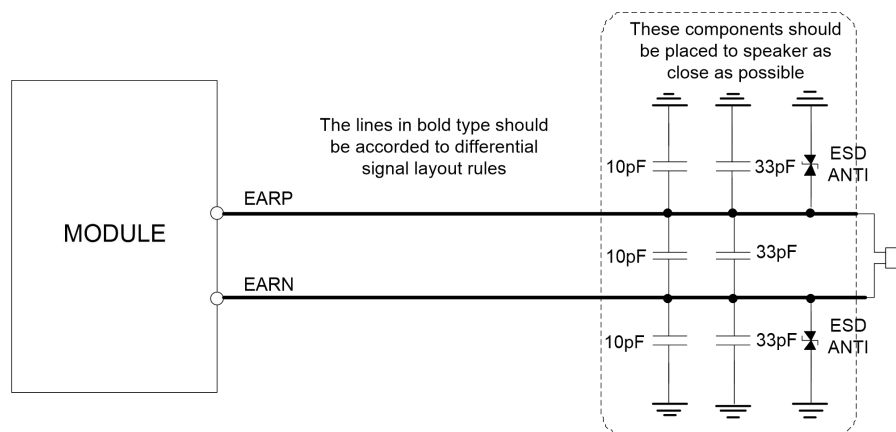


Figure 23: Receiver interface configuration

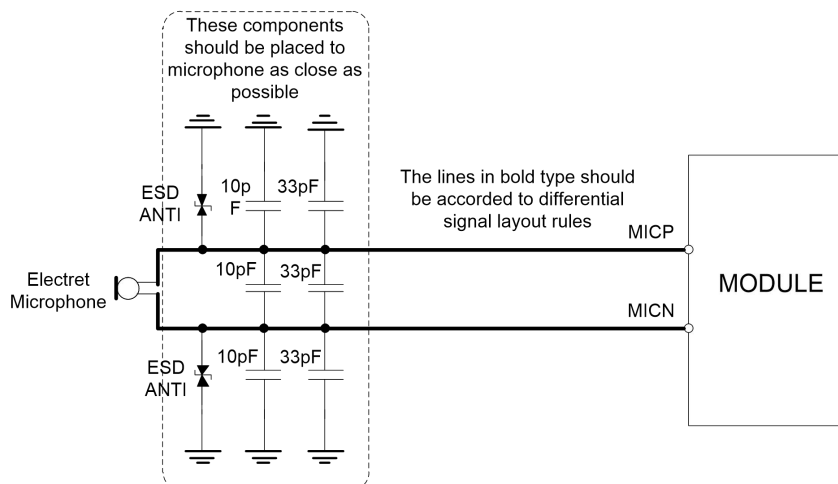


Figure 24: Microphone interface configuration

Note: SIM7600 Series-PCIEA has integrated MIC bias circuit. There is no need to pull the MICP and MICN up to the external power, just connect it to microphone. MICP and MICN must be differential lines.

Main audio parameters can be changed to satisfy users' requirement. User can adjust them through AT command according to their own electronic and mechanical design. For more details please refers to audio application document.

4. RF Specifications

4.1 GSM/WCDMA/LTE

Table 18: Conducted transmission power

| Frequency | Power | Min. |
|-----------------|---------------------|----------------|
| GSM850 | 33dBm \pm 2dB | 5dBm \pm 5dB |
| EGSM900 | 33dBm \pm 2dB | 5dBm \pm 5dB |
| DCS1800 | 30dBm \pm 2dB | 0dBm \pm 5dB |
| PCS1900 | 30dBm \pm 2dB | 0dBm \pm 5dB |
| GSM850 (8-PSK) | 27dBm \pm 3dB | 5dBm \pm 5dB |
| EGSM900 (8-PSK) | 27dBm \pm 3dB | 5dBm \pm 5dB |
| DCS1800 (8-PSK) | 26dBm \pm 3/-4dB | 0dBm \pm 5dB |
| PCS1900 (8-PSK) | 26dBm \pm 3/-4dB | 0dBm \pm 5dB |
| WCDMA B1 | 24dBm \pm 1/-3dB | <-50dBm |
| WCDMA B2 | 24dBm \pm 1/-3dB | <-50dBm |
| WCDMA B4 | 24dBm \pm 1/-3dB | <-50dBm |
| WCDMA B5 | 24dBm \pm 1/-3dB | <-50dBm |
| WCDMA B6 | 24dBm \pm 1/-3dB | <-50dBm |
| WCDMA B8 | 24dBm \pm 1/-3dB | <-50dBm |
| WCDMA B19 | 24dBm \pm 1/-3dB | <-50dBm |
| LTE-FDD B1 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B3 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B4 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B5 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B7 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B8 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B12 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B13 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B18 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B19 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B20 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B25 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B26 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B28 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-FDD B66 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-TDD B34 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-TDD B38 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-TDD B39 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-TDD B40 | 23dBm \pm /-2.7dB | <-40dBm |
| LTE-TDD B41 | 23dBm \pm /-2.7dB | <-40dBm |

Table 19: Operating frequencies

| Frequency | Receiving | Transmission |
|-----------|---------------|---------------|
| GSM850 | 869~894MHz | 824~849 MHz |
| EGSM900 | 925~960MHz | 880~915 MHz |
| DCS1800 | 1805~1880 MHz | 1710~1785 MHz |
| PCS1900 | 1930~1990 MHz | 1850~1910 MHz |

| | | |
|---|---------------------|---------------|
| WCDMA B1 | 2110~2170 MHz | 1920~1980 MHz |
| WCDMA B2 | 1930~1990 MHz | 1850~1910 MHz |
| WCDMA B4 | 2110~2155MHz | 1710~1755MHz |
| WCDMA B5 | 869~894 MHz | 824~849 MHz |
| WCDMA B6 | 877~882MHz | 832~837MHz |
| WCDMA B8 | 925~960 MHz | 880~915 MHz |
| WCDMA B19 | 875~890MHz | 835~845MHz |
| The LTE Operating frequencies are shown in the following table 20. | | |
| Note: Operating frequencies of LTE TDD B41 for the MODULE is 100MHz BW, 2555~2655 MHz | | |
| GPS | 1574.4 ~1576.44 MHz | - |
| GLONASS | 1598 ~1606 MHz | - |
| BD | 1559 ~1563 MHz | |

Table 20: E-UTRA operating bands

| E-UTRA Operating Band | Uplink (UL) operating band | Downlink (DL) operating band | Duplex Mode |
|-----------------------------|----------------------------|---------------------------------|----------------|
| 1 | 1920 ~1980 MHz | 2110 ~2170 MHz | FDD |
| 2 | 1850~1910 MHz | 1930~1990 MHz | FDD |
| 3 | 1710 ~1785 MHz | 1805 ~1880 MHz | FDD |
| 4 | 1710~1755MHz | 2110~2155MHz | FDD |
| 5 | 824~849 MHz | 869~894MHz | FDD |
| 7 | 2500~2570MHz | 2620~2690MHz | FDD |
| 8 | 880 ~915 MHz | 925 ~960 MHz | FDD |
| 12 | 699~716MHz | 728~746MHz | FDD |
| 13 | 777~787MHz | 746~757MHz | FDD |
| 18 | 815~830MHz | 860~875MHz | FDD |
| 19 | 830~845MHz | 875~890MHz | FDD |
| 20 | 832~862MHz | 791~ 821MHz | FDD |
| 25 | 1850~1915MHz | 1930~1995MHz | FDD |
| 26 | 814~849MHz | 859~894MHz | FDD |
| 28 | 703~748MHz | 758~803MHz | FDD |
| 66 | 1710~1780MHz | 2110~2200MHz | FDD |
| 34 | 2010~2025MHz | 2010~2025MHz | TDD |
| 38 | 2570 ~2620 MHz | 2570 ~2620 MHz | TDD |
| 39 | 1880~1920MHz | 1880~1920MHz | TDD |
| 40 | 2300 ~2400 MHz | 2300 ~2400 MHz | TDD |
| 41 | 2496~2696 MHz | 2496~2696 MHz | TDD |

Note: Operating frequencies of LTE TDD B41 for the SIM7600 Series-PCIE is 100MHz BW, 2555~2655 MHz

Table 21: Conducted receive sensitivity

| Frequency | Receive sensitivity(Typical) | Receive sensitivity(MAX) |
|-------------|------------------------------|--------------------------|
| GSM850 | < -109dBm | 3GPP |
| EGSM900 | < -109dBm | 3GPP |
| DCS1800 | < -109dBm | 3GPP |
| PCS1900 | < -109dBm | 3GPP |
| WCDMA B1 | < -110dBm | 3GPP |
| WCDMA B2 | < -110dBm | 3GPP |
| WCDMA B4 | < -110dBm | 3GPP |
| WCDMA B5 | < -110dBm | 3GPP |
| WCDMA B6 | < -110dBm | 3GPP |
| WCDMA B8 | < -110dBm | 3GPP |
| WCDMA B19 | < -110dBm | 3GPP |
| LTE FDD/TDD | See table 26. | 3GPP |

Table 22: Reference sensitivity (QPSK)

| E-UTR A band | 1.4 MHz Standard | 3 MHz Standard | 5 MHz Standard | 10 MHz Standard | 5 MHz Test Resort | 15 MHz Standard | 20 MHz Standard | Duplex Mode |
|-----------------|---------------------|-------------------|-------------------|--------------------|----------------------|--------------------|--------------------|----------------|
| 1 | - | - | -100 | -97 | -95.2 | -94 | FDD | FDD |
| 2 | -102.7 | -99.7 | -98 | -95 | -93.2 | -92 | FDD | FDD |
| 3 | -101.7 | -98.7 | -97 | -94 | -92.2 | -91 | FDD | FDD |
| 4 | -104.7 | -101.7 | -100 | -97 | -95.2 | -94 | FDD | FDD |
| 5 | -103.2 | -100.2 | -98 | -95 | | | FDD | FDD |
| 7 | | | -98 | -95 | -93.2 | -92 | FDD | FDD |
| 8 | -102.2 | -99.2 | -97 | -94 | | | FDD | FDD |
| 12 | -101.7 | -98.7 | -97 | -94 | | | FDD | FDD |
| 13 | | | -97 | -94 | | | FDD | FDD |
| 18 | | | -100 | -97 | -95.2 | | FDD | FDD |
| 19 | | | -100 | -97 | -95.2 | | FDD | FDD |
| 20 | | | -97 | -94 | -91.2 | -90 | FDD | FDD |
| 25 | -101.2 | -98.2 | -96.5 | -93.5 | -91.7 | -90.5 | FDD | FDD |
| 26 | -102.7 | -99.7 | -97.5 | -94.5 | -92.7 | | FDD | FDD |
| 28 | | -100.2 | -98.5 | -95.5 | -93.7 | -91 | FDD | TDD |
| 66 | -104.7 | -101.7 | -100 | -97 | -95.2 | -94 | FDD | TDD |
| 34 | | | -100 | -97 | -95.2 | | TDD | TDD |
| 38 | - | - | -100 | -97 | -95.2 | -94 | TDD | |
| 39 | | | -100 | -97 | -95.2 | | TDD | |
| 40 | - | - | -100 | -97 | -95.2 | -94 | TDD | |
| 41 | - | - | -99 | -96 | -94.2 | -93 | TDD | |

4.2 RF Antenna Connector

SIM7600 Series-PCIE have 3 antenna connectors, one of which is the GSM/UMTS/LTE main antenna connector, the others are UMTS/LTE auxiliary antenna connector and GPS/GLONASS antenna connector. Recommended antenna characteristics of SIM7600 Series-PCIE are described by 2 following tables.

Table 23: Recommended Passive Antenna Characteristics

| Passive | Recommended standard |
|-----------------|----------------------|
| Direction | omnidirectional |
| Gain | > -3dBi (Avg) |
| Input impedance | 50 ohm |
| Efficiency | > 50 % |
| VSWR | < 2 |

Table 24: Recommended Active Antenna Characteristics

| Band | Performance | |
|-----------|---------------------|------------------------------------|
| | TRP | TIS |
| GSM850 | $\geq 29\text{dBm}$ | $\leq -104\text{dBm}$ |
| EGSM900 | $\geq 29\text{dBm}$ | $\leq -104\text{dBm}$ |
| DCS1800 | $\geq 26\text{dBm}$ | $\leq -104\text{dBm}$ |
| PCS1900 | $\geq 26\text{dBm}$ | $\leq -104\text{dBm}$ |
| WCDMA B1 | $\geq 19\text{dBm}$ | $\leq -104\text{dBm}$ |
| WCDMA B2 | $\geq 19\text{dBm}$ | $\leq -104\text{dBm}$ |
| WCDMA B4 | $\geq 19\text{dBm}$ | $\leq -104\text{dBm}$ |
| WCDMA B5 | $\geq 19\text{dBm}$ | $\leq -104\text{dBm}$ |
| WCDMA B6 | $\geq 19\text{dBm}$ | $\leq -104\text{dBm}$ |
| WCDMA B8 | $\geq 19\text{dBm}$ | $\leq -104\text{dBm}$ |
| WCDMA B19 | $\geq 19\text{dBm}$ | $\leq -104\text{dBm}$ |
| LTE B1 | $\geq 18\text{dBm}$ | $\leq -92\text{dBm}(10\text{MHz})$ |
| LTE B2 | $\geq 18\text{dBm}$ | $\leq -92\text{dBm}(10\text{MHz})$ |
| LTE B3 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B4 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B5 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B7 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B8 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B12 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B13 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B18 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B19 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B20 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B25 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |

| | | |
|---------|---------------------|------------------------------------|
| LTE B26 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B28 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B66 | $\geq 18\text{dBm}$ | $\leq -89\text{dBm}(10\text{MHz})$ |
| LTE B38 | $\geq 18\text{dBm}$ | $\leq -92\text{dBm}(10\text{MHz})$ |
| LTE B39 | $\geq 18\text{dBm}$ | $\leq -92\text{dBm}(10\text{MHz})$ |
| LTE B40 | $\geq 18\text{dBm}$ | $\leq -92\text{dBm}(10\text{MHz})$ |
| LTE B41 | $\geq 18\text{dBm}$ | $\leq -91\text{dBm}(10\text{MHz})$ |

NOTE: The above LTE only test 10MHZ bandwidth

The RF connector in the module side is an ultra small surface mount coaxial connector (Part Number: U.FL-R-SMT, vended by HRS). It has high performance with wide frequency range, surface mountable and reflows solderable. Following are parameters (Figure 19). Certainly user can visit <http://www.hirose-connectors.com/> for more information.

To get good RF performance in user's design, SIMCom suggests user to use the matching RF adapter cable which is also supplied by HRS (Part Number: U.FL-LP (V) -040), the following figure (Figure 20) is the dimensions of U.FL series RF adapter cable. User can contact SIMCom for more information.

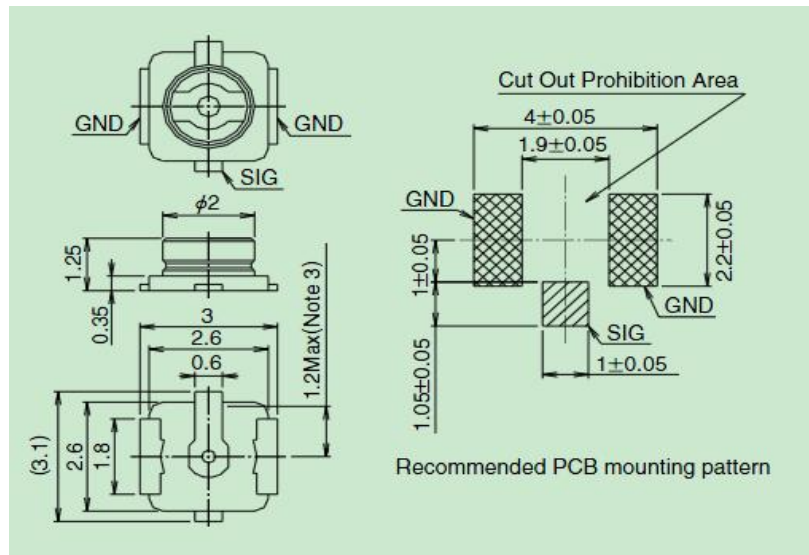
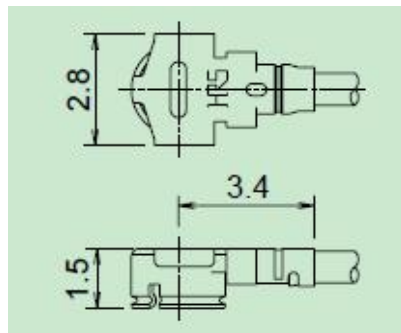


Figure 25: U.FL-R-SMT (Unit: mm)



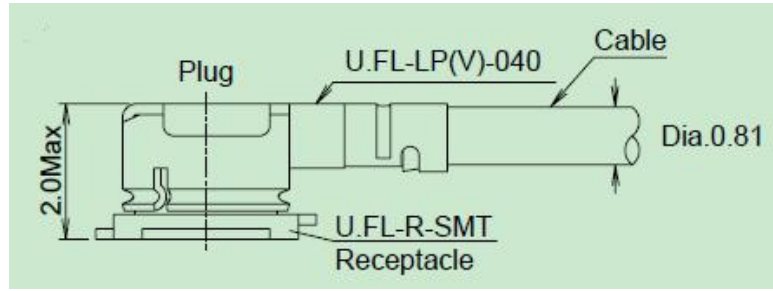


Figure 26: U.FL series RF adapter cable (Unit: mm)

To facilitate the antenna tuning and certification test, a RF connector and an antenna matching circuit should be added. The following figure is the recommended circuit.

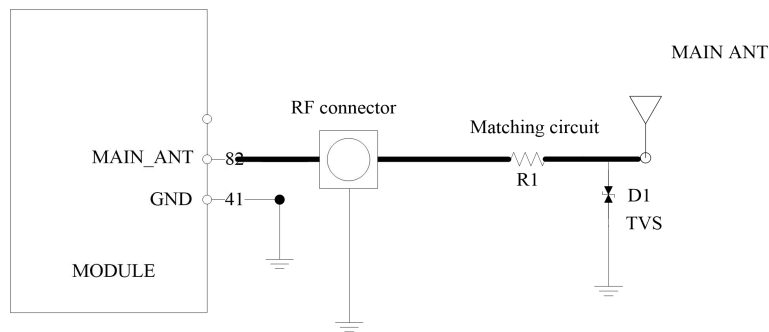


Figure 27: Antenna matching circuit (MAIN_ANT)

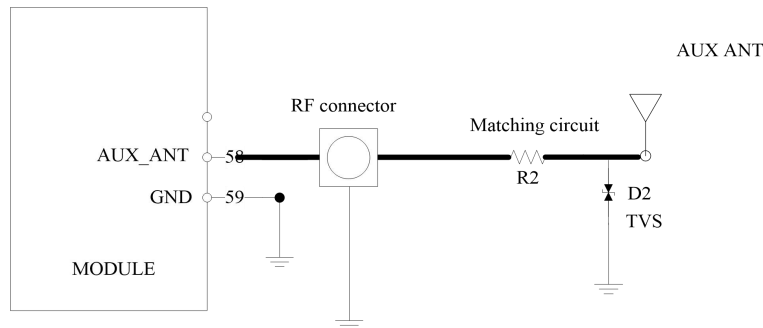


Figure 28: Antenna matching circuit (AUX_ANT)

In above figure, the component R1/R2 is reserved for antenna matching, the value of components can only be got after the antenna tuning, usually, The RF test connector in the figure is used for the conducted RF performance test, and should be placed as close as to the module's antenna pin. The traces impedance between components must be controlled in $50\ \Omega$. The component D1/D2 is a Bidirectional ESD Protection device, which is suggested to add to protection circuit, the recommended Part Numbers of the TVS are listed in the following table:

Table 25: TVS part number list

| Package | Type | Supplier |
|---------|----------------|----------|
| 0201 | LXES03AAA1-154 | Murata |
| 0402 | LXES15AAA1-153 | Murata |

Note : SIMCom suggests the LTE auxiliary antenna to be kept on, since there are many high bands in the designing of LTE-TDD, such as band38, band40 and band41.

4.3 GNSS

SIM7600 Series-PCIE merges GNSS (GPS/GLONASS/BD) satellite and network information to provide a high-availability solution that offers industry-leading accuracy and performance. This solution performs well, even in very challenging environmental conditions where conventional GNSS receivers fail, and provides a platform to enable wireless operators to address both location-based services and emergency mandates.

4.3.1 GNSS Technical specification

Tracking sensitivity: -159 dBm (GPS) /-158 dBm (GLONASS) /TBD (BD)
Cold-start sensitivity: -148 dBm
Accuracy (Open Sky): 2.5m (CEP50)
TTFF (Open Sky) : Hot start <1s, Cold start<35s
Receiver Type: 16-channel, C/A Code
GPS L1 Frequency: 1575.42±1.023MHz
GLONASS: 1597.5~1605.8 MHz
BD: 1559.05~1563.14 MHz
Update rate: Default 1 Hz
GNSS data format: NMEA-0183
GNSS Current consumption : 100mA (GSM/UMTS/LTE Sleep ,in total on VBAT pins)
GNSS antenna: Passive/Active antenna

It is suggested either the external LNA or active antenna used. It is not needed for both of them at the same time.

Note: Performance will vary depending on the environment, antenna type and signal conditions and so on.

4.3.2 GNSS Operate Mode

SIM7600 Series-PCIE supports both A-GPS and S-GPS, and then provides three operating modes: mobile-assisted mode, mobile-based mode and standalone mode. A-GPS includes mobile-assisted and mobile-based mode.

In mobile-assisted mode, when a request for position location is issued, available network information is provided to the location server (e.g. Cell-ID) and assistance is requested from the location server. The location server sends the assistance information to the handset. The handset/mobile unit measures the GNSS observables and provides the GNSS measurements along with available network data (that is appropriate for the given air interface technology) to the location server. The location server then calculates the position location and returns results to the requesting entity.

In mobile-based mode, the assistant data provided by the location server encompasses not only the information required to assist the handset in measuring the satellite signals, but also the information required to calculate the handset's position. Therefore, rather than provide the GNSS measurements and available network data back to the location server, the mobile calculates the location on the handset and passes the result to the requesting entity.

In standalone (autonomous) mode, the handset demodulates the data directly from the GNSS satellites. This mode has some reduced cold-start sensitivity, and a longer time to first fix as compared to the assisted modes. However, it requires no server interaction and works out of network coverage.

This combination of GNSS measurements and available network information provides:

- High-sensitivity solution that works in all terrains: Indoor, outdoor, urban, and rural
- High availability that is enabled by using both satellite and network information

Therefore, while network solutions typically perform poorly in rural areas and areas of poor cell geometry/density, and while unassisted, GNSS-only solutions typically perform poorly indoors. The SIM7600 Series-PCIE GNSS solution provides optimal time to fix, accuracy, sensitivity, availability, and reduced network utilization in both of these environments, depending on the given condition.

GNSS can be used by NMEA port. User can select NMEA as output through UART or USB. NMEA sentences are automatic and no command is provided. NMEA sentences include GSV, GGA, RMC, GSA, and VTG. Before using GNSS, user should configure SIM7600 Series-PCIE in proper operating mode by AT command. Please refer to related document for details. SIM7600 Series-PCIE can also get position location information through AT directly.

4.3.3 Application Guide

Users can adopt an active antenna as GNSS signal receiver. The following is the reference circuit.

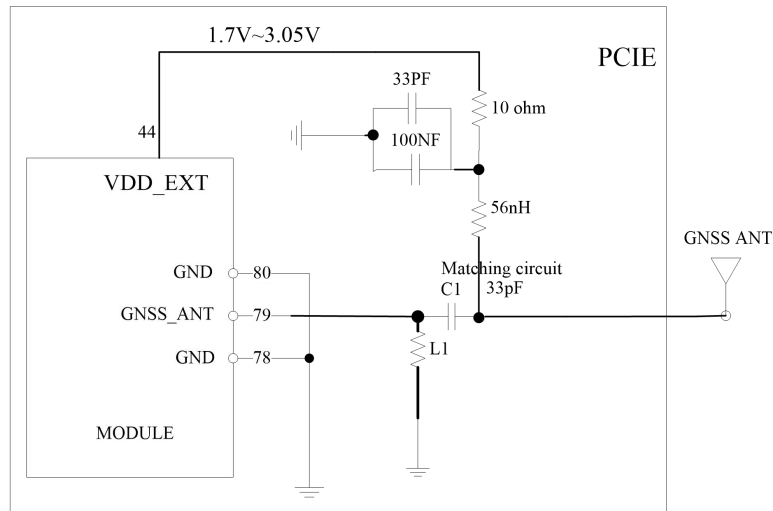


Figure 29: Active antenna circuit

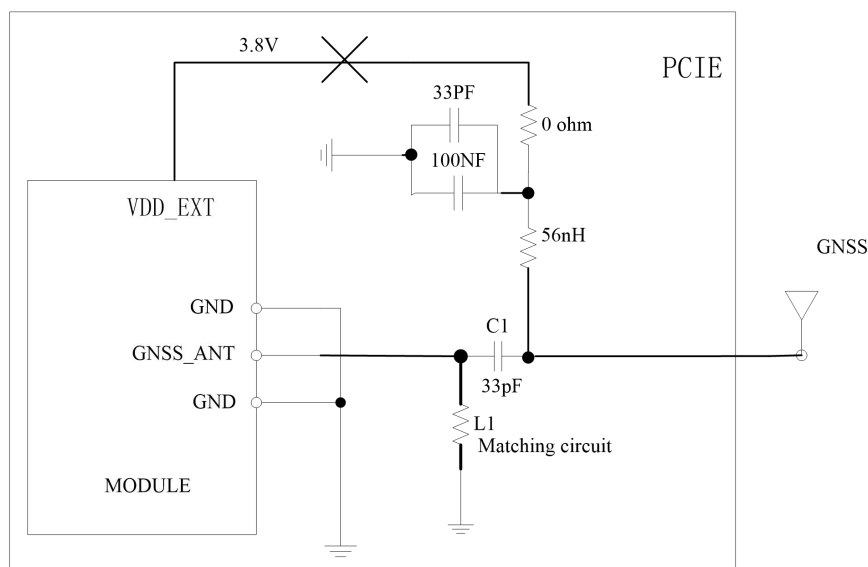


Figure 30: Passive antenna circuit

In above Figure 29 the active antenna is used, If users want to change the voltage of VDD_EXT, use this AT command; “AT+CVAUXV”. For example, if customer needs the output voltage value to be 1.8V, the AT command should be “AT+CVAUXV=1800000”. The output voltage range of VDD_EXT is from 1.7V to 3.05V.

In above two figures, the component C1 is used for DC isolation, and L1 is used for antenna matching, the value of it can be obtained after the antenna tuning usually, so the default value is NC. In active antenna circuit, users also can use an external LDO/DCDC to provide VDD voltage which value should be taken according to active antenna characteristic, and VDD can be shut down to avoid consuming additional current when not being used.

Note; For more details of AT commands about VDD_EXT, please refer to document [1].

Note: GNSS is closed by default, it could be started by AT+CGPS. The AT command has two parameters, the first is on/off, and the second is GNSS mode. Default mode is standalone mode.

AGPS mode needs more support from the mobile telecommunication network. Please refer to document [22] for more details.

5. Electrical Specifications

5.1 Absolute Maximum Ratings

The absolute maximum ratings are described by the following table. Module may be damaged beyond these ratings.

Table 26: Absolute maximum ratings

| Symbol | Parameter | Min | Type | Max | Unit |
|-----------------|--|------|------|-----|------|
| V _{CC} | VCC input voltage | -0.3 | - | 3.6 | V |
| V _{IO} | Voltage at digital pins (1.8V digital I/O) * | -0.3 | - | 2.1 | V |

***Note: These parameters are for digital interface pins, such as I2C, UART, GPIO.**

5.2 Recommended Operating Conditions

Please refer to the follow table for recommended operating conditions.

Table 27: Operating Conditions

| Symbol | Parameter | Min | Type | Max | Unit |
|-------------------|--|-----|------|------|------|
| V _{CC} | 3.3V Input voltage | 3.0 | 3.3 | 3.6 | V |
| V _{IO} | Voltage at digital pins (1.8V digital I/O) | 0 | 1.8 | 1.95 | V |
| T _{OPER} | Operating temperature | -40 | +25 | +85 | °C |
| T _{STG} | Storage temperature | -45 | +25 | +90 | °C |

5.3 Operating Mode

5.3.1 Operating Mode

The table below summarizes the various operating modes of SIM7600 Series-PCIE.

Table 28: Operating Mode

| Mode | | Function |
|----------------------------|--------------------------------------|---|
| Normal operation | GSM/UMTS/LTE Sleep | In this case, the current consumption of module will be reduced to the minimal level and the module can still receive paging message and SMS. |
| | GSM /UMTS/LTE Idle | Software is active. Module is registered to the network, and the module is ready to communicate. |
| | GSM /UMTS/LTE Talk | 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, antenna. |
| | GPRS/EDGE/UMTS/LTE Standby | Module is ready for data transmission, but no data is currently sent or received. In this case, power consumption depends on network settings. |
| | GPRS/EDGE/UMTS/LTE Data transmission | 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. |
| Minimum functionality mode | | AT command “AT+CFUN” can be used to set the module to a minimum functionality mode without removing the power supply. In this mode, the RF part of the module will not work or the USIM card will not be accessible, or both RF part and USIM card will be closed, and the serial port and USB port are still accessible. The power consumption in this mode is lower than normal mode. |
| Power off | | Customer could cut off the VBAT to power off module. |

5.3.2 Power saving mode

SIM7600 Series-PCIE has two power saving modes: minimum functionality mode and sleep mode. In which module will achieve lower power consumption for power saving.

5.3.3 Sleep mode

In sleep mode, the current consumption of module will be reduced to the minimal level, and module can still receive paging message and SMS.

Several hardware and software conditions must be satisfied together in order to let SIM7600 Series-PCIE 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 and refer to Document [22] for more details.

5.3.4 Minimum functionality mode

Minimum functionality mode ceases a majority function of module, thus minimizing the power consumption.

This mode is set by the AT command which provides a choice of the functionality levels.

- AT+CFUN=0: Minimum functionality
- AT+CFUN=1: Full functionality (Default)
- AT+CFUN=4: Disable RF function of the module (Flight mode)

If SIM7600 Series-PCIE has been set to minimum functionality mode, the module will firstly enter sleep mode, then the RF function and USIM card function will be closed. In this case, the serial port is still accessible, but RF function or USIM card will be unavailable. When SIM7600 Series-PCIE is in minimum functionality or flight mode, it can return to full functionality by the AT command “AT+CFUN=1”.

5.4 Current Consumption

The current consumption is listed in the table below.

Table 29: Current Consumption (VCC=3.3V)

| GNSS | |
|---|--|
| GNSS supply current (AT+CFUN=0,with USB connection) | @ -140dBm, Tracking Typical:35mA |
| GSM sleep/idle mode | |
| GSM/GPRS supply current (GNSS off, without USB connection) | Sleep mode@ BS_PA_MFRMS=2 Typical: 2.8mA Idle mode@ BS_PA_MFRMS=2 Typical: 18mA |
| UMTS sleep/idle mode | |
| WCDMA supply current (GNSS off, without USB connection) | Sleep mode @DRX=9 Typical: 3.3mA Idle mode @DRX=9 Typical: 17.5mA |
| LTE sleep/idle mode | |
| LTE supply current (GNSS off, without USB connection) | Sleep mode Typical: 4.6mA Idle mode Typical: 17.5mA |
| GSM Talk | |
| GSM850 | @power level #5 Typical: 220mA |
| EGSM900 | @ power level #5 Typical: 230mA |
| DCS1800 | @power level #5 Typical: 162mA |
| PCS1900 | @power level #5 Typical: 190mA |
| UMTS Talk | |
| WCDMA B1 | @Power 24dBm Typical: 540mA |
| WCDMA B2 | @Power 24dBm Typical: 470mA |
| WCDMA B4 | @Power 24dBm Typical: TBD |
| WCDMA B5 | @Power 24dBm Typical: 530mA |
| WCDMA B6 | @Power 24dBm Typical: 530mA |
| WCDMA B8 | @Power 24dBm Typical: 385mA |
| WCDMA B19 | @Power 24dBm Typical: TBD |
| GPRS | |
| GSM850(1 Rx,4 Tx) | @power level #5 Typical: 480mA |
| EGSM900(1 Rx,4 Tx) | @power level #5 Typical: 230mA |

| | | | |
|----------------------|--------------------------------|----------------|----------------|
| DCS1800(1 Rx,4 Tx) | @power level #0 Typical: 195mA | | |
| PCS1900(1 Rx,4 Tx) | @power level #0 Typical: 390mA | | |
| GSM850(3Rx, 2 Tx) | @power level #5 Typical: 330mA | | |
| EGSM900(3Rx, 2 Tx) | @power level #5 Typical: 370mA | | |
| DCS1800(3Rx, 2 Tx) | @power level #0 Typical: 275mA | | |
| PCS1900(3Rx, 2 Tx) | @power level #0 Typical: 245mA | | |
| EDGE | | | |
| GSM850(1 Rx,4 Tx) | @power level #8 Typical: 340mA | | |
| EGSM900(1 Rx,4 Tx) | @power level #8 Typical: 400mA | | |
| DCS1800(1 Rx,4 Tx) | @power level #2 Typical: 300mA | | |
| PCS1900(1 Rx,4 Tx) | @power level #2 Typical: 330mA | | |
| GSM850(3Rx, 2 Tx) | @power level #8 Typical: 280mA | | |
| EGSM900(3Rx, 2 Tx) | @power level #8 Typical: 320mA | | |
| DCS1800(3Rx, 2 Tx) | @power level #2 Typical: 230mA | | |
| PCS1900(3Rx, 2 Tx) | @power level #2 Typical: 268mA | | |
| HSDPA data | | | |
| WCDMA B1 | @Power 24dBm | Typical: 478mA | |
| WCDMA B2 | @Power 23dBm | Typical: 475mA | |
| WCDMA B4 | @Power 24dBm | Typical: TBD | |
| WCDMA B5 | @Power 24dBm | Typical: 480mA | |
| WCDMA B6 | @Power TBD | Typical: TBD | |
| WCDMA B8 | @Power 24dBm | Typical: 430mA | |
| WCDMA B19 | @Power 24dBm | Typical: TBD | |
| LTE data | | | |
| LTE-FDD B1 | @5Mbps | 22.3dBm | Typical: 577mA |
| | @10Mbps | 22.4dBm | Typical: 590mA |
| | @20Mbps | 22.4dBm | Typical: 630mA |
| LTE-FDD B2 | @5Mbps | 22.1dBm | Typical: 515mA |
| | @10Mbps | 22.4dBm | Typical: 544mA |
| | @20Mbps | 22.3dBm | Typical: 575mA |
| LTE-FDD B3 | @5Mbps | 22.2dBm | Typical: 479mA |
| | @10Mbps | 22.1dBm | Typical: 498mA |
| | @20Mbps | 22.1dBm | Typical: 530mA |
| LTE-FDD B4 | @5Mbps | 22.0dBm | Typical: 527mA |
| | @10Mbps | 22.1dBm | Typical: 559mA |
| | @20Mbps | 22.6dBm | Typical: 555mA |
| LTE-FDD B5 | @5Mbps | 22.2dBm | Typical: 610mA |
| | @10Mbps | 22.1dBm | Typical: 600mA |
| | @20Mbps | 22.1dBm | Typical: 630mA |
| LTE-FDD B7 | @5Mbps | 22.2dBm | Typical: 650mA |
| | @10Mbps | 22.1dBm | Typical: 650mA |
| | @20Mbps | 22.1dBm | Typical: 630mA |
| LTE-FDD B8 | @5Mbps | 22.8dBm | Typical: 644mA |
| | @10Mbps | 22.8dBm | Typical: 646mA |
| LTE-FDD B12 | @5Mbps | 22.7dBm | Typical: 493mA |
| | @10Mbps | 22.7dBm | Typical: 510mA |
| LTE-FDD B13 | @5Mbps | 21.9dBm | Typical: 505mA |
| | @10Mbps | 22.0dBm | Typical: 497mA |
| LTE-FDD B18 | @5Mbps | 21.3dBm | Typical: 531mA |
| | @10Mbps | 22.5dBm | Typical: 523mA |
| | @15Mbps | 22.6dBm | Typical: 570mA |
| LTE-FDD B19 | @5Mbps | 22.4dBm | Typical: 532mA |
| | @10Mbps | 22.3dBm | Typical: 541mA |
| | @15Mbps | 22.5dBm | Typical: 590mA |
| LTE-FDD B20 | @5Mbps | 21.8dBm | Typical: 579mA |

| | | | |
|-------------|---------|---------|----------------|
| | @10Mbps | 21.8dBm | Typical: 590mA |
| | @20Mbps | 21.8dBm | Typical: 600mA |
| LTE-FDD B25 | @5Mbps | 22dBm | Typical: TBD |
| | @10Mbps | 22dBm | Typical: TBD |
| | @20Mbps | 22dBm | Typical: TBD |
| LTE-FDD B26 | @5Mbps | 22.4dBm | Typical: 525mA |
| | @10Mbps | 22.7dBm | Typical: 570mA |
| | @15Mbps | 22.3dBm | Typical: 580mA |
| LTE-FDD B28 | @5Mbps | 22.4dBm | Typical: 612mA |
| | @10Mbps | 22.5dBm | Typical: 510mA |
| | @20Mbps | 22.4dBm | Typical: 670mA |
| LTE-FDD B66 | @5Mbps | 22dBm | Typical: TBD |
| | @10Mbps | 22dBm | Typical: TBD |
| | @20Mbps | 22dBm | Typical: TBD |
| LTE-TDD B38 | @5Mbps | 21.8dBm | Typical: 370mA |
| | @10Mbps | 21.8dBm | Typical: 380mA |
| | @20Mbps | 21.8dBm | Typical: 403mA |
| LTE-TDD B39 | @5Mbps | 22dBm | Typical: TBD |
| | @10Mbps | 22dBm | Typical: TBD |
| | @20Mbps | 22dBm | Typical: TBD |
| LTE-TDD B40 | @5Mbps | 21.5dBm | Typical: 407mA |
| | @10Mbps | 21.7dBm | Typical: 416mA |
| | @20Mbps | 21.7dBm | Typical: 444mA |
| LTE-TDD B41 | @5Mbps | 21.6dBm | Typical: 390mA |
| | @10Mbps | 21.7dBm | Typical: 396mA |
| | @20Mbps | 21.7dBm | Typical: 420mA |

Note: In the table above the current consumption value is the typical one of the module tested in the laboratory. In the mass production stage, there may be some difference.

5.5 Electro-Static Discharge

SIM7600 Series-PCIE is an ESD sensitive component, so more attention should be paid to the procedure of handling and packaging. The ESD test results are shown in the following table.

Table 30: ESD characteristics (Temperature: 25°C, Humidity: 45 %)

| Part | Contact discharge | Air discharge |
|--------------|-------------------|---------------|
| VBAT,GND | +/-5K | +/-10K |
| Antenna port | +/-4K | +/-8K |
| Other PADs | +/-0.5K | +/-1K |

Packaging

SIM7600 Series-PCIE module support tray packaging.

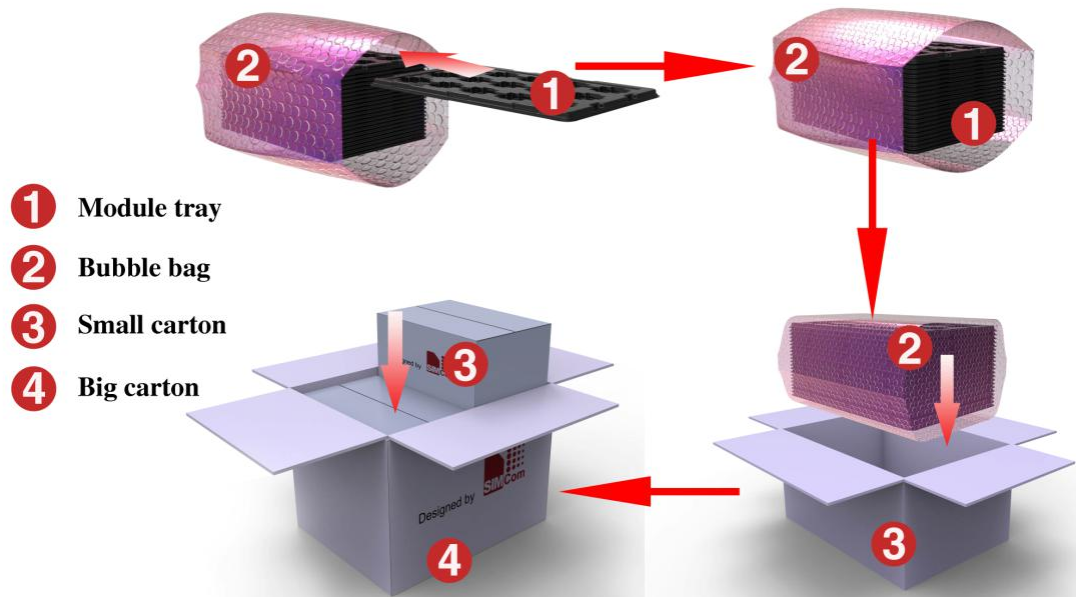


Figure 30: Tray packaging

Module tray drawing:

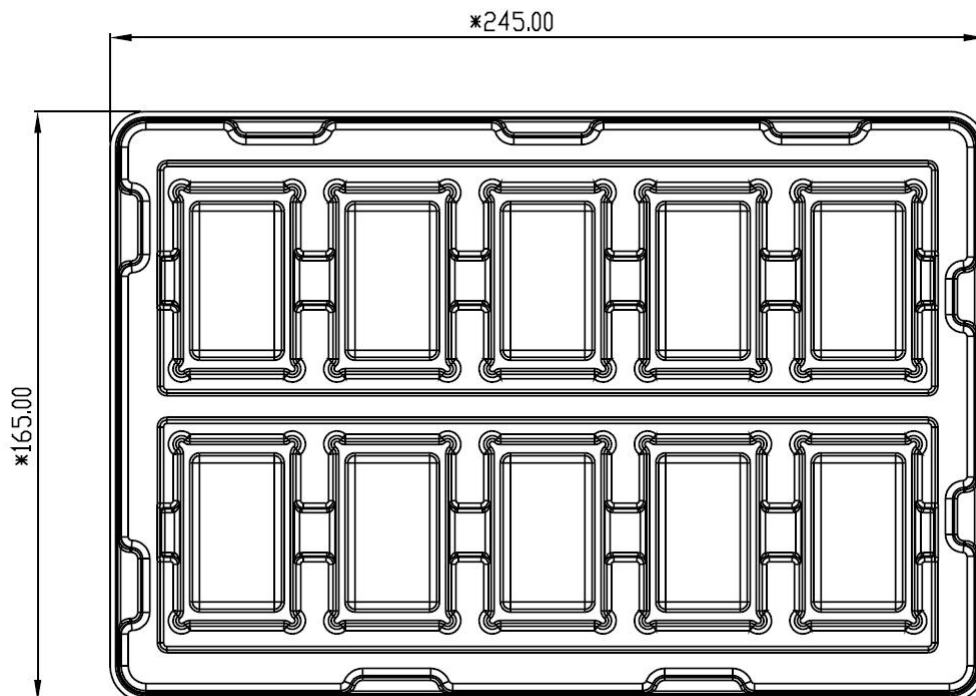


Figure 31: Tray drawing

Table 31: Tray size

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

Small carton drawing:

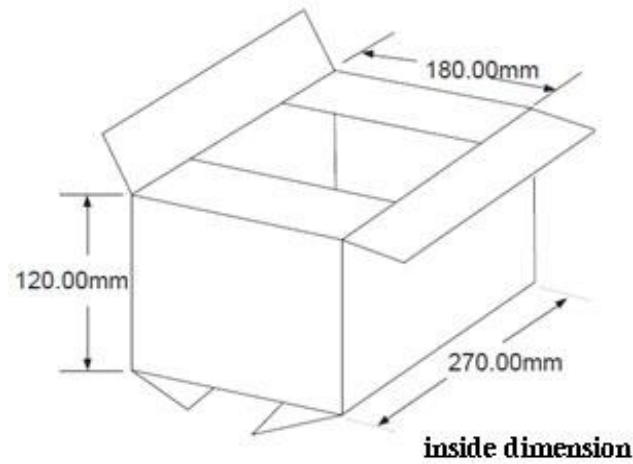


Figure 32: Small carton drawing

Table 32: Small Carton size

| Length($\pm 10\text{mm}$) | Width ($\pm 10\text{mm}$) | Height ($\pm 10\text{mm}$) | Number |
|-----------------------------|-----------------------------|------------------------------|-----------|
| 270 | 180 | 120 | 10*10=100 |

Big carton drawing:

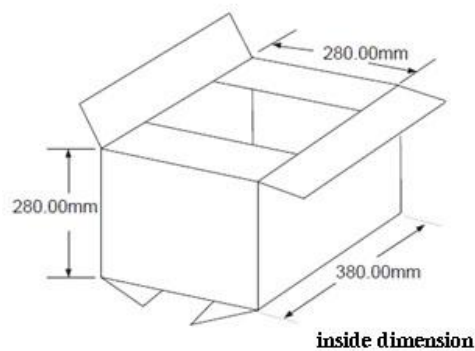


Figure 33: Big carton drawing

Table 33: Big Carton size

| Length($\pm 10\text{mm}$) | Width ($\pm 10\text{mm}$) | Height ($\pm 10\text{mm}$) | Number |
|-----------------------------|-----------------------------|------------------------------|-----------|
| 380 | 280 | 280 | 100*4=400 |

Appendix

I. Coding Schemes and Maximum Net Data Rates over Air Interface

Table 34: Coding Schemes and Maximum Net Data Rates over Air Interface

| Multislot definition(GPRS/EDGE) | | | |
|---------------------------------|-------------------------|----------------|--------------------|
| Slot class | DL slot number | UL slot number | Active slot number |
| 1 | 1 | 1 | 2 |
| 2 | 2 | 1 | 3 |
| 3 | 2 | 2 | 3 |
| 4 | 3 | 1 | 4 |
| 5 | 2 | 2 | 4 |
| 6 | 3 | 2 | 4 |
| 7 | 3 | 3 | 4 |
| 8 | 4 | 1 | 5 |
| 9 | 3 | 2 | 5 |
| 10 | 4 | 2 | 5 |
| 11 | 4 | 3 | 5 |
| 12 | 4 | 4 | 5 |
| GPRS coding scheme | Max data rata (4 slots) | | Modulation type |
| CS 1 = 9.05 kb/s / time slot | 36.2 kb/s | | GMSK |
| CS 2 = 13.4 kb/s / time slot | 53.6 kb/s | | GMSK |
| CS 3 = 15.6 kb/s / time slot | 62.4 kb/s | | GMSK |
| CS 4 = 21.4 kb/s / time slot | 85.6 kb/s | | GMSK |
| EDGE coding scheme | Max data rata (4 slots) | | Modulation type |
| MCS 1 = 8.8 kb/s/ time slot | 35.2 kb/s | | GMSK |
| MCS 2 = 11.2 kb/s/ time slot | 44.8 kb/s | | GMSK |
| MCS 3 = 14.8 kb/s/ time slot | 59.2 kb/s | | GMSK |
| MCS 4 = 17.6 kb/s/ time slot | 70.4 kb/s | | GMSK |
| MCS 5 = 22.4 kb/s/ time slot | 89.6 kb/s | | 8PSK |
| MCS 6 = 29.6 kb/s/ time slot | 118.4 kb/s | | 8PSK |
| MCS 7 = 44.8 kb/s/ time slot | 179.2 kb/s | | 8PSK |
| MCS 8 = 54.4 kb/s/ time slot | 217.6 kb/s | | 8PSK |
| MCS 9 = 59.2 kb/s/ time slot | 236.8 kb/s | | 8PSK |
| 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 |
| LTE-FDD device category (Downlink) | Max data rate (peak) | Modulation type |
| Category 1 | 10Mbps | QPSK/16QAM/64QAM |
| Category 2 | 50Mbps | QPSK/16QAM/64QAM |
| Category 3 | 100Mbps | QPSK/16QAM/64QAM |
| Category 4 | 150Mbps | QPSK/16QAM/64QAM |
| LTE-FDD device category (Uplink) | Max data rate (peak) | Modulation type |
| Category 1 | 5Mbps | QPSK/16QAM |
| Category 2 | 25Mbps | QPSK/16QAM |
| Category 3 | 50Mbps | QPSK/16QAM |
| Category 4 | 50Mbps | QPSK/16QAM |

II. Related Documents

Table 35: Related Documents

| SN | Title | Description |
|------|--|---|
| [1] | SIM7500_SIM7600 Series_AT Command Manual_V1.xx.pdf | SIM7600 AT command document |
| [2] | ITU-T Draft new recommendation V.25ter | Serial asynchronous automatic dialing and control |
| [3] | GSM 07.07 | Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME) |
| [4] | GSM 07.10 | Support GSM 07.10 multiplexing protocol |
| [5] | 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) |
| [6] | 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 |
| [7] | GSM 11.11 | Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface |
| [8] | GSM 03.38 | Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information |
| [9] | GSM 11.10 | Digital cellular telecommunications system (Phase 2); Mobile Station (MS) conformance specification; Part 1: Conformance specification |
| [10] | 3GPP TS 51.010-1 | Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification |
| [11] | 3GPP TS 34.124 | Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment. |
| [12] | 3GPP TS 34.121 | Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment. |
| [13] | 3GPP TS 34.123-1 | Technical Specification Group Radio Access Network; Terminal conformance specification; Radio transmission and reception (FDD) |
| [14] | 3GPP TS 34.123-3 | User Equipment (UE) conformance specification; Part 3: Abstract Test Suites. |
| [15] | 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 |
| [16] | 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 |
| [17] | IEC/EN60950-1(2001) | Safety of information technology equipment (2000) |
| [18] | 3GPP TS 51.010-1 | Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification |
| [19] | GCF-CC V3.23.1 | Global Certification Forum - Certification Criteria |

| | | |
|------|---|--|
| [20] | 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) |
| [21] | Module secondary-SMT-UGD-V1.xx | Module secondary SMT Guidelines |
| [22] | SIM7100_GPS_Application _Note_V0.xx | SIM7100 GPS Application Note |
| [23] | ANTENNA DESIGN GUIDELINES FOR DIVERSITY RECEIVER SYSTEM | ANTENNA DESIGN GUIDELINES FOR DIVERSITY RECEIVER SYSTEM |
| [24] | SIM7100_SIM7500_SIM76 00_Sleep Mode_Application Note V1.xx | Sleep Mode Application Note |
| [25] | SIM7100_SIM7500_SIM76 00 Series_USB AUDIO_Application Note_V1.xx | USB AUDIO Application Note |

III. Terms and Abbreviations







Table 36: 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 |
| GPRS | General Packet Radio Service |
| GSM | Global Standard for Mobile Communications |
| HR | Half Rate |
| HSPA | High Speed Packet Access |
| I2C | Inter-Integrated Circuit |
| IMEI | International Mobile Equipment Identity |
| LTE | Long Term Evolution |
| MO | Mobile Originated |
| MS | Mobile Station (GSM engine), also referred to as TE |
| MT | Mobile Terminated |
| PAP | Password Authentication Protocol |
| PBCCH | Packet Switched Broadcast Control Channel |
| PCB | Printed Circuit Board |
| PCS | Personal Communication System, also referred to as GSM 1900 |
| RF | Radio Frequency |
| RMS | Root Mean Square (value) |
| RTC | Real Time Clock |
| SIM | Subscriber Identification Module |
| SMS | Short Message Service |
| SPI | serial peripheral interface |
| SMPS | Switched-mode power supply |
| TDMA | Time Division Multiple Access |

| | |
|--------|--|
| TE | Terminal Equipment, also referred to as DTE |
| TX | Transmit Direction |
| UART | Universal Asynchronous Receiver & Transmitter |
| VSWR | Voltage Standing Wave Ratio |
| SM | SIM phonebook |
| NC | Not connect |
| EDGE | Enhanced data rates for GSM evolution |
| HSDPA | High Speed Downlink Packet Access |
| HSUPA | High Speed Uplink Packet Access |
| ZIF | Zero intermediate frequency |
| WCDMA | Wideband Code Division Multiple Access |
| VCTCXO | Voltage control temperature-compensated crystal oscillator |
| USIM | Universal subscriber identity module |
| UMTS | Universal mobile telecommunications system |
| UART | Universal asynchronous receiver transmitter |

IV. Safety Caution

Table 37: 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 to not operate normally for 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. Forget to think much of these instructions may lead to the flight safety or offend against local legal action, or both. |
|  | Do not operate the cellular terminal or mobile in the presence of flammable 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, for example no mobile fee or a invalid SIM card. While you are in this condition and need emergent help, please remember using 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> |

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| Middle East me-support@ simcom.com | Big China China-support@ simcom.com | |
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