# SIM7000-PCIE Hardware Design

LPWA Module

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# 1. Introduction

This document describes the electronic specifications, RF specifications, interfaces, mechanical characteristics and testing results of SIM7000-PCIE. With the help of this document and other related software application notes/user guides, users can understand and use SIM7000-PCIE to design and develop applications quickly.

## 1.1 Product Outline

Aimed at global market, the SIM7000-PCIE supports LTE CAT-M1, LTE CAT-NB1, GPRS and EDGE. Users can choose the PCIE according to the wireless network configuration. SIM7000-PCIE includes SIM7000A-PCIE, SIM7000C-PCIE, SIM7000E-PCIE, SIM7000JC-PCIE and SIM7000G-PCIE.
The supported radio frequency bands are described in the following table.

**Table 1: SIM7000-PCIE Frequency Bands**

| Standard | Frequency | SIM7000A | SIM7000C | SIM7000E | SIM7000JC | SIM7000G |
|---|---|---|---|---|---|---|
| GPRS | 850MHz | | | | | ✓ |
| | 900MHz | | ✓ | ✓ | | ✓ |
| | 1800MHz | | ✓ | ✓ | | ✓ |
| | 1900MHz | | | | | ✓ |
| LTE | FDD B1 | | ✓ | | ✓ | ✓ |
| | FDD B2 | ✓ | | | | ✓ |
| | FDD B3 | | ✓ | ✓ | ✓ | ✓ |
| | FDD B4 | ✓ | | | | ✓ |
| | FDD B5 | | ✓ | | ✓ | ✓ |
| | FDD B8 | | ✓ | ✓ | ✓ | ✓ |
| | FDD B12 | ✓ | | | | ✓ |
| | FDD B13 | ✓ | | | | ✓ |
| | FDD B18 | | | | ✓ | ✓ |
| | FDD B19 | | | | ✓ | ✓ |
| | FDD B20 | | | ✓ | | ✓ |
| | FDD B25 | | | | | ✓ |
| | FDD B26 | | | | ✓ | ✓ |
| | FDD B28 | | | ✓ | | ✓ |
| | TDD B39 | | | | | ✓ |

| | | | | | | |
|---|---|---|---|---|---|---|
| **Category** | LTE-M1 | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Category** | LTE-NB1 | | ✓ | ✓ | ✓ | ✓ |
| **GNSS** | GPS | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Galileo | ✓ | ✓ | ✓ | ✓ | ✓ |
| | GLONASS | ✓ | ✓ | ✓ | ✓ | ✓ |
| | BeiDou | | ✓ | ✓ | ✓ | ✓ |

## 1.2 Hardware Interface Overview

SIM7000-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
- GPIOs

## 1.3 Hardware Block Diagram

The following figure is SIM7000-PCIE hardware block diagram.

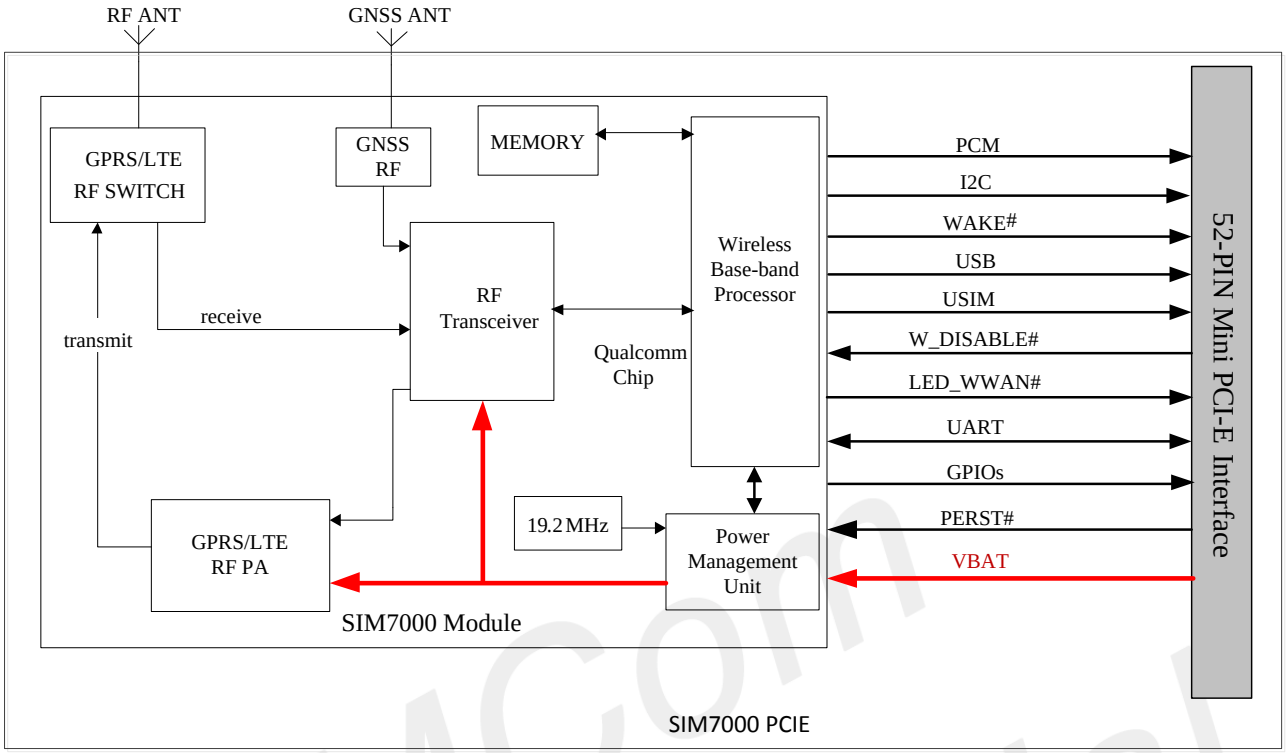


**Figure1: SIM7000-PCIE Block Diagram**

## 1.4 Functional Overview

**Table 2: SIM7000-PCIE Key Features**

| Feature | Implementation |
|---|---|
| **Power supply** | Single supply voltage 3.3～4.3V |
| **Radio frequency bands** | Please refer to the table 1 |
| **Transmitting power** | GPRS power class:<br>--EGSM900: 4 (2W)<br>--DCS1800: 1 (1W)<br>EDGE power class:<br>--EGSM900: E2 (0.5W)<br>--DCS1800: E1 (0.4W)<br>LTE power class: 3 (0.25W) |
| **Data Transmission Throughput** | GPRS multi-slot class 12<br>EDGE multi-slot class 12<br>LTE CAT M1: 300Kbps(DL)<br>LTE CAT M1: 375Kbps(UL)<br>LTE CAT NB1: 34Kbps (DL)<br>LTE CAT NB1: 66Kbps (UL)<br>LTE CAT 4 ： 150 Mbps (DL) |

| | |
|---|---|
| **Antenna** | GPRS/EDGE/LTE main antenna<br>GNSS antenna |
| **GNSS** | GNSS engine (GPS,GLONASS,BD and Galileo)<br>Protocol: NMEA |
| **SMS** | MT, MO, CB, Text and PDU mode<br>SMS storage: USIM card or ME(default) |
| **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: SM, FD, LD, RC, ON, MC |
| **Audio feature** | Support PCM interface<br>Only support PCM master mode and short frame sync, 16-bit linear data formats |
| **UART interface** | A full modem serial port by default<br>Baud rate: 300bps to 3686400bps. Default rate is 0bps (auto baud rate)<br>Support auto baud rate, but only limited to 9600, 19200, 38400, 57600 and 115200 bps<br>Can be used as the AT commands or data stream channel<br>Support RTS/CTS hardware handshake |
| **USB** | USB 2.0 high speed interface |
| **Firmware upgrade** | Firmware upgrade over USB interface |
| **Physical characteristics** | Size: 50.80*30*5.2mm<br>Weight: 10g |
| **Temperature range** | Normal operation temperature: -30°C to +80°C<br>Extended operation temperature: -40°C to +85°C*<br>Storage temperature -45°C to +90°C |

**NOTE**

PCIE is able to make and receive voice calls, data calls, SMS and make GPRS/ /LTE traffic in -40℃~+85℃. 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

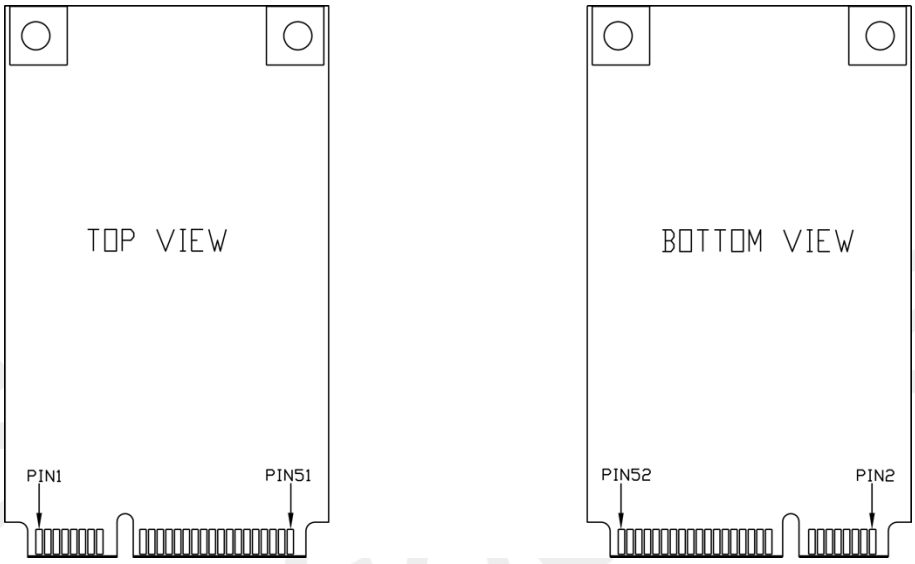


**Figure2: SIM7000-PCIE Pin out Diagram**

## 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** | | | | |
| **VBAT** | 2,24,39,41,52 | I | Power supply for PCIE | 3.8V typical |
| **GND** | 4,9,15,18,21,26 ,27,29,34,35,37 ,40,43, 50 | | Ground | |
| **Reset interface** | | | | |
| **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 | |
| **UART interface** | | | | |
| **UART_CTS** | 11 | O | Clear to Send | If unused, keep open |
| **UART_RTS** | 13 | I | Request to send | |
| **UART_RXD** | 17 | I | Receive Data | |
| **UART_TXD** | 19 | O | Transmit Data | |
| **UART_DCD** | **31** | **O** | Carrier detects | |
| **UART_RI** | 25 | O | Ring Indicator | |
| **UART_DTR** | 23 | I | DTE get ready | |
| **I2C interface** | | | | |
| **I2C_SCL** | 30 | O | I2C clock output | Pulled up inside PCIE,<br>If unused, keep open |
| **I2C_SDA** | 32 | I/O | I2C data input/output | |
| **PCM interface** | | | | |
| **PCM_CLK** | 45 | DO | PCM data bit clock. | If unused, keep open |
| **PCM_SYNC** | 51 | DO | PCM data frame sync signal. | |
| **PCM_DIN** | 49 | DI | PCM data input. | |
| **PCM_DOUT** | 47 | DO | PCM data output. | |
| **Others** | | | | |
| **WAKE#** | 1 | I/O | Wake up host | If unused, keep open |
| **W_DISABLE#** | 20 | I | Low power consumption control Input<br>Low level effective. | |

| | | | | |
|---|---|---|---|---|
| | | | When input is low, the PCIE will enter low power mode | |
| **LED_WWAN#** | 42 | O | Network Status Indication output.<br>OC output. | |
| **LED_WLAN#** | 44 | O | LED_WLAN signal is the NETLIGHT of the connected module, which is for network light, but LED_WLAN is the GPIO2 of the connected module. GPIO2 of the module does not do any functions by default, which needs to be configured and defined by software | |
| **GPIO0** | 46 | IO | General Purpose Input/output | GPIO power domain is 1.8V. If unused, keep open. |
| **GPIO1** | 33 | IO | General Purpose Input/output | |
| **NC** | 3,5,7,6,28, 48 | | No connection | Keep open |

## 2.3 Package Dimensions

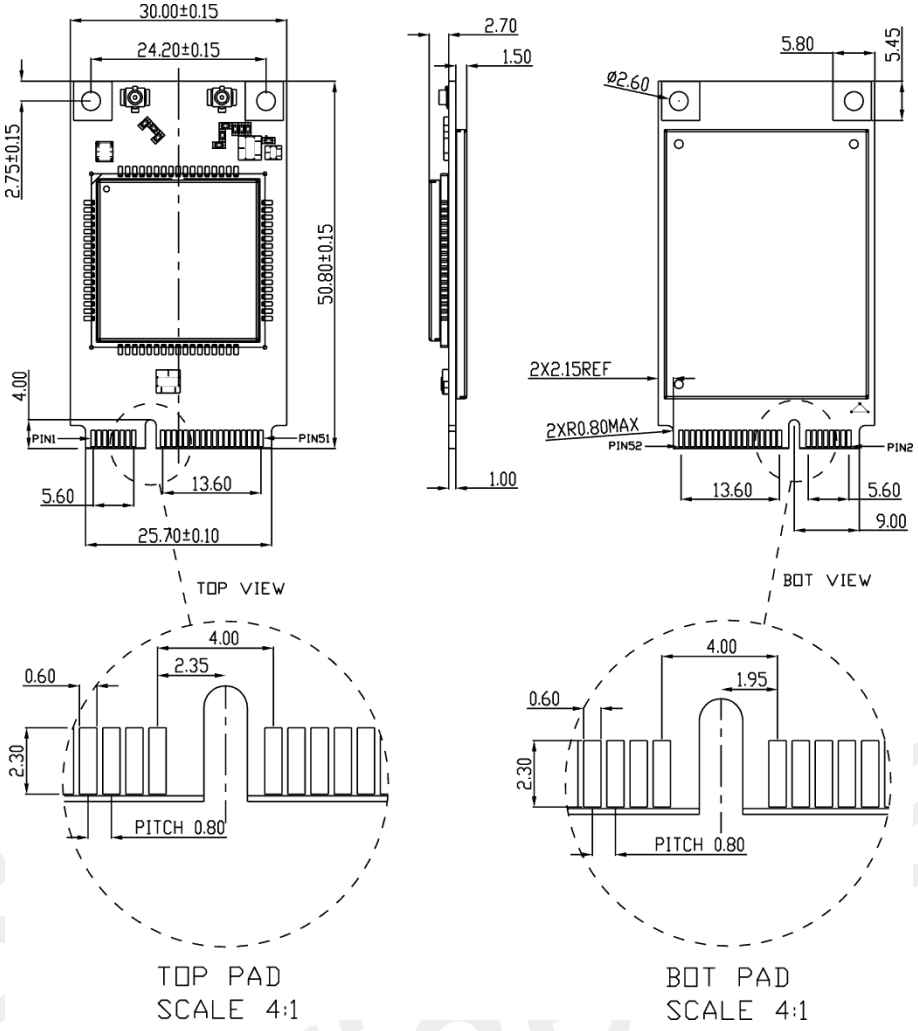


**Figure 3: Dimensions of SIM7000-PCIE (Unit: mm)**

# 3. Interface Application

## 3.1 Power Supply

The power supply pins of SIM7000-PCIE are VBAT

**Table 4: Recommended 3.3V Power Supply Characteristics**

| Symbol | Description | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **VBAT** | PCIE power voltage | 3.3 | 3.8 | 4.3 | V |
| **IVBAT(peak)** | PCIE power peak current in GSM and EDGE emission mode. | | 2 | | A |
| | PCIE power peak current in CAT-M1 and NB-IoT emission mode. | | 0.6 | | A |

The following figure shows the reference circuit with 5V input and 3.8V output.

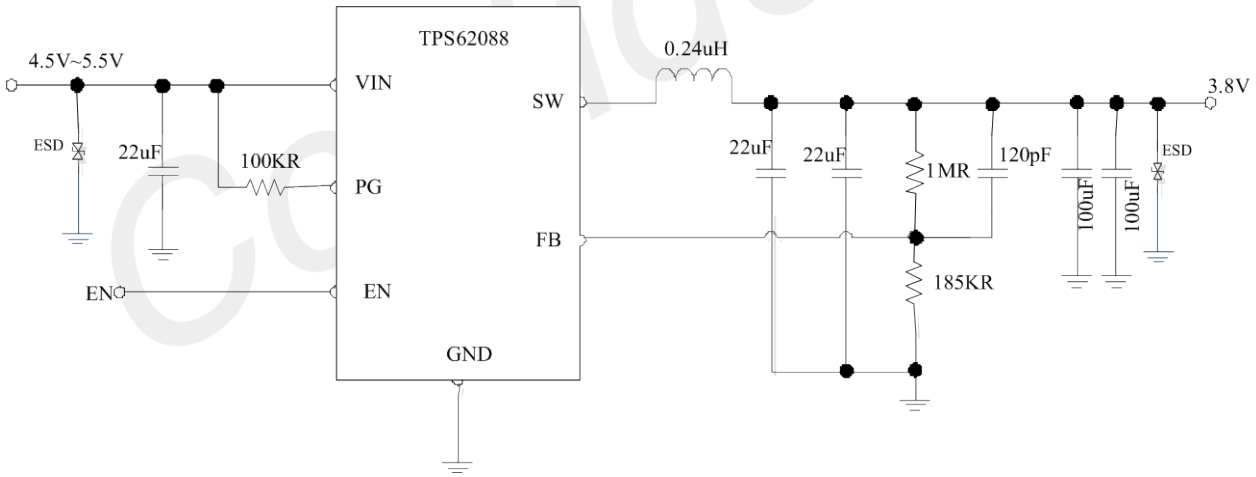


**Figure 4: power supply reference circuit**

## 3.2 PERST#

SIM7000-PCIE can be reset by pulling the PERST# pin down to ground.

The PERST# pin has been pulled up with a 47KΩ 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.

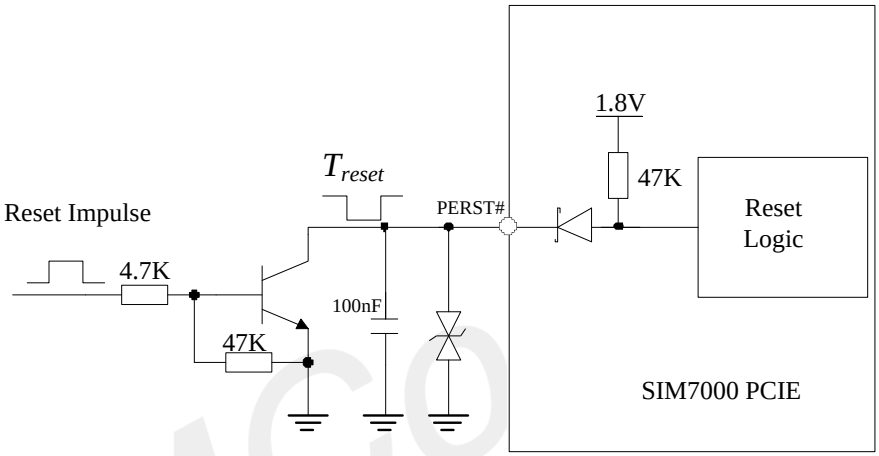


**Figure 5: PERST# Reference Circuit**

**Table 5: PERST# Pin Electronic Characteristic**

| Symbol | Description | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| **Treset** | The active low level time impulse on PERST# pin to reset PCIE | 225 | 500 | | ms |
| **$V_{IH}$** | Input high level voltage | 1.17 | 1.8 | 2.1 | 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 SIM7000-PCIE to enter or exit low power mode.

**Table 6: W_DISABLE# Pin Status**

| W_DISABLE# status | PCIE operation |
|---|---|
| **Input Low Level** | GNSS ANT power supply is closed<br>USB_VBUS power supply is closed |

| | |
|---|---|
| | DTR PIN will be pulled up. PCIE. PCIEs are allowed to enter sleep mode |
| **Input High Level** | GNSS ANT power supply is enabled<br>USB_VBUS power supply is enabled<br>DTR PIN will be pulled down. PCIEs will never enter sleep mode |

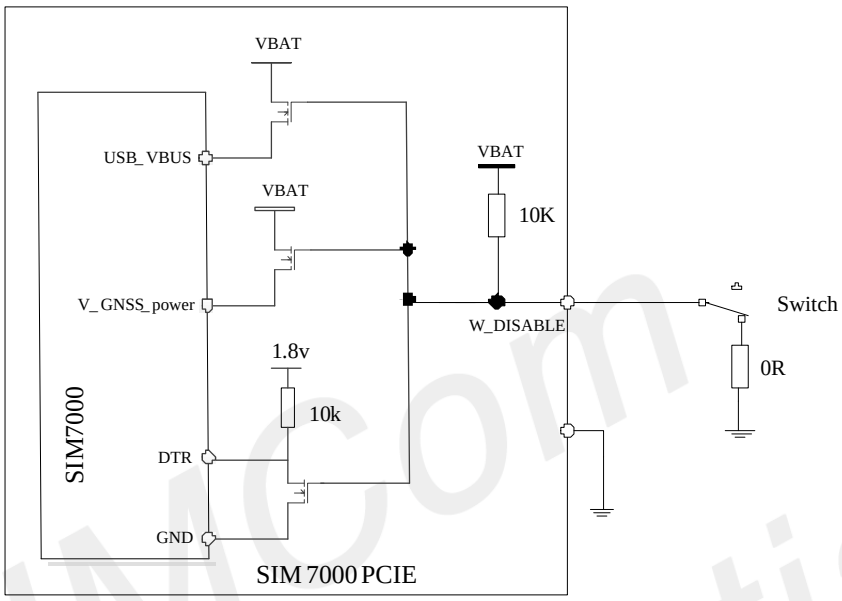


**Figure 6: W_DISABLE# Reference Circuit**

When the input state of the W_DISABLE# pin is high, SIM7000 PCIE will increase the power consumption of about 28mA.

When the input state of the W_DISABLE# pin is low, SIM7000 PCIE will enter the low-power mode after setting AT command “AT+CSCLK=1”.

## 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 7: Network Status Indication LED Status**

| NETLIGHT pin status | PCIE status |
|---|---|
| **64ms ON, 800ms OFF** | No registered network |
| **64ms ON, 3000ms OFF** | Registered network (PS domain registration success) |
| **64ms ON, 300ms OFF** | Data transmit (PPP dial-up state and use of data services such as internal TCP/FTP/HTTP) |

| | |
|---|---|
| **OFF** | Power off |

Reference circuit is recommended in the following figure:

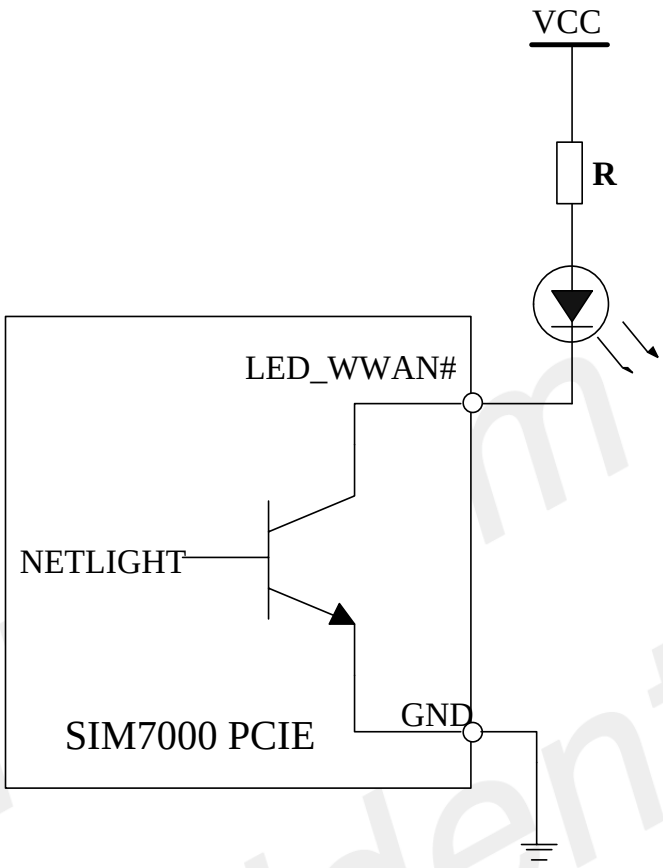


**Figure 7: LED_WWAN# Reference Circuit**

## 3.5 LED_WLAN#

The LED_WLAN# pin is open collector gate (OC) output. It can drive external circuits in one direction.

Reference circuit is recommended in the following figure:

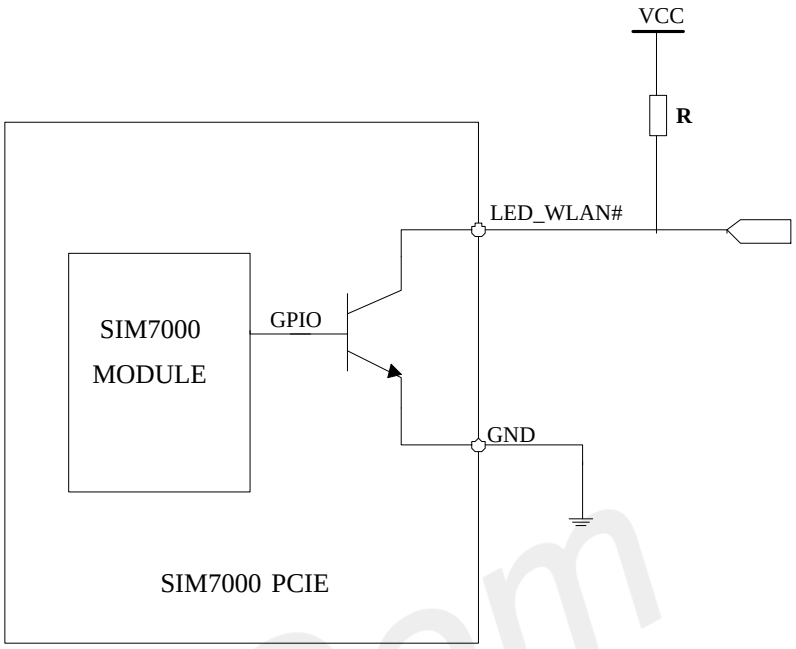


**Figure 8: LED_WLAN# Reference Circuit**

## 3.6 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 or URC reporting, then WAKE# will change to low logic level to inform the master (client PC).

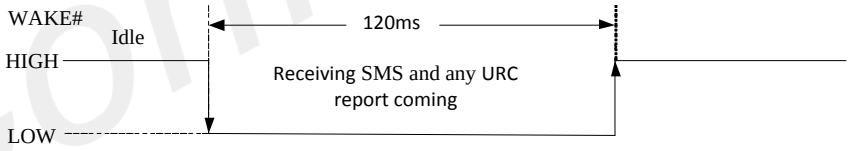


**Figure 9: WAKE# behaviour**

WAKE# Reference circuit is recommended in the following figure:

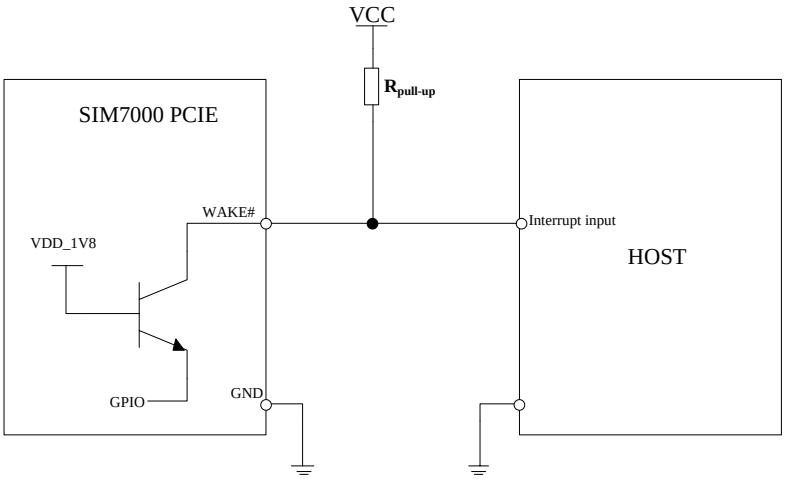


**Figure 10: WAKE# Reference Circuit**

## 3.7 USB2.0

SIM7000-PCIE is compliant with USB 2.0 specification. It supports full-speed and high- speed when acting as a peripheral device.

SIM7000-PCIE USB_VBUS had connected with VBAT power via a MOSFET. Users can control the USB_VBUS power up or power down through W_DISABLE. If W_DISABLE is high level, the USB_VBUS will power up. If W_DISABLE is low level, VBUS will be power down.

SIM7000-PCIE doesn't support USB suspend mode. If USB_VBUS had power supply, SIM7000-PCIE will increase power consumption by about 20mA.

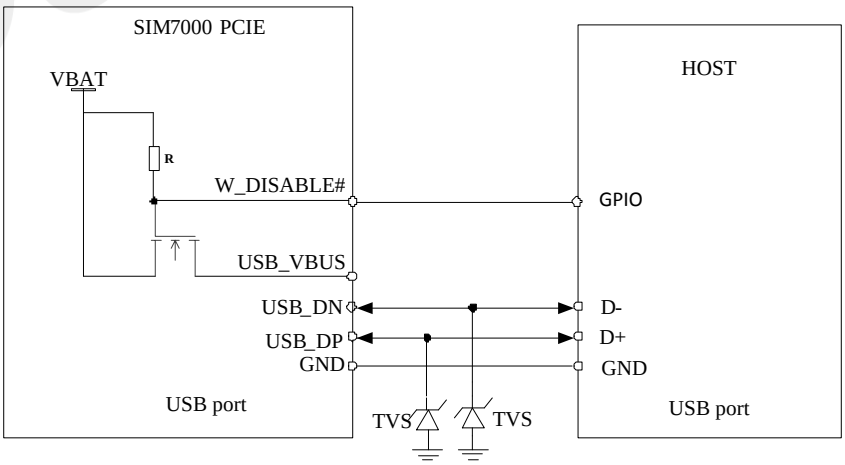


**Figure 11: USB Reference Circuit**

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+/-10% differential impedance.
2. The USB VBUS of the PCIE is connected to VBAT internally, so there is no need to connect externally.

## 3.8 USIM Interface

Both 1.8V and 3.0V USIM cards are supported. USIM interface is powered from an internal regulator in the PCIE.

**Table 8: USIM Electronic characteristic in 1.8V mode (USIM_VDD =1.8V)**

| Symbol | Parameter | Min | Type | Max | Unit |
|---|---|---|---|---|---|
| **USIM_VDD** | LDO power output voltage | 1.75 | 1.8 | 1.95 | V |
| **VIH** | High-level input voltage | 0.65*USIM_VDD | | USIM_VDD +0.3 | V |
| **VIL** | Low-level input voltage | -0.3 | 0 | 0.35*USIM_VDD | V |
| **VOH** | High-level output voltage | USIM_VDD -0.45 | | USIM_VDD | V |
| **VOL** | Low-level output voltage | 0 | 0 | 0.45 | V |

**Table 9: USIM Electronic characteristic 3.0V mode (USIM_VDD =2.95V)**

| Symbol | Parameter | Min | Type | Max | Unit |
|---|---|---|---|---|---|
| **USIM_VDD** | LDO power output voltage | 2.75 | 2.95 | 3.05 | V |
| **VIH** | High-level input voltage | 0.65*USIM_VDD | | USIM_VDD +0.3 | V |
| **VIL** | Low-level input voltage | -0.3 | 0 | 0.25·USIM_VDD | V |
| **VOH** | High-level output voltage | USIM_VDD -0.45 | | USIM_VDD | V |
| **VOL** | Low-level output voltage | 0 | 0 | 0.45 | V |

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 PCIE

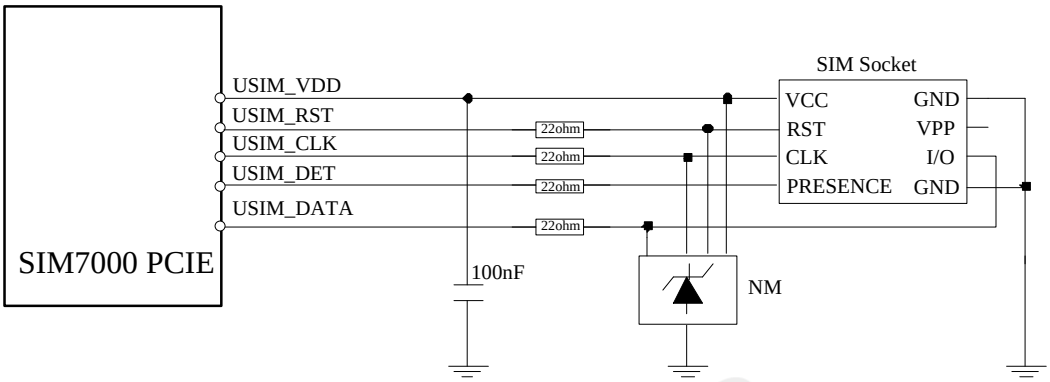


**Figure 12: USIM interface reference circuit with detection function**

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.

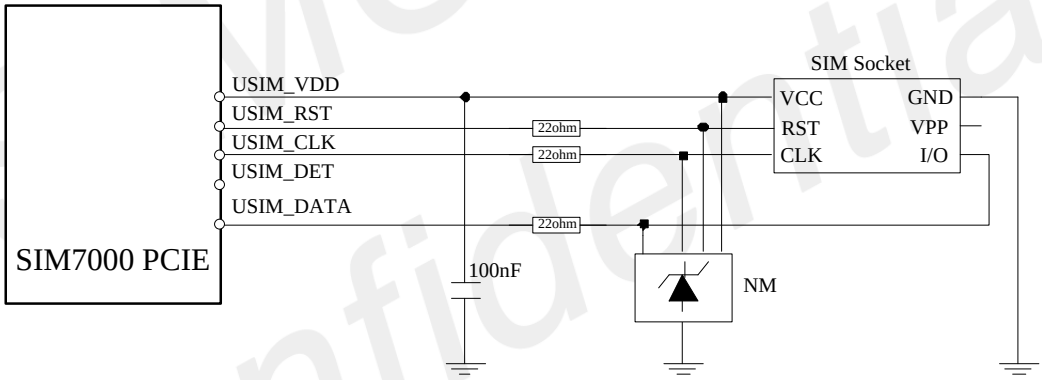


**Figure 13: USIM interface reference circuit**

**NOTE**

1. USIM_DATA has been pulled up with a 10KΩ resistor to USIM_VDD in PCIE. A 100nF capacitor on USIM_VDD is used to reduce interference.
2. USIM_CLK is very important signal; customer must make sure the rise time and fall time of USIM_CLK less than 40ns!

## 3.9 UART Interface

SIM7000-PCIE provides one UART (universal asynchronous serial transmission) port. The PCIE 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.

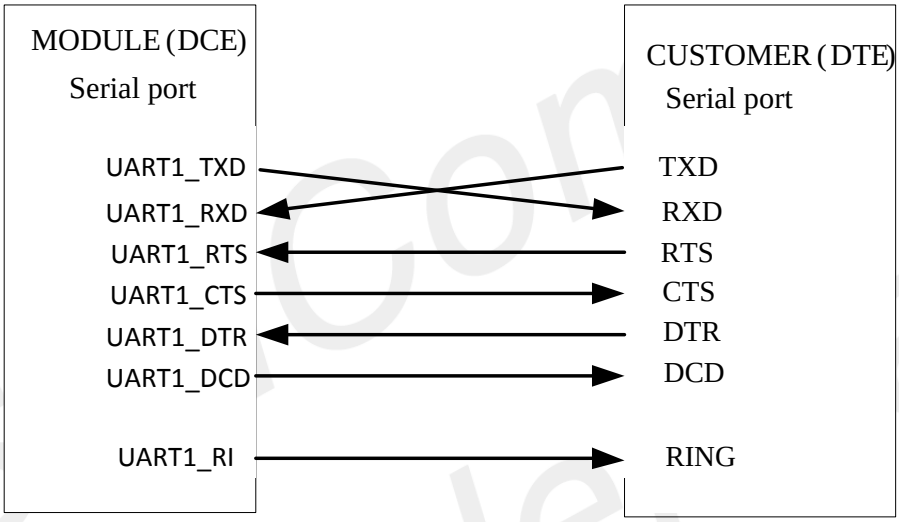


**Figure 14: UART Full modem**

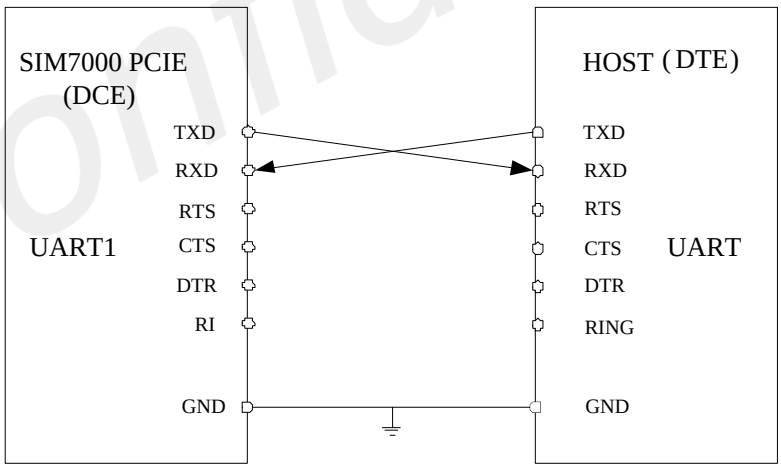


**Figure 15: UART Null modem**

**Table 10: UART Electrical Characteristic**

| 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 |

The SIM7000-PCIE UART is 1.8V interface. A voltage level converter should be used if user's application is equipped with a 3.3V UART interface. A voltage level converter TXB0108RGYR provided by Texas Instruments is recommended. The reference design of the TXB0108RGYR is in the following figures.

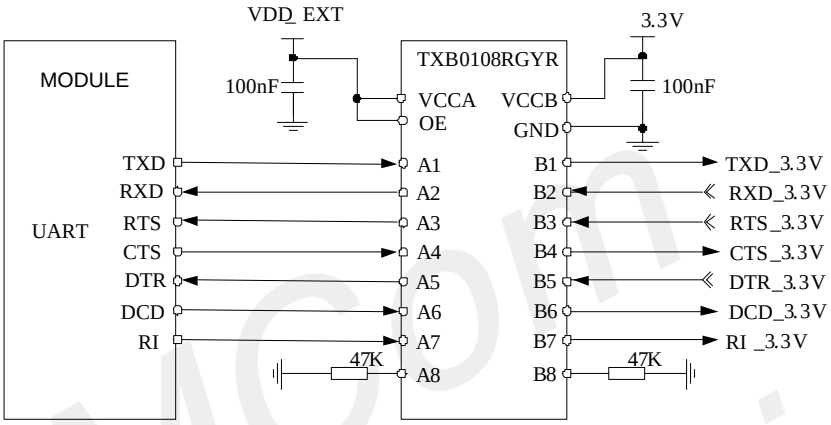


**Figure 16 Reference circuit of level shift**

To comply with RS-232-C protocol, the RS-232-C level shifter chip should be used to connect SIM7000-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.

**NOTE**

SIM7000-PCIE supports the following baud rate: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600, 2000000, 3200000, 3686400bps. Default baud rate is 115200bps.

### 3.9.1 RI and DTR Behavior

The RI pin description:
The RI pin can be used to interrupt output signal to inform the host controller such as application CPU. Before that, users must use AT command "AT+CFGRI=1" to enable this function.
Normally RI will keep high level until certain conditions such as receiving SMS, or a URC report coming, then it will output a low level pulse 120ms, in the end, it will become high level.

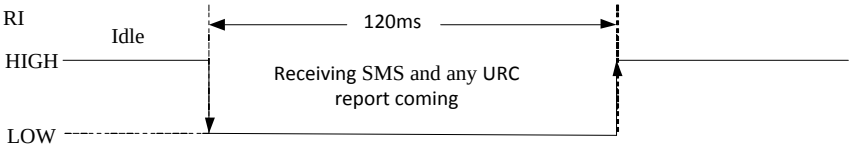


**Figure 17: RI behaviour ( SMS and URC report )**

The DTR pin description:
After setting the AT command “AT+CSCLK=1”, and then pulling up the DTR pin, SIM7000 will enter sleep mode when module is in idle mode. In sleep mode, the UART is unavailable. When SIM7000 enters sleep mode, pulling down DTR can wake up module.

After setting the AT command “AT+CSCLK=0”, SIM7000 will do nothing when the DTR pin is pulling up.

**NOTE**

For more details of AT commands about UART, please refer to document [1] and [22].

## 3.10 I2C Interface

SIM7000-PCIE provides I2C interface compatible with I2C specification, version 5.0, with clock rate up to 400 kH. 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 audio codec chip is not mounted on board, users could ignore this.

The following figure shows the I2C bus reference design.

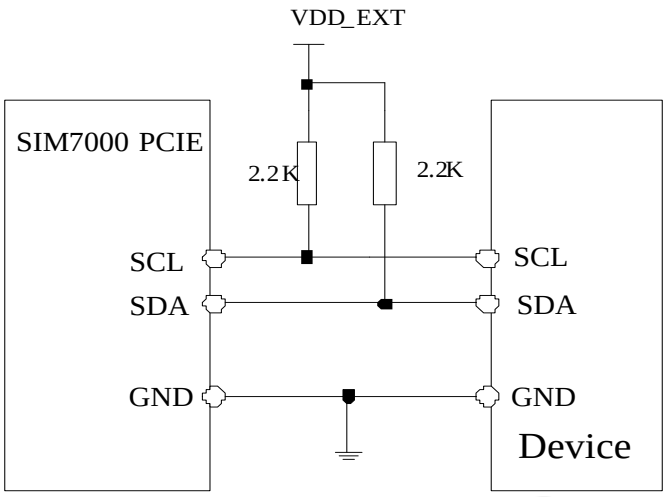


**Figure 18: I2C Reference Circuit**

**NOTE**

For more details about I2C AT commands please refer to document [1].

**Table 11: I2C Electrical Characteristic**

| Symbol | Parameter | Min | Type | Max | Unit |
|---|---|---|---|---|---|
| **VIH** | High-level input voltage | 1.17 | 1.8 | 2.1 | V |
| **VIL** | Low-level input voltage | -0.3 | 0 | 0.63 | V |
| **VOH** | High-level output voltage | 1.35 | 1.8 | 1.8 | V |
| **VOL** | Low-level output voltage | 0 | 0 | 0.45 | V |

## 3.11 PCM Interface

SIM7000-PCIE provides a PCM interface for external codec, which can be used in master mode with short sync and 16 bits linear format.

**Table 12: PCM format**

| 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 |

The following figure shows the external codec reference design.

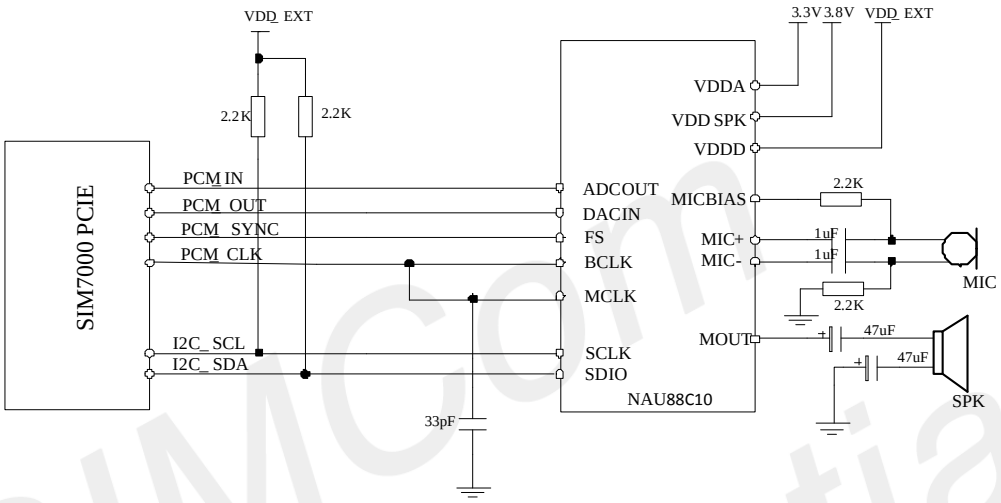


**Figure 19: Receiver interface configuration**

# 4. RF Specifications

## 4.1 GSM/LTE RF Specifications

**Table 13: Conducted transmission power**

| Frequency | Power | Min |
|---|---|---|
| EGSM900 | 33dBm ±2dB | 5dBm ± 5dB |
| GSM850 | 33dBm ±2dB | 5dBm ± 5dB |
| DCS1800 | 30dBm ±2dB | 0dBm ± 5dB |
| PCS1900 | 30dBm ±2dB | 0dBm ± 5dB |
| LTE-FDD B1 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B2 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B3 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B4 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B5 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B8 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B12 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B13 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B17 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B18 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B19 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B20 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B26 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B28 | 23dBm +/-2.7dB | <-40dBm |
| LTE-FDD B39 | 23dBm +/-2.7dB | <-40dBm |

**NOTE**

The max power is tested result for 1RB in CAT-M1 and single-tone in CAT-NB1. MPR for CAT-M1 please refer to 6.2.3EA.5 part for 3GPP. Multi-tone test results please refer to part 6.2.3F.3 for CAT-NB1.

Table 14: Maximum Power Reduction (MPR) for UE category NB1 Power Class 3

| Modulation | QPSK | | |
|---|---|---|---|
| Tone positions for 3 Tones allocation | 0-2 | 3-5 and 6-8 | 9-11 |
| MPR | ≤ 0.5 dB | 0 dB | ≤ 0.5 dB |
| Tone positions for 6 Tones allocation | 0-5 and 6-11 | | |
| MPR | ≤ 1 dB | ≤ 1 dB | |
| Tone positions for 12 Tones allocation | 0-11 | | |
| MPR | ≤ 2 dB | | |

Table 15: Operating frequencies

| Frequency | Receiving | Transmission |
|---|---|---|
| EGSM900 | 925～960MHz | 880～915 MHz |
| GSM850 | 869.2~893.8 | 824.2~848.8 |
| DCS1800 | 1805～1880 MHz | 1710～1785 MHz |
| PCS1900 | 1805.2~1879.8 | 1710.2~1784.8 |
| GPS L1 BAND | 1574.4 ～1576.44 MHz | |
| GLONASS | 1598 ～1606 MHz | |
| BD | 1559 ～1563 MHz | |
| LTE BAND | Refers to Table 21 | |

Table 16: E-UTRA operating bands

| E-UTRA | UL Freq. | DL Freq. | Duplex Mode |
|---|---|---|---|
| 1 | 1920 ~1980 MHz | 2110 ~2170 MHz | HD-FDD |
| 3 | 1710 ~1785 MHz | 1805 ~1880 MHz | HD-FDD |
| 5 | 824 ~849 MHz | 869 ~894 MHz | HD-FDD |
| 6 | 830 ~840 MHz | 875 ~885 MHz | HD-FDD |
| 8 | 880 ~915 MHz | 925 ~960 MHz | HD-FDD |
| 12 | 699 ~716 MHz | 729 ~746 MHz | HD-FDD |
| 13 | 777 ~787 MHz | 746 ~756 MHz | HD-FDD |
| 18 | 815 ~830 MHz | 860 ~875 MHz | HD-FDD |
| 19 | 830 ~845 MHz | 875 ~890 MHz | HD-FDD |
| 20 | 832 ~862 MHz | 791 ~821 MHz | HD-FDD |
| 26 | 814 ~849 MHz | 859 ~894 MHz | HD-FDD |
| 28 | 703 ~748 MHz | 758 ~803 MHz | HD-FDD |
| 39 | 1880 ~1920 MHz | 1880 ~1920 MHz | TDD |

Table 17: Conducted receive sensitivity

| Frequency | Receive sensitivity(Typical) | Receive sensitivity(MAX) |
|---|---|---|
| EGSM900/GSM850 | < -109dBm | 3GPP |
| DCS1800/DCS1900 | < -109dBm | 3GPP |
| LTE FDD/TDD | Refers to Table 23 | |

**Table 18: Reference sensitivity for HD-FDD UE category M1 QPSK PREFSENS**

| E-UTRA Band | REFSENS (dBm) | Duplex Mode |
|---|---|---|
| 1 | -103 | HD-FDD |
| 2 | -101 | HD-FDD |
| 3 | -100 | HD-FDD |
| 4 | -103 | HD-FDD |
| 5 | -101.5 | HD-FDD |
| 8 | -100.5 | HD-FDD |
| 12 | -100 | HD-FDD |
| 13 | -100 | HD-FDD |
| 17 | -100 | HD-FDD |
| 18 | -103[4] | HD-FDD |
| 19 | -103 | HD-FDD |
| 20 | -100.5 | HD-FDD |
| 26 | -101 | HD-FDD |
| 28 | *-101.5* | HD-FDD |
| 39 | -103 | HD-FDD |

**Table 19: CAT-NB1 Reference sensitivity (QPSK)**

| Operating band | REFSENS (dBm) 3GPP Request | REFSENS Typical(dBm) | REFSENS Typical Repeated(dBm) |
|---|---|---|---|
| 1, 2, 3, 4,5, 8, 12, 13, 17, 18, 19, 20, 26, 28 | -108.2 | -114 | -129 |

## 4.2 GSM/LTE Antenna Interface

Users should connect antennas to SIM7000's antenna connector. SIMCom recommends that the antennas used should meet the following requirements:

- Make sure the efficiency of LTE main ANT more than 40%
- Keep the decoupling of LTE main ANT to WLAN ANT more than 15dB
- Keep the decoupling of LTE main ANT to GNSS ANT more than 30dB

**NOTE**

The decoupling value can be provided by ANT adventure. More details can refer to the document [22].

## 4.3 GNSS

SIM7000 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 Antenna interface

The power supply of GNSS active antenna is integrated in SIM7000 PCIE, the power supply range is from 2.5V to 3.3V. And the current consumption of GNSS active antennas is about 7ma.

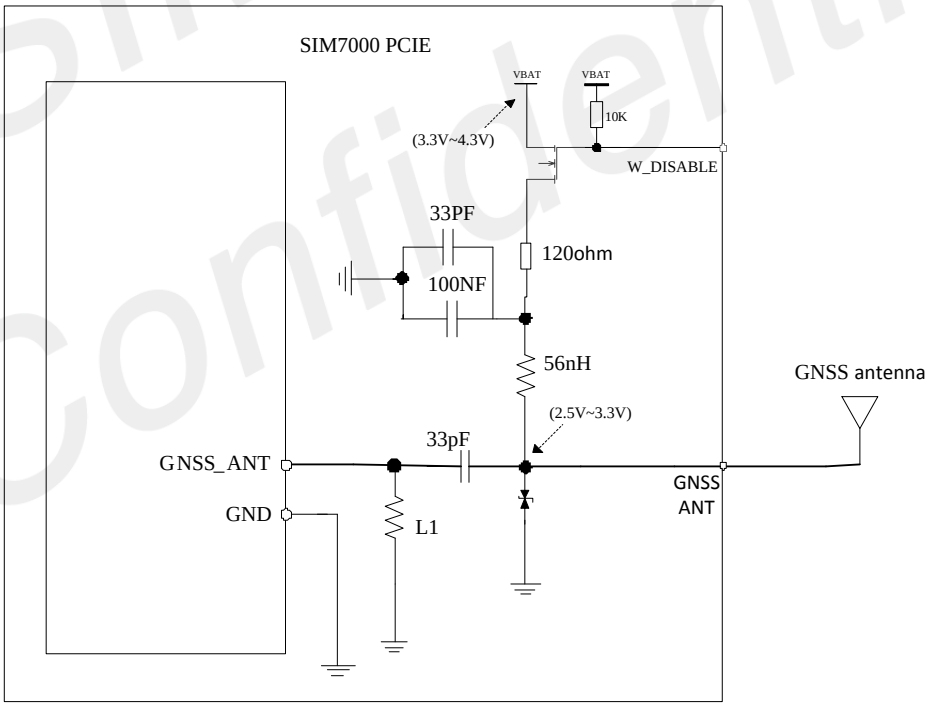


**Figure 20: GNSS antenna Reference Circuit**

If it is passive antenna, customers can connect the antenna directly.

### 4.3.2 GNSS Technical specification

- Tracking sensitivity: -162 dBm（GPS）/-157 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 : 30mA (GSM/LTE Sleep, in total on VBAT pins)
- GNSS antenna: Passive/Active antenna

# 5. Electrical Specifications

## 5.1. Absolute Maximum Ratings

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

**Table 20: Absolute maximum ratings**

| Symbol | Parameter | Min | Type | Max | Unit |
|---|---|---|---|---|---|
| $V_{BAT}$ | VBAT input voltage | -0.3 | | 4.5 | 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, and GPIO.

## 5.2. Recommended Operating Conditions

Please refer to the follow table for recommended operating conditions.

**Table 21: Operating Conditions**

| Symbol | Parameter | Min | Type | Max | Unit |
|---|---|---|---|---|---|
| $V_{BAT}$ | 3.8V Input voltage | 3.3 | 3.8 | 4.3 | 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 | ℃ |
| $T_{STG}$ | Storage temperature | -45 | +25 | +90 | ℃ |

## 5.3. Operating Mode

### 5.3.1. Operating Mode

The table below summarizes the various operating modes of SIM7000-PCIE.

**Table 22: Operating Mode**

| Mode | | Function |
|---|---|---|
| Normal operation | GPRS/EDGE/LTE Sleep | In this case, the current consumption of PCIE will be reduced to the minimal level and the PCIE can still receive paging message and SMS. |
| | GPRS/EDGE /LTE Idle | Software is active. PCIE is registered to the network, and the PCIE is ready to communicate. |
| | GPRS/EDGE/LTE Standby | PCIE is ready for data transmission, but no data is currently sent or received. In this case, power consumption depends on network settings. |
| | GPRS/EDGE/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 PCIE to a minimum functionality mode without removing the power supply. In this mode, the RF part of the PCIE 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 ON | | PCIE will turn on automatically after VBAT power supply. |
| Power Off | | Users could cut off the VBAT to power off PCIE. |

### 5.3.2. Low Power consumption mode

SIM7000-PCIE has two low power consumption modes: minimum functionality mode and sleep mode. In which PCIE will achieve lower power consumption for power saving.

Because SIM7000 PCIE PWRKEY pin is pulled down permanently to GND via a 0R resistor, SIM7000 PCIE does not support PSM mode.

#### 5.3.2.1 Sleep Mode

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

Several hardware and software conditions must be satisfied together in order to let SIM7000-PCIE enter into sleep mode:

- UART condition
- USB condition
- Software condition

**NOTE**

Before designing, pay attention to how to realize sleeping/waking function and refer to Document [22] for more details.

#### 5.3.2.2 Minimum functionality mode

Minimum functionality mode ceases a majority function of PCIE, 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 PCIE (Flight mode)

If SIM7000-PCIE has been set to minimum functionality mode, the PCIE 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 SIM7000-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 23: Current Consumption (Testing Environment: VBAT=3.3V)

| | |
|---|---|
| **GNSS** | |
| GNSS supply current (AT+CFUN=0,without USB connection) | @ -140dBm，Tracking Typical:30mA |
| **GSM sleep/idle mode** | |
| GSM/GPRS supply current (GNSS off，without USB connection) | Sleep mode@ BS_PA_MFRMS=2 Typical: 2mA<br>Idle mode@ BS_PA_MFRMS=2 Typical: 15mA |
| **LTE sleep/idle mode** | |
| LTE supply current (GNSS off，without USB connection) | Sleep mode Typical: 2mA<br>Idle mode Typical: 15mA |
| **GPRS** | |
| EGSM900( 1 Rx,4 Tx ) | @power level #5 Typical: 563mA |
| DCS1800( 1 Rx,4 Tx ) | @power level #0 Typical: 358mA |
| EGSM900( 3Rx, 2 Tx ) | @power level #5 Typical: 432mA |
| DCS1800( 3Rx, 2 Tx ) | @power level #0 Typical: 266mA |
| **EDGE** | |
| EGSM900( 1 Rx,4 Tx ) | @power level #8 Typical: 522mA |
| DCS1800( 1 Rx,4 Tx ) | @power level #2 Typical: 367mA |
| EGSM900( 3Rx, 2 Tx ) | @power level #8 Typical: 398mA |
| DCS1800( 3Rx, 2 Tx ) | @power level #2 Typical: 225mA |
| **LTE Cat-M** | |
| LTE-FDD B1 | @23dbm Typical: 161mA<br>@10dbm Typical: 111mA<br>@0dbm Typical: 98mA |
| LTE-FDD B2 | @23dbmTypical: 160mA<br>@10dbm Typical: 116mA<br>@0dbm Typical: 102mA |
| LTE-FDD B3 | @23dbmTypical: 150mA<br>@10dbm Typical: 110mA<br>@0dbm Typical: 102 mA |
| LTE-FDD B4 | @23dbmTypical: 150mA<br>@10dbm Typica : 114mA<br>@0dbm Typical: 102mA |
| LTE-FDD B5 | @23dbmTypical: 168mA<br>@10dbm Typical: 117mA<br>@0dbm Typical: 113mA |
| LTE-FDD B8 | @23dbmTypical: 165mA<br>@10dbm Typical: 110mA<br>@0dbm Typical: 98mA |
| LTE-FDD B12 | @23dbmTypical: 167mA<br>@10dbm Typical: 109mA<br>@0dbm Typical: 96mA |
| LTE-FDD B13 | @23dbmTypical: 168mA<br>@10dbm Typical: 114mA<br>@0dbm Typical: 97mA |
| LTE-FDD B18 | @23dbmTypical: 167mA<br>@10dbm Typical: 109mA<br>@0dbm Typical: 98mA |

| | |
|---|---|
| **LTE-FDD B19** | @23dbmTypical: 171mA<br>@10dbm Typical: 110mA<br>@0dbm Typical: 99mA |
| **LTE-FDD B20** | @23dbmTypical: 167mA<br>@10dbm Typical: 110mA<br>@0dbm Typical: 98mA |
| **LTE-FDD B26** | @23dbmTypical: 168mA<br>@10dbm Typical: 109mA<br>@0dbm Typical: 98mA |
| **LTE-FDD B28** | @23dbmTypical: 195mA<br>@10dbm Typical: 135mA<br>@0dbm Typical: 115mA |

| **LTE Cat-NBdata transmission** | | |
|---|---|---|
| B5 | UL mac padding _15KHZ_1RU_1 subcarrier_0dbm | 59.94 mA |
| | UL mac padding _15KHZ_1RU_1 subcarrier_10dbm | 68.48 mA |
| | UL mac padding _15KHZ_1RU_1 subcarrier_23dbm | 143.22 mA |
| | UL mac padding _3.75KHZ_1RU_1 subcarrier_0dbm | 83.60 mA |
| | UL mac padding _3.75KHZ_1RU_1 subcarrier_10dbm | 100.03 mA |
| | UL mac padding _3.75KHZ_1RU_1 subcarrier_23dbm | 244.96 mA |
| | UL mac padding _15KHZ_12subcarrier_23dbm | 92mA |
| | DL mac padding _15KHZ_12subcarrier_23dbm | 66.42mA |
| B8 | UL mac padding _15KHZ_1RU_1 subcarrier_0dbm | 60.42 mA |
| | UL mac padding _15KHZ_1RU_1 subcarrier_10dbm | 69.54 mA |
| | UL mac padding _15KHZ_1RU_1 subcarrier_23dbm | 144.60 mA |
| | UL mac padding _3.75KHZ_1RU_1 subcarrier_0dbm | 83.84 mA |
| | UL mac padding _3.75KHZ_1RU_1 subcarrier_10dbm | 101.37 mA |
| | UL mac padding _3.75KHZ_1RU_1 subcarrier_23dbm | 248.67 mA |
| | UL mac padding _15KHZ_12subcarrier_23dbm | 93mA |
| | DL mac padding _15KHZ_12subcarrier_23dbm | 68.4mA |

## 5.5. Electro-Static Discharge

SIM7000-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 24: ESD characteristics (Temperature: 25℃, Humidity: 45 %)**

| Part | Contact discharge | Air discharge |
|---|---|---|
| **VBAT,GND** | +/-6K | +/-12K |
| **Antenna port** | +/-5K | +/-10K |
| **USB** | +/-4K | +/-8K |

| | | |
|---|---|---|
| **UART** | +/-3K | +/-6K |
| **Other PADs** | +/-3K | +/-6K |

# 6. Packaging

SIM7000 PCIE supports tray packaging.

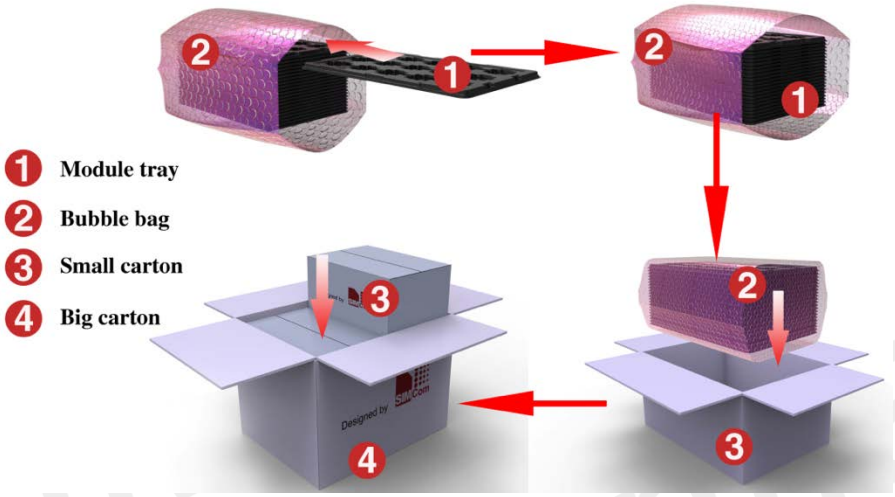


**Figure 21: Tray packaging**

SIM7000 PCIE tray drawing:

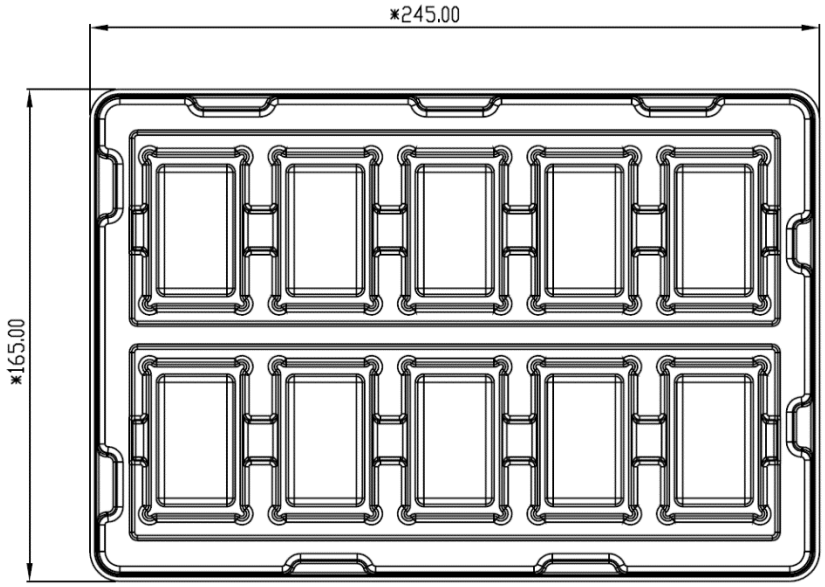


**Figure 22: Tray drawing**

**Table 25: Tray size**

| Length ( ±3mm ) | Width ( ±3mm ) | Number |
|---|---|---|
| 245.0 | 165.0 | 10 |

Small carton drawing:

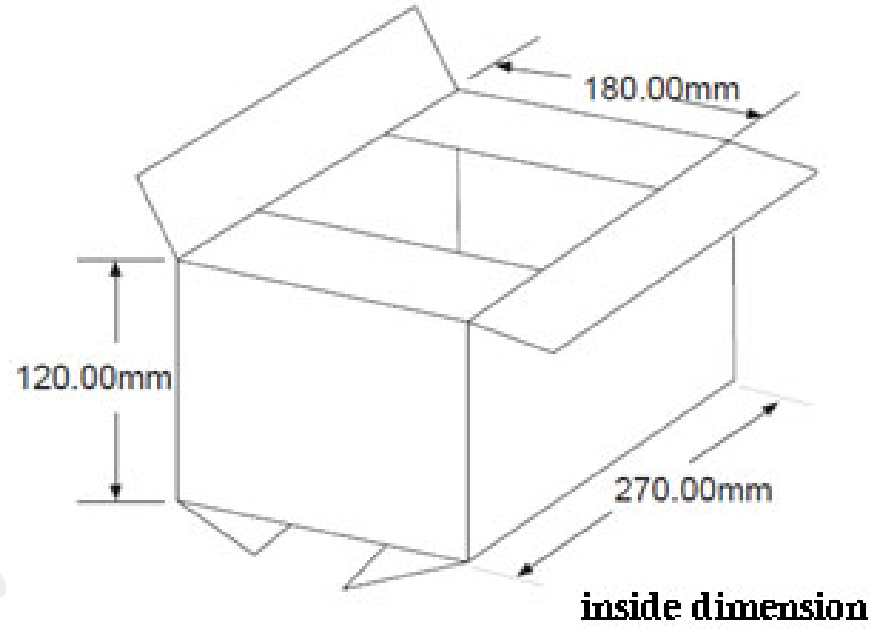


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**Figure 23: Small carton drawing**

**Table 26: Small Carton size**

| Length ( ±10mm ) | Width ( ±10mm ) | Height ( ±10mm ) | Number |
|---|---|---|---|
| 270 | 180 | 120 | 10*10=100 |

Big carton drawing:

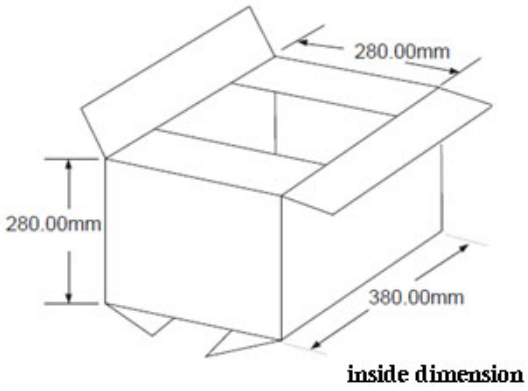


**Figure 24: Big carton drawing**

**Table 27: Big Carton size**

| Length ( ±10mm ) | Width ( ±10mm ) | Height ( ±10mm ) | Number |
|---|---|---|---|
| 380 | 280 | 280 | 100*4=400 |

# Appendix

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

**Table 28: 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 |
| **LTE-FDD device category (Uplink)** | **Max data rate（peak）** | **Modulation type** |
| Category NB | DL/UL:~60kbps/~50kbps | QPSK |
| Category M1 | DL/UL:1Mbps | QPSK/16QAM |

## II. Related Documents

**Table 29: Related Documents**

| NO. | Title | Description |
|---|---|---|
| [1] | SIM7000 Series AT Command Manual V1.xx | AT Command Manual |
| [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] | 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) |
| [19] | Module secondary-SMT-UGD V1.xx | Module secondary SMT Guidelines |
| [20] | SIM7000 Series UART Application Note_V1.xx | This document describes how to use UART interface of SIMCom modules. |
| [21] | ETSI EN 301 908-13 (ETSI TS 136521-1 R13.4.0) | IMT cellular networks; Harmonized EN covering the essential requirements of article 3.2 of the R&TTE Directive; Part 13 |
| [22] | ANTENNA DESIGN GUIDELINES FOR MULTI-ANTENNA SYSTEM V1 01 | Design notice for multi-antenna. |

## III. Terms and Abbreviations

**Table 30: 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 PCIE |
| 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 PCIE |
| UMTS | Universal mobile telecommunications system |
| UART | Universal asynchronous receiver transmitter |

# Safety Caution

**Table 31: 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. |
|  | 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. Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call. |

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