



# SIM7075G

## User Manual

LPWA Module

### **SIMCom Wireless Solutions Limited**

SIMCom Headquarters Building, Building 3, No. 289 Linhong  
Road, Changning District, Shanghai P.R. China

Tel: 86-21-31575100

[support@simcom.com](mailto:support@simcom.com)

[www.simcom.com](http://www.simcom.com)

|                        |                      |
|------------------------|----------------------|
| <b>Document Title:</b> | SIM7075G User Manual |
| <b>Version:</b>        | 1.00                 |
| <b>Date:</b>           | 2022-09-14           |
| <b>Status:</b>         | Released             |

## GENERAL NOTES

SIMCOM OFFERS THIS INFORMATION AS A SERVICE TO ITS CUSTOMERS, TO SUPPORT APPLICATION AND ENGINEERING EFFORTS THAT USE THE PRODUCTS DESIGNED BY SIMCOM. THE INFORMATION PROVIDED IS BASED UPON REQUIREMENTS SPECIFICALLY PROVIDED TO SIMCOM BY THE CUSTOMERS. SIMCOM HAS NOT UNDERTAKEN ANY INDEPENDENT SEARCH FOR ADDITIONAL RELEVANT INFORMATION, INCLUDING ANY INFORMATION THAT MAY BE IN THE CUSTOMER'S POSSESSION. FURTHERMORE, SYSTEM VALIDATION OF THIS PRODUCT DESIGNED BY SIMCOM WITHIN A LARGER ELECTRONIC SYSTEM REMAINS THE RESPONSIBILITY OF THE CUSTOMER OR THE CUSTOMER'S SYSTEM INTEGRATOR. ALL SPECIFICATIONS SUPPLIED HEREIN ARE SUBJECT TO CHANGE.

## COPYRIGHT

THIS DOCUMENT CONTAINS PROPRIETARY TECHNICAL INFORMATION WHICH IS THE PROPERTY OF SIMCOM WIRELESS SOLUTIONS LIMITED. COPYING, TO OTHERS AND USING THIS DOCUMENT, ARE FORBIDDEN WITHOUT EXPRESS AUTHORITY BY SIMCOM. OFFENDERS ARE LIABLE TO THE PAYMENT OF INDEMNIFICATIONS. ALL RIGHTS RESERVED BY SIMCOM IN THE PROPRIETARY TECHNICAL INFORMATION, INCLUDING BUT NOT LIMITED TO REGISTRATION GRANTING OF A PATENT, A UTILITY MODEL OR DESIGN. ALL SPECIFICATION SUPPLIED HEREIN ARE SUBJECT TO CHANGE WITHOUT NOTICE AT ANY TIME.

### **SIMCom Wireless Solutions Limited**

SIMCom Headquarters Building, Building 3, No. 289 Linhong Road, Changning District, Shanghai P.R. China  
Tel: +86 21 31575100  
Email: [simcom@simcom.com](mailto:simcom@simcom.com)

### **For more information, please visit:**

<https://www.simcom.com/download/list-863-en.html>

### **For technical support, or to report documentation errors, please visit:**

<https://www.simcom.com/ask/> or email to: [support@simcom.com](mailto:support@simcom.com)

Copyright © 2021 SIMCom Wireless Solutions Limited All Rights Reserved.

## Version History

| Date       | Version | Description of change | Author                    |
|------------|---------|-----------------------|---------------------------|
| 2022-05-23 | 1.00    | Original              | Yanping Yang<br>Meihao Li |

SIMCom  
Confidential

# Contents

|                                                        |           |
|--------------------------------------------------------|-----------|
| <b>1. Introduction .....</b>                           | <b>8</b>  |
| 1.1 Product Outline .....                              | 8         |
| 1.2 Hardware Interface Overview .....                  | 9         |
| 1.3 Hardware Block Diagram .....                       | 10        |
| 1.4 Functional Overview .....                          | 10        |
| <b>2. Package Information .....</b>                    | <b>12</b> |
| 2.1 Pin Assignment Overview .....                      | 12        |
| 2.2 Pin Description .....                              | 14        |
| 2.3 Mechanical Information .....                       | 19        |
| 2.4 Footprint Recommendation .....                     | 20        |
| <b>3. Interface Application .....</b>                  | <b>21</b> |
| 3.1 Power Supply .....                                 | 21        |
| 3.1.1 Power Supply Design Guide .....                  | 22        |
| 3.1.2 Recommended Power Supply Circuit .....           | 23        |
| 3.1.3 Voltage Monitor .....                            | 23        |
| 3.2 Power on/Power off Function .....                  | 23        |
| 3.2.1 Power on .....                                   | 24        |
| 3.2.2 Power off .....                                  | 25        |
| 3.3 UART Interface .....                               | 26        |
| 3.3.1 UART Design Guide .....                          | 27        |
| 3.3.2 RI and DTR Behavior .....                        | 29        |
| 3.4 USB Interface .....                                | 30        |
| 3.5 Force USB Download Interface .....                 | 31        |
| 3.6 SIM Interface .....                                | 31        |
| 3.6.1 SIM Application Guide .....                      | 32        |
| 3.7 PCM Interface .....                                | 33        |
| 3.7.1 PCM timing .....                                 | 33        |
| 3.7.2 PCM Application Guide .....                      | 34        |
| 3.8 I2C Interface .....                                | 35        |
| 3.9 Network status .....                               | 36        |
| 3.10 ADC interface .....                               | 37        |
| 3.11 LDO output .....                                  | 37        |
| <b>4. RF Specifications .....</b>                      | <b>39</b> |
| 4.1 LTE RF Specifications .....                        | 39        |
| 4.2 LTE Antenna Design Guide .....                     | 42        |
| 4.3 GNSS .....                                         | 43        |
| 4.3.1 GNSS Technical specification .....               | 43        |
| 4.3.2 GNSS Application Guide .....                     | 44        |
| 4.4 RF traces note .....                               | 45        |
| 4.4.1 RF traces layout .....                           | 45        |
| 4.4.2 LTE ANT and other system ANT decoupling .....    | 47        |
| <b>5. Electrical Specifications .....</b>              | <b>48</b> |
| 5.1 Absolute maximum ratings .....                     | 48        |
| 5.2 Operating conditions .....                         | 48        |
| 5.3 Operating Mode .....                               | 50        |
| 5.3.1 Operating Mode Definition .....                  | 50        |
| 5.3.2 Sleep mode .....                                 | 51        |
| 5.3.3 Minimum functionality mode and Flight mode ..... | 51        |
| 5.3.4 Power Saving Mode (PSM) .....                    | 52        |
| 5.3.5 Extended Mode DRX (e-DRX) .....                  | 52        |
| 5.4 Current Consumption .....                          | 53        |
| 5.5 ESD Notes .....                                    | 56        |
| <b>6. SMT Production Guide .....</b>                   | <b>58</b> |

|                                                                       |           |
|-----------------------------------------------------------------------|-----------|
| 6.1 Top and Bottom View of SIM7075G .....                             | 58        |
| 6.2 Label Information .....                                           | 59        |
| 6.3 Typical SMT Reflow Profile .....                                  | 60        |
| 6.4 Moisture Sensitivity Level (MSL) .....                            | 60        |
| 6.5 Baking .....                                                      | 61        |
| 6.6 Stencil Foil Design Recommendation .....                          | 62        |
| <b>7. Packaging .....</b>                                             | <b>63</b> |
| 7.1 Tray packaging .....                                              | 63        |
| <b>8. Appendix .....</b>                                              | <b>66</b> |
| A. Reference Design .....                                             | 66        |
| B. Design check list .....                                            | 67        |
| C. Coding Schemes and Maximum Net Data Rates over Air Interface ..... | 68        |
| D. Related Documents .....                                            | 69        |
| E. Terms and Abbreviations .....                                      | 70        |
| F. Safety Caution .....                                               | 72        |

SIMCom  
Confidential

## Table Index

|                                                                                          |           |
|------------------------------------------------------------------------------------------|-----------|
| Table 1: SIM7075G frequency bands and air interface .....                                | 8         |
| Table 2: General features .....                                                          | 10        |
| Table 3: Pin definition .....                                                            | 13        |
| Table 4: IO parameters definition .....                                                  | 14        |
| Table 5: Pin description .....                                                           | 15        |
| Table 6: VBAT pins electronic characteristic .....                                       | 21        |
| Table 7: Minimum input voltage .....                                                     | 22        |
| Table 8: Recommended TVS diode list .....                                                | 22        |
| Table 9: Alarm and Shutdown Voltage Range .....                                          | 23        |
| Table 10: Power on timing and electronic characteristic .....                            | 24        |
| Table 11: Power off timing and electronic characteristic .....                           | 26        |
| Table 12: UART electronic characteristic .....                                           | 28        |
| Table 13: Recommended TVS models .....                                                   | 31        |
| Table 14: SIM electronic characteristic in 1.8V mode (SIM_VDD=1.8V) .....                | 32        |
| Table 15: PCM format .....                                                               | 33        |
| Table 16: PCM timing parameters .....                                                    | 34        |
| Table 17: Control voltage rang .....                                                     | 36        |
| Table 18: NETLIGHT pin status .....                                                      | 36        |
| Table 19: ADC electronic characteristics .....                                           | 37        |
| Table 20: Electronic characteristic .....                                                | 38        |
| Table 21: Conducted transmission power .....                                             | 错误！未定义书签。 |
| Table 22: Maximum Power Reduction (MPR) for UE category NB&M1 Power Class 5 .....        | 39        |
| Table 23: Operating frequencies .....                                                    | 39        |
| Table 24: E-UTRA operating bands .....                                                   | 40        |
| Table 25: Conducted receive sensitivity .....                                            | 40        |
| Table 26: CAT-M1 Reference sensitivity (QPSK) .....                                      | 40        |
| Table 27: CAT-NB2Reference sensitivity (QPSK) .....                                      | 41        |
| Table 28: Trace loss .....                                                               | 42        |
| Table 29: Recommended TVS .....                                                          | 43        |
| Table 30: Absolute maximum ratings .....                                                 | 48        |
| Table 31: Module recommended operating ratings .....                                     | 48        |
| Table 32: 1.8V Digital I/O characteristics* .....                                        | 49        |
| Table 33: Recommended operating ratings .....                                            | 49        |
| Table 34: Operating temperature .....                                                    | 49        |
| Table 35: Operating mode Definition .....                                                | 50        |
| Table 36: Current consumption on VBAT Pins (VBAT=3.8V) .....                             | 53        |
| Table 37: The ESD performance measurement table (Temperature: 25℃, Humidity: 45%.) ..... | 56        |
| Table 38: The description of label information .....                                     | 59        |
| Table 39: Moisture Sensitivity Level and Floor Life .....                                | 60        |
| Table 40: Baking conditions .....                                                        | 61        |
| Table 41: Tray size .....                                                                | 64        |
| Table 42: Small Carton size .....                                                        | 64        |
| Table 43: Big Carton size .....                                                          | 65        |
| Table 44: Schematic Check List .....                                                     | 67        |
| Table 45: PCB Layout Check List .....                                                    | 67        |
| Table 46: Coding Schemes and Maximum Net Data Rates over Air Interface .....             | 68        |
| Table 47: Related Documents .....                                                        | 69        |
| Table 48: Terms and Abbreviations .....                                                  | 70        |
| Table 49: Safety Caution .....                                                           | 72        |

## Figure Index

|                                                                                 |    |
|---------------------------------------------------------------------------------|----|
| Figure 1: SIM7075G block diagram .....                                          | 10 |
| Figure 2: Pin assignment overview .....                                         | 12 |
| Figure 3: Dimensions (Unit: mm) .....                                           | 19 |
| Figure 4: Footprint recommendation (Unit: mm) .....                             | 20 |
| Figure 5: Voltage drop in EDGE or GPRS mode .....                               | 21 |
| Figure 6: Power supply application circuit .....                                | 22 |
| Figure 7: Power supply reference circuit .....                                  | 23 |
| Figure 8: Reference power on/off circuit .....                                  | 24 |
| Figure 9: Power on timing sequence .....                                        | 24 |
| Figure 10: Power off timing sequence .....                                      | 26 |
| Figure 11: UART full modem .....                                                | 27 |
| Figure 12: UART null modem .....                                                | 28 |
| Figure 13: Reference circuit with level shifter IC .....                        | 28 |
| Figure 14: Reference circuit with Transistor .....                              | 29 |
| Figure 15: RI behaviour (SMS and URC report) .....                              | 29 |
| Figure 16: USB reference circuit .....                                          | 30 |
| Figure 17: Reference circuit of BOOT_CFG interface .....                        | 31 |
| Figure 18: SIM interface reference circuit .....                                | 32 |
| Figure 19: PCM_SYNC timing .....                                                | 33 |
| Figure 20: External codec to module timing .....                                | 34 |
| Figure 21: Module to external codec timing .....                                | 34 |
| Figure 22: Audio codec reference circuit .....                                  | 35 |
| Figure 23: I2C reference circuit .....                                          | 35 |
| Figure 24: NETLIGHT reference circuit .....                                     | 36 |
| Figure 25: Power on sequence of the VDD_EXT .....                               | 38 |
| Figure 26: Antenna matching circuit (MAIN_ANT) .....                            | 43 |
| Figure 27: Active antenna circuit .....                                         | 44 |
| Figure 28: Passive antenna circuit (Default) .....                              | 44 |
| Figure 29: RF trace should be far away from other high speed signal lines ..... | 46 |
| Figure 30: The distance between GND to the inner conductor of SMA .....         | 46 |
| Figure 31: e-DRX diagrammatic sketch .....                                      | 52 |
| Figure 32: Top and bottom view of SIM7075G .....                                | 58 |
| Figure 33: Label information .....                                              | 59 |
| Figure 34: The ramp-soak-spike reflow profile of SIM7075G .....                 | 60 |
| Figure 35: stencil recommendation (Unit: mm) .....                              | 62 |
| Figure 36: packaging diagram .....                                              | 63 |
| Figure 37: Tray drawing .....                                                   | 63 |
| Figure 38: Small carton drawing .....                                           | 64 |
| Figure 39: Big carton drawing .....                                             | 65 |
| Figure 40: Reference design .....                                               | 66 |

# 1. Introduction

This document describes the electronic specifications, RF specifications, interfaces, mechanical characteristics and testing results of the SIMCom SIM7075G module. With the help of this document and other SIM7075G software application notes/user guides, users can understand and use SIM7075G module to design and develop applications quickly.

## 1.1 Product Outline

The SIM7075G modules support LTE CAT-M1, LTE CAT-NB1/CAT-NB2, GSM, GPRS and EDGE. The physical dimension of SIM7075G is 19.9mm×23.6mm×2.2 mm. It is designed for applications that need low latency, Low throughput data communication in a variety of radio propagation conditions. Due to the unique combination of performance, security and flexibility, this module is ideally suited for M2M applications, such as metering, asset tracking, remote monitoring, E-health and etc.

**Table 1: SIM7075G frequency bands and air interface**

| Network Type | Band        | SIM7075G |     |
|--------------|-------------|----------|-----|
|              | Category    | M1       | NB2 |
| LTE-HD-FDD   | LTE-FDD B1  | ✓        | ✓   |
|              | LTE-FDD B2  | ✓        | ✓   |
|              | LTE-FDD B3  | ✓        | ✓   |
|              | LTE-FDD B4  | ✓        | ✓   |
|              | LTE-FDD B5  | ✓        | ✓   |
|              | LTE-FDD B8  | ✓        | ✓   |
|              | LTE-FDD B12 | ✓        | ✓   |
|              | LTE-FDD B13 | ✓        | ✓   |
|              | LTE-FDD B14 | ✓        |     |
|              | LTE-FDD B18 | ✓        | ✓   |
|              | LTE-FDD B19 | ✓        | ✓   |
|              | LTE-FDD B20 | ✓        | ✓   |
|              | LTE-FDD B25 | ✓        | ✓   |
|              | LTE-FDD B26 | ✓        | ✓   |
|              | LTE-FDD B27 | ✓        |     |
|              | LTE-FDD B28 | ✓        | ✓   |
|              | LTE-FDD B31 |          |     |
|              | LTE-FDD B66 | ✓        | ✓   |
|              | LTE-FDD B71 |          | ✓   |

| LTE-FDD B72       |            |   |
|-------------------|------------|---|
| GSM/GPRS/<br>EDGE | GSM850MHz  | ✓ |
|                   | EGSM900MHz | ✓ |
|                   | DCS1800MHz | ✓ |
|                   | PCS1900MHz | ✓ |
| GNSS              | GPS        | ✓ |
|                   | GLONASS    | ✓ |
|                   | BeiDou     | ✓ |
|                   | Galileo    | ✓ |

#### NOTE

Galileo is default closed in software. But users can open it via AT command “AT+CGNSMOD”. For more information about these AT commands, please refer to Document [1]

## 1.2 Hardware Interface Overview

The interfaces are described in detail in the next chapters include:

- Power Supply
- USB Interface
- UART Interface
- SIM Interface
- ADC
- LDO Power Output
- PCM Interface
- I2C Interface
- GPIOs
- Antenna Interface

## 1.3 Hardware Block Diagram

The block diagram of the SIM7075G module is shown in the figure below.

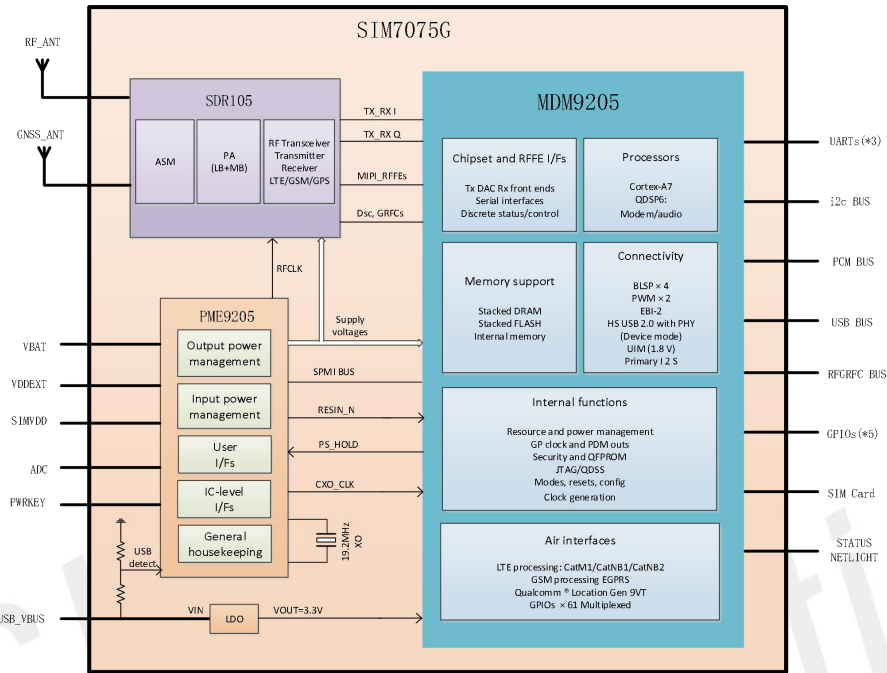


Figure 1: SIM7075G block diagram

## 1.4 Functional Overview

Table 2 describes the features of the SIM7075G modules.

**Table 2: General features**

| Feature               | Implementation                                          |
|-----------------------|---------------------------------------------------------|
| Power supply          | SIM 7075G Power supply voltage 3.3V~4.3V. Default :3.8V |
| Power saving          | Current in PSM mode: 9uA                                |
| Radio frequency bands | Please refer to the table 1                             |
| Transmitting power    | GSM/GPRS power class:                                   |
|                       | -- GSM850: 4 (2W)                                       |
|                       | -- EGSM900: 4 (2W)                                      |
|                       | -- DCS1800: 1 (1W)                                      |
|                       | -- PCS1900: 4 (1W)                                      |
|                       | EDGE power class:                                       |
|                       | -- GSM850: E2 (0.5W)                                    |
|                       | -- EGSM900: E2 (0.5W)                                   |
|                       | -- DCS1800: E1 (0.4W)                                   |
|                       | -- PCS1900: E1 (0.4W)                                   |

|                              |                                                                                                                                                                                                                                                                                                                                                                                                |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                              | LTE power class: 5 (0.125W).Band31/Band72 power class: 2(0.4W)                                                                                                                                                                                                                                                                                                                                 |
| Data Transmission Throughput | GPRS: Uplink up to 85.6Kbps, Downlink up to 85.6Kbps.<br>EDGE: Uplink up to 296Kbps, Downlink up to 236.8Kbps<br>LTE CAT M1:589Kbps (DL).<br>LTE CAT M1: 1119Kbps (UL).<br>LTE CAT NB1/NB2: 127Kbps (DL).<br>LTE CAT NB1/NB2: 158.5Kbps (UL).                                                                                                                                                  |
| Antenna                      | LTE main antenna.<br>GNSS antenna.                                                                                                                                                                                                                                                                                                                                                             |
| GNSS                         | GNSS engine (GPS, GLONASS, BDS and Galileo).<br>Protocol: NMEA.                                                                                                                                                                                                                                                                                                                                |
| SIM interface                | Support identity card: 1.8V only.                                                                                                                                                                                                                                                                                                                                                              |
| Digital audio feature        | Support PCM interface.<br>Only support PCM master mode and short frame sync                                                                                                                                                                                                                                                                                                                    |
| UART interface               | One channel full-function UART1 by default can be used for AT communication.<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>Support RTS/CTS hardware handshake.<br>Two channel 2-wire UART2 and UART3 only used as UART in DAM application when secondary development. |
| USB                          | USB 2.0 high speed interface.                                                                                                                                                                                                                                                                                                                                                                  |
| Firmware upgrade             | Firmware upgrade over USB interface                                                                                                                                                                                                                                                                                                                                                            |
| Physical characteristics     | Size: 19.9×23.6×2.2mm<br>Weight:2.0g±0.2g                                                                                                                                                                                                                                                                                                                                                      |
| Temperature range            | operation temperature: -40℃~ +85℃<br>Storage temperature -45℃ to +90℃                                                                                                                                                                                                                                                                                                                          |

## 2. Package Information

### 2.1 Pin Assignment Overview

All functions of the SIM7075G will be provided through 102 pads that will be connected to the customers' platform. The Figure 2 is the pin assignment of the SIM7075G.

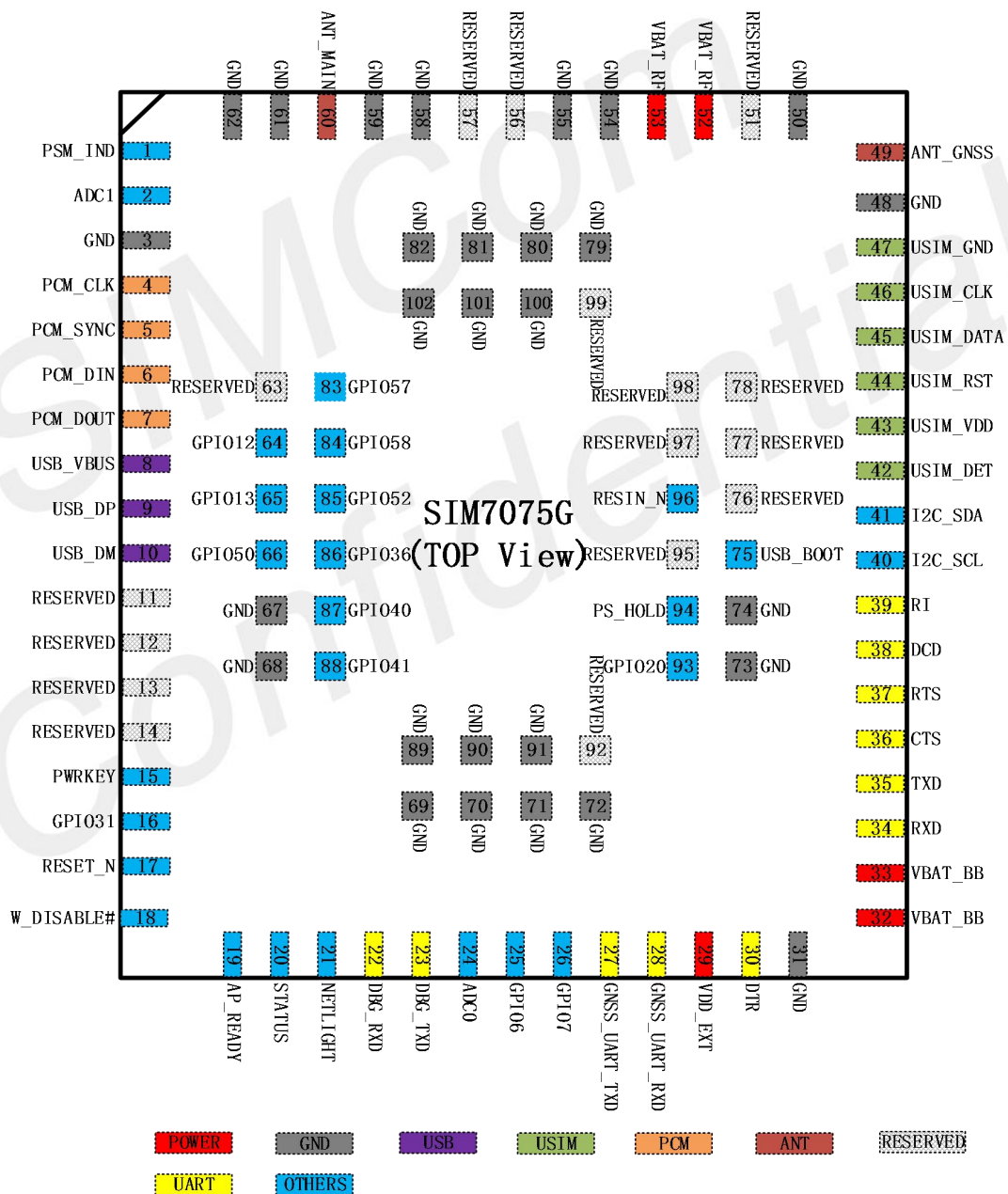


Figure 2: Pin assignment overview

Table 3 lists the SIM7075G module pin numbers and pin definitions.

**Table 3: Pin definition**

| Pin No. | Pin Name      | Pin No. | Pin Name      |
|---------|---------------|---------|---------------|
| 1       | PSM_IND       | 2       | ADC1          |
| 3       | GND           | 4       | PCM_CLK       |
| 5       | PCM_SYNC      | 6       | PCM_DIN       |
| 7       | PCM_DOUT      | 8       | USB_VBUS      |
| 9       | USB_DP        | 10      | USB_DM        |
| 11      | RESERVED      | 12      | RESERVED      |
| 13      | RESERVED      | 14      | RESERVED      |
| 15      | PWRKEY        | 16      | GPIO31        |
| 17      | RESET_N       | 18      | W_DSIABLE#    |
| 19      | AP_REDAY      | 20      | STATUS        |
| 21      | NETLIGHT      | 22      | DEBUG_RXD     |
| 23      | DEBUG_TXD     | 24      | ADC0          |
| 25      | GPIO6         | 26      | GPIO7         |
| 27      | GNSS_UART_TXD | 28      | GNSS_UART_RXD |
| 29      | VDD_EXT       | 30      | DTR           |
| 31      | GND           | 32      | VBATT_BB      |
| 33      | VBATT_BB      | 34      | RXD           |
| 35      | TXD           | 36      | CTS           |
| 37      | RTS           | 38      | DCD           |
| 39      | RI            | 40      | I2C_SCL       |
| 41      | I2C_SDA       | 42      | USIM_DET      |
| 43      | USIM_VDD      | 44      | USIM_RST      |
| 45      | USIM_DATA     | 46      | USIM_CLK      |
| 47      | USIM_GND      | 48      | GND           |
| 49      | ANT_GNSS      | 50      | GND           |
| 51      | RESERVED      | 52      | VBAT_RF       |
| 53      | VBAT_RF       | 54      | GND           |
| 55      | GND           | 56      | RESERVED      |
| 57      | RESERVED      | 58      | GND           |
| 59      | GND           | 60      | ANT_MAIN      |
| 61      | GND           | 62      | GND           |
| 63      | RESERVED      | 64      | GPIO12        |
| 65      | GPIO13        | 66      | GPIO50        |
| 67      | GND           | 68      | GND           |
| 69      | GND           | 70      | GND           |
| 71      | GND           | 72      | GND           |
| 73      | GND           | 74      | GND           |

|     |          |     |          |
|-----|----------|-----|----------|
| 75  | USB_BOOT | 76  | RESERVED |
| 77  | RESERVED | 78  | RESERVED |
| 79  | GND      | 80  | GND      |
| 81  | GND      | 82  | GND      |
| 83  | GPIO57   | 84  | GPIO58   |
| 85  | GPIO52   | 86  | GPIO36   |
| 87  | GPIO40   | 88  | GPIO41   |
| 89  | GND      | 90  | GND      |
| 91  | GND      | 92  | RESERVED |
| 93  | GPIO20   | 94  | PS_HOLD  |
| 95  | RESERVED | 96  | RESIN_N  |
| 97  | RESERVED | 98  | RESERVED |
| 99  | RESERVED | 100 | GND      |
| 101 | GND      | 102 | GND      |

**NOTE**

Before the normal power up, USB\_BOOT cannot be pulled up.

## 2.2 Pin Description

This section describes the SIM7075G of pins and pin function definitions

**Table 4: IO parameters definition**

| Pintype | Description                    |
|---------|--------------------------------|
| PI      | Power input                    |
| PO      | Power output                   |
| AI      | Analog input                   |
| AIO     | Analog input/output            |
| I/O     | Bidirectional input /output    |
| DI      | Digital input                  |
| DO      | Digital output                 |
| DOH     | Digital output with high level |
| DOL     | Digital output with low level  |
| PU      | Pull up                        |
| PD      | Pull down                      |

**Table 5: Pin description**

| Pin name              | Pin No.                                                                                                   | Default status | Description                                                                                                                                                                                                                                                                                                         | Comment                                                                                                     |
|-----------------------|-----------------------------------------------------------------------------------------------------------|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|
| <b>Power supply</b>   |                                                                                                           |                |                                                                                                                                                                                                                                                                                                                     |                                                                                                             |
| VBAT_BB               | 32,33                                                                                                     | PI             | Power supply, voltage range: 3.3~4.3V. typical: 3.8V                                                                                                                                                                                                                                                                |                                                                                                             |
| VBAT_RF               | 52,53                                                                                                     | PI             | Power supply, voltage range: 3.3~4.3V. typical: 3.8V                                                                                                                                                                                                                                                                |                                                                                                             |
| VDD_EXT               | 29                                                                                                        | PO             | LDO power output 1.8V for other external circuits with Max 50mA current output.                                                                                                                                                                                                                                     | This power supply only use for external GPIO pulling up or level shift circuit.<br>If unused, keep it open. |
| GND                   | 3,31<br>48,50<br>54,55<br>58,54<br>58,59<br>61,62<br>67~74<br>,79~8<br>2,89,9<br>0,91,1<br>00,10<br>1,102 |                | Ground                                                                                                                                                                                                                                                                                                              |                                                                                                             |
| <b>System Control</b> |                                                                                                           |                |                                                                                                                                                                                                                                                                                                                     |                                                                                                             |
| PWRKEY                | 15                                                                                                        | DI,PU          | System power on/off control input, active low.<br>The efficient input low level must be below 0.45V.<br>The efficient input high level must be higher than 1.0V.<br>After the PWRKEY continues to pull down more than 12.6S, the system will automatically reset. Therefore, long-term grounding is not recommended | The level is 1.5V when this PIN is floating;<br>$C_{max}=10pF$                                              |
| RESET_N               | 17                                                                                                        |                | Reset the module                                                                                                                                                                                                                                                                                                    |                                                                                                             |
| <b>SIM interface</b>  |                                                                                                           |                |                                                                                                                                                                                                                                                                                                                     |                                                                                                             |
| SIM_VDD               | 43                                                                                                        | PO             | Power output for SIM card, its output Voltage depends on SIM card type automatically. Its output current is up to 50mA.                                                                                                                                                                                             |                                                                                                             |
| SIM_DATA              | 45                                                                                                        | I/O,PU         | SIM Card data I/O, which has been pulled up via a 20KR resistor to SIM_VDD internally. Do not pull it up or down externally.                                                                                                                                                                                        | All lines of SIM interface should be protected against ESD.                                                 |
| SIM_CLK               | 46                                                                                                        | DO             | SIM clock                                                                                                                                                                                                                                                                                                           |                                                                                                             |
| SIM_RST               | 44                                                                                                        | DO             | SIM Reset                                                                                                                                                                                                                                                                                                           |                                                                                                             |

|                |    |       |                                                                                                                                  |                                                                                      |
|----------------|----|-------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| SIM_DET        | 42 | DI    | SIM card detect, the module is not support hot-swap function.                                                                    |                                                                                      |
| USIM_GND       | 47 |       | Ground for SIM Card                                                                                                              |                                                                                      |
| USB*           |    |       |                                                                                                                                  |                                                                                      |
| USB_VBUS       | 8  | DI,PD | Valid USB detection input with 3.5~5.25V detection voltage                                                                       | Software download interface. It is recommended to reserve interfaces or test points. |
| USB_DP         | 9  | I/O   | Positive line of the differential, bi-directional USB signal.                                                                    |                                                                                      |
| USB_DM         | 10 | I/O   | Negative line of the differential, bi-directional USB signal.                                                                    |                                                                                      |
| UART interface |    |       |                                                                                                                                  |                                                                                      |
| UART1_DTR      | 30 | DI,PH | DTE get ready                                                                                                                    | If unused, keep them open.                                                           |
| UART1_RXD      | 34 | DI,PL | Receive Data                                                                                                                     |                                                                                      |
| UART1_TXD      | 35 | DOH   | Transmit Data                                                                                                                    |                                                                                      |
| UART1_CTS      | 36 | DOL   | Clear to Send                                                                                                                    |                                                                                      |
| UART1_RTS      | 37 | DI,PL | Request to send                                                                                                                  |                                                                                      |
| UART1_DCD      | 38 | DOH   | Carrier detects                                                                                                                  |                                                                                      |
| UART1_RI       | 39 | DOH   | Ring Indicator                                                                                                                   | Debug UART, the boot log will be output during boot up. If unused, keep them open.   |
| DEBUG_RXD      | 22 | DI,PL | The default function is GPIO, and UART is only used for software secondary development. Cannot be used as AT communication port. |                                                                                      |
| DEBUG_TXD      | 23 | DOH   |                                                                                                                                  |                                                                                      |
| GNSS_UART_TXD  | 27 | DO    | GNSS transmit data                                                                                                               |                                                                                      |
| GNSS_UART_RXD  | 28 | DI    | GNSS receive data                                                                                                                |                                                                                      |
| I2C interface  |    |       |                                                                                                                                  |                                                                                      |
| I2C_SCL        | 40 | OD    | I2C clock output                                                                                                                 | If unused, keep open, or else pull them up via1KΩ resistors to the VDD_EXT.          |
| I2C_SDA        | 41 | OD    | I2C data input/output                                                                                                            |                                                                                      |
| PCM interface  |    |       |                                                                                                                                  |                                                                                      |
| PCM_CLK        | 4  | DO    | PCM data bit clock.                                                                                                              | If unused, please keep them open.                                                    |
| PCM_SYNC       | 5  | DO    | PCM data frame sync signal.                                                                                                      |                                                                                      |
| PCM_DIN        | 6  | DI    | PCM data input.                                                                                                                  |                                                                                      |
| PCM_DOUT       | 7  | DO    | PCM data output.                                                                                                                 |                                                                                      |
| SPI interface  |    |       |                                                                                                                                  |                                                                                      |
| SPI_MOSI       | 19 | DO    | Main Controller DATA output. Multiplexed by GPIO1                                                                                | If unused, please keep them open.                                                    |
| SPI_MISO       | 20 | DO    | Main Controller DATA input. Multiplexed by GPIO2                                                                                 |                                                                                      |
| SPI_CLK        | 21 | DI    | Bus clock output, Multiplexed by GPIO3                                                                                           |                                                                                      |
| SPI_CS         | 48 | DO    | Chip Select, Multiplexed by GPIO5                                                                                                |                                                                                      |

## GPIO

|            |    |    |                                                                                             |                            |
|------------|----|----|---------------------------------------------------------------------------------------------|----------------------------|
| NETLIGHT   | 52 | DO | LED control output as network status indication.                                            | If unused, keep them open. |
| STATUS     | 66 | DO | Operating status output.<br>High level: Power on and firmware ready<br>Low level: Power off |                            |
| W_DISABLE# | 18 | DI | Airplane mode control                                                                       |                            |
| AP_READY   | 19 | DI | Application processor sleep state detection                                                 |                            |
| GPIO31     | 16 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO6      | 25 | IO | General purpose input/output, Without interrupt function.                                   |                            |
| GPIO7      | 26 | IO | General purpose input/output, Without interrupt function.                                   |                            |
| GPIO12     | 64 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO13     | 65 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO50     | 66 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO57     | 83 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO58     | 84 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO52     | 85 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO36     | 86 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO40     | 87 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO41     | 88 | IO | General purpose input/output, With interrupt function                                       |                            |
| GPIO20     | 93 | IO | General purpose input/output, With interrupt function                                       |                            |

## RF interface

|          |    |     |                            |               |
|----------|----|-----|----------------------------|---------------|
| ANT_GNSS | 49 | AI  | GNSS antenna soldering pad | 50Ω impedance |
| ANT_MAIN | 60 | AIO | MAIN antenna soldering pad | 50Ω impedance |

## Other interface

|          |    |       |                                                                                                                                                                                   |                                                                                   |
|----------|----|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|
| BOOT_CFG | 6  | DI,PD | If it needs to enter into forced USB download mode, it must be pulling up this pin to VDD_EXT before press the PWRKEY. If it needs to boot up normally, please keep this pin open | Reserve a test points for it. Keep it open.DO NOT PULL UP DURING NORMAL POWER UP! |
| ADC1     | 2  | AI    | Analog-digital converter input. voltage range:0V~1.875V.                                                                                                                          | ADC0 and ADC1 cannot be used Simultaneously, if unused, keep them open.           |
| ADC0     | 24 | AI    | Analog-digital converter input. voltage range:0V~1.875V.                                                                                                                          |                                                                                   |
| PS_HOLD  | 94 | DI    | Power supply hold control input. This signal's main purpose is to tell the                                                                                                        | C <sub>max</sub> =10 pF                                                           |

|          |                                                                             |    |                                                                                                               |
|----------|-----------------------------------------------------------------------------|----|---------------------------------------------------------------------------------------------------------------|
|          |                                                                             |    | master PMIC device to keep its power supplies on, and it can initiate a reset or power down when asserted low |
| RESIN_N  | 96                                                                          | DI | Wake up the module from PSM                                                                                   |
| RESERVED | 11,12,<br>13,14,<br>51,56,<br>57,63,<br>76,77,<br>78,92,<br>95,97,<br>98,99 |    | No connection. Keep it open                                                                                   |

**NOTE**

Please reserve a test point for USB\_BOOT and VDD\_EXT. If there is no USB connector, please also reserve a test point for USB\_VBUS, USB\_DP, and USB\_DM for firmware upgrade.

## 2.3 Mechanical Information

Figure 3 depicts the mechanical dimensions of the SIM7075G and describes the length, width, height and tolerance of the SIM7075G of modules.

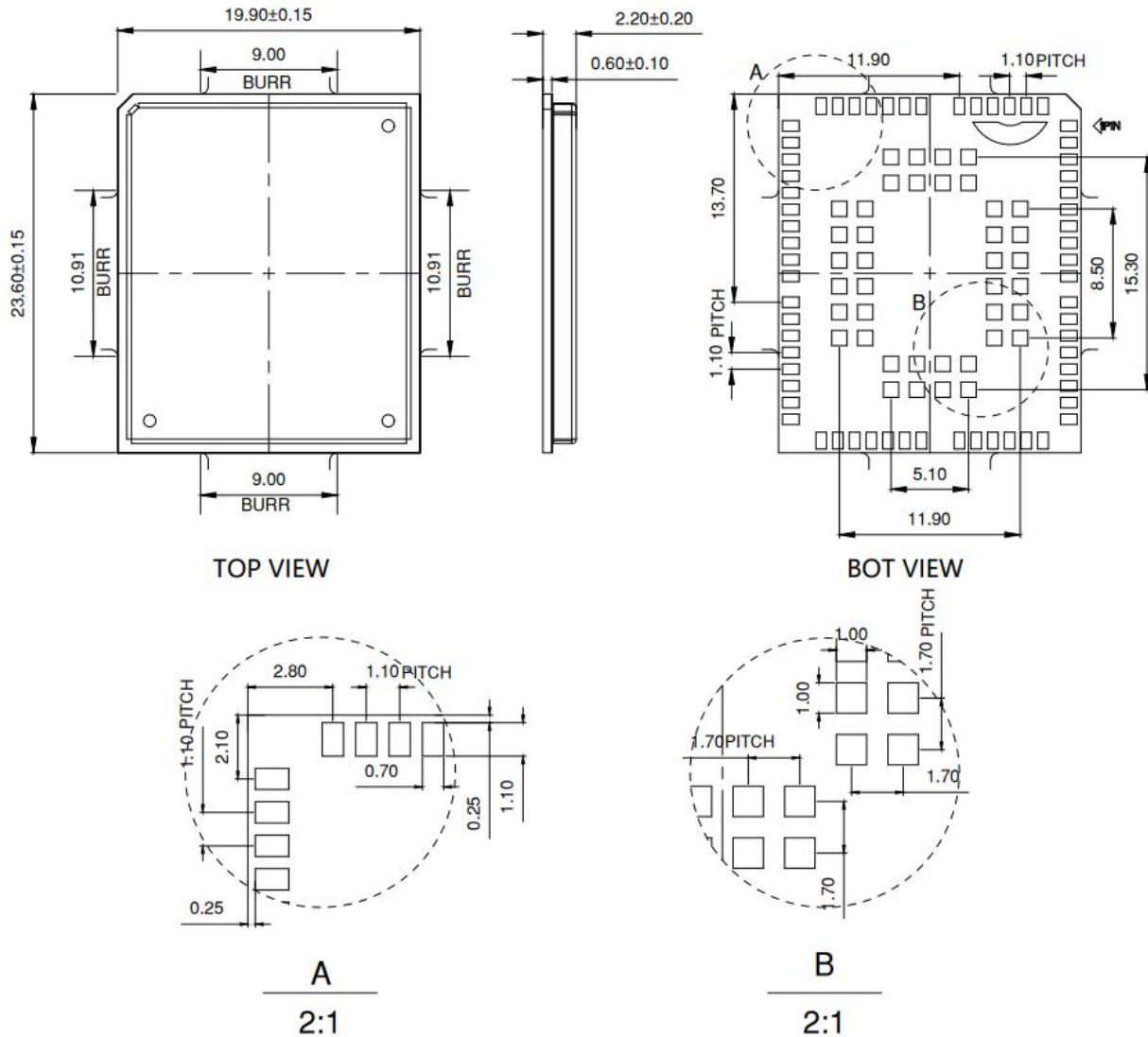


Figure 3: Dimensions (Unit: mm)

## 2.4 Footprint Recommendation

Figure 4 depicts the Foot printer commended of The SIM7075G modules.

SMT stencil  
outline  
(Unit:mm)

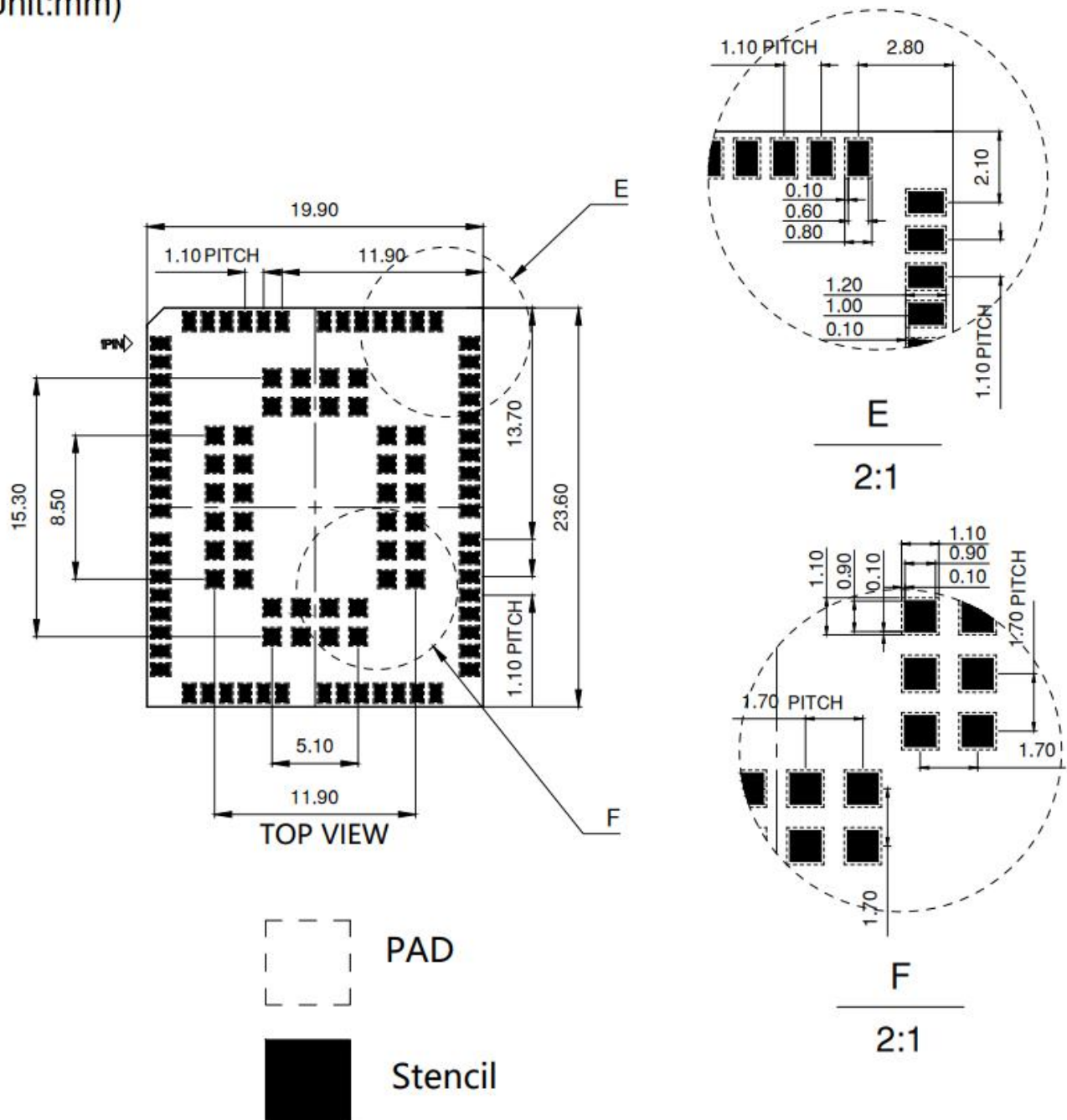


Figure 4: Footprint recommendation (Unit: mm)

## 3. Interface Application

### 3.1 Power Supply

Pin 32, pin 33 and pin 52, pin 53 are VBAT power input.

On VBAT pads, when module works on CAT-M1 mode, the ripple current is up to 0.6A typically. For steady voltage, the power supply capability must be up to 0.5A.

On VBAT pads, when module works on EDGE or GPRS mode, The ripple current is up to 2A typically. For steady voltage, the power supply capability must be up to 2A. in order to avoid the voltage dropped down more than 300mV, the load capacitor on VBAT pads must be up to 300uF.

The figure 5 shows the VBAT voltage ripple wave at the maximum power transmit phase in EDGE/GPRS emission mode.

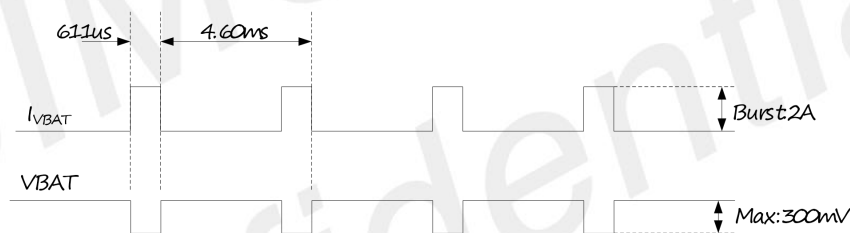


Figure 5: Voltage drop in EDGE or GPRS mode

Table 6 describes the electrical characteristics of the VBAT pin and the current consumption of the module in different modes.

**Table 6: VBAT pins electronic characteristic**

| Symbol           | Description                                                   |                                 | Min | Typ | Max | Unit |
|------------------|---------------------------------------------------------------|---------------------------------|-----|-----|-----|------|
| VBAT             | Module power voltage                                          | SIM7070G                        | 3.3 | 3.8 | 4.3 | V    |
| IVBAT(peak)      | Module power peak current in CAT-M1 and NB-IoT emission mode. |                                 | -   | 0.5 | -   | A    |
| IVBAT(average)   | Module power average current in normal mode                   | Please refer to the chapter 5.4 |     |     |     |      |
| IVBAT(sleep)     | Power supply current in sleep mode                            |                                 |     |     |     |      |
| IVBAT(power-off) | Module power current in power off mode.                       |                                 | -   | -   | 20  | uA   |
| IVBAT(PSM)       | Module power current in PSM mode.                             |                                 | -   | 3.5 | -   | uA   |

### 3.1.1 Power Supply Design Guide

In the user's design, special attention must be paid to the design of the power supply section to ensure that the VBAT drop cannot be lower than the minimum voltage shown in Table 7 even when the module current consumption reaches the instantaneous maximum. If the VBAT voltage drops below the minimum input voltage, the module may shut down due to low voltage.

**Table 7: Minimum input voltage**

| Module   | Minimum input voltage(V) |
|----------|--------------------------|
| SIM7075G | 3.3                      |

The figure 6 shows the recommended circuit.

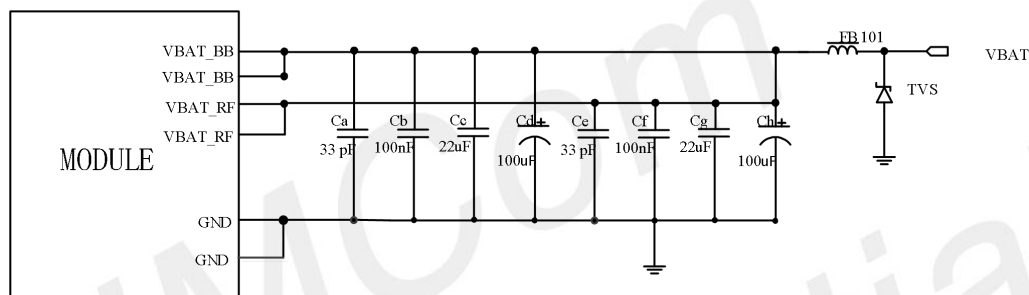


Figure 6: Power supply application circuit

In addition, for ESD protection, it is suggested to add a TVS diode near the VBAT PINs. These capacitors should be put as close as possible to VBAT pads. Also, users should keep VBAT trace on circuit board wider than 2 mm to minimize PCB trace impedance.

**Table 8: Recommended TVS diode list**

| No. | Manufacturer | Part Number   | Package |
|-----|--------------|---------------|---------|
| 1   | Prisemi      | PESDHC2FD4V5B | DFN1006 |
| 2   | Prisemi      | PESDHC3D3V3U  | SOD323  |
| 3   | WILLsemi     | ESD5651N-2/TR | DFN1006 |

#### NOTE

1. The customer's circuit design must have the function that the master can control the power off of the module. The module can be shut down or restarted normally. Only when the module is abnormal and cannot be shut down or restarted normally can the power be turned off.
2. When the module is working normally, do not cut off the power supply of the module VBAT directly to avoid damage to the internal flash of the module. It is strongly recommended to turn off the module through PWRKEY or AT command before disconnecting the module VBAT power.

### 3.1.2 Recommended Power Supply Circuit

If the supply voltage exceeds the supply range of VBAT, the buck circuit should be used to meet the demand of power supply. When choosing buck chip, besides considering the maximum current output capability of IC to meet the demand of SIM7075G, it is also necessary to consider the low static power consumption of IC in PSM mode.

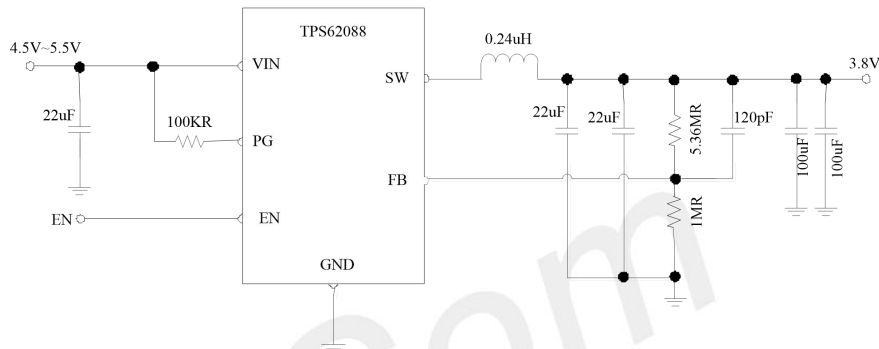


Figure 7: Power supply reference circuit

### 3.1.3 Voltage Monitor

To monitor the VBAT voltage, the AT command "AT+CBC" can be used.

AT command "AT+CBATCHK=1" can be used to enable the VBAT voltage monitoring function. When the VBAT voltage exceeds the preset alarm voltage range, a warning message will be reported through the AT port. When the VBAT voltage exceeds the preset shutdown voltage range, the module will automatically shut down. The default alarm voltage and shutdown voltage of the SIM7075G are shown in Table 9.

**Table 9: Alarm and Shutdown Voltage Range**

| Module   | Low voltage shutdown(V) | Low voltage alarm(V) | High voltage shutdown(V) | High voltage alarm(V) |
|----------|-------------------------|----------------------|--------------------------|-----------------------|
| SIM7075G | 2.9                     | 3.1                  | 4.65                     | 4.7                   |

#### NOTE

Under-voltage warning function and under-voltage power-off function are disabled by default. For more information about these AT commands, please refer to Document [1].

## 3.2 Power on/Power off Function

### 3.2.1 Power on

The PWTRKEY pin has a default voltage of 1.5V. SIM7075G can be powered on by briefly pulling the PWRKEY pin to ground. It is strongly recommended to put an ESD protection diode close to the PWRKEY pin, as it would strongly enhance the ESD performance of PWRKEY pin.

The PWRKEY pin has its own reset function. The reset time is determined by the internal timer (default is 12.6 seconds). After the PWRKEY is pulled low, the module will be reset after 12.6 seconds. Therefore, it is not recommended to connect PWRKEY to GND all the time in external circuit design.

Please refer to the following figure for the recommended reference circuit.

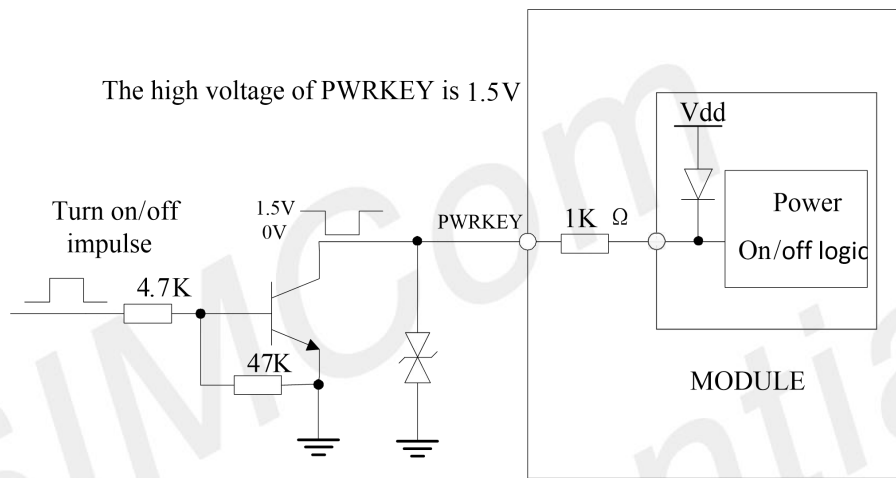


Figure 8: Reference power on/off circuit

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

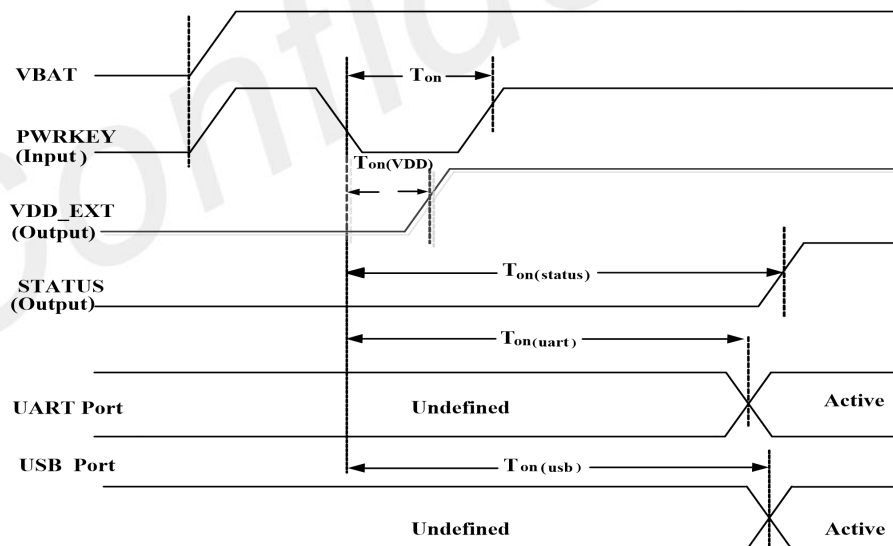


Figure 9: Power on timing sequence

**Table 10: Power on timing and electronic characteristic**

| Symbol | Parameter                                                             | Min. | Typ. | Max. | Unit |
|--------|-----------------------------------------------------------------------|------|------|------|------|
| Ton    | The time of active low level impulse of PWRKEY pin to power on module | 1    | -    | 12.6 | s    |

|             |                                                                                          |      |     |     |    |
|-------------|------------------------------------------------------------------------------------------|------|-----|-----|----|
| Ton(Vdd)    | The time from power-on issue to VDD_EXT pin output high level.                           | -    | 64  | -   | ms |
| Ton(status) | The time from power-on issue to STATUS pin output high level(indicating power up ready ) | 1.8  | -   | -   | s  |
| Ton(uart)   | The time from power-on issue to UART port ready                                          | 1.8  | -   | -   | s  |
| Ton(usb)    | The time from power-on issue to USB port ready                                           | 1.8  | -   | -   | s  |
| VIH         | Input high level voltage on PWRKEY pin                                                   | 1.0  | 1.5 | 1.8 | V  |
| VIL         | Input low level voltage on PWRKEY pin                                                    | -0.3 | 0   | 0.4 | V  |

#### NOTE

1. PWRKEY cannot be shorted all the way to GND.
2. It is recommended to ensure that the VBAT voltage rises and stabilizes before pulling down the PWRKEY pin to start up.
3. Before turning on the module, be sure to pay attention to the maximum conditions (such as voltage and temperature range) allowed by the module, otherwise exceeding the absolute maximum value of the module may cause permanent damage to the module.
4. The ESD protection diode junction capacitance on the PWR cannot exceed 10pF, otherwise the module may be turned on automatically.

### 3.2.2 Power off

The following methods can be used to power off SIM7075G.

- Method 1: Power off SIM7075G by pulling the PWRKEY pin to ground.
- Method 2: Power off SIM7075G by AT command "AT+CPOWD=1".
- Method 3: over-voltage or under-voltage automatic power off. The function can be enabled by AT command "AT+CBATCHK=1". Default is disabled.

#### NOTE

For details about "AT+CPOWD" and "AT+CBATCHK", please refer to Document [1].

It is not recommended to turn off the module by disconnecting VBAT power. Otherwise, there is a risk of damage to the module file system.

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

The power off scenario by pulling down the PWRKEY pin is illustrated in the figure 10.

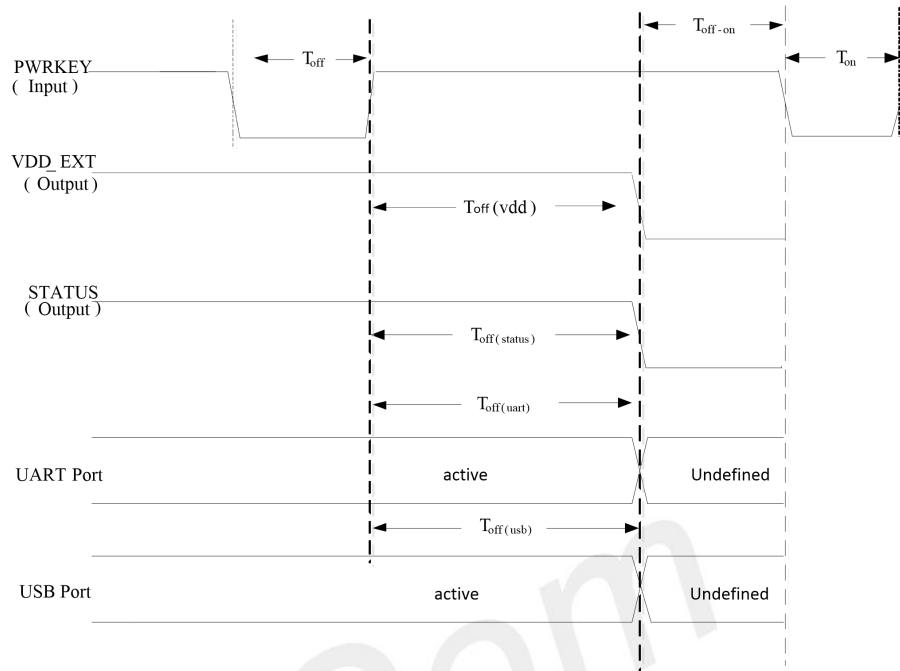


Figure 10: Power off timing sequence

Table 11: Power off timing and electronic characteristic

| Symbol       | Parameter                                                                            | Time value |      |      | Unit |
|--------------|--------------------------------------------------------------------------------------|------------|------|------|------|
|              |                                                                                      | Min.       | Typ. | Max. |      |
| Toff         | The active low level time pulse on PWRKEY pin to power off module                    | 1.2        | -    | -    | s    |
| Toff(vdd)    | The time from power-off issue to VDD_EXT pin output low level                        | 1.8        | -    | -    | s    |
| Toff(status) | The time from power-off issue to STATUS pin output low level(indicating power off )* | 1.8        | -    | -    | s    |
| Toff(uart)   | The time from power-off issue to UART port off                                       | 1.8        | -    | -    | s    |
| Toff(usb)    | The time from power-off issue to USB port off                                        | 1.8        | -    | -    | s    |
| Toff-on      | The buffer time from power-off issue to power-on issue                               | 2          | -    | -    | s    |

#### NOTE

The STATUS pin can be used to detect whether module is powered on or not. When module has been powered on and firmware goes ready, STATUS will be high level, or else STATUS will still low level.

### 3.3 UART Interface

SIM7075G can provide 3channels serial ports:

One channel full-function serial port UART1, it can be used for AT command communication between the module and the peripheral MCU.

One channel 2-wire serial port UART3, the default function after booting is GPIO. It can be configured as a UART function, but it cannot be used for AT command communication. It is only used as UART in DAM (Downloadable Application Module) application when secondary development. It can also be configured as a GNSS NMEA data output port.

One channel serial port DEBUG\_UART, the boot log will be output from here during the system boot-up. The default function after booting is GPIO. It can be configured as a UART function, but it cannot be used for AT command communication. It is only used as UART in DAM (Downloadable Application Module) application when secondary development.

When the UART port is used as the AT communication port, it supports high speed mode, the baud rate is up to 4Mbps.

The communication baud rates include:

0,300,600,1200,2400,4800,9600,19200,38400,57600,115200,230400,921600,2000000,3000000,3200000 and 3686400 bps.

The rate 0bps marks auto baud rate. And it supports auto baud rate, but the rate only supported on 9600, 19200, 38400, 57600, 115200. If users need to change to other baud rate, it needs to switch via manual operation.

### 3.3.1 UART Design Guide

The following figures show the reference design.

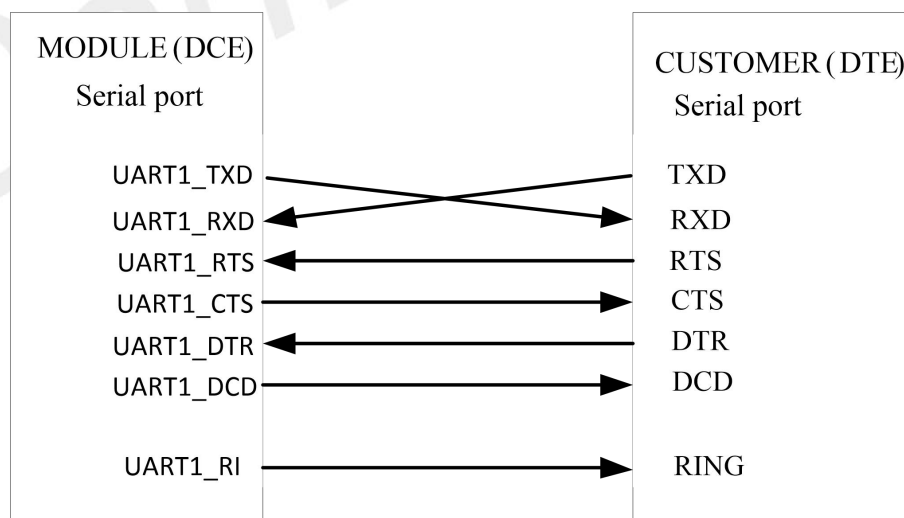


Figure 11: UART full modem

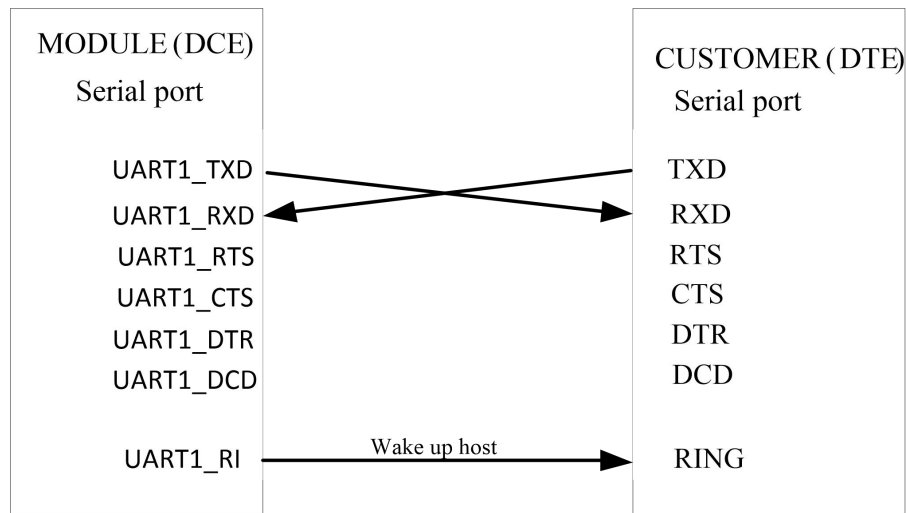


Figure 12: UART null modem

Table 12: UART electronic characteristic

| Symbol | Description                    | Min. | Typ. | Max. | Unit |
|--------|--------------------------------|------|------|------|------|
| VIH    | UART input high level voltage  | 1.17 | 1.8  | 2.1  | V    |
| VIL    | UART input low level voltage   | -0.3 | 0    | 0.63 | V    |
| VOH    | UART output high level voltage | 1.35 | 1.8  | 1.8  | V    |
| VOL    | UART output low level voltage  | 0    | 0    | 0.45 | V    |

The SIM7075G UART is 1.8V voltage interface. If user's UART application circuit is 3.3V voltage interface, the level shifter circuits should be used for voltage matching. The following figure shows the voltage matching reference design.

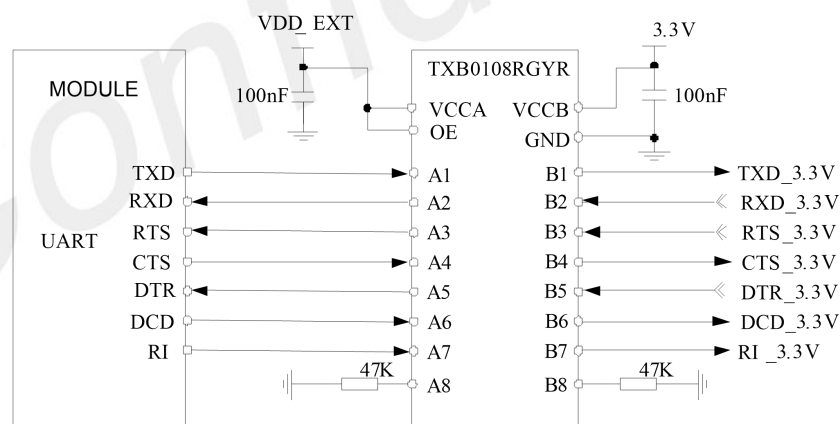


Figure 13: Reference circuit with level shifter IC

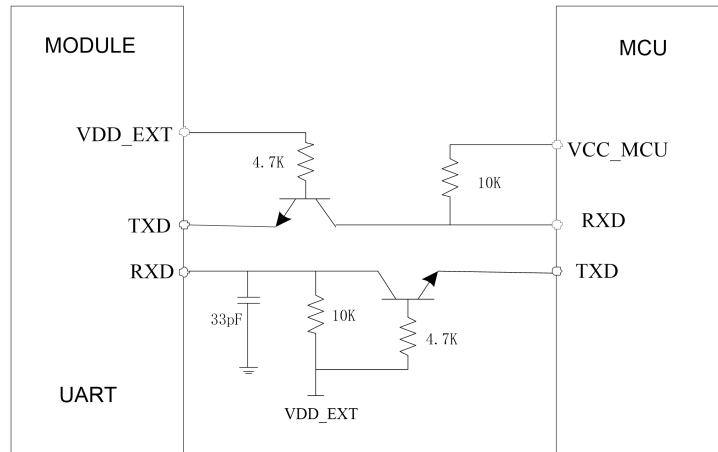


Figure 14: Reference circuit with Transistor

#### NOTE

When it uses the level shifter IC, the pull up resistance on TXD\_3.3V, RTS\_3.3V, DCD\_3.3V and RI\_3.3V should not be less than 47KΩ.

When it uses the transistor, the selection of the transistor must be a high-speed transistor, and the model MMBT3904 is recommended.

### 3.3.2 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.

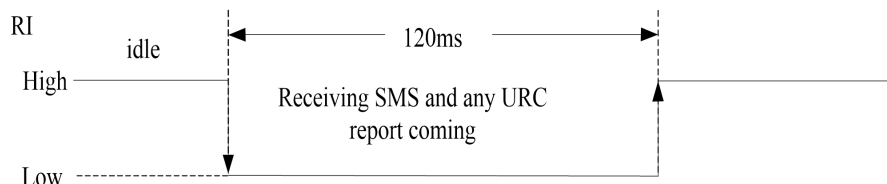


Figure 15: RI behaviour (SMS and URC report)

The DTR pin description:

After setting the AT command "AT+CSCLK=1", and then pulling up the DTR pin, Module will enter sleep mode when module is in idle mode. In sleep mode, the UART is unavailable. When SIM7070 enters sleep mode, pulling down DTR can wake up module.

After setting the AT command “AT+CSCLK=0”, SIM7075G 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 [20].

### 3.4 USB Interface

SIM7075G has a USB2.0 interface. It can be used for software upgrade and software debugging.

The USB of the SIM7075G only supports slave mode and does not support USB charging. USB does not support Suspend mode, the module will not be able to enter the minimum power mode when USB is connected.

USB\_VBUS is the detecting signal for USB inserting. The input voltage range on the USB\_VBUS pin is from 3.5V to 5.25V. If there is out of this range, it may be due to USB function unidentifiable, even damaging the module.

The reference circuit refers to the following figure.

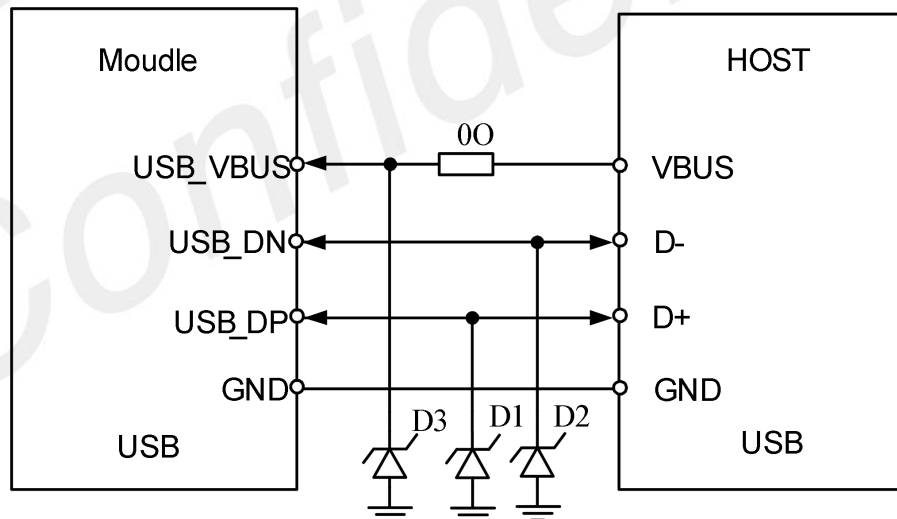


Figure 16: USB reference circuit

Because of the high speed on USB bus, more attention should be paid to the influence of the junction capacitance of the ESD component on USB data lines. Typically, the capacitance of the D1 and D2 should be less than 3pF.

D3 is suggested to select the diode with anti-ESD and voltage surge function, or customer could add a ZENER diode for surge clamping.

**Table 13: Recommended TVS models**

| No. | Manufacturer | Part Number   | Package |
|-----|--------------|---------------|---------|
| 1   | NXP          | PESD5V0X1BCAL | 0402    |
| 2   | Willsemi     | ESD5301N      | 0402    |
| 3   | NXP          | PESD5V0H1BSF  | 0201    |
| 4   | Willsemi     | ESD5311Z-2/TR | 0201    |

**NOTE**

The USB interface is strongly recommended to reserve test points.  
The USB\_DM and USB\_DP nets must be traced by 90Ohm+/-10% differential impedance.

### 3.5 Force USB Download Interface

The module can enter the USB forced download mode with pulling up the USB\_BOOT pin. The reference circuit refers to the following figure.

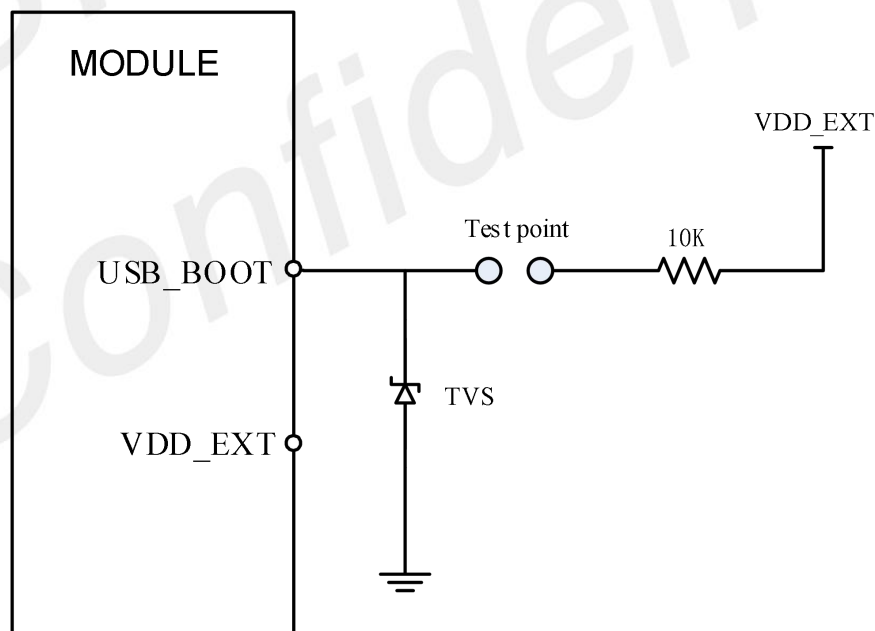


Figure 17: Reference circuit of BOOT\_CFG interface

### 3.6 SIM Interface

SIM7075G only supports 1.8V SIM Cards. SIM\_VDD is provided by LDO inside the module, the default

value is 1.8V.

**Table 14: SIM electronic characteristic in 1.8V mode (SIM\_VDD=1.8V)**

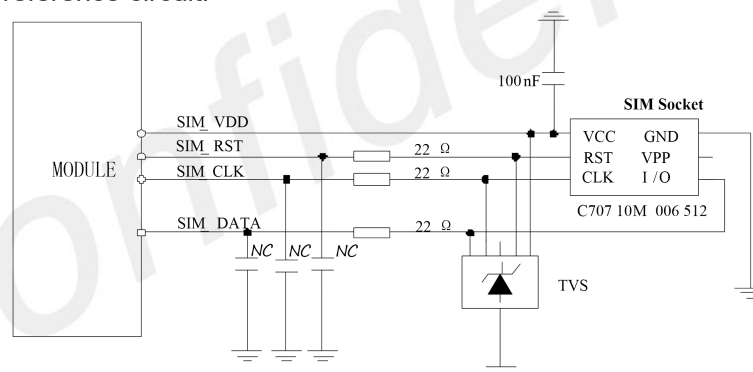
| Symbol          | Parameter                 | Min.          | Typ. | Max.         | Unit |
|-----------------|---------------------------|---------------|------|--------------|------|
| SIM_VDD         | LDO power output voltage  | 1.75          | 1.8  | 1.95         | V    |
| V <sub>IH</sub> | High-level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

#### NOTE

1. The module does not support 3V SIM card.
2. The software does not support the SIM card hot swap function.

### 3.6.1 SIM Application Guide

Note that the SIM peripheral circuit should be close to the SIM card socket. The following figure shows the 6-pin SIM card holder reference circuit.



**Figure 18: SIM interface reference circuit**

SIM\_DATA has been pulled up with a 20KR resistor to SIM\_VDD in module, so it no need pulled up resistor anymore. SIM\_VDD needs a 100nF capacitor close to SIM socket.

SIM\_CLK is very important signal, the rise time and fall time of SIM\_CLK should be less than 40ns. So the junction capacity of the TVS need to less 50pF.

In order to enhance the reliability and availability of the (U)SIM card in applications. Please follow the guidelines below when designing.

- It is recommended to place a 100nF capacitor on the SIM\_VDD signal line close to the SIM card holder.

- Place TVS near the SIM card holder. The junction capacity of the TVS should not exceed 50pF. The 22Ω resistor in series between the SIM card holder and the module can enhance the ESD protection performance.
- Keep SIM card signals away from RF and VBAT traces.
- SIM card signal line traces to avoid branch.
- To avoid cross-talk between SIM\_DATA and SIM\_CLK, keep them away from each other and shield them with surrounded ground. USIM\_RST should also be ground shielded.

## 3.7 PCM Interface

SIM7075G provides a PCM interface for external codec, which can be used in master mode with short sync and 16 bits linear format.

**Table 15: 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                |

### NOTE

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

### 3.7.1 PCM timing

SIM7075G supports 2.048 MHz PCM data and sync timing for 16 bits linear format codec.

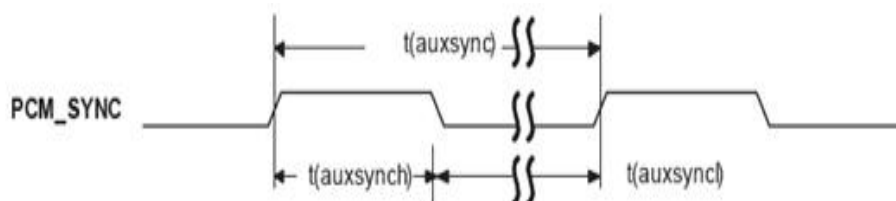


Figure 19: PCM\_SYNC timing

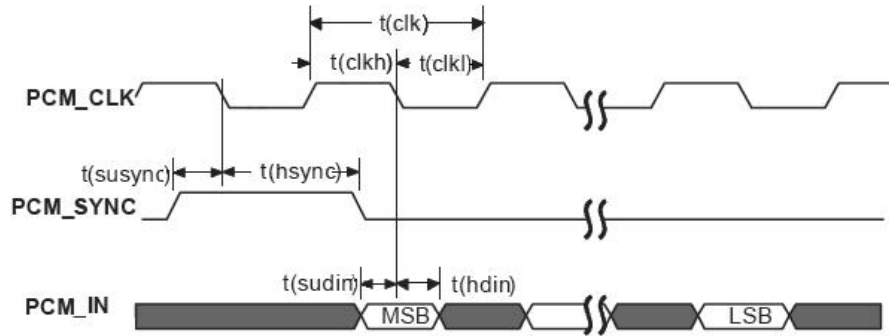


Figure 20: External codec to module timing

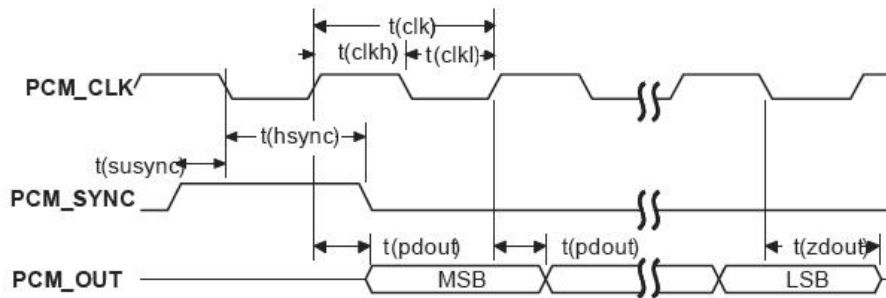


Figure 21: Module to external codec timing

Table 16: 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 <sub>l</sub> ) | 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   |

### 3.7.2 PCM Application Guide

The following figure shows the external codec reference design.

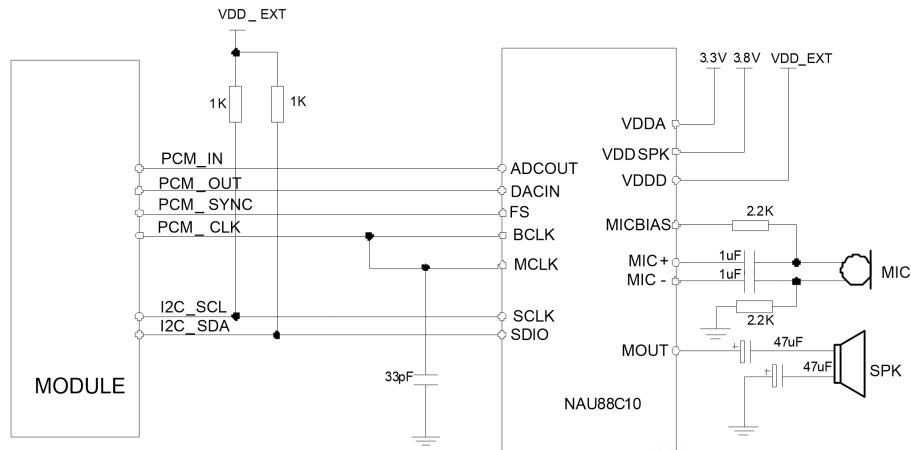


Figure 22: Audio codec reference circuit

### 3.8 I2C Interface

SIM7075G provides an I2C interface with clock rate up to 400 kbps. Its operation voltage is 1.8V.

The following figure shows the I2C bus reference design.

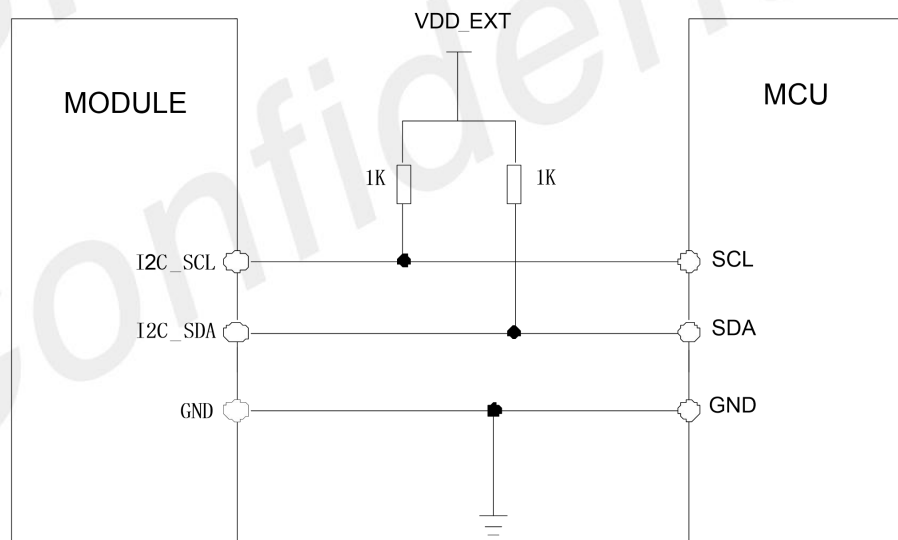


Figure 23: I2C reference circuit

#### NOTE

The I2C signal has no pull-up resistors in module. So the pulling up resistors 1KΩ to VDD\_EXT is necessary in application circuit.

**Table 17: Control voltage rang**

| Symbol | Parameter                 | Min. | Typ. | 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    |

### 3.9 Network status

The NETLIGHT pin is used to control Network Status LED, its reference circuit is shown in the following figure.

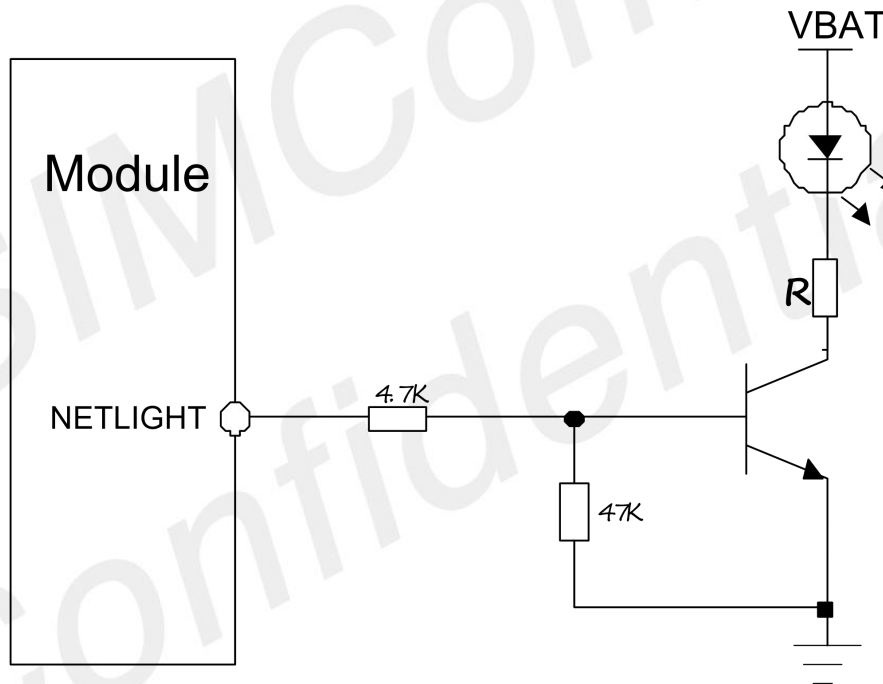


Figure 24: NETLIGHT reference circuit

#### NOTE

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

**Table 18: NETLIGHT pin status**

| NETLIGHT pin status | Module 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 or PSM mode                                                                    |

**NOTE**

NETLIGHT output low level as "OFF" and high level as "ON".

### 3.10 ADC interface

SIM7075G module provides a 10-bit high sample rate (ADC) interfaces. It is available for digitizing analog signals such as battery voltage and so on. Its input voltage range is from 0V to 1.8V. That is the maximum measurement range of ADC cannot exceed 1.8V. If the input voltage of ADC PIN exceeds its range, it is necessary to implement the resistance partial pressure on the hardware. The electronic specifications are shown in the following table.

**Table 19: ADC electronic characteristics**

| Characteristics           | Min. | Typ. | Max.  | Unit       |
|---------------------------|------|------|-------|------------|
| Input Range               | 0    |      | 1.875 | V          |
| Internal pull-up resistor |      | 400  |       | K $\Omega$ |
| Input serial resistance   | 1    | –    | –     | M $\Omega$ |

**NOTE**

"AT+CADC" can be used to read the voltage of the ADC pin, for more details, please refer to document [1].

### 3.11 LDO output

SIM7075G has a LDO power output named VDD\_EXT. The output voltage is 1.8V. This voltage can only be pulled up for the external GPIO or power supply for the level conversion circuit.

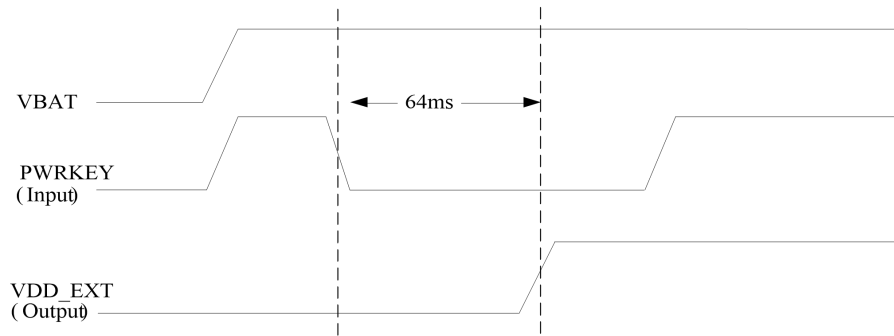


Figure 25: Power on sequence of the VDD\_EXT

**Table 20: Electronic characteristic**

| Symbol               | Description    | Min. | Typ. | Max. | Unit |
|----------------------|----------------|------|------|------|------|
| V <sub>VDD_EXT</sub> | Output voltage | 1.75 | 1.8  | 1.85 | V    |
| IO                   | Output current | -    | -    | 50   | mA   |

**NOTE**

The VDD\_EXT is used to the IO power in the module. The Output voltage is not supported to adjust.

## 4. RF Specifications

### 4.1 LTE RF Specifications

**Table 22: Maximum Power Reduction (MPR) for UE category NB&M1 Power Class 5 CAT-NB1/CAT-NB2**

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

#### CAT-M1

| Modulation | Channel bandwidth / Transmission bandwidth (NRB) |          |       |        |        |        | MPR (dB) |
|------------|--------------------------------------------------|----------|-------|--------|--------|--------|----------|
|            | 1.4 MHz                                          | 3.0 MHz  | 5 MHz | 10 MHz | 15 MHz | 20 MHz |          |
| QPSK       | >2                                               | >2       | >3    | >5     | -      | -      | $\leq 1$ |
| QPSK       | >5                                               | >5       | -     | -      | -      | -      | $\leq 2$ |
| 16 QAM     | $\leq 2$                                         | $\leq 2$ | >3    | >5     | -      | -      | $\leq 1$ |
| 16QAM      | >2                                               | >2       | >5    | -      | -      | -      | $\leq 2$ |

#### NOTE

For each sub-frame, the MPR is calculated per slot and is given by the maximum value transmitted within the slot; then the maximum MPR on both slots is applied to the entire sub-frame.

**Table 23: Operating frequencies**

| Frequency | Receiving     | Transmission  |
|-----------|---------------|---------------|
| EGSM900   | 925~960MHz    | 880~915 MHz   |
| GSM800    | 869~894MHz    | 824~849MHz    |
| DCS1800   | 1805~1880 MHz | 1710~1785 MHz |

|                                          |                        |              |
|------------------------------------------|------------------------|--------------|
| PCS1900                                  | 1930~1990MHz           | 1850~1910MHz |
| LTE BAND Information 【Refers to Table 1】 |                        |              |
| GPS L1 BAND                              | 1574.4~1576.44 MHz     | -            |
| GLONASS                                  | 1598.0625 ~1605.375MHz | -            |
| BDS                                      | 1559.052~1591.788MHz   | -            |
| Galileo                                  | 1574.4~1576.44 MHz     | -            |

**Table 24: E-UTRA operating bands**

| E-UTRA | UL Freq.       | DL Freq.       | Duplex Mode |
|--------|----------------|----------------|-------------|
| 1      | 1920 ~1980 MHz | 2110 ~2170 MHz | HD-FDD      |
| 2      | 1850~1910MHz   | 1930~1990MHz   | HD-FDD      |
| 3      | 1710 ~1785 MHz | 1805 ~1880 MHz | HD-FDD      |
| 4      | 1710~1755MHz   | 2110~2155      | HD-FDD      |
| 5      | 824 ~849 MHz   | 869 ~894 MHz   | HD-FDD      |
| 8      | 880 ~915 MHz   | 925 ~960 MHz   | HD-FDD      |
| 12     | 699~716MHz     | 729~746MHz     | HD-FDD      |
| 13     | 777~787MHz     | 746~756MHz     | HD-FDD      |
| 14     | 788~798MHz     | 758~768MHz     | HD-FDD      |
| 18     | 815 ~830 MHz   | 860 ~875 MHz   | HD-FDD      |
| 19     | 830 ~845 MHz   | 875 ~890 MHz   | HD-FDD      |
| 20     | 832~862MHz     | 791~821MHz     | HD-FDD      |
| 25     | 1850~1915MHz   | 1930~1995MHz   | HD-FDD      |
| 26     | 814 ~849 MHz   | 859 ~894 MHz   | HD-FDD      |
| 27     | 807~824MHz     | 852~869MHz     | HD-FDD      |
| 28     | 703~748MHz     | 758~803MHz     | HD-FDD      |
| 66     | 1710~1780MHz   | 2110~2180MHz   | HD-FDD      |
| 71     | 663~698MHz     | 617~652MHz     | HD-FDD      |

**Table 25: Conducted receive sensitivity**

| Frequency  | Receive sensitivity(Typical)voice | Receive sensitivity(MAX) |
|------------|-----------------------------------|--------------------------|
| EGSM900    | 107.9dBm                          | 3GPP                     |
| GSM850     | 108.2dBm                          | 3GPP                     |
| DCS1800    | 107.5dBm                          | 3GPP                     |
| PCS1900    | 107.2dBm                          | 3GPP                     |
| LTE HD-FDD | Reference 【Table26】 【Table27】     | 3GPP                     |

**Table 26: CAT-M1 Reference sensitivity (QPSK)**

| E-UTRA | REFSENS | SIM7075G | SIM7070E | SIM7070G-NG | Duplex |
|--------|---------|----------|----------|-------------|--------|
|--------|---------|----------|----------|-------------|--------|

| Band | MAX(dBm)<br>3GPP Request | REFSENS<br>Typical<br>(dBm) | REFSENS<br>Typical<br>(dBm) | REFSENS<br>Typical (dBm) | Mode   |
|------|--------------------------|-----------------------------|-----------------------------|--------------------------|--------|
| 1    | -103                     | -108.1                      | -108.4                      | NA                       | HD-FDD |
| 2    | -101                     | -106.2                      | -106.6                      | NA                       | HD-FDD |
| 3    | -100                     | -107.5                      | -107.3                      | NA                       | HD-FDD |
| 4    | -103                     | -106.5                      | -106.2                      | NA                       | HD-FDD |
| 5    | -101.5                   | -108.2                      | -108.8                      | NA                       | HD-FDD |
| 8    | -100.5                   | -106.1                      | -106.5                      | NA                       | HD-FDD |
| 12   | -100                     | -107.4                      | -107.3                      | NA                       | HD-FDD |
| 13   | -100                     | -105.5                      | -106.1                      | NA                       | HD-FDD |
| 14   | -100                     | -106.5                      | -107.3                      | NA                       | HD-FDD |
| 18   | -103                     | -108.5                      | -109.5                      | NA                       | HD-FDD |
| 19   | -103                     | -108.1                      | -108.8                      | NA                       | HD-FDD |
| 20   | -100.5                   | -108.3                      | -107.8                      | NA                       | HD-FDD |
| 25   | -99.5                    | -103.2                      | -103.8                      | NA                       | HD-FDD |
| 26   | -101                     | -108.1                      | -108.3                      | NA                       | HD-FDD |
| 27   | -101.5                   | -106.2                      | -106.8                      | NA                       | HD-FDD |
| 28   | -101.5                   | -108.2                      | -108.8                      | NA                       | HD-FDD |
| 31   | -97.3                    | -102.4                      | -105.7                      | NA                       | HD-FDD |
| 66   | NA                       | -108.5                      | -108.4                      | NA                       | HD-FDD |
| 72   | NA                       | -102.4                      | -105.7                      | NA                       | HD-FDD |

**Table 27: CAT-NB2Reference sensitivity (QPSK)**

| Operating<br>bands | SIM7070G                               |                                 |                                                                                         | SIM7070E                        |                                                                                         | SIM7070G-NG                     |                                                                                         |
|--------------------|----------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------------------------------------------------------|
|                    | REFSENS<br>MAX(dBm)<br>3GPP<br>Request | REFS<br>ENS<br>Typica<br>l(dBm) | REFSENS<br>Typical<br>Repetition<br>12/ 7/1/128<br>[EPRE<br>dbm/15KH<br>z] <sup>①</sup> | REFS<br>ENS<br>Typica<br>l(dBm) | REFSENS<br>Typical<br>Repetition<br>12/ 7/1/128<br>[EPRE<br>dbm/15KH<br>z] <sup>①</sup> | REFS<br>ENS<br>Typica<br>l(dBm) | REFSENS<br>Typical<br>Repetition<br>12/ 7/1/128<br>[EPRE<br>dbm/15KH<br>z] <sup>①</sup> |
| 1                  | -108.2                                 | -115.1                          | -131                                                                                    | -115.1                          | -131                                                                                    | -115.1                          | -131                                                                                    |
| 2                  | -108.2                                 | -114.8                          | -130                                                                                    | -114.8                          | -130                                                                                    | -114.8                          | -130                                                                                    |
| 3                  | -108.2                                 | -115.4                          | -131                                                                                    | -115.4                          | -131                                                                                    | -115.4                          | -131                                                                                    |
| 4                  | -108.2                                 | -115.1                          | -130                                                                                    | -115.1                          | -130                                                                                    | -115.1                          | -130                                                                                    |
| 5                  | -108.2                                 | -114.3                          | -129                                                                                    | -114.3                          | -129                                                                                    | -114.3                          | -129                                                                                    |
| 8                  | -108.2                                 | -113.9                          | -130                                                                                    | -113.9                          | -130                                                                                    | -113.9                          | -130                                                                                    |
| 12                 | -108.2                                 | -116                            | -130                                                                                    | -116                            | -130                                                                                    | -116                            | -130                                                                                    |
| 13                 | -108.2                                 | -115.7                          | -130                                                                                    | -115.7                          | -130                                                                                    | -115.7                          | -130                                                                                    |

|    |        |        |      |        |      |        |      |
|----|--------|--------|------|--------|------|--------|------|
| 18 | -108.2 | -114.9 | -129 | -114.9 | -129 | -114.9 | -129 |
| 19 | -108.2 | -115.1 | -128 | -115.1 | -128 | -115.1 | -128 |
| 20 | -108.2 | -114.1 | -128 | -114.1 | -128 | -114.1 | -128 |
| 25 | -108.2 | -114.6 | -130 | -114.6 | -130 | -114.6 | -130 |
| 26 | -108.2 | -114.6 | -129 | -114.6 | -129 | -114.6 | -129 |
| 28 | -108.2 | -115.9 | -130 | -115.9 | -130 | -115.9 | -130 |
| 31 | -108.2 |        |      | -114.7 | -129 |        |      |
| 66 | -108.2 | -114.8 | -129 | -114.8 | -129 | -114.8 | -129 |
| 71 | -108.2 | -114.4 | -129 |        |      | -114.4 | -129 |

**NOTE**

The 12/7/1/128 of the REFSENS Typical Repeated 12/ 7/1/128 means Subcarriers=12, MCS.TBS=7, #SF/#RU=1, #Repetition=128.

## 4.2 LTE Antenna Design Guide

Users should connect antennas to SIM7075G antenna pads through micro-strip line or other types of RF trace and the trace impedance must be controlled in 50Ω. SIMCom recommends that the total insertion loss between the antenna pads and antennas should meet the following requirements:

**Table 28: Trace loss**

| Frequency       | Loss   |
|-----------------|--------|
| 700MHz-960MHz   | <0.5dB |
| 1710MHz-2170MHz | <0.9dB |
| 2300MHz-2650MHz | <1.2dB |

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.

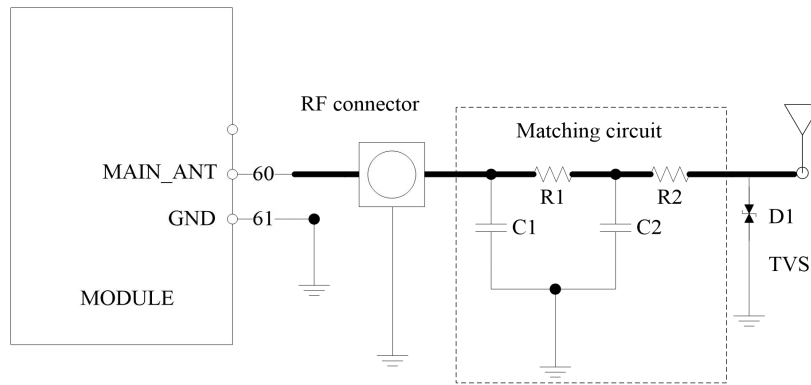


Figure 26: Antenna matching circuit (MAIN\_ANT)

In above figure, the components R1, C1, C2 and R2 are used for antenna matching, the values of components can only be achieved after the antenna tuning and usually provided by antenna vendor. By default, the R1, R2 are 0Ω resistors, and the C1, C2 are reserved for tuning. The component D1 is a TVS for ESD protection, and it is optional for users according to application environment.

The RF test connector is used for the conducted RF performance test, and should be placed as close as to the module's MAIN\_ANT pin. The traces impedance between SIM7075G and antenna must be controlled in 50Ω.

Two TVS are recommended in the table below.

**Table 29: Recommended TVS**

| Package | Part Number   | Vender  |
|---------|---------------|---------|
| 0201    | CE0201S05G01R | 硕凯      |
| 0402    | PESD0402-03   | PRISIMI |

## 4.3 GNSS

SIM7075G merges GNSS (GPS/GLONASS/BD/Galileo) 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+GLONASS)/-159 dBm (GPS+BD)
- Cold-start sensitivity: -147.5 dBm
- Accuracy (Open Sky): 0.4 m(GPS+BD)
- TTFF (Open Sky) : Hot start < 1 s, Cold start < 31 s
- Receiver Type: 16-channel, C/A Code
- GPS L1 Frequency: 1575.42±1.023MHz
- GLONASS L1: 1598.0625 ~1605.375MHz
- BDS B1: 1559.052~1591.788MHz

- Galileo L1:1575.42±1.023MHz
- Update rate: Default 1 Hz
- GNSS data format: NMEA-0183
- GNSS Current consumption :54mA (AT+CFUN=0,without USB)
- GNSS antenna: Passive/Active antenna

#### NOTE

If the antenna is active type, the power should be given by main board because there is no power supply on the GNSS antenna pad. If the antenna is passive, it is suggested that the external LNA should be used.

### 4.3.2 GNSS Application Guide

Users can adopt an active antenna or a passive antenna to SIM7075G. If using a passive antenna, an external LNA is a must to get better performance. The following figures are the reference circuits.

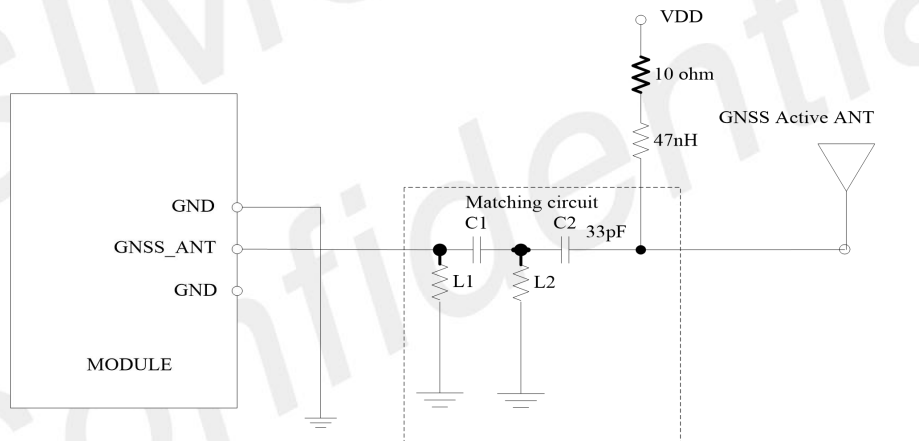


Figure 27: Active antenna circuit

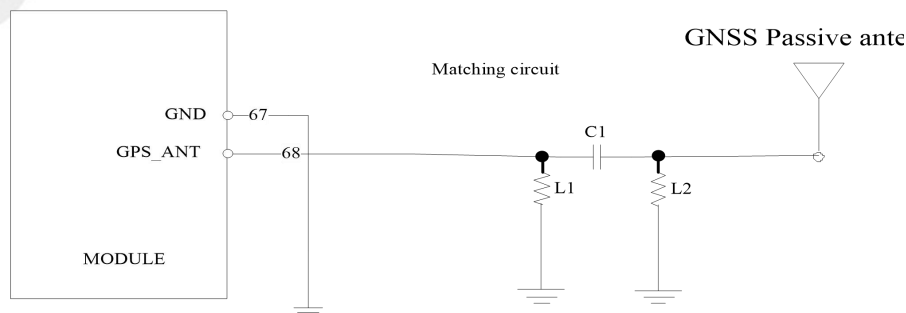


Figure 28: Passive antenna circuit (Default)

In above figures, the components C1, L1 and L2 are used for antenna matching. Usually, the values of the components can only be achieved after antenna tuning and usually provided by antenna vendor. C2 is used for DC blocking. L3 is the matching component of the external LNA, and the value of L3 is determined by

the LNA characteristic and PCB layout. Both VDD of active antenna and V\_LNA need external power supplies which should be considered according to active antenna and LNA characteristic. LDO/DCDC is recommended to get lower current consuming by shutting down active antennas and LNA when GNSS is not working.

GNSS can be tested by NMEA port. NMEA sentences can be obtained through UART or USB automatically. NMEA sentences include GSV, GGA, RMC, GSA, and VTG. Before using GNSS, user should configure SIM7075G in proper operating mode by AT command. Please refer to related documents for details. SIM7075G can also get position location information through AT directly.

**NOTE**

1. GNSS is closed by default and can be started by "AT+CGNSPWR=1". 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 [21] for more details.
2. If the passive antenna is used, put the LNA close to the antenna.
3. Make sure there are no noise signals around GNSS antenna.

## **4.4 RF traces note**

### **4.4.1 RF traces layout**

- Keep the RF trace from module ant pin to antenna as short as possible
- RF trace should be 50  $\Omega$  either on the top layer or in the inner layer
- RF trace should be avoided right angle and sharp angle.
- Put enough GND vias around RF traces.
- RF trace should be far away from other high speed signal lines.

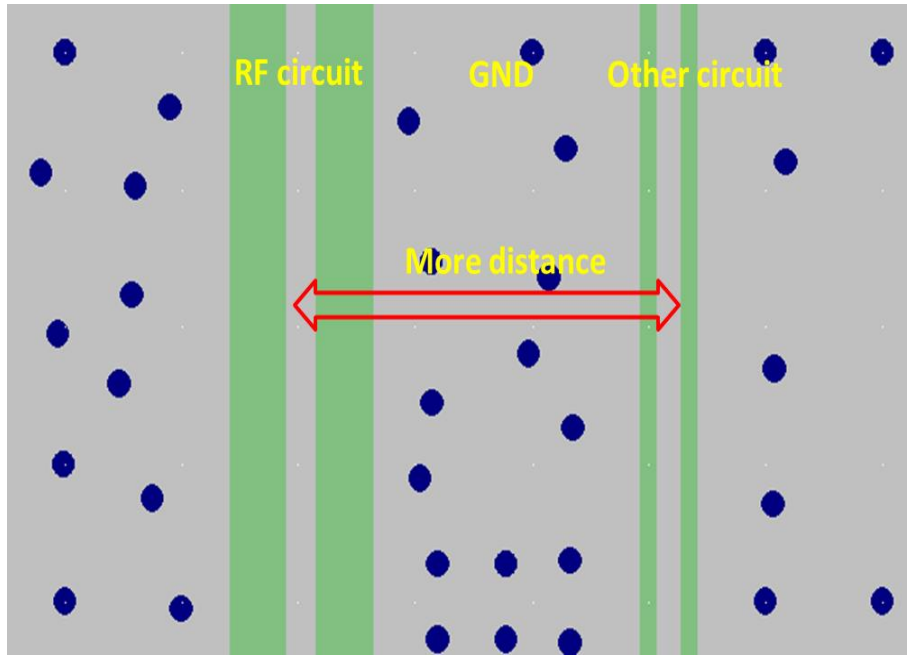


Figure 29: RF trace should be far away from other high speed signal lines

- Avoiding the paroling rout of other system antennas nearby.
- There should be some distance from The GND to the inner conductor of the SMA connector. It is better to keep out all the layers from inner to the outer conductor.

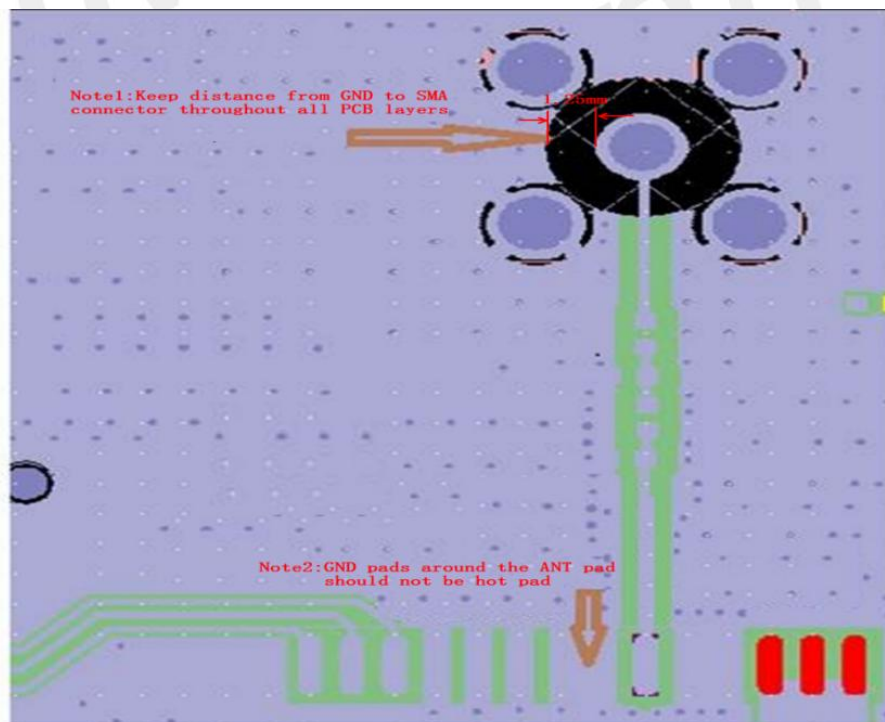


Figure 30: The distance between GND to the inner conductor of SMA

- GND pads around the ANT pad should not be hot pad to keep the GND complete.

#### **4.4.2 LTE ANT and other system ANT decoupling**

- 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].

SIMCom  
Confidential

## 5. Electrical Specifications

### 5.1 Absolute maximum ratings

Absolute maximum rating for digital and analog pins of SIM7075G are listed in the following table:

**Table 30: Absolute maximum ratings**

| Parameter                                            | Min. | Typ. | Max.  | Unit |
|------------------------------------------------------|------|------|-------|------|
| Voltage on VBAT                                      | -0.3 | -    | 6.0   | V    |
| Voltage on USB_VBUS                                  | -0.3 | -    | 6.0   | V    |
| Voltage at digital pins<br>(RESET,GPIO,I2C,UART,PCM) | -0.3 | -    | 2.1   | V    |
| Voltage at PWRKEY                                    | -0.3 | -    | 2.1   | V    |
| ADC                                                  | -0.3 | -    | 1.875 | V    |

#### NOTE

The absolute parameter is tested when VBAT has the power but the PWRKEY has no pulled down. If it is over the range, the module will be damage. If the power supply on VBAT pin had been shut down, and the other pin should not have the voltage. Otherwise, it may lead to abnormally boot up or damage the module.

### 5.2 Operating conditions

**Table 31: Module recommended operating ratings**

| Parameter               |             | Min. | Typ. | Max. | Unit |
|-------------------------|-------------|------|------|------|------|
| Voltage at VBAT         | SIM7070G    | 3.0  | 3.8  | 4.6  | V    |
|                         | SIM7070E    | 3.2  | 3.8  | 4.2  | V    |
|                         | SIM7070G-NG | 3.0  | 3.8  | 4.6  | V    |
| Voltage at USB_VBUS pin |             | 3.5  | 5.0  | 5.25 | V    |

**Table 32: 1.8V Digital I/O characteristics\***

| Parameter | Description                                        | Min. | Typ. | 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  | V    |
| VOL       | Low-level output voltage                           | 0    | -    | 0.45 | V    |
| IOH       | High-level output current(no pull down resistor)   | -    | 2    | -    | mA   |
| IOL       | Low-level output current(no pull up resistor)      | -    | -2   | -    | mA   |
| IIH       | Input high leakage current (no pull down resistor) | -    | -    | 1    | uA   |
| IIL       | Input low leakage current(no pull up resistor)     | -1   | -    | -    | uA   |

**NOTE**

These parameters are for digital interface pins, such as GPIOs (including NETLIGHT and STATUS), I2C, UART, PCM, SPI and BOOT\_CFG.

**Table 33: Recommended operating ratings**

| Parameter           |             | Min. | Typ. | Max. | Unit |
|---------------------|-------------|------|------|------|------|
| Voltage at VBAT     | SIM7070G    | 3.0  | 3.8  | 4.6  | V    |
|                     | SIM7070E    | 3.2  | 3.8  | 4.2  |      |
|                     | SIM7070G-NG | 3.0  | 3.8  | 4.6  | V    |
| Voltage at USB_VBUS |             | 3.5  | 5.0  | 5.25 | V    |

The operating temperature of SIM7075G is listed in the following table.

**Table 34: Operating temperature**

| Parameter             | Min. | Typ. | Max. | Unit |
|-----------------------|------|------|------|------|
| operation temperature | -40  | 25   | 85   | °C   |
| Storage temperature   | -45  | 25   | +90  | °C   |

**NOTE**

Module is able to make and receive voice calls, data calls, SMS and make GPRS/LTE traffic in  $-40^{\circ}\text{C} \sim +85^{\circ}\text{C}$ . The performance will be reduced slightly from the 3GPP specifications if the temperature is outside the normal operating temperature range and still within the extreme operating temperature range.

## 5.3 Operating Mode

### 5.3.1 Operating Mode Definition

The table below summarizes the various operating modes of SIM7075G product.

**Table 35: Operating mode Definition**

| Mode                       |                   | Function                                                                                                                                                                                                                                                                                                                                                     |
|----------------------------|-------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Normal operation           | 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.                                                                                                                                                                                                                |
|                            | Idle              | Software is active. Module is registered to the network, and the module is ready to communicate.                                                                                                                                                                                                                                                             |
|                            | Cat-M1 Voice Call | Connection between two subscribers is in progress. In this case, the power consumption depends on network settings.                                                                                                                                                                                                                                          |
|                            | Standby           | Module is ready for data transmission, but no data is currently sent or received. In this case, power consumption depends on network settings.                                                                                                                                                                                                               |
|                            | 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=0" and "AT+CSCLK=1" 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 and the SIM card will not be accessible, but the serial port and USB port are still accessible. The power consumption in this mode is lower than normal mode. |
| Flight mode                |                   | AT command "AT+CFUN=4" can be used to set the module to flight mode without removing the power supply. In this mode, the RF part of the module will not work, but the serial port and USB port are still accessible. The power consumption in this mode is lower than normal mode.                                                                           |
| Power Saving Mode (PSM)    |                   | Setting AT command "AT+CPSMS=1" can be enable the PSM mode.                                                                                                                                                                                                                                                                                                  |

|                           |                                                                                                                                                                                                                                                                                                    |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                           | In this mode, The mode is similar to power-off. But the module remains registered on the network and there is no need to re-attach or re-establish the network connections. And all of the functions will be unavailable except the RTC function. PWRKEY and timer expires can wake up the module. |
| Extended Mode DRX (e-DRX) | In idle or sleep mode, module and the network may negotiate over non-access stratum signaling the use of extended mode DRX for reducing power consumption.                                                                                                                                         |

### 5.3.2 Sleep mode

Module can enter into sleep mode for reducing its power consumption in idle module. In sleep mode, the current consumption of module will be reduced to very small level, and module can still receive paging message and SMS.

Several hardware and software conditions must be satisfied together in order to let SIM7075G enter sleep mode:

- USB condition: Connected USB can't enter into sleep mode. So if module wants to enter into sleep mode, it must disconnect the power supply for USB\_VBUS first.
- Software condition: If module wants to enter into sleep mode, AT comment "AT+CSCLK=1" must be set to close some clock in the module. If the value "AT+CSCLK" is "0", module will never enter into sleep mode.
- UART condition: If module wants to enter into sleep mode, AT comment "AT+CSCLK=1" must be set to close some clock in the module. If the value "AT+CSCLK" is "0", module will never enter into sleep mode.

If it meets all the conditions at the same time, module will enter into sleep mode. In sleep mode, the UART is unavailable. If the host need to communicate with module, it need to pull down DTR can wake up module.

### 5.3.3 Minimum functionality mode and Flight mode

Minimum functionality mode ceases a majority function of the 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: Flight mode

If SIM7075G has been set to minimum functionality mode, the RF function and SIM card function will be closed. In this case, the serial port and USB are still accessible, but RF function and SIM card will be unavailable.

If SIM7075G has been set to flight mode, the RF function will be closed. In this case, the serial port and USB are still accessible, but RF function will be unavailable.

When SIM7075G is in minimum functionality or flight mode, it can return to full functionality by the AT command "AT+CFUN=1".

### 5.3.4 Power Saving Mode (PSM)

SIM7075G module can enter into PSM for reducing its power consumption. The mode is similar to power-off, but the module remains registered on the network and there is no need to re-attach or re-establish the network connections. So in PSM all the functions will be unavailable except the RTC function, module cannot immediately respond users' requests.

When the module wants to use the PSM, it can be enabled via "AT+CPSMS=1" command. The command takes effect after module reboot. If the network supports PSM and accepts that the module uses PSM, the network confirms usage of PSM by allocating an Active Time value to the module. Module will be into PSM according to the command from network.

Either of the following methods will wake up the module from PSM:

- Pulling PWRKEY pin to low level will wake up the module.
- When the timer expires, the module will be automatically woken up.

### 5.3.5 Extended Mode DRX (e-DRX)

In idle or sleep mode, module and the network may negotiate over non-access stratum signaling the use of extended mode DRX for reducing power consumption.

E-DRX diagrammatic sketch refer to the following figure.

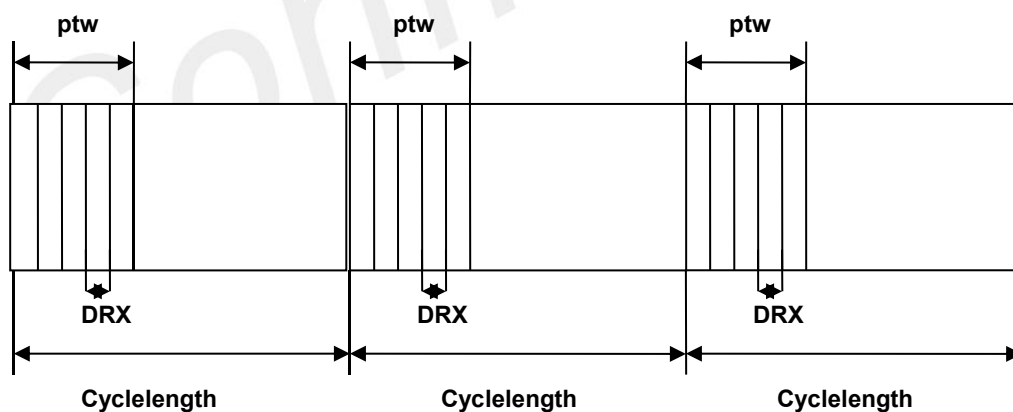


Figure 31: e-DRX diagrammatic sketch

When module and the network negotiate stratum signaling in idle mode or sleep mode, extended mode DRX can decrease the times of paging time window (PTW) and increase the cycle length. For this reason it had reduced the times of DRX, and had reduced the frequency of DRX between module and the network. So that can reduce power consumption for module.

If e-DRX is supported by the network, then it can be enabled by “AT+CEDRXS” command.

**NOTE**

For details about “AT+CEDRXS”, please refer to Document [1]

## 5.4 Current Consumption

The current consumption is listed in the table below.

**Table 36: Current consumption on VBAT Pins (VBAT=3.8V)**

### GNSS

|                                                            |                         |
|------------------------------------------------------------|-------------------------|
| GNSS supply current<br>(AT+CFUN=0, without USB connection) | Tracking, typical: 54mA |
|------------------------------------------------------------|-------------------------|

### Idle mode

|                                                                                    |         |               |
|------------------------------------------------------------------------------------|---------|---------------|
| LTE supply current<br>(AT+CSCLK=0; AT+CFUN=1,<br>GNSS off, without USB connection) | GSM     | typical: 12mA |
|                                                                                    | CAT-M1  | typical: 18mA |
|                                                                                    | NB1/NB2 | typical: 14mA |

### Sleep mode

|                                                                                    |     |                 |
|------------------------------------------------------------------------------------|-----|-----------------|
| GSM supply current<br>(AT+CSCLK=1; AT+CFUN=1,<br>GNSS off, without USB connection) | GSM | typical: 2.1mA  |
| GSM supply current<br>(AT+CSCLK=1; AT+CFUN=0,<br>GNSS off, without USB connection) | GSM | typical: 0.45mA |

### Power Saving Mode

|                    |                       |
|--------------------|-----------------------|
| PSM supply current | PSM mode Typical: 9uA |
|--------------------|-----------------------|

### e-DRX

|                                                     |                                                       |
|-----------------------------------------------------|-------------------------------------------------------|
| e-DRX mode supply current<br>(Tested in sleep mode) | @PTW=40.96s; eDRX=81.92s; DRX=2.56s<br>Typical: 0.6mA |
|                                                     | @PTW=25.6s; eDRX=163.84s; DRX=2.56s<br>Typical: 0.4mA |

### GPRS data transmission

|                   |                                |
|-------------------|--------------------------------|
| EGSM850(3DL,2UL)  | @power class #5 Typical: 369mA |
| DCS1800(3DL,2UL)  | @power class #0 Typical: 274mA |
| EGSM 850(1DL,4UL) | @power class #5 Typical: 500mA |
| DCS1800 (1DL,4UL) | @power class #0 Typical: 401mA |

### EDGE data transmission

|                                            |                                                                       |
|--------------------------------------------|-----------------------------------------------------------------------|
| EGSM850(3DL,2UL)                           | @power class #5 Typical: 210mA                                        |
| DCS1800(3DL,2UL)                           | @power class #0 Typical:172mA                                         |
| EGSM 850(1DL,4UL)                          | @power class #5 Typical: 311mA                                        |
| DCS1800 (1DL,4UL)                          | @power class #0 Typical: 285mA                                        |
| <b>LTE Cat-M (10MHz) data transmission</b> |                                                                       |
| LTE-FDD B1                                 | @21dbm Typical: 116mA<br>@10dbm Typical: 103mA<br>@0dbm Typical: 91mA |
| LTE-FDD B2                                 | @21dbm Typical: 115mA<br>@10dbm Typical: 102mA<br>@0dbm Typical:90mA  |
| LTE-FDD B3                                 | @21dbm Typical: 114mA<br>@10dbm Typical: 102mA<br>@0dbm Typical: 90mA |
| LTE-FDD B4                                 | @21dbm Typical: 114mA<br>@10dbm Typical: 102mA<br>@0dbm Typical:91mA  |
| LTE-FDD B5                                 | @21dbm Typical: 117mA<br>@10dbm Typical: 100mA<br>@0dbm Typical: 90mA |
| LTE-FDD B8                                 | @21dbm Typical: 117mA<br>@10dbm Typical: 101mA<br>@0dbm Typical:91mA  |
| LTE-FDD B12                                | @21dbm Typical: 116mA<br>@10dbm Typical: 100mA<br>@0dbm Typical: 90mA |
| LTE-FDD B13                                | @21dbm Typical: 118mA<br>@10dbm Typical: 101mA<br>@0dbm Typical:93mA  |
| LTE-FDD B14                                | @21dbm Typical: 119mA<br>@10dbm Typical: 101mA<br>@0dbm Typical: 90mA |
| LTE-FDD B18                                | @21dbm Typical: 117mA<br>@10dbm Typical: 100mA<br>@0dbm Typical:90mA  |
| LTE-FDD B19                                | @21dbm Typical: 117mA<br>@10dbm Typical: 101mA<br>@0dbm Typical: 90mA |
| LTE-FDD B20                                | @21dbm Typical: 118mA<br>@10dbm Typical: 101mA<br>@0dbm Typical: 91mA |
| LTE-FDD B25                                | @21dbm Typical: 115mA<br>@10dbm Typical: 102mA<br>@0dbm Typical:91mA  |
| LTE-FDD B26                                | @21dbm Typical: 116mA<br>@10dbm Typical: 100mA                        |

|             |                                                                        |
|-------------|------------------------------------------------------------------------|
|             | @0dbm Typical:90mA                                                     |
| LTE-FDD B27 | @21dbm Typical: 117mA<br>@10dbm Typical: 101mA<br>@0dbm Typical:90mA   |
| LTE-FDD B28 | @21dbm Typical: 116mA<br>@10dbm Typical: 100mA<br>@0dbm Typical: 91mA  |
| LTE-FDD B31 | @27dbm Typical: 345mA<br>@17dbm Typical: 185mA<br>@8dbm Typical:137mA  |
| LTE-FDD B66 | @21dbm Typical: 167mA<br>@10dbm Typical: 131mA<br>@0dbm Typical: 103mA |
| LTE-FDD B72 | @27dbm Typical: 348mA<br>@17dbm Typical:178mA<br>@8dbm Typical: 138mA  |
|             |                                                                        |
| LTE-FDD B1  | @21dbm Typical: 137mA<br>@10dbm Typical: 87mA<br>@0dbm Typical: 55mA   |
| LTE-FDD B2  | @21dbm Typical: 140mA<br>@10dbm Typical: 87mA<br>@0dbm Typical: 53mA   |
| LTE-FDD B3  | @21dbm Typical: 142mA<br>@10dbm Typical: 87mA<br>@0dbm Typical: 53mA   |
| LTE-FDD B4  | @21dbm Typical: 141mA<br>@10dbm Typical: 86mA<br>@0dbm Typical: 53mA   |
| LTE-FDD B5  | @21dbm Typical: 146mA<br>@10dbm Typical: 80mA<br>@0dbm Typical: 53mA   |
| LTE-FDD B8  | @21dbm Typical: 143mA<br>@10dbm Typical: 80mA<br>@0dbm Typical: 52mA   |
| LTE-FDD B12 | @21dbm Typical: 139mA<br>@10dbm Typical: 78mA<br>@0dbm Typical: 51mA   |
| LTE-FDD B13 | @21dbm Typical: 153mA<br>@10dbm Typical: 83mA<br>@0dbm Typical: 52mA   |
| LTE-FDD B18 | @21dbm Typical: 147mA<br>@10dbm Typical: 80mA<br>@0dbm Typical: 53mA   |

|             |                                                                        |
|-------------|------------------------------------------------------------------------|
| LTE-FDD B19 | @21dbm Typical: 147mA<br>@10dbm Typical: 80mA<br>@0dbm Typical: 53mA   |
| LTE-FDD B20 | @21dbm Typical: 147mA<br>@10dbm Typical: 81mA<br>@0dbm Typical: 52mA   |
| LTE-FDD B25 | @21dbm Typical: 140mA<br>@10dbm Typical: 87mA<br>@0dbm Typical: 54mA   |
| LTE-FDD B26 | @21dbm Typical: 147mA<br>@10dbm Typical: 81mA<br>@0dbm Typical: 53mA   |
| LTE-FDD B28 | @21dbm Typical: 143mA<br>@10dbm Typical: 81mA<br>@0dbm Typical: 53mA   |
| LTE-FDD B31 | @26dbm Typical: 302mA<br>@17dbm Typical: 185mA<br>@8dbm Typical: 120mA |
| LTE-FDD B66 | @21dbm Typical: 141mA<br>@10dbm Typical: 87mA<br>@0dbm Typical: 53mA   |
| LTE-FDD B71 | @21dbm Typical: 133mA<br>@10dbm Typical: 76mA<br>@0dbm Typical: 64mA   |
|             |                                                                        |

## 5.5 ESD Notes

SIM7075G is sensitive to ESD in the process of storage, transporting, and assembling. When SIM7075G is mounted on the users' mother board, the ESD components should be placed beside the connectors which human body may touch, such as SIM card holder, audio jacks, switches, keys, etc. The following table shows SIM7075G ESD measurement performance without any external ESD component.

**Table 37: The ESD performance measurement table (Temperature: 25°C, Humidity: 45%.)**

| Part         | Contact discharge | Air discharge |
|--------------|-------------------|---------------|
| VBAT,GND     | +/-6K             | +/-12K        |
| Antenna port | +/-5K             | +/-10K        |
| Other PADs   | +/-1K             | +/-3K         |

**NOTE**

Test Conditions:

1. The external of the module has surge protection diodes and ESD protection diodes.
2. The data in Table 37 was tested using SIMCom EVB.

SIMCom  
Confidential

## 6. SMT Production Guide

### 6.1 Top and Bottom View of SIM7075G

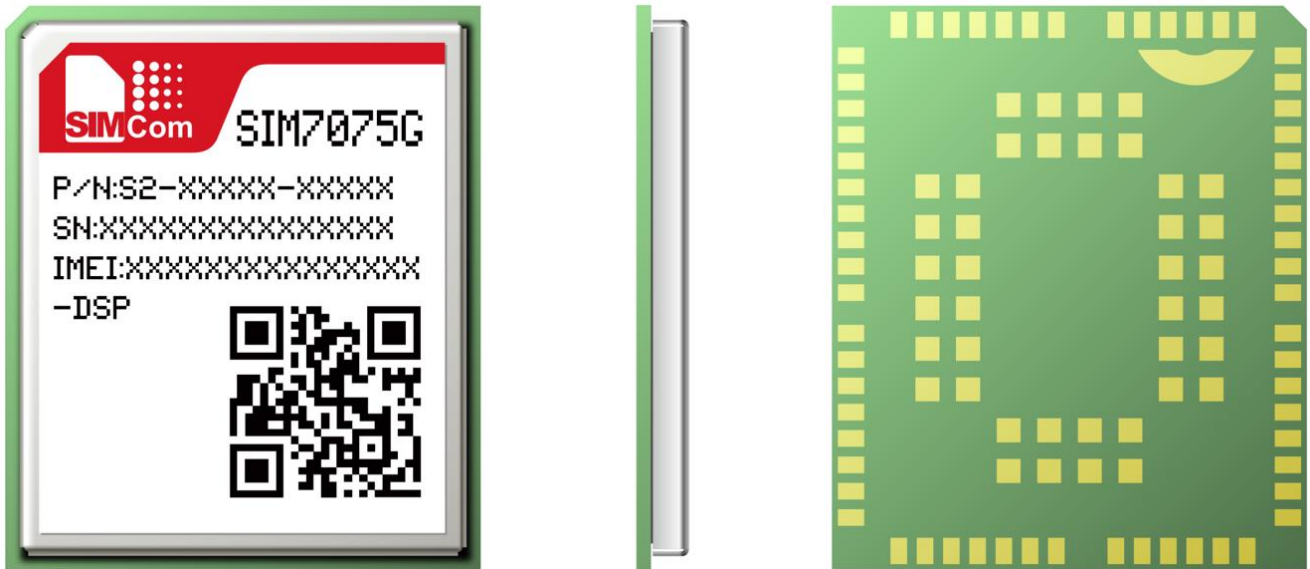


Figure 32: Top and bottom view of SIM7075G

## 6.2 Label Information



Figure 33: Label information

Table 38: The description of label information

| No. | Description                             |
|-----|-----------------------------------------|
| A   | LOGO,No.1 Pin                           |
| B   | Project name                            |
| C   | Product code                            |
| D   | Serial number                           |
| E   | International mobile equipment identity |
| F   | QR code                                 |

## 6.3 Typical SMT Reflow Profile

SIMCom provides a typical soldering profile. Therefore the soldering profile shown below is only a generic recommendation and should be adjusted to the specific application and manufacturing constraints.

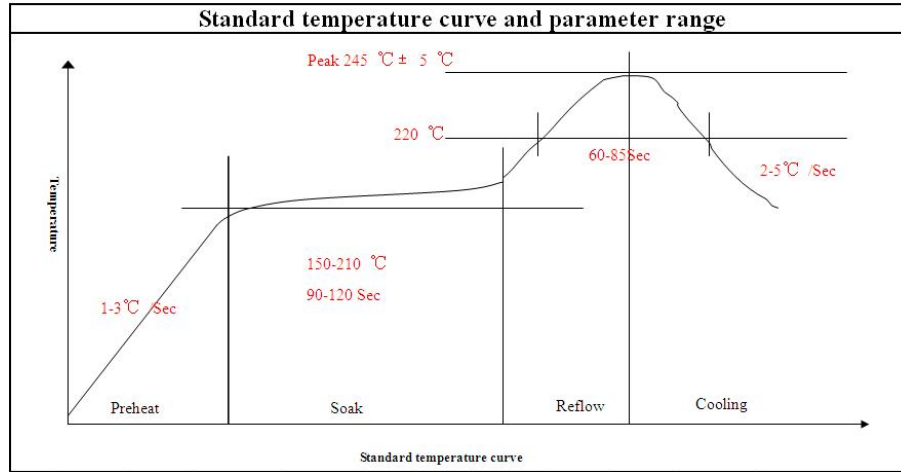


Figure 34: The ramp-soak-spike reflow profile of SIM7075G

### NOTE

For more details about secondary SMT, please refer to the document [19].

## 6.4 Moisture Sensitivity Level (MSL)

SIM7075G is qualified to Moisture Sensitivity Level (MSL) 3 in accordance with JEDEC J-STD-033.

The following table shows the features of Moisture Sensitivity Level (MSL). After seal off, storage conditions must meet the following table. If the storage time was expired, module must be baking before SMT.

**Table 39: Moisture Sensitivity Level and Floor Life**

| Moisture Sensitivity Level (MSL) | Floor Life (out of bag) at factory ambient $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ or as stated |
|----------------------------------|---------------------------------------------------------------------------------------------------|
| 1                                | Unlimited at $\leq 30^{\circ}\text{C}/85\% \text{ RH}$                                            |
| 2                                | 1 year at $\leq 30^{\circ}\text{C}/60\% \text{ RH}$                                               |
| 2a                               | 4 weeks at $\leq 30^{\circ}\text{C}/60\% \text{ RH}$                                              |
| 3                                | 168 hours at $\leq 30^{\circ}\text{C}/60\% \text{ RH}$                                            |
| 4                                | 72 hours at $\leq 30^{\circ}\text{C}/60\% \text{ RH}$                                             |

|    |                                                                                                          |
|----|----------------------------------------------------------------------------------------------------------|
| 5  | 48 hours at $\leq 30^{\circ}\text{C}/60\% \text{ RH}$                                                    |
| 5a | 24 hours at $\leq 30^{\circ}\text{C}/60\% \text{ RH}$                                                    |
| 6  | Mandatory bake before use. After bake, it must be reflowed within the time limit specified on the label. |

## 6.5 Baking

In order to get better yield, the module need to bake before SMT.

- If the packaging is in perfect condition, the module which date of production is within six months has no use for baking. If the date of production is more than six months, the module must be baking.
- If the packaging had been opened or damaged, the module must be baking.

**Table 40: Baking conditions**

| conditions         | parameters |
|--------------------|------------|
| Baking temperature | 120°C      |
| Baking time        | 8 hours    |

### NOTE

IPC / JEDEC J-STD-033 standard must be followed for production and storage.

## 6.6 Stencil Foil Design Recommendation

The recommended thickness of stencil foil is 0.15mm.

Recommended PCB  
footprint outline  
(Unit:mm)

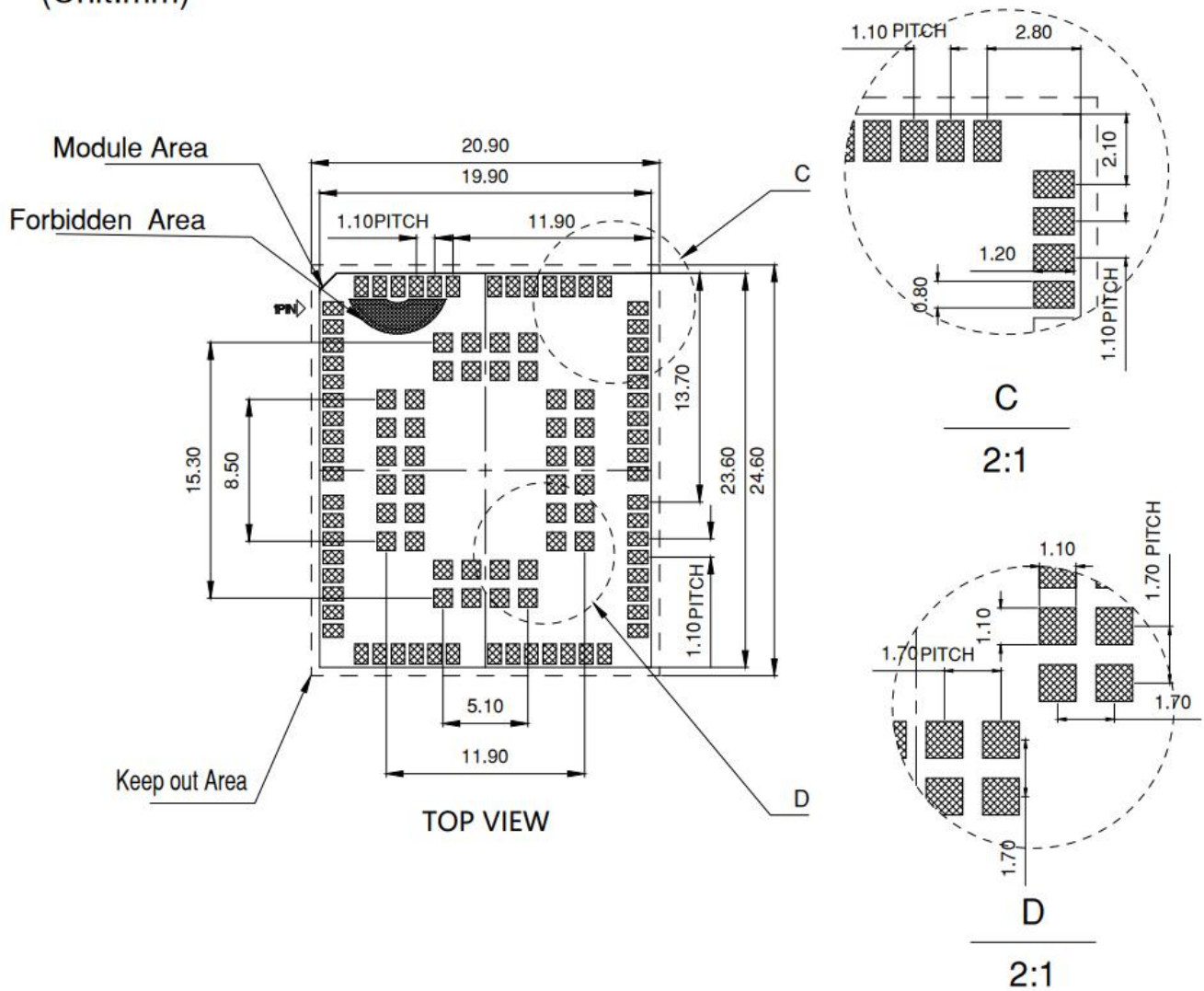


Figure 35: stencil recommendation (Unit: mm)

## 7. Packaging

### 7.1 Tray packaging

SIM7075G module support tray packaging.

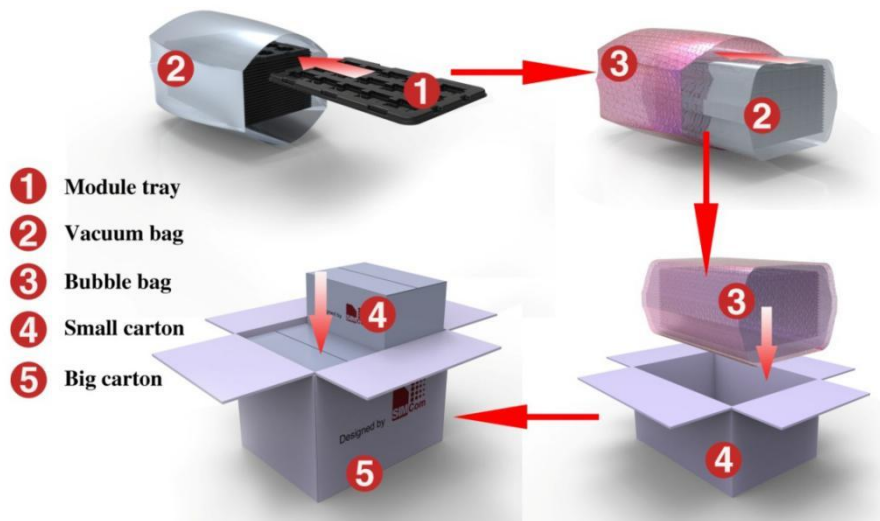


Figure 36: packaging diagram

Module tray drawing:

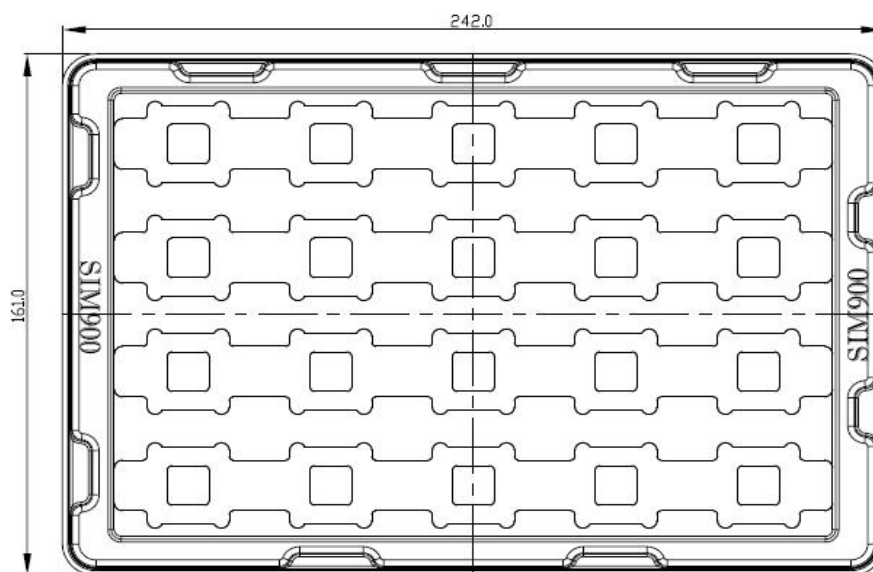


Figure 37: Tray drawing

**Table 41: Tray size**

| Length ( $\pm 3\text{mm}$ ) | Width ( $\pm 3\text{mm}$ ) | Module number |
|-----------------------------|----------------------------|---------------|
| 242.0                       | 161.0                      | 20            |

Small carton drawing:

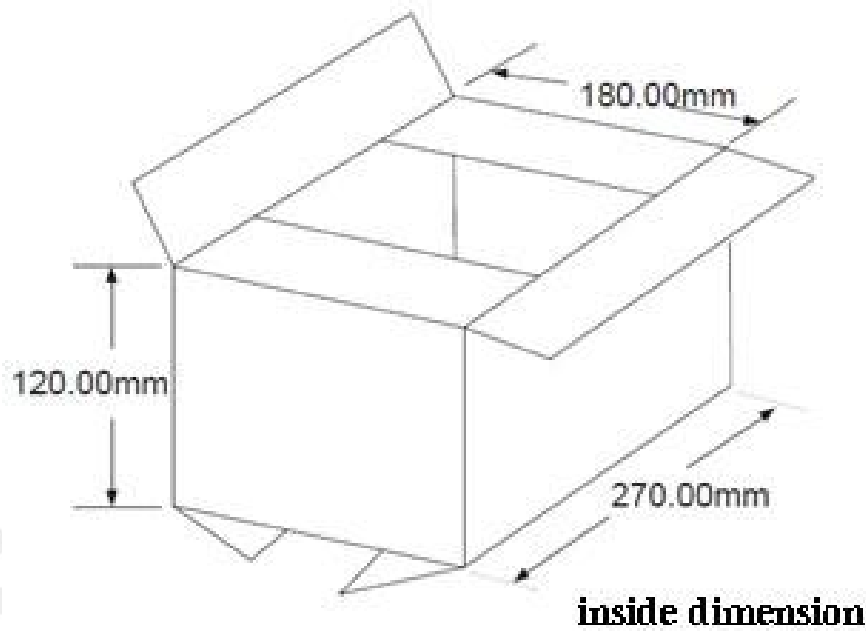


Figure 38: Small carton drawing

**Table 42: Small Carton size**

| Length ( $\pm 10\text{mm}$ ) | Width ( $\pm 10\text{mm}$ ) | Height ( $\pm 10\text{mm}$ ) | Module number |
|------------------------------|-----------------------------|------------------------------|---------------|
| 270                          | 180                         | 120                          | 20*20=400     |

Big carton drawing:

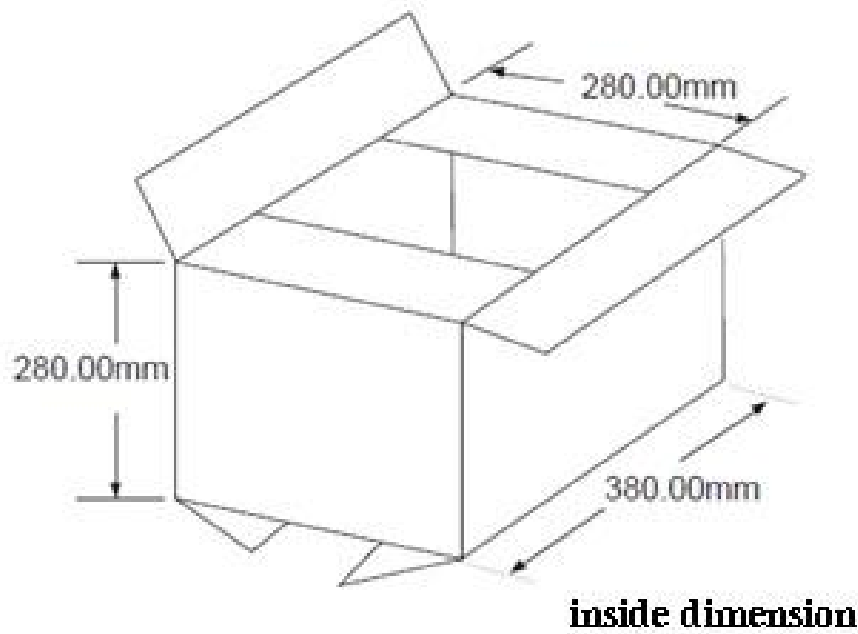


Figure 39: Big carton drawing

Table 43: Big Carton size

| Length ( $\pm 10\text{mm}$ ) | Width ( $\pm 10\text{mm}$ ) | Height ( $\pm 10\text{mm}$ ) | Module number |
|------------------------------|-----------------------------|------------------------------|---------------|
| 380                          | 280                         | 280                          | 400*4=1600    |

## 8. Appendix

### A. Reference Design

Refer to <SIM7075G Reference Design V1.01> for the details.

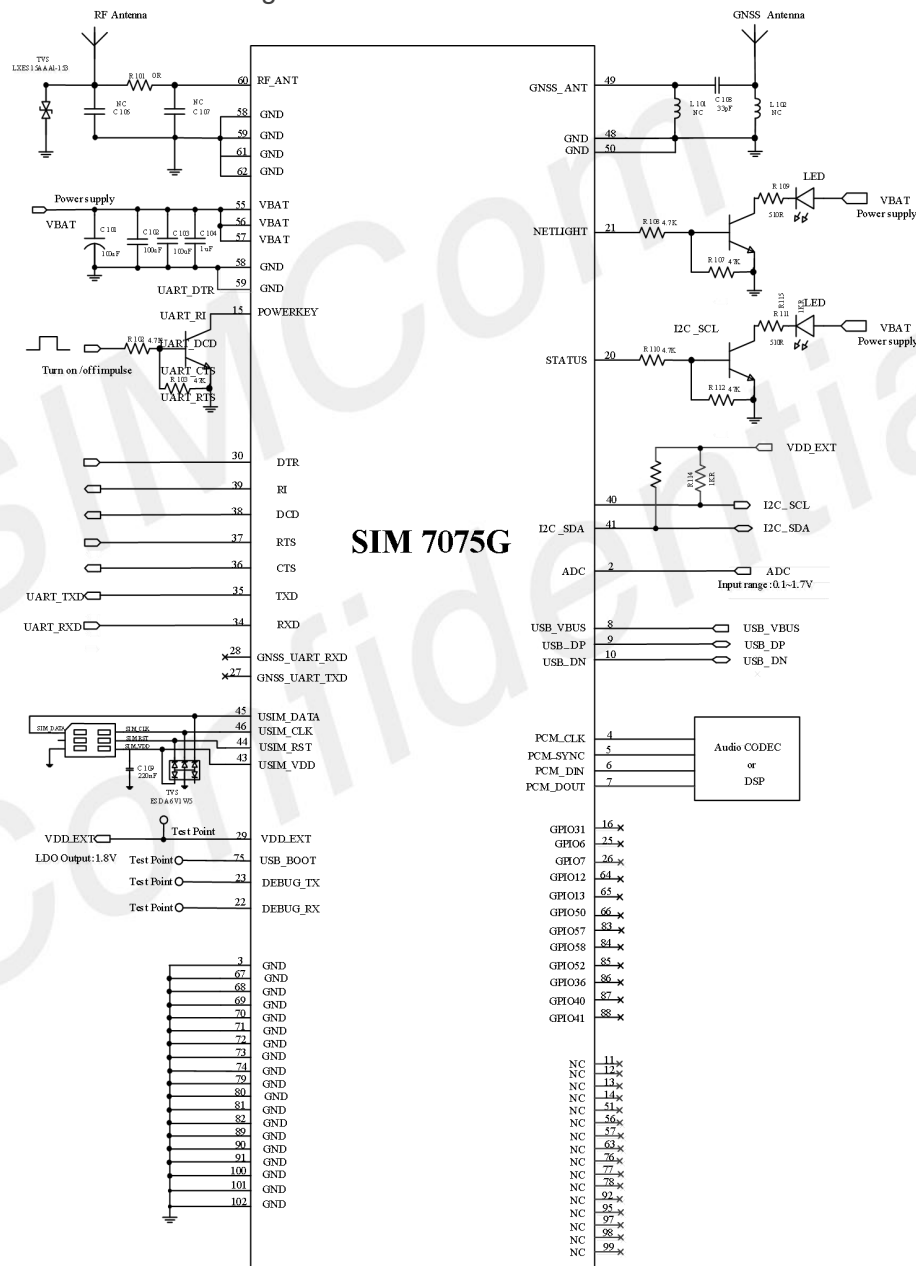


Figure 40: Reference design

## B. Design check list

**Table 44: Schematic Check List**

| NO. | Items                                                                                                                                                                                                         |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Insure the supply voltage for VBAT is within the range                                                                                                                                                        |
| 2   | Insure the maximum supply current for VBAT is above its consumption when it is maximum power emission.                                                                                                        |
| 3   | Insure the capacitor for VBAT is meet its request, in order to avoid the voltage drop exceed 300mV.                                                                                                           |
| 4   | Insure the input signal for PWRKEY pin meet its electrical level match. It recommended use BJT to shift its level.                                                                                            |
| 5   | Insure the netconnections of UART be correctness according to signal direction. Insure the signal for UART pins meet its electrical level match. It recommended use BJT or level shift IC to shift its level. |
| 6   | Insure USB port had used TVS to protect signal. And the junction capacity of TVS for DP/DM must be less than 3pf.                                                                                             |
| 7   | Insure SIM card signal had used TVS to protect. And the junction capacity of TVS must be less than 50pf.                                                                                                      |
| 8   | The power supply of the active antenna should be controlled and closed.                                                                                                                                       |
| 9   | Insure I2C signal had used resistors 1Kohm pull up to VDD_EXT if used.                                                                                                                                        |
| 10  | The electrical level of all GPIOs is 1.8V. Insure the signal for GPIO pins meet its electrical level match.                                                                                                   |
| 11  | The input range of ADC is 0V~1.875V. Insure the input signal never exceed its range.                                                                                                                          |
| 12  | User must pull up DTR when module enters into sleep mode. Insure DTR can be controlled by host.                                                                                                               |
| 13  | Suggesting to reserve test ports for VDD_EXT and BOOT_CFG. BOOT_CFG should keep open before boot up.                                                                                                          |
| 14  | LTE main ANT should Keep TVS to prevent ESD destroyed. And the TVS should be Low junction capacitance.                                                                                                        |
| 15  | LTE main ANT should have a PI type matching to debug antenna                                                                                                                                                  |

**Table 45: PCB Layout Check List**

| NO. | Items                                                                                                                                                                                                              |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Insure the capacitor placement for VBAT be near module pin.                                                                                                                                                        |
| 2   | Insure VBAT trace width be greater than 2mm. If NB only, insure VBAT trace width be greater than 1mm. And the VIA number must be enough for getting through the current.                                           |
| 3   | Insure the return path GND of the power supply is good. Insure the connectivity between module GND and mother board GND is good.                                                                                   |
| 4   | Insure PCM trance is protected by GND, and keep it far from interference source, such as power supply trace, USB trace, RF trace and so on.                                                                        |
| 5   | Insure USB trance is protected by GND, and keep it far from interference source, such as power supply trace, RF trace and so on. Insure DM/DP trace is differential routing, and differential impedance is 90 ohm. |
| 6   | Insure ADC trance is protected by GND.                                                                                                                                                                             |
| 7   | Insure SIM card signal trance is protected by GND. Especially SIM_CLK must be protected alone. And avoid signal trace branched Routing.                                                                            |
| 8   | Insure TVS avoid bypass. The trace must go through TVS pad first, and then arrived module pad.                                                                                                                     |

|    |                                                                                                                                                           |
|----|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 9  | There should be enough ground around the RF line. RF lines Routing prohibit right angles and sharp angles, trying to trace circular or obtuse angle line. |
| 10 | The RF line reference GND should be complete. And avoid high speed lines crossing below it.                                                               |
| 11 | the GND side of the RF output pin should be non hot welding disk                                                                                          |
| 12 | The routing which is RF output PIN to antenna should be isolated from other high-speed lines. And the routing should be 50Ω impedance control.            |

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

**Table 46: Coding Schemes and Maximum Net Data Rates over Air Interface**

| Channel 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               |

| <b>LTE-FDD device category (Downlink)</b> | <b>Max data rate (peak)</b> | <b>Modulation type</b> |
|-------------------------------------------|-----------------------------|------------------------|
| Category M1                               | 300 kbps                    | QPSK/16QAM             |
| Category NB2                              | 20 kbps                     | BPSK/QPSK              |
| <b>LTE-FDD device category (Uplink)</b>   | <b>Max data rate (peak)</b> | <b>Modulation type</b> |
| Category M1                               | 300 kbps                    | QPSK/16QAM             |
| Category NB2                              | 10.3 kbps                   | BPSK/QPSK              |

## D. Related Documents

**Table 47: Related Documents**

| <b>NO.</b> | <b>Title</b>                     | <b>Description</b>                                                                                                                                                                                                                                                                                        |
|------------|----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| [1]        | SIM7075G 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] | SIM7075G 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.                                                                                                                                                                                                                                              |

## E. Terms and Abbreviations

**Table 48: Terms and Abbreviations**

| Abbreviation | Description                                                     |
|--------------|-----------------------------------------------------------------|
| ADC          | Analog-to-Digital Converter                                     |
| ARP          | Antenna Reference Point                                         |
| BER          | Bit Error Rate                                                  |
| BD           | BeiDou                                                          |
| 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                                      |
| DAM          | Downloadable Application Module                                 |
| DPO          | Dynamic Power Optimization                                      |
| DRX          | Discontinuous Reception                                         |
| e-DRX        | Extended Discontinuous Reception                                |

|       |                                                             |
|-------|-------------------------------------------------------------|
| EFR   | Enhanced Full Rate                                          |
| EGSM  | Enhanced GSM                                                |
| EMC   | Electromagnetic Compatibility                               |
| ESD   | Electrostatic Discharge                                     |
| ETS   | European Telecommunication Standard                         |
| EVDO  | Evolution Data Only                                         |
| FCC   | Federal Communications Commission (U.S.)                    |
| FD    | SIM fix dialing phonebook                                   |
| FDMA  | Frequency Division Multiple Access                          |
| FR    | Full Rate                                                   |
| GMSK  | Gaussian Minimum Shift Keying                               |
| GNSS  | Global Navigation Satellite System                          |
| GPRS  | General Packet Radio Service                                |
| GPS   | Global Positioning System                                   |
| GSM   | Global Standard for Mobile Communications                   |
| HR    | Half Rate                                                   |
| HSPA  | High Speed Packet Access                                    |
| 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                                           |
| NMEA  | National Marine Electronics Association                     |
| 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                                       |
| 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        |
| SIM    | Universal subscriber identity module                              |
| UMTS   | Universal mobile telecommunications system                        |
| UART   | Universal asynchronous receiver transmitter                       |
| PSM    | Power saving mode                                                 |
| LD     | SIM last dialing phonebook (list of numbers most recently dialed) |
| MC     | Mobile Equipment list of unanswered MT calls (missed calls)       |
| ON     | SIM (or ME) own numbers (MSISDNs) list                            |
| RC     | Mobile Equipment list of received calls                           |
| SM     | SIM phonebook                                                     |
| NC     | Not connect                                                       |

## F. Safety Caution

**Table 49: 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.

Antenna Type:

monopole antenna

Antenna Gain:

| Band    | Antenna Gain |
|---------|--------------|
| GSM850  | 6dBi         |
| DCS1900 | 3dBi         |
| LTE B2  | 3dBi         |
| LTE B4  | 6dBi         |
| LTE B5  | 6dBi         |
| LTE B12 | 6dBi         |
| LTE B13 | 10dBi        |
| LTE B14 | 10dBi        |
| LTE B25 | 3dBi         |
| LTE B26 | 6dBi         |
| LTE B66 | 6dBi         |
| LTE B71 | 6dBi         |

The following warning statements :

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

(1) This device may not cause harmful interference, and

(2) this device must accept any interference received, including interference that may cause undesired operation.

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

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not

occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following

measures:

-- Reorient or relocate the receiving antenna.

-- Increase the separation between the equipment and receiver.

-- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

-- Consult the dealer or an experienced radio/TV technician for help.

Exposure to Radio Frequency Radiation. This equipment must be installed and operated in accordance with provided instructions, and the antenna(s) used for this transmitter must be installed to provide a separation

distance of at least 20 cm from all persons and must not be collocated or operating in conjunction with any other antenna or transmitter. End-users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF exposure compliance.

This Modular Approval is limited to OEM installation for mobile and fixed applications only. The antenna installation and operating configurations of this Modular, including any applicable source-based time averaging duty factor, antenna gain and cable loss must satisfy MPE categorical Exclusion Requirements of 2.1091.

if the host is marketed so that end users do not have straight forward commonly used methods for access to remove the module so that the FCC ID of the module is visible; then an additional permanent label referring to the enclosed module: Contains Transmitter Module FCC ID: 2AJYU-8VC0004 or Contains FCC ID: 2AJYU-8VC0004 must be used.

SIMCom  
Confidential