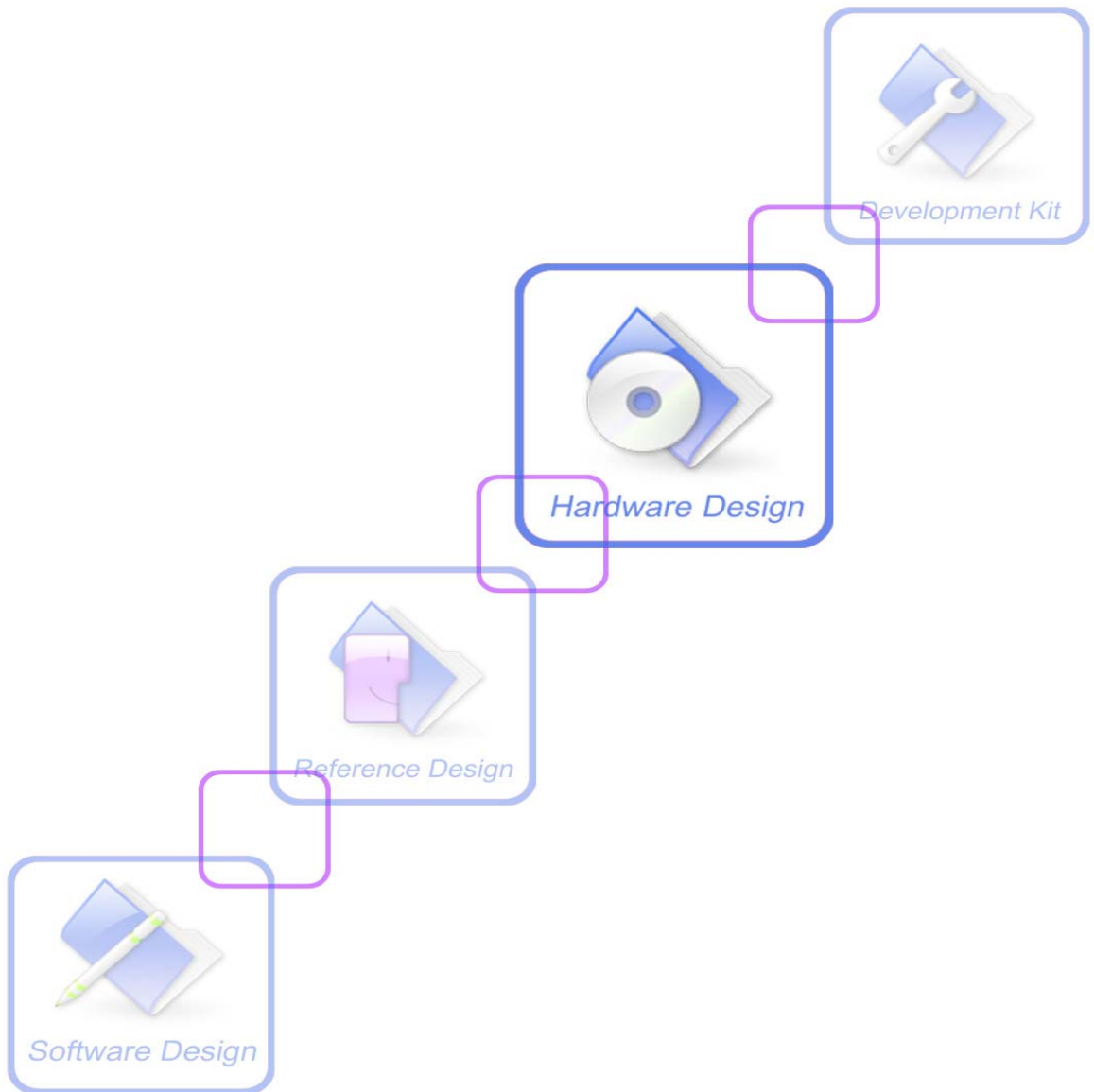




A company of SIM Tech

SIM800_Hardware Design_V1.07



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Version History

| Date | Version | Description of change | Author |
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| 2013-07-29 | 1.00 | Origin | Ma Honggang Teng Lili |
| 2013-08-05 | 1.01 | Update RESET pin parameter; Update figure 12, 13, 15. | Ma Honggang |
| 2013-08-21 | 1.02 | Update figure 3 and figure 23; Update chapter 7.3; | Ma Honggang |
| 2014-01-17 | 1.03 | Update table32, correct NETLIGHT to PIN 52; | Ma Honggang |
| 2014-03-11 | 1.04 | Update table 11 | Ma Honggang |
| 2014-03-25 | 1.05 | Update figure 32 and figure 33 | Ma Honggang |
| 2014-07-18 | 1.06 | Update figure 12 and 13, timing of VDD_EXT changed; Update the baudrate that SIM800 supports; Rename some pin name to follow the SIMCom naming rules; Uptade table 6, table9; Add GPIO timing sequences of figure 43; Update figure 51; | Ma Honggang |
| 2014-12-01 | 1.07 | Update table 45 | WuCHengbing |

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1. Introduction

This document describes SIM800 hardware interface in great detail.

This document can help user to quickly understand SIM800 interface specifications, electrical and mechanical details. With the help of this document and other SIM800 application notes, user guide, users can use SIM800 to design various applications quickly.

2. SIM800 Overview

Designed for global market, SIM800 is a quad-band GSM/GPRS module that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHz. SIM800 features GPRS multi-slot class 12/ class 10 (optional) and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

With a tiny configuration of 24*24*3mm, SIM800 can meet almost all the space requirements in users' applications, such as M2M, smart phone, PDA and other mobile devices.

SIM800 has 68 SMT pads, and provides all hardware interfaces between the module and customers' boards.

- Support up to 5*5*2 Keypads.
- One full function UART port, and can be configured to two independent serial ports.
- One USB port can be used as debugging and firmware upgrading.
- Audio channels which include a microphone input and a receiver output.
- Programmable general purpose input and output.
- One SIM card interface.
- Support Bluetooth function.
- Support one PWM.
- PCM/SPI/SD card interface, only one function can be accessed synchronously. (default function is PCM)

SIM800 is designed with power saving technique so that the current consumption is as low as 1.0mA in sleep mode.

SIM800 integrates TCP/IP protocol and extended TCP/IP AT commands which are very useful for data transfer applications. For details about TCP/IP applications, please refer to *document [11]*.

2.1. SIM800 Key Features

Table 1: SIM800 key features

| Feature | Implementation |
|-----------------|--|
| Power supply | 3.4V ~4.4V |
| Power saving | Typical power consumption in sleep mode is 1.0mA (BS-PA-MFRMS=9) |
| Frequency bands | <ul style="list-style-type: none"> ● SIM800 Quad-band: GSM 850, EGSM 900, DCS 1800, PCS 1900. SIM800 can search the 4 frequency bands automatically. The frequency bands also can be set by AT command "AT+CBAND". For details, please refer to <i>document [1]</i>. ● Compliant to GSM Phase 2/2+ |

| | |
|-------------------------------|---|
| Transmitting power | <ul style="list-style-type: none"> ● Class 4 (2W):GSM850,EGSM900 ● Class 1 (1W):DCS1800,PCS1900 |
| GPRS connectivity | <ul style="list-style-type: none"> ● GPRS multi-slot class 12 (default) ● GPRS multi-slot class 1~12 (option) |
| Temperature range | <ul style="list-style-type: none"> ● Normal operation:-40°C ~ +85°C ● Storage temperature -45°C ~ +90°C |
| Data GPRS | <ul style="list-style-type: none"> ● GPRS data downlink transfer: max. 85.6 kbps ● GPRS data uplink transfer: max. 85.6 kbps ● Coding scheme: CS-1, CS-2, CS-3 and CS-4 ● PAP protocol for PPP connect ● Integrate the TCP/IP protocol. ● Support Packet Broadcast Control Channel (PBCCH) ● CSD transmission rates:2.4,4.8,9.6,14.4 kbps |
| CSD | <ul style="list-style-type: none"> ● Support CSD transmission |
| USSD | <ul style="list-style-type: none"> ● Unstructured Supplementary Services Data (USSD) support |
| SMS | <ul style="list-style-type: none"> ● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card |
| SIM interface | Support SIM card: 1.8V, 3V |
| External antenna | Antenna pad |
| Audio features | <p>Speech codec modes:</p> <ul style="list-style-type: none"> ● Half Rate (ETS 06.20) ● Full Rate (ETS 06.10) ● Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80) ● Adaptive multi rate (AMR) ● Echo Cancellation ● Noise Suppression |
| Serial port and USB interface | <p>Serial port:</p> <ul style="list-style-type: none"> ● Full modem interface with status and control lines, unbalanced, asynchronous. ● 1200bps to 460800bps ● Can be used for AT commands for data stream ● Support RTS/CTS hardware handshake and software ON/OFF flow control ● Multiplex ability according to GSM 07.10 Multiplexer Protocol ● Autobauding supports baud rate from 1200 bps to 115200bps <p>USB interface:</p> <ul style="list-style-type: none"> ● Can be used as debugging and firmware upgrading |
| Phonebook management | Support phonebook types: SM, FD, LD, RC, ON, MC |
| SIM application toolkit | Support SAT class 3, GSM 11.14 Release 99 |
| Real time clock | Support RTC |
| Alarm function | Can be set by AT command |
| Physical characteristics | <p>Size:24*24*3mm</p> <p>Weight:3.2g</p> |
| Firmware upgrade | Firmware upgrading by serial port and USB interface |

Table 2: Coding schemes and maximum net data rates over air interface

| Coding scheme | 1 timeslot | 2 timeslot | 4 timeslot |
|---------------|------------|------------|------------|
| CS-1 | 9.05kbps | 18.1kbps | 36.2kbps |
| CS-2 | 13.4kbps | 26.8kbps | 53.6kbps |
| CS-3 | 15.6kbps | 31.2kbps | 62.4kbps |
| CS-4 | 21.4kbps | 42.8kbps | 85.6kbps |

2.2. Operating Modes

The table below summarizes the various operating modes of SIM800.

Table 3: Overview of operating modes

| Mode | Function |
|----------------------------|---|
| Normal operation | GSM/GPRS SLEEP Module will automatically go into sleep mode if the conditions of sleep mode are enabling and there is no on air and no hardware interrupt (such as GPIO interrupt or data on serial port). In this case, the current consumption of module will reduce to the minimal level. In sleep mode, the module can still receive paging message and SMS. |
| | GSM IDLE Software is active. Module registered to the GSM network, and the module is ready to communicate. |
| | GSM TALK Connection between two subscribers is in progress. In this case, the power consumption depends on network settings such as DTX off/on, FR/EFR/HR, hopping sequences, antenna. |
| | GPRS STANDBY Module is ready for GPRS data transfer, but no data is currently sent or received. In this case, power consumption depends on network settings and GPRS configuration. |
| | GPRS DATA There is GPRS data transfer (PPP or TCP or UDP) in progress. In this case, power consumption is related with network settings (e.g. power control level); uplink/downlink data rates and GPRS configuration (e.g. used multi-slot settings). |
| Power down | Normal power down by sending the AT command “AT+CPOWD=1” or using the PWRKEY. The power management unit shuts down the power supply for the baseband part of the module, and only the power supply for the RTC is remained. Software is not active. The serial port is not accessible. Power supply (connected to VBAT) remains applied. |
| Minimum functionality mode | AT command “AT+CFUN” can be used to set the module to a minimum functionality mode without removing the power supply. In this mode, the RF part of the module will not work or the SIM card will not be accessible, or both RF part and SIM card will be closed, and the serial port is still accessible. The power consumption in this mode is lower than normal mode. |

2.3. SIM800 Functional Diagram

The following figure shows a functional diagram of SIM800:

- GSM baseband engine
- Flash
- GSM RF part
- Antenna interfaces
- Other interfaces

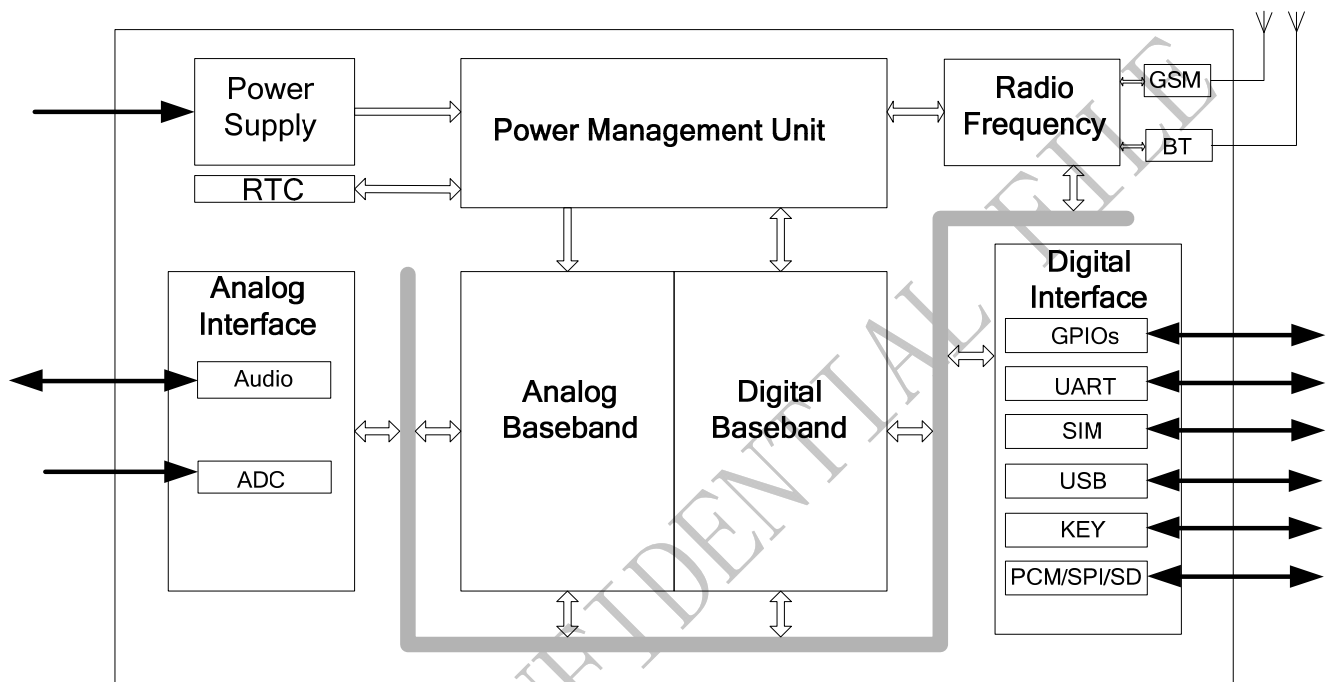


Figure 1: SIM800 functional diagram

3. Package Information

3.1. Pin Out Diagram

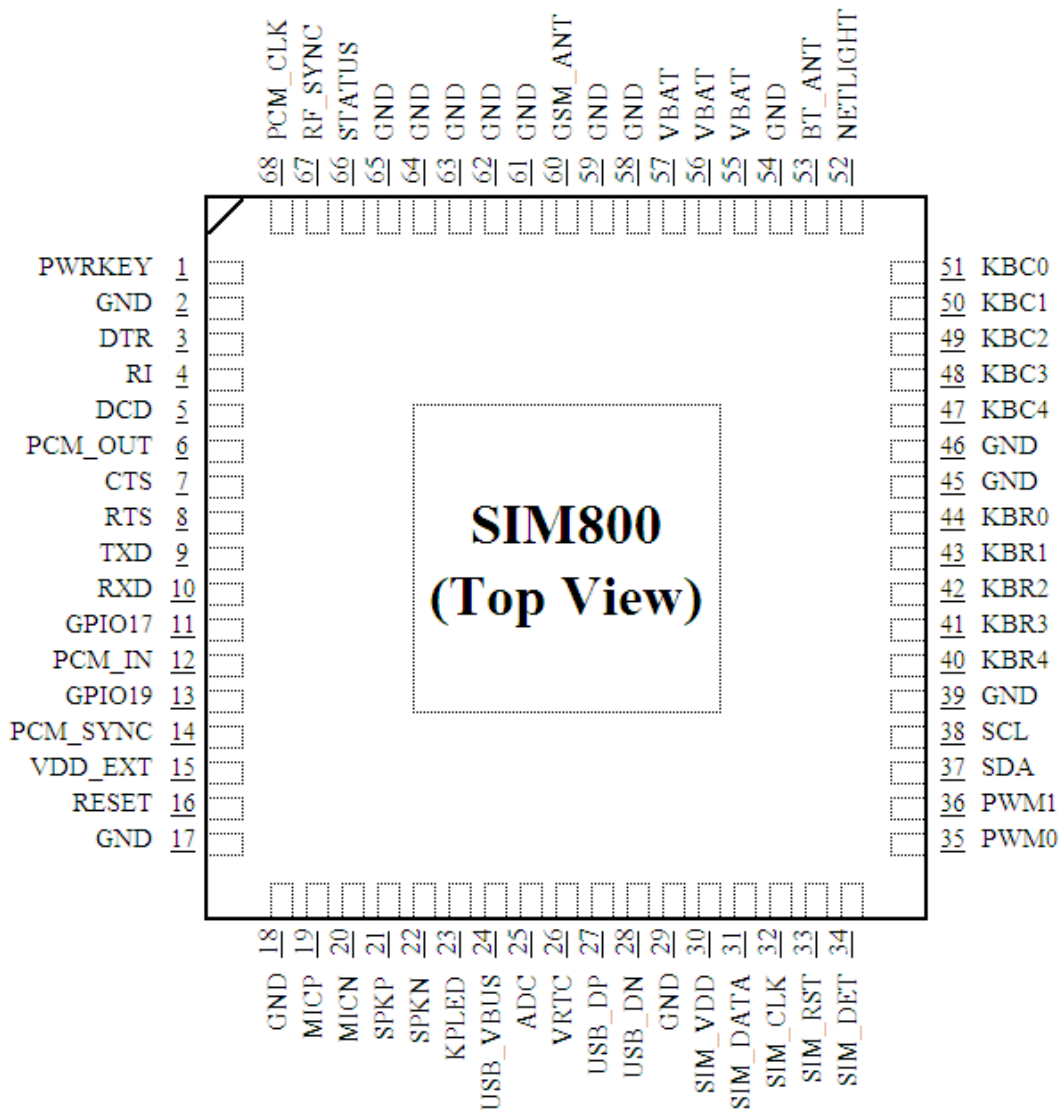


Figure 2: SIM800 pin out diagram (Top view)

3.2. Pin Description

Table 4: Pin description

| Pin name | Pin number | I/O | Description | Comment |
|-------------------------|---|-----|--|---|
| Power supply | | | | |
| VBAT | 55,56,57 | I | SIM800 supplies 3 VBAT pins, and the power range is from 3.4V to 4.4V. Power supply should provide sufficient current so that the module can work normally; the peak current is nearly 2A. | Zener diode is Strongly recommended to anti surge on VBAT. |
| VRTC | 26 | I/O | Power supply for RTC | It is recommended to connect VRTC to a battery or a capacitor (e.g. 4.7uF). |
| VDD_EXT | 15 | O | 2.8V power output | Keep floating if unused. |
| GND | 2,17,18,29,39,45,46,54,58,59,61,62,63,64,65 | | Ground | Recommend connecting 62,63,64,65pin to the power GND. |
| Power on/off | | | | |
| PWRKEY | 1 | I | PWRKEY should be pulled low at least 1 second and then released to power on/down the module. | Internally pulled up to VBAT. |
| Audio interface | | | | |
| MICP | 19 | I | Differential audio input | Keep floating if unused. |
| MICN | 20 | | | |
| SPKP | 21 | O | Differential audio output | |
| SPKN | 22 | | | |
| PCM interface | | | | |
| PCM_OUT | 6 | O | PCM interface for audio | Keep floating if unused. |
| PCM_IN | 12 | I | | |
| PCM_SYNC | 14 | O | | |
| PCM_CLK | 68 | I | | |
| Keypad interface | | | | |
| KBC4 | 47 | I | Support up to 50 buttons (5*5*2) | Keep floating if unused. (KBC0 can not be pulled down). |
| KBC3 | 48 | I | | |
| KBC2 | 49 | I | | |
| KBC1 | 50 | I | | |
| KBC0 | 51 | I | | |
| KBR4 | 40 | O | | |
| KBR3 | 41 | O | | |

| | | | | |
|----------------------|----|-----|--|--|
| KBR2 | 42 | O | | |
| KBR1 | 43 | O | | |
| KBR0 | 44 | O | | |
| GPIO | | | | |
| GPIO17 | 11 | I/O | Programmable general purpose input and output. | |
| GPIO19 | 13 | I/O | | |
| NETLIGHT | 52 | O | Network status | Can not multiplex with GPIO function. |
| STATUS | 66 | O | Power on status | |
| Serial port | | | | |
| DTR | 3 | I | Data terminal ready | Keep floating if unused. |
| RI | 4 | O | Ring indicator | |
| DCD | 5 | O | Data carrier detect | |
| CTS | 7 | O | Clear to send | |
| RTS | 8 | I | Request to send | |
| TXD | 9 | O | Transmit data | |
| RXD | 10 | I | Receive data | |
| USB interface | | | | |
| USB_VBUS | 24 | I | Debug and firmware upgrading | Keep floating if unused. |
| USB_DP | 27 | I/O | | |
| USB_DN | 28 | I/O | | |
| ADC | | | | |
| ADC | 25 | I | 10 bit general analog to digital converter | Keep floating if unused. |
| PWM | | | | |
| PWM0 | 35 | O | Pulse-width modulation, multiplex with GPIO22. | Keep floating if unused. |
| PWM1 | 36 | O | Pulse-width modulation, multiplex with GPIO23. | |
| I2C | | | | |
| SDA | 37 | I/O | I2C serial bus data | Internal pulled up to 2.8V via 4.7K Ω |
| SCL | 38 | O | I2C serial bus clock | |
| SIM interface | | | | |
| SIM_VDD | 30 | O | Voltage supply for SIM card. Support 1.8V or 3V for SIM card | All signals of SIM interface should be protected against ESD with a TVS diode array. |
| SIM_DATA | 31 | I/O | SIM data input/output | |
| SIM_CLK | 32 | O | SIM clock | |
| SIM_RST | 33 | O | SIM reset | |
| SIM_DET | 34 | I | SIM card detection | |
| Antenna | | | | |
| GSM_ANT | 60 | I/O | Connect GSM antenna | Impedence must be controlled to 50 Ω . |
| BT_ANT | 53 | I/O | Connect Bluetooth antenna | Impedence must be |

| | | | | |
|---------------------------|----|---|-----------------------------|--------------------|
| | | | | controlled to 50Ω. |
| RF synchronization | | | | |
| RF_SYNC | 67 | O | RF burst synchronous signal | Do not pull up |
| Other signal | | | | |
| RESET | 16 | I | Reset input(Active low) | |
| KPLED | 23 | I | Drive keypad backlight | |

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3.3. Package Dimensions

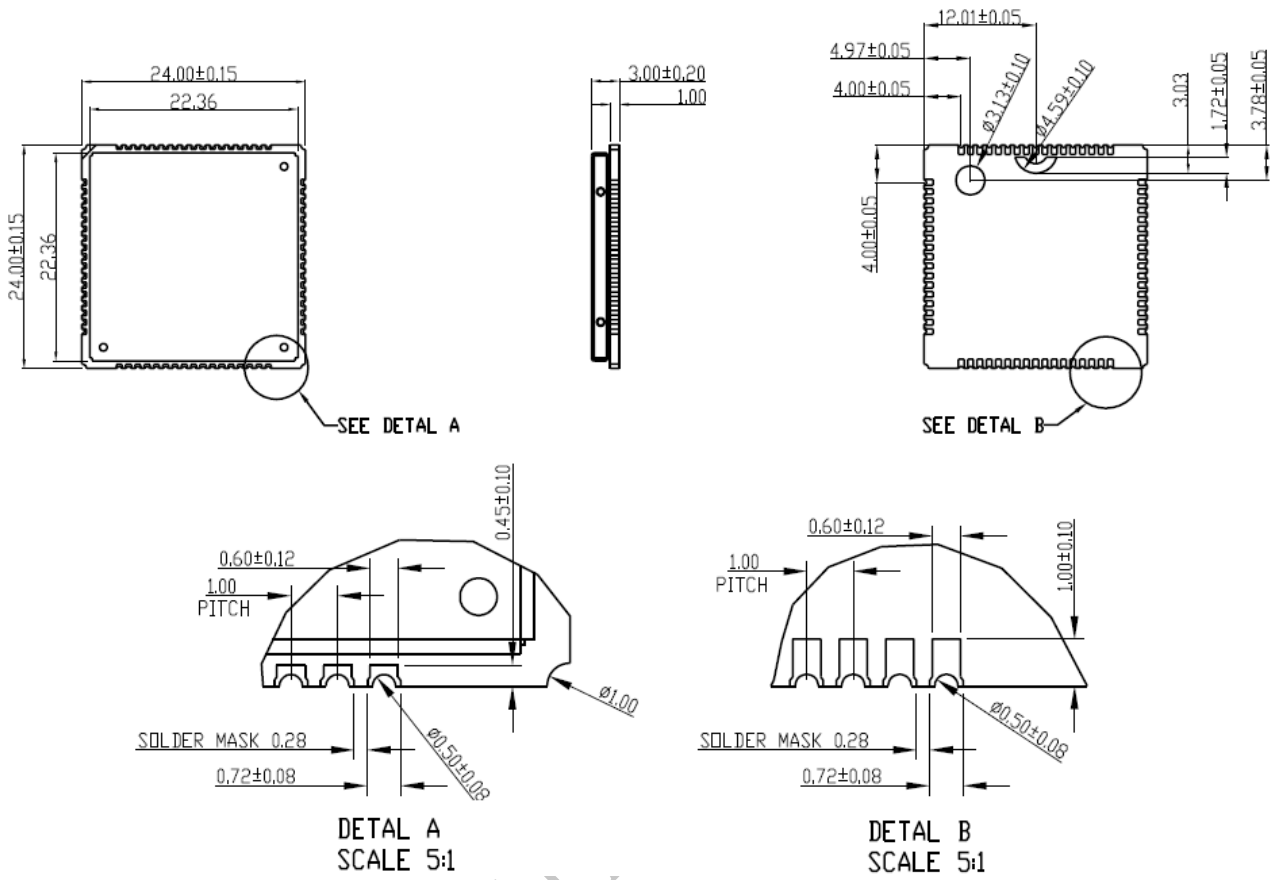


Figure 3: Dimensions of SIM800 (Unit: mm)

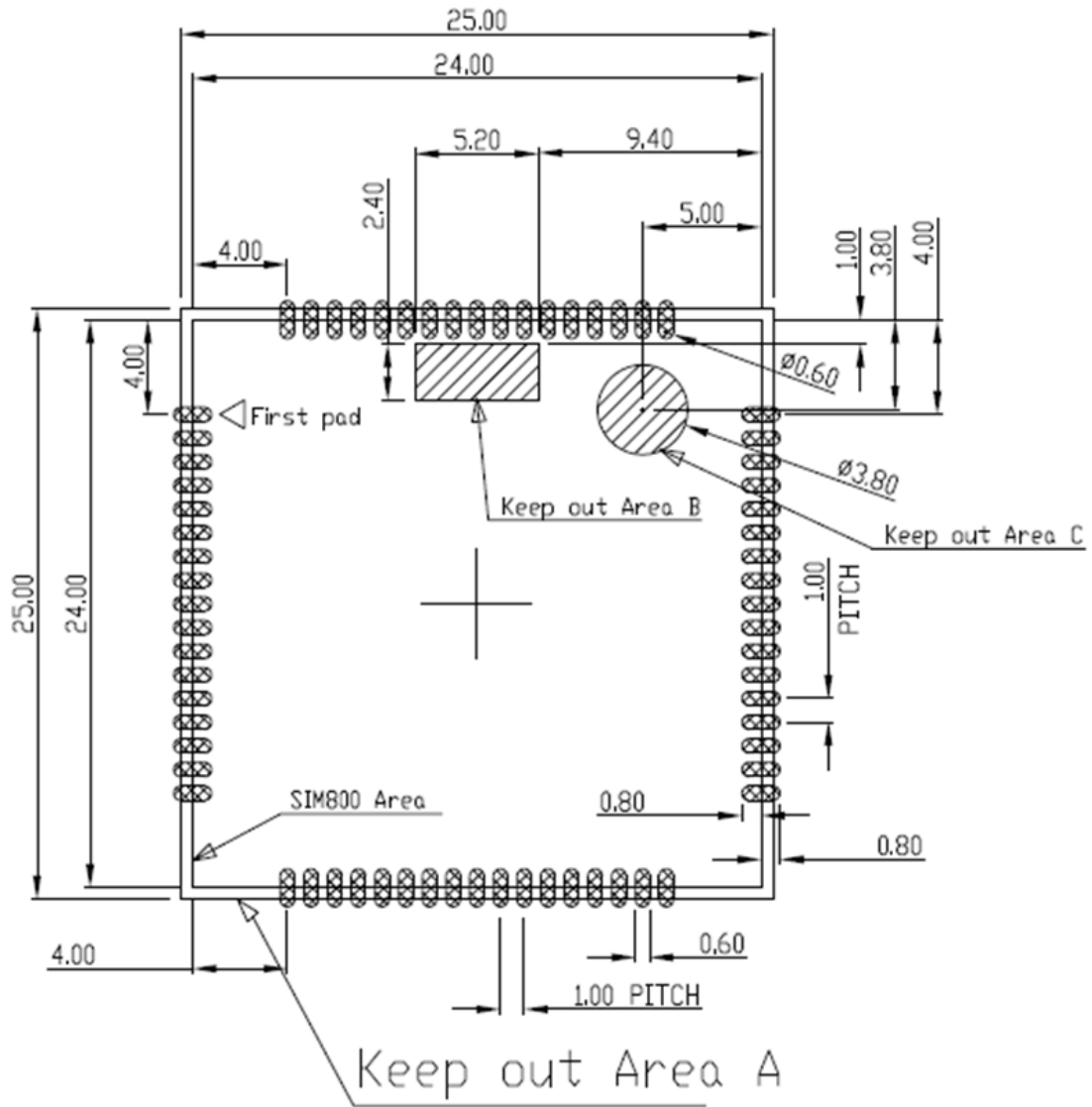


Figure 4: Recommended PCB footprint outline (Unit: mm)

Note: Keep copper out of area B and C.

4. Application Interface

4.1. Power Supply

The power supply range of SIM800 is from 3.4V to 4.4V. Recommended voltage is 4.0V. The transmitting burst will cause voltage drop and the power supply must be able to provide sufficient current up to 2A. For the VBAT input, a bypass capacitor (low ESR) such as a 100 μ F is strongly recommended.

The 33pF and 10pF capacitors can effectively eliminate the high frequency interference. A 5.1V/500mW Zener diode is strongly recommended, the diode can prevent chip from damaging by the voltage surge. These capacitors and Zener diode should be placed as close to SIM800 VBAT pins as possible.

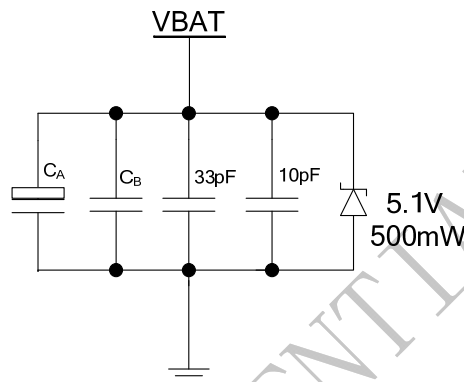


Figure 5: Reference circuit of the VBAT input

Table 5: Recommended Zener diode

| | Vendor | Part number | Power (watts) | Package |
|---|---------|--------------|---------------|---------|
| 1 | On semi | MMSZ5231BT1G | 500mW | SOD123 |
| 2 | cj-elec | MMSZ5231B | 500mW | SOD123 |
| 3 | Prisemi | PZ3D4V2H | 500mW | SOD323 |
| 5 | Vishay | MMSZ4689-V | 500mW | SOD123 |
| 6 | Crownpo | CDZ55C5V1SM | 500mW | 0805 |

The following figure is the reference design of +5V input power supply. The designed output for the power supply is 4.1V, thus a linear regulator can be used.

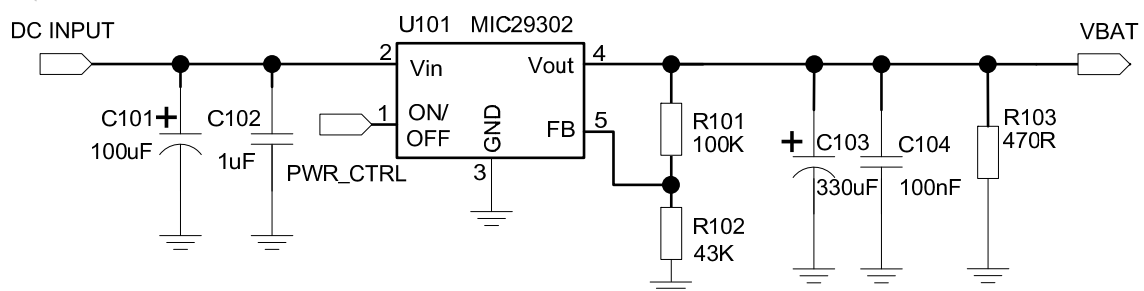


Figure 6: Reference circuit of the power supply

If there is a high drop-out between the input and the desired output (VBAT), a DC-DC power supply will be preferable because of its better efficiency especially with the 2A peak current in burst mode of the module. The following figure is the reference circuit. FB101 is very important, customer can get better EMI feature with appropriate filtering bead.

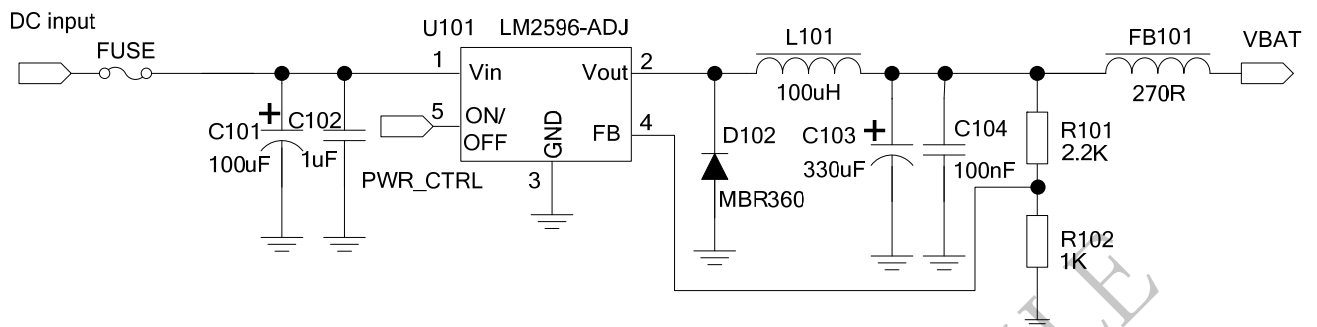


Figure 7: Reference circuit of the DC-DC power supply

The single 3.7V Li-ion cell battery can be connected to SIM800 VBAT pins directly. But the Ni-Cd or Ni-MH battery must be used carefully, since their maximum voltage can rise over the absolute maximum voltage of the module and damage it.

When battery is used, the total impedance between battery and VBAT pins should be less than 150mΩ.

The following figure shows the VBAT voltage drop at the maximum power transmit phase, and the test condition is as following:

VBAT=4.0V,
 A VBAT bypass capacitor $C_A=100\mu\text{F}$ tantalum capacitor (ESR=0.7Ω),
 Another VBAT bypass capacitor $C_B=1\mu\text{F}$. (See C_A and C_B in figure 5)

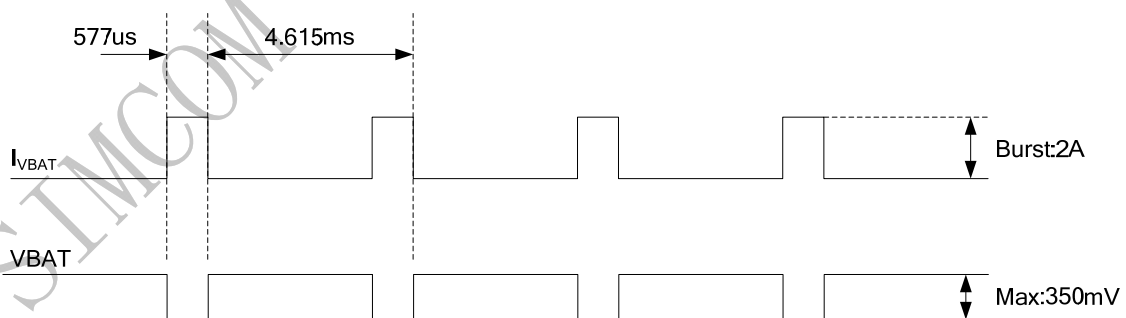


Figure 8: VBAT voltage drop during transmit burst

4.1.1. Power Supply Pin

The 3 VBAT pins are used for power input, and pin 62,63,64,65 should be connected to the power GND. VRTC pin is power supply of the RTC circuit in the module. VDD_EXT will output 2.8V when module powered up.

When designing the power supply in user’s application, pay special attention to power losses. Ensure that the

input voltage never drop below 3.0V even when current consumption rises to 2A in the transmit burst. If the power voltage drops below 3.0V, the module may be shut down automatically. The PCB traces from the VBAT pins to the power supply must be wide enough (at least 60mil) to decrease voltage drops in the transmit burst. The power IC and the bypass capacitor should be placed to the module as close as possible.

VBAT



Figure 9: The minimal VBAT voltage requirement at VBAT drop

Note: Hardware power down voltage is 3.0V.

4.1.2. Monitoring Power Supply

The AT command “AT+CBC” can be used to monitor the VBAT voltage. For details please refer to *document [1]*.

4.2. Power on/down SIM800

4.2.1. Power on SIM800

User can power on SIM800 by pulling down the PWRKEY pin at least 1 second and then release. This pin is already pulled up to VBAT in the module internal, so external pull up is not necessary. Reference circuit is shown as below.

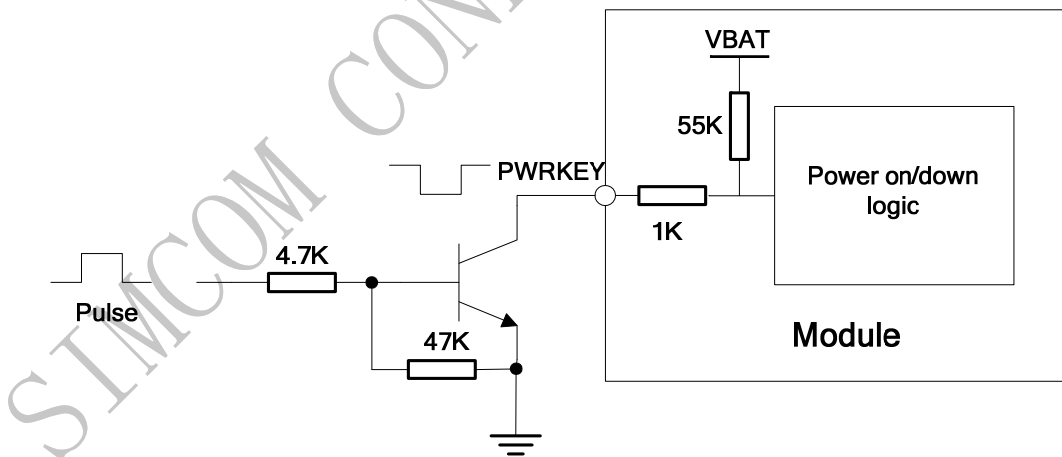


Figure 10: Power on/down module using transistor

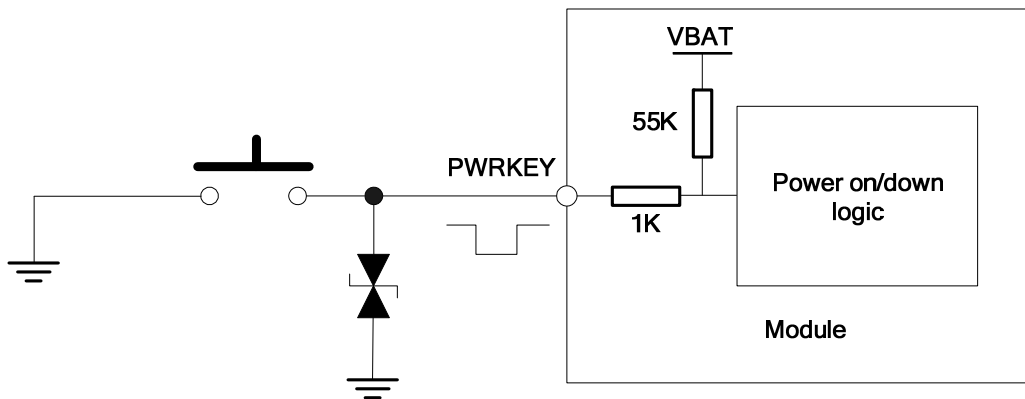


Figure 11: Power on/down module using button

The power on timing is illustrated as following figure.

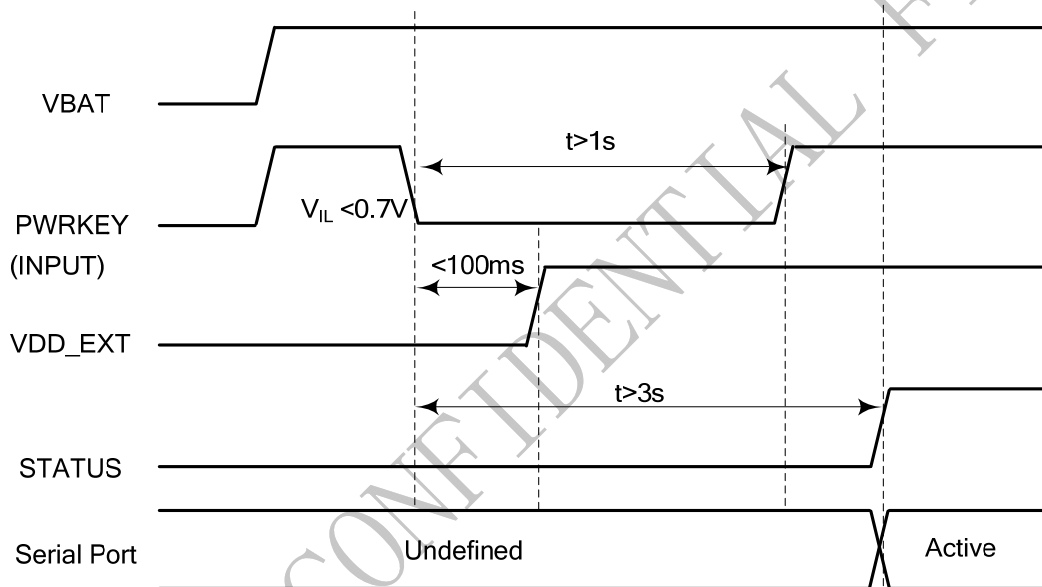


Figure 12: Timing of power on module

When power on procedure is completed, SIM800 will send following URC to indicate that the module is ready to operate at fixed baud rate.

RDY

This URC does not appear when autobauding function is active.

Note: User can use AT command “AT+IPR=x” to set a fixed baud rate and save the configuration to non-volatile flash memory. After the configuration is saved as fixed baud rate, the Code “RDY” should be received from the serial port every time when SIM800 is powered on. For details, please refer to the chapter “AT+IPR” in document [1].

4.2.2. Power down SIM800

SIM800 will be powered down in the following situations:

- Normal power down procedure: power down SIM800 by the PWRKEY pin.
- Normal power down procedure: power down SIM800 by AT command “AT+CPOWD=1”.

- Abnormal power down: over-voltage or under-voltage automatic power down.
- Abnormal power down: over-temperature or under-temperature automatic power down.

4.2.2.1. Power down SIM800 by the PWRKEY Pin

User can power down SIM800 by pulling down the PWRKEY pin for at least 1 second and then release. Please refer to the power on circuit. The power down sequence is illustrated in following figure.

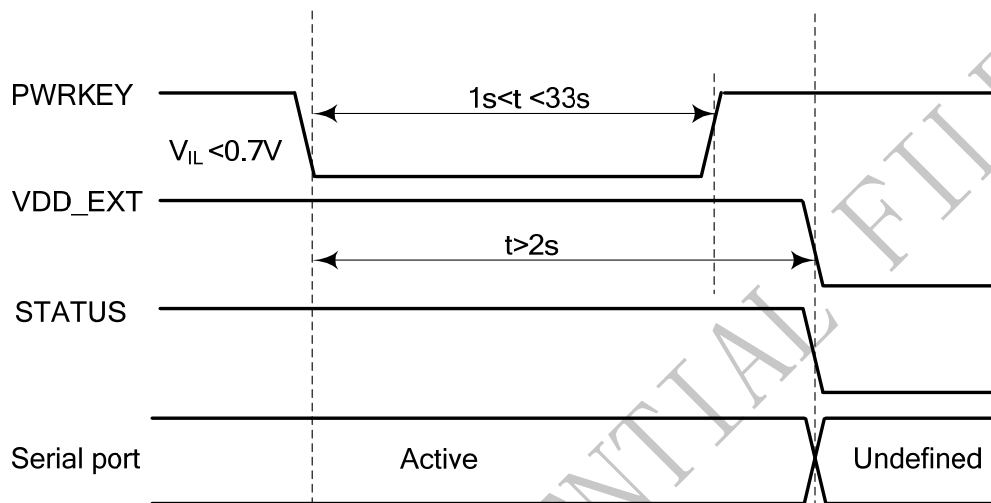


Figure 13: Timing of power down SIM800 by PWRKEY

Note: When module is powered off by pulling down PWRKEY, the pull down time exceeds 33 seconds will course the module power up.

This procedure makes the module log off from the network and allows the software to enter into a secure state to save data before completely shut down.

Before the completion of the power down procedure, the module will send URC:

NORMAL POWER DOWN

At this moment, AT commands can not be executed any more, and only the RTC is still active. Power down mode can also be indicated by STATUS pin, which is low level at this time.

4.2.2.2. Power down SIM800 by AT Command

SIM800 can be powered down by AT command “AT+CPOWD=1”. This procedure makes the module log off from the network and allows the software to enter into a secure state to save data before completely shut down.

Before the completion of the power down procedure, the module will send URC:

NORMAL POWER DOWN

At this moment, AT commands can not be executed any more, and only the RTC is still active. Power down mode can also be indicated by STATUS pin, which is at low level at this time.

For details about the AT command “AT+CPOWD”, please refer to *document [1]*

4.2.2.3. Over-voltage or Under-voltage Power down

The module software monitors the VBAT voltage constantly.

If the voltage $\leq 3.5V$, the following URC will be reported:

UNDER-VOLTAGE WARNNING

If the voltage $\geq 4.3V$, the following URC will be reported:

OVER-VOLTAGE WARNNING

If the voltage $< 3.4V$, the following URC will be reported, and the module will be automatically powered down.

UNDER-VOLTAGE POWER DOWN

If the voltage $> 4.4V$, the following URC will be reported, and the module will be automatically powered down.

OVER-VOLTAGE POWER DOWN

At this moment, AT commands can not be executed any more, and only the RTC is still active. Power down mode can also be indicated by STATUS pin, which is low level at this time.

4.2.2.4. Over-temperature or Under-temperature Power down

The module will constantly monitor the temperature of the module,

If the temperature $> +80^{\circ}C$, the following URC will be reported:

+CMTE: 1

If the temperature $< -30^{\circ}C$, the following URC will be reported:

+CMTE:-1

If the temperature $> +85^{\circ}C$, the following URC will be reported, and the module will be automatically powered down.

+CMTE: 2

If the temperature $< -40^{\circ}C$, the following URC will be reported, and the module will be automatically powered down.

+CMTE:-2

At this moment, AT commands can not be executed any more, and only the RTC is still active. Power down mode can also be indicated by STATUS pin, which is at low level at this time.

Note: Temperature detection is disable by default, the AT command “AT+CMTE” could be used to read the temperature when the module is running. For details please refer to document [1].

4.2.3. Reset Function

SIM800 also have a RESET pin used to reset the module. This function is used as an emergency reset only when AT command “AT+CPOWD=1” and the PWRKEY pin have no effect. User can pull the RESET pin to ground, and then the module will restart.

This pin is already isolated in the module, so the external isolation is not necessary. Following figure is internal circuit of the RESET pin.

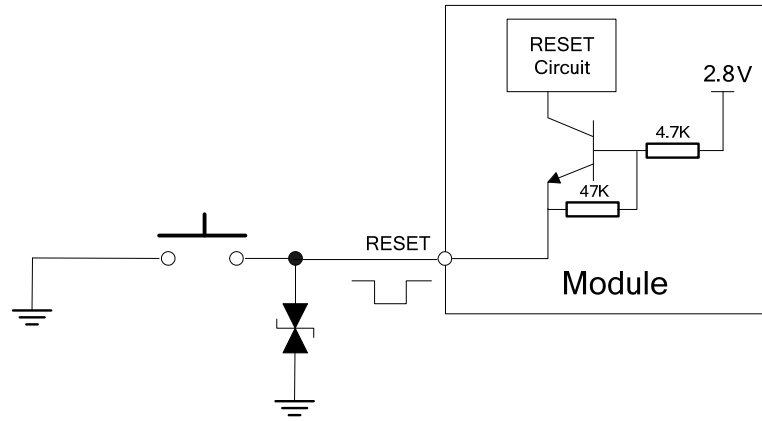


Figure 14: Reset circuit

The typical value of RESET pin high level is 2.8V, so for the 3V or 3.3V, customer could use MCU’s GPIO to driver this pin directly, resistor in serial the RESET signal could enhance the ESD performance but the value should not be too high, otherwise the level of RESET could be lower than threshold value; RESET hardware parameters can refer to the following table.

Table 6: Electronic characteristic of the RESET Pin

| Pin name | Symbol | Min | Typ | Max | Unit |
|----------|------------------|-----|-----|-----|------|
| RESET | V_{IH} | 2.7 | - | - | V |
| | V_{IL} | - | - | 0.6 | V |
| | $T_{pull\ down}$ | 105 | | - | mS |

The reset scenarios are illustrated in the following figures.

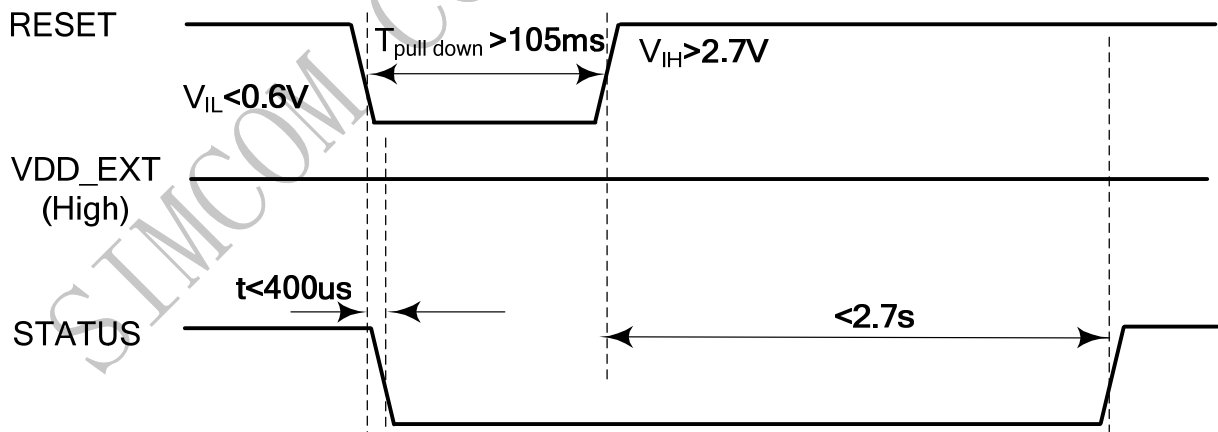


Figure 15: Reset timing sequence

4.3. Power Saving Mode

SIM800 has two power saving modes: Minimum function mode and sleep mode. The AT command “AT+CSCLK=1” can be used to set SIM800 into sleep mode. The AT command “AT+CFUN=<fun>” can be used to set SIM800 into minimum function. When SIM800 is in sleep mode and minimum function mode, the current of module is the lowest.

4.3.1. Function Mode

There are three function modes, which could be set by the AT command “AT+CFUN=<fun>”. The command provides the choice of the function levels <fun>=0, 1, 4.

- AT+CFUN=0: Minimum function.
- AT+CFUN=1: Full function (default).
- AT+CFUN=4: Flight mode (disable RF function).

Table 7: The current consumption of function modes (BS-PA-MFRMS=5)

| <Fun> | Current consumption(mA) (CSCLK=1) |
|-------|-----------------------------------|
| 0 | 0.79 |
| 1 | 1.3 |
| 4 | 0.83 |

Minimum function mode minimizes the current consumption to the lowest level. If SIM800 is set to minimum functionality by “AT+CFUN=0”, the RF function and SIM card function will be disabled. In this case, the serial port is still accessible, but all AT commands correlative with RF function and SIM card function will not be accessible.

For detailed information about the AT Command “AT+CFUN=<fun>”, please refer to *document [1]*.

4.3.2. Sleep Mode (AT+CSCLK=1)

User can control SIM800 module to enter or exit the sleep mode (AT+CSCLK=1) by DTR signal. When DTR is in high level and without interrupt (on air and hardware such as GPIO interrupt or data in serial port), SIM800 will enter sleep mode automatically. In this mode, SIM800 can still receive paging or SMS from network but the serial port is not accessible.

Note: *Autobauding is the default setting. Module can not enter sleep mode if the baud rate of MCU’s serial port not synchronous with module after module power on.*

4.3.3. Wake Up SIM800 from Sleep Mode (AT+CSCLK=1)

When SIM800 is in sleep mode (AT+CSCLK=1), the following methods can wake up the module:

- Pull down DTR pin.
The serial port will be active after DTR pin is pulled to low level for about 50ms.
- Receive a voice or data call from network.
- Receive a SMS from network.
- Receive external interrupt

4.4. RTC Backup

VRTC is an input pin when the VBAT is not supplied by external power. When the VBAT power supply is in present and the backup battery is in low voltage state, VRTC can charge the backup battery. The RTC power supply of module can be provided by an external capacitor or a battery (non-chargeable or rechargeable) through the VRTC. The following figures show various reference circuits for RTC back up.

- **External capacitor backup**

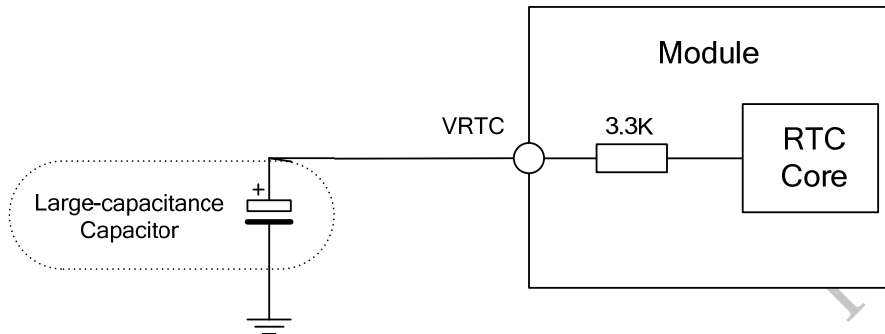


Figure 16: RTC supply from capacitor

- **Non-chargeable battery backup**

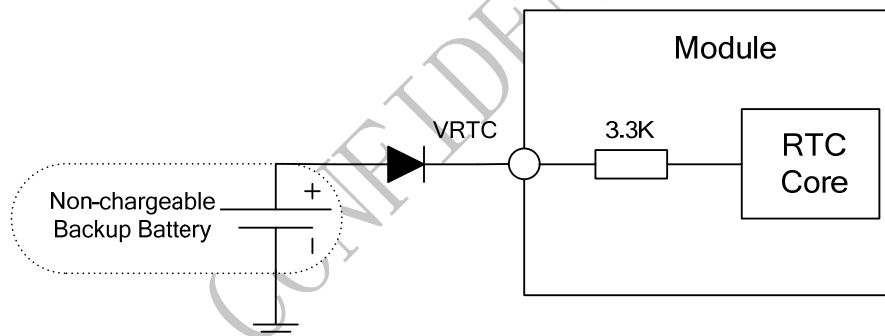


Figure 17: RTC supply from non-chargeable battery

- **Rechargeable battery backup**

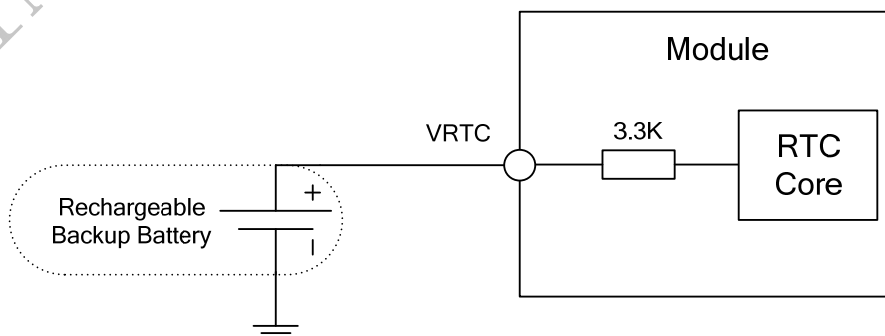


Figure 18: RTC supply from rechargeable battery

4.5. Serial Port and USB Interface

SIM800 provides one unbalanced asynchronous serial port. The module is designed as a DCE (Data Communication Equipment). The following figure shows the connection between module and client (DTE).

Table 8: Serial port and USB pin definition

| | Name | Pin number | Function |
|---------------|----------|------------|------------------------|
| Serial Port | DTR | 3 | Data terminal ready |
| | RI | 4 | Ring indicator |
| | DCD | 5 | Data carrier detect |
| | CTS | 7 | Clear to send |
| | RTS | 8 | Request to send |
| | TXD | 9 | Transmit data |
| | RXD | 10 | Receive data |
| USB Interface | USB_VBUS | 24 | USB power supply |
| | USB_DP | 27 | USB data line positive |
| | USB_DN | 28 | USB data line negative |

Note: Hardware flow control is disabled by default. The AT command “AT+IFC=2,2” can enable hardware flow control. The AT command “AT+IFC=0,0” can disable hardware flow control. For more details, please refer to document [1].

Table 9: Serial port characteristics

| Symbol | Min | Typ | Max | Unit |
|-----------------|------|-----|-----|------|
| V _{IL} | -0.3 | - | 0.7 | V |
| V _{IH} | 2.1 | - | 3.1 | V |
| V _{OL} | - | - | 0.4 | V |
| V _{OH} | 2.4 | - | - | V |

4.5.1 Function of Serial Port

Serial port:

- Full modem device.
- Contains data lines TXD and RXD, hardware flow control lines RTS and CTS, status lines DTR, DCD and RI.
- Serial port can be used for CSD FAX, GPRS service and AT communication. It can also be used for multiplex function. For details about multiplex function, please refer to *table 11*.
- Serial port supports the following baud rates:
1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200bps, 230400 and 460800bps
- Autobauding only supports the following baud rates:
1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200bps
- The default setting is autobauding.

Autobauding allows SIM800 to automatically detect the baud rate of the host device. Pay more attention to the following requirements:

- **Synchronization between DTE and DCE:**

When DCE powers on with autobauding enabled, firstly, user must send character “A” or “a” to synchronize the baud rate. It is recommended to send “AT” until DTE receives the “OK” response, which means DTE and DCE are correctly synchronized. For more information please refer to the AT command “AT+IPR”.

- **Restrictions of autobauding operation:**

The DTE serial port must be set at 8 data bits, no parity and 1 stop bit.

The URC such as "RDY", "+CFUN: 1" and "+CPIN: READY" will not be reported.

Note: User can use AT command “AT+IPR=x” to set a fixed baud rate and the setting will be saved to non-volatile flash memory automatically. After the configuration is set as fixed baud rate, the URC such as “RDY”, “+CFUN: 1” and “+CPIN: READY” will be reported when SIM800 is powered on.

4.5.2 Serial Port

The following figure shows the connection between module and client (DTE).

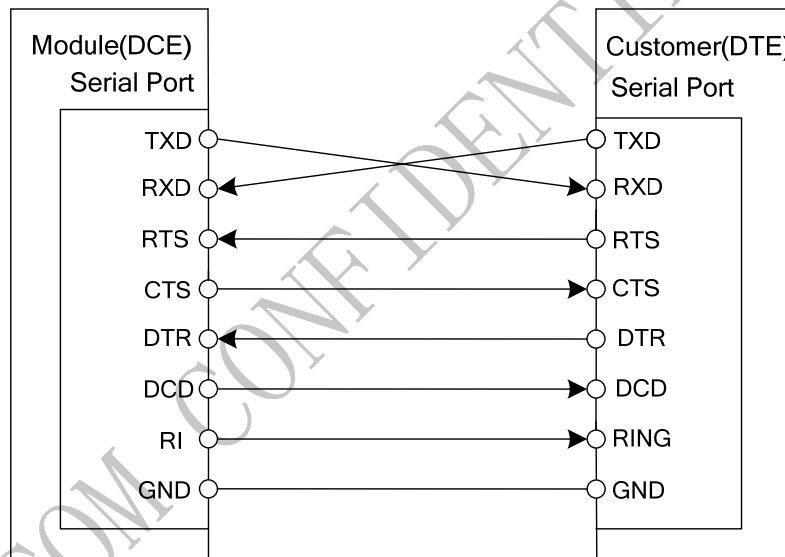


Figure 19: Connection of the serial port

If the voltage of UART is 3.3V, the following reference circuits are recommended. If the voltage is 3.0V, please change the resistors in the following figure from 5.6K to 14K.

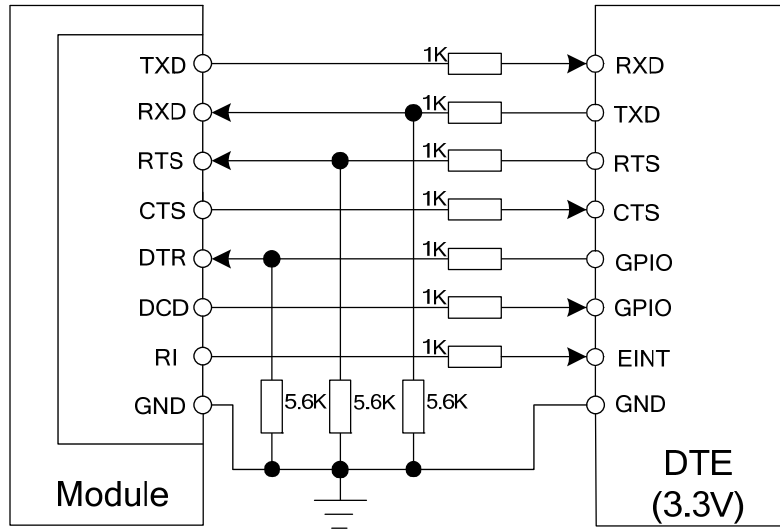


Figure 20: Level converting by resistor

If the voltage of UART is 3V or 3.3V, user also can use following reference circuits:

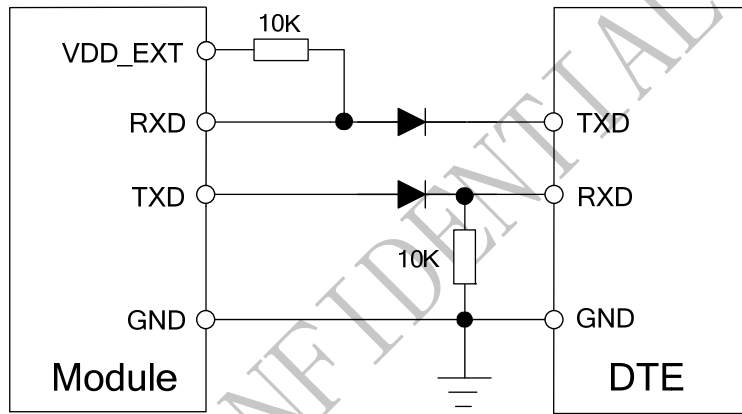


Figure 21: Isolation circuit by diodes

Note: when a diode used to isolate voltage cross, customer should notice that there's voltage drop on the diode. And the signal's voltage level should meet the customer's electrical character. The recommend diode is Schottky diode e.g. RB551V-30TE-17 and SDM20U40.

If the voltage of UART is 5V on customer side, customer can use the following reference circuits:

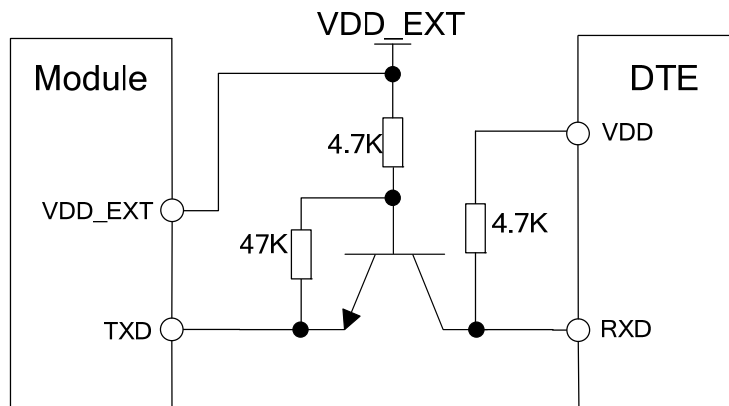


Figure 22: TX level converting by transistor

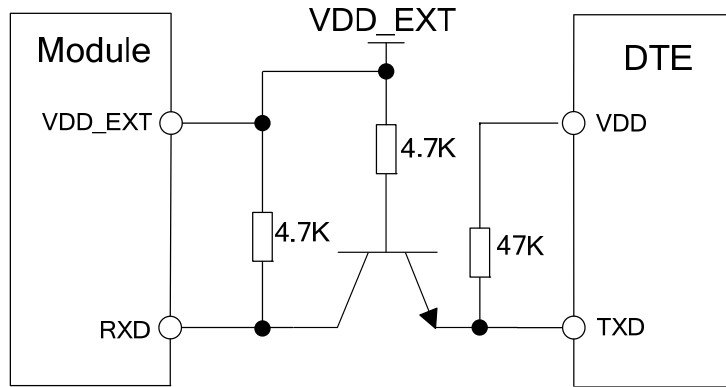


Figure 23: RX level converting by transistor

Note: The recommend Transistors' part numbers are 2SC4617TLR and PBHV8115Z.

4.5.3 USB Interface

USB interface supports software debug function. When power on the module, connect USB_VBUS, USB_DP, USB_DN and GND to PC, then install the driver successfully, a UART port could be recognized by the PC, customer could achieve the software Debug purpose with this UART port.

The following diagram is recommended:

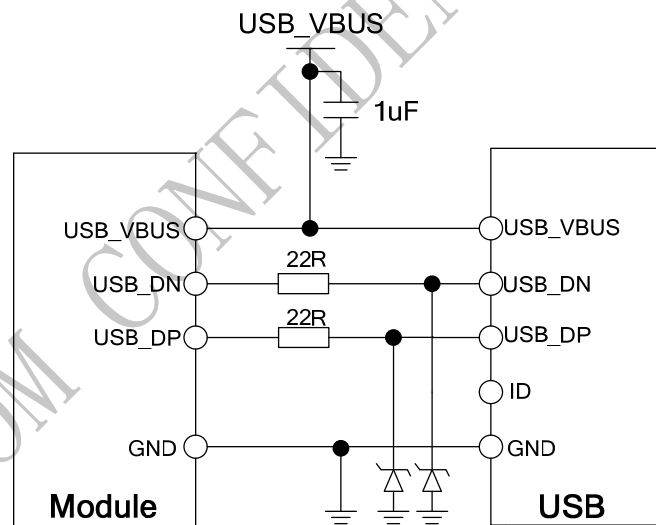


Figure 24: USB reference circuit

The maximum allowable cap load of TVS on USB data line should be less than 5pF (e.g. ESD9L5.0ST5G and ESD9M5.0ST5G). The USB_DP and USB_DN should be routed in differential traces.

Note: please reserve the USB interface or test point for debug.

Table 10: USB_VBUS operation voltage

| Pin | Min | Typ | Max | Unit |
|----------|-----|-----|-----|------|
| USB_VBUS | 4.3 | 5.0 | 7.0 | V |

Note: USB_VBUS is only used for USB inserting detection, can not be used as a power source.

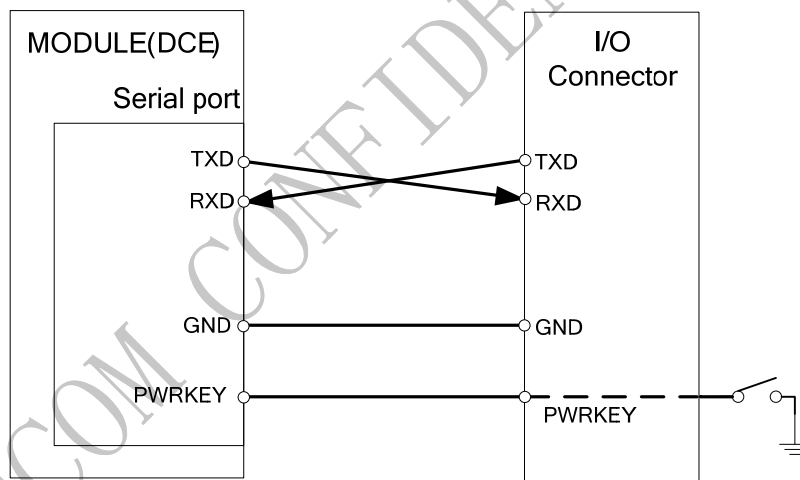
4.5.4 Software Upgrade and Debug

USB and UART interfaces can be used for firmware upgrade.

If customer upgrading firmware via the USB port, SIM800 must be powered first, then connect USB_VBUS, USB_DP, USB_DN and GND to PC. There is no need to operate PWRKEY pin in the whole procedure, when SIM800 detects USB_VBUS and could communicate normally by USB_DP and USB_DN, module will enter USB download mode automatically.

Note: When only USB_DP and USB_DN connected, no USB_VBUS, customer need to pull down KBC0 before power on the module, then press the PWRKEY button, the module will enter download mode;

If customer upgrading firmware via the UART port, it is strongly recommended that reserve the TXD, RXD, GND and PWRKEY pins to I/O connector for the upgrade, and PWRKEY pin should connect to GND while upgrading. Refer to the following figure for upgrading software.


Figure 25: Connection for software upgrading

The serial port supports the CMOS level. If user connects the module to the computer, the level shifter should be added between the DCE and DTE.

4.5.5 Multiplex Function of Serial Port

If full modem function is not used, the UART port could be configured to two serial ports without flow control, the details could be founded in the following table:

Table 11: Multiplex function of serial port

| Name | Pin | Mode 0(default) | Mode 1 |
|------|-----|-----------------|------------|
| DTR | 3 | DTR | GPIO22 |
| RI | 4 | RI | GPIO23 |
| DCD | 5 | DCD | GPIO24 |
| CTS | 7 | CTS | URXD2(IN) |
| RTS | 8 | RTS | UTXD2(OUT) |
| TXD | 9 | TXD | UTXD1(OUT) |
| RXD | 10 | RXD | URXD1(IN) |

Note: customer could use the AT+CMNRP=1set SIM800 to the dual UART function, for the detail application notes please contact SIMCom.

4.6. RI Behaviors

Table 12: RI Behaviors

| State | RI response |
|------------|---|
| Standby | High |
| Voice call | The pin is changed to low. When any of the following events occur, the pin will be changed to high: (1)Establish the call (2)Hang up the call |
| Data call | The pin is changed to low. When any of the following events occur, the pin will be changed to high: (1)Establish the call (2)Hang up the call |
| SMS | The pin is changed to low, and kept low for 120ms when a SMS is received. Then it is changed to high. |
| URC | The pin is changed to low, and kept low for 120ms when some URCs are reported. Then it is changed to high. For more details, please refer to <i>document [10]</i> . |

The behavior of the RI pin is shown in the following figure when the module is used as a receiver.

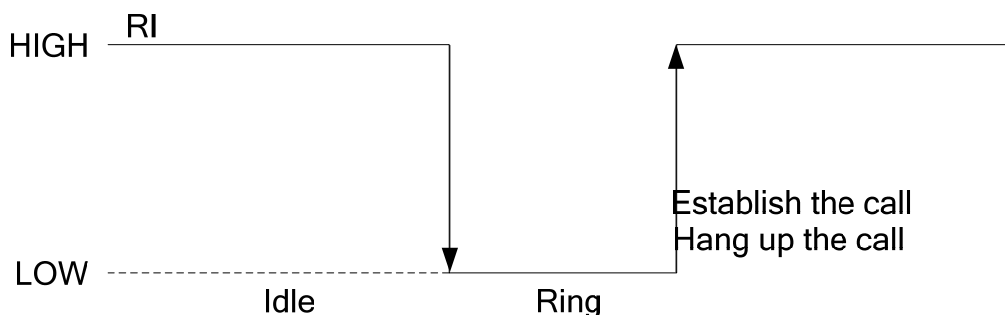


Figure 26: RI behaviour of voice calling as a receiver

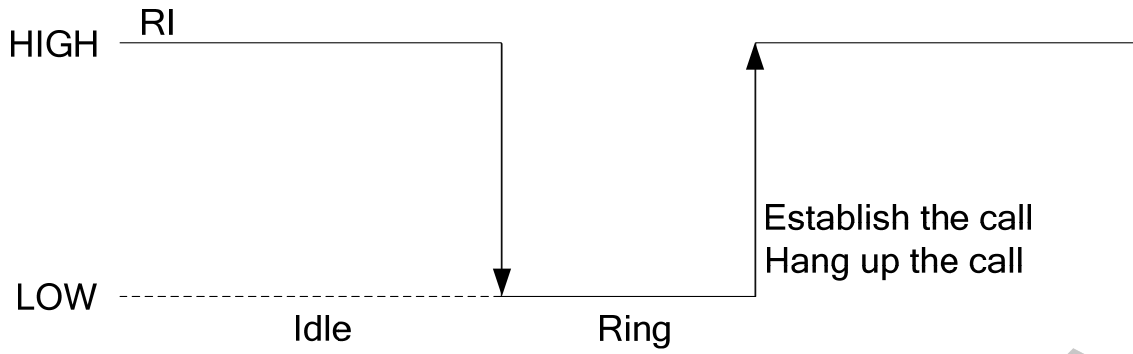


Figure 27: RI behaviour of data calling as a receiver

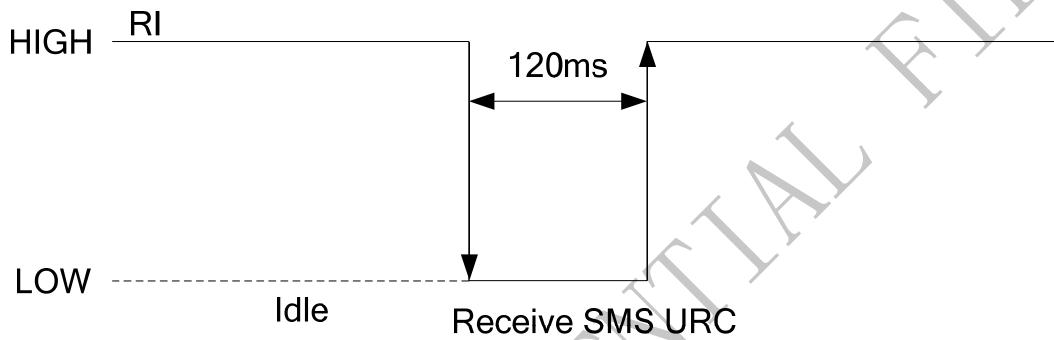


Figure 28: RI behaviour of URC or receive SMS

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

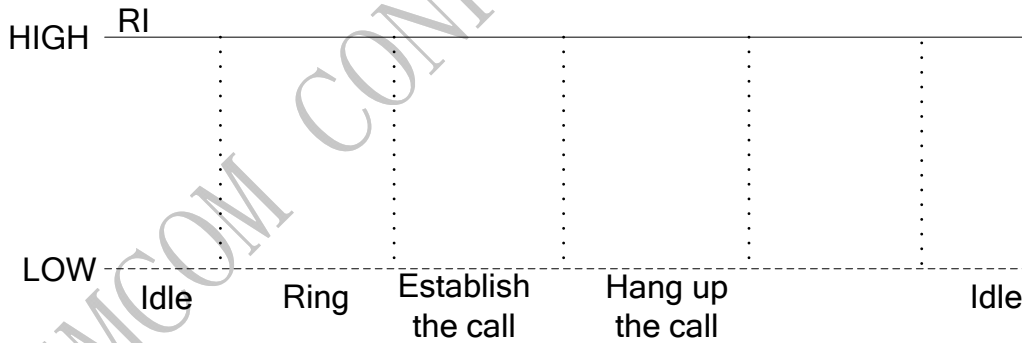


Figure 29: RI behaviour as a caller

4.7. Audio Interfaces

SIM800 provides one analog input, which could be used for electret microphone. The module also provides one analog output. The output can directly drive 32Ω receiver.

Table 13: Audio interface definition

| | Pin name | Pin number | Function |
|---------------|----------|------------|-----------------------|
| Audio channel | MICP | 19 | Audio input positive |
| | MICN | 20 | Audio input negative |
| | SPKP | 21 | Audio output positive |
| | SPKN | 22 | Audio output negative |

“AT+CMIC” is used to adjust the input gain level of microphone. “AT+SIDET” is used to set the side-tone level. In addition, “AT+CLVL” is used to adjust the output gain level. For more details, please refer to document [1]

In order to improve audio performance, the following reference circuits are recommended. The audio signals have to be layout according to differential signal layout rules as shown in following figures.

4.7.1. Speaker Interfaces Configuration

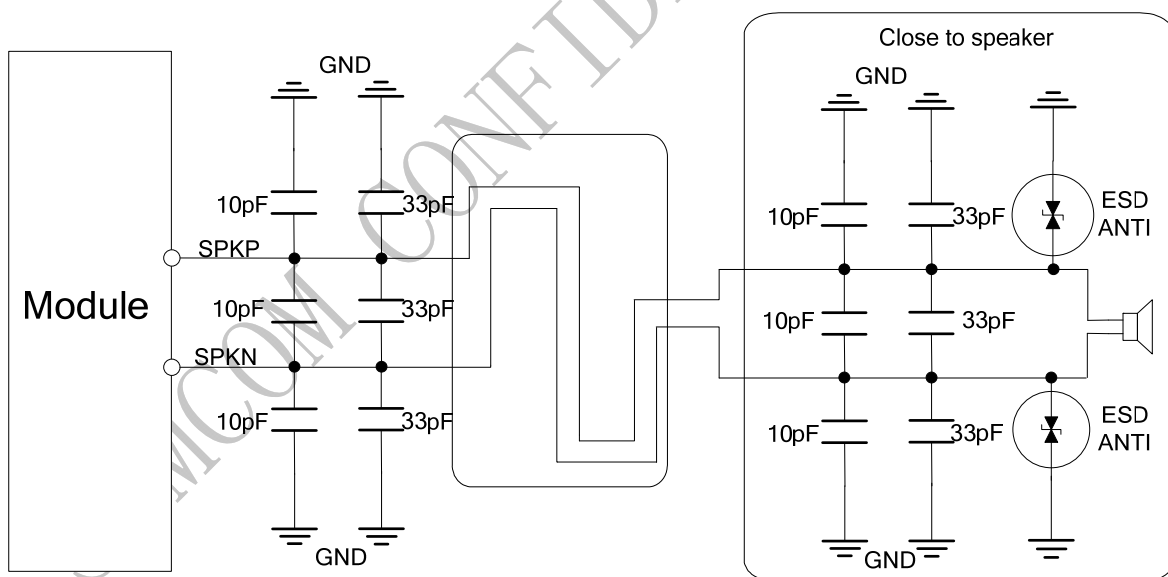


Figure 30: Speaker reference circuit

4.7.2. Microphone Interfaces Configuration

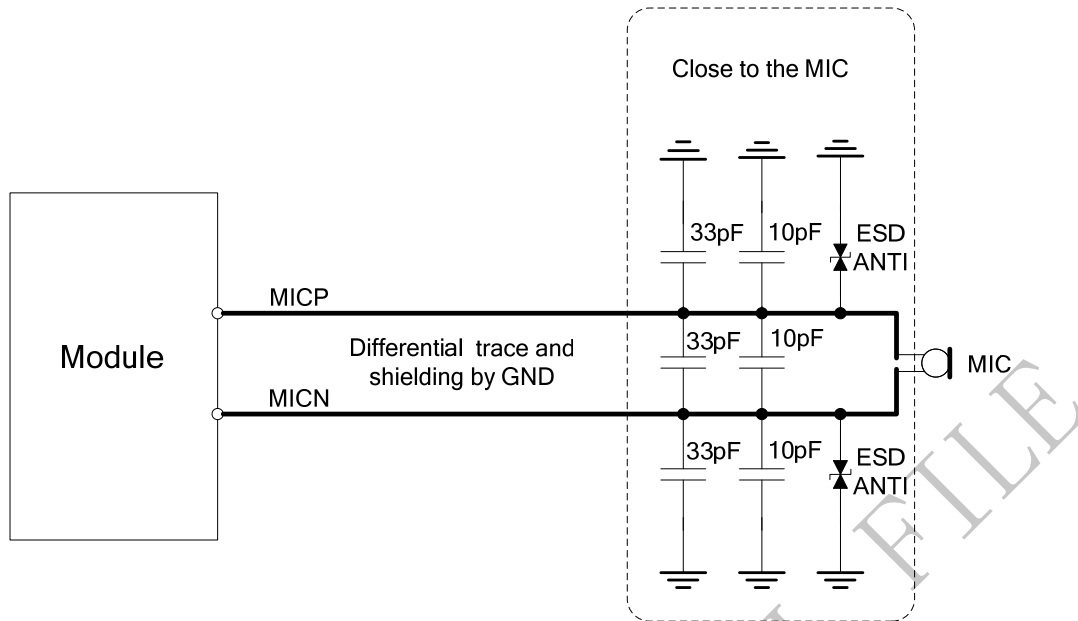


Figure 31: Microphone reference circuit

4.7.3. Audio Electronic Characteristic

Table 14: Microphone input characteristics

| Parameter | Min | Typ | Max | Unit |
|-------------------------------|---------------------|-----|-----|------------|
| Mic biasing voltage | | 1.9 | 2.2 | V |
| Working Current | | | 2 | mA |
| Input impedance(differential) | 13 | 20 | 27 | K Ω |
| Idle channel noise | | | -67 | dBm |
| SINAD | Input level:-40dBm0 | 29 | | dB |
| | Input level:0dBm0 | | 69 | dB |

Table 15: Audio output characteristics

| parameter | Conditions | Min | Typ | Max | Unit |
|---------------|--------------------------------------|-----|-----|-----|------|
| Normal output | R _L =32 Ω receiver | - | 90 | - | mW |

4.7.4. TDD

GSM signal could interfere audio by coupling or conducting. Coupling noise could be filtered by adding 33 pF and 10pF capacitor over audio lines. 33pF capacitor could eliminate noise from GSM900MHz, while 10pF capacitor could eliminate noise from DCS1800MHz frequency. Coupling noise has great relatives with PCB layout. Under some scenarios, TDD noise from GSM 900MHz frequency affects heavily, but some different

story is from GSM1800MHz fervency, so customer should develop this filter solution according to field test result.

GSM antenna is the key coupling interfering source of TDD noise. Pay attention to the layout of audio lines which should be far away from RF cable & antenna and VBAT pin. The bypass capacitor for filtering should be placed near module and another group placed near to connector.

Conducting noise is mainly caused by the VBAT drop. If Audio PA was powered by VBAT directly, then there will be some cheep noise from SPK output easily. So, it's better to put big capacitor and ferrite bead near audio PA input.

TDD noise has something to do with GND signal surely. if GND signal issued not good, lots of high-frequency noise will interfere MIC and speaker over bypass capacitor. So, take care of GND well during PCB layout.

4.8. Bluetooth

SIM800 supports Bluetooth function, customer only needs to design the Bluetooth antenna, and then customer can operate Bluetooth conveniently by AT commands. For the detail commands about Bluetooth please refer to *document [1]*

- Fully compliant with Bluetooth specification 3.0 + EDR
- Support operation with GPS and GSM/GPRS worldwide radio systems
- Fully integrated PA provides 10dbm output power
- Up to 4 simultaneous active ACL links
- Support sniff mode
- Supports PCM interface and built-in programmable transcoders for liner voice with transmission

4.9. SIM Card Interface

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

4.9.1. SIM Card Application

Table 16: SIM pin definition

| Name | Pin | function |
|----------|-----|--|
| SIM_VDD | 30 | Voltage supply for SIM card. Support 1.8V or 3V SIM card |
| SIM_DATA | 31 | SIM data input/output |
| SIM_CLK | 32 | SIM clock |
| SIM_RST | 33 | SIM reset |
| SIM_DET | 34 | SIM card detection |

It is recommended to use an ESD protection component such as ST (www.st.com) ESDA6V1-5W6 or ON SEMI (www.onsemi.com) SMF05C. The SIM peripheral circuit should be close to the SIM card socket. The

reference circuit of the 8-pin SIM card holder is illustrated in the following figure.

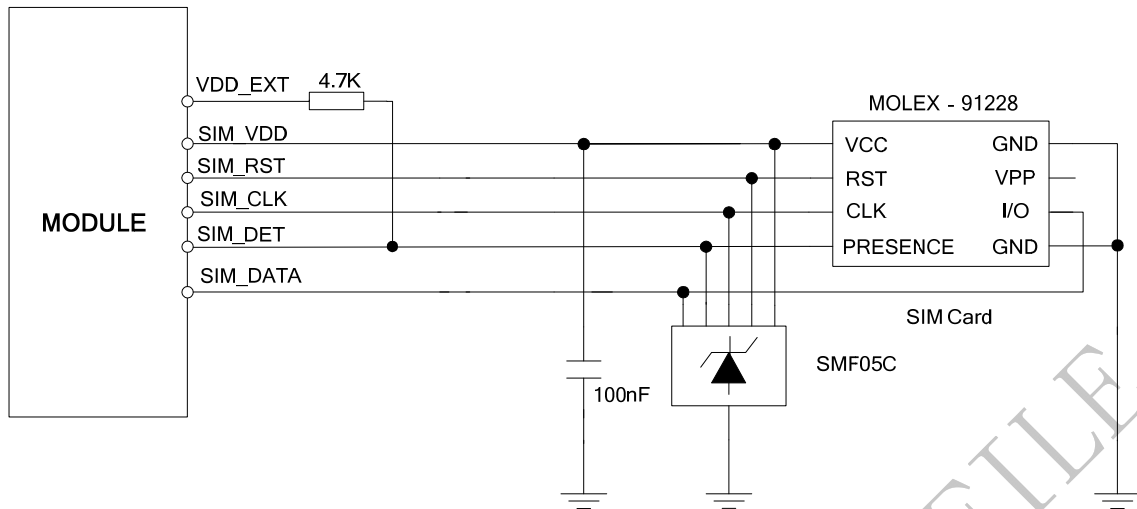


Figure 32: Reference circuit of the 8-pin SIM card holder

The SIM_DET pin is used for detection of the SIM card hot plug in. User can select the 8-pin SIM card holder to implement SIM card detection function. AT command “AT+CSDT” is used to enable or disable SIM card detection function. For details of this AT command, please refer to *document [1]*.

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

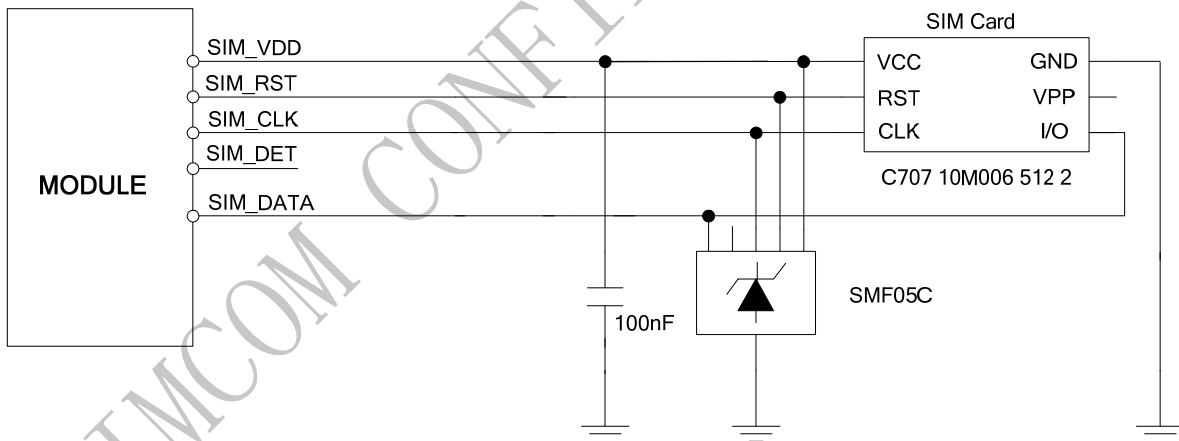


Figure 33: Reference circuit of the 6-pin SIM card holder

4.9.2. SIM Card Design Consideration

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

- Make sure that SIM card holder should far away from GSM antenna while in PCB layout.
- SIM traces should keep away from RF lines, VBAT and high-speed signal lines.
- The traces should be as short as possible.
- Keep SIM holder’s GND connect to main ground directly.

- Shielding the SIM card signal by ground well.
- Recommended to place a 100nF capacitor on SIM_VDD line and keep close to the holder.
- Add some TVS and the parasitic capacitance should not exceed 50pF, and 22Ω resistor in serials the SIM signal could enhance ESD protection.

4.9.3. Design Considerations for SIM Card Holder

For 8 pins SIM card holder, SIMCom recommends to use Molex 91228. User can visit <http://www.molex.com> for more information about the holder.

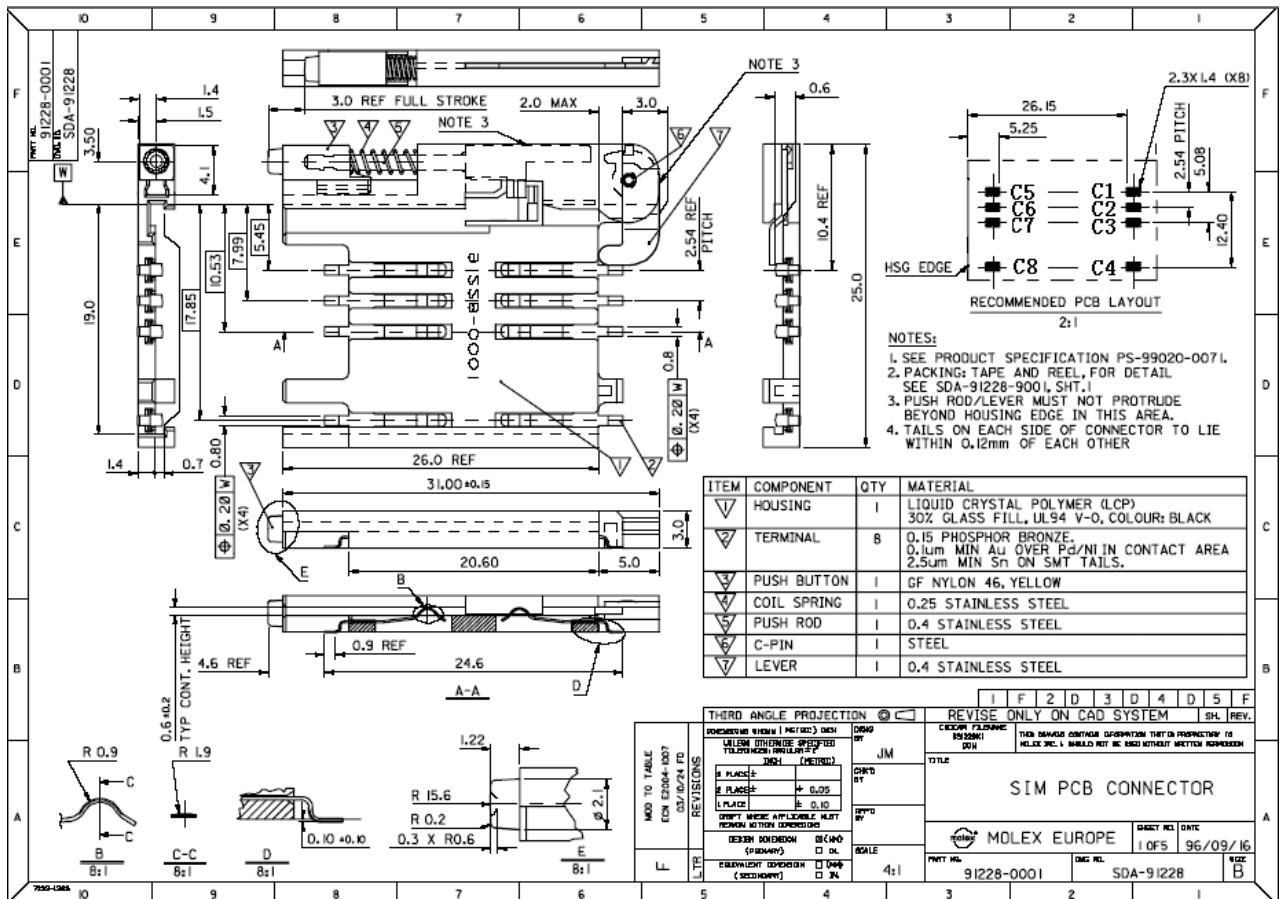


Figure 34: Molex 91228 SIM card holder

Table 17: Pin description (Molex SIM card holder)

| Pin name | Signal | Description |
|----------|----------|-----------------------|
| C1 | SIM_VDD | SIM card power supply |
| C2 | SIM_RST | SIM card reset |
| C3 | SIM_CLK | SIM card clock |
| C4 | GND | Connect to GND |
| C5 | GND | Connect to GND |
| C6 | VPP | Not connect |
| C7 | SIM_DATA | SIM card data I/O |

For 6-pin SIM card holder, SIMCom recommends to use Amphenol C707 10M006 512 .User can visit <http://www.amphenol.com> for more information about the holder.

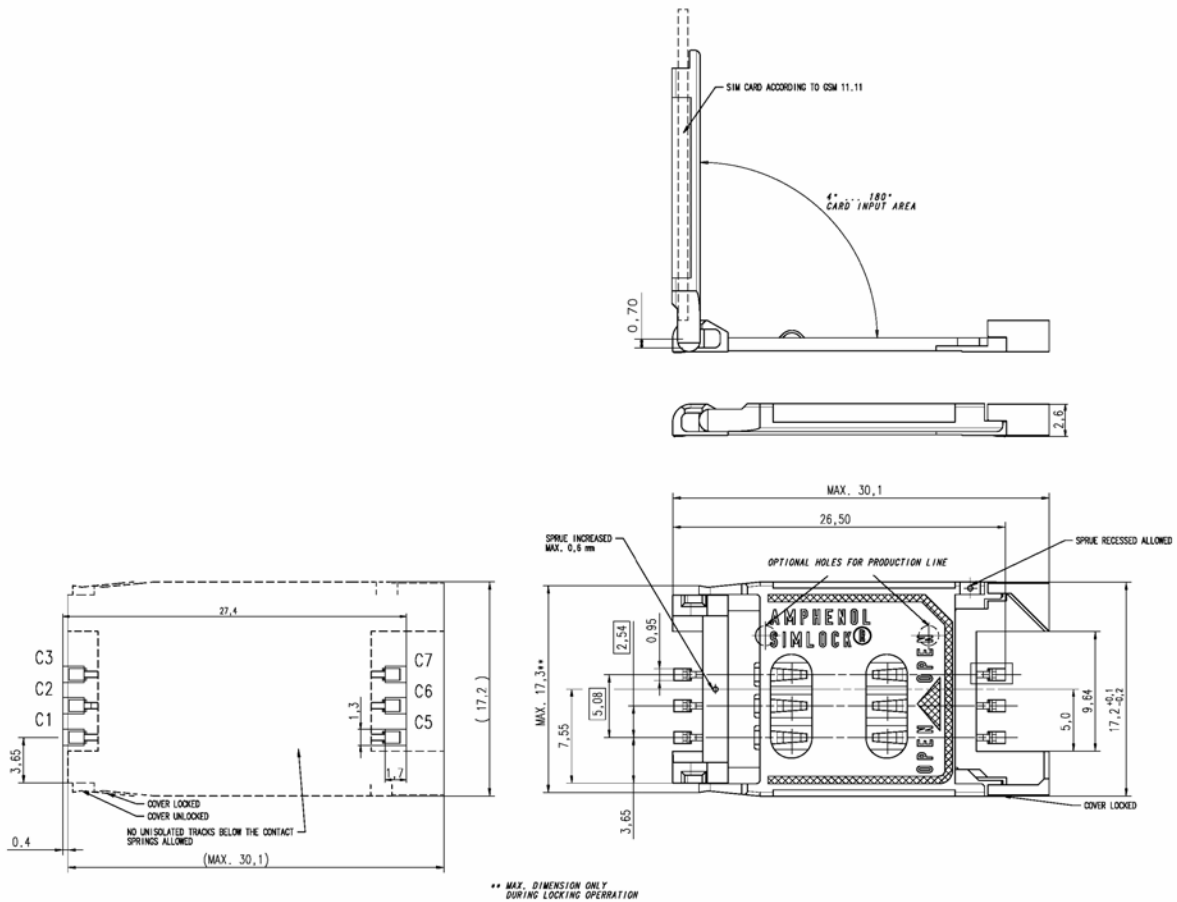


Figure 35: Amphenol C707 10M006 512 SIM card holder

Table 18: Pin description (Amphenol SIM card holder)

| Pin name | Signal | Description |
|----------|----------|-----------------------|
| C1 | SIM_VDD | SIM card power supply |
| C2 | SIM_RST | SIM card reset |
| C3 | SIM_CLK | SIM card clock |
| C5 | GND | Connect to GND |
| C6 | VPP | Not connect |
| C7 | SIM_DATA | SIM card data I/O |

4.10. PCM Interface

SIM800 provides PCM interface.

Table 19: PCM pin definition

| Pin name | Pin number | Description |
|----------|------------|-----------------|
| PCM_OUT | 6 | PCM data output |
| PCM_IN | 12 | PCM data input |
| PCM_SYNC | 14 | PCM synchrony |
| PCM_CLK | 68 | PCM clock |

SIM800 PCM interface only supports master mode, data length is 16 bits (linear), and PCM clock rate is 256 KHz.

Table 20: PCM specification

| Feature | specification |
|-----------------------------|-----------------------------------|
| Line Interface Format | Linear(Fixed) |
| Data length | 16bits(Fixed) |
| PCM Clock/Sync Source | Master Mode(Fixed) |
| PCM Clock Rate | 256Khz(Fixed) |
| PCM Sync Format | Short sync/Long sync both support |
| Zero Padding/Sign extension | Default Zero Padding |
| Data Ordering | MSB/LSB both support |

Note: User can use AT command control PCM interface, for details please refer to document [1].

4.10.1. PCM Multiplex Function

With GPIO17 and GPIO19, PCM interface can be configured as SPI or SD interface, the following table shows the detailed multiplex function.

Table 21: PCM Multiplex Function:

| Name | Pin number | Mode 0(default) | Mode 1 | Mode 2 | Mode 3 |
|----------|------------|-----------------|-----------|-----------|--------|
| PCM_OUT | 6 | PCM_OUT | GPIO16 | SD_DATA3 | GPIO16 |
| PCM_IN | 12 | PCM_IN | DISP_DATA | SD_DATA 2 | GPIO18 |
| PCM_SYNC | 14 | PCM_SYNC | DISP_CS | SD_CLK | GPIO20 |
| PCM_CLK | 68 | PCM_CLK | GPIO12 | SD_CMD | GPIO12 |
| GPIO17 | 11 | GPIO17 | DISP_CLK | SD_DATA 1 | GPIO17 |
| GPIO19 | 13 | GPIO19 | DISP_D/C | SD_DATA0 | GPIO19 |

Note: Multiplex Function need different software version.

4.10.2. PCM Interface

Refer to the following figure for PCM design:

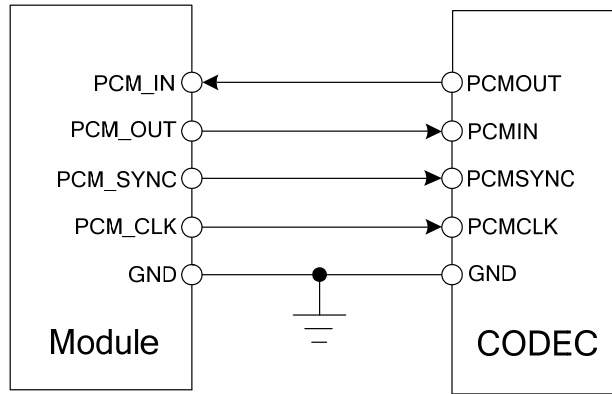


Figure 36: PCM reference circuit

4.10.3. LCD Display/SPI Interface

SIM800 provides a serial interface. It could be used as SPI interface in the embedded AT application. For details about embedded AT application, please refer to *document [1]*.

Refer to the following figure for SPI design:

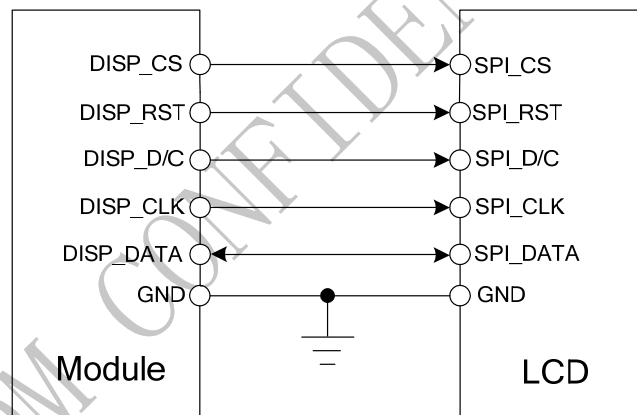


Figure 37: LCD reference circuit

Note: This function is not supported in the standard firmware. If user wants this function, the firmware must be customized. Please contact SIMCom for more details.

4.10.4. SD Card Interface

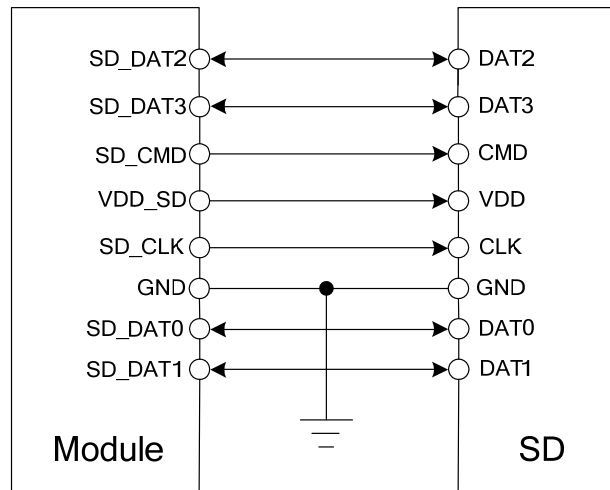


Figure 38: SD reference circuit

If the VDD of SD card is 2.8V, user can use VDD_EXT power the SD card directly. If the VDD is 3.3V, customer should design the power circuit external.

4.11. Keypad Interface

SIM800 consists of 5 keypad column outputs and 5 keypad row inputs, and it can support two kinds of connections, the traditional 5*5 keypad matrix and the extended 5*5*2 keypad matrix.

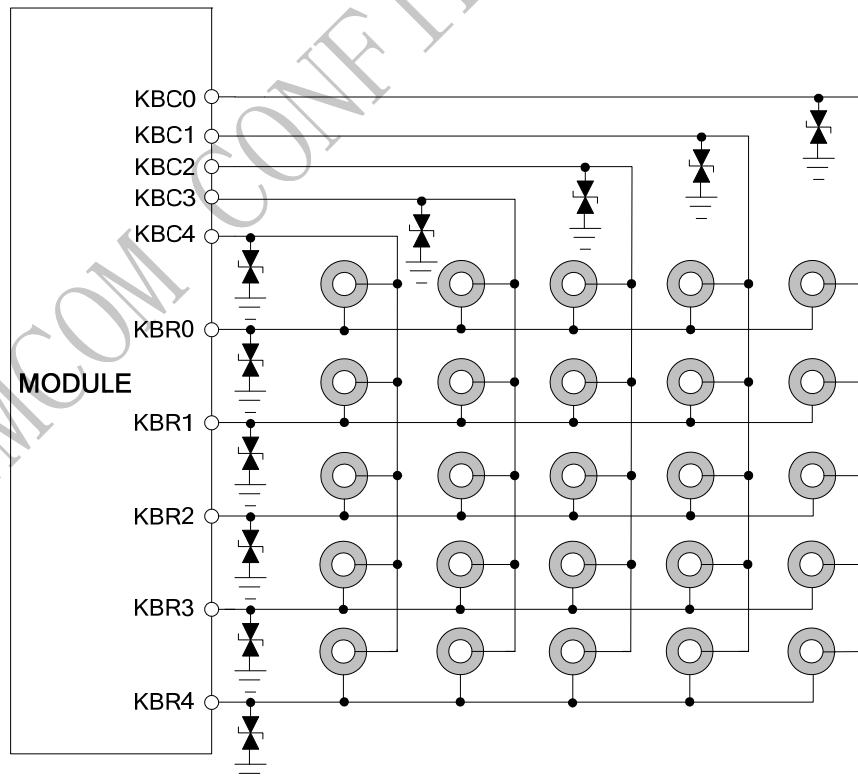


Figure 39: Traditional keypad reference circuit

*Note: According to the traditional 5*5 keypad matrix, when there are unused KBCs or KBRs, user can execute AT command to define unused KBCs and KBRs as GPIO, for details please see the document [1].*

Module supports a new keypad connection, it can support 5*5*2 amount 50 keypads, meet full keyboard demand, and the connection diagram is as follow:

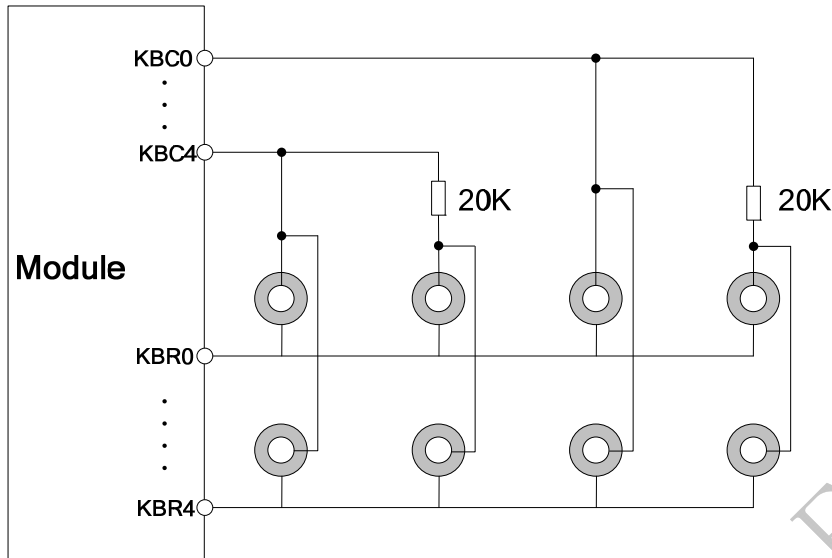


Figure 40: Extended keypad reference circuit

Note: Do not change the 20KΩ resistor in the diagram.

Customer should add a resistor to enhance the ESD performance and the value of resistor should be less than 1KΩ, the connection diagram is shown in figure 41 as an example.

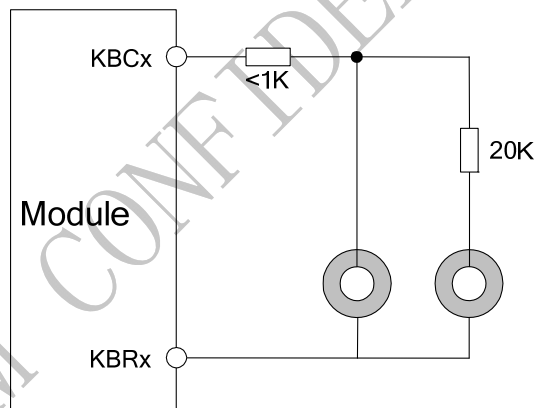


Figure 41: Enhance the ESD performance of keypad circuit

Module can detect two buttons pressed synchronously at both the traditional and extended keypad connection, but customer should notice that, do not assign keys which will be pressed at the same time on same KBC and KBR when implement the extended keypad design. The following figure is an example to explain this situation, “CTRL” and “A” can not be recognized if the two buttons were pressed at the same time.

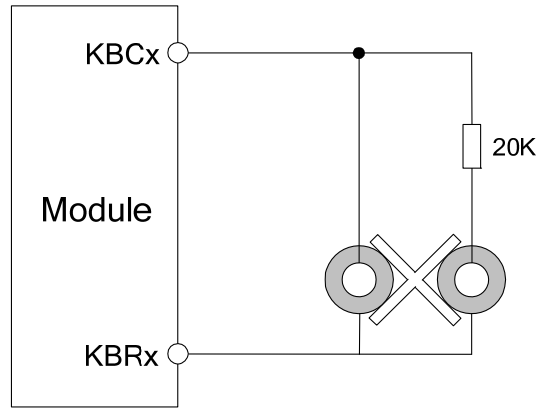


Figure 42: Keypad detected

Table 22: Pin definition of the keypad interface

| Name | Pin | Function | Default state |
|------|-----|----------------------|---------------|
| KBC0 | 51 | Keypad matrix column | Pull up |
| KBC1 | 50 | | Pull down |
| KBC2 | 49 | | Pull down |
| KBC3 | 48 | | Pull down |
| KBC4 | 47 | | Pull down |
| KBR0 | 44 | Keypad matrix row | Pull down |
| KBR1 | 43 | | Pull down |
| KBR2 | 42 | | Pull down |
| KBR3 | 41 | | Pull down |
| KBR4 | 40 | | Pull down |

Table 23: Keypad multiplex function

| Pin name | Pin number | Mode 0(default) | Mode 1 |
|----------|------------|-----------------|--------|
| KBC0 | 51 | KBC0 | GPIO10 |
| KBC1 | 50 | KBC1 | GPIO9 |
| KBC2 | 49 | KBC2 | GPIO8 |
| KBC3 | 48 | KBC3 | GPIO7 |
| KBC4 | 47 | KBC4 | GPIO6 |
| KBR0 | 44 | KBR0 | GPIO5 |
| KBR1 | 43 | KBR1 | GPIO4 |
| KBR2 | 42 | KBR2 | GPIO3 |
| KBR3 | 41 | KBR3 | GPIO2 |
| KBR4 | 40 | KBR4 | GPIO1 |

Note: Multiplex Function need different software version.

4.12. I2C BUS

The SIM800 provides an I2C interface, it can be driven by either the master or slave and conform to the I2C specification. It has the following features:

- Compliant master mode operation
- Adjustable clock speed for LS/FS mode operation
- Support 7-bit/10-bit addressing
- Support high speed mode
- Support slave clock extension
- START/STOP/REPEATED condition
- Manual transfer mode
- Multi-write per transfer (up to 8 data bytes for non-DMA mode)
- Multi-read per transfer (up to 8 data bytes for non-DMA mode)
- Multi-transfer per transaction
- Combined format transfer with length change capability
- Active drive/write-and I/O configuration

Table 24: Pin definition of the I2C

| Pin name | Pin number | Description |
|----------|------------|----------------------|
| SCL | 37 | I2C serial bus clock |
| SDA | 38 | I2C serial bus data |

Note: I2C has been pulled up to 2.8V via 4.7KΩ.

Table 25: I2C multiplex function

| Pin name | Pin number | Mode 0(default) | Mode 1 |
|----------|------------|-----------------|--------|
| SCL | 37 | SCL | GPIO24 |
| SDA | 38 | SDA | GPIO25 |

4.13. General Purpose Input/Output (GPIO)

SIM800 provides 2 GPIO pins. The output voltage level of the GPIO can be set by the AT command “AT+SGPIO”. The input voltage level of the GPIO can also be read by the AT command “AT+ SGPIO”. For more details, please refer to *document [1]*.

Table 26: Pin definition of the GPIO

| Pin name | Pin number | Reset state |
|----------|------------|-------------|
| GPIO17 | 11 | - |
| GPIO19 | 13 | - |

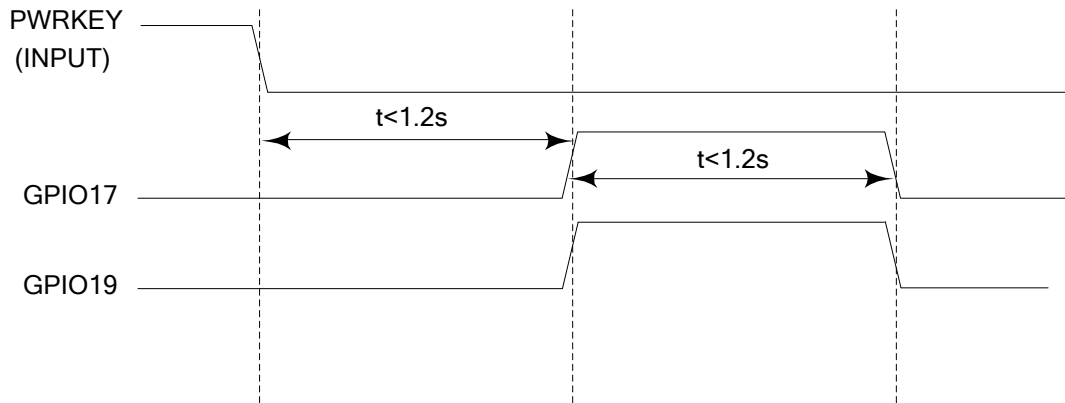


Figure 43: GPIO timing sequences

4.14. ADC

Table 27: Pin definition of the ADC

| Pin name | Pin number | Description |
|----------|------------|-----------------------------|
| ADC | 25 | Analog to Digital Converter |

SIM800 provides an auxiliary ADC, which can be used to measure the voltage. User can use AT command “AT+CADC” to read the voltage value. For details of this AT command, please refer to *document [1]*.

Table 28: ADC specification

| Parameter | Min | Typ | Max | Unit |
|----------------|-----|-----|--------|------|
| Voltage range | 0 | - | 2.8 | V |
| ADC Resolution | - | 10 | - | bits |
| Sampling rate | - | - | 1.0833 | MHz |
| ADC precision | | 10 | 20 | mV |

Note: the voltage should less than 2.8V, or the ADC may be damaged.

4.15. PWM

Table 29: Pin definition of the PWM

| Pin name | Pin number | Description |
|----------|------------|-----------------------------|
| PWM0 | 35 | PWM0, multiplex with GPIO22 |
| PWM1 | 36 | PWM1, multiplex with GPIO23 |

Note: SIM800 can only support 1 PWM synchronously, if customer set PIN 35 as PWM, so PIN36 can only be used as GPIO.

PWM output frequency varies from 0 to 2KHz. Two 7-bit unsigned binary parameters are used for the output period and for the duty cycle. The AT command “AT + SPWM” is used to set the output period and duty cycle of the PWM. For details, please refer to *document [1]*.

A typical circuit of the PWM drives buzzer is shown in the following figure:

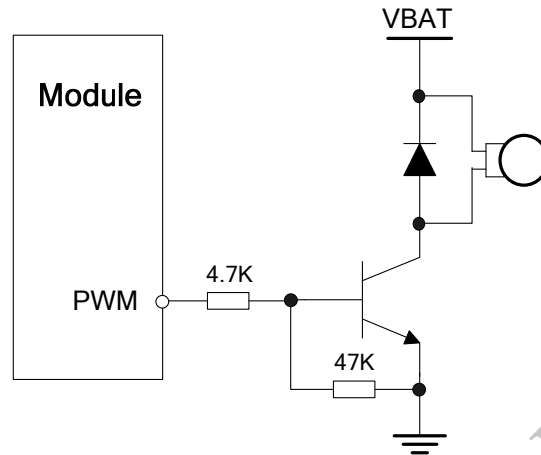


Figure 44: Reference circuit of PWM drive buzzer

Table 30: Buzzer output characteristics

| Parameter | Min | Typ | Max | Unit |
|-----------------|-----|-----|-----|------|
| Working voltage | 2.5 | 2.8 | 2.9 | V |
| Working current | | | 16 | mA |

Note: PWM pin must keep low when module in the boot process.

Table 31: PWM multiplex function

| Pin name | Pin number | Mode 0(default) | Mode 1 |
|----------|------------|-----------------|--------|
| PWM0 | 35 | PWM0 | GPIO22 |
| PWM1 | 36 | GPIO23 | PWM1 |

4.16. Network Status Indication

Table 32: Pin definition of the NETLIGHT

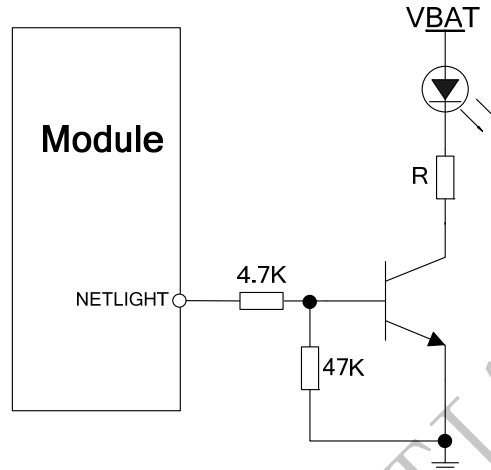
| Pin name | Pin number | Description |
|----------|------------|---------------------------|
| NETLIGHT | 52 | Network Status Indication |

The NETLIGHT pin can be used to drive a network status indication LED. The status of this pin is listed in following table:

Table 33: Status of the NETLIGHT pin

| Status | SIM800 behavior |
|---------------------|-----------------------------------|
| Off | SIM800 is not running |
| 64ms On/ 800ms Off | SIM800 not registered the network |
| 64ms On/ 3000ms Off | SIM800 registered to the network |
| 64ms On/ 300ms Off | GPRS communication is established |

Reference circuit is recommended in the following figure:


Figure 45: Reference circuit of NETLIGHT

4.17. Operating Status Indication

The STATUS pin indicates the operating status of module. The pin output high when module power on, output is low when module powered off.

Table 34: Pin definition of the STATUS

| Pin name | Pin number | Description |
|----------|------------|-----------------------------|
| STATUS | 66 | Operating status indication |

4.18. KPLED

SIM800 provides one open-drain LED driver pin.

Table 35: Pin definition of the KPLED

| Pin name | Pin number | Description |
|----------|------------|-----------------------------|
| KPLED | 23 | Sink current for keypad LED |

Reference circuit is recommended in the following figure:

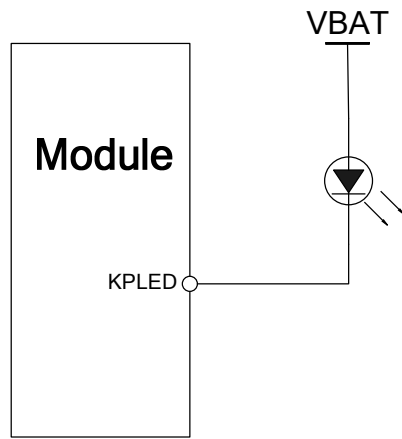


Figure 46: KPLED driver reference circuit

Table 36: KPLED specification

| Pin name | Min | Typ | Max | Unit |
|----------|-----|-----|-----|------|
| KPLED | 60 | - | 100 | mA |

4.19. RF Synchronization Signal

The synchronization signal serves to indicate growing power consumption during the transmit burst.

Table 37: Definition of the RF_SYNC pin

| Pin name | Pin number | Description |
|----------|------------|---------------------------------|
| RF_SYNC | 67 | Transmit synchronization signal |

Note: Do not pull up RF_SYNC.

The timing of the synchronization signal is shown in the following figure. High level of the RF_SYNC signal indicates increased power consumption during transmission.

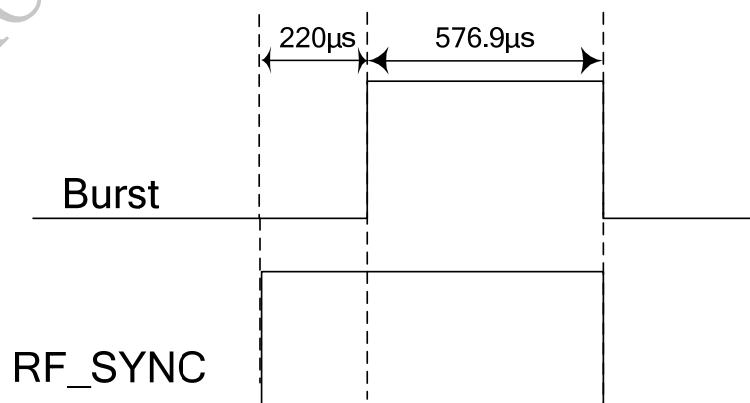


Figure 47: RF_SYNC signal during transmit burst

4.20. Antenna Interface

There are two antenna ports for SIM800, GSM antenna port named GSM_ANT and Bluetooth antenna port named BT_ANT; The RF interfaces of the two antenna ports both have the impedance of 50Ω

- The input impedance of the antenna should be 50Ω, and the VSWR should be less than 2.
- It is recommended that GSM antenna and Bluetooth antenna be placed as far as better.
- The isolations of the two antenna should be more than 30db

NOTE: About the RF trace layout please refer to “AN_SMT Module_RF_Reference_Design_Guide”

4.20.1. GSM Antenna Interface

There is a GSM antenna pad named GSM_ANT to connect an external GSM antenna, the connection of the antenna must be decoupled from DC voltage. This is necessary because the antenna connector is DC coupled to ground via an inductor for ESD protection. The external antenna must be matched properly to achieve the best performance, so the matching circuit is necessary, the connection is recommended as following:

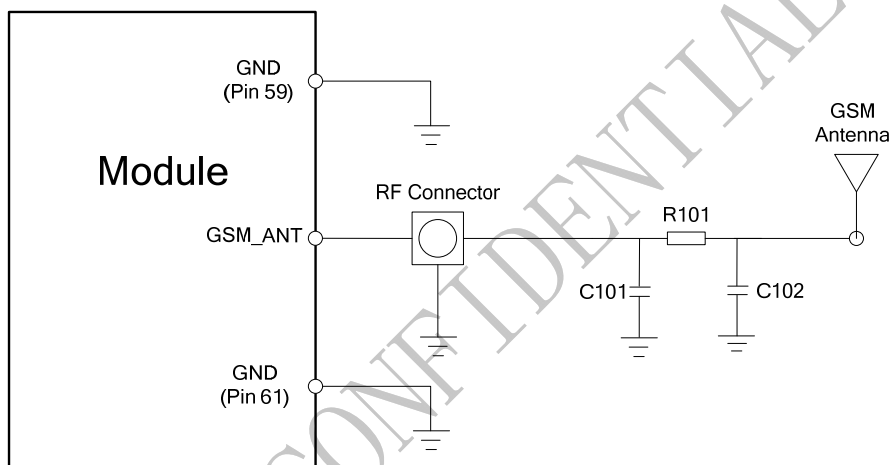


Figure 48: GSM antenna matching circuit

R101, C101, C102 are the matching circuit, the values depend on antenna debug result. Normally R101 is 0Ω, C101 and C102 are not mounted. The RF connector is used for conducted test. If the space between RF pin and antenna is not enough, the matching circuit could be simplified as the following figure:

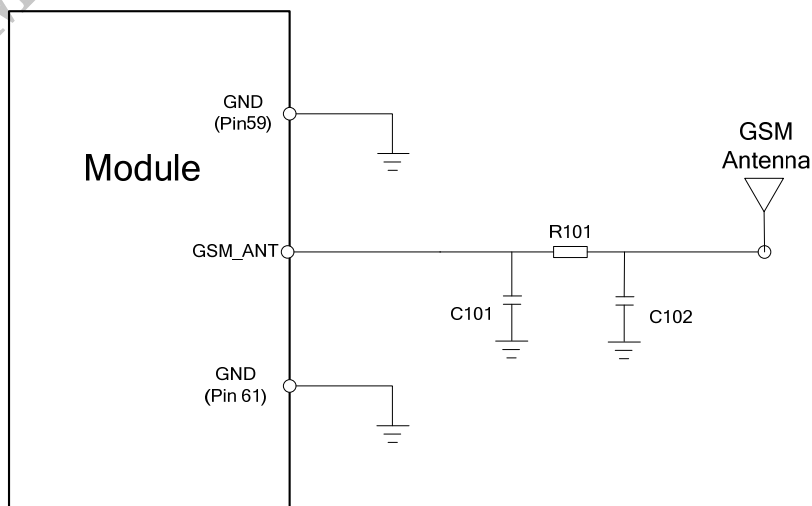


Figure 49: GSM simple antenna matching circuit

Normally R101 is 0Ω; C101 and C102 are not mounted.

4.20.2. Bluetooth Antenna Interface

The module provides a Bluetooth antenna interface named BT_ANT.

The external antenna must be matched properly to achieve best performance, so the matching circuit is necessary, the connection is recommended as the following figure:

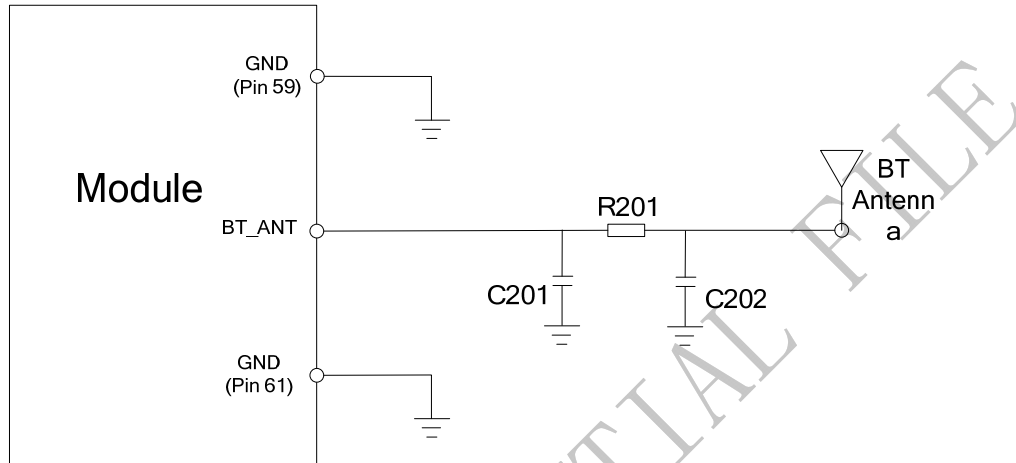


Figure 50: Bluetooth antenna matching circuit

R201, C201, C202 are the matching circuit, the values depend on antenna debug result. Normally R201 is 0Ω, C201 and C202 are not mounted.

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5. PCB Layout

Usually, most electronic products with good performance are based on good PCB layout. Poor PCB layout will lead to lots of issues, like TDD noise, SIM card undetected, etc. The final solution for these problems is to redo PCB layout. Making good PCB layout will save developing schedule and cost as well.

This section will give some guidelines on PCB layout, in order to eliminate interfere or noise by greatest degree, and save product development period.

5.1 PIN Assignment

Before the placement of the PCB design, customer should learn well about PIN assignment in order to get reasonable layout with so many external components. Please refer to figure 2 for the details.

5.2 Principle of PCB Layout

During layout, we should pay attention to the following interfaces, like Antenna, power supply, SIM card interface, audio interface, and so on.

5.2.1 Antenna

There are some suggestions for components placing and RF routing of GSM and Bluetooth RF traces:

- The RF connector is used for conducted test, so keep it as close to the GSM_ANT pin as possible;
- Antenna matching circuit should be closed to the antenna;
- Keep the RF traces as 50Ω;
- The RF traces should be kept far away from the high frequency signals and strong disturbing source.
- If using a RF cable, kept it far away from SIM card, power ICs;
- It is recommended that GSM antenna and Bluetooth antenna be placed as far as better.

5.2.2. Power Supply

Not only VBAT but also power ground is very important in layout. The positive line of VBAT should be as shorter and wider as possible. The correct flow from source to VBAT pin should go though Zener diode then huge capacitor. PIN 62, 63, 64, 65 are GND signals, and should be designed shortest layout to GND of power source.

5.2.3 SIM Card Interface

SIM card holder will take much more space on board, and there has no anti-EMI component inside, so, SIM card interface always be interfered. So, pay attention to this interface during layout. Ensure SIM card holder far way from antenna or RF cable inside. And it's better to put SIM card holder near module, And it's better to add ESD component to protect clock, data, reset and SIM_VDD signals which should be far away from power and high-speed signal.

5.2.4 Audio Interface

In order to avoid TDD noise, or current noise, or some other noise, the signal trace of audio should far away from antenna and power, and it is recommended to surround audio traces by ground. And do not rout audio trace and VBAT trace parallel.

5.2.5 Others

It's better to trace signal lines of UART bunched, as well as signals of USB and LCM.

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6. Electrical, Reliability and Radio Characteristics

6.1 Absolute Maximum Ratings

The absolute maximum ratings stated in following table are stress ratings under non-operating conditions. Stresses beyond any of these limits will cause permanent damage to SIM800.

Table 38: Absolute maximum ratings

| Symbol | Min | Typ | Max | Unit |
|------------------|-----|-----|-----|------|
| VBAT | - | - | 4.5 | V |
| Peak Current | 0 | - | 2.0 | A |
| USB_VBUS | - | - | 12 | V |
| I _I * | - | - | 8 | mA |
| I _O * | - | - | 8 | mA |

These parameters are for digital interface pins, such as keypad, GPIO, I2C, UART, LCD and PCM.

6.2 Recommended Operating Conditions

Table 39: Recommended operating conditions

| Symbol | Parameter | Min | Typ | Max | Unit |
|-------------------|-----------------------|-----|-----|-----|------|
| VBAT | Power supply voltage | 3.4 | 4.0 | 4.4 | V |
| T _{OPER} | Operating temperature | -40 | +25 | +85 | °C |
| T _{STG} | Storage temperature | -45 | | +90 | °C |

6.3 Digital Interface Characteristics

Table 40: Digital interface characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|-----------------|---------------------------|------|-----|-----|------|
| V _{IH} | High-level input current | 2.1 | - | 3.1 | V |
| V _{IL} | Low-level input current | -0.3 | - | 0.7 | V |
| V _{OH} | High-level output voltage | 2.4 | - | - | V |
| V _{OL} | Low-level output voltage | - | - | 0.4 | V |

* These parameters are for digital interface pins, such as keypad, GPIO, I2C, UART, LCD and PCM.

6.4 SIM Card Interface Characteristics

Table 41: SIM card interface characteristic

| Symbol | Parameter | Min | Typ | Max | Unit |
|----------|---------------------------|------|-----|------|---------|
| I_{IH} | High-level input current | -1 | - | 1 | μA |
| I_{IL} | Low-level input current | -1 | - | 1 | μA |
| V_{IH} | High-level input voltage | 1.4 | - | - | V |
| | | 2.4 | - | - | V |
| V_{IL} | Low-level input voltage | - | - | 0.27 | V |
| | | - | - | 0.4 | V |
| V_{OH} | High-level output voltage | 1.62 | - | - | V |
| | | 2.7 | - | - | V |
| V_{OL} | Low-level output voltage | - | - | 0.36 | V |
| | | - | - | 0.4 | V |

6.5 SIM_VDD Characteristics

Table 42: SIM_VDD characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|--------|----------------|-----|-----|-----|------|
| V_O | Output voltage | - | 3.0 | - | V |
| | | - | 1.8 | - | |
| I_O | Output current | - | - | 10 | mA |

6.6 VDD_EXT Characteristics

Table 43: VDD_EXT Characteristics

| Symbol | Parameter | Min | Typ | Max | Unit |
|--------|----------------|-----|-----|-----|------|
| V_O | Output voltage | 2.7 | 2.8 | 2.9 | V |
| I_O | Output current | - | - | 50 | mA |

6.7 VRTC Characteristics

Table 44: VRTC Characteristics

| Symbol | Description | Min | Typ | Max | Unit |
|---------------|---------------------|-----|-----|-----|---------|
| V_{RTC-IN} | VRTC input voltage | 1.2 | 2.8 | 3.0 | V |
| I_{RTC-IN} | VRTC input current | - | 3.0 | - | μA |
| $V_{RTC-OUT}$ | VRTC output voltage | - | 2.8 | - | V |
| $I_{RTC-OUT}$ | VRTC output current | - | - | 2.0 | mA |

6.8 Current Consumption (VBAT=4V)

Table 45: Current consumption

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | | |
|-------------------|-----------------|--|--------------|-------------------|----------------------------------|----------------|----------|---|
| VBAT | Voltage | | 3.4 | 4.0 | 4.4 | V | | |
| | Power drop | PCL=5 | | | 350 | mV | | |
| | Voltage ripple | PCL=5 @ f<200kHz @ f>200kHz | | | 50 2.0 | mV mV | | |
| I _{VBAT} | Average current | Power down mode | | 150 | | uA | | |
| | | Sleep mode (AT+CFUN=1): (BS-PA-MFRMS=9) (BS-PA-MFRMS=5) (BS-PA-MFRMS=2) | | 1.2 1.3 2.0 | | mA mA mA | | |
| | | Idle mode (AT+CFUN=1): EGSM900 | | 22.1 | | mA | | |
| | | Voice call (PCL=5): GSM850 EGSM900 DCS1800 PCS1900 | | | 204.8 203.9 133.1 137.9 | | mA mA | |
| | | Data mode GPRS (1Rx,4Tx): GSM850 EGSM900 DCS1800 PCS1900 | | | 450.9 457.3 281.8 288.4 | | mA mA | |
| | | Data mode GPRS (3Rx,2Tx): GSM850 EGSM900 DCS1800 PCS1900 | | | 386.1 345.0 216.8 239.1 | | mA mA | |
| | | Data mode GPRS (4Rx,1Tx): GSM850 EGSM900 DCS1800 PCS1900 | | | 217.8 217.9 156.4 159.8 | | mA mA | |
| | | I _{MAX} | Peak current | During TX burst | | 2.0 | | A |

* In above table the current consumption value is the typical one of the module tested in laboratory. In the mass production stage, there may be differences among each individual.

6.9 Electro-Static Discharge

SIM800 is an ESD sensitive component, so more attention should be paid to the procedure of handling and packaging. The ESD test results are shown in the following table.

Table 46: The ESD characteristics (Temperature: 25°C, Humidity: 45 %)

| Pin name | Contact discharge | Air discharge |
|---------------------|-------------------|---------------|
| VBAT | ±5KV | ±10KV |
| GND | ±5KV | ±10KV |
| RXD, TXD | ±4KV | ±8KV |
| GSM_ANT | ±5KV | ±10KV |
| SPKP/SPKN/MICP/MICN | ±4KV | ±8KV |
| PWRKEY | ±4KV | ±8KV |

6.10 Radio Characteristics

The following table shows the module conducted output power, it is followed by the 3GPP TS 05.05 technical specification requirement.

Table 47: GSM 900 and GSM 850 conducted RF output power

| GSM850,EGSM900 | | | |
|----------------|----------------------------|-------------------------------|---------|
| PCL | Nominal output power (dBm) | Tolerance (dB) for conditions | |
| | | Normal | Extreme |
| 5 | 33 | ±2 | ±2.5 |
| 6 | 31 | ±3 | ±4 |
| 7 | 29 | ±3 | ±4 |
| 8 | 27 | ±3 | ±4 |
| 9 | 25 | ±3 | ±4 |
| 10 | 23 | ±3 | ±4 |
| 11 | 21 | ±3 | ±4 |
| 12 | 19 | ±3 | ±4 |
| 13 | 17 | ±3 | ±4 |
| 14 | 15 | ±3 | ±4 |
| 15 | 13 | ±3 | ±4 |
| 16 | 11 | ±5 | ±6 |
| 17 | 9 | ±5 | ±6 |
| 18 | 7 | ±5 | ±6 |
| 19-31 | 5 | ±5 | ±6 |

Table 48: DCS 1800 and PCS 1900 conducted RF output power

| DCS1800,PCS1900 | | | |
|-----------------|----------------------------|-------------------------------|---------|
| PCL | Nominal output power (dBm) | Tolerance (dB) for conditions | |
| | | Normal | Extreme |
| 0 | 30 | ±2 | ±2.5 |
| 1 | 28 | ±3 | ±4 |
| 2 | 26 | ±3 | ±4 |
| 3 | 24 | ±3 | ±4 |
| 4 | 22 | ±3 | ±4 |
| 5 | 20 | ±3 | ±4 |
| 6 | 18 | ±3 | ±4 |
| 7 | 16 | ±3 | ±4 |
| 8 | 14 | ±3 | ±4 |
| 9 | 12 | ±4 | ±5 |
| 10 | 10 | ±4 | ±5 |
| 11 | 8 | ±4 | ±5 |
| 12 | 6 | ±4 | ±5 |
| 13 | 4 | ±4 | ±5 |
| 14 | 2 | ±5 | ±6 |
| 15 | 0 | ±5 | ±6 |

6.11 Module RF Receive Sensitivity

The following table shows the SIM800 conducted receive sensitivity; it is tested under static condition.

Table 49: Conducted RF receive sensitivity

| Frequency | Receive sensitivity(Typical) | Receive sensitivity(Max) |
|-----------------|------------------------------|--------------------------|
| GSM850,EGSM900 | < -108dBm | < -106dBm |
| DCS1800,PCS1900 | < -108dBm | < -106dBm |

6.12 Module Operating Frequencies

The following table shows the module's operating frequency range; it is followed by the 3GPP TS 05.05 technical specification requirement.

Table 50: Operating frequencies

| Frequency | Receive | Transmit | Channel |
|-----------|----------------|----------------|----------------------|
| GSM850 | 869 ~ 894MHz | 824 ~ 849MHz | 128 ~ 251 |
| EGSM900 | 925 ~ 960MHz | 880 ~ 915MHz | 0 ~ 124 , 975 ~ 1023 |
| DCS1800 | 1805 ~ 1880MHz | 1710 ~ 1785MHz | 512 ~ 885 |
| PCS1900 | 1930 ~ 1990MHz | 1850 ~ 1910MHz | 512 ~ 810 |

7. Manufacturing

7.1. Top and Bottom View of SIM800

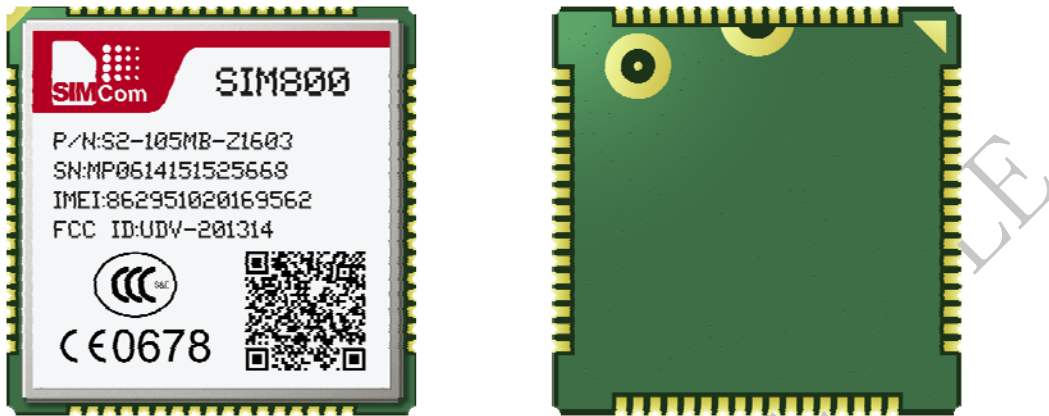


Figure 51: Top and Bottom View of SIM800

7.2. Typical Solder Reflow Profile

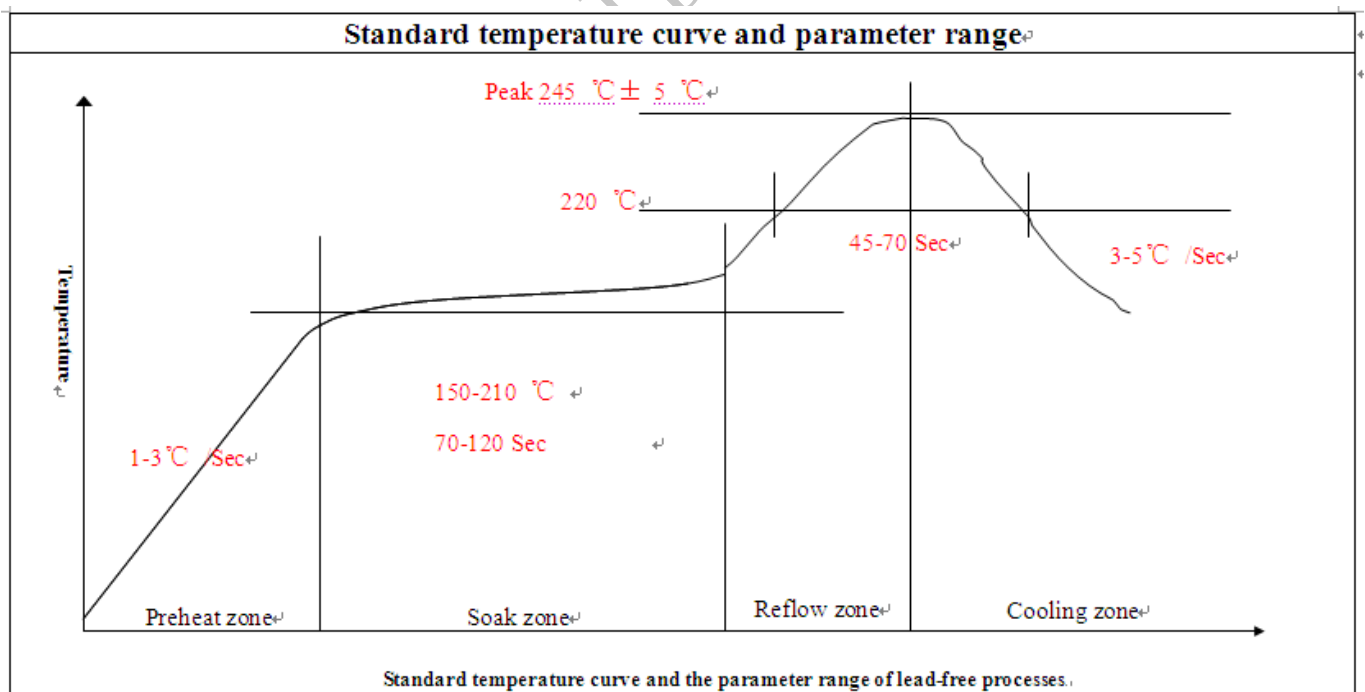


Figure 52: Typical Solder Reflow Profile

Note: Please refer to “Module secondary-SMT-UGD” for more information about the module shipping and manufacturing.

7.3. The Moisture Sensitivity Level

The moisture sensitivity level of SIM800 is 3. The module should be mounted within 168 hours after unpacking in the environmental conditions of temperature $<30^{\circ}\text{C}$ and relative humidity of $<60\%$ (RH). It is necessary to bake the module if the above conditions are not met:

Table 51: Moisture classification level and floor life

| Level | Floor Life (out of bag) at factory ambient $\leq 30^{\circ}\text{C} / 60\%$ RH or as stated |
|-------|--|
| 1 | Unlimited at $\leq 30^{\circ}\text{C} / 85\%$ RH |
| 2 | 1 year |
| 2a | 4 weeks |
| 3 | 168 hours |
| 4 | 72 hours |
| 5 | 48 hours |
| 5a | 24 hours |
| 6 | Mandatory bake before use. After bake, it must be reflowed within the time limit specified on the label. |

NOTES:

- If the vacuum package is not open for 6 months or longer than the packing date, baking is also recommended before re-flow soldering.*
- For product handling, storage, processing, IPC / JEDEC J-STD-033 must be followed.*

7.4. Baking Requirements

Because of its sensitivity to moisture absorption, SIM800 should be baked sufficiently before re-flow soldering. Otherwise SIM800 will be at the risk of permanent damage during re-flow soldering. SIM800 should be baked 192 hours at temperature $40^{\circ}\text{C} +5^{\circ}\text{C} / -0^{\circ}\text{C}$ and $<5\%$ RH for low-temperature device containers, or 72 hours at temperature $80^{\circ}\text{C} \pm 5^{\circ}\text{C}$ for high-temperature device containers. Care should be taken that the plastic tray is not heat resistant, SIM800 modules should be taken out for baking, and otherwise the tray may be damaged by high-temperature during baking.

Table 52: Baking requirements

| Baking temperature | Moisture | Time |
|---|----------|-----------|
| $40^{\circ}\text{C} \pm 5^{\circ}\text{C}$ | $<5\%$ | 192 hours |
| $120^{\circ}\text{C} \pm 5^{\circ}\text{C}$ | $<5\%$ | 4 hours |

8. Appendix

I. Related Documents

Table 53: Related Documents

| SN | Document name | Remark |
|------|---|--|
| [1] | SIM800 Series_AT Command Manual_V1.00.doc | |
| [2] | ITU-T Draft new recommendation V.25ter: | Serial asynchronous automatic dialing and control |
| [3] | GSM 07.07: | Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME) |
| [4] | GSM 07.10: | Support GSM 07.10 multiplexing protocol |
| [5] | GSM 07.05: | Digital cellular telecommunications (Phase 2+); Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE – DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS) |
| [6] | GSM 11.14: | Digital cellular telecommunications system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface |
| [7] | GSM 11.11: | Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface |
| [8] | GSM 03.38: | Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information |
| [9] | GSM 11.10 | Digital cellular telecommunications system (Phase 2); Mobile Station (MS) conformance specification; Part 1: Conformance specification |
| [10] | AN_Serial Port | AN_Serial Port |
| [11] | AN_SIM900_TCPIP | TCP/IP Applications User Manual |
| [12] | Module secondary-SMT-UGD | |
| [13] | AN_SMT Module_RF_Reference Design_Guide | |
| [14] | SIM800_EVB kit_User Guide_VX.XX | |

II. Multiplex Function

Table 54: Multiplex Function

| Pin name | Reset status | Pin number | Mode 0(default) | Mode 1 | Mode 2 | Mode 3 |
|----------|--------------|------------|-----------------|-----------|-----------|--------|
| DTR | I/PD | 3 | DTR | GPIO13 | EINT2 | - |
| RI | I/PD | 4 | RI | GPIO14 | - | - |
| DCD | I/PD | 5 | DCD | GPIO15 | - | |
| PCM_OUT | I/PD | 6 | PCM_OUT | GPIO16 | SD_DATA3 | GPIO16 |
| GPIO17 | I/PD | 11 | GPIO17 | DISP_CLK | SD_DATA 1 | GPIO17 |
| PCM_IN | I/PD | 12 | PCM_IN | DISP_DATA | SD_DATA 2 | GPIO18 |
| GPIO19 | I/PD | 13 | GPIO19 | DISP_D/C | SD_DATA 0 | GPIO19 |
| PCM_SYNC | I/PD | 14 | PCM_SYNC | DISP_CS | SD_CLK | GPIO20 |
| SIM_DET | I/PD | 34 | SIM_DET | GPIO21 | EINT7 | - |
| PWM0 | I/PD | 35 | PWM0 | GPIO22 | EINT0 | - |
| PWM1 | I/PD | 36 | GPIO23 | PWM1 | EINT8 | - |
| SDA | I/PD | 37 | SDA | GPIO24 | - | |
| SCL | I/PD | 38 | SCL | GPIO25 | - | |
| KBR4 | I/PD | 40 | KBR4 | GPIO1 | EINT3 | |
| KBR3 | I/PD | 41 | KBR3 | GPIO2 | - | |
| KBR2 | I/PD | 42 | KBR2 | GPIO3 | - | |
| KBR1 | I/PD | 43 | KBR1 | GPIO4 | - | |
| KBR0 | LO | 44 | KBR0 | GPIO5 | - | |
| KBC4 | I/PD | 47 | KBC0 | GPIO6 | EINT1 | |
| KBC3 | I/PD | 48 | KBC1 | GPIO7 | - | |
| KBC2 | I/PD | 49 | KBC2 | GPIO8 | - | |
| KBC1 | I/PD | 50 | KBC3 | GPIO9 | - | |
| KBC0 | I/PU | 51 | KBC4 | GPIO10 | - | |
| RF_SYNC | I/PD | 67 | RF_SYNC | GPIO11 | - | |
| PCM_CLK | I/PD | 68 | PCM_CLK | GPIO12 | SD_CMD | GPIO12 |

III. Terms and Abbreviations

Table 55: Terms and Abbreviations







| Abbreviation | Description |
|--------------|---|
| ADC | Analog-to-Digital Converter |
| AMR | Adaptive Multi-Rate |
| BT | Bluetooth |
| CS | Coding Scheme |
| CSD | Circuit Switched Data |
| CTS | Clear to Send |
| DTE | Data Terminal Equipment (typically computer, terminal, printer) |
| DTR | Data Terminal Ready |
| DTX | Discontinuous Transmission |
| EFR | Enhanced Full Rate |
| EGSM | Enhanced GSM |
| ESD | Electrostatic Discharge |
| ETS | European Telecommunication Standard |
| FR | Full Rate |
| GPRS | General Packet Radio Service |
| GSM | Global Standard for Mobile Communications |
| HR | Half Rate |
| IMEI | International Mobile Equipment Identity |
| Li-ion | Lithium-Ion |
| MO | Mobile Originated |
| MS | Mobile Station (GSM engine), also referred to as TE |
| MT | Mobile Terminated |
| PAP | Password Authentication Protocol |
| PBCCH | Packet Broadcast Control Channel |
| PCB | Printed Circuit Board |
| PCL | Power Control Level |
| PCS | Personal Communication System, also referred to as GSM 1900 |
| PDU | Protocol Data Unit |
| PPP | Point-to-point protocol |
| RF | Radio Frequency |
| RMS | Root Mean Square (value) |
| RTC | Real Time Clock |
| RX | Receive Direction |
| SIM | Subscriber Identification Module |
| SMS | Short Message Service |
| TDD | Time Division Distortion |

| | |
|--------------------------------|---|
| TE | Terminal Equipment, also referred to as DTE |
| TX | Transmit Direction |
| UART | Universal Asynchronous Receiver & Transmitter |
| URC | Unsolicited Result Code |
| USSD | Unstructured Supplementary Service Data |
| VSWR | Voltage Standing Wave Ratio |
| Phonebook abbreviations | |
| FD | SIM fix dialing phonebook |
| 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 |

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IV. Safety Caution

Table 56: Safety caution

| Marks | Requirements |
|---|---|
|  | When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive to not operate normally for RF energy interference. |
|  | Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Forget to think much of these instructions may lead to the flight safety or offend against local legal action, or both. |
|  | Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard. |
|  | Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment. |
|  | Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for hands free operation. Before making a call with a hand-held terminal or mobile, park the vehicle. |
|  | <p>GSM cellular terminals or mobiles operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, for example no mobile fee or a invalid SIM card. While you are in this condition and need emergent help, please remember using emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength.</p> <p>Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call.</p> <p>Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.</p> |

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