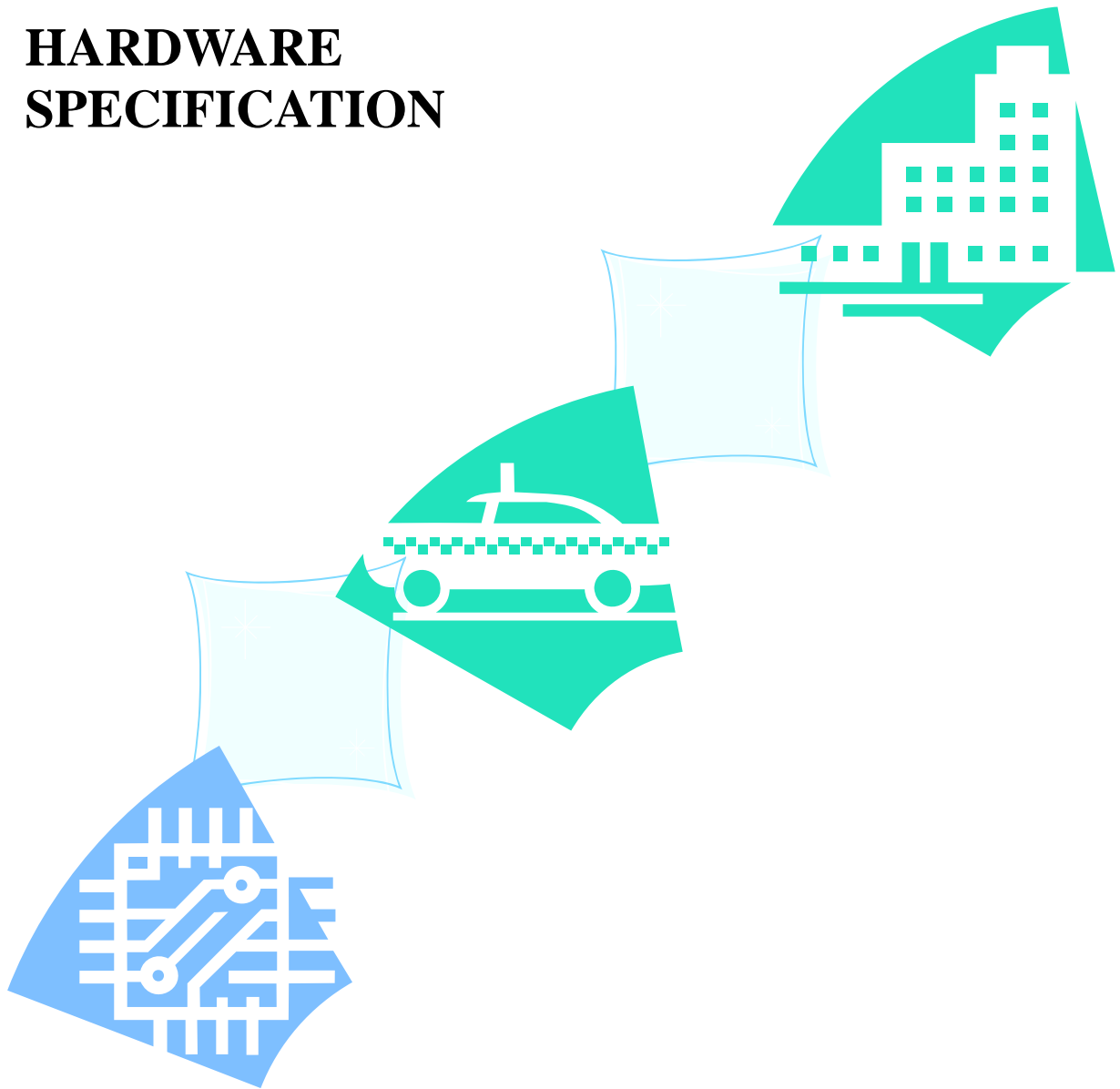


# SIM300D

## HARDWARE SPECIFICATION



Design by SIMCOM Ltd.,



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**Version history**

<b>Data</b>	<b>Version</b>	<b>Description of change</b>	<b>Author</b>
2006-03-8	1.00	Origin	
2006-06-27	2.01	Pin description	
2006-9-13	2.02	Delete the SIM_presence PIN, Modify the figure of the timing of turn on system, Modify the figure of the timing of turn off system, Modify the high voltage and low voltage of the PWRKEY.	

## 1 Introduction

This document describes the hardware interface of the SIMCOM SIM300D module that connects to the specific application and the air interface. As SIM300D can be integrated with a wide range of applications, all functional components of SIM300D are described in great detail.

This document can help you quickly understand SIM300D interface specifications, electrical and mechanical details. With the help of this document and other SIM300D application notes, user guide, you can use SIM300D module to design and set-up mobile applications quickly.

### 1.1 Related documents

**Table 1: Related documents**

SN	Document name	Remark
[1]	SIM300D_ATC	SIM300D_ATC
[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 07.05:	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

## 1.2 Terms and abbreviations

**Table 2: Terms and abbreviations**

<b>Abbreviation</b>	<b>Description</b>
ADC	Analog-to-Digital Converter
ARP	Antenna Reference Point
ASIC	Application Specific Integrated Circuit
BER	Bit Error Rate
BTS	Base Transceiver Station
CHAP	Challenge Handshake Authentication Protocol
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DAC	Digital-to-Analog Converter
DRX	Discontinuous Reception
DSP	Digital Signal Processor
DTE	Data Terminal Equipment (typically computer, terminal, printer)
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
FCC	Federal Communications Commission (U.S.)
FDMA	Frequency Division Multiple Access
FR	Full Rate
GMSK	Gaussian Minimum Shift Keying
GPRS	General Packet Radio Service
GSM	Global Standard for Mobile Communications
HR	Half Rate
I/O	Input/Output
IC	Integrated Circuit
IMEI	International Mobile Equipment Identity
kbps	Kilo bits per second
LED	Light Emitting Diode
Li-Ion	Lithium-Ion
MO	Mobile Originated



<b>Abbreviation</b>	<b>Description</b>
MS	Mobile Station (GSM engine), also referred to as TE
MT	Mobile Terminated
PAP	Password Authentication Protocol
PBCCH	Packet Switched Broadcast Control Channel
PCB	Printed Circuit Board
PCS	Personal Communication System, also referred to as GSM 1900
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
TDMA	Time Division Multiple Access
TE	Terminal Equipment, also referred to as DTE
TX	Transmit Direction
URC	Unsolicited Result Code
USSD	Unstructured Supplementary Service Data
VSWR	Voltage Standing Wave Ratio
<b>Phonebook abbreviations</b>	
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)
ME	Mobile Equipment phonebook
RC	Mobile Equipment list of received calls
SM	SIM phonebook
DC	ME dialed calls list(+CPBW may not be applicable or this storage)(same as LD)
LA	Last Number All list (LND/LNM/LNR)
ON	SIM (or ME) own numbers (MSISDNs) list
SD	SIM service dial number
VM	SIM voice mailbox
BN	SIM barred dialled number

## 2 Product concept

Designed for global market, SIM300D is tri-band GSM/GPRS engine that works on frequencies, GSM 900 MHz, DCS 1800 MHz and PCS1900 MHz. SIM300D provides GPRS multi-slot class 10 /Class 8<sup>①</sup> capability and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

① SIM300D also provides GPRS multi-slot class 8, and the default is class 10.

With a tiny configuration of 33mm x 33mm x 3 mm, SIM300D can fit almost all the space requirement in your application, such as Smart phone, PDA phone, Car Phone, Wireless PSTN, and other mobile device.

The hardware package of 48 pins

- 9 GND PINS and 2 VBAT pins
- 1 pin is programmable as General Purpose I/O. **This gives you the flexibility to develop customized applications.**
- Serial port and Debug port can help you easily develop your applications. But they can not work at the same time.
- Two audio channels include two microphones inputs and two speaker outputs. This can be easily configured by AT command.

With the charge circuit integrated inside the SIM300D, it is very suitable for the battery power application.

The SIM300D provides RF antenna interface. And customer's antenna should be located in the customer's mainboard and connect to module's antenna pad through micro strip line or other type RF traces whose impedance must be controlled in 50Ω.

The SIM300D is designed with power saving technique, the current consumption is as low as 2.5mA in SLEEP mode (paging rate 5).

The SIM300D is integrated with the TCP/IP protocol, Extended TCP/IP AT commands are developed for customers to use the TCP/IP protocol easily, which is useful for those data transfer applications.

## 2.1 SIM300D key features at a glance

**Table 3: SIM300D key features**

Feature	Implementation
Power supply	Single supply voltage 3.4V – 4.5V
Power saving	Typical power consumption in SLEEP mode to 2.5mA ( BS-PA-MFRMS=5 )
Charging	Supports charging control for Li-Ion battery
Frequency bands	<ul style="list-style-type: none"> <li>● SIM300D tri-band: GSM 900, DCS 1800, PCS 1900. The band can be set by AT COMMAND, and default band is EGSM 900 and DCS 1800.</li> <li>● Compliant to GSM Phase 2/2+</li> </ul>
GSM class	Small MS
Transmit power	<ul style="list-style-type: none"> <li>● Class 4 (2W) at EGSM900</li> <li>● Class 1 (1W) at DCS1800 and PCS 1900</li> </ul>
GPRS connectivity	<ul style="list-style-type: none"> <li>● GPRS multi-slot class 8 ( optional )</li> <li>● GPRS multi-slot class 10 ( default)</li> <li>● GPRS mobile station class B</li> </ul>
Temperature range	<ul style="list-style-type: none"> <li>● Normal operation: -20°C to +55°C Restricted operation: -30°C to -20°C and +55°C to +80°C</li> <li>● Storage temperature -40°C to +80°C</li> </ul>
DATA GPRS:	<ul style="list-style-type: none"> <li>● GPRS data downlink transfer: max. 85.6 kbps</li> <li>● GPRS data uplink transfer: max. 42.8 kbps</li> <li>● Coding scheme: CS-1, CS-2, CS-3 and CS-4</li> <li>● SIM300D supports the protocols PAP (Password Authentication Protocol) usually used for PPP connections.</li> <li>● The SIM300D integrates the TCP/IP protocol.</li> <li>● Support Packet Switched Broadcast Control Channel (PBCCH)</li> </ul>
CSD:	<ul style="list-style-type: none"> <li>● CSD transmission rates: 2.4, 4.8, 9.6, 14.4 kbps, non-transparent</li> <li>● Unstructured Supplementary Services Data (USSD) support</li> </ul>
SMS	<ul style="list-style-type: none"> <li>● MT, MO, CB, Text and PDU mode</li> <li>● SMS storage: SIM card</li> <li>● Support transmission of SMS alternatively over CSD or GPRS. User can choose preferred mode.</li> </ul>
FAX	Group 3 Class 1
SIM interface	Support SIM card: 1.8V ,3V
External antenna	Connected via 50 Ohm antenna connector or antenna pad
Audio features	Speech codec modes: <ul style="list-style-type: none"> <li>● Half Rate (ETS 06.20)</li> </ul>

	<ul style="list-style-type: none"> <li>● Full Rate (ETS 06.10)</li> <li>● Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80)</li> <li>● Echo suppression</li> </ul>
Serial interface and Debug interface	<ul style="list-style-type: none"> <li>● Serial Port Seven lines on Serial Port Interface</li> <li>● Serial Port can be used for CSD FAX, GPRS service and sending AT command of controlling module.</li> <li>● Autobauding supports baud rates from 1200 bps to 115200bps.</li> <li>● Debug port provide two lines on Serial Port Interface /TXD and /RXD</li> <li>● Debug port is only used for transmitting AT command.</li> </ul>
Phonebook management	Support phonebook types: SM, FD, LD, MC, RC, ON, ME,BN,VM,LA,DC,SD
SIM Application Toolkit	Support SAT class 3, GSM 11.14 Release 98
Real time clock	Implemented
Timer function	Programmable via AT command
Physical characteristics	Size: <b>33±0.15 x 33±0.15 x 3±0.3 mm</b> Weight: <b>8g</b>
Firmware upgrade	Firmware upgrade over serial interface

**Table 4: 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

### 3 Application interface

All hardware interfaces are described in detail in following chapters:

- Power supply and charging control (see Chapters 3.3 and 3.5)
- Provide serial interface and Debug interface (see chapter 3.9)
- Two analog audio interfaces (see chapter 3.10)
- SIM interface (see chapter 3.11)

#### 3.1 SIM300D pin description

Table 5: Pin description

Power Supply			
PIN NAME	I/O	DESCRIPTION	
VBAT		TWO VBAT pins are dedicated to connect the supply voltage. The power supply of SIM300D has to be a single voltage source of VBAT= 3.4V...4.5V. It must be able to provide sufficient current in a transmit burst which typically rises to 2A. mostly, these 2 pins are voltage input, however, when use the charge circuit to charge the battery, these pins become the current output, select one of these pins as the charge current output pin	Vmax= 4.5V Vmin=3.4V Vnorm=4.0V
VRTC	I/O	Current input for RTC when the battery is not supplied for the system. Current output for backup battery when the main battery is present and the backup battery is in low voltage state.	Vmax=2.0V Vmin=1.2V Vnorm=1.8V I norm= 20uA
VCHG	I	Voltage input for the charge circuit, as the signal for detecting the charger connecting	Vmax=5.25V Vmin=1.1 * VBAT Vnorm=5.1V Imin=650mA
GND		Digital ground	

**Power on or power off**

PIN NAME	I/O	DESCRIPTION	
PWRKEY	I	Voltage input for power on key. Press the key , the PWRKEY get a low level Voltage for user to power on or power off the system, the user should keep pressing the key for a moment when power on or power off the system. Because the system need margin time assert the software.	VILmax=0.2*VBAT VIHmin=0.6*VBAT VImax=VBAT

**Audio interfaces**

PIN NAME	I/O	DESCRIPTION	
MIC1P MIC1N	I	Positive and negative voiceband input	Audio DC Characteristics refer to chapter 3.10
MIC2P MIC2N	I	Auxiliary positive and negative voiceband input	
SPK1P SPK1N	O	Positive and negative voiceband output	
SPK2P SPK2N	O	Auxiliary positive and negative voiceband output	
AGND		Analog ground	

**GERNERAL PURPOSE input/output**

PIN NAME	I/O	DESCRIPTION	
STATUS	O	Indicate work status	VILmin=0V
GPO1	O	The GPO can be configured by AT command for outputting high or low level voltage. All of the GPOs are initial low without any setting from AT command.	VILmax=0.3 *VDD_EXT
DISP_DATA	I/O		VIHmin=0.7*VDD_EXT
DISP_CLK	O		VIHmax= VDD_EXT+0.3
DISP_CS	O		VOLmin=GND
DISP_D/C	O		VOLmax=0.2V
DISP_RST	O		VOHmin= VDD_EXT-0.2
KBR0	I		VOHmax= VDD_EXT

**Serial interface**

PIN NAME	I/O	DESCRIPTION	
RXD	I	Receive Data	VILmin=0V
DTR	I	Data Terminal Ready	VILmax=0.3*VDD_EXT
TXD	O	Transmit Data	VIHmin=0.7*VDD_EXT
RTS	I	Request to Send	VIHmax= VDD_EXT+0.3
CTS	O	Clear to Send	VOLmin=GND
RI	O	Ring Indicator	VOLmax=0.2V
			VOHmin= VDD_EXT-0.2
			VOHmax= VDD_EXT

Debug interface			
DBG_TXD	O	Serial interface for debugging and communication	
DBG_RXD	I		
SIM interface			
PIN NAME	I/O	DESCRIPTION	
SIM_VDD	O	Voltage Supply for SIM card	The voltage can be select by software either 1.8v or 3V
SIM_DATA	I/O	SIM Data Output	VILmin=0V
SIM_CLK	O	SIM Clock	VILmax=0.3*SIM_VDD
SIM_RST	O	SIM Reset	VIHmin=0.7*SIM_VDD VIHmax= SIM_VDD+0.3 VOLmin=GND VOLmax=0.2V VOHmin= SIM_VDD-0.2 VOHmax= SIM_VDD
ADC			
PIN NAME	I/O	DESCRIPTION	
ADC0	I	General purpose analog to digital converter.	Input voltage value scope 0V to 2.4V
TEMP_BAT	I	For measure the batter temperature	

### 3.2 Operating modes

The following table summarizes the various operating modes, each operating modes is referred to in the following chapters.

**Table 6: Overview of operating modes**

Mode	Function	
Normal operation	GSM/GPRS SLEEP	Module will automatically go into SLEEP mode if DTR is set to high level and there is no on air or audio activity is required 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.  During sleep mode, the module can still receive paging message and SMS from the system normally.
	GSM IDLE	Software is active. Module has registered to the GSM network, and the module is ready to send and receive.

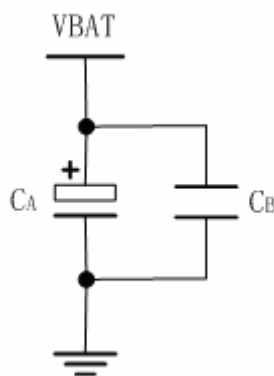
	GSM TALK	CSD connection is going on between two subscribers. In this case, the power consumption depends on network settings such as DTX off/on, FR/EFR/HR, hopping sequences, antenna.
	GPRS IDLE	Module is ready for GPRS data transfer, but no data is currently sent or received. In this case, power consumption depends on network settings and GPRS configuration (e.g. multi-slot settings).
	GPRS DATA	There is GPRS data in transfer (PPP or TCP or UDP). 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 shutdown by sending the “AT+CPOWD” command or using the PWRKEY. The power management ASIC disconnects the power supply from the baseband part of the module, only the power supply for the RTC is remained. Software is not active. The serial interfaces are not accessible. Operating voltage (connected to BATT+) remains applied.
Minimum functionality mode (without remove power supply)		Use the “AT+CFUN” command can set the module to a minimum functionality mode without remove the power supply. In this case, the RF part of the module will not work or the SIM card will not be accessible, or RF part and SIM card will be closed all, the serial interfaces is still accessible. The power consumption in this case is very low.
Alarm mode		RTC alert function launches this restricted operation while the module is in POWER DOWN mode. SIM300D will not be registered to GSM network and only parts of AT commands can be available.
GHOST Mode (Charge-only mode)		GHOST mode means off and charging mode. In this mode, the module can not be registered to GSM network and only limited AT commands can be accessible, the following way will launch GHOST mode: <ul style="list-style-type: none"> <li>● From POWER DOWN mode: Connect charger to the module’s VCHG pin and VBAT pin while SIM300D is power down.</li> <li>● From Normal mode: Connect charger to the module’s VCHG pin and VBAT pin, then power down the module by “AT+CPOWD”</li> </ul>
Charge mode during normal operation		Start charging while the module is in normal mode including: SLEEP, IDLE, TALK, GPRS IDLE and GPRS DATA)

### 3.3 Power supply

The power supply of SIM300D is from a single voltage source of VBAT= 3.4V...4.5V. In some case, the ripple in a transmit burst may cause voltage drops when current consumption rise to typical peaks of 2A, So the power supply must be able to provide sufficient current up to 2A..



For the VBAT input, a local bypass capacitor is recommended. A capacitor (about 100 $\mu$ F, low ESR) is recommended. Multi-layer ceramic chip (MLCC) capacitors can provide the best combination of low ESR and small size but may not be cost effective. A lower cost choice may be a 100  $\mu$ F tantalum capacitor (low ESR) with a small (0.1  $\mu$ F to 1  $\mu$ F) ceramic in parallel, which is illustrated as figure1. And the capacitors should put as closer as possible to the SIM300D VBAT pins.



**Figure 1: VBAT input**

The following figure is the VBAT voltage ripple wave at the maximum power transmit phase, the test condition is VBAT=4.0V, VBAT maximum output current =2A, CA=100  $\mu$ F tantalum capacitor (ESR=0.7 $\Omega$ ) and CB=1 $\mu$ F.



**Figure 2: VBAT voltage drop at the maximum power transmit phase**

### 3.3.1 Power supply pins

Two VBAT pins of SIM300D are dedicated to connect the supply voltage. Nine GND pins are recommended for grounding. The VCHG pin serves as a control signal for charging a Li-Ion battery. VRTC pin can be used to back up the RTC.

### 3.3.2 Minimizing power losses

Please pay special attention to the supply power when you are designing your applications. Please make sure that the input voltage will never drop below 3.4V even in a transmit burst during which the current consumption may rise up to 2A. If the power voltage drops below 3.4V, the module may be switched off. You should also take the resistance of the power supply lines on the host board or of battery pack into account.

### 3.3.3 Monitoring power supply

To monitor the supply voltage, you can use the “AT+CBC” command which include three parameters: charge state, voltage percent and voltage value (in mV). It returns charge state, the battery voltage 1-100 percent of capacity and actual value measured at VBAT and GND.

The voltage is continuously measured at intervals depending on the operating mode. The displayed voltage (in mV) is averaged over the last measuring period before the AT+CBC command was executed.

For details please refer to *document [1]*

## 3.4 Power up / down scenarios

### 3.4.1 Turn on SIM300D

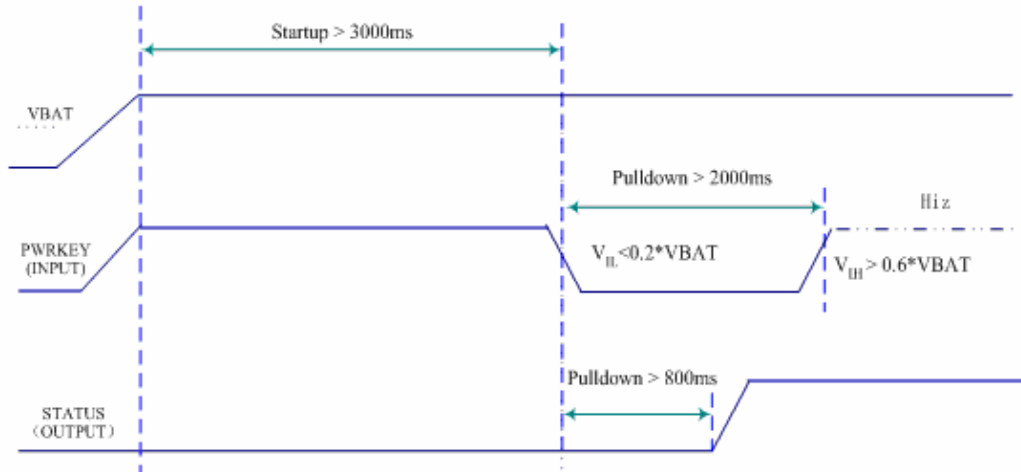
SIM300D can be turned on by various ways, which are described in following chapters:

- Via PWRKEY pin: starts normal operating mode (see chapter 3.2);
- Via VCHG pin: starts GHOST modes (see chapter 3.4.1.2);
- Via RTC interrupt: starts ALARM modes (see chapter 3.4.1.4)

**Note: Only enter AT command through serial port after SIM300D is power on and Unsolicited Result Code “RDY” is received from serial port. If configured to a fixed baud rate, SIM300D will send the result code “RDY” to indicate that it is ready to operate. This result code does not appear when autobauding is active. You can use AT+IPR=x:&W to set a fixed baud rate and save the configuration to non-volatile flash memory. See Chapter AT+IPR in *document [1]*.**

#### 3.4.1.1 Turn on SIM300D using the PWRKEY pin (Power on)

You can turn on the SIM300D by driving the PWRKEY to a low level voltage for period time. The power on scenarios illustrate as figure3.



**Figure 3: Timing of turn on system**

When power on procedure completed, SIM300D will send out following result code to indicate the module is ready to operate, when set as fixed baud rate.. STATUS pin will drive to 2.8V and keep this level when in work mode. If configured to a fixed baud rate, SIM300D will send the result code “RDY” to indicate that it is ready to operate. This result code does not appear when autobauding is active.

***RDY***

### 3.4.1.2 Turn on the SIM300D using the VCHG signal

As described in chapter 3.4, charger can be connected to SIM300D’s VCHG pin regardless of the module’s operating mode.

If the charger is connected to the module’s VCHG pin while SIM300D is in POWER DOWN mode, SIM300D will go into the GHOST mode (Off and charging). In this mode, the module will not register to network, and only a few AT commands can work in this mode. For detailed information please refers to chapter 3.5.

When module is powered on using the VCHG signal, SIM300D sends out result code as following when fixed baud rate:

***RDY***

***GHOST MODE***

In GHOST mode, by driving the PWRKEY to a low level voltage for period time (Please refer to the power on scenarios in 3.4), SIM300D will power up and go into charge mode (charging in normal mode), all operation and AT commands can be available. In this case, SIM300D will send out result code as following:

***From GHOST MODE to NORMAL MODE***

### 3.4.1.3 Turn on SIM300D using the RTC (Alarm mode)

Alarm mode is a power-on approach by using the RTC. The alert function of RTC makes the SIM300D wake up while the module power off. In alarm mode, SIM300D will not register to GSM network and the software protocol stack is closed. Thus the parts of AT commands related with SIM card and Protocol stack will not be accessible, and the others can be used as well as in normal mode.

Use the AT+CALARM command to set the alarm time. The RTC remains the alarm time if SIM300D power down by “AT+CPOWD” or by PWRKEY pin. Once the alarm time expired and executed, SIM300D goes into the Alarm mode. In this case, SIM300D will send out an Unsolicited Result Code (URC) when set as fixed baud rate::

***RDY***

***ALARM MODE***

During Alarm mode, use AT+CFUN command to query the status of software protocol stack; it will return 0 which indicates that the protocol stack is closed. Then after 90s, SIM300D will power down automatically. However, during Alarm mode, if the software protocol is started by AT+CFUN=1 command, the process of automatic power down will not be available. In ALARM mode, drive the PWRKEY to a low level voltage for a period time will cause SIM300D enter into power down mode.(Please refer to the power down scenarios).

The table follow briefly summarizes the AT commands that are used usually during alarm mode, for details of the instructions refer to *document [1]*:

**Table 7: AT commands used in Alarm mode**

<b>AT command</b>	<b>USE</b>
AT+CALARM	Set alarm time
AT+CCLK	Set data and time of RTC
AT+CPOWD	Power down
AT+CFUN	Start or close the protocol stack

### 3.4.2 Turn off SIM300D

Following procedure can be used to turn off the SIM300D:

- Normal power down procedure: Turn off SIM300D using the PWRKEY pin
- Normal power down procedure: Turn off SIM300D using AT command
- Under-voltage automatic shutdown: Take effect if Under-voltage is detected
- Over-temperature automatic shutdown: Take effect if Over-temperature is detected

### 3.4.2.1 Turn off SIM300D using the PWRKEY pin (Power down)

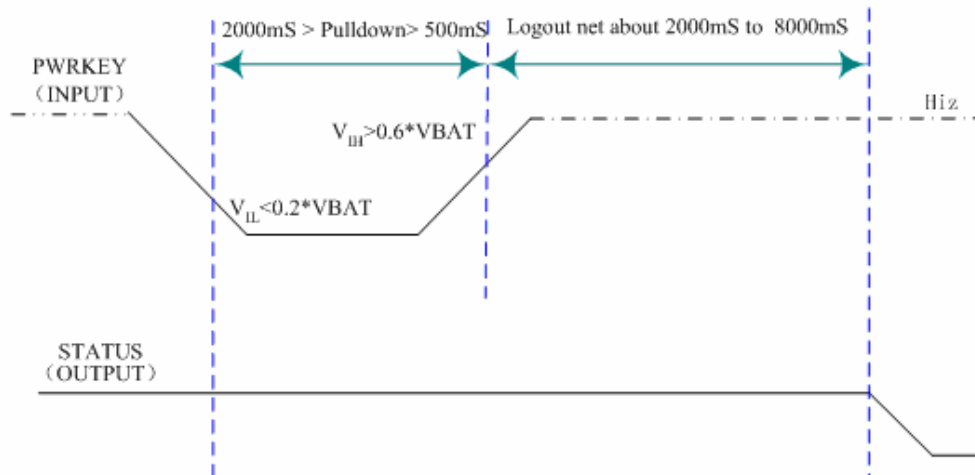
You can turn off the SIM300D by driving the PWRKEY to a low level voltage for a period time. The power down scenarios illustrate as figure4.

This procedure will make the module log off from the network and allow the software to enter into a secure state and save data before completely disconnect the power supply.

Before the completion of the switching off procedure the module will send out result code:

**POWER DOWN**

After this moment, the AT commands can not be executed. Module enters the POWER DOWN mode, only the RTC is still active. POWER DOWN can also be indicated by STATUS pin, which is a low level voltage in this mode.



**Figure 4: Timing of turn off system**

### 3.4.2.2 Turn off SIM300D using AT command

You can use an AT command “AT+CPOWD” to turn off the module. This command will make the module log off from the network and allow the software to enter into a secure state and save data before completely disconnect the power supply.

Before switching off, the module will send out result code:

**POWER DOWN**

After this moment, any AT commands can not be executed. Module enters into the POWER DOWN mode, only the RTC is still active. POWER DOWN can also be indicated by STATUS pin, which is a low level voltage in this mode.

Please refer to *document [1]* for detail about the AT command of “AT+CPOWD”.

### 3.4.2.3 Under-voltage Automatic shutdown

Software will constantly monitor the voltage applied on the VBAT, if the measured battery voltage is no more than 3.5V, the module will send out result code:

***POWER LOW WARNING***

If the measured battery voltage is no more than 3.4V, the following URC will be presented:

***UNDERVOLTAGE POWER DOWN***

After this moment, no further more AT commands can be executed. The module will log off from network and enter POWER DOWN mode, only the RTC is still active. POWER DOWN can also be indicated by STATUS pin, which is a low level voltage in this mode.

### 3.4.2.4 Over-temperature automatic shutdown

Software will constantly monitor the temperature of the module, if the measured temperature is equal or higher than 80°C, the following URC will be presented:

***+CMTE:1***

If the measured temperature  $\leq -30^{\circ}\text{C}$ , the following URC will be presented:

***+CMTE:-1***

The uncritical temperature range is  $-35^{\circ}\text{C}$  to  $85^{\circ}\text{C}$ . If the measured temperature  $\geq 85^{\circ}\text{C}$  or  $\leq -35^{\circ}\text{C}$ , the module will be automatic shutdown soon.

If the measured temperature  $\geq 85^{\circ}\text{C}$ , the following URC will be presented:

***+CMTE:2***

If the measured temperature  $\leq -35^{\circ}\text{C}$ , the following URC will be presented:

***+CMTE:-2***

After this moment, the AT commands can not be executed. The module will log off from network and enter into POWER DOWN mode, only the RTC is still active. POWER DOWN can also be indicated by STATUS pin, which is a low level voltage in this mode.

To monitor the temperature, you can use the “AT+CMTE” command to measure the temperature when the module is power on.

For details please refer to *document [1]*

### 3.5 Charging interface

SIM300D has integrated a charging circuit inside the module for Li-Ion batteries charging control, which make it very convenient for applications to manage their battery charging. A common connection is shown in the following figure:

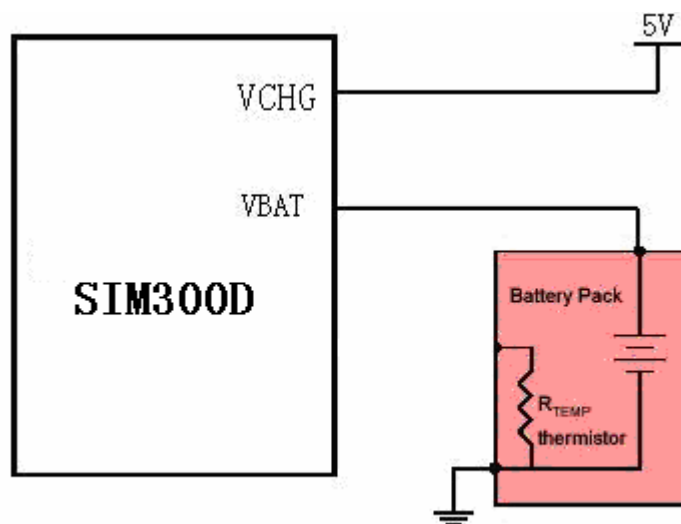


Figure 5: Battery charger and pack

#### 3.5.1 Battery pack characteristics

SIM300D has optimized the charging algorithm for the Li-Ion battery that meets the characteristics listed below. To use SIM300D's charging algorithm properly, it is recommended that the battery pack you integrated into your application is compliant with these specifications. The battery pack compliant with these specifications is also important for the AT command "AT+CBC" to monitor the voltage of battery, or the "AT+CBC" may return incorrect battery capacity values.

- The maximum charging voltage of the Li-Ion battery pack is 4.2V and the recommended capacity is 580mAh. If the Battery packs with a capacity more than 580 mAh, it will cost more time for charging.
- The pack should have a protection circuit to avoid overcharging, deep discharging and over-current. This circuit should be insensitive to pulsed current.
- On the SIM300D, the build-in circuit of SIM300D's power management chipset monitors the supply voltage constantly. Once the Under-voltage is detected, the SIM300D will be power down automatically. Under-voltage thresholds are specific to the battery pack.
- The internal resistance of the battery and the protection circuit should be as low as possible. It is recommended not to exceed 200mΩ.
- The battery pack must be protected from reverse pole connection.

### 3.5.2 Recommended battery pack

Following is the spec of recommended battery pack:

**Table 8: Spec of recommended battery pack**

Product name & type	BYD, Li-Ion, 3.7V, 580mAh
To obtain more information Please contact :	BYD COMPANY LIMITED
Normal voltage	3.7V
Capacity	NORMAL 580mAh
Charge Voltage	4.200±0.049V
Max Charge Current	1.5C
Charge Method	CC / CV (Constant Current / Constant Voltage)
Max Discharge Current	1.5C (for continuous discharging mode)
Discharge Cut-off Voltage	2.75V/ cell
Internal resistance	Initial ≤200mΩ After 400cycles ≤270mΩ

### 3.5.3 Implemented charging technique

The SIM300D include the function for battery charging. There are three pins in the connector related with the battery charging function: VCHG, VBAT and BAT\_TEMP pins. The VCHG pin is driven by an external voltage, system can use this pin to detect a charger supply and provide most charging current through SIM300D module to battery when charging is in fast charge state. The VBAT give out charging current from SIM300D module to external battery. BAT\_TEMP pin is for user to measure the battery temperature. Just let this pin open if battery temperature measuring is not your concern.

So it is very simple to implement charging technique, you need only connect the charger to the VCHG pin and connect the battery to the VBAT pin.

The SIM300D detect charger supply and the battery is present, battery charging will happen. If there is no charger supply or no battery present the charging will not be enabled.

Normally, there are three main states in whole charging procedure.

- DDLO charge and UVLO charge;
- Fast charge;
- Trickle charge;

#### **DDLO charge and UVLO charge:**

DDLO (deep discharge lock out) is the state of battery when its voltage is under 2.4V. And UVLO (under voltage lock out) means the battery voltage less than 3.2V and more than 2.4V.



The battery is not suitable for fast charge when its condition is DDLO or UVLO. The SIM300D provides a small constant current to the battery when the battery is between DDLO and UVLO. In DDLO charge, SIM300D gives out 5mA current to the battery. And in UVLO charge, SIM300D provides about 25mA current to the battery.

DDLO charge terminated when the battery voltage reaches 2.4V. UVLO charge terminated when the battery voltage is up to 3.2V. Both DDLO and UVLO charge are controlled by the SIM300D hardware only.

#### **Fast charge:**

If there is a charger supply and battery present and the battery is not in DDLO and UVLO, SIM300D will enter fast charge state. Fast charge is controlled by the software. Fast charge delivers a strong and constant current (about 550mA) through VBAT pin to the battery until battery voltage reach 4.2V.

#### **Trickle charge:**

After fast charging, the battery voltage is close to the whole battery capacity, trickle charge begins. In this state, the SIM300D charges the battery under constant voltage.

### **3.5.4 Operating modes during charging**

The battery can be charged during various operating mode. That means that when the GSM engine is in Normal mode (SLEEP, IDLE, TALK, GPRS IDLE or GPRS DATA mode), charging can be in progress while SIM300D remains operational (In this case the voltage supply should be sufficient). Here we name Charging in Normal mode as Charge mode.

If the charger is connected to the module's VCHG pin and the battery is connected to the VBAT pin while SIM300D is in POWER DOWN mode, SIM300D will go into the GHOST mode (Off and charging). The following table gives the difference between Charge mode and GHOST mode:

**Table 9: operating modes**

	<b>How to activate mode</b>	<b>Features</b>
<b>Charge Mode</b>	Connect charger to module's VCHG pin and connect battery to VBAT pin of module while SIM300D is in Normal operating mode, including: IDLE, TALK mode; SLEEP mode etc;	<ul style="list-style-type: none"> <li>● GSM remains operational and registered GSM network while charging is in progress;</li> <li>● The serial interfaces are available in IDLE, TALK mode, the AT command set can be used fully in this case; In SLEEP mode, the serial interfaces are not available, once the serial port is connected and there is data in transfer. Then SIM300D will exit the SLEEP mode.</li> </ul>

<b>GHOST Mode</b>	<p>Connect charger to module's VCHG pin while SIM300D is in POWER DOWN mode.</p> <p>IMPORTANT: Here GHOST mode is OFF and Charging mode, it means that not all software tasks are running.</p>	<ul style="list-style-type: none"> <li>● Battery can be charged when GSM engine is not registered to GSM network;</li> <li>● Only a few AT commands is available as listed below.</li> </ul>
-------------------	--	--

**Note:**

VBAT can not provide much more than 5mA current while sim300D module is during the DDLO charge state. In other words it is strongly recommended that VBAT should not be the main power supply in the application subsystem while sim300D module is during the DDLO charge state.

**Table 10: AT Command usually used in GHOST mode**

AT command	Function
AT+CALARM	Set alarm time
AT+CCLK	Set data and time of RTC
AT+CPOWD	Power down
AT+CBC	Indicated charge state and voltage
AT+CFUN	Start or close the protocol Set AT command“ AT+CFUN =1”,module can be transferred from <b>GHOST</b> mode to <b>Charging in normal</b> mode, In <b>GHOST</b> mode , the default value is 0

**3.5.5 Charger requirements**

Following is the requirements of charger for SIM300D.

- a) Simple transformer power plug
  - Output voltage: 5.0V-5.25V
  - Charging current limitation: 650mA
  - A 10V peak voltage is allowed for maximum 1ms when charging current is switched off.
  - A 1.6A peak current is allowed for maximum 1ms when charging current is switched on.

**3.6 Power saving**

There are two methods to achieve SIM300D module extreme low power. “AT+CFUN” is used to set module into minimum functionality mode and DTR hardware interface signal can be used to set system to be SLEEP mode (or Slow clocking mode).

### 3.6.1 Minimum functionality mode

Minimum functionality mode reduces the functionality of the module to a minimum and, thus, minimizes the current consumption to the lowest level. This mode is set with the “AT+CFUN” command which provides the choice of the functionality levels <fun>=0, 1, 4

- 0: minimum functionality;
- 1: full functionality (Default);
- 4: disable phone both transmit and receive RF circuits;

If SIM300D has been set to minimum functionality by “AT+CFUN=0”, then the RF function and SIM card function will be closed, in this case, the serial port is still accessible, but all AT commands need RF function or SIM card function will not be accessible.

If SIM300D has been disabled all RF function by “AT+CFUN=4”, then RF function will be closed, the serial ports is still active in this case but all AT commands need RF function will not be accessible.

When SIM300D is in minimum functionality or has been disable all RF functionality by “AT+CFUN=4”, it can return to full functionality by “AT+CFUN=1”.

For detailed information about “AT+CFUN”, please refer to *document [1]*.

### 3.6.2 SLEEP mode (slow clocking mode)

You can use DTR signal to control SIM300D module to enter or exit the SLEEP mode in your applications.

When DTR is in high level, at the same time there is no on air or audio activity is required and no hardware interrupt (such as GPIO interrupt or data on serial port), SIM300D will enter SLEEP mode automatically. In this mode, SIM300D can still receive paging or SMS from network.

In SLEEP mode, the serial port is not accessible.

**Note: For some special soft versions, it requests to set AT command “AT+CSCLK=1” to enable the sleep mode; the default value is 0, that can’t make the module enter sleep mode, for more details please refer to the AT command list.**

### 3.6.3 Wake up SIM300D from SLEEP mode

When SIM300D is in SLEEP mode, the following method can wake up the module.

- Enable DTR pin to wake up SIM300D  
If DTR Pin is pull down to a low level, this signal will wake up SIM300D from power saving mode. The serial port will be active after DTR change to low level about 20mS.

- Receive a voice or data call from network to wake up SIM300D
- Receive a SMS from network to wake up SIM300D
- RTC alarm expired to wake up SIM300D

### 3.7 Summary of state transitions (except SLEEP mode)

**Table 11: Summary of state transitions**

Further mode	POWER DOWN	Normal mode	Ghost mode (Charge-only mode)	Charging in normal	Alarm mode
Current mode					
POWER DOWN		Use PWRKEY	Connect charger to VCHG and connect battery to VBAT	No direct transition, but via “Ghost mode” or “Normal mode”	Switch on from POWER DOWN mode by RTC
Normal mode	AT+CPOWD or use PWRKEY pin		Connect charger to VCHG and connect battery to VBAT, then switch off module by AT+CPOWD or using PWRKEY	Connect charger to VCHG pin of module and connect battery to VBAT pin of module	Set alarm by “AT+CALARM”, and then switch off the module. When the timer expire, the module turn on and enter Alarm mode
Ghost mode (Charge-only mode)	Disconnect charger	No direct transition, but via “Charging in normal” mode		Turn on the module using PWRKEY OR SET AT Command “AT+CFUN=1”	Set alarm by “AT+CALARM”, when the timer expire, module will enter Alarm mode
Charging in normal	AT+CPOWD → “Ghost mode”, then disconnect charger	Disconnect the charger	Switch off module by AT+CPOWD or using PWRKEY		No direct transition
Alarm mode	Use PWRKEY pin or wait module switch off automatically	Use AT+CFUN	No transition	Use AT+CFUN let module enter Normal mode, then connect the charger to VCHG pin of module	

### 3.8 RTC backup

The RTC (Real Time Clock) power supply of module can be provided by an external battery or a battery (rechargeable or non-chargeable) through VRTC pin. There is a 10K resistance which has been integrated in SIM300D module used for restricting current. You need only a coin-cell battery or a super-cap to VRTC pin to backup power supply for RTC.

The following figures show various sample circuits for RTC backup.

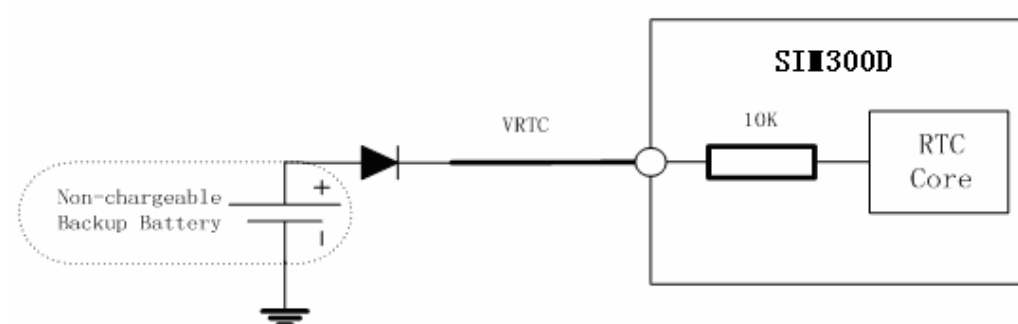


Figure 6: RTC supply from non-chargeable battery

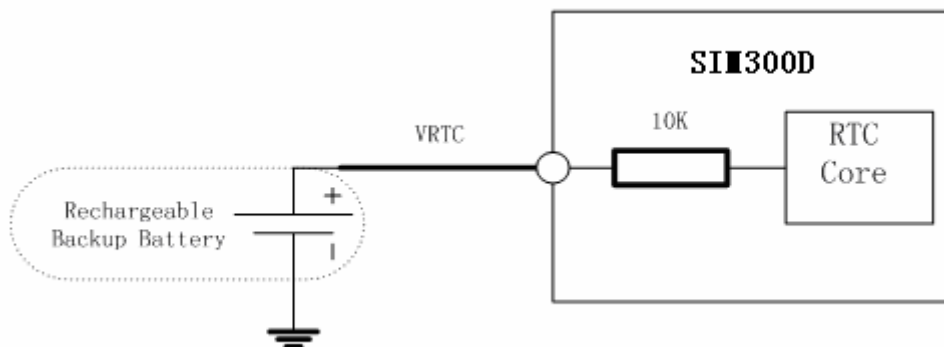


Figure 7: RTC supply from rechargeable battery

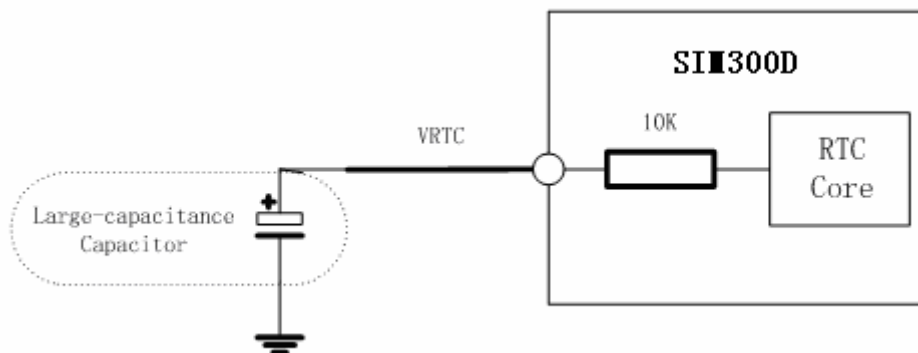


Figure 8: RTC supply from capacitor

- **Li-battery backup**

Rechargeable Lithium coin cells such as the TC614 from Maxell, or the TS621 from Seiko, are also small in size, but have higher capacity than the double layer capacitors resulting in longer backup times.

Typical charge curves for each cell type are shown in following figures. Note that the rechargeable Lithium type coin cells are generally pre-charged from the vendor.

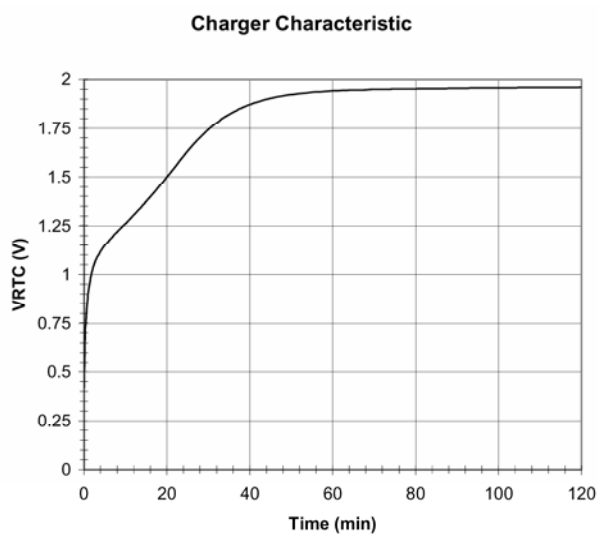
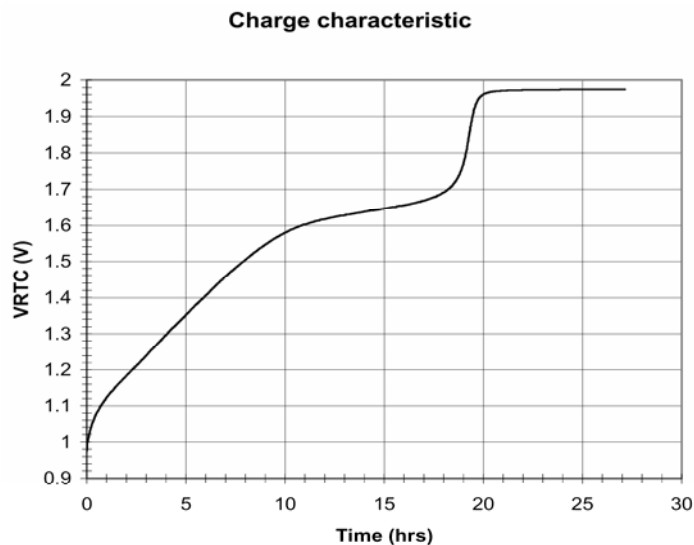
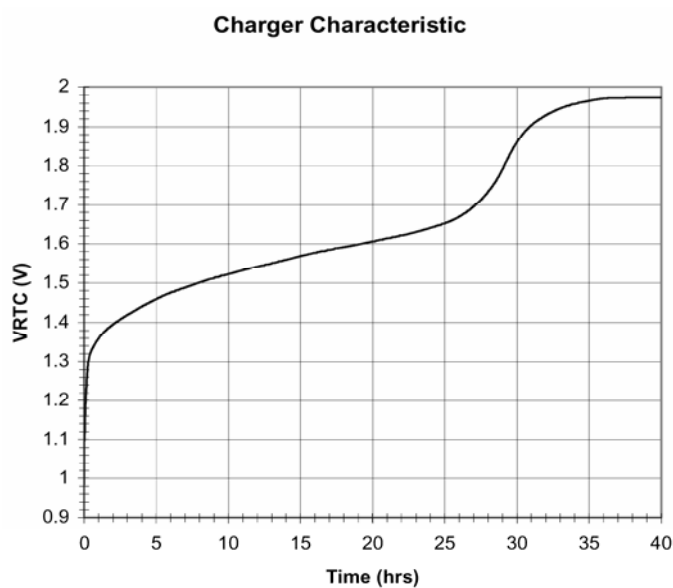


Figure 9: Panasonic EECEMOE204A Charge Characteristic



**Figure 10: Maxell TC614 Charge Characteristic**



**Figure 11: Seiko TS621 Charge Characteristic**

**Note:**

Gold-capacitance backup

Some suitable coin cells are the electric double layer capacitors available from Seiko (XC621), or from Panasonic (EECEM0E204A). They have a small physical size (6.8 mm diameter) and a nominal capacity of 0.2 F to 0.3 F, giving hours of backup time.

### 3.9 Serial interfaces

SIM 300D provides two unbalanced asynchronous serial ports. One is the serial port and another is the debug port. The GSM module is designed as a DCE (Data Communication Equipment), following the traditional DCE-DTE (Data Terminal Equipment) connection, the module and the client (DTE) are connected through the following signal (as figure 12 shows). Autobauding supports bit rates from 1.200 bps to 115200bps.

#### Serial port

- Port/TXD @ Client sends data to the RXD signal line of module
- Port/RXD @ Client receives data from the TXD signal line of module

#### Debug port

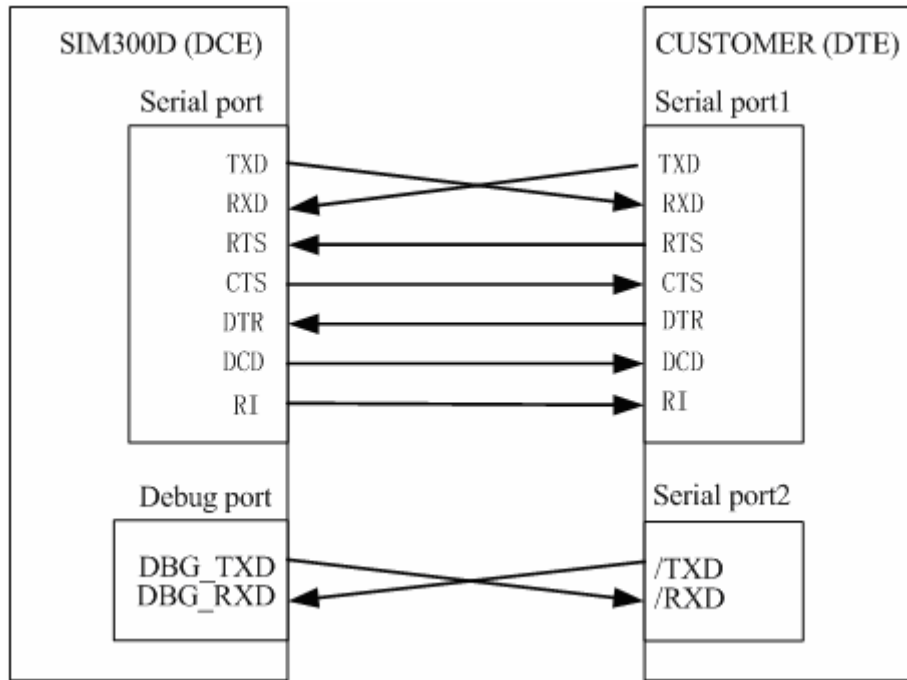
- Port/TXD @ Client sends data to the DBG\_RXD signal line of module
- Port/RXD @ Client receives data from the DBG\_TXD signal line of module

**NOTE:** All pins of both serial ports have 8mA driver, the logic levels are described in following table

**Table 12: Logic levels of serial ports pins**

Parameter	Min	Max	Unit
Logic low input	0	0.3*VDD_EXT	V
Logic high input	0.7 *VDD_EXT	VDD_EXT +0.3	V
Logic low output	GND	0.2	V
Logic high output	VDD_EXT -0.2	VDD_EXT	V





**Figure 12: Interface of serial ports**

### 3.9.1 Function of Serial port and Debug port supporting

#### Serial port

- Seven lines on Serial Port Interface
- Contains Data lines TXD and RXD, State lines RTS and CTS, Control lines DTR, DCD and RING;
- Serial Port can be used for CSD FAX, GPRS service and send AT command of controlling module. Serial Port can use multiplexing function;
- Serial Port supports the communication rate as following:  
300, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 Default as 115200bps.
- Autobauding supports the communication rate as following:  
1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200bps.

Autobauding allows the GSM engine to automatically detect the baud rate configured in the host application. The serial interface of the GSM engine supports autobauding for the following baud rates: 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200. Factory setting is autobauding enabled. This gives you the flexibility to put the GSM engine into operation no matter what bit rate your host application is configured to. To take advantage of autobaud mode specific attention must be paid to the following requirements:

#### **Synchronization between DTE and DCE.**

Ensure that DTE and DCE are correctly synchronized and the baud rate used by the DTE is

detected by the DCE (= ME). To allow the baud rate to be synchronized simply issue an "AT" or "at" string. This is necessary

- after you have activated autobauding
- when you start up the GSM engine while autobauding is enabled. It is recommended to wait 3 to 5 seconds before sending the first AT character. Otherwise undefined characters might be returned.

### Restrictions on autobauding operation

- The serial interface has to be operated at 8 data bits, no parity checkouting and 1 stop bit (factory setting).
- The Unsolicited Result Codes like "RDY", "+CFUN: 1" and "+CPIN: READY" are not indicated when you start up the ME while autobauding is enabled. This is due to the fact that the new baud rate is not detected unless DTE and DCE are correctly synchronized as described above.

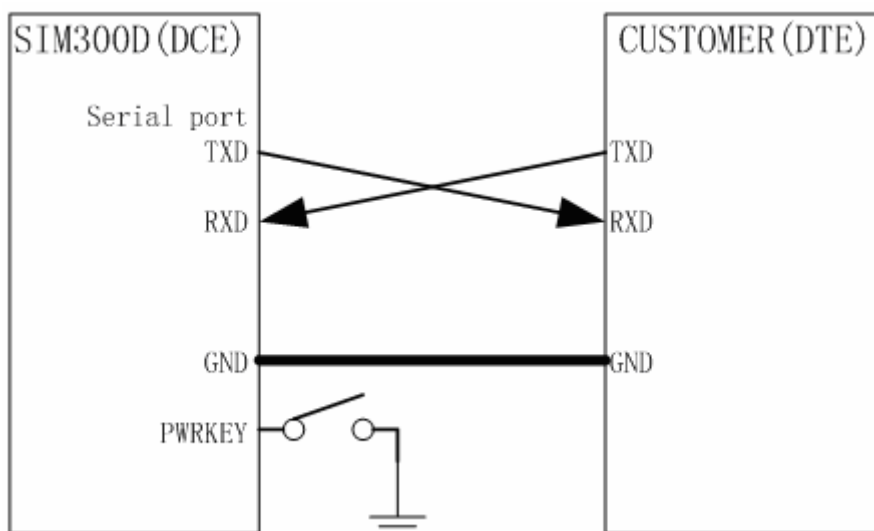
#### Debug port

- Two lines on Serial Port Interface
- Only contains Data lines /TXD and /RXD
- Debug Port only used for debugging. It cannot be used for CSD call, FAX call. And the Debug port can not use multiplexing function;
- Debug port supports the communication rate as following:  
9600, 19200, 38400, 57600, 115200

*Note: You can use AT+IPR=x;&W to set a fixed baud rate and save the configuration to non-volatile flash memory. After the configuration was saved as fixed baud rate, the Unsolicited Result Codes like "RDY" should be received from the serial port all the time when the SIM300 was power on.*

### 3.9.2 Software upgrade and serial Port

The TXD, RXD, DBG\_TXD, DBG\_RXD, GND must be connected to the IO connector when user need to upgrade software and debug software, the TXD, RXD should be used for software upgrade and the DBG\_TXD, DBG\_RXD for software debug. The PWRKEY pin is recommended to connect to the IO connector. The user also can add a switch between the PWRKEY and the GND. The PWRKEY should be connected to the GND when SIM300D is upgrading software. Please refer to the following figure.



**Figure 13: Interface of software upgrade**

*Note: You should match the level of serial port between DCE and DTE.*

### 3.10 Audio interfaces

**Table 13: Audio interface signal**

	Name	Pin	Function
(AIN1/AOUT1)	MIC1P	20	Microphone1 input +
	MIC1N	21	Microphone1 input -
	SPK1P	23	Audio1 output+
	SPK1N	24	Audio1 output-
(AIN2/AOUT2)	MIC2P	18	Microphone2 input +
	MIC2N	19	Microphone2 input -
	SPK2P	26	Audio2 output+
	SPK2N	25	Audio2 output-

The module provides two analog input channels, AIN1 and AIN2, which may be used for both microphone and line inputs. The AIN1 and AIN2 channels are identical. One of the two channels is typically used with a microphone built into a handset. The other channel is typically used with an external microphone or external line input. The module analog input configuration is determined by control register settings and established using analog multiplexers.

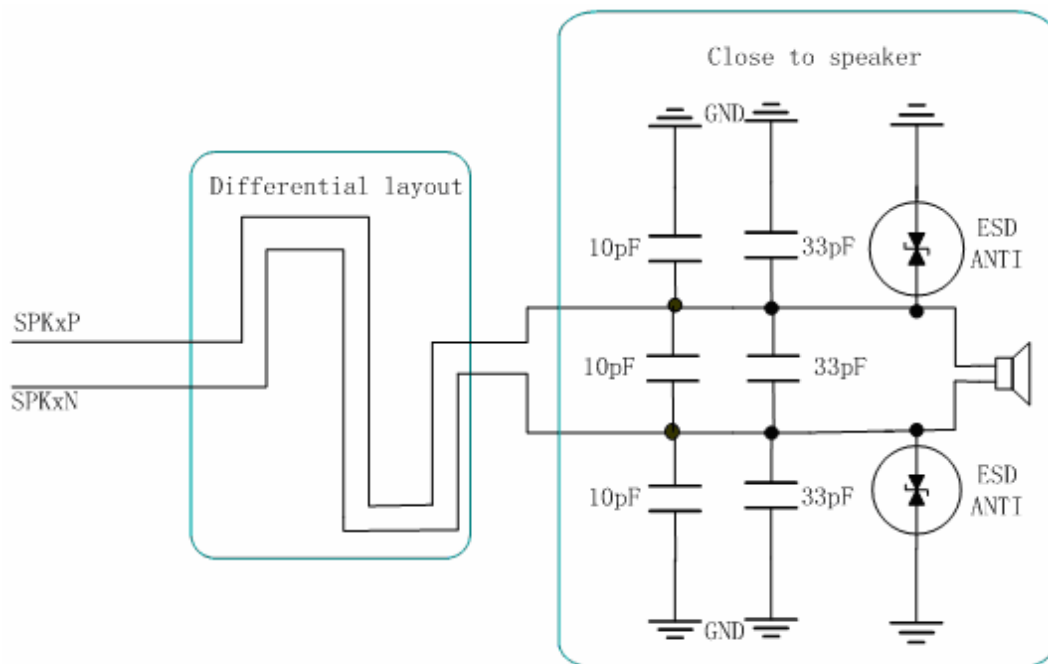
For each channels, you can use AT+CMIC to set the input gain level of microphone, use AT+ECHO to set the parameters for echo cancellation. Also, you can use AT+SIDET to set the side-tone level. For detail, please refer to *document [1]*.

It is suggested that you adopt the one of following two matching circuits in order to reject common mode noise and audio noise. The difference audio signals have to be layout according to difference signal layout rules.

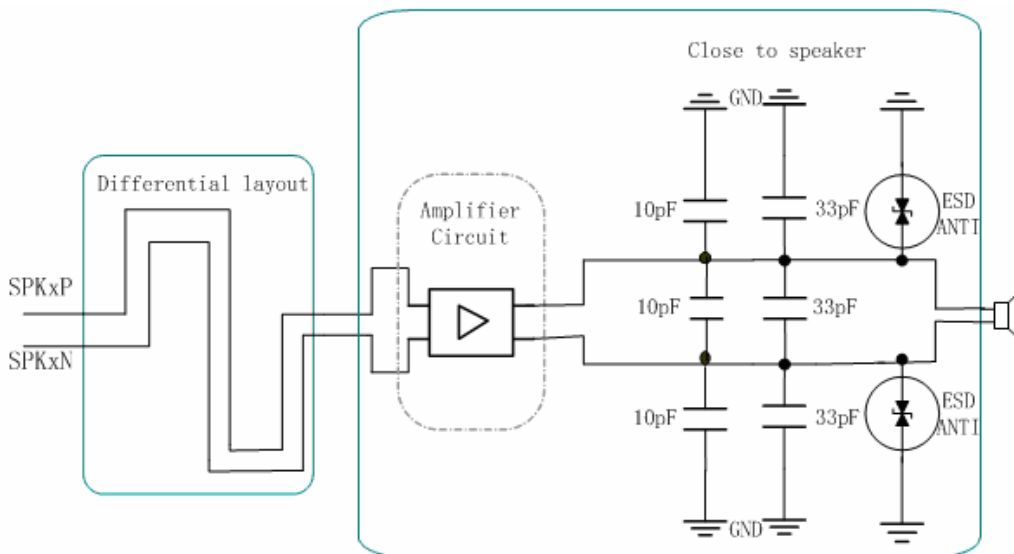
**Notes:**

*As show in following Figures (Note : all components package are 0603) .BEAD must has low impedance and can be removed according to their environment such as the ground plane, shielding, power lost. The best way is to plan all the components shown in the follow figure. If you want to adopt an amplifier circuit for audio, we commend National company's LM4890. But you can select it according to your needs.*

### 3.10.1 Speaker interface configuration

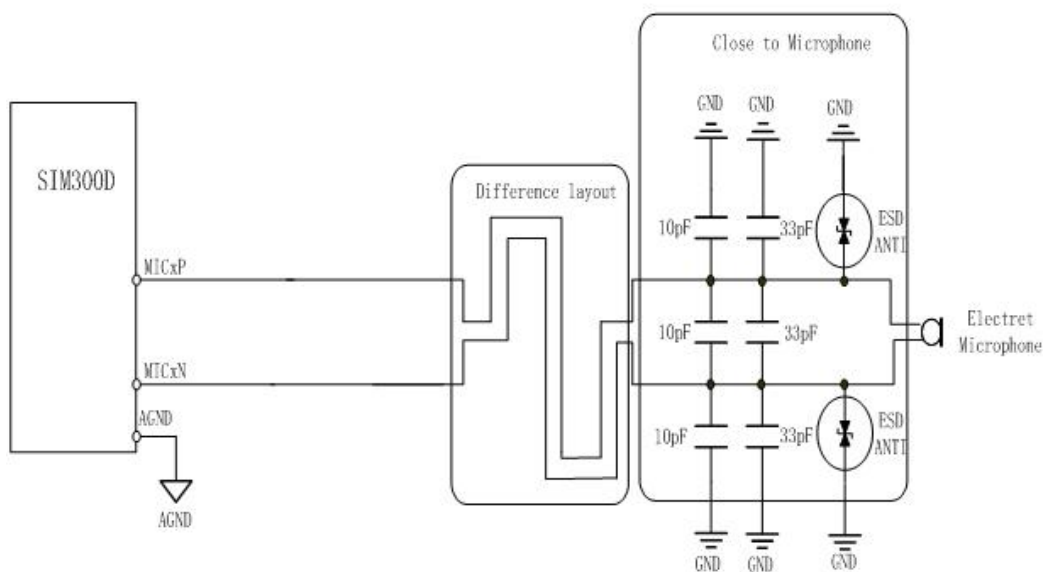


**Figure 14: Speaker interface configuration**



**Figure 15: Speaker interface with amplifier configuration**

### 3.10.2 Microphone interfaces configuration



**Figure 16: Microphone interface configuration**

### 3.10.3 Earphone interface configuration

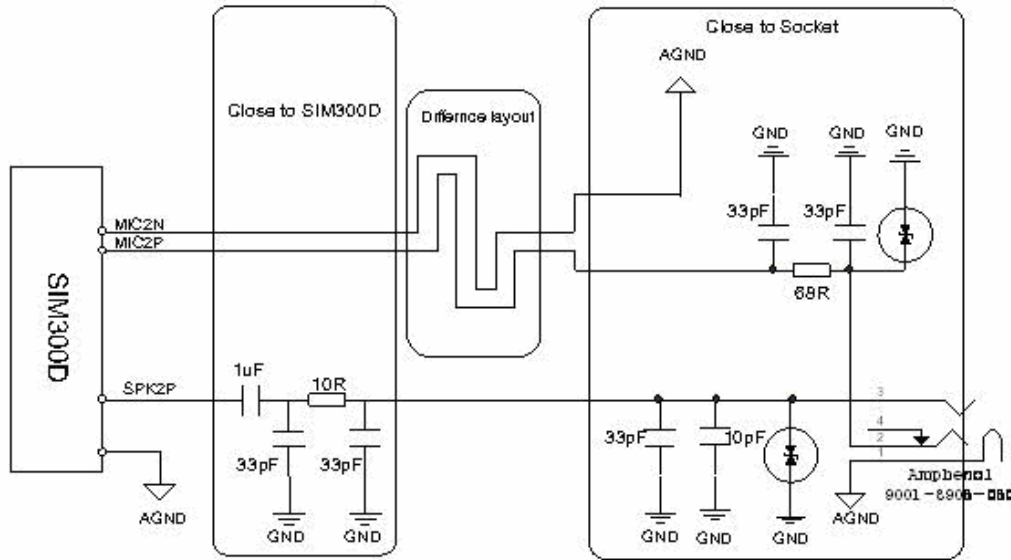


Figure 17: Earphone interface configuration

### 3.10.4 Referenced electronic characteristic

Table 14: MIC Input Characteristics

Parameter	Min	Typ	Max	Unit
Working Voltage		1.25	2.5	V
Working Current	5		300	uA
External Microphone Load Resistance	1.2	2.2		k Ohms

Table 15: Audio Output Characteristics

Parameter		Min	Typ	Max	Unit	
Normal Output(SP1)	Single Ended	load Resistance	27	32		Ohm
		Ref level			1.0954	Vpp
	Differential	load Resistance	27	32		
		Ref level			0.5477	Vpp
Auxiliary Output(SP2)	Single Ended	load Resistance	27	32		Ohm
		Ref level			1.0954	Vpp
	Differential	load Resistance	27	32		
		Ref level			0.5477	Vpp

## 3.11 SIM interface

### 3.11.1 SIM card application

You can use AT Command to get information in SIM card. For more information, please refer to *document [1]*.

The SIM interface supports the functionality of the GSM Phase 1 specification and also supports the functionality of the new GSM Phase 2+ specification for FAST 64 kbps SIM (intended for use with a SIM application Tool-kit).

Both 1.8V and 3.0V SIM Cards are supported.

The SIM interface is powered from an internal regulator in the module having nominal voltage 2.8V. All pins reset as outputs driving low. Logic levels are as described in table

**Table 16: Signal of SIM interface**

Pin	Signal	Description
65	SIM_VDD	SIM Card Power supply, it can identify automatically the SIM Card power mode, one is 3.0V±10%, another is 1.8V±10%. Current is about 10mA.
62	SIM_DATA	SIM Card data I/O
63	SIM_CLK	SIM Card Clock
64	SIM_RST	SIM Card Reset

Following is the reference circuit about SIM interface. We recommend an Electro-Static discharge device ST ([www.st.com](http://www.st.com)) ESDA6V1W5 or ON SEMI ([www.onsemi.com](http://www.onsemi.com)) SMF05C for “ESD ANTI”. The 22Ω resistors showed in the following figure should be added in series on the IO line between the module and the SIM card for matching the impedance. The pull up resistor (about 10KΩ) must be added on the SIM\_DATA line. Note that the SIM peripheral circuit should be placed close to the SIM card socket.

### 3.11.2 Design considerations for SIM card holder

The reference circuit about 6 pins SIM card illustrates as following figure.

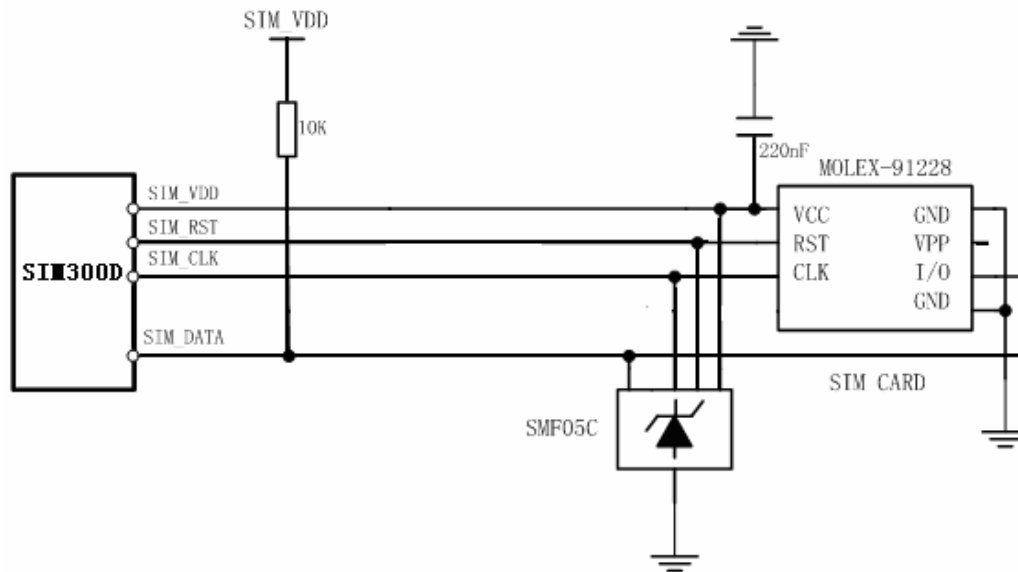


Figure 18: SIM interface reference circuit with 6 pins SIM card

### 3.12.2 Design considerations for SIM card holder

For 6 pins SIM card, we recommend to use Amphenol C707-10M006 512 2 .You can visit <http://www.amphenol.com> for more information about the holder.



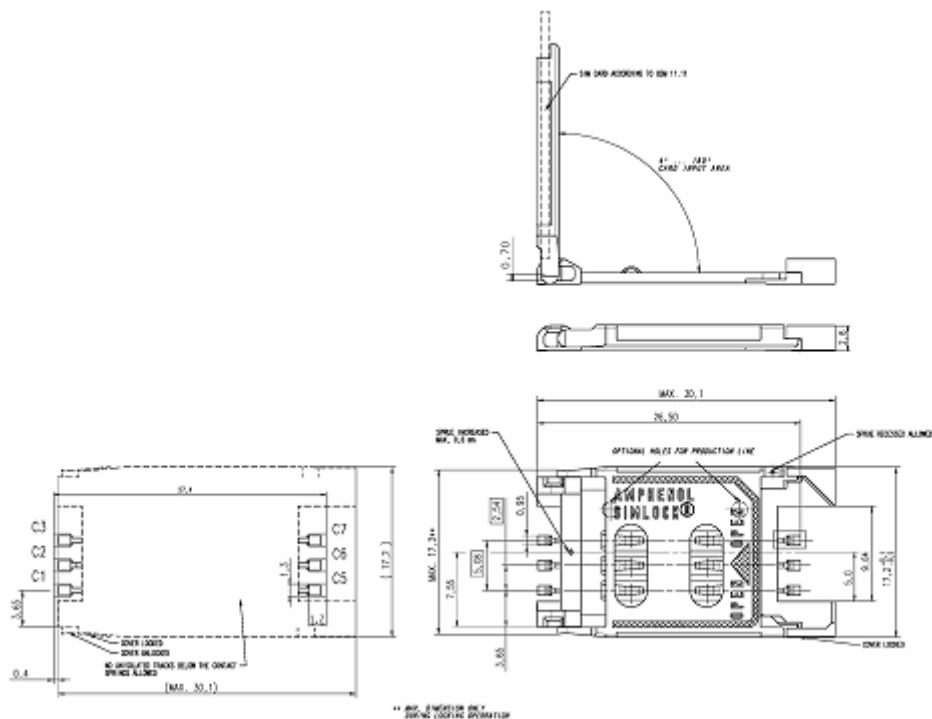


Figure 19: Amphenol C707-10M006 512 2 SIM card holder

Table 17: Pin description (Amphenol SIM card holder)

Pin	Signal	Description
C1	SIM_VDD	SIM Card Power supply, it can identify automatically the SIM Card power mode, one is 3.0V±10%, another is 1.8V±10%. Current is about 10mA.
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.

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

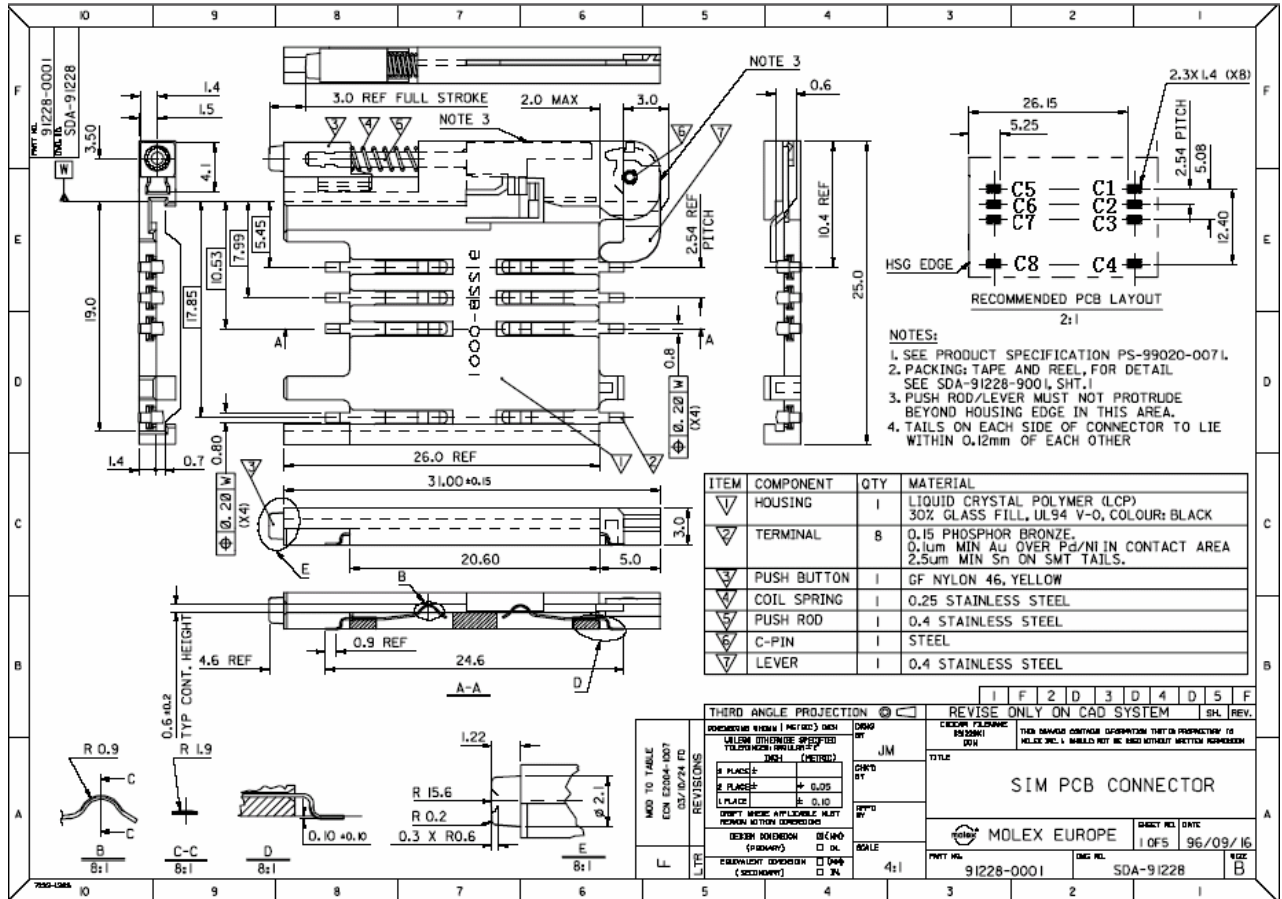


Figure 20: Molex 91228 SIM card holder

Table 18: Pin description (Molex SIM card holder)

Pin	Signal	Description
C1	SIM_VDD	SIM Card Power supply, it can identify automatically the SIM Card power mode, one is 3.0V±10%, another is 1.8V±10%. Current is about 10mA.
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.

Notes: Implement SIM Card Presence function must select 8 pin SIM Card Holder, and use AT command enable SIM Card Presence detect.

### 3.13 General purpose input & output (GPIO)

SIM300D provides a limited number of General Purpose Input/Output signal pin.

**Table 19: GPO of SIM300D**

Name	Pin
GPO1	40

SIM300D supports one general purpose output signal pin. This pin can be configured through AT command “AT+CGPIO” in users’ application to high voltage level or low voltage level. For detail of this AT command, please refer to *document [1]*.

### 3.14 ADC

SIM300D provide two auxiliary ADC (General purpose analog to digital converter.) as voltage input pin, which can be used to detect the values of some external items such as voltage, temperature etc. User can use AT command “AT+RADC” to read the voltage value added on ADC pin. For detail of this AT command, please refer to [1].

**Table 20: ADC pin of SIM300D**

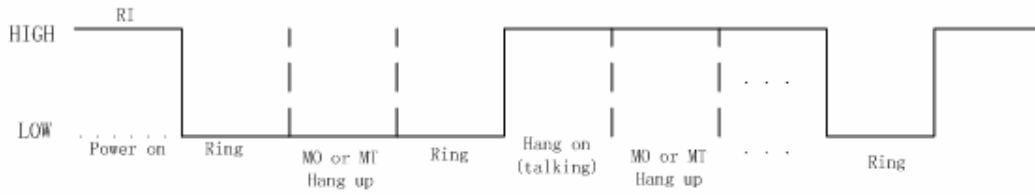
Name	Pin (On board-to-board connector)	Input voltage scope( V )
ADC0	14	0 – 2.4

### 3.15 Behaviors of the RI line (Serial port1 interface only)

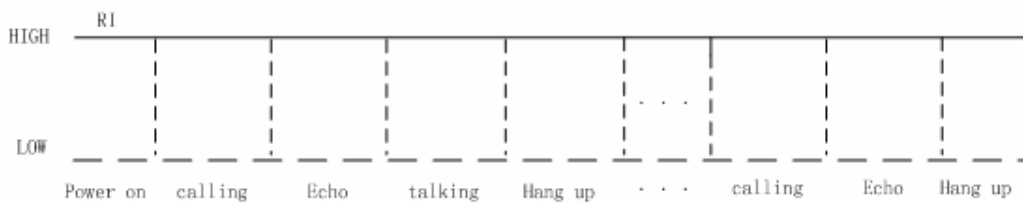
**Table 21: Behaviours of the RI line**

State	RI respond
Standby	HIGH
Voice calling	Change LOW, then: (1) Change to HIGH when establish calling. (2) Use AT command ATH the RING hold LOW. (3) Sender hang up, change to HIGH
Data calling	Change LOW, then: (1) Change to HIGH when establish calling. (2) Use AT command ATH , the RI change to HIGH.
SMS	When receive SMS, The RI will change to Low and hold low level about 120 ms, then change to HIGH.

If the module is used as caller, signal RI will maintain high. But when it is used as receiver, following is timing of RI.



**Figure 21: SIM300D Services as Receiver**



**Figure 22: SIM300D Services as caller**

**3.16 Network status indication LED lamp**

The PIN 10 NETLIGHT can be used to drive a network status indication LED lamp. The working state of this pin is listed in table22:

**Table 22: Working state of network status indication LED pin**

State	SIM300D function
Off	SIM300D is not running
64ms On/ 800ms +50%Off	SIM300D does not find the network
64ms On/ 3000ms +50%Off	SIM300D find the network
64ms On/ 300ms +50%Off	GPRS communication

We provide a reference circuitry for you, shown as figure24:

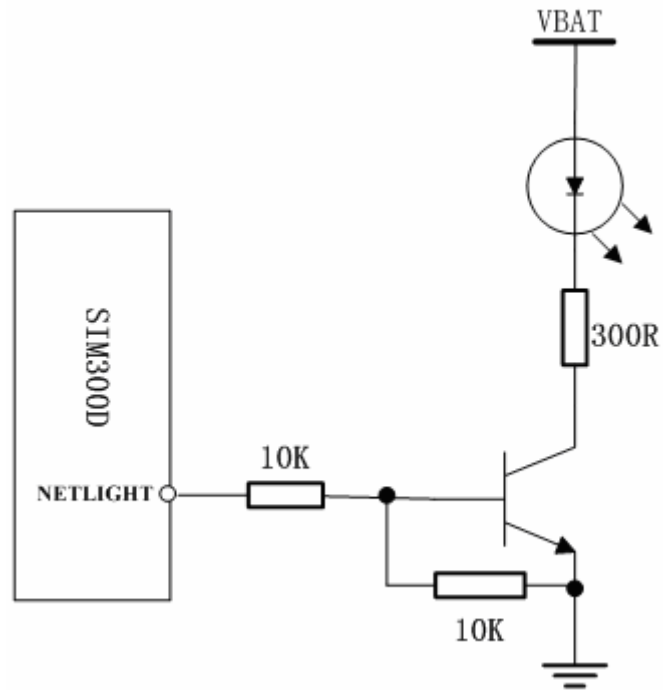


Figure 23: Reference circuit for Network status LED

## 4 Antenna interface

- The pin 33 is the RF antenna pad. The RF interface has an impedance of 50Ω.

### 4.1 Antenna installation

#### 4.1.1 Antenna pad

SIM300D provides RF antenna interface. And customer's antenna should be located in the customer's mainboard and connect to module's antenna pad through microstrip line or other type RF trace which impedance must be controlled in 50Ω. To help you to ground the antenna, SIM300D comes with a grounding plane located close to the antenna pad. The antenna pad of SIM300D is shown as figure 25(right):

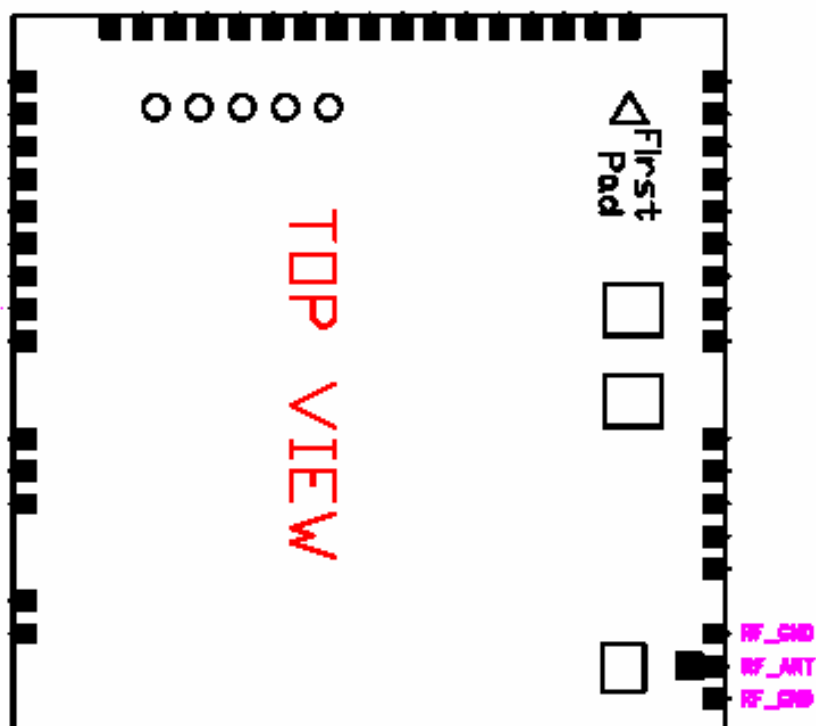


Figure 24: RF pad

SIM300D material properties:  
SIM300D PCB Material: FR4  
Antenna pad: Gold plated pad

## 4.2 Module RF output power

**Table 23: SIM300D conducted RF output power**

Frequency	Max	Min
E-GSM900	33dBm ±2db	5dBm±5db
DCS1800	30dBm ±2db	0dBm±5db
PCS1900	30dBm ±2db	0dBm±5db

## 4.3 Module RF receive sensitivity

**Table 24: SIM300D conducted RF receive sensitivity**

Frequency	Receive sensitivity
E-GSM900	< -106dBm
DCS1800	< -106dBm
PCS1900	< -106dBm

## 4.4 Module operating frequencies

**Table 25: SIM300D operating frequencies**

Frequency	Receive	Transmit
E-GSM900	925 ~ 960MHz	880 ~ 915MHz
DCS1800	1805 ~ 1880MHz	1710 ~ 1785MHz
PCS1900	1930 ~ 1990MHz	1850 ~ 1910MHz

## 5 Electrical, reliability and radio characteristics

### 5.1 Absolute maximum ratings

Absolute maximum rating for power supply and voltage on digital and analog pins of SIM300D are list in table26:

**Table 26: Absolute maximum rating**

Parameter	Min	Max	Unit
Peak current of power supply	0	4.0	A
RMS current of power supply (during one TDMA- frame)	0	0.7	A
Voltage at digit pins	-0.3	3.3	V
Voltage at analog pins	-0.3	3.0	V
Voltage at digit/analog pins in POWER DOWN mode	-0.25	0.25	V

### 5.2 Operating temperatures

The operating temperature is listed in table26:

**Table 27: SIM300D operating temperature**

Parameter	Min	Typ	Max	Unit
Ambient temperature	-20	25	55	°C
Restricted operation*	-30 to -20		55 to 80	°C
Storage temperature	-40		+85	°C

\* SIM300D can work, but the deviation from the GSM specification may occur.

### 5.3 Power supply rating

**Table 28: SIM300D power supply rating**

Parameter	Description	Conditions	Min	Typ	Max	Unit
VBAT	Supply voltage	Voltage must stay within the min/max values, including voltage drop, ripple, and spikes.	3.4	4.0	4.5	V



	Voltage drop during transmit burst	Normal condition, power control level for Pout max			400	mV
	Voltage ripple	Normal condition, power control level for Pout max @ f<200kHz @ f>200kHz			50 2	mV
IVBAT	Average supply current)	POWER DOWN mode SLEEP mode ( BS-PA-MFRMS=5 )		45 2.5		uA mA
		IDLE mode EGSM 900 DCS1800/PCS1900		18.7 18		mA
		TALK mode EGSM 900 DCS1800/PCS1900		250 184		mA
		DATA mode GPRS, (3 Rx, 2 TX) EGSM 900 DCS1800/PCS1900		436 350		mA
		DATA mode GPRS, (4 Rx, 1 TX) EGSM 900 DCS1800/PCS1900		245 180		mA
	Peak supply current (during transmission slot every 4.6ms)	Power control level for Pout max.		2	3	A

## 6 Mechanics

This chapter describes the mechanical dimensions of SIM300D.

### 6.1 Mechanical dimensions of SIM300D

Following are SIM300D top view, side view and bottom view. These show you Package Physical Specifications of SIM300D.

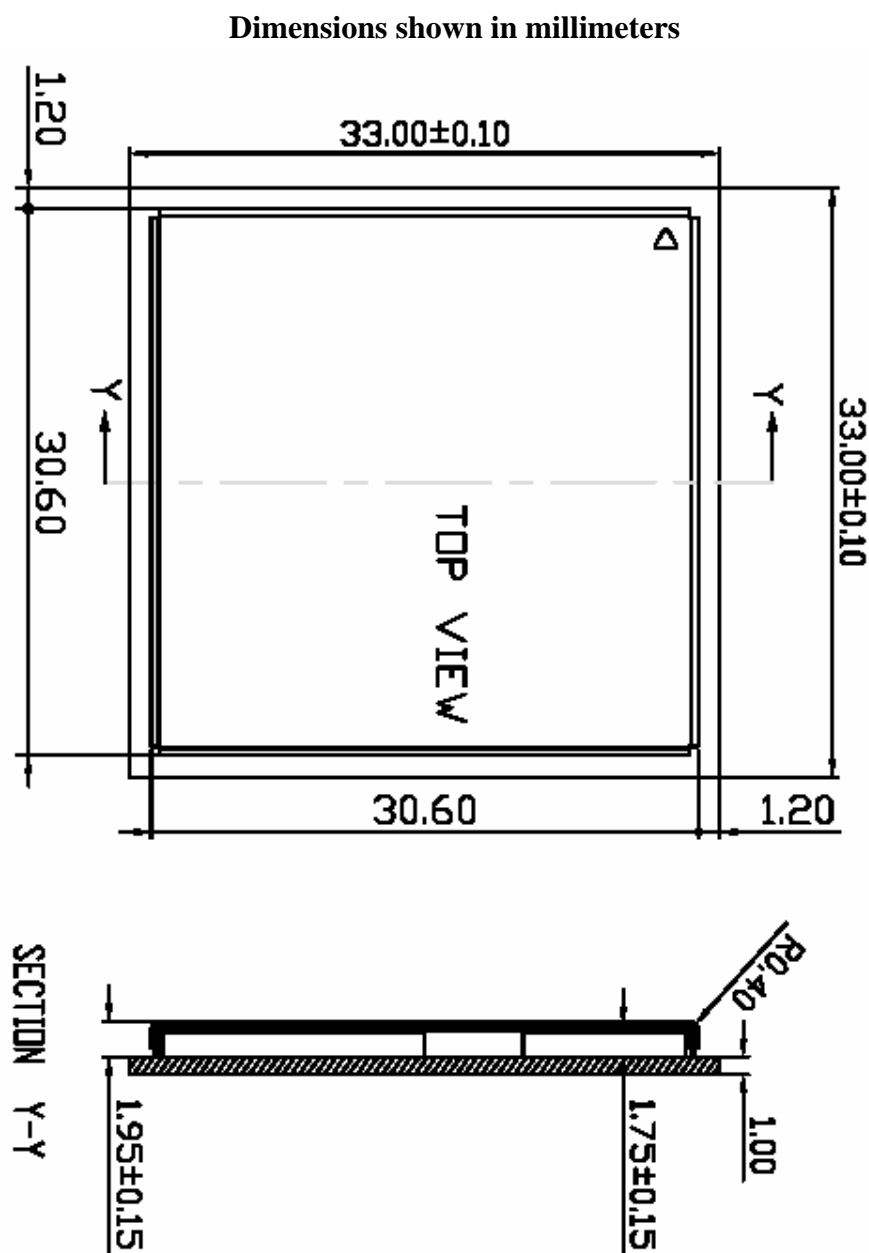


Figure 25: SIM300D TOP view and SIDE view

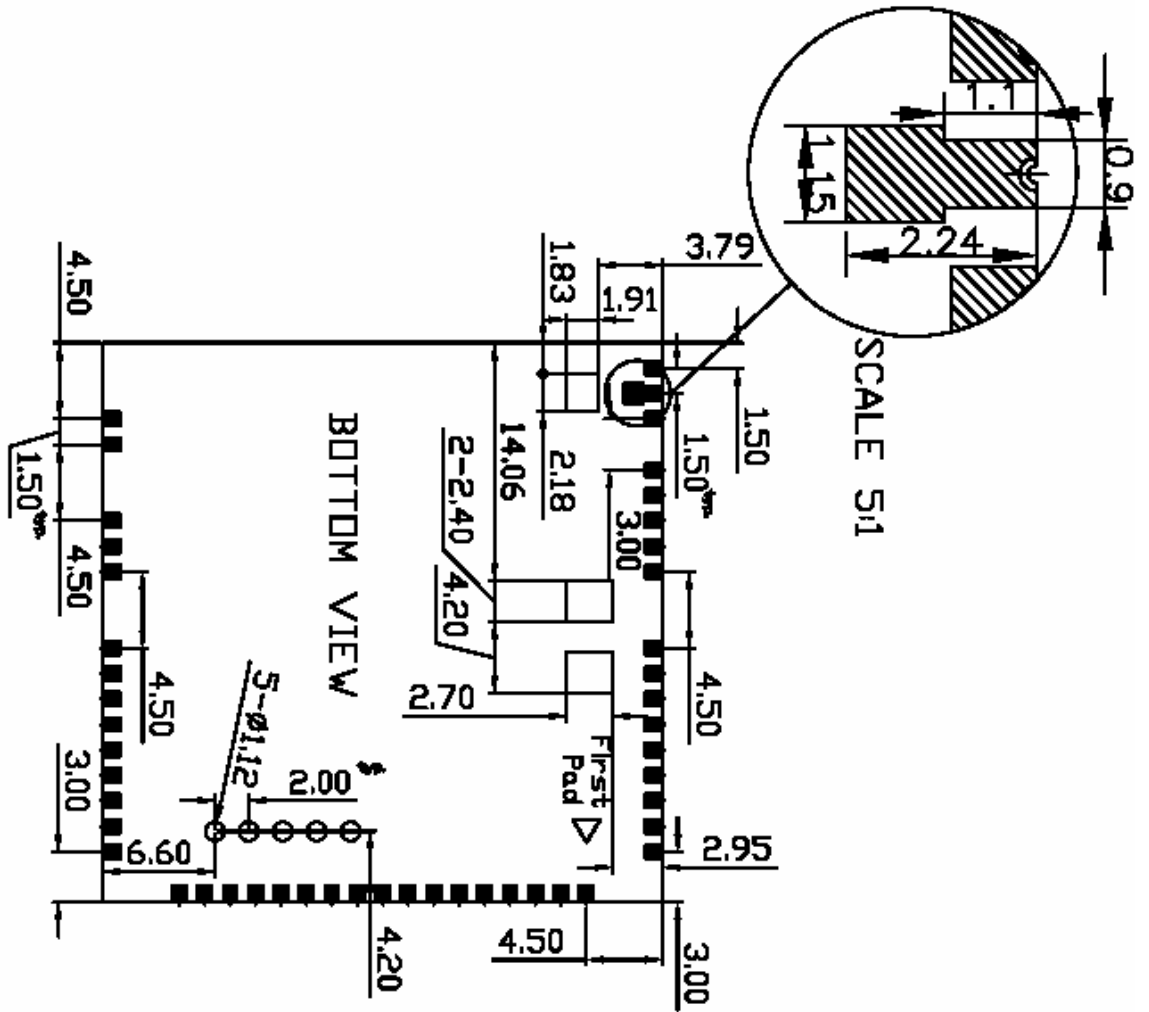


Figure 26: SIM300D bottom view

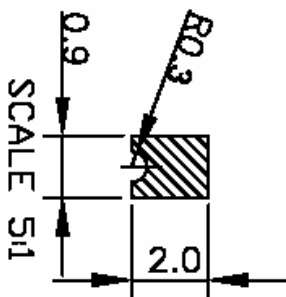


Figure 27: PAD BOTTOM VIEW

**FOOT PRINT RECOMMENDATION**

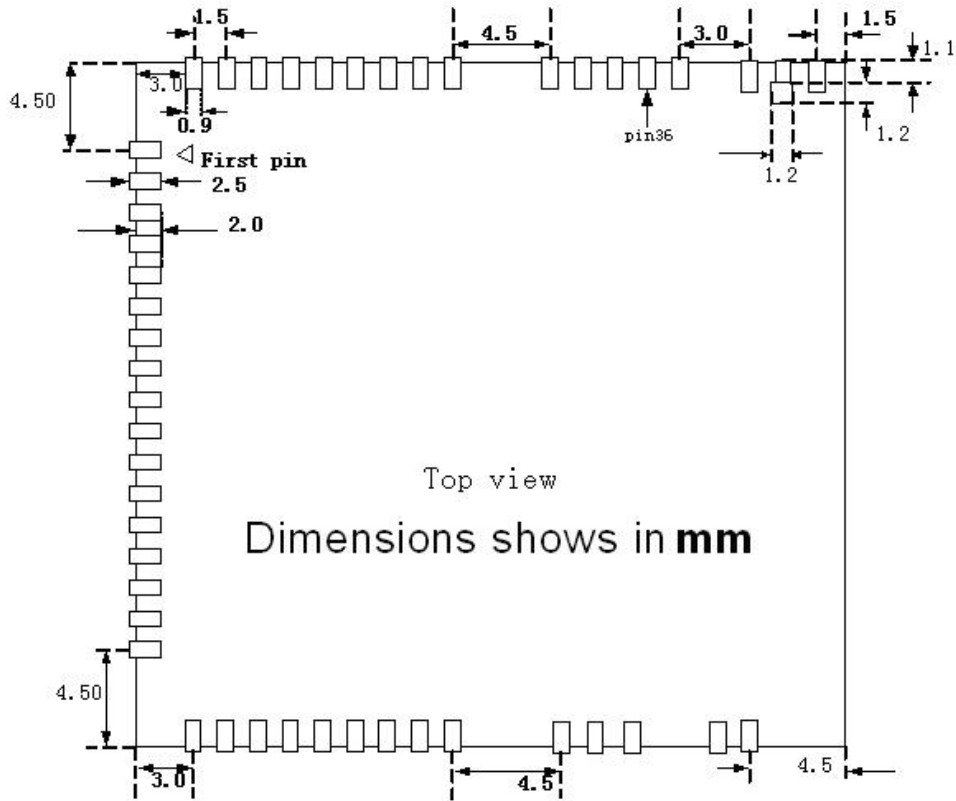


Figure 28: Footprint recommendation

**6.2 PIN assignment of SIM300D**

Table 29: PIN assignment

Pin NUM	NAME	Pin NUM	NAME
1	DBG_RXD	36	GND
2	DBG_TXD	37	GND
3	RXD	38	VBAT
4	TXD	39	VBAT
5	STATUS	40	GPO1
6	SIM_DATA	41	NETLIGHT
7	SIM_CLK	42	DCD
8	SIM_RST	43	DTR
9	SIM_VDD	44	RTS
10	KBR0	45	CTS

11	RI	46	DISP_CS
12	PWRKEY	47	NC
13	DISP_CLK	48	GND
14	DISP_DATA		
15	VRTC		
16	DISP_D/C		
17	GND		
18	MIC2P		
19	MIC2N		
20	MIC1N		
21	MIC1P		
22	AGND		
23	SPK1P		
24	SPK1N		
25	SPK2N		
26	SPK2P		
27	TEMP_BAT		
28	VCHG		
29	ADC0		
30	GND		
31	GND		
32	GND		
33	ANTENNA		
34	GND		
35	GND		

**NOTE:** If any pin you would not use in your application design, it is recommended that leave the relative pad empty in your main board.



Figure 29: Physical SIM300D



Figure 30: Bottom view of SIM300D