2 Product concept

Designed for global market, SIM300DZ is tri-band GSM/GPRS engine that works on frequencies, GSM 900 MHz, DCS 1800 MHz and PCS1900 MHz. SIM300DZ features GPRS multi-slot class 10 /Class 8 ① capability and supports the GPRS coding schemes CS-1, CS-2, CS-3 and CS-4.

① SIM300DZ also provides GPRS multi-slot class 8 and the default is class 10.

With a tiny configuration of 33mm x 33mm x 3 mm, SIM300DZ 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 microphone inputs and two speaker outputs. This can be easily configured by AT command.

With the charge circuit integrated inside the SIM300DZ, it is very suitable for the battery power application.

The SIM300DZ 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 impendence must be controlled in 50Ω.

The SIM300DZ is designed with power saving technique, the current consumption is as low as 2.5mA in SLEEP mode (BS-PA-MFRMS=5).

The SIM300DZ 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 SIM300DZ key features at a glance

Table 3: SIM300DZ 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	● SIM300DZ tri-band: GSM 900, DCS 1800, PCS 1900. The SIM300DZ can search the 3 frequency bands automatically. The frequency bands also can be set by AT command. ● Compliant to GSM Phase 2/2+
GSM class	Small MS
Transmit power	● Class 4 (2W) at EGSM900 ● Class 1 (1W) at DCS1800 and PCS 1900
GPRS connectivity	● GPRS multi-slot class 8 （optional） ● GPRS multi-slot class 10 （default) ● GPRS mobile station class B
Temperature range	● Normal operation: -20°C to +55°C ● Restricted operation: -30°C to -20°C and +55°C to +80°C ● Storage temperature -40°C to +80°C
DATA *GPRS:* *CSD:*	● GPRS data downlink transfer: max. 85.6 kbps ● GPRS data uplink transfer: max. 42.8 kbps ● Coding scheme: CS-1, CS-2, CS-3 and CS-4 ● SIM300DZ supports the protocols PAP (Password Authentication Protocol) usually used for PPP connections. ● The SIM300DZ integrates the TCP/IP protocol. ● Support Packet Switched Broadcast Control Channel (PBCCH) ● CSD transmission rates: 2.4, 4.8, 9.6, 14.4 kbps, non-transparent ● Unstructured Supplementary Services Data (USSD) support
SMS	● MT, MO, CB, Text and PDU mode ● SMS storage: SIM card
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: ● Half Rate (ETS 06.20) ● Full Rate (ETS 06.10) ● Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80)

	● Echo suppression
Serial interface and Debug interface	● Serial Port: Seven lines on Serial Port Interface ● Serial Port can be used for CSD FAX, GPRS service and sending AT command of controlling module. ● Autobauding supports baud rates from 1200 bps to 115200bps. ● Debug port ： provide two lines on Serial Port Interface /TXD and /RXD ● Debug port is only used for transmitting AT command.
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 99
Real time clock	Implemented
Timer function	Programmable via AT command
Physical characteristics	Size: 33±0.15 x 33±0.15 x 3±0.3 mm Weight: 8g
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 chapter3.9)*
- Two analog audio interfaces *(see chapter 3.10)*
- SIM interface *(see chapter 3.11)*

3.1 SIM300DZ pin description

Table 5: Pin description

Power Supply			
PIN NAME	I/O	DESCRIPTION	
VBAT		2 VBAT pins are dedicated to connect the supply voltage. The power supply of SIM300DZ 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 VILmax=0.3 *VDD_EXT VIHmin=0.7*VDD_EXT VIHmax= VDD_EXT+0.3 VOLmin=GND VOLmax=0.2V VOHmin= VDD_EXT-0.2 VOHmax= VDD_EXT
GPO1	O	Normal Output Port	
DISP_DATA	I/O	Display interface	
DISP _CLK	O		
DISP _CS	O		
DISP _D/C	O		
DISP _RST	O		
KBR0	I		
Serial interface			
PIN NAME	I/O	DESCRIPTION	
RXD	I	Receive data	VILmin=0V VILmax=0.3*VDD_EXT VIHmin=0.7*VDD_EXT VIHmax= VDD_EXT+0.3
DTR	I	Data terminal Ready	
TXD	O	Transmit data	
RTS	I	Request to send	

CTS	O	Clear to send	VOLmin=GND VOLmax=0.2V VOHmin= VDD_EXT-0.2 VOHmax= VDD_EXT
RI	O	Ring indicator	
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 VILmax=0.3*SIM_VDD VIHmin=0.7*SIM_VDD VIHmax= SIM_VDD+0.3 VOLmin=GND VOLmax=0.2V VOHmin= SIM_VDD-0.2 VOHmax= SIM_VDD
SIM_CLK	O	SIM clock	
SIM_RST	O	SIM reset	
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 battery temperature	

3.2 Operating modes

The table below briefly summarizes the various operating modes 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	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 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 (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. SIM300DZ 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: ● From POWER DOWN mode: Connect charger to the module’s VCHG pin and VBAT pin while SIM300DZ is power down. ● From Normal mode: Connect charger to the module’s VCHG pin and VBAT pin, then power down the module by “AT+CPOWD”	
Charge mode during normal operation	Start charging while the module is in normal mode including: SLEEP, IDLE, TALK, GPRS IDLE and GPRS DATA)	

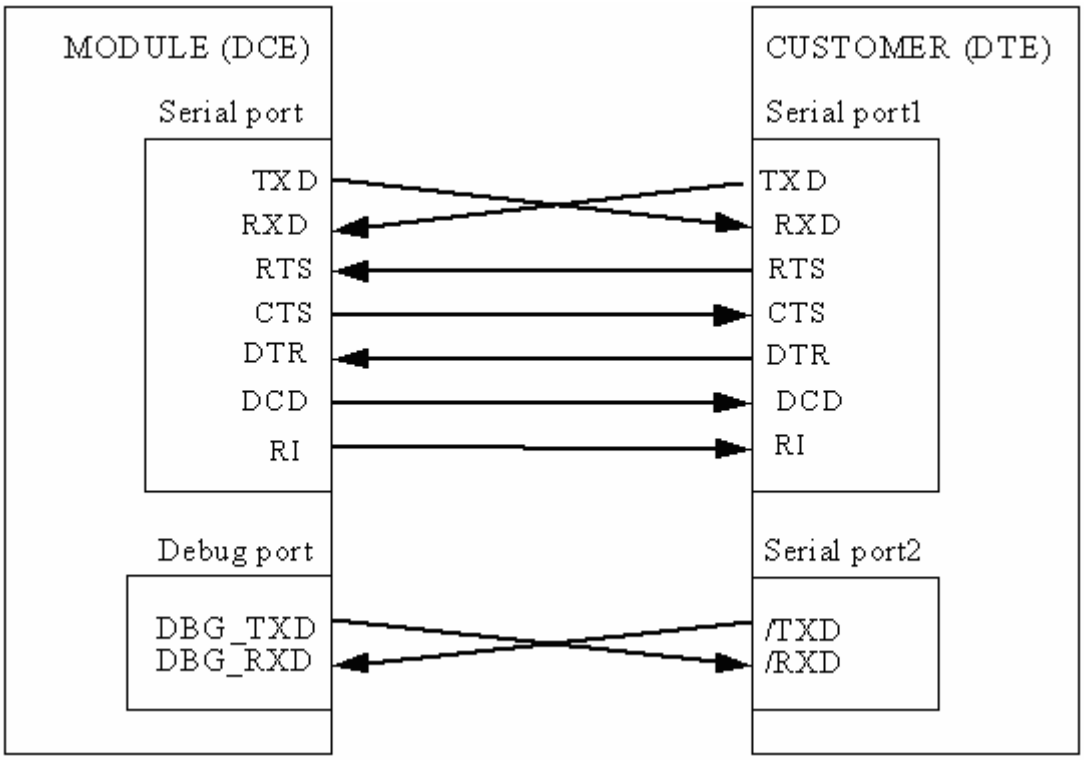

Figure 13: Interface of serial ports

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, and115200bps.

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

When DCE powers on with the autobauding enabled, it is recommended to wait 2 to 3 seconds before sending the first AT character. After receiving the “OK” response, DTE and DCE are correctly synchronized.

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, 115200bps

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 SIM300DZ is upgrading software. Please refer to the following figure.

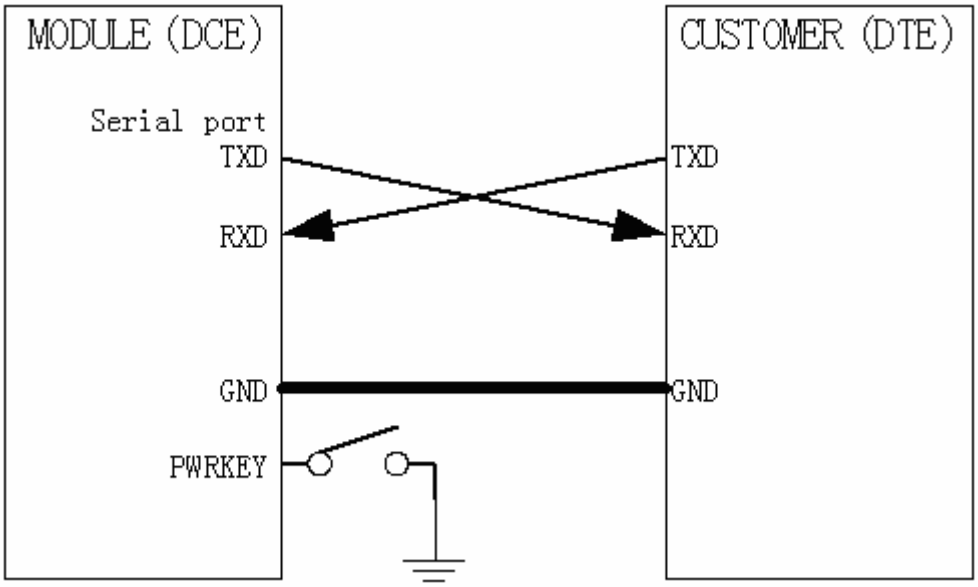

Figure 14: Interface of software upgrade

Note: The RTS PIN must be connected to the GND in the customer circuit when only the TXD and RXD used in the Serial Port communication.

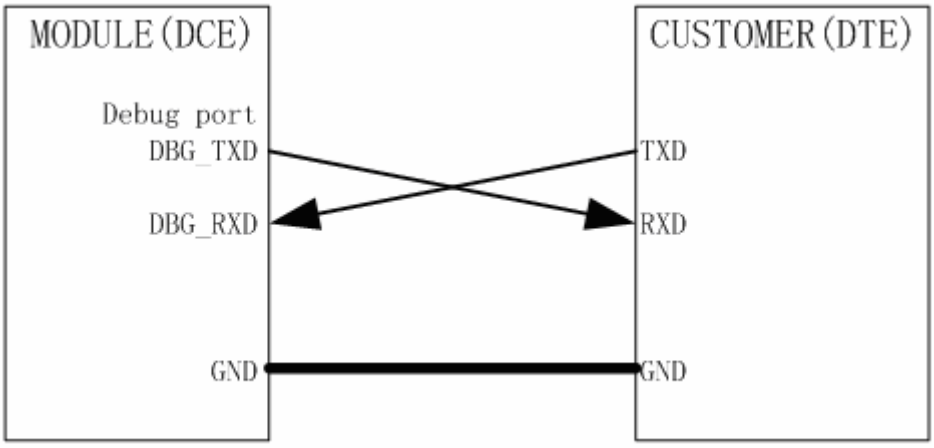

Figure 15: Interface of software debug

Note: The serial port doesn't support the RS_232 level, it only supports the TTL level. You should add the level converter IC between the DCE and DTE, if you connect it to the PC.

		Ref level		1.0954 -6.02		Vpp dBm
Auxiliary Output(SPK2)	Single Ended	load Resistance	27	32		Ohm
		Ref level		0.5477 -12.04		Vpp dBm
	Differential	load Resistance	27	32		Ohm
		Ref level		1.0954 -6.02		Vpp dBm

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 normal voltage 3V. 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) ESDA6V1W5 or ON SEMI (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 protecting the SIM I/O port. 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.

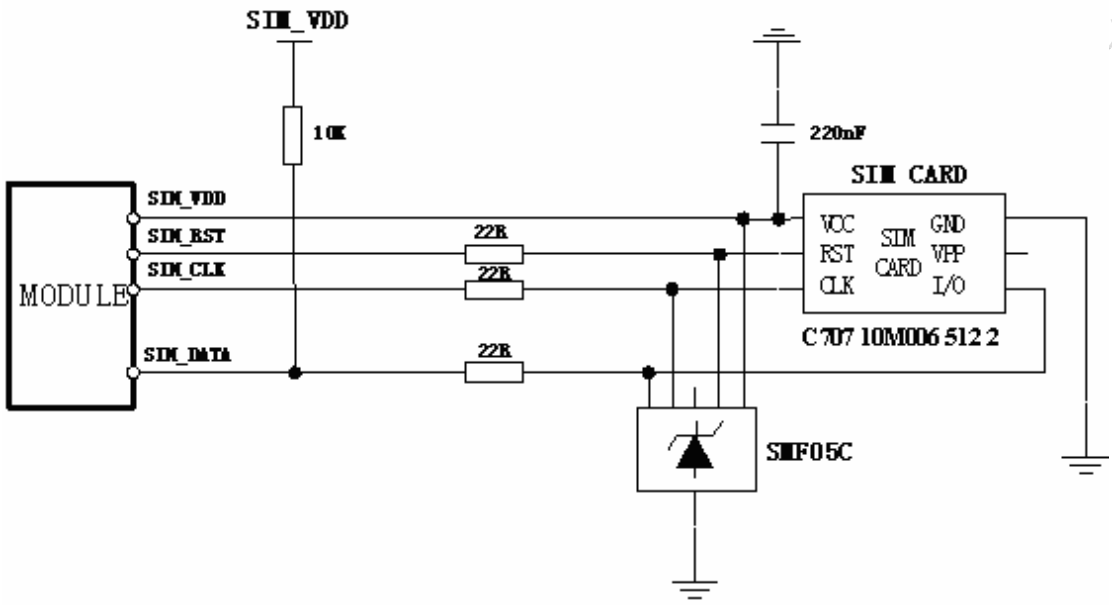

Figure 20: SIM interface reference circuit with 6 pins SIM card

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.

4.2 Module RF output power

Table 23: SIM300DZ conducted RF output power

Frequency	Max	Min
EGSM900	33dBm ±2db	5dBm±5db
DCS1800	30dBm ±2db	0dBm±5db
PCS1900	30dBm ±2db	0dBm±5db

4.3 Module RF receive sensitivity

Table 24: SIM300DZ conducted RF receive sensitivity

Frequency	Receive sensitivity
EGSM900	< -106dBm
DCS1800	< -106dBm
PCS1900	< -106dBm

4.4 Module operating frequencies

Table 25: SIM300DZ operating frequencies

Frequency	Receive	Transmit
EGSM900	925 ～ 960MHz	880 ～ 915MHz
DCS1800	1805 ～ 1880MHz	1710 ～ 1785MHz
PCS1900	1930 ～ 1990MHz	1850 ～ 1910MHz

FOOT PRINT RECOMMENDATION

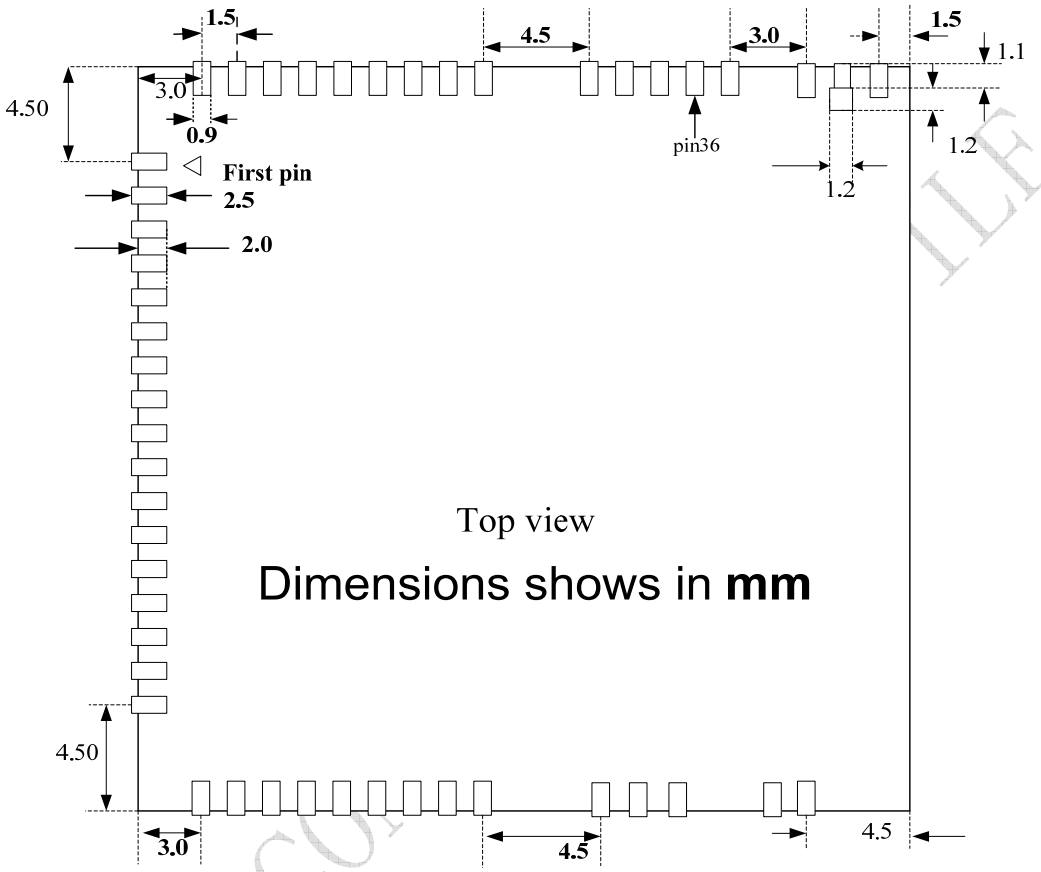

Figure 29: Footprint recommendation

6.2 PIN assignment of SIM300DZ

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 30: Physical SIM300DZ

Figure 31: Bottom view of SIM300DZ