MG2639_V2 Module Hardware Design User Manual

Version：V1.1

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With strong technical force, ZTE Corporation can provide CDMA/GPRS/WCDMA/GSM module customers with the following all-around technical support:

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Preface

Summary

This document introduces MG2639_V2 module's product principle diagram, PINs, hardware interface and module's mechanical design, which can instruct the users how to quickly and conveniently design different kinds of wireless terminals based on this type of module.

Target Readers

This document mainly applies to the following engineers:

- System designing engineers
- Mechanical engineers
- Hardware engineers
- Software engineers
- Test engineers

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1 General description of module

With 30-PIN stamp-hole interface, MG2639_V2 module developed by ZTE Corporation is a kind of GSM850/EGSM900/DCS1800/PCS1900 industrial module, which can be built in the Set-Top-Box, vehicle-mounted terminals, and enable users to get access to the Internet wirelessly and send/receive Emails, browse the web pages, download at high speed, etc.

It enables users to get access to the Internet any time in a place where the GSM network is covered. It also features in SMS, voice call, etc. and provides highly free and convenient solutions for users in mobile data communication, and truly realizes the dream of mobile office.

This chapter mainly provides a general description of the module, including basic functions and logic block diagram.

1.1 Introduction of module's functions

See the functions of MG2639_V2 module in table 1-1:

Table 1-1 Module's functions

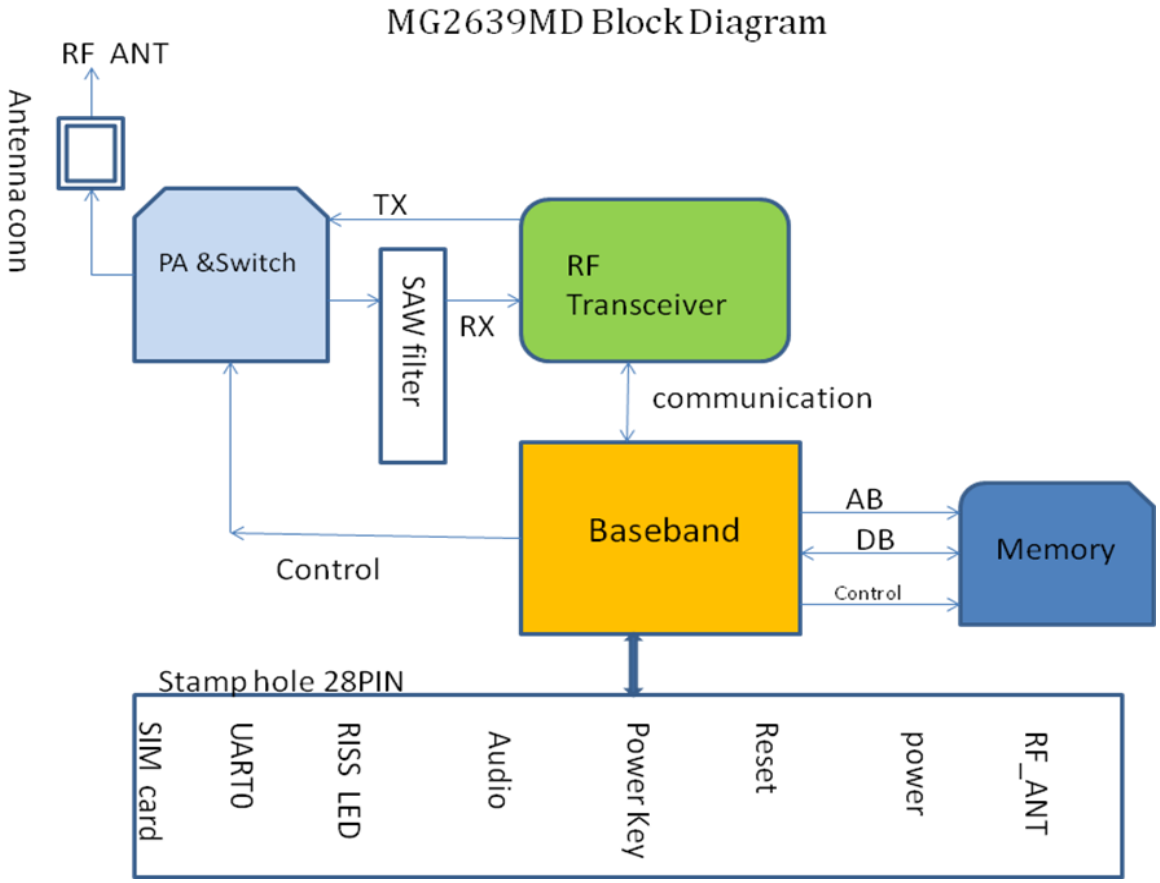
Parameter	**MG2639_V2**
General Features	
Frequency Bands	GSM850/EGSM900/DCS1800/PCS1900
Dimensions	30.0×25.0x2.68mm
Weight	7g
Operating Temperature Range	-30°C~+70°C
Storage Temperature Range	-40°C~+85°C
Performance	
Operating Voltage Range	3.4V~4.25V/Typical: 3.8V
Standard power consumption	Standby Current: 2mA@-75dBm
	Talk Current: 128mA@-75dBm
	Max. Current: 300mA@-104dBm
Max. TX Power	GSM850/EGSM900: Class 4 (2W)
	DCS1800/PCS1900: Class 1 (1W)
Rx. Sensitivity	<-107dBm
Interfaces	
Connector	30Pin Stamp-hole
Antenna	SMT 50Ω Antenna Connector
Integrated Full Duplex UART	AT commands/Data transmission
SIM Card Interface	1.8V/3.0V
Data Features	
GPRS	Class 10

Parameter	MG2639_V2
Mobile Station	Class B
Max Downlink	85.6kbps
Max Uplink	42.8kbps
Protocol	Internal TCP/IP&UDP
	Embedded FTP
SMS	
	Support TEXT/PDU Mode
	Point-to-point MO/MT
	SMS Cell Broadcast
Voice call	
	Vocoders HR/FR/EFR/AMR
	Echo Cancellation/Volume Control/DTMF
AT Command Set	
	GSM 07.05/GSM 07.07/ZTE Proprietary AT Commands

1.2 Module's principle diagram

See the application block diagram of MG2639_V2 in figure 1-1:

Figure 1-1 Module's application block diagram



1.3 Abbreviations

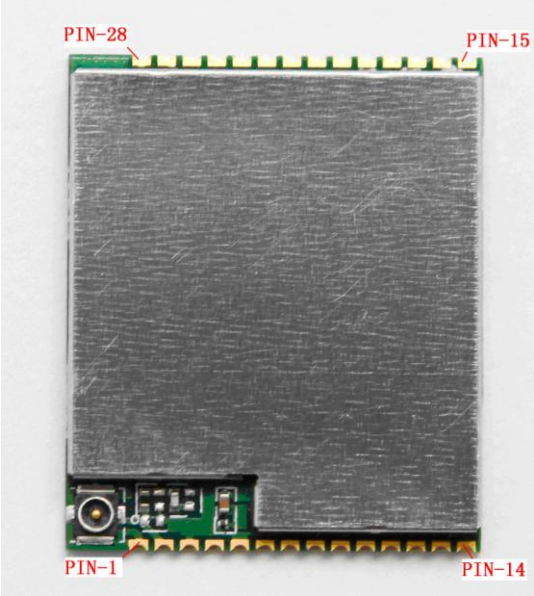
A		
ADC	Analog-Digital Converter	
AFC	Automatic Frequency Control	
AGC	Automatic Gain Control	
ARFCN	Absolute Radio Frequency Channel Number	
ARP	Antenna Reference Point	
ASIC	Application Specific Integrated Circuit	
B		
BER	Bit Error Rate	
BTS	Base Transceiver Station	
C		
CDMA	Code Division Multiple Access	
CDG	CDMA Development Group	
CS	Coding Scheme	
CSD	Circuit Switched Data	
CPU	Central Processing Unit	
D		
DAI	Digital Audio interface	
DAC	Digital-to-Analog Converter	
DCE	Data Communication Equipment	

DSP	Digital Signal Processor	
DTE	Data Terminal Equipment	
DTMF	Dual Tone Multi-Frequency	
DTR	Data Terminal Ready	
E		
EDGE	Enhanced Data Rate for GSM Evolution	
EFR	Enhanced Full Rate	
EGSM	Enhanced GSM	
EMC	Electromagnetic Compatibility	
EMI	Electro Magnetic Interference	
ESD	Electronic Static Discharge	
ETS	European Telecommunication Standard	
F		
FDMA	Frequency Division Multiple Access	
FR	Full Rate	
G		
GPRS	General Packet Radio Service	
GSM	Global Standard for Mobile Communications	
H		
HR	Half Rate	
I		
IC	Integrated Circuit	
IMEI	International Mobile Equipment Identity	
ISO	International Standards Organization	
ITU	International Telecommunications Union	
L		
LCD	Liquid Crystal Display	
LED	Light Emitting Diode	
M		
MCU	Machine Control Unit	
MMI	Man Machine Interface	
MS	Mobile Station	
MTBF	Mean Time Before Failure	
P		
PCB	Printed Circuit Board	
PCL	Power Control Level	
PCS	Personal Communication System	
PDU	Protocol Data Unit	
PLL	Phase Locked Loop	
PPP	Point-to-point protocol	
R		
RAM	Random Access Memory	
RF	Radio Frequency	
ROM	Read-only Memory	
RMS	Root Mean Square	
RTC	Real Time Clock	
S		
SIM	Subscriber Identification Module	
SMS	Short Message Service	
SMT	Surface Mount Technology	

SRAM	Static Random Access Memory	
T		
TA	Terminal adapter	
TDMA	Time Division Multiple Access	
TE	Terminal Equipment also referred it as DTE	
U		
UART	Universal asynchronous receiver-transmitter	
UIM	User Identifier Management	
USB	Universal Serial Bus	
USIM	Universal Subscriber Identity Module	
V		
VSWR	Voltage Standing Wave Ratio	
Z		
ZTE	ZTE Corporation	

2 Descriptions of module's external interfaces

MG2639_V2 module adopts a 30PIN stamp-hole connector for the external connections.



2.1 Definitions of module's interfaces

See the definitions of the 30PIN stamp-hole of MG2639_V2 module below:

Table 2-1 30Pin stamp-hole definition

No.	Classification	Definition	I/O	Description	DC feature	Remarks
1	GND	GND		Ground		
2	ANT	RF_ANT	I/O	RF antenna plug		
3	GND	GND		Ground		
4	UART	RING	O	Ring signal indication	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO , output driver capability is 4mA.	The voltage varies upon an incoming call or receipt of text message.
5	GND	GND		Ground		
6	POWER	VBAT	I	Work voltage	Vmin=3.4V,Vmax=4.25v, Typical=3.9V	
7	Other	RSSI_LED	O	Network signal indication		Internal pull-down, drive at high level. For details, please refer to 3.1.5.
8	UART	RTS1	O	Ready to send	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO,	

					V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	
9	UART	CTS1	I	Clear to send	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	
10	UART	DCD1	O	Carrier detection	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	
11	UART	SIM_RST	O	SIM card reset	3.0V SIM card: V_{OLmax}=0.36V,V_{OHmin} =0.9*VSIM; 1.8V SIM card: V_{OLmax}=0.2*VSIM,V_{OHmin} =0.9*VSIM；	
12	UART	SIM_CLK	O	SIM card clock	3.0V SIM card: V_{OLmax}=0.4V,V_{OHmin} =0.9*VSIM 1.8V SIM card: V_{OLmax}=0.12*VSIM,V_{OHmin} =0.9*VSIM；	
13	SIM	SIM_DATA	I/O	SIM card data	3.0V SIM card: V_{ILmax}=0.4V,V_{IHmin} =0.9*VSIM, V_{OLmax}=0.4V,V_{OHmin} =0.9*VSIM 1.8V SIM card: V_{ILmax}=0.15*VSIM,V_{IHmin} =VSIM-0.4, V_{OLmax}=0.15*VSIM,V_{OHmin} = VSIM-0.4	
14	SIM	VSIM	O	SIM card voltage	3.0V SIM card: Vmax==3.15V,Vmin=2.9V, 1.8V SIM card: Vmax==1.9V,Vmin=1.71V,	Compatible with 3.0V/1.8V SIM card
15	UART	RXD1	I	Receive through First group of ports	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	
16	UART	TXD1	O	Transmit through first group of ports	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	
17	POWER	SYSRST_N	I	Module reset		Valid at low level. For details, please refer to 4.1 Power and reset.
18	AUDIO	SPK2_P	O	Headset speaker		
19	AUDIO	SPK1_P	O	Host speaker		
20	AUDIO	SPK1_N	O	Host speaker		
21	AUDIO	MIC2_P	I	Headset receiver		

22	AUDIO	MIC1_P	I	Host receiver		
23	AUDIO	MIC1_N	I	Host receiver		
24	POWER	PWRKEY_N	I	power on-off		Internal pull-up, valid at low pulse. For details, please refer to 4.1 Power and reset.
25	UART	DTR1 _WAKEUP	I	Data terminal ready	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	Duplexing PIN, valid at low level; besides the DTR signal, also used as the module's wakeup signal as the module enters the sleep mode and needs to wake up by the external signal
26	UART	DSR1	O	Data set ready	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	
27	POWER	VDDIO	O	2.8V output	Vmin=2.7V,Typical=2.8V, Vmax=2.9V	powered by external level conversion
28	GND	GND		Group		
29	UART	RXD2	I	Receive through Second group of ports	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	
30	UART	TXD2	O	Transmit through Second group of ports	V_{ILmax}=0.25*VDDIO,V_{IHmin} =0.75*VDDIO, V_{OLmax}=0.15*VDDIO,V_{OHmin} =0.85*VDDIO	

2.2 Antenna interface

Regarding the antenna of MG2639_V2 module, proper measures should be taken to reduce the access loss of effective bands, and good shielding should be established between external antenna and RF connector. Besides, external RF cables should be kept far away from all interference sources such as high-speed digital signal or switch power supply.

According to mobile station standard, stationary wave ratio of MG2639_V2 module's antenna should be between 1.1 and 1.5, and input impedance is 50 ohm. Different environments may have different requirements on the antenna's gain. Generally, the larger gain in the band and smaller outside the band, the better performance the antenna has.

Isolation degree among ports must more than 30dB when multi-ports antenna is used. For example, between two different polarized ports on dual-polarized antenna, two different frequency ports on dual-frequency antenna, or among four ports on dual-polarized dual-frequency antenna, isolation degree should be more than 30dB.

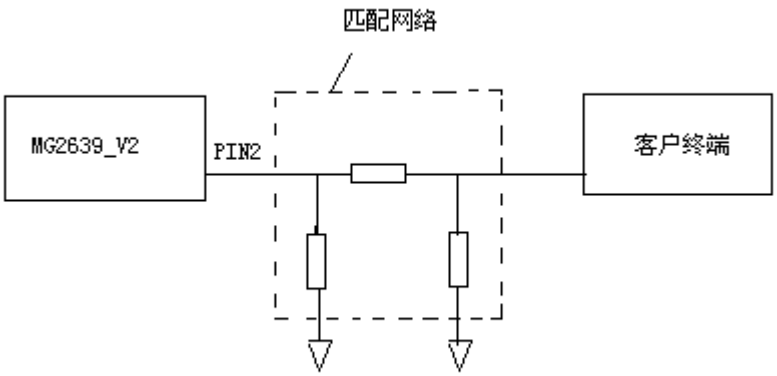
MG2639_V2 module provides two kind of external antenna interfaces, therefore customers can select reasonably according to the product form to optimize the cost of BOM.

Program 1：

PIN2 is used as the antenna PIN. Pay attention to the following when using it as the antenna's feed PIN:

（1） The feed connected to PIN2 is 50ohm micro-strip or strip line. To approach the module, put π shape or F shape matching network for later tuning.

Figure 2-1π shape matching network diagram



（2）The RF wires must be kept away from the GND, and generally the distance should be 3 times of the width of RF wires.

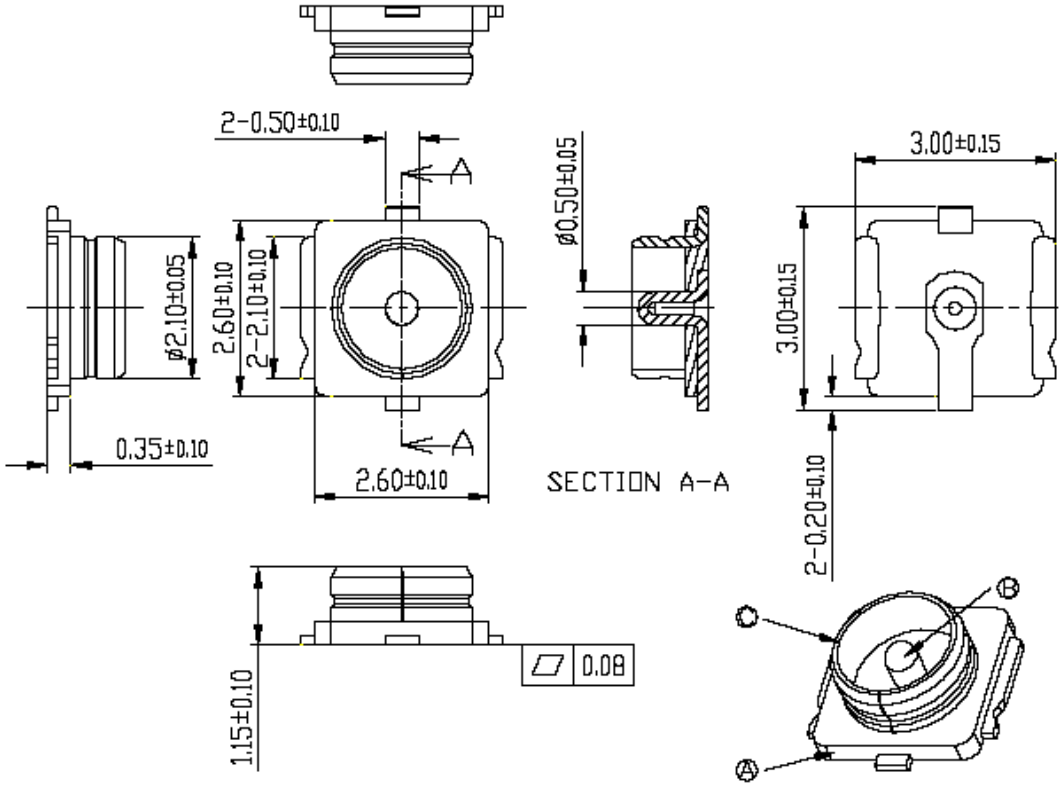
（3）It's forbidden to put some interference sources such as DCDC, WIFI module around RF wires or RF port

Program 2:

When using RF plug as the antenna feed, disconnect PIN2 from the main board and make sure there are some clean areas below or around PIN2. Keep 2mm distance between the surface of PIN2 and GND, and drill holes below PIN2. It's not suggested to use the compatible design of PIN2 at the same time when using the RF connector.

Figure 2-2 Antenna interface diagram

Figure 2-3 RF test socket's dimensions



2.3 Antenna interface's RF performance

See the antenna interface's RF performance in table 2-2:

Table 2-2 Antenna interface's RF performance

Antenna interface's RF performance	Module's uplink （MS->BTS）	Module's downlink （BTS->MS）	Power （dBm）	Antenna interface's Rx. sensitivity
GSM850	824MHz-849MHz	869MHz-894MHz	33±2	< -107dBm
EGSM900	880MHz-915MHz	925MHz-960MHz	33±2	< -107dBm
DCS1800	1710MHz-1785MHz	1805MHz-1880MHz	30±2	< -107dBm
PCS1900	1850MHz-1910MHz	1930MHz-1990MHz	30±2	< -107dBm

3 Module's electrical characteristics

This chapter mainly introduces the module's electrical characteristics, including the level, power consumption, reliability of module's interfaces.

3.1 Descriptions of levels of interface signals

It describes the MAX, MIN and typical value of the level of module's external interfaces.

3.1.1 Reset

The reset PIN is pulled up to 2.8V（Vmax=2.9V，Vmin=2.7V，Typical=2.8V）through the resistance inside the module.

The SYSRST_N PIN is used to reset the module's main chipset. You have to pull down the SYSRST_N signal 500ms when resetting the module.

3.1.2 UART

MG2639_V2 module provides two serial interfaces UART1 and UART2. The UART1 supports 8-wire serial BUS interface or 4-wire serial BUS interface or 2-wire serial interface; while UART2 supports 2-wire serial interface only. The module can communicate externally and input the AT commands through the UART interface

3.1.3 SIM Card Interface

MG2639_V2 module baseband processor integrates SIM card interface conforming to ISO 7816-3 standard, and it's compatible with SIM card with two voltages 1.8V/3.0V and reserves SIM card interface signal on the stamp-hole PIN.

Users should note that SIM card's electrical interface definitions are the same as SIM card socket's definitions.

Table 3-1 SIM card's electronic signals

Classification	No.	Definition	I/O	Description	Remarks
SIM	14	VSIM	O	SIM card voltage	1.8V/3V; maximum output current 30mA
	11	SIM_RST	O	SIM card reset	
	12	SIM_CLK	O	SIM card clock	
	13	SIM_DATA	I/O	SIM card data	

3.1.4 Audio Interface

MG2639_V2 module supports 2CH audio signal inputs/outputs. These two MIC inputs are coupled in AC domain and the offset voltage is added inside, and they should directly connect with the receiver. See the audio interface signals in the table below:

Table 3-2 Audio interface's signal definitions

Classification	No.	Definition	I/O	Description	Remarks
AUDIO	23	MIC1_N	I	Host receiver	Differential input
	22	MIC1_P	I	Host receiver	
	21	MIC2_P	I	Headset receiver	Single-ended input
	20	SPK1_N	O	Host speaker	Differential input
	19	SPK1_P	O	Host speaker	
	18	SPK2_P	O	Headset speaker	Single-ended input

3.1.5 Network Signal Indication

RSSI_LED drive at high level.
-Power-on status: LED off;
-Network searching status: LED blinks at 3Hz
-Idle status: LED blinks at 1Hz

-Traffic status (call, data): LED blinks at 5Hz.

The RSSI_LED PIN output status is defined according to the software protocol. The RSSI_LED PIN is common I/O port, and it's output driving capability is 4mA.

3.2 Module Power Consumption

It describes the module's power consumption under each status:

Table 3-3 MG2639_V2 power consumption

Status	Frequency	Rx. power	MIN	Ave.	MAX	Remarks
Power-off				34uA		VBAT=4.2V
Idle			1 mA			Sleep
Talk	GSM850			208 mA		
	EGSM900			233 mA		
	GSM1800			177 mA		
	GSM1900			172 mA		
Network searching				67mA		

3.3 Reliability Characteristics

The module's reliability testing items include: High/low temperature operation, high/low temperature storage, thermal shock, alternating temperature humidity, etc. The test results must conform to the industrial requirements. See the module's working temperature in the table below:

Table 3-4 MG2639_V2 module's temperature characteristics

Parameters	Descriptions	MIN	MAX	Remarks
To	Normal working temperature	-30℃	75℃	
Ta	Limited work temperature	-40℃	+85℃	Make sure there is no obvious decline in the RF performance
Ts	Module's storage temperature	-40℃	+85℃	

3.4 ESD Characteristics

See the ESD characteristics at room temperature below:

Table 3-5 ESD performance

Interface	Testing items	Testing requirements	Performance
Antenna interface	Air discharge	±8 kV	Nothing unusual
	Contact discharge	±6 kV	Nothing unusual
SIM card interface	Air discharge	±8 kV	Nothing unusual
	Contact discharge	±6 kV	Nothing unusual

4 Interface circuit design

It provides the reference design circuit of the interface and precautions according to the module's functions.

4.1 Reset and power design

See the power and reset circuit reference design principle in figure 4-1. Since VD1 is TVS tube, you can select appropriate parameters according to the actual selected power supply; since VT1 is MOS tube, you can select CJ2305 from Changjiang Electronics or DMP2305U-7 from DIODES. Refer to figure 4-2 for the design of power circuit. Select MIC29302 and adjust the output voltage through the adjustment of R5 and R6. Please refer to the specification of MIC29302 for detailed parameter design. Please note that the components in the figure are just for your reference. For details, please adjust according to the actual circuit.

Figure 4-1 Power and reset circuit reference design principle diagram

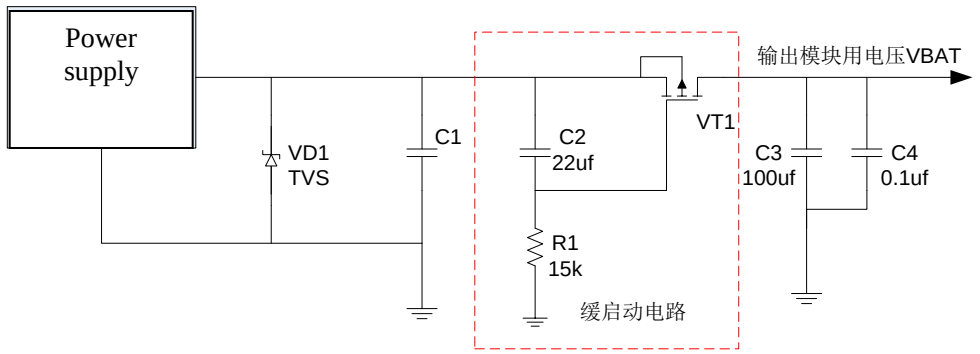
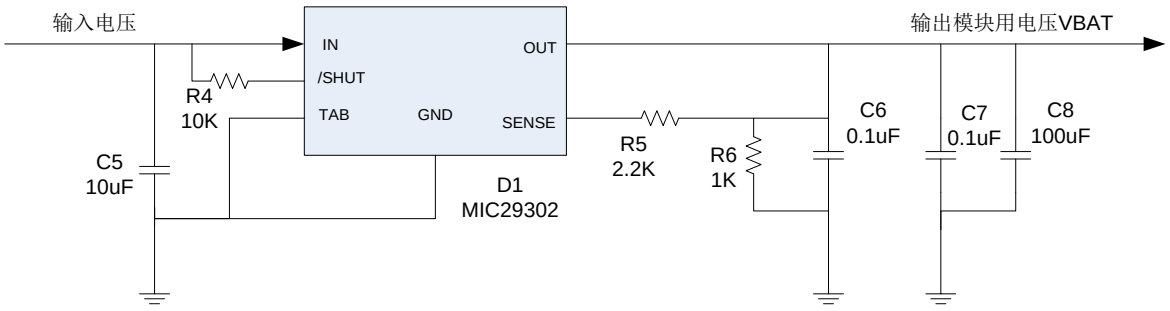


Figure 4-2 Power reference circuit



- Power design

MG2639_V2 module is powered by VBAT. If the external power cannot be stably started, it's recommended to add buffer circuit in the circuit. See the module's required voltage characteristics in table 4-1.

Table 4-1 Voltage characteristics

Classification	MIN	Typical	MAX
Input voltage	3.4V	3.8V	4.25V
Input current	1mA	--	300mA（depends on the network signal）

The module is very strict with the requirements on power and GND:

(1) The filtering must be performed to power and GND, and the power ripple must be controlled under 50Mv. Do not power any other part in the system because it might affect the RF performance.

(2) Select the power cables with at least 80mil traces during the layout and keep the integrality of ground line.

(3) Make sure the Max. instantaneous output current is larger than 2A if the Max. input current is very high.

- Power on

The module is under power-off status after it's normally powered on. To turn on the module, provide a 2s-5s low level pulse to PWRKEY_N pin when the module is OFF. If one 1K resistance is connected with PWRKEY_N, the module can be turned on after power supply.

- Power off

To turn off the module, use AT command "AT+ZPWROFF" or provide a 2s~5s low level pulse to PWRKEY_N PIN.

- Reset

Use the above method to firstly "power-off" and then "power-on" to hard reset the module.
If the external reset function has to be used, low level pulse lasting at least 500ms should be provided to /RESET Pin within 2 seconds after the module is turned on. Before that, the external I/O signal must be kept at low level. See the reset circuit design in figure 4-1.
If SYSRST_N Pin is not used, suspend the pin.
See the module's power-on/off time sequence in figure 4-3 below:

Figure 4-3 Power-on/off time sequence

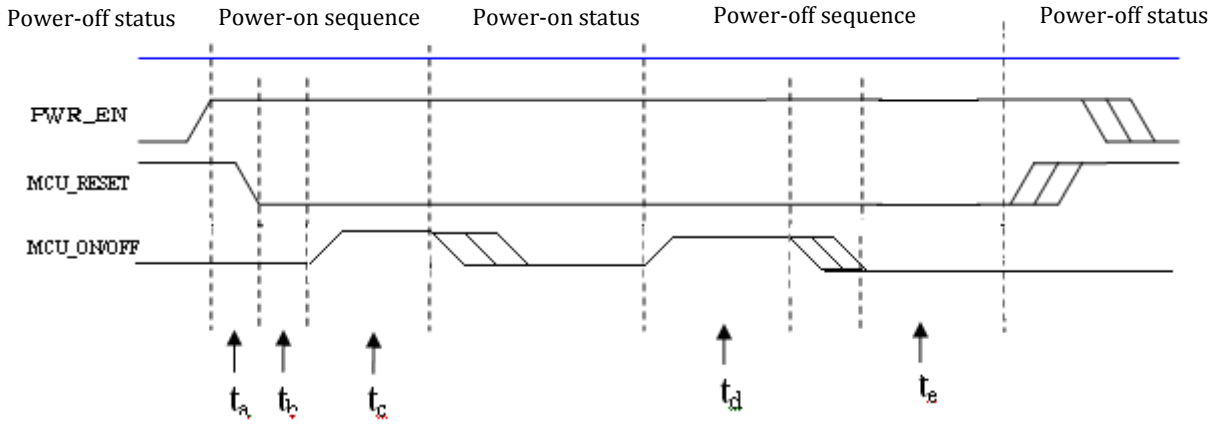


Table 4-2 Power-on/off circuit time characteristics

t_a	t_b	t_c	t_d	t_e
20ms	10ms	3s	3s	6s

- VDDIO

The module has one LDO voltage output pin, which can be used to supply external power to the main board. The voltage output is available only when the module is on. The normal output voltage is 2.8V, and the user should absorb the current from this pin as little as possible (less than 10mA). Generally, it is recommended to use this pin to pull up the chipset PIN as per the requirements of level matching. Therefore, it's not recommended to use this pin for other purposes.

- Other advice

In order to make sure the data is saved safely, please don't cut off the power when the module is on. It's strongly recommended to add battery or soft switch like the power key on the module.

4.2 UART interface

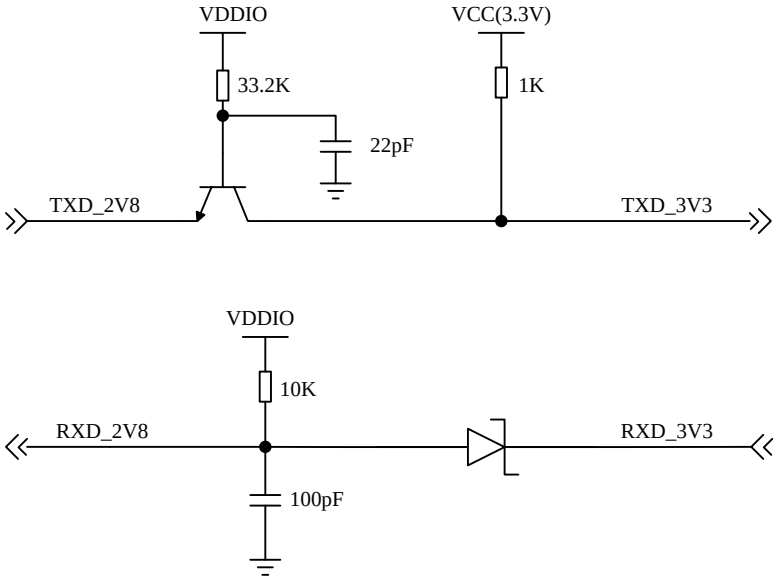
MG2639_V2 module provides an integrated full duplex UART1 interface and an accessorial full duplex UART2 interface with the maximal baud rate is 115200bps. The external interface adopts 2.8V CMOS level signal, which conforms to RS-232 interface protocol. The UART1 interface could be used as serial interface for AT commands transmission, data service and software upgrade. The UART2 interface can be used to debug the applications.

Note: when using the module for overall unit design, users should educe UART1 for module's software upgrade.

MG2639_V2 module's output IO level is 2.8V，it needs to transfer the level when connecting with standard 3.3V or 5V logic circuit（such as MCU or RS232 drive chip MAX3238 etc）, Figure 4-3 shows the COM port level transfer circuit. The converted signal should connect with MCU or RS232 drive chip directly. Common low power switch triode should be applied as the crystal triode shown in Figure 4-3. Please note that the module won't enter sleep mode as RXD is at high level.

The module's output I/O level is 2.8V，therefore the level should be converted when it connects with standard 3.3V or 5V logic circuit (such as MCU or RS232 drive chip MAX3238 etc）. Normally a triode is used to realize the level conversion. Figure 4-3 shows the level conversion to 3.3V through the serial port. The resistance and capacitance in figure 4-3 are just for reference, and they need to be recalculated during the design. The diode in Figure 4-4 is Schottky diode (forward voltage drop is 0.3V). If you select other diodes, please select one with lower forward voltage drop to make sure RXD_2V8 is below the threshold when inputting low level.

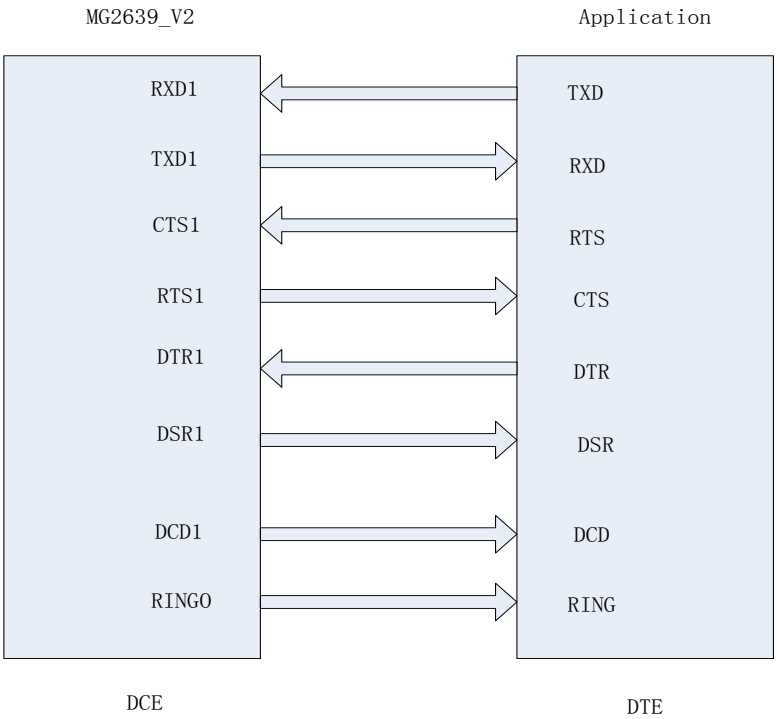
Figure 4-4 UART interface reference design diagram



Remarks: the module doesn't support USB.

4.2.1 UART1 Interface

Figure 4-5 UART1 DCE—DTE connection relationship



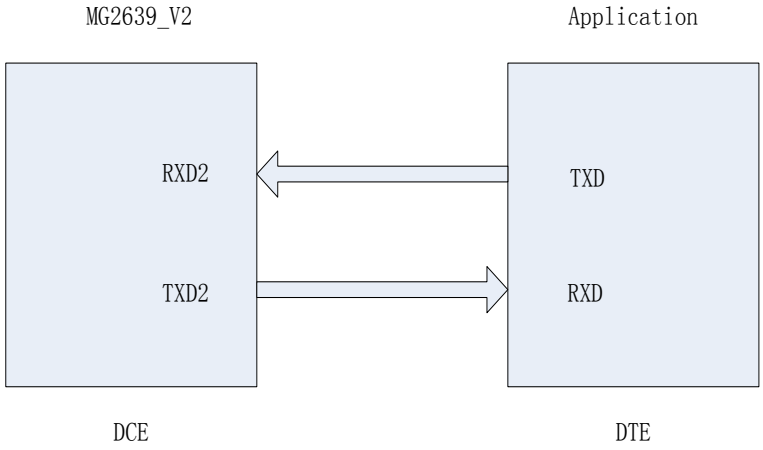
See the definitions of UART1 interface in table 4-3.

Table 4-3 UART1 Interface Definitions

Classification	No.	Definitions	I/O	Descriptions	Remarks
UART	15	RXD1	I	Receive data	DTE transmits serial data
	8	RTS1	O	Ready to send	DTE informs DCE to send
	16	TXD1	O	Transmit data	DTE receives serial data
	25	DTR1	I	Data terminal ready	DTE is ready
	9	CTS1	I	Clear to send	DCE has switched to Rx. mode
	4	RING	O	Ringtone indication	Inform DTE upon a remote call
	26	DSR1	O	Data set ready	DCE is ready
	10	DCD1	O	Carrier detection	Data link connected

4.2.2 UART2 Interface

Figure 4-6 UART2 DCE—DTE connection relationship



See the definitions of UART2 interface in table 4-4.

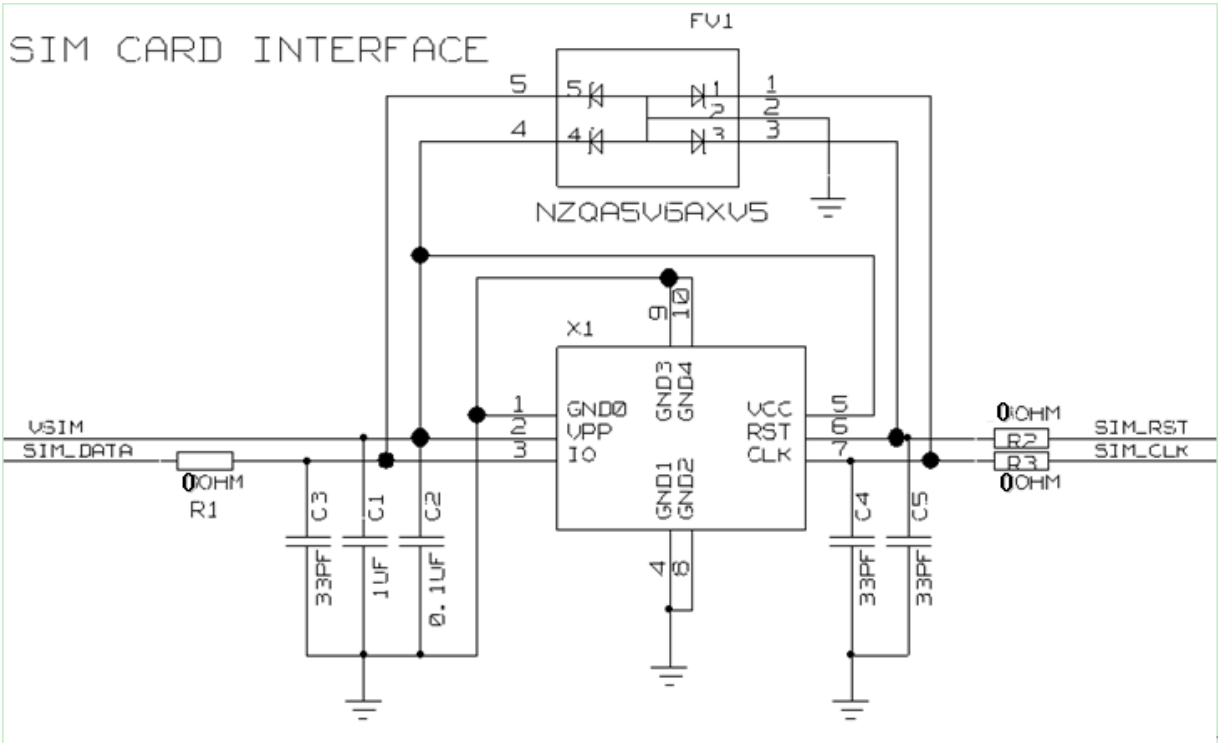
Table 4-4 UART2 Interface Definitions

Classification	No.	Definitions	I/O	Descriptions	Remarks
UART	29	RXD2	I	Receive data	DTE transmits serial data
	30	TXD2	O	Transmit data	DTE receives serial data

4.3 SIM card interface

MG2639_V2 module supports 1.8V or 3.0V SIM card. Refer to figure 4-7 for design.

Figure 4-7 SIM card circuit reference design diagram



NOTE:

(1) The SIM card PCB wiring should be laid closely around the module as much as possible.

(2) The VSIM, CLK, DATA and RST signals should be enveloped by the ground wires. The position of 33pF capacitance should be reserved on CLK, DATA and RST signals wiring and the position should be close to the SIM card socket to prevent the interference sources from affecting the SIM card's reading/writing.

(3) *Since the ESD components are very close to the SIM card socket, it's recommended to add TVS components on 4-CH SIM card signals, meanwhile, the signal wires need go through TVS component before entering the module's baseband processor during the layout to avoid damaging the module.*

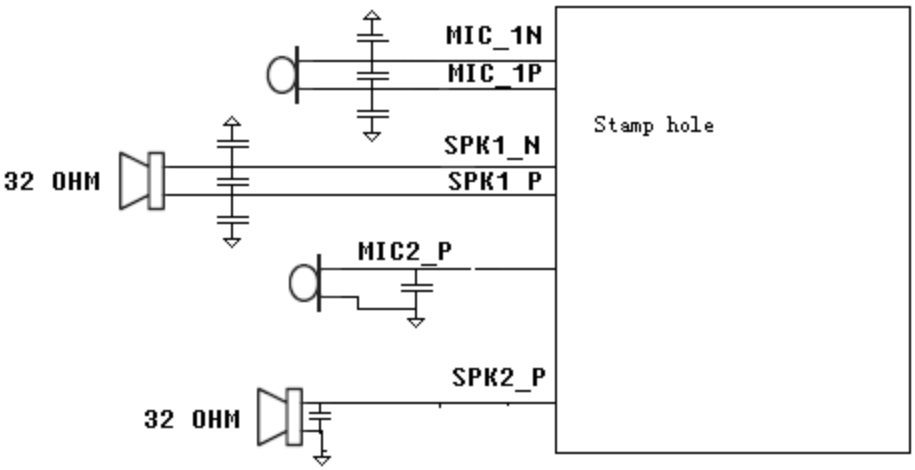
(4) The width of VSIM power wiring should be above 6mil at least (recommended to use 8mil).

(5) The filter capacitance of VSIM power wiring adopts 1uf (the value can't be larger than 10uf or smaller than 1uf), and then 0.1uf capacitance is added.

4.4 Audio interface

MG2639_V2 module provides audio input and output interfaces through its PINs. There are 2 Speaker interfaces and 2 Microphone interfaces. Only one pair I/O works at the same time. See the audio interface circuit in figure 4-8.

Figure 4-8 Audio interface circuit reference design principle diagram



Note: the capacitance value which is not marked is 33pF.

- **Microphone**

The MIC_N & MIC_P are both differential interfaces, and they can also be used for single-ended input. It's recommended to use differential method to reduce the noises. The MIC_2 interface is only used for single-ended input. Directly connect to the microphone since two inputs are coupled in AC domain and 1.9V offset voltage is generated.

- **Speaker**

The SPK_P & SPK_N are both differential interfaces with 32 ohm impedance, while the SPK2_P is single-ended interface with 32 ohm impedance.
GSM/GPRS module audio interface is designed as below:

- Design of the audio interface on the receiver

Select the microphone with the sensitivity lower than -51.5dB since the max. gain inside MIC1 reaches 51.5dB. The level of MIC1_P is about 1.48V.

Note: *if other kind of audio input method is adopted, the dynamic range of input signals should be within 0.5V. If the dynamic range is lower than 0.5V, then the pre-amplifier should be added. If the dynamic range is higher than 0.5V, then network attenuation should be added.*

- Design of the audio interface on the earphone

Select the microphone with the sensitivity lower than -51.5dB since the max. gain in MIC2 reaches 51.5dB. The level of MIC2_P is about 1.73V.

Note: In order to get better audio effect for users, we present the following suggestions:

1）During the process of using MG2639_V2 module, it's advised to use 100pf & 33pf capacitance on its external audio path, and serially connect with the beads to improve the audio quality

2）Connect TVS tube or pressure sensitive resistance on the audio path (approaching the module's interface) to prevent the ESD from damaging the module.

3）Make sure the use environment and module are well grounded and there is no mutual influence.

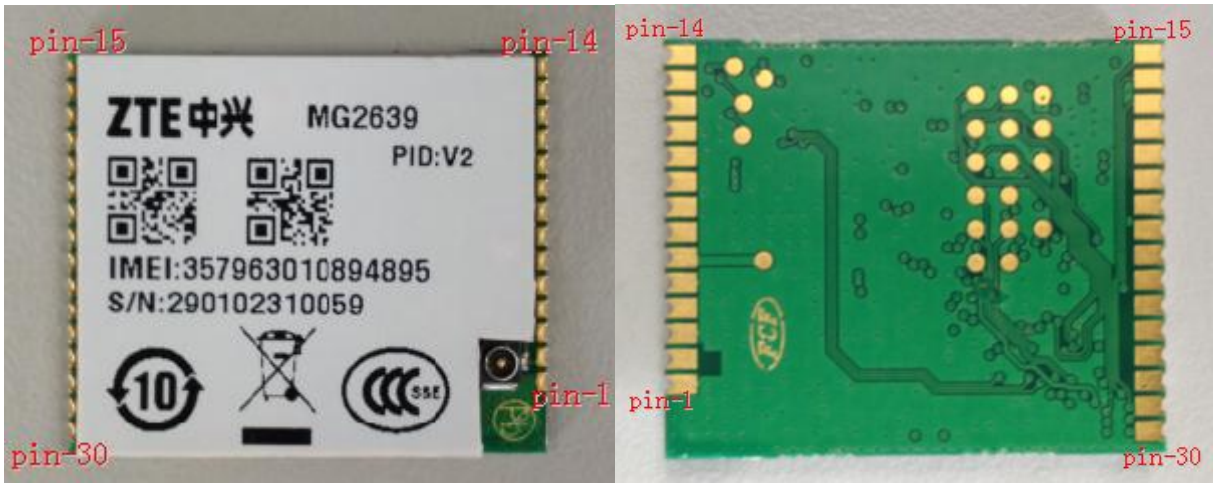
4）The power ripple supplied to the module is less than 50mV.

5. Mechanical dimensions

It introduces the module's mechanical dimensions.

5.1 Module's Appearance Diagram

Figure 0-1 MG2639_V2 appearance diagram

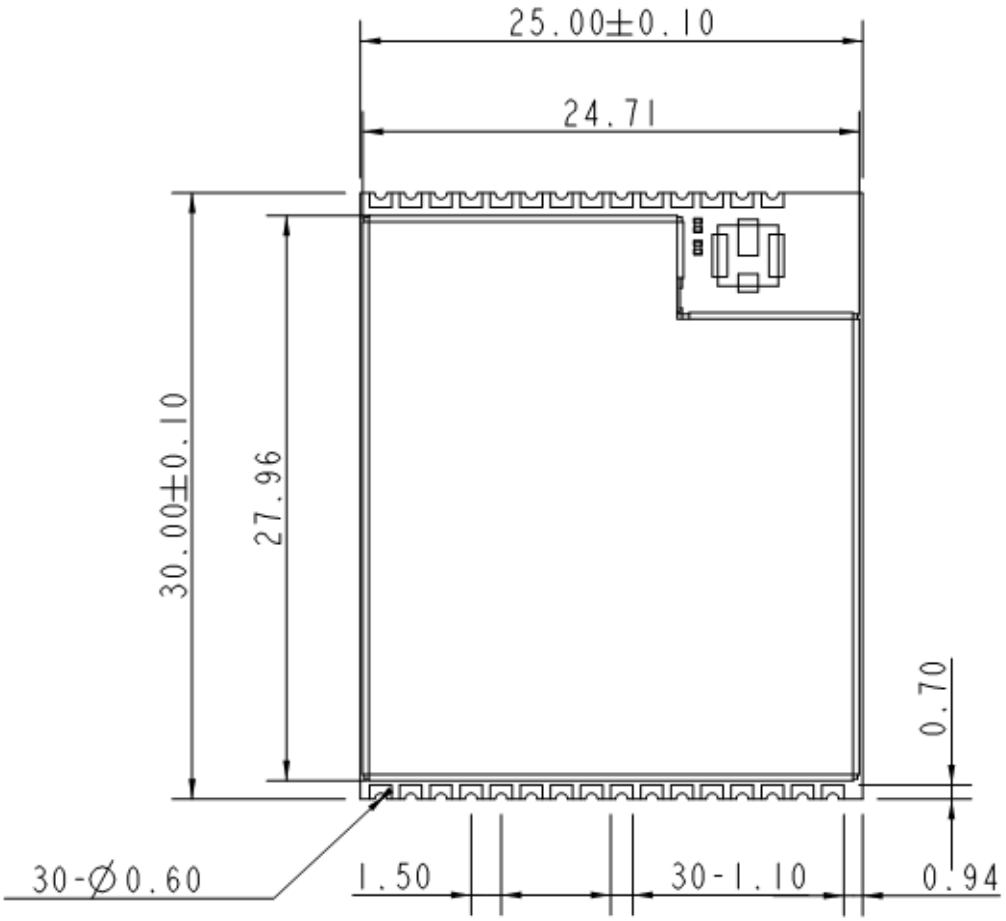


- Dimensions (L×W×H): 30.0×25.0×2.68mm
- Weight: <6g

5.2 Module's Assembly Diagram

See the module assembly diagram in figure 5.2.

Figure 0-2 Module's assembly diagram



5.3 PCB Dimensions

See the module's PCB dimensions in figure 5-3.

Figure 0-3 Relevant encapsulation dimensions from TOP view

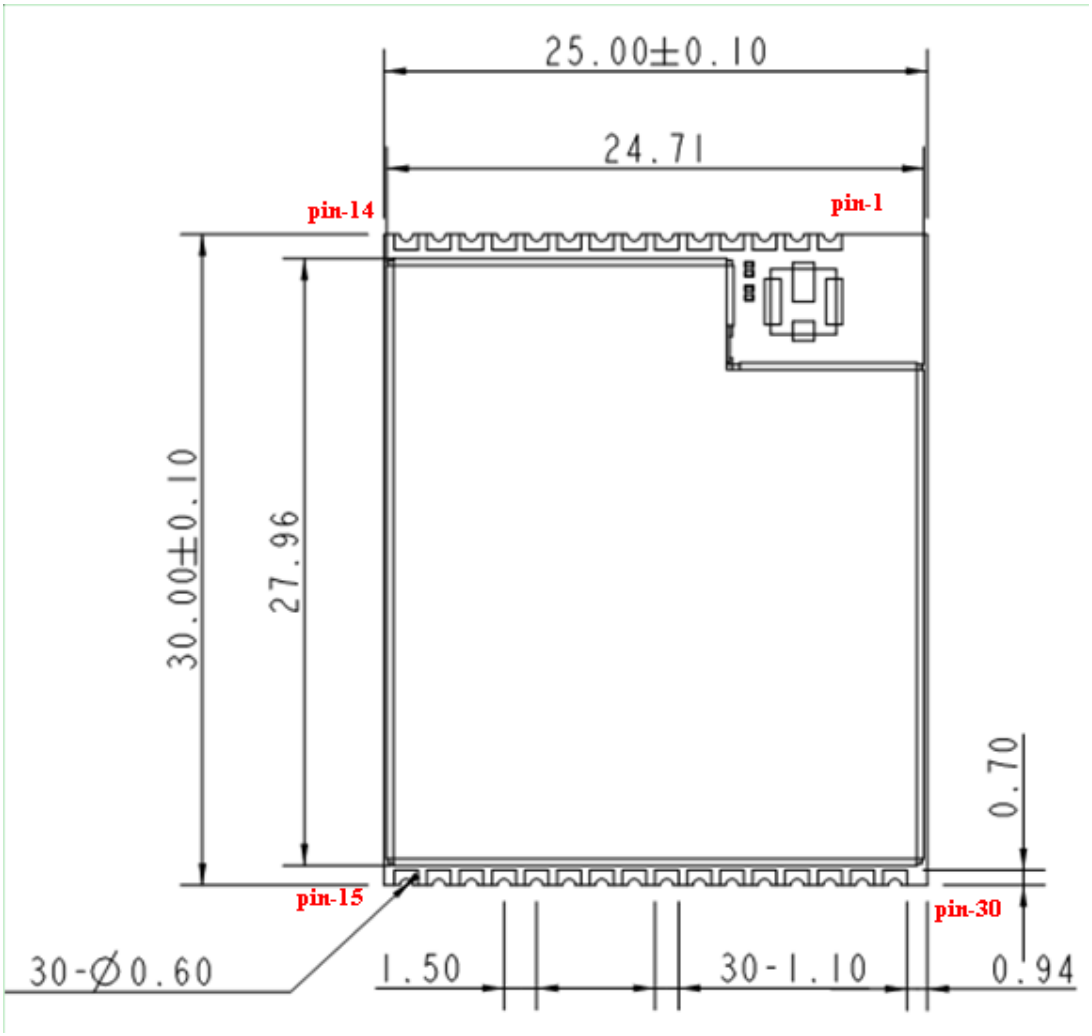
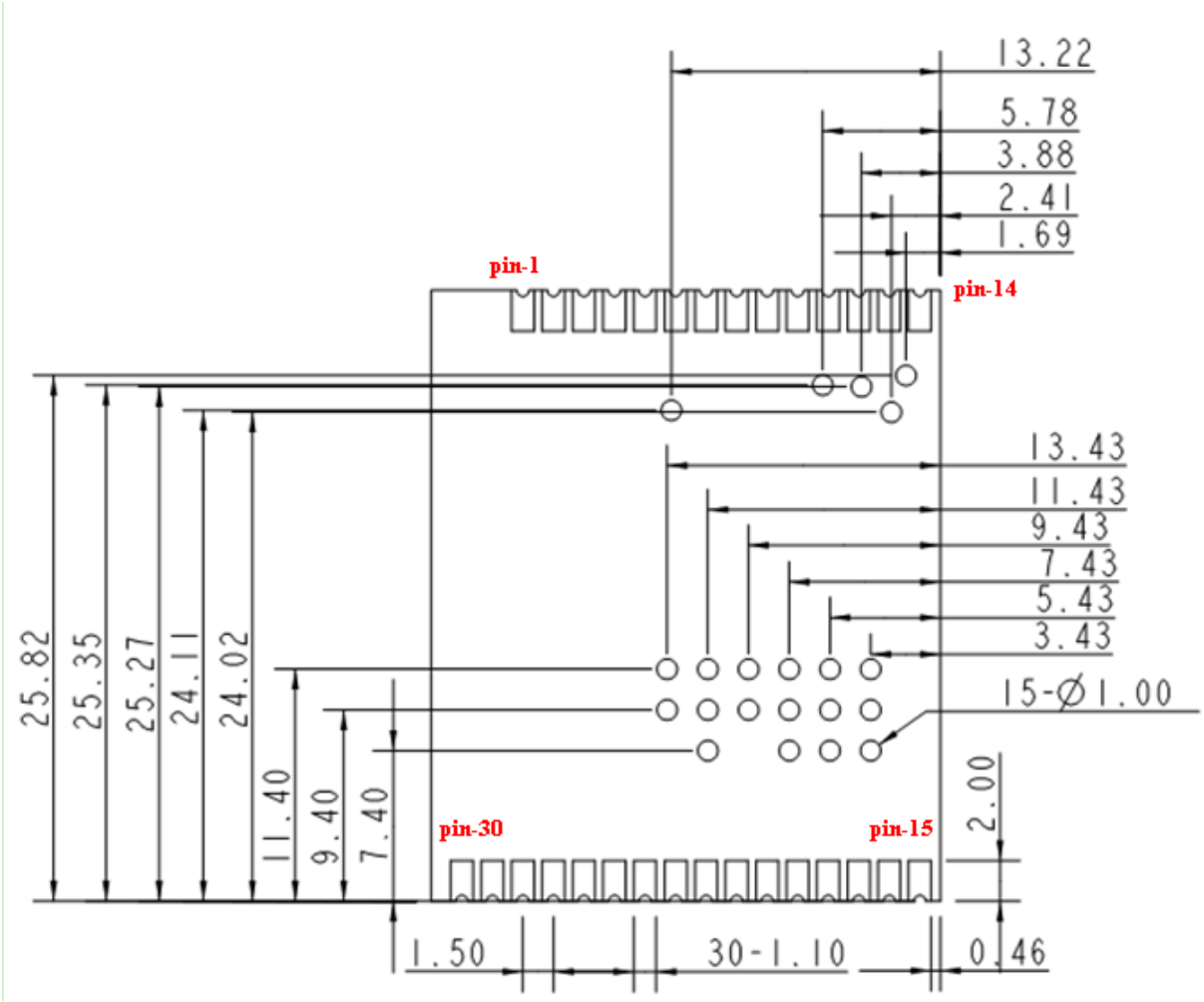


Figure 0-4 Relevant encapsulation dimensions from BOTTOM view



Precautions while designing PCB:

1）Copper-clad and wiring are forbidden on each layer of the PCB at the area below the RF test points.

2）For the convenience of testing and maintenance, it might be necessary to drill holes on the PCB to expose J-TAG test points.