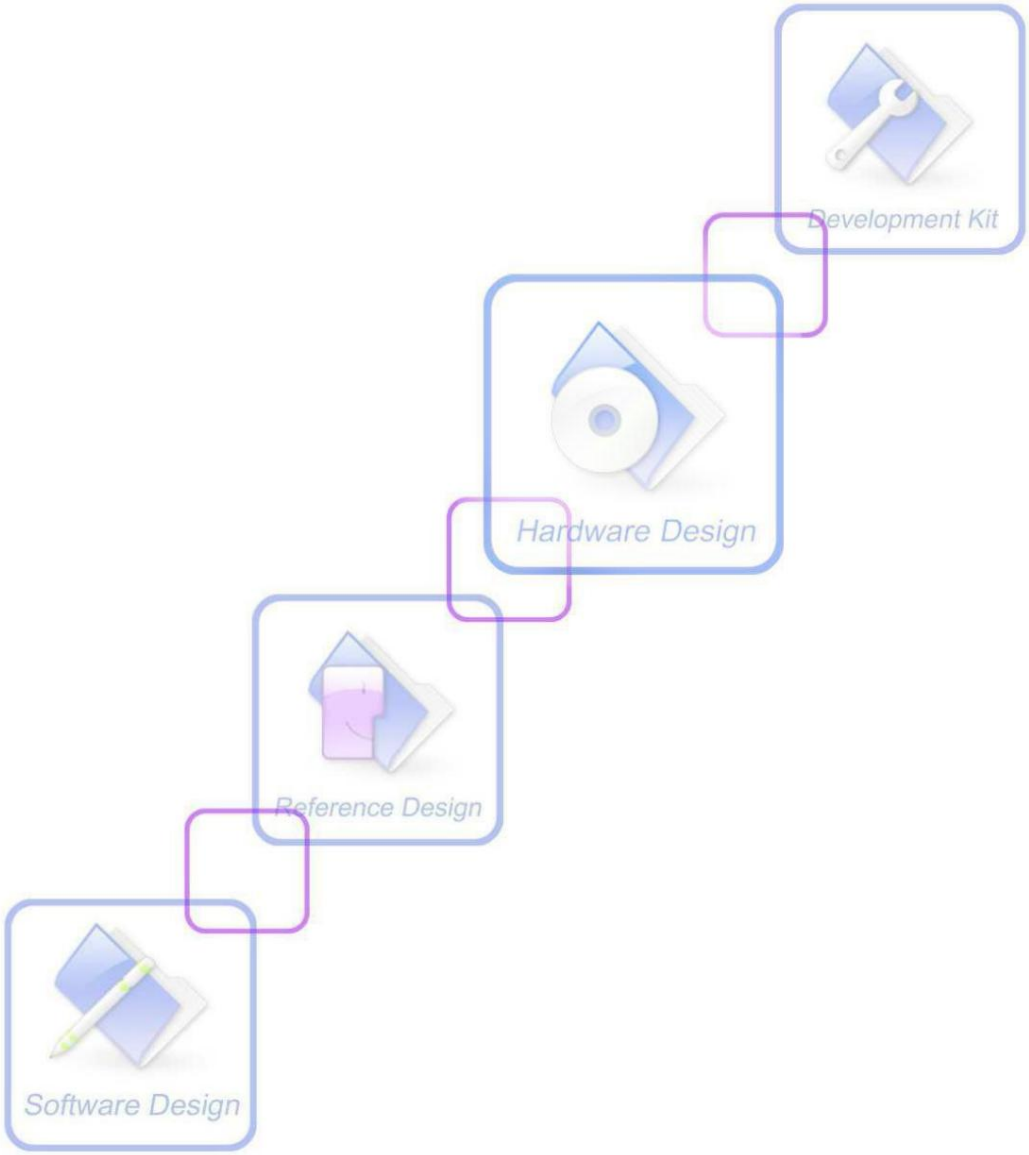
Shenzhen Guoyun Technology Co., Ltd.

GA6_Hardware Specifications_V1.04



Document Name:	GA6 Hardware Design Manual
Version: Date:	1.04
Status: Document	2017-1-18
Control Number:	release
	GA6_HD_CN_V1.04

foreword

Thanks for using the GA6 module provided by Guoyun. This product is a GPRS module. With standard AT command interface, it can provide GSM voice,

TTS, short message and TCP/IP data transmission. Please read the user manual carefully before use, you will appreciate its perfect functions and concise operation methods.

This module is mainly used for voice or data communication. The company does not assume the responsibility for property loss or personal injury caused by the user's abnormal operation.

appoint. Users are requested to develop corresponding products according to the technical specifications and reference designs in the manual. Also pay attention to the use of mobile products, especially GSM products

General safety considerations that should be addressed.

Before making a statement, the company has the right to modify the contents of this manual according to the needs of technological development.

GOOUUU TECH
深圳市果云科技有限公司

content

Table Index

Image Index

Version history

Date Version Change Description 1.01			author
2016-08-3 1	First Release		Bao
2016-11-1 7	Version 1.02, update NETLIGHT pin, DTR pin, RING pin information,	Update 3.4.2 Shutdown method	Bao
2016-12-1 7	Version 1.03, add audio interface		Bao
2017-1-18 1.04	3rd edition, add audio reference circuit		Bao

1 Introduction

1.1 Related documents

This document describes the hardware application interface of GA6, including circuit connection and radio frequency interface in related applications. The application of GA6 is very Broadly speaking, this document will detail all the features of the GA6.

This document can help users to quickly understand the detailed information of GA6 interface definition, electrical performance and structure size. In conjunction with this document and For other GA6 application documents, users can quickly use GA6 to design mobile communication applications.

Table 1: Related Documentation

Serial number document		Notes
name[1]	ITU-T Draft new recommendation V.25ter:	Serial asynchronous automatic dialing and control
[2]	GSM 07.07:	Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME)
[3]	GSM 07.10:	Support GSM 07.10 multiplexing protocol
[4]	GSM 07.05:	Digital cellular telecommunications (Phase 2+); Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE – DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
[5]	GSM 11.14:	Digital cellular telecommunications system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface
[6]	GSM 11.11:	Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface
[7]	GSM 03.38:	Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information
[8]	GSM 11.10	Digital cellular telecommunications system (Phase 2) ; Mobile Station (MS) conformance specification; Part 1: Conformance specification
[9]	AN_Serial Port	AN_Serial Port

1.2 Terms and explanations

Table 2: Terms and Explanations

the term	explain
ADC	Analog-to-Digital Converter
AMR	Adaptive Multi-Rate
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 (US)
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

the term	explain
led	Light Emitting Diode

Li-Ion	Lithium-Ion
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE
MT	Mobile Terminated
PAP	Password Authentication Protocol
PBCCH	Packet 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
UART	Universal Asynchronous Receiver & Transmitter
URC	Unsolicited Result Code
USSD	Unstructured Supplementary Service Data
VSWR	Voltage Standing Wave Ratio
Vmax	Maximum Voltage Value
Vnorm	Normal Voltage Value
Vmin	Minimum Voltage Value
VIHmax	Maximum Input High Level Voltage Value
VIHmin	Minimum Input High Level Voltage Value
VILmax	Maximum Input Low Level Voltage Value
VILmin	Minimum Input Low Level Voltage Value
VImax	Absolute Maximum Input Voltage Value
VImin	Absolute Minimum Input Voltage Value
VOHmax	Maximum Output High Level Voltage Value
VOHmin	Minimum Output High Level Voltage Value
VOLmax	Maximum Output Low Level Voltage Value
VOLmin	Minimum Output Low Level Voltage Value

the term	explain
Inorm	Normal Current
Imax	Maximum Load Current
Phonebook	

abbreviations	
FD	SIM fix dialing phonebook
LD	SIM last dialing phonebook (list of numbers most recently dialed)
MC	Mobile Equipment list of unanswered MT calls (missed calls)
ON	SIM (or ME) own numbers (MSISDNs) list
RC	Mobile Equipment list of received calls
SM	SIM phonebook
NC	Not connect

1.3 Safety Warning

Pay attention to the following safety precautions when using or servicing any terminal or mobile phone that contains a GA6 module. terminal device should When informing users of the following safety information. Otherwise, Jinxun will not be responsible for any consequences arising from the user's failure to follow these warnings.

	When in hospital or near medical equipment, observe the restrictions on cell phone use. If necessary, please turn off the terminal or mobile phone , otherwise the medical equipment may malfunction due to radio frequency interference.
	Turn off the wireless terminal or mobile phone before boarding. To prevent interference with the communication system, the use of wireless communication equipment is prohibited on board the aircraft. Ignoring the above will violate local laws and may result in a flight accident.
	Do not use mobile terminals or cell phones in the presence of flammable gas. Turn off cell phone terminals when near explosive operations, chemical plants, fuel depots, or gas stations. It is dangerous to operate the mobile terminal near any potentially explosive electrical equipment .
	When the mobile phone terminal is turned on, it will receive or transmit radio frequency energy. Interference with televisions, radios, computers or other electrical equipment may occur when near them.
	Road safety comes first! Do not use handheld terminals or mobile phones when driving vehicles, use hands-free devices. Park your car before using a handheld terminal or mobile phone.
	GSM mobile terminals operate under RF signals and cellular networks, but are not guaranteed to connect in all conditions. For example, no call credit or an invalid SIM card. When you are in this situation and need emergency services, remember to use the emergency number. In order to be able to make and receive calls, the mobile terminal must be turned on and in a service area with a sufficiently strong mobile signal. Emergency calls are not allowed when certain network services or phone functions are in use, such as feature lock, keypad lock. Disabling these functions before using an emergency phone . Some networks require active SIM support.

2 GA6 Overview

GA6 is a 4-band GSM/GPRS module, the working frequency is: EGSM 900MHz, GSM850MHz and DCS 1800, PCS1900. GA6 supports GPRS multi-slot class 10/ class 8 (optional) and GPRS coding formats CS-1, CS-2, CS-3 and CS-4.

The size of the module is only 22.8mm x 16.8mm x 2.2 mm, which can meet the space size requirements in almost all user applications, such as M2M, data transmission system, etc.

The physical interface between the module and the user's mobile application is 42 SMD pad pins, which provide all the hardware interfaces of the application module.

GA6 is designed with power saving technology, so the minimum current consumption in SLEEP mode is only 0.9mA .

GA6 is embedded with TCP/IP protocol, and the extended TCP/IP AT command makes it convenient for users to use TCP/IP protocol, which is very important for users to do data transmission.

Very useful when applying.

Note: Please contact us if you need TTS.

2.1 Main Features of GA6

Table 3: GA6 Key Features

Feature	instruction
power supply	Single Voltage: 3.5V – 4.2V
power saving	Current consumption in SLEEP mode is 0.9mA
frequency band	ÿQuad frequency: GSM850, EGSM 900 and DCS 1800, PCS1900 can automatically search four frequency bands. ÿCompliant with GSM Phase 2/2+
GSM type	small mobile station
transmit power	ÿ Class 4 (2W): EGSM 900 / GSM850 ÿ Class 1 (1W): DCS 1800 / PCS1900
GPRS connection features	ÿ GPRS multi-slot class 10 (default) ÿ GPRS multi-slot class 8 (optional)
temperature range	ÿNormal operating temperature: -30°C ~ +80°C ÿRestricted operating temperature: ~ -30°C and +80°C ~ +85°C* -40°C ÿStorage temperature: -45°C ~ +90°C

characteristic	instruction
GPRS data characteristics Circuit Switched (CSD)	ÿ GPRS data downlink transmission: maximum 85.6 kbps ÿ GPRS data upstream transmission: maximum 42.8 kbps ÿEncoding formats: CS-1, CS-2, CS-3 and CS-4 ÿSupports the PAP (Password Authentication Protocol) protocol commonly used for PPP connections ÿ Embedded TCP/IP protocol ÿSupport Packet Broadcast Control Channel (PBCCH) ÿ CSD transfer rate: 2.4, 4.8, 9.6, 14.4 kbps ÿSupport Unstructured Supplementary Data Service (USSD)·
Short Message (SMS)	ÿ MT, MO, CB, Text and PDU modes ÿShort message (SMS) storage device: SIM card
SIM card interface	Supported SIM Cards: 1.8V, 3V
antenna interface	GSM antenna pins
serial port and debugging port serial port:	ÿSupport 4-wire serial port ÿTransmission rate support from 2400bps to 115200bps ÿCan send AT commands and data through the serial port ÿSupport RTS/CTS hardware flow control, and can open or close the flow control function through software can ÿSupport serial port multiplexing function in accordance with GSM 07.10 protocol ÿSupport 115200bps automatic baud rate detection function Debug port: ÿFor debugging and software upgrade
Contacts	Support types: SM, FD, LD, ON,.
Management SIM Application Toolkit supports SAT class 3, GSM 11.14 Release 99	
Real Time Clock (RTC) support	
Timing function is set by AT command	
Mechanical Dimensions Dimensions: 22.8mm x 16.8mm x 2.2 mm	
Weight: 7g	
Software upgrade Upgrade software through the debug port	

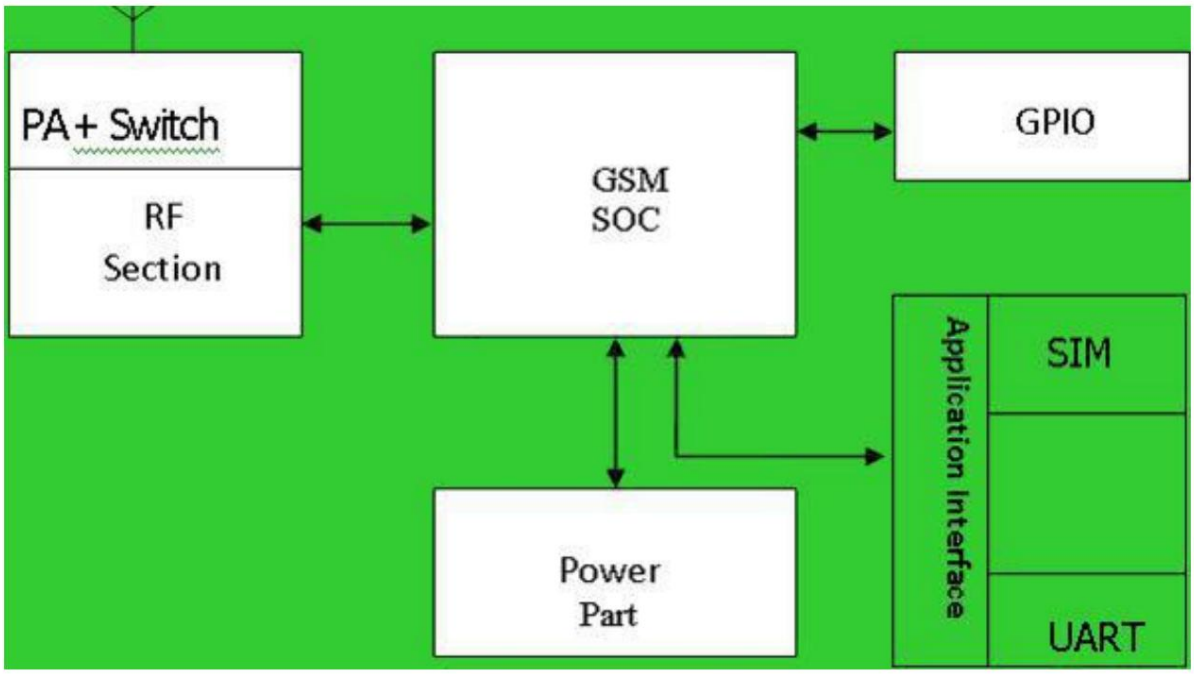
* GA6 will work, but some RF performance may exceed GSM specifications.

Table 4: Encoding Formats and Maximum Network Data Rates

Feature	instruction
encoding format	1 Timeslot 2 Timeslot 4 Timeslot
CS-1:	9.05kbps 18.1kbps 36.2kbps
CS-2:	13.4kbps 26.8kbps 53.6kbps
CS-3:	15.6kbps 31.2kbps 62.4kbps
CS-4:	21.4kbps 42.8kbps 85.6kbps

2.2 GA6 functional block diagram

The following figure lists the main functional parts of the module: ÿ GSM baseband ÿ GSM radio frequency ÿ Antenna interface ÿ Other interfaces



3 Application interface

The GA6 is connected to the mobile application platform via 42 SMD pins. The following sections describe each interface function in detail:

ÿPower supply (please refer to 3.3)

ÿSerial port (please refer to 3.7)

ÿ SIM card interface (please refer to 3.8)

Please refer to Chapter 5 for electrical characteristics and mechanical dimensions

3.1 GA6 pin description

Table 5: Pin Descriptions

power supply					
pin name	Serial I/O	Description	Module	DC characteristics	Remark
VBAT	41,42	I	source pin power supply, voltage range Vmin=3.5V operates on a single power supply Power through 2 VBAT power Vmax= 4.2V Range: 3.5V-4.2V, electrical Vnorm=4.0V Flow > 2A		
VDD_EXT	37	O	After the module is powered on, it will Provide this 3V power output; Power supply capability is 100mA		
GND	13,18,22, 25,28,34,	ground			
	36,39,40,				
Power on and off					
PWR_EN	8	I	Power-on button, >1.9V and above It can be turned on after 2s; After booting, the foot keeps breaking can be open; this pin only needs to provide voltage, not Power supply needs to be considered		Inside the module 10K pulldown, so provide on demand certain drive ability.
serial port					
AT_UART_CTS	10	O	send clear I send	3.0V	
AT_UART_RTS	11		request	3.0V	
AT_UART_RXD	31	I	send input O send output	3.0V	
AT_UART_TXD	30			3.0V	
AT_UART_DTR	9	I	Data Terminal Ready 3.0V		
AT_UART_RING	7	O	Ringing indication	3.0V	
SIM card interface					
SIM_VDD	16	O	SIM card power		SIM card all signals line should be connected
SIM_RST	14	O	SIM card reset signal		
SIM_CLK	15	O	SIM card clock signal		

SIM_DATA	17	I/O	SIM card data signal		
Indicator light interface					
NETLIGHT	6	O	Network indicator	When not registered: on for 100MS and off for 700MS; Register to the network: on for 100MS off 1900MS; Connect to the server: 100MS Off 100MS	
External reset					
RST	12	I	External reset input (low power effective)		appears in the module In exceptional circumstances, Pull down to put Module shutdown Internally already 2.8V pull-up, Pay attention to the voltage domain Different to divide the pressure design
Antenna interface					
GSM_RF	35		GSM antenna interface		
debug serial port					
HST_RXD	32	I	debug serial input 3.0V		
HST_TXD	33	O	Debug serial port output 3.0V		
audio interface					
EAR_L	twenty three	O	Headphone left channel		
EAR_R	twenty four	O	Headphone right channel		
REC+	26	O	speaker positive		
REC-	27	O	Speaker negative		
MIC-	19	I	MIC negative		
MIC+	20	I	MIC positive		
reserved					
Reserved	1, 2, 3, 4 , 5 21 29, , 38,				

3.3 Power supply

The GA6 is powered by a single power supply, the voltage input range of VBAT is from 3.5V to 4.2V, and the recommended voltage is 4.0V. The burst transmitted by the module will lead to When the voltage drops, the peak value of the current will reach up to 2A. Therefore, the current supply capacity of the power supply cannot be less than 2A.

A bypass capacitor close to VBAT is recommended, a 100μF, low ESR capacitor is recommended. It is also possible to use a 100 μF tantalum capacitor (low ESR) in parallel with a (1μF 10μF) ceramic capacitor. The figure below shows the recommended circuit as shown in the figure below. The capacitor should be placed as close as possible to the VBAT pin of the module during PCB layout.

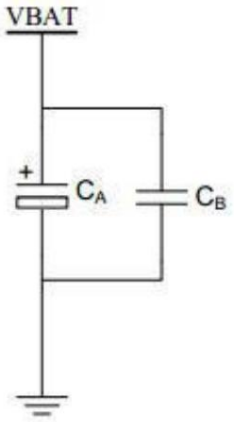


Figure 1: VBAT Bypass Capacitor Reference Circuit

The following figure is a reference design circuit with a DC input voltage of +5V. Because the output of the design is 4V, it can be implemented with a linear regulator. If the voltage difference between input and output (VBAT) is large, a switching regulator should be used. Especially when the current reaches 2A when the module bursts, the efficiency advantage of the switching regulator is obvious. The module can be powered directly by a 3.6V lithium-ion battery, or by a nickel-cadmium or nickel-manganese battery, but please note that the maximum voltage cannot exceed the maximum voltage of the module, otherwise the module will be damaged.

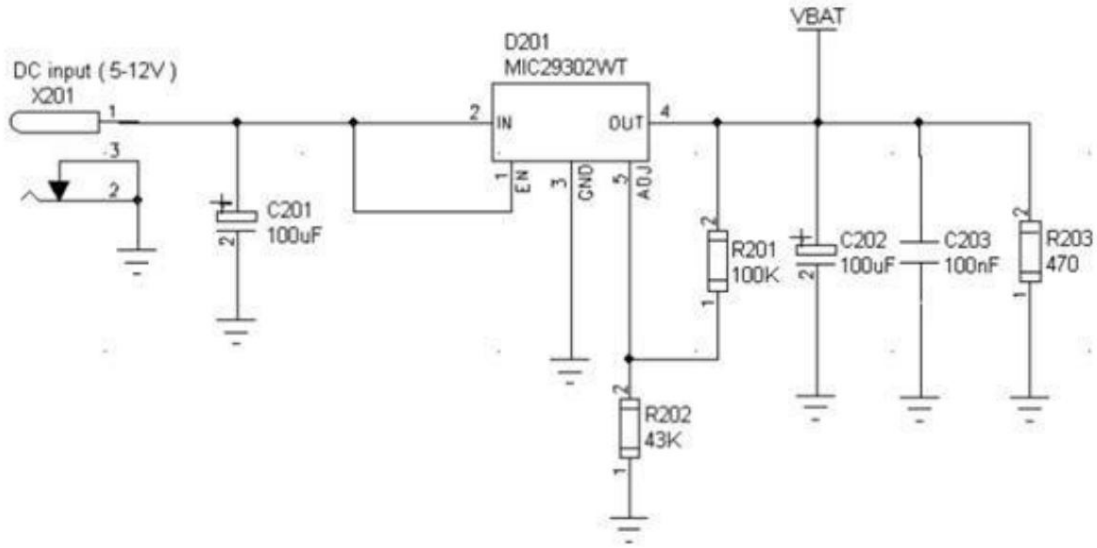


Figure 2: Power supply input reference design

circuit The figure below shows the drop of VBAT when VBAT is equal to 4V and the maximum transmit power. Test Conditions: The maximum output current of VBAT is equal to 2A, CA is a 100μF tantalum capacitor, ESR is equal to 0.7 ohms, and CB is equal to 1μF.

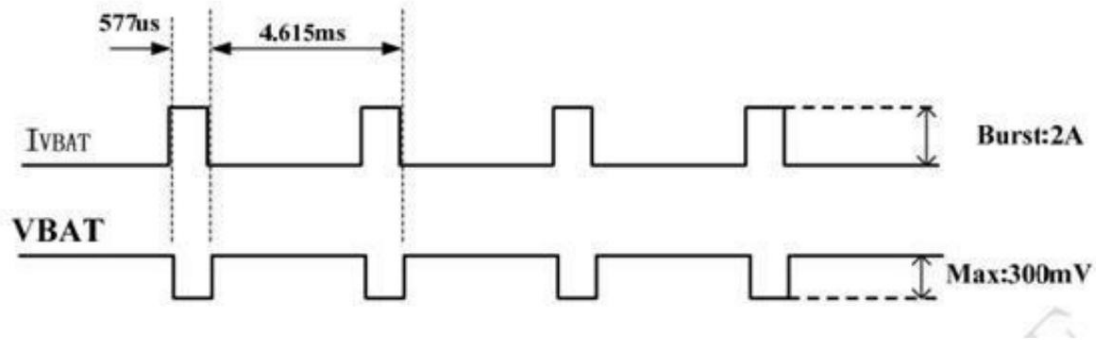


Figure 3: Drop of VBAT during burst

3.3.1 Power pins

Two VBAT pins are used for power input, and 9 GND pins are used for grounding. In the user's design, please pay special attention to the design of the power supply part to ensure that even when the current consumption of the module reaches 2A, the drop of VBAT will not be lower than 3.3V. If the voltage drops below 3.3V, the module may shut down. The PCB trace from the VBAT pin to the power supply should be wide enough to reduce voltage droop during transmission burst mode.

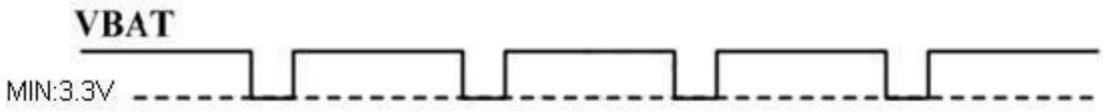


Figure 4: Minimum voltage at which VBAT drops

3.4 Power on and off

Do not turn on the module when the temperature and voltage limits described in Section 3.4.2 are exceeded. The module shuts down as soon as it detects these unsuitable conditions. In extreme cases such operations can lead to permanent damage to the module.

3.4.1 GA6 boot

The following chapters describe how to boot the GA6:

ÿUse the PWRKEY pin

Using the PWRKEY pin to turn on the module (Power On) The

user powers on by pulling the PWRKEY signal high for at least 2 seconds and then releasing it. This pin has been pulled down to GND internally in the module. The recommended circuit is as follows:

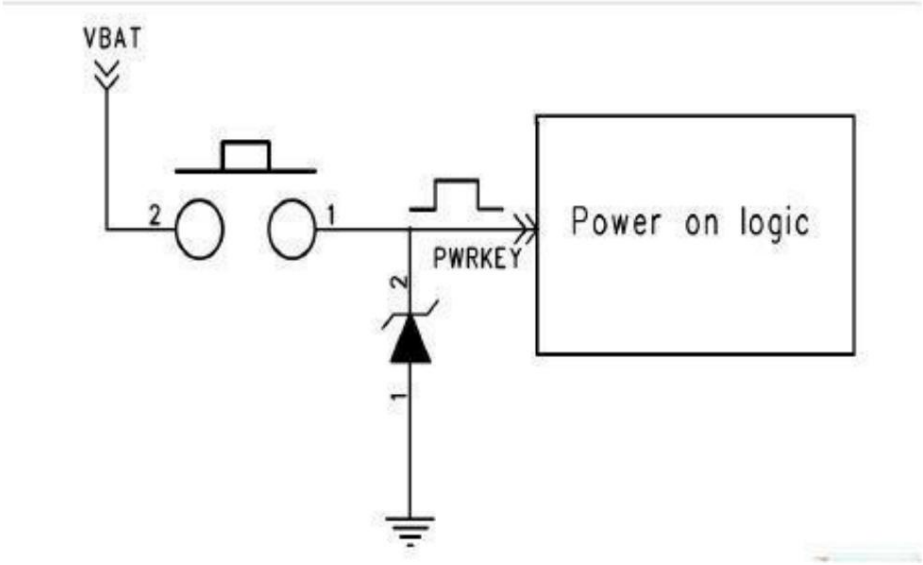


Figure 5: Using the PWRKEY button to power on

The following figure shows the boot sequence description:

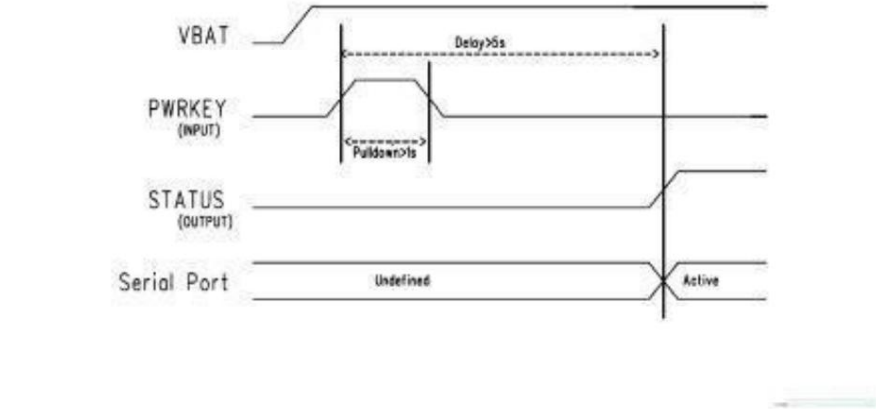


Figure 6: Boot sequence diagram using PWRKEY

3.4.2 GA6 shutdown

The following are several ways to shut down the GA6:

ÿUse PWRKEY pin to shut down

The user can turn off the module by pulling PWRKEY high for 2S and then releasing it. The shutdown circuit can refer to the design of the power-on circuit. after shutdown The AT serial port will report: "POWEROFOK"

ÿUsing AT command to shut down the user can

To shut down by AT command. shutdown

The AT command isAT+CPOF

"

" After shutdown, it will be reported on the AT serial port:" +CPOF: MSOF OK

3.5 Module sleep wake-up function

3.5.1 Module SLEEP Mode

Put the system into SLEEP mode by pulling the DTR pin low, wake up the system by pulling the DTR pin high

3.5.2 Module SLEEP current

3. GSM real network Sleep current consumption (unit: mA)			
	no card	move	Unicom
Minimum current	0.9	0.98	0.97
average current	3.1	3.3	3.4

3.5.3 The module wakes up the master when it receives a call or SMS

The module wakes up the master through the RI pin;

1) SMS wake up the master, RI pin will pull 3 low pulses of 100ms, RI pin waveform is as follows:

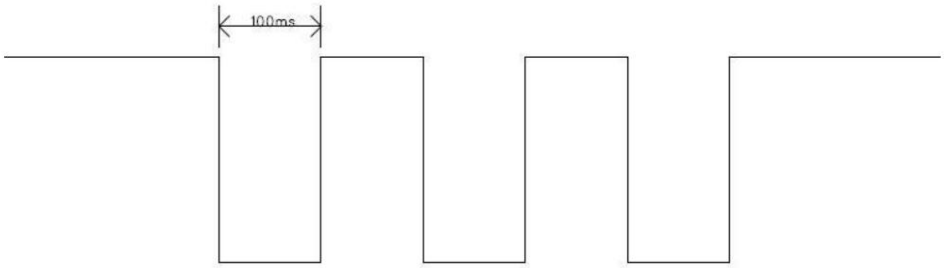


Figure 7: SMS wake up the master, RI pin waveform

1) The phone wakes up the master, and the RI pin will continue to pull a low pulse of 250ms and a high pulse of 3750ms until the phone hangs up or is connected, and the RI pin pulses

The shape is as follows:

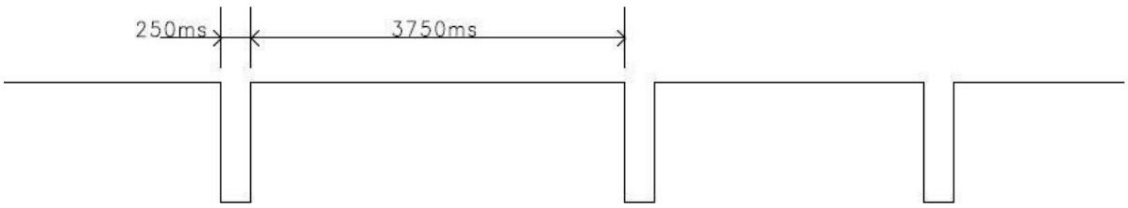


Figure 8: The phone wakes up the master, RI pin waveform

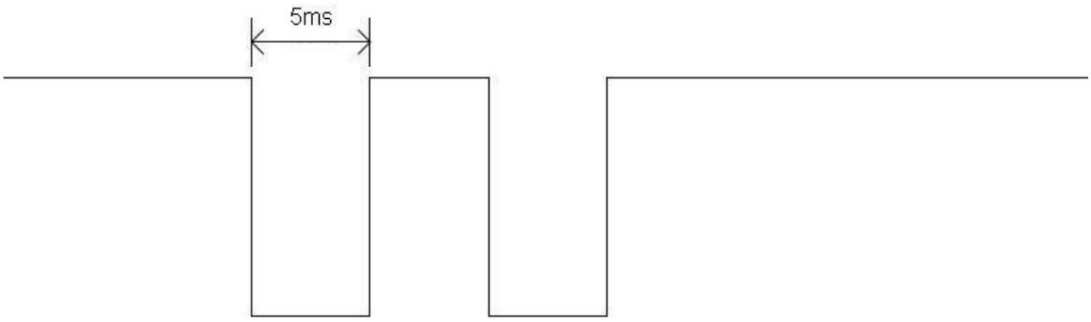


Figure 9: Data wake-up master, RI pin waveform

3.6 GPIO, INT, UART and other interactive design points

Because the module uses a 3.0V IO power supply system, the maximum input limit voltage of all IO ports cannot exceed 3.3V, otherwise

The IO port of the module may be damaged. The output voltage of the IO port under the 3.3V power supply system, due to the incompleteness of signal integrity design and other aspects

Good, the output voltage of the IO port is likely to cause the IO output to actually exceed 3.3V due to overshoot, and sometimes even

When it reaches 3.5V, the 3.3V IO signal at this time is directly connected to the IO of the 3.0V system of the module, which may damage the IO pins of the module. This

When it is necessary to increase the series resistance and parallel capacitance and other design measures.

pin name pin number		I/O function	Voltage Domain	Notes
PWRKEY	8	I AP_PWR_ON_OFF_BP		Module power on
RST	12	I AP_PWR_OFF_BP	3.0V	Module reset
TXD	30	O data sending	3.0V	data sending
RXD	31	I data reception	3.0V	data reception

Auxiliary Enhancement Control Signal

In order to enhance the more reliable communication between the AP and the module, it is recommended that when the AP has redundant GPIO or interface resources, add the

on these interfaces.

Pin name	Pin No. I/O Function 11		Voltage Domain	Notes
RTS		I UART_RTS	3.0V	Hardware flow control for UART
CTS	10	O UART_CTS	3.0V	Hardware flow control for UART

3.7 Serial port

serial port				
RXD	31	I data reception	3.0V	

TXD	30	O data sending	3.0V	
RTS	11	I send request	3.0V	
CTS	10	O send clear	3.0V	0

Table 6: Serial Port Pin Definitions

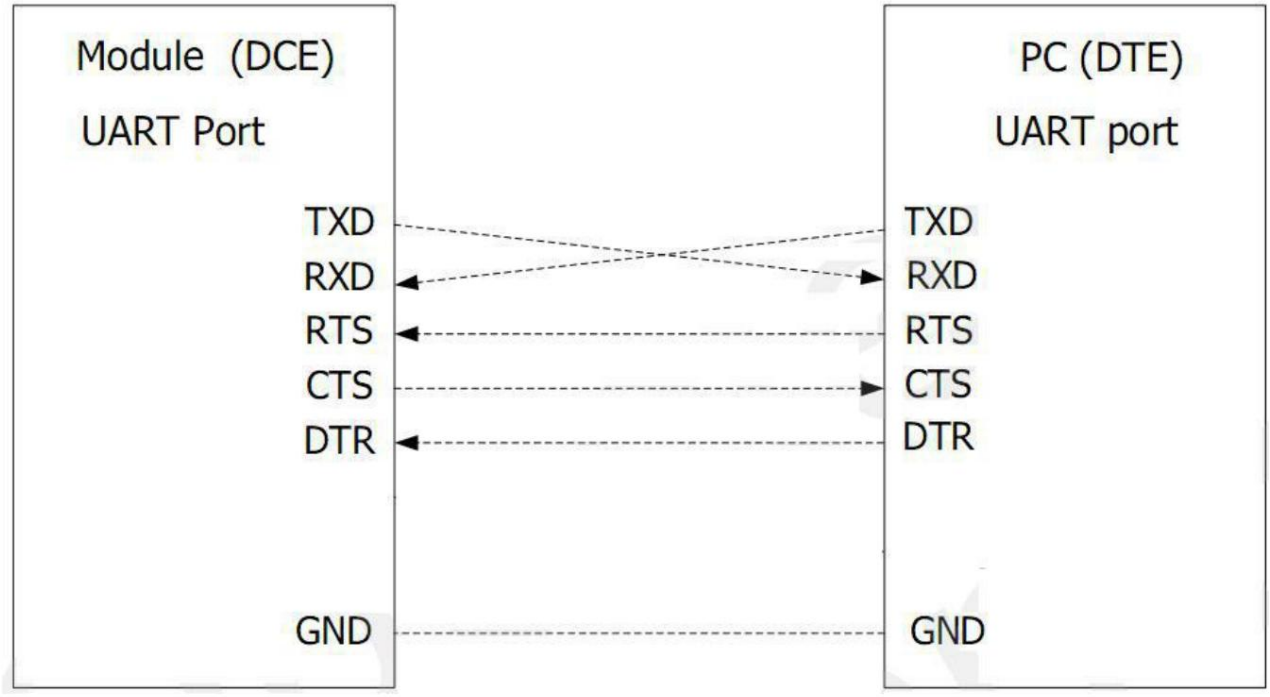


Figure 10: Serial connection diagram

Serial port:

ÿ TXD: Send data to the RXD signal line of the DTE device.

ÿ RXD: Receive data from the TXD signal line of the DTE device.

The serial port logic levels are described in the table below.

Table 6: Logic Levels for Serial Ports

parameter	minimum	maximum	unit
VIL	0	0.7	V
VIH	2.1	3.3	V
VOL	0	0.4	V
VOH	2.4	-	V

When the level of the host serial port is 5V, the level conversion needs to be performed when connecting with the module serial port. It is recommended to use the level conversion of FAIRCHILD company.

Chip NC7WZ07, the following is the reference design circuit diagram.

GOOUUU TECH
深圳市果云科技有限公司

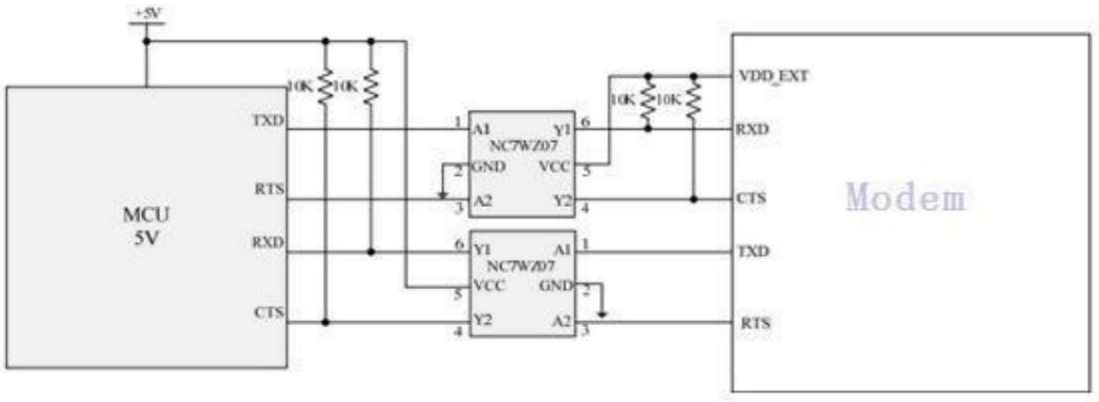
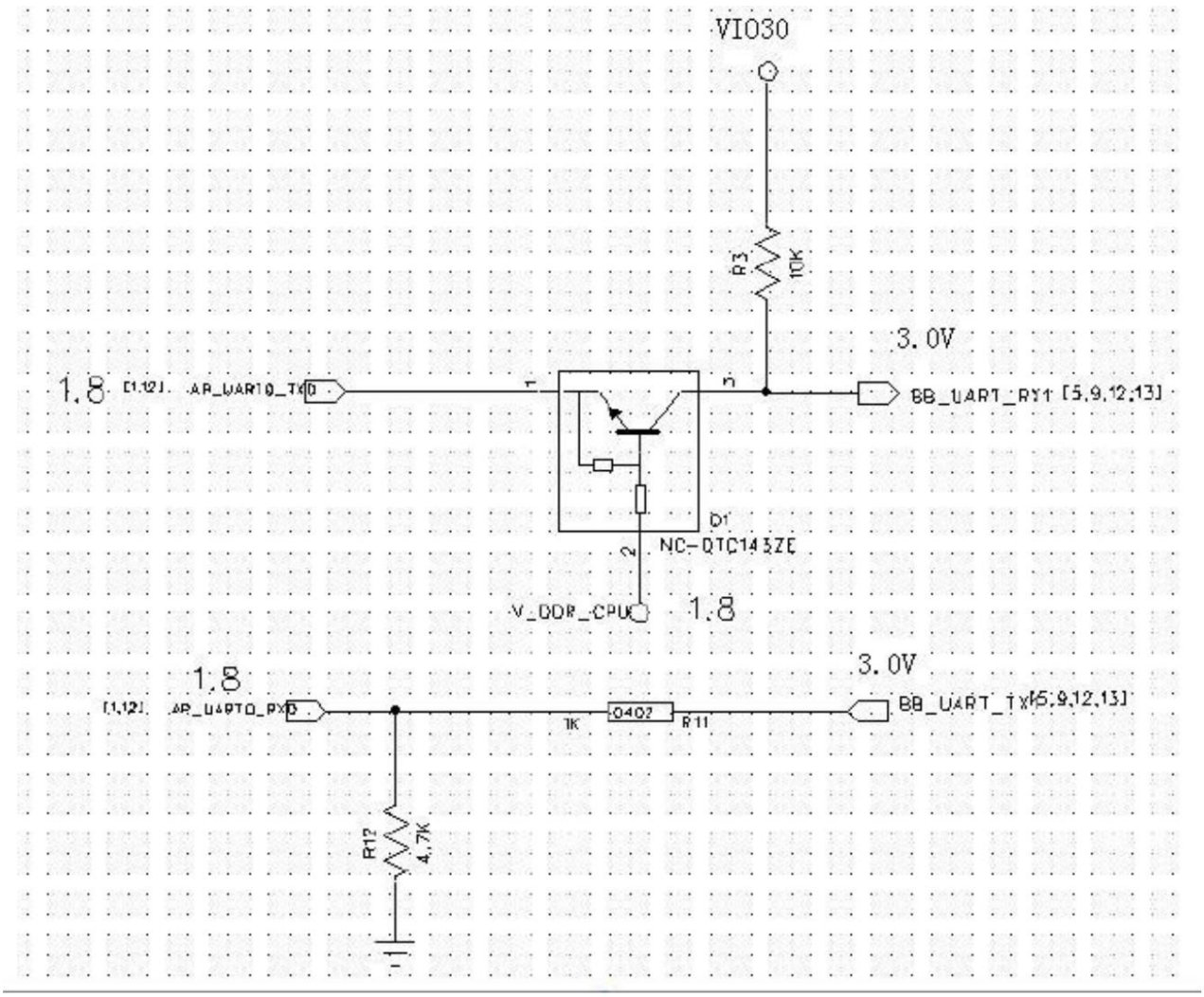


Figure 11: 5V to 3.0V level conversion circuit reference design When

using the UART port of the GA6 module to communicate with a PC or MCU, please pay attention to the TX and RX directions, especially the GA6 UART port only supports 3.0V voltage, so For external UARTs other than 3.0V, level shifting is required, and the usual practice is to use diodes or triodes to achieve level shifting. It can also be implemented using level shift chips. As shown in the figure, the transistor and the resistor realize 1.8V/3.0V level conversion. The resistance in the figure is only for illustration. Please recalculate it according to the actual needs when designing.



3.7.1 Serial port function

serial port

ÿSupport Modem devices

ÿContains data signal lines TXD and RXD, and status signal lines RTS and CTS. ÿThe

serial port can be used for GPRS service, receiving AT command control module. It can also be used for serial port multiplexing.

ÿ GA6 only supports basic multiplexing mode.

The communication baud rates supported by the serial port are as follows:

2400, 4800, 9600, 14400, 19200, 38400, 57600, 115200bps.

The serial port does not support RS232 level, only CMOS level. See Table 9 for level information. A must be added between DCE and DTE

level shifting IC. If you are connecting to a computer, please refer to the image below.

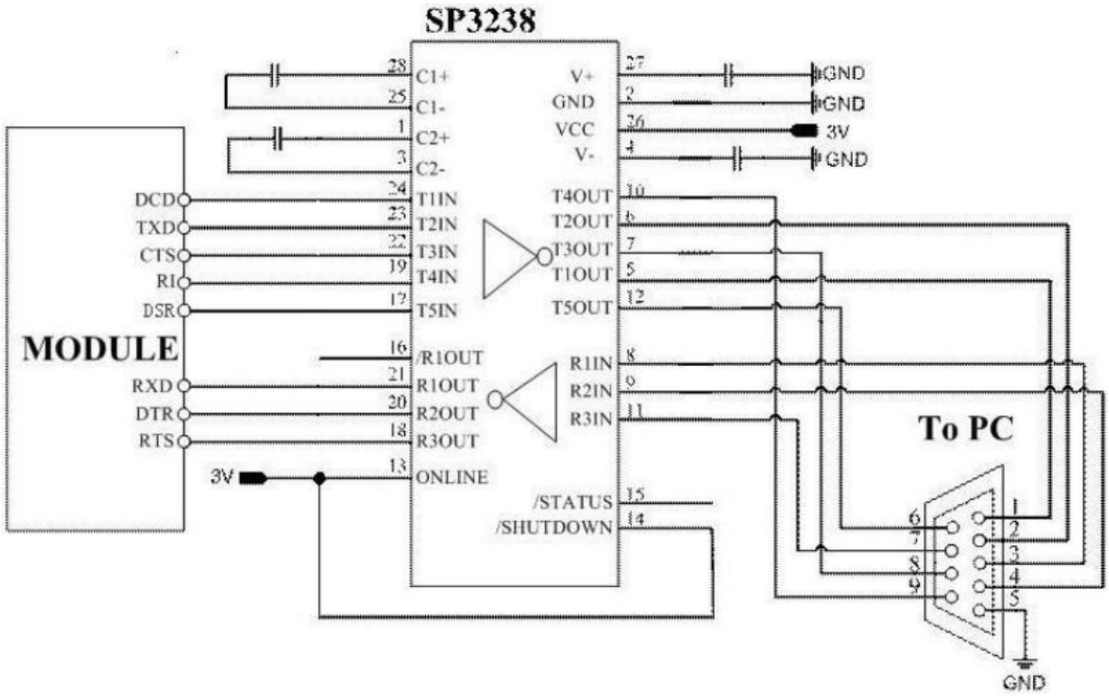


Figure 12: RS232 level conversion circuit

3.8 Audio Interface

audio port					
EAR_L	twenty three	O	Headphone left channel		
EAR_R	twenty four	O	Headphone right channel		
REC+	26	O	speaker positive		
REC-	27	O	Speaker negative		
MIC-	19	I	MIC negative		
MIC+	20	I	MIC positive		

The module provides 1 analog audio input channel which can be used to connect a microphone. When using a microphone for the audio input, an electret microphone is recommended. The audio output is used to connect the receiver, and it can only drive the maximum 32 ohm receiver. It is recommended that the user choose the following circuit according to the actual application to get a better sound effect. Note that the REC+/REC- audio signal line is a differential signal, which needs to be fully considered during PCB layout. As shown below. If you need to choose audio amplifier circuit, it is recommended to use LM4890 from National Company. In addition, the module also provides a headphone earpiece audio port

3.8.1 Receiver interface circuit

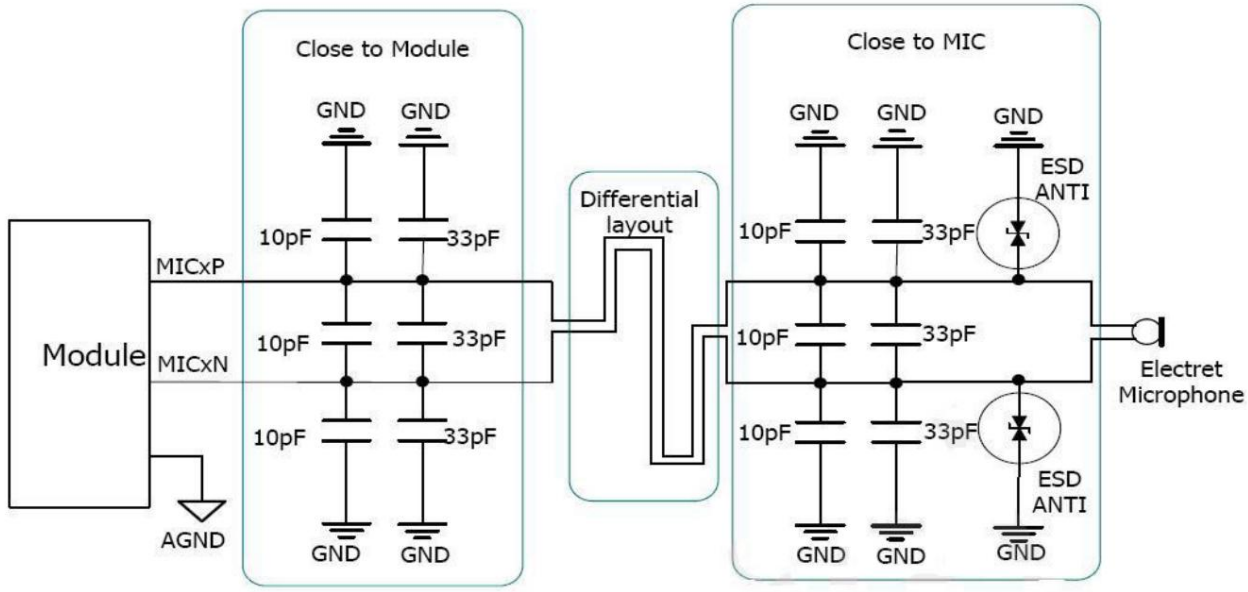


Figure 13: Receiver **MIC** interface circuit

3.8.2 Earpiece output interface circuit

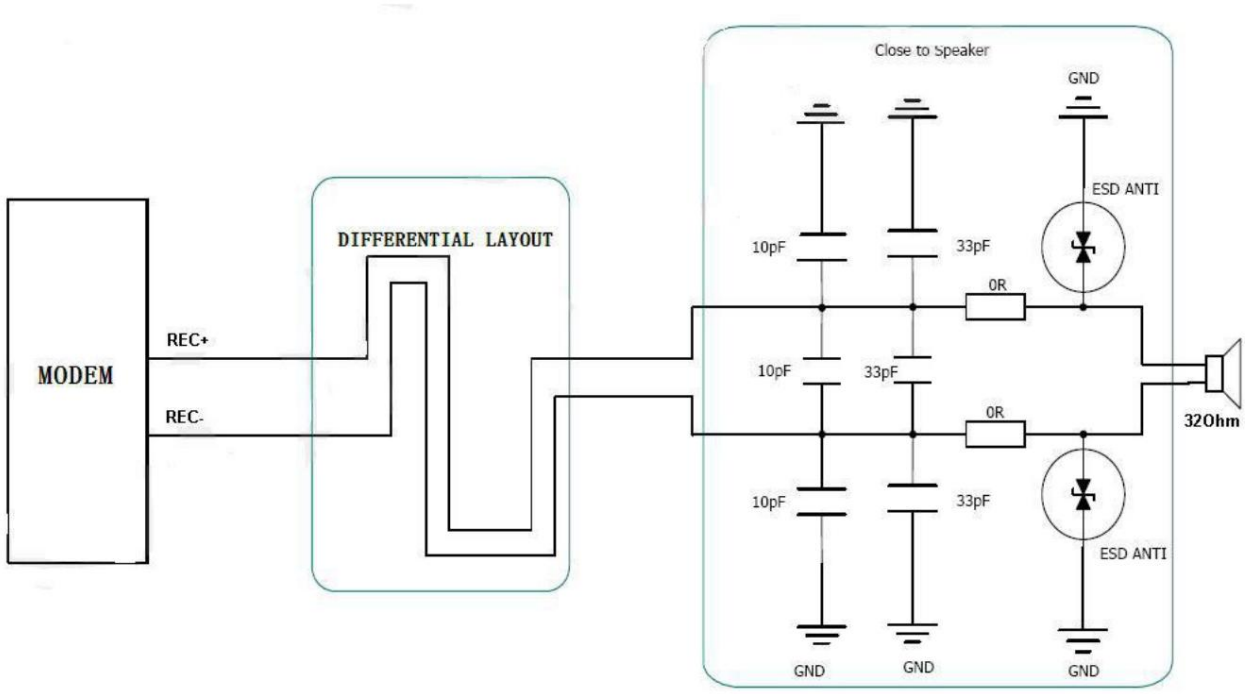


Figure **14: REC** handset output interface

3.8.3 Headphone receiver interface circuit

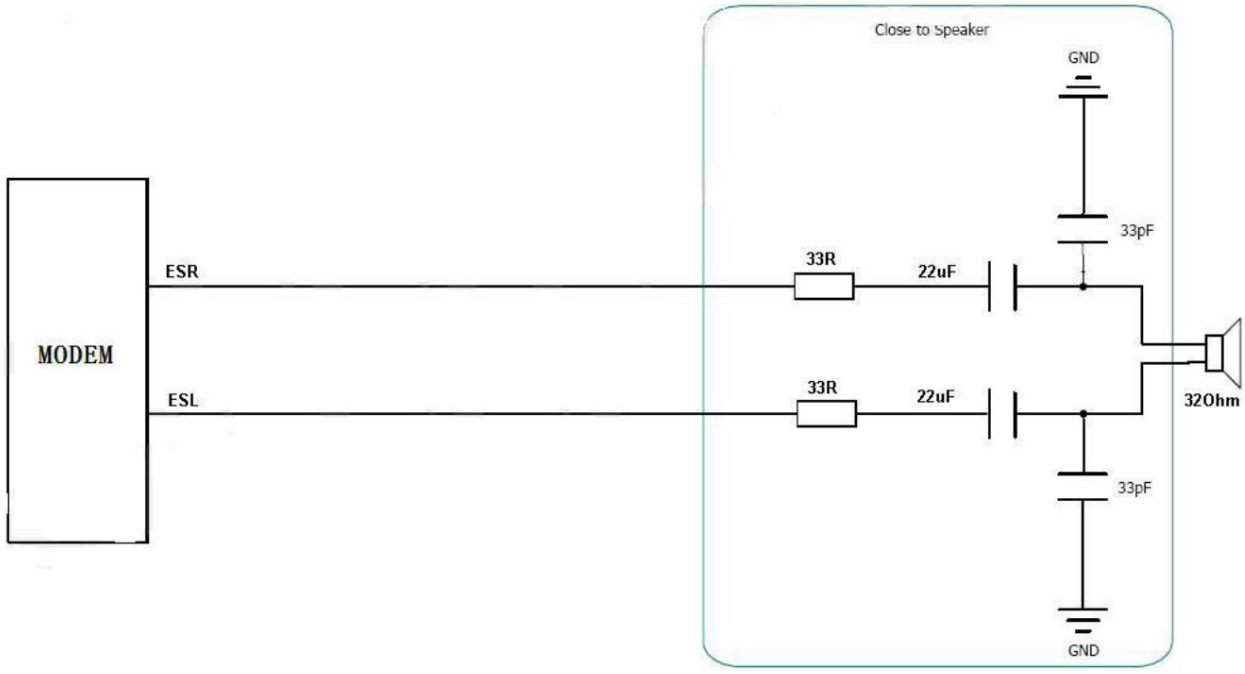


Figure 15: Headphone handset output interface

3.9 SIM card interface

3.9.1 SIM Application

The SIM card interface of the module supports the GSM Phase 1 specification, as well as the new GSM Phase 2+ specification and the FAST 64 kbps SIM card (with in SIM Application Toolkit).

1.8V and 3.0V SIM cards are supported.

The interface power supply of the SIM card is provided by the voltage regulator inside the module, the normal voltage is 2.8V or .

1.8V Table 7: SIM card interface pin definition

Pin Name	pin number	Features
SIM_DATA	17	SIM card data I/O
SIM_CLK	15	SIM card clock
SIM_RST	14	SIM card reset
SIM_VDD	16	SIM power supply, automatically select output according to the type of SIM card voltage, can be 3.0V±10% Or at 1.8V±10%, the output current is about 10mA.

The following figure is the recommended interface circuit of SIM card. To protect the SIM card, it is recommended to use ST (www.st.com) ESDA6V1W5 or ON SEMI (www.onsemi.com) SMF05C for ESD protection. In the figure below, the 22ÿ resistor in the IO port line is used to match the module and SIM card

The impedance between the data signal line SIM_DATA has been pulled up inside the module. Devices of the peripheral circuit of the SIM card should be close to the SIM card holder.

The recommended circuit of the 8-pin card holder is as follows:

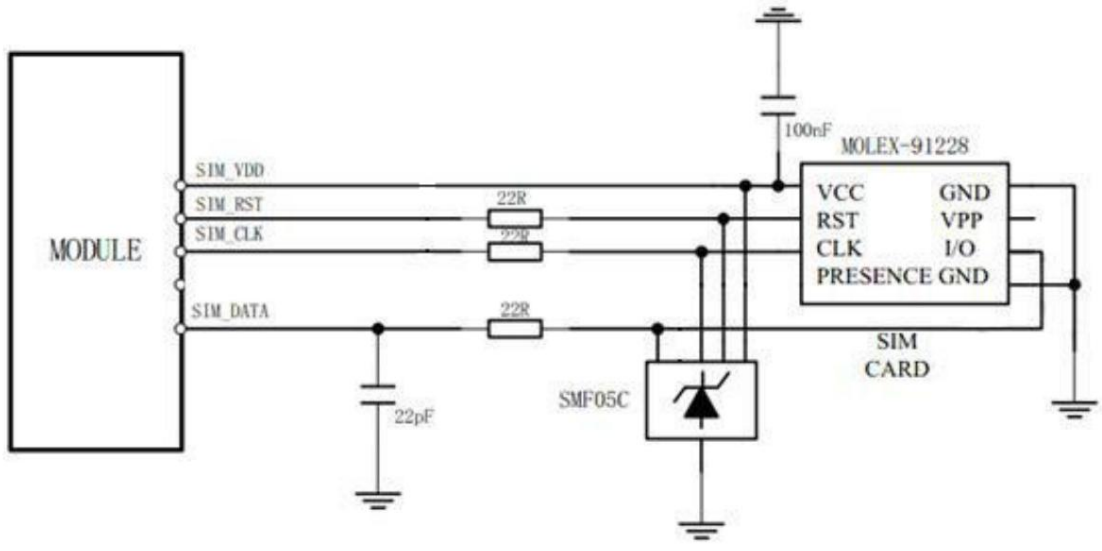


Figure 16: Recommended circuit for interface of 8-pin SIM card holder

SIM_PRESENCE is floating.

The interface circuit of the 6 -pin SIM card holder is as follows:

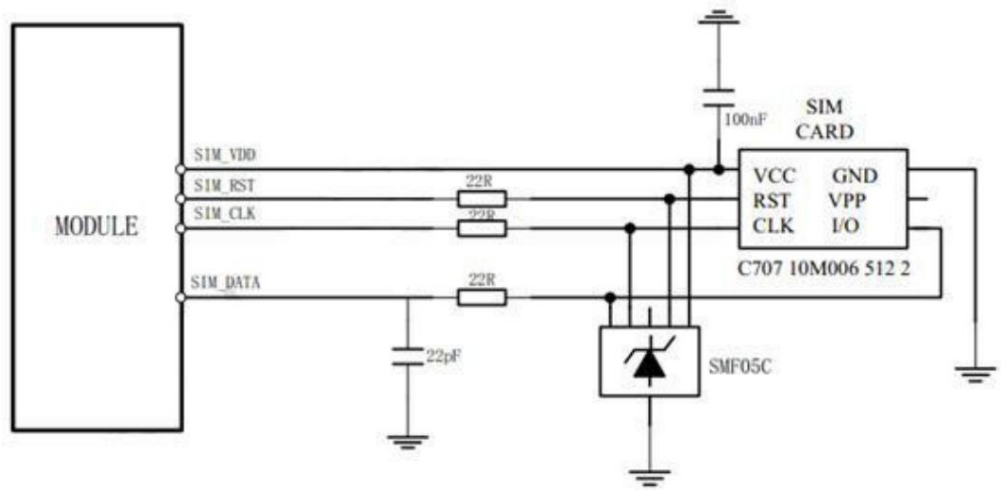
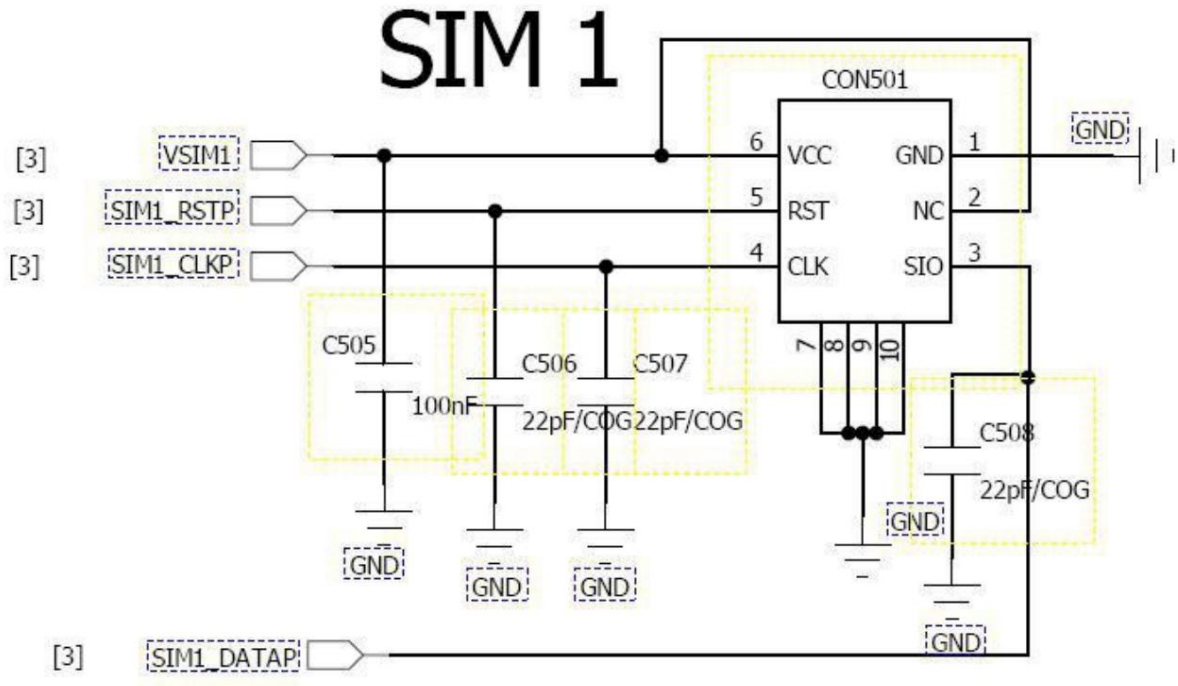


Figure 17: Recommended circuit for interface of 6-pin SIM card holder

Hardware design

suggestion: Independent TVS tube can be used here, and it can be used as appropriate according to the actual ESD

test situation. If the ESD is good and the TVS tube is not needed, please use a 22pF~33pF decoupling capacitor for the TVS position to improve the anti-RF interference capability of the SIM card. If the ESD test comes down, the TVS tube is indispensable, please use the TVS tube with the capacitance value not exceeding 50pF. The 22R resistor can be added or removed as appropriate according to the actual test situation. The following figure shows a concise reference design for verification



3.9.2 Selection of SIM Card Holder

For a 6-pin SIM card holder, Amphenol C707 10M006 5122 is recommended. Please visit http://www.amphenol.com webpage

to know more information!

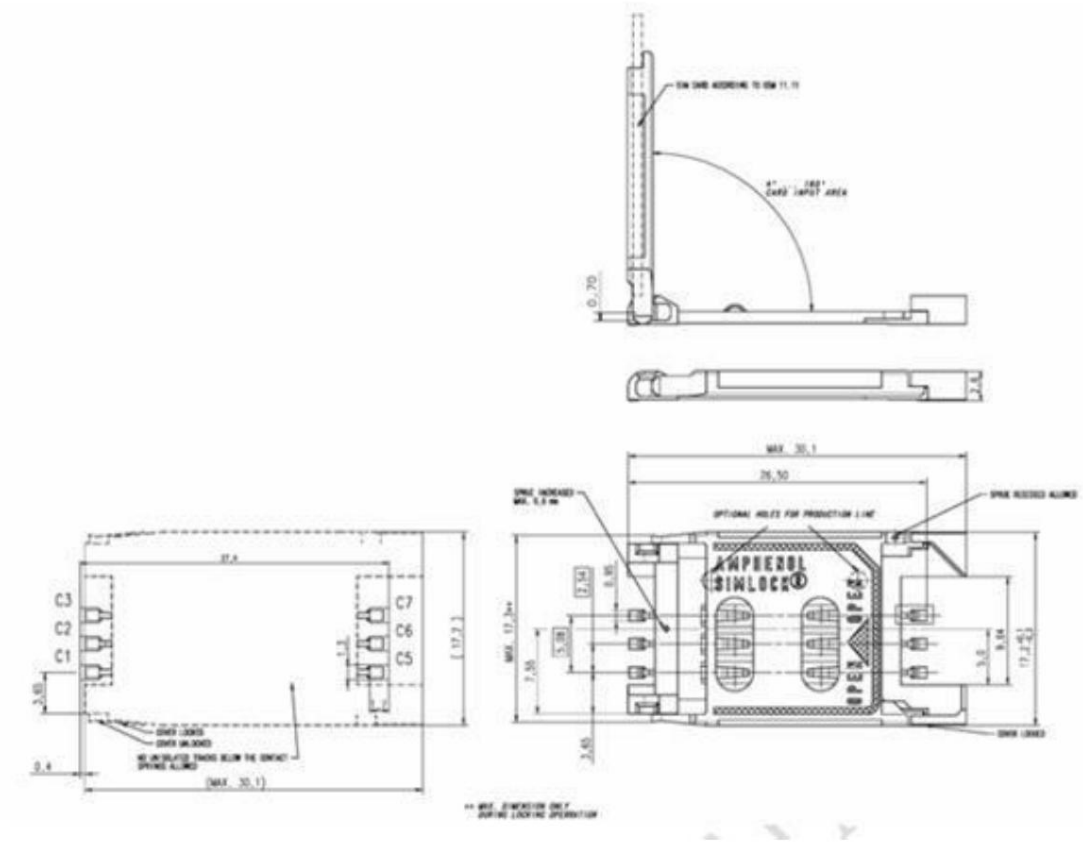


Figure 18: Dimensions of Amphenol C707 10M006 5122 SIM card holder

Table 8: Pin Description (Amphenol SIM Card Holder)

Pin Name Signal Description		
C1	SIM_VDD	SIM power supply, the output voltage is automatically selected according to the type of SIM card. Think 3.0V±10% or is 1.8V±10%, and the output current is about 10mA.
C2	SIM_RST	SIM card reset
C3	SIM_CLK	SIM card clock
C5	GND	ground
C6	VPP	not connected
C7	SIM_DATA	SIM card data I/O

8-pin SIM card holder, Molex 91228 is recommended. Please visit http://www.molex.com for more information.

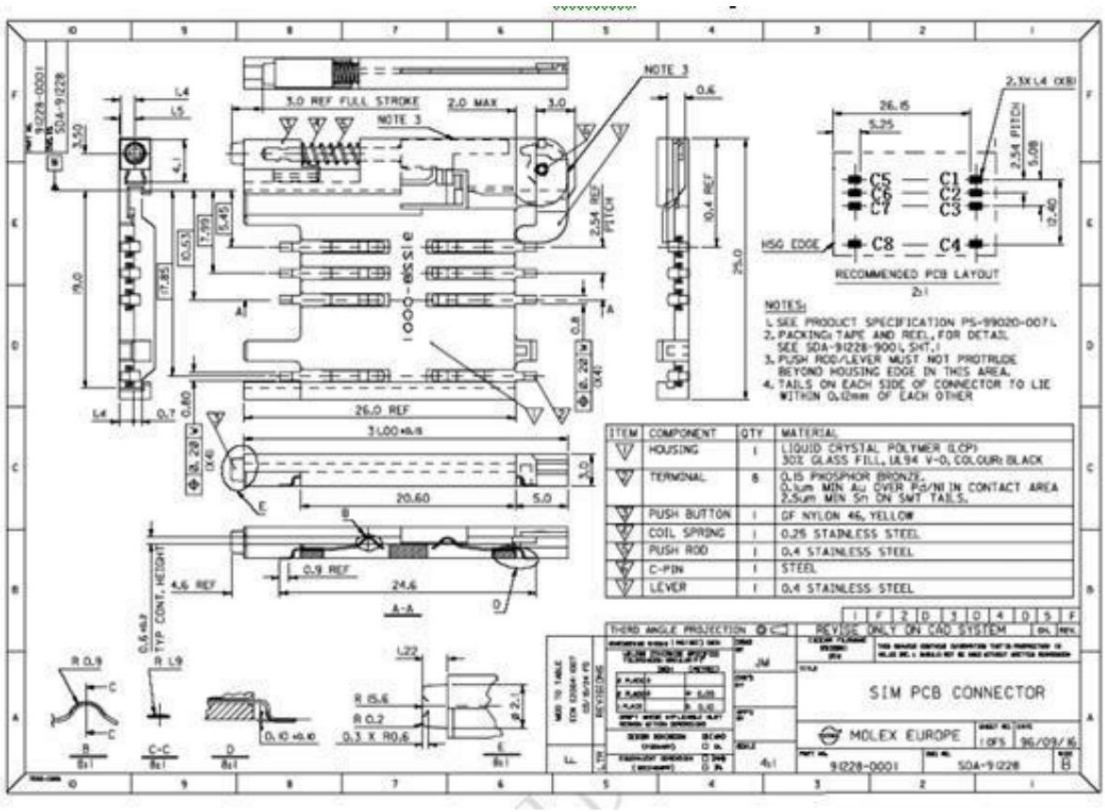


Figure 19: Molex 91228 SIM Card Holder Dimensions

Table 9: Pin Description (Molex SIM Card Holder)

Pin Name Signal Description		
C1	SIM_VDD	SIM power supply, the output voltage is automatically selected according to the type of SIM card, which can be 3.0V±10% Or at 1.8V±10%, the output current is about 10mA.
C2	SIM_RST	SIM card reset
C3	SIM_CLK	SIM card clock
C4	GND	ground
C5	GND	ground
C6	VPP	not connected
C7	SIM_DATA	SIM card data I/O
C8	SIM_PRESENCE	SIM card insertion and removal detection (floating)

3.10 External reset input

The device can be put into reset state through the external reset pin NRESET. This signal is only used for emergency reset, such as the module cannot respond to AT command, or a graceful shutdown is not possible. The module will be reset when the NRESET pin is low, this pin has been pulled up internally. should be in

A decoupling capacitor is connected to the NRESET pin in parallel to prevent interference. After RESET, you need to press the power button again to restart the module.

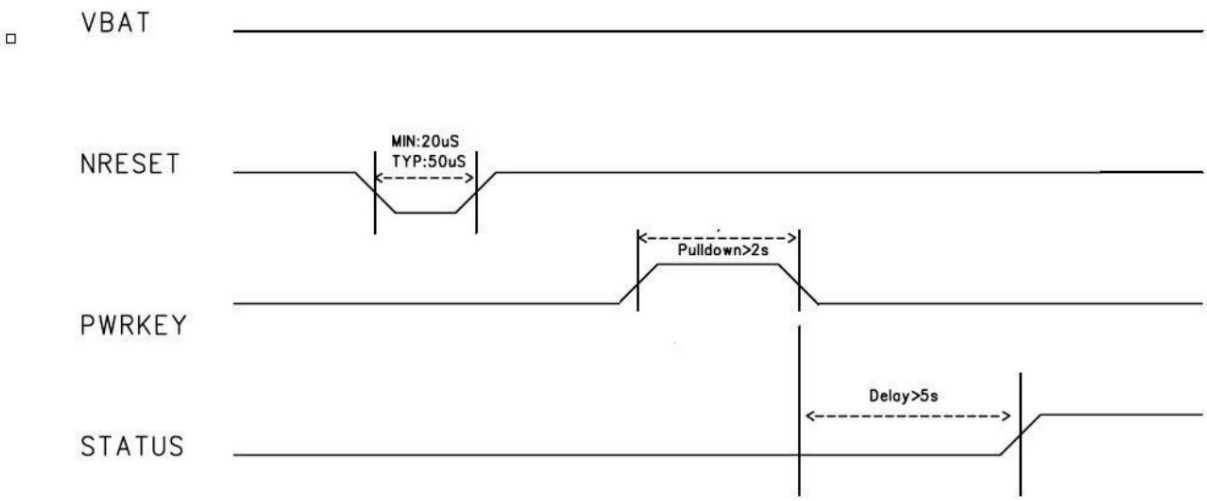


Figure 20: Reset Timing Diagram

Reset recommended design circuit:

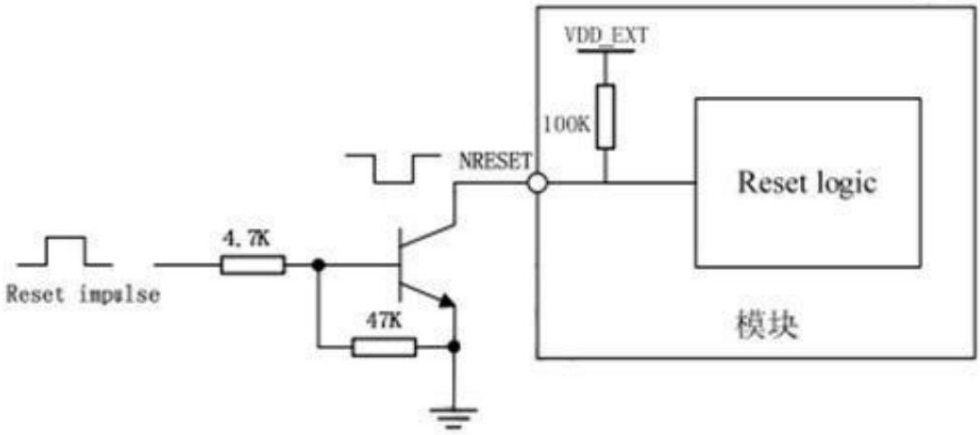
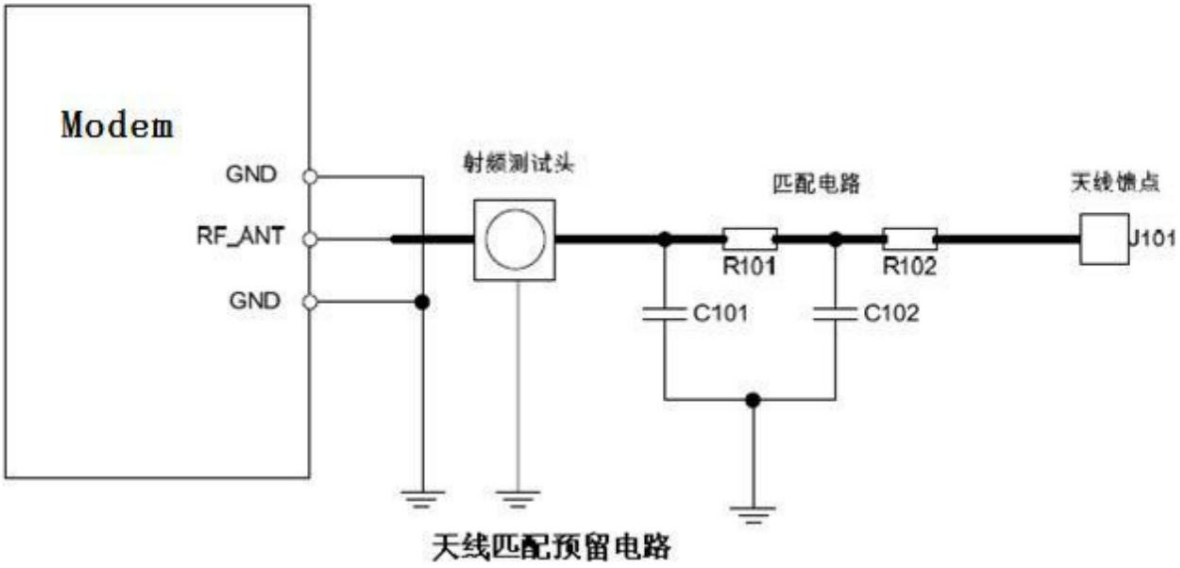


Figure 21: Reset reference design circuit

4 Antenna ports

The module provides an antenna interface pin. The antenna on the user's motherboard should be connected to the module's antenna pin using a microstrip line or other types of RF traces (the impedance should be controlled to be 50 ohms). In order to facilitate antenna debugging and certification testing, an RF connector and antenna matching network should be added. The recommended circuit diagram is as follows: It is recommended to reserve a PI type matching circuit for the GSM_ANT of the module.



天线匹配预留电路

4.1 Module RF output power

Table 10: GA6 Conducted RF Output Power

frequency band	maximum	minimum
EGSM900 / GSM850	33dBm ±2dB	5dBm± 5dB
DCS1800 / PCS1900	30dBm ±2dB	0dBm± 5dB

4.2 Module RF Receive Sensitivity

Table 11: GA6 Conducted RF Receive Sensitivity

frequency band	Receive Sensitivity (Typical)	Receive Sensitivity (Maximum)
EGSM900/GSM850	< -109dBm	< -107dBm
DCS1800/PCS1900	< -109dBm	< -107dBm

4.3 Module operating frequency

Table 12: GA6 operating frequency bands

frequency band	take over	emission
EGSM900/GSM850	925ÿ960MHz	880ÿ915MHz
DCS1800/PCS1900	1805ÿ1880MHz	1710ÿ1785MHz

5 Electrical, reliability and RF characteristics

5.1 Absolute Maximum

The following table shows the status of the absolute maximum value under abnormal operating conditions. Exceeding these limits may result in permanent damage to the module.

Table 13: Absolute Maximum Values

parameter	minimum	maximum	unit
VBAT	-	4.2	V
Peak current of power supply	0	3.0	A
Voltage at digit pins*	-0.3	3.3	V
Ii*	-	10	mA
Io*	-	10	mA

* Suitable for digital interfaces such as: GPIO, I2C, UART, LCD.

5.2 Operating temperature

The following table shows the operating temperature range of the module:

Table 14: GA6 Operating Temperature

	minimum	typical	maximum	unit
Parameters	-30	+25	+80	°C
Operating Temperature Limited Operating Temperature* -40			+80 to +85 ÿ	
to -30 Storage Temperature	-45		+90	°C

* GA6 will work, but some RF performance may exceed GSM specifications.

5.3 Power Ratings

Table 15: GA6 Power Supply Ratings

Parameter Description		The	Minimum	Typical	Maximum	Unit
VBAT	Supply Voltage	conditional voltage must be between the maximum and minimum values, including Sudden momentary drops and ripples	3.5	4.0 4.2 V		
	Transmit moment voltage fall	Typical conditions, maximum RF output power			300mV	
	Voltage ripple	Typical conditions, maximum RF output power @f<200kHz @f>200kHz			502 mV	
	peak current	Power control at maximum output power		2.0		A

5.4 Current consumption

Please refer to the current values in the table below.

Table 16: GA6 current consumption

1. Power consumption test under different RF power (wake state)			
GSM900 Power		DCS1800 power consumption	
ARFCN	Consumption (mA)	ARFCN	Power consumption (mA)
5	247.6	0	195
6	234	1	172.6
7	190.1	2	146
8	177.3	3	130
9	154.3	4	117.6
10	138.3	5	108
11	124.2	6	100.4
12	114	7	94
13	105.1	8	89.8
14	98.1	9	85.7
15	93	10	83
16	88.4	11	81.3
17	85.7	12	79.5
18	83.2	13	78.6
19	80.8	14	77.8
		15	77.3

2. Turn-on current of different voltages (under the maximum power of CMU, TALK mode (mA))				
Voltage	1# current consumption	2# current consumption	3# current consumption	4# Current consumption
3.8	247.1	245.3	248.5	247.7
4	242.9	239.7	244.2	243.8
4.2	249.5	248.6	249.4	248.7
AVG	246.5	244.5333333	247.3666667	246.7333333

3. GSM real network Sleep current consumption (unit: mA)			
	1# Current consumption (no card)	2# Current consumption (mobile)	3# Current consumption (Unicom)
Minimum current	0.9	0.98	0.97
average current	3.1	3.3	3.4

4. GPRS current consumption in different modes when connected to CMU (unit: mA)

3Rx 2Tx				
	GSM(P5,C62)		DCS(P0,C698)	
	Voltage	current consumption	Voltage	current consumption
1	3.6	280.5	3.6	211.2
2	3.8	278.3	3.8	218.4
AVR		279.4		214.8
4Rx 1Tx				
	GSM(P5,C62)		DCS(P0,C698)	
	Voltage	current consumption	Voltage	current consumption
1	3.6	285.3	3.6	210.2
2	3.8	276.5	3.8	219.4
AVR		280.9		214.8

5.5 ESD Protection

The modules are not specifically protected against electrostatic discharge. Therefore, users need to take some appropriate protective measures for the module in use. in production, assembly and

Proper electrostatic protection must be observed when handling the module.

6 Mechanical Dimensions

This chapter describes the mechanical dimensions of the GA6.

6.1 Recommended Land Map for GA6

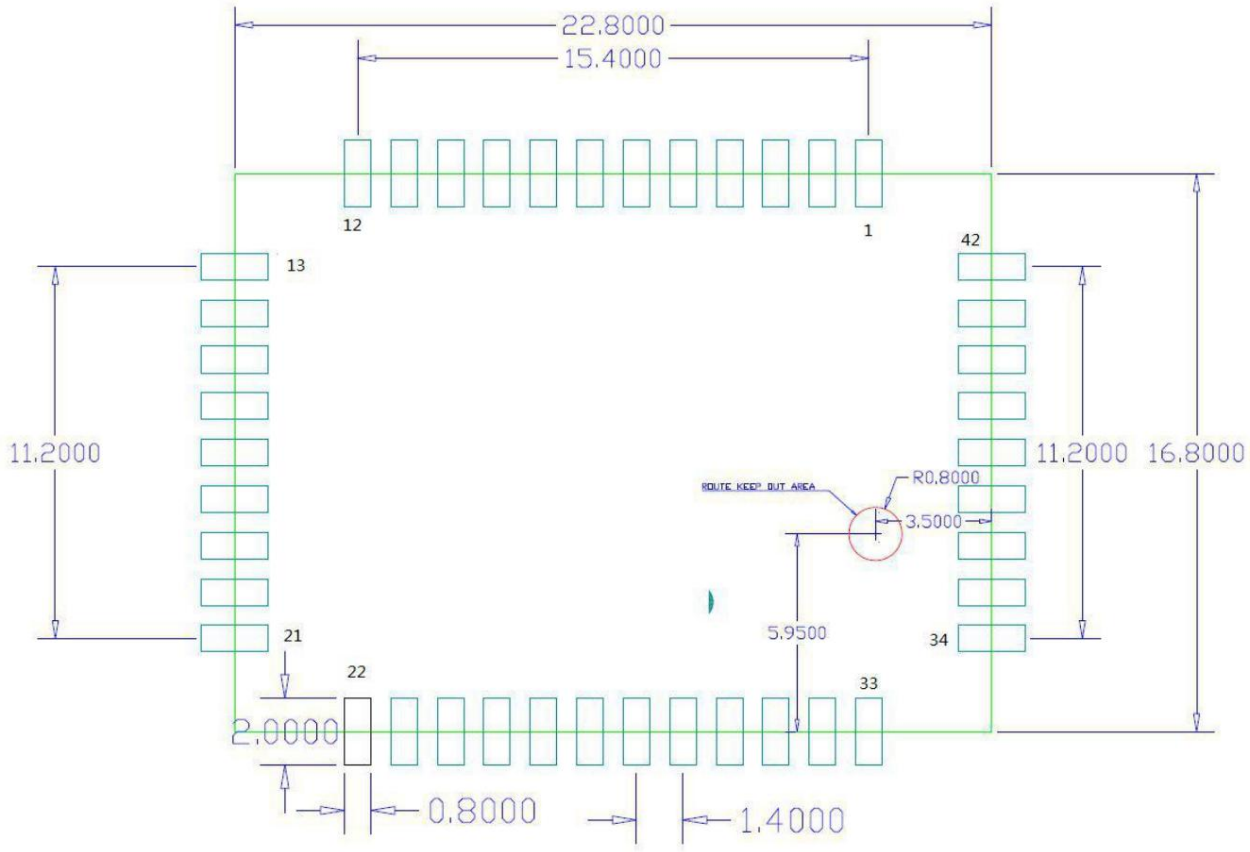


Figure 22: GA6 Recommended Land Map

6.2 GA6 pin assignment

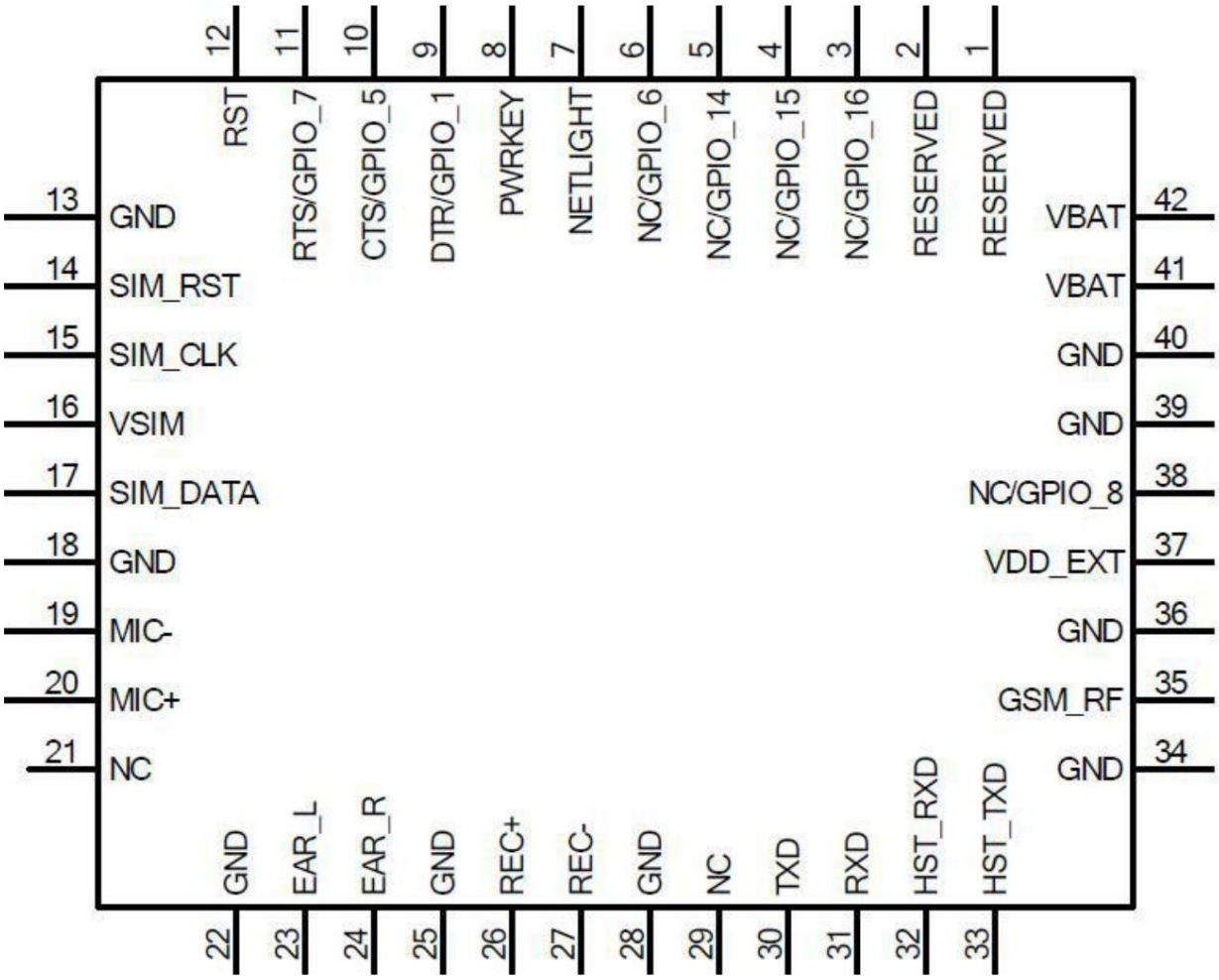


Figure 23: GA6 pinout (top view)

Table 17: Pin Assignments

pin number	pin name	pin number	pin name
	RESERVED	22	GND
1 2	RESERVED	23	EAR_L
3	NC	twenty four	EAR_R
4	NC	25	GND
5	NC	26	REC+
6	NETLIGHT	27	REC
7	RING	28	GND
8	PWRKEY	29	NC
9	DTR	30	TXD
10	CTS	31	RXD
11	RTS	32	HST_RXD
12	RST	33	HST_TXD
13	GND	34	GND
14	SIM_RST	35	GSM_RF
15	SIM_CLK	36	GND
16	SIM_VDD	37	VDD_EXT
17	SIM_DATA	38	NC
18	GND	39	GND
19	MIC-	40	GND
20	MIC+	41	VBAT
twenty one	NC	42	VBAT

6.3 GA6 Recommended Soldering Furnace Temperature Curve

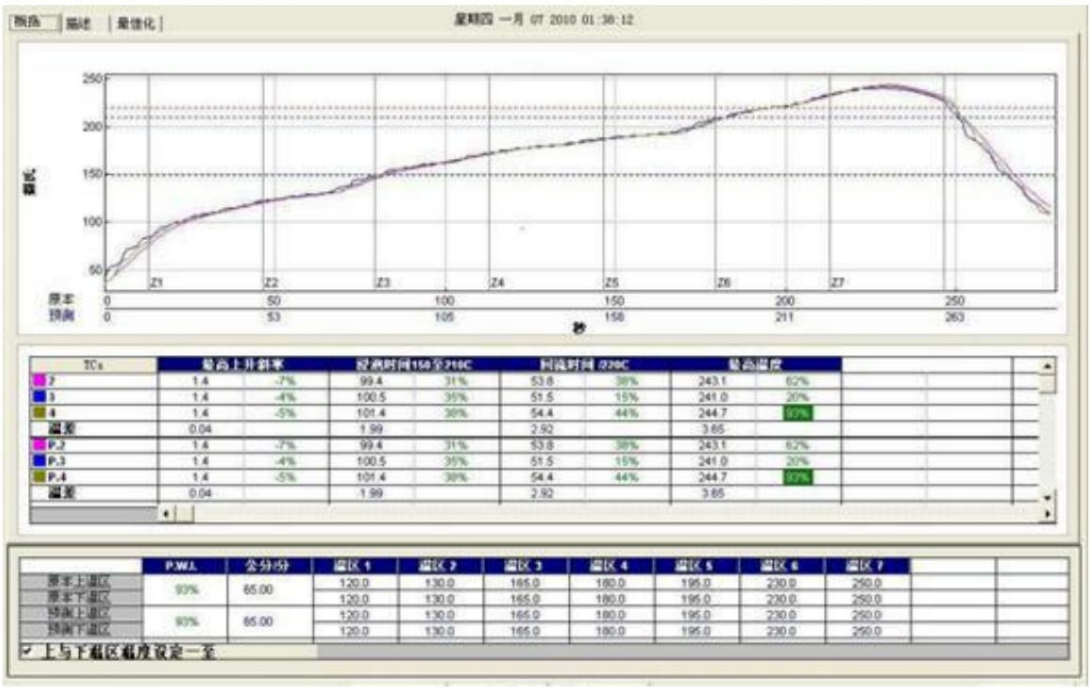


Figure 24: Recommended soldering furnace temperature curve for GA6

GOOUUU TECH

深圳市果云科技有限公司