GPRS Series Module User Manual

Version 1.7

Shenzhen Ai-Thinker Technology Co.,Ltd

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Version record

Date	Version	Author	Description
2017.09.11	V1.0	Fang	Initial version
2017.09.20	V1.1	Fang	Add A9G and power consumption description, etc.
2017.10.12	V1.2	LVX	Modified the description of A9's UART2 and A9G's GPS serial port
2017.10.17	V1.3	LVX	Added A6 RST, A9/A9G PWR_KEY and RST Description
2017.11.29	V1.4	LVX	1.Added A9/A9G boot and reset reference circuit and A6/A9/A9G reset circuit timing description (Annex 2) 2.Modified the description of IO29 pin

2017.12.08	V1.5	LVX	1. Add Annex 1 2. Increase the description of the serial port 3. Added description of GPS\GPRS indicator
2017.12.11	V1.6	LVX	Revised the reset description of the A9/A9G button reset circuit (Annex 2)
2019.12.27	V1.7	XYJ	Modified the power supply voltage, deleted the content of A6, updated the docs link

CONTENT

1 PRODUCT OVERVIEW

GPRS series modules are a series of simple and easy-to-use GPRS data transmission modules newly launched by Anxinke Technology. They provide information transmission functions such as serial port to GPRS/SMS/voice calls, and are widely used in IoT/vehicle/electric environment detection, etc. field.
Anxinke Technology provides customers with complete hardware and software reference solutions in order to shorten your product development cycle and save you cost.

1.1 Product characteristics

- Working voltage 3.8V-4.2V, recommended 4.0V power supply.
- Low power consumption mode average current below 2mA；
- Support GSM/GPRS four frequency bands, including 850/900/1800/1900Mhz
- GPRS Class 10；
- Sensitivity <-105；
- Support voice calls and SMS text messages；
- GPIO level is at 2.8V；
- Support GPRS data service, maximum data rate,download 85.6Kbps, upload 42.8Kbps；
- Support standard GSM07.07,07.05 AT commands and Ai-Thinker extended commands；
- A9 supports 3 serial ports, including 1 download serial port and 1 AT command port；
- A9G supports 3 serial ports, including 1 download serial port, 1 AT command port, and 1 GPS serial port；
- AT commands support standard AT and TCP/IP command interfaces；
- Support digital audio and analog audio, support HR, FR, EFR, AMR voice coding；

1.2 Application

- Meter
- Security
- Smart home
- Car
- Street light
- Car position
- Medical
- Smart city
- Wearable
- Industrial
- PDA
- Wireless POS

2 INTERFACE OF MODULE

2.1 Size and package

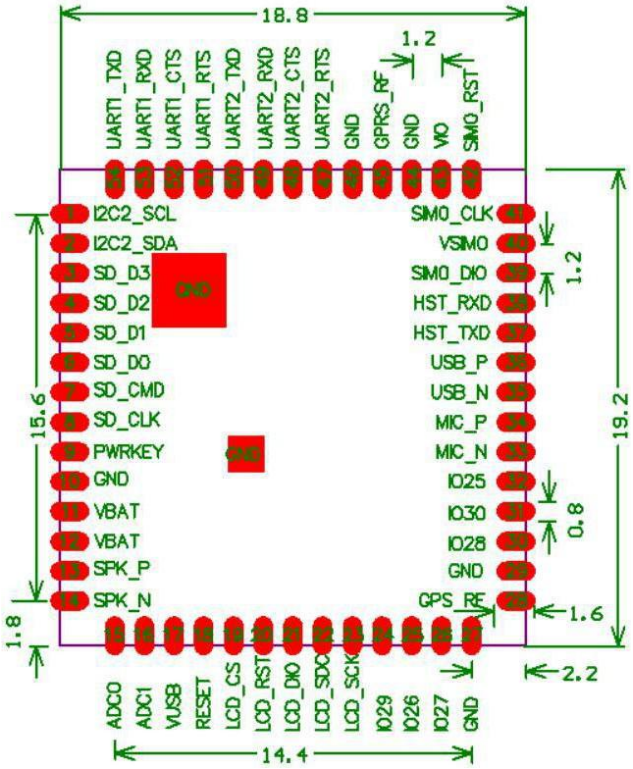


图2.2 A9管脚尺寸图

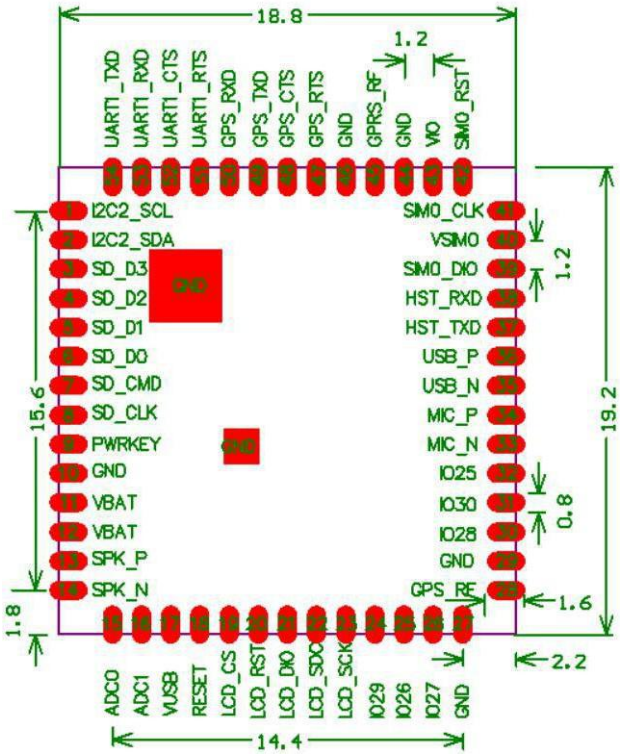


Image 2.3 A9G Pin definition diagram

List 2.1 GPRS series module size comparison

Model	Length (mm)	Width (mm)	Height (mm)	Pin size (mm)	Pin spacing (mm)	Shielding shell (mm)	Thickness (mm)
A9	19.2	18.8	3.0	1.2*0.6	1.2	17.2*16.8*1.9	0.8
A9G	19.2	18.8	3.0	1.6*0.6	1.2	17.2*16.8*1.9	0.8

Note: The size error range is ±0.2mm

2.1 Pin definition

List 2.3 A9 and A9G module pin function definition

IO No.	IO name	Function description
1	I2C2_SCL	I2C2 clock
2	I2C2_SDA	I2C2 data
3	SD_D3	SD Serial data pin
4	SD_D2	SD Serial data pin
5	SD_D1	SD Serial data pin
6	SD_D0	SD Serial data pin
7	SD_CMD	SD command
8	SD_CLK	SD Serial clock pin
9	PWRKEY	Power-on button, give this pin a low-level power on.
10	GND	Ground
11	VBAT	Connect to the external power supply pin 3.5V~4.2V, the maximum power supply current is not less than 2A

12	VBAT	Connect to the external power supply pin 3.5V~4.2V, the maximum power supply current is not less than 2A
13	SPK_P	The speaker interface is positive
14	SPK_N	The negative pole of the speaker interface
15	ADC0	ADC0 pin (maximum input 1.8V)
16	ADC1	ADC1 pin (maximum input 1.8V)
17	VUSB	USB power supply pin (externally connected to 5V power supply)
18	RESET	Module hardware RESET pin. When this pin is used, the low level is <0.05V, and the current is about 70mA. It must be controlled by an NMOS tube; this pin cannot have leakage current during normal operation, otherwise it will cause the module to be unstable and difficult to register to the network; Reference attachment: reset circuit timing diagram and description
19	LCD_CS	LCD CS pin
20	LCD_RST	LCD RST pin
21	LCD_DIO	LCD DIO pin
22	LCD_SDC	LCD SDC pin
23	LCD_SCK	LCD SCK pin
24	IO29	Special function pins. After the module works normally (AT command), pull down this pin to enter shutdown mode.
25	IO26	General-purpose IO pin (no pull-up resistor can be added externally, and the level cannot be high when power is on). Remark: This low-power indicator pin, if there is data, SMS, phone wake up There will be a 50ms pulse
26	IO27	General-purpose IO pin (no pull-up resistor can be added externally, and the level cannot be high when power is on). Remarks: The default is the network status indicator IO (refer to the description in Annex 1)
27	GND	Ground
28	GPS_RF	The antenna pin can be connected to the antenna. If it is connected to the circuit on the PCB, pay attention to the Use 50 ohm wiring (only A9G is valid).
29	GND	Ground
30	IO28	General-purpose IO pin (no pull-up resistor can be added externally, and the level cannot be high when power is on). Remarks: The default is GPS status indicator IO (refer to the description of attachment 1)
31	IO30	General-purpose IO pin.
32	IO25	General-purpose IO pin, enter and exit low power consumption pin, low level means enter low power mode

33	MIC_N	MIC negative pole
34	MIC_P	MIC positive pole
35	USB_N	USB D-pin
36	USB_P	USB D+ pin
37	HST_TXD	Download the serial port TXD pin. Pin level 2.8V, compatible with 3.3V, not compatible with 5V
38	HST_RXD	Download the serial port RXD pin. Pin level 2.8V, compatible with 3.3V, not compatible with 5V
39	SM0_DIO	SIM card data
40	VSM0	SIM card power
41	SM0_CLK	SIM card CLK

42	SM0_RST	SIM card RST
43	VIO	Output 3V. Remarks: 1. If the pin is not used, leave it open; 2. The load drive current does not exceed 10mA.
44	GND	Ground
45	GPRS_RF	The antenna pin can be connected to the antenna. If it is connected to the circuit on the PCB, pay attention to the Use 50 ohm traces.
46	GND	Ground
47	(A9)UART2_RTS (A9G)GPS_RTS	UART2 serial port RTS pin pin level 2.8V, compatible with 3.3V, not compatible with 5V GPS serial port RTS pin.
48	(A9)UART2_CTS (A9G)GPS_CTS	UART2 serial port CTS pin pin level 2.8V, compatible with 3.3V, not compatible with 5V GPS serial port CTS pin.
49	(A9)UART2_RXD (A9G)GPS_TXD	UART2 serial port rxd pin Pin level 2.8V, compatible with 3.3V, not compatible with 5V GPS serial port TXD pin (A9G internally connects to GPS).
50	(A9)UART2_TXD (A9G)GPS_RXD	UART2 serial port txd pin Pin level 2.8V, compatible with 3.3V, not compatible with 5V GPS serial port RXD pin (A9G internally connects to GPS).
About pin47.48.49.50: The pin47.48.49.50 of A9 is UART2; A9's pin49 is UART2_RXD, pin50 is UART2_TXD; A9G's pin47.48.49.50 is GPS serial port; A9G's pin49 is GPS_TXD, and pin50 is GPS_RXD; The flow control function of A9 and A9G is temporarily not supported.		
51	UART1_RTS	AT serial port RTS pin. Pin level 2.8V, compatible with 3.3V, not compatible with 5V
52	UART1_CTS	AT serial port CTS pin. Pin level 2.8V, compatible with 3.3V, not compatible with 5V
53	UART1_RXD	AT serial port RXD pin. Pin level 2.8V, compatible with 3.3V, not compatible with 5V
54	UART1_TXD	AT serial port TXD pin. Pin level 2.8V, compatible with 3.3V, not compatible with 5V

3 电ELECTRICAL CHARACTERISTICS

3.1 Limit parameters

list 3.1 Maximum rating

Rated value	Condition	Value	Unit
torage temperature		-40~125	℃
Maximum welding temperature	Lead-free	245	℃
Supply voltage	V_{bat}	4.6	V

3.2 Working environment

List 3.2 working environment

working environment	Min	Typical	Max	Unit
Working temperature	-20	25	70	℃
Storage temperature	-40	25	125	℃
Voltage	3.8	4.0	4.2	V

3.3 Digital port characteristics

List 3.3 Digital port characteristics

Symbol	Description	Min	Typical	Max	Unit
VDD	Digital circuit power supply	VDD-0.2	1.8/2.8	VDD+0.2	V
VIL	Input logic low	0	-	0.3*VDD	V
VIH	Input logic high	0.7*VDD	-	VDD	V

3.4 Power consumption

List 3.4 Power consumption

Status	Base mean	Average value	Pulse peak	Unit
Default state after boot	8.8	9.16	58.8	mA
GPRS communication	56	-	213	mA
Make a call (not connected)	72	150	600	mA
Make a call (connect)	72	139	548	mA
Answer the call (not connected)	63	149	600	mA
Receive a call (connected)	63	114	420	mA
Send and receive text messages	65	-	544	mA
Increased current when GPS is turned on	39	43	46	mA
Turn on GPS+BDS to increase the current	44	48	51	mA
ow power mode	-	1.46	-	mA
Shutdown	-	216	-	uA
Peak current	-	1.6	2	A

Note 1: The base mean value represents the average value of the normal base power consumption in this state; the pulse peak value represents the current peak value of the instantaneous pulse in this state; the average value represents the average current of the long-term integrated base and pulse (- indicates the non-periodic pulse Sex cannot determine the overall average);
Note 2: The test condition is 4.2V DC power supply;
Note 3: The peak current condition is the maximum transmission time slot of GSM850/GSM900.

3.5 Transmit power

List 3.5 Parameters

Frequency range	Mix	Max
GSM850	5dBm±5dB	33dBm±2dB
EGSM900	5dBm±5dB	33dBm±2dB
DCS1800	0dBm±5dB	30dBm±2dB
PCS1900	0dBm±5dB	30dBm±2dB

Note: In GPRS network 4 timeslot transmission mode, the maximum output power is reduced by 2.5dB. This design complies with the GSM specification described in section 13.16 in 3GPP TS 51.010-1.

3.6 Receiving sensitivity

List 3.6 Receiving sensitivity

Frquency range	Receiving sensitivity	Unit
GSM850	< -108.5	dBm
EGSM900	< -108.5	dBm
DCS1800	< -108.5	dBm
PCS1900	< -108.5	dBm

4 HARDWARE GUIDANCE

4.1 Power design

Power supply design is the most important link in the application of GSM modules. To facilitate customer hardware design, the following reference designs are provided::

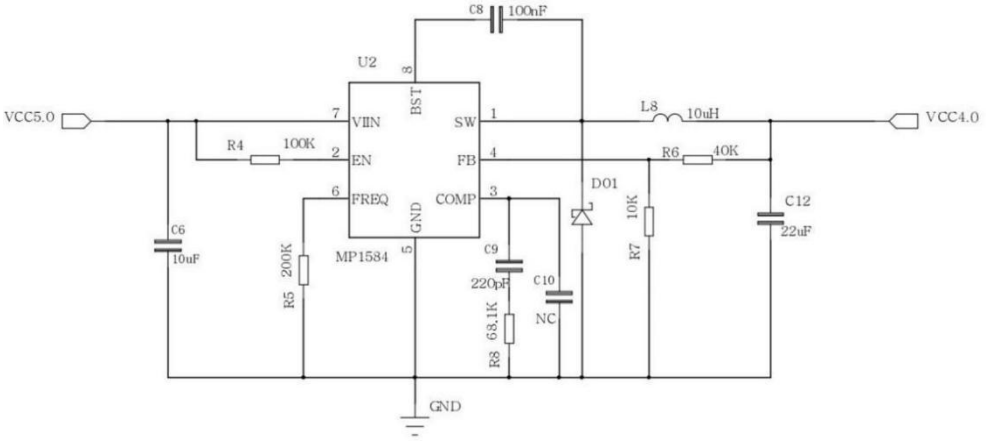


Diagram 4.1 A6 Power supply circuit reference design

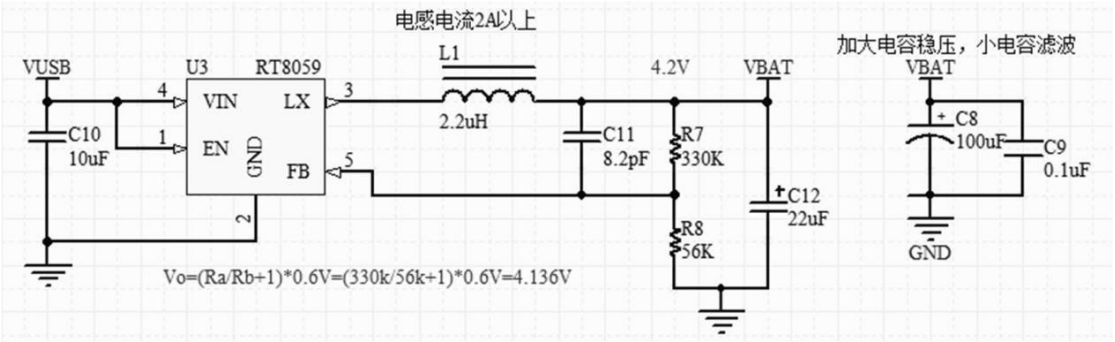


Diagram 4.2 A9 Power supply circuit

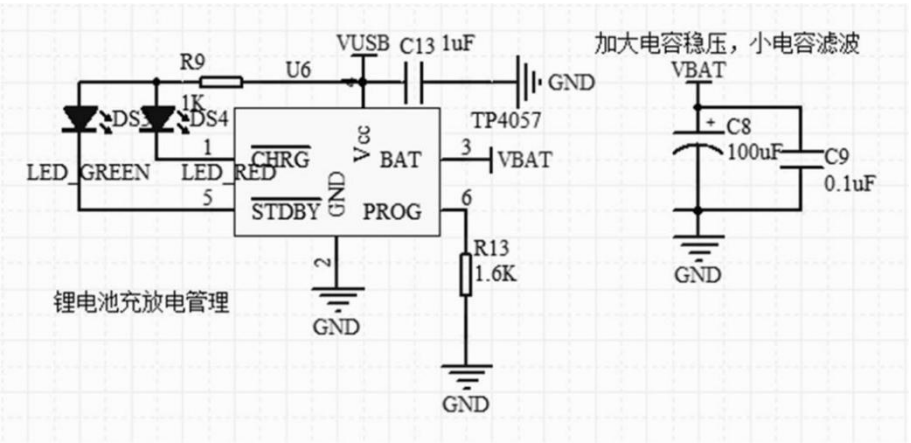


Diagram 4.3 A9 Battery powered circuit

Note: The above two power supply circuits A9 can only choose one of the two.

4.2 Switch circuit design

Switch circuit reference design:

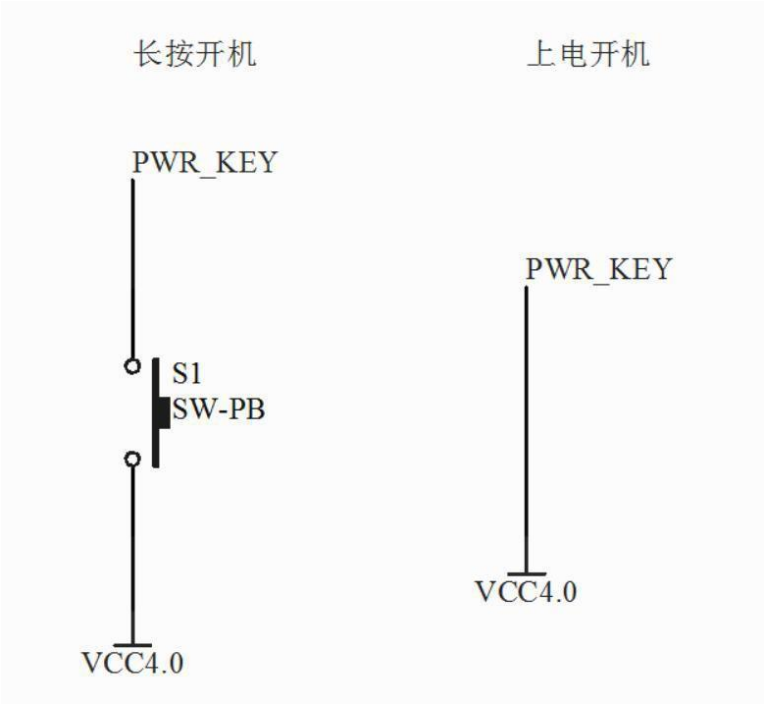


Diagram 4.5 A6 switch circuit reference design

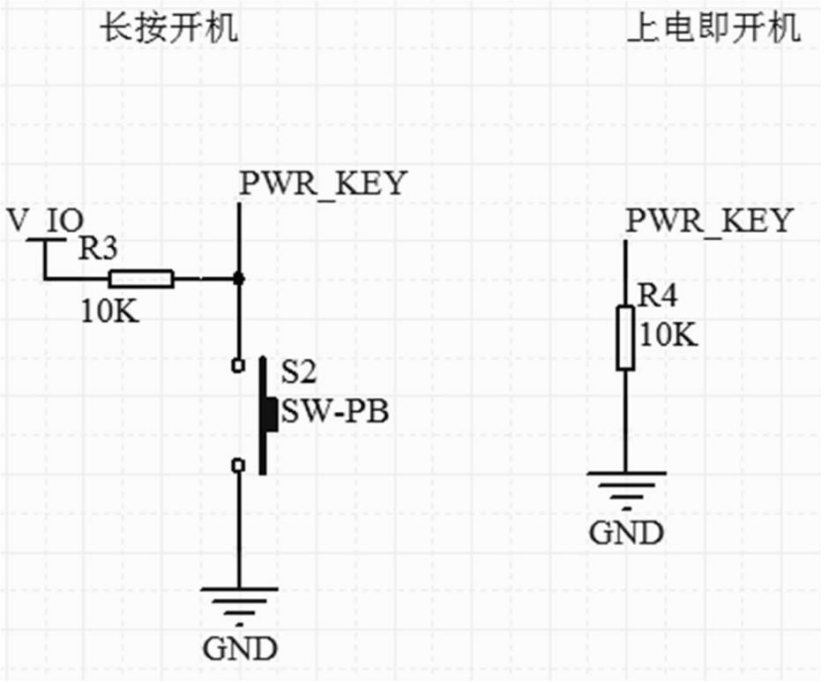


Diagram 4.5 A9/A9G switch circuit reference design

Reset circuit reference design:

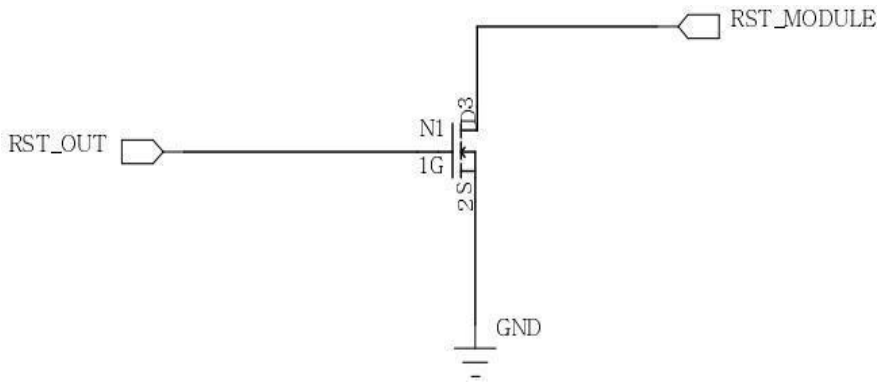


Diagram 4.6 A6/A9/A9G IO reset circuit reference design

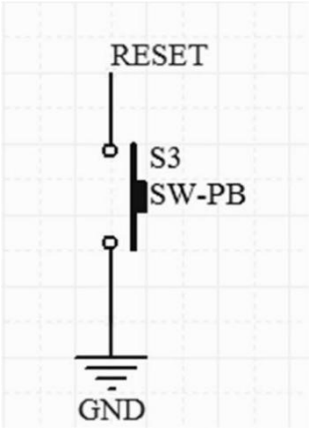


Diagram 4.7 A6/A9/A9G reset circuit reference design

Note: Short-circuit reset (low-level reset), if the MCU pin is used to control the reset, a drive current of more than 70mA is required. It is recommended to connect an external Mos tube (such as AO3400) to drive, refer to the reset circuit of A6.

4.3 SIM card design

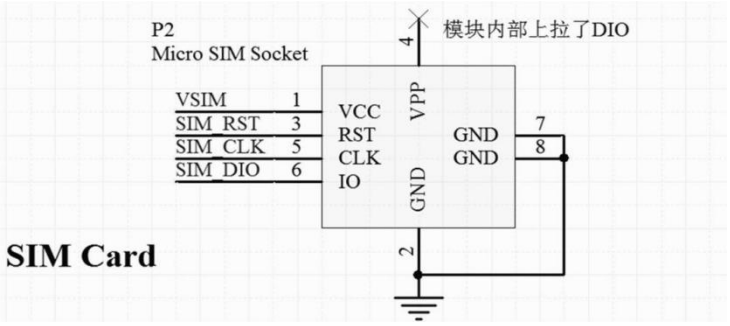


Diagram 4.8 SIM card reference design

Note: The SIM cards of A6 and A9 are powered by the internal power supply of the module.

4.4 ADC reference design

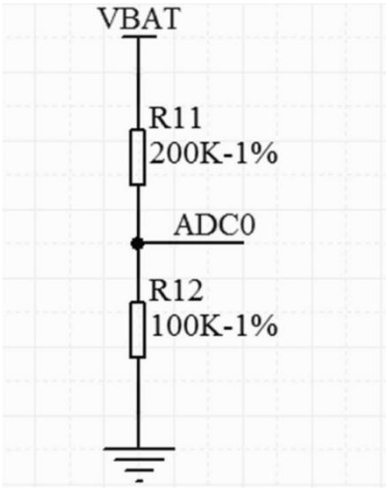


Diagram 4.9 A9 ADC reference design

Note: The value of two ADCs can be queried in AT firmware, and it can be selected as power supply voltage monitoring, maximum input 1.8V, the input resistance is generally above 500K.

4.5 SPEAKER design for reference

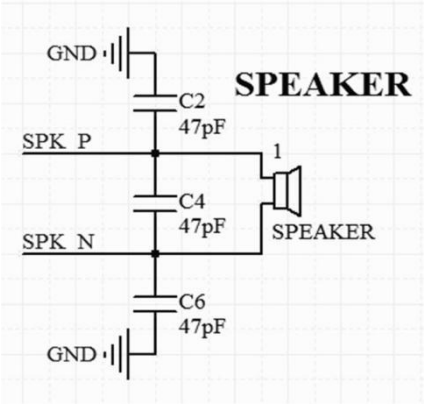


Diagram 4.10 SPEAKER design for reference

4.6 MIC design for reference

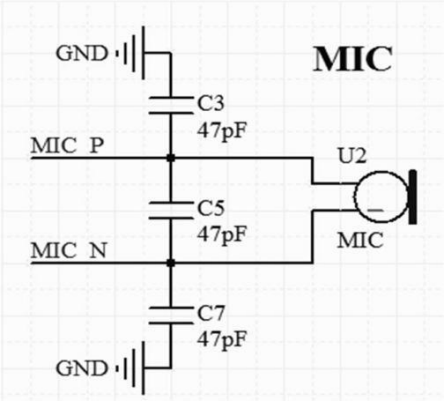


Diagram 4.11 MIC design for reference

4.7 Antenna design

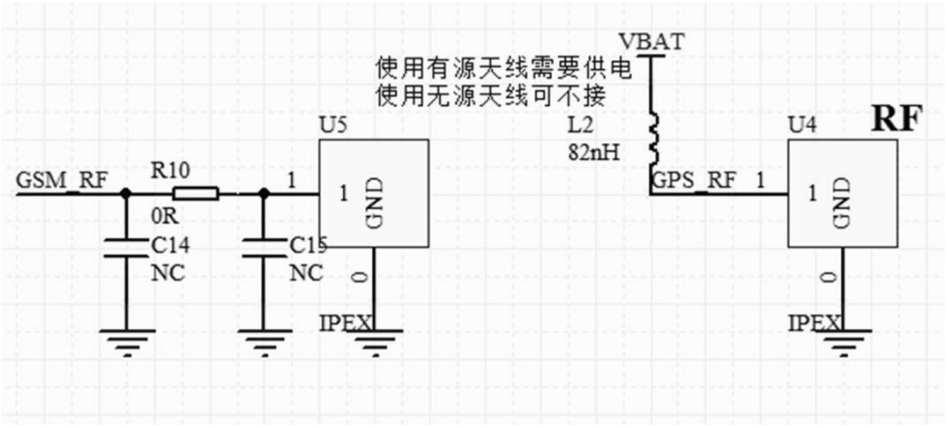


Diagram 4.12 antenna design for reference

Note: The RF wiring is routed in accordance with 50 ohms.

5 USAGE GUIDANCE

GPRS series modules have built-in AT firmware by default when they leave the factory, and the default baud rate is 115200.

Serial port and network debugging help download:https://docs.ai-thinker.com/tools。

5.1 Introduction to basic AT command

This chapter only introduces the commonly seen AT commands. For more commands, please refer to

https://docs.ai-thinker.com/gprs

5.1.1 AT

Command	AT
Description	Test if AT is OK
Example	AT OK

5.1.2 AT+GMR

Command	AT+GMR
Description	Return firmware version information
Example	AT+GMR V01.00.2017091 118H38 OK

5.1.3 AT+RST=1

Command	AT+RST=1
Description	Soft restart module

Example	AT+RST=1 Init... ^CINIT: 1, 0, 0 ^CINIT: 2, 32, 41891

	+CIEV: service, 0 +CIEV: roam, 0 +CREG: 2 ^CINIT: 8, 2048, 1 ^CINIT: 16, 0, 3276850 ^CINIT: 32, 0, 0 +CTZV:17/09/15,08:39:23,+08 +CIEV: service, 1 +CIEV: roam, 0 +CREG: 1 +CREG: 0 +CTZV:17/09/15,08:39:24,+08 +CIEV: READY

5.1.4 AT+CCID

Command	AT+CCID
Description	Query SIM card number
Example	AT+CCID +CCID: xxxxxxxxxxxxxxxxxxx OK

5.1.5 AT+CSQ

Command	AT+CSQ
Description	Check signal quality

Example	AT+CSQ +CSQ: 28,99

	OK

5.2 Usage example

This chapter explains how to establish TCP communication between GPRS module and remote server. The specific steps are as follows::

一、Boot up

The startup info:

```
Init...

^CINIT: 1, 0, 0

^CINIT: 2, 32, 41891

^CINIT: 8, 2048, 1

+CIEV: service,  0
+CIEV: roam, 0

+CREG: 2

^CINIT: 16, 0, 3276850

^CINIT: 32, 0, 0

+CTZV:17/09/15,09:06:31,+08

+CIEV: service,  1
+CIEV: roam, 0
```

+CREG: 1 +CREG: 0 +CTZV:17/09/15,09:06:32,+08 +CIEV: READY

二、Check whether the module is registered to the Internet

Command	AT+CREG?
Returned messages	AT+CREG? +CREG: 1,1 OK

三、Check signal quality

Command	AT+CSQ
Returned messages	AT+CSQ +CSQ: 27,99 OK

四、Attached network

Command	AT+CGATT=1
Returned messages	AT+CGATT=1 +CGATT:1

	OK

五、Specify PDP context

Command	AT+CGDCONT=1,"IP","CMNET"
Returned messages	AT+CGDCONT=1,"IP","CMNET" OK

六、Activate the specified PDP context

Command	AT+CGACT=1,1
Returned messages	AT+CGACT=1,1 OK

七、Connection server domain name or IP

Command	AT+CIPSTART="TCP","122.114.122.174",33836
Returned messages	AT+CIPSTART="TCP","122.114.122.174",33836 CONNECT OK OK
Remarks	The IP address and port number here need to be modified according to your actual situation. The remote server in this example uses Anxin transparent transmission cloud, the following is the link address: http://tt.ai-thinker.com:8000/ttcloud

八、Send data

Command	1. Send command AT+CIPSEND to enter sending mode; 2. Send the data to be sent;

	3. Send end character (hex 1A)
Returned messages	1.Send AT+CIPSEND and get the information AT+CIPSEND > 3. Successful return value OK

九、Receiving data

Receive data from the server: +CIPRCV:12,Hello, World

More usage example

http://wiki.ai-thinker.com/gprs/examples

附件

Attachment 1 Supplement

1. GPS and GPRS status indicator description

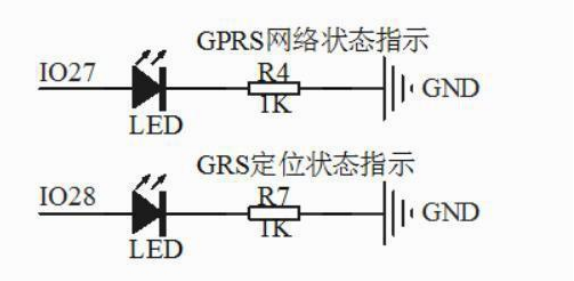


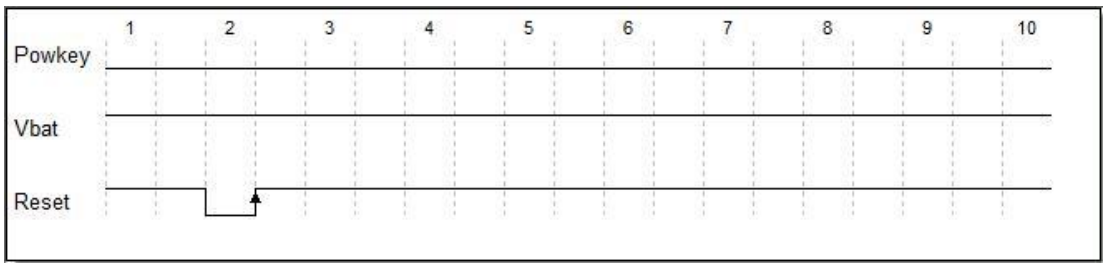
Diagram 1.1 Status indicator wiring diagram

Indicator	Status	Indicator status
GPRS(IO27)	Unregistered network	go out
	The process of registering the network	Off for 1s, on for 10ms
	registration success	Off for 3s, on for 10ms
GPS(IO28)	Not positioned	The indicator light flashes, the time interval is 0.5s
	Get positioned	The indicator light flashes, the time interval is 2s

For example, registration is successful. On—(after 10ms)—>off—(after 3s)—>on

Attachment 2 A9/A9G Reset circuit timing diagram and description

A9/A9G Reset circuit
timing diagram
Power-on reset circuit



Description

In the A9/A9G power-on reset circuit, Powkey is always at low level and Vbat is always at high level. At this time, directly set the Reset pin level to low level and then to high level. The reset is complete.

Button power-on reset circuit

In the A9/A9G key switch-on circuit, the Powkey pin is at low level and floats after the start-up action is completed. To complete the reset action, you need to first set the Powkey pin to high level and then to low level, and then set the Reset pin level to low level (active low), and then to high level The reset can be completed.

6 APPENDIX

Please click the link to get historical documents:

https://docs.ai- thinker.com/_media/a6_a9_a9g_gprs_user_manual.pdf.pdf

This information is the latest version of the document, subject to the latest version of the document

7 CONTACT US

Official website： https://www.ai-thinker.com

Development DOCS： https://docs.ai-thinker.com

Official forum： http://bbs.ai-thinker.com

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