



GPRS Series Module User Manual

version 1.7

Ai-Thinker Inc

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version record

date	version	author	Release Notes
2017.09.11	V1.0		Initial version of Fang
2017.09.20	V1.1		Fang added A9G and power consumption description, etc.
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1 Product Overview

GPRS series modules are a series of simple and easy-to-use GPRS digital modules newly launched by Anxinke Technology.

According to the transmission module, it provides information transmission functions such as serial port to GPRS/short message/voice call, and is widely used

In the fields of Internet of Things/vehicle/power environment detection.

Anxinke Technology provides customers with complete hardware and software reference solutions to shorten your product development

The development cycle saves you cost input.

1.1 Product Features

- Working voltage 3.8V-4.2V, 4.0V power supply is recommended.

The average current in low power consumption mode is 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 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 scheme

- Remote meter reading

- Smart street light

- Wearable devices

- Security monitoring

- Vehicle positioning

- Industrial grade

- Smart home

- Smart medical care

- PDA

- Smart nzh car n A-link i-

hnology Co., Ltd Ai-Thinker

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· Wireless POS

2 module interface

2.1 size package

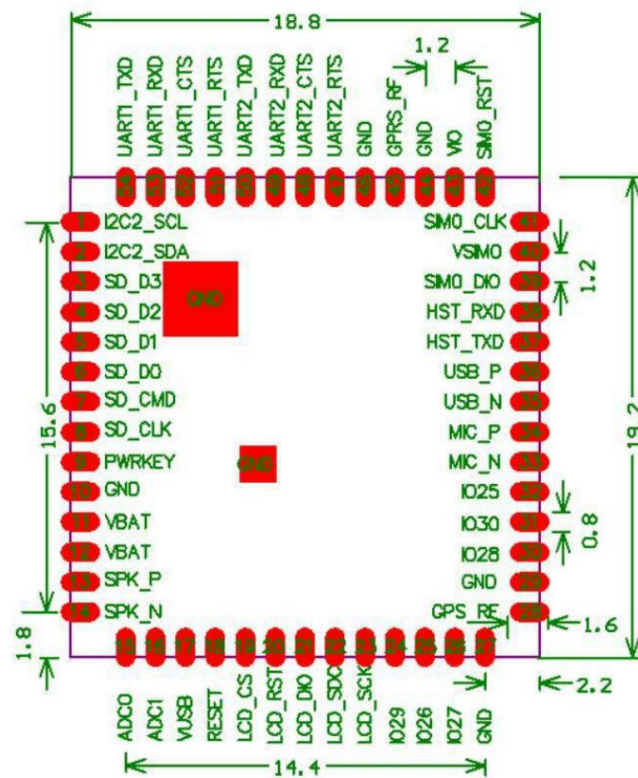


图2.2 A9管脚尺寸图

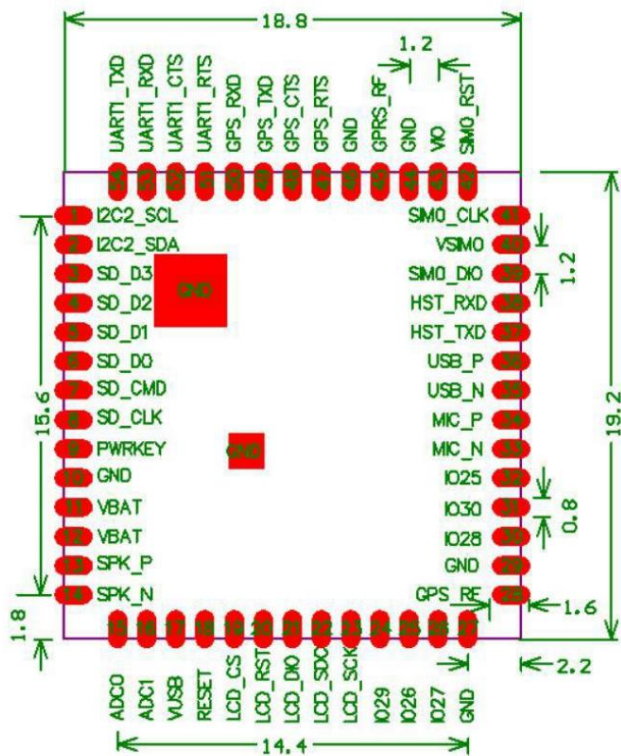


Figure 2.3 A9G pin size diagram

Table 2.1 GPRS series module size comparison table

module model	long (mm)	Width (mm)	high (mm)	Pin size (mm)	Pin spacing (mm)	shielding case (mm)	plate 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

Table 2.3 A9 and A9G module pin function definition

Pin number	Pin name	Functional description
1	I2C2_SCL	I2C2 clock pin.
2	I2C2_SDA	I2C2 data pin.
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 8		SD command pin.
	SD_CLK	SD serial clock pin.
9 PWRKEY		Power button, give this pin a low level to power on.
10 GND		feet.
11 VBAT		Connect to the external power supply pin 3.5V~4.2V, the maximum supply current is not less than 2A.

12	VBAT	Connect to the external power supply pin 3.5V~4.2V, the maximum supply current is not less than 2A.
13	SPK_P	Speaker connector positive.
14	SPK_N	Speaker connector negative.
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	<p>Module hardware RESET pin, low level <0.05V when this pin is used, current Around 70mA.</p> <p>It must be controlled by an NMOS tube; this pin cannot have Leakage is the same, otherwise it will cause the module to be unstable and difficult to register with the network;</p> <p>Refer to the attachment: reset circuit timing diagram and description</p>
19	LCD_CS	LCD CS pin.
20	LCD_RST	LCD RST pin.
21	LCD_DIO	LCD DIO pull leg.
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 into shutdown mode.
25	IO26	<p>General-purpose IO pins (no external pull-up resistors, and the level cannot be high when powered on).</p> <p>Remarks: This low power consumption indicator pin, if there is data, SMS, phone wake up , there will be a 50ms pulse</p>
26	IO27	<p>General-purpose IO pins (no external pull-up resistors, and the level cannot be high when powered on).</p> <p>Remarks: By default, it is used as the network status indicator IO (refer to the description in Annex 1)</p>
27	GND	feet.
28	GPS_RF	<p>The antenna pin can be connected to the antenna. If it is connected to the circuit on the PCB, pay attention to the use of the PCB on the PCB.</p> <p>Use 50 ohm wiring (only valid for A9G).</p>
29	GND	feet.
30	IO28	<p>General-purpose IO pins (no external pull-up resistors, and the level cannot be high when powered on).</p> <p>Remarks: By default, it is used as the GPS status indication IO (refer to the description in Annex 1)</p>
31	IO30	General purpose IO pin.
32	IO25	General IO pins, enter and exit low-power pins, low for entering low power mode
33	MIC_N	MIC negative.
34	MIC_P	MIC positive.
35	USB_N	USB D-pin.
36	USB_P	USB D+ pin.
37	HST_TXD	Download serial port TXD pin. Pin level 2.8V, compatible with 3.3V, not compatible with 5V
38	HST_RXD 39	Download the serial port RXD pin. Pin level 2.8V, compatible with 3.3V, not compatible with 5V
	SM0_DIO	SIM card data pin.
40	VSM0	SIM card power pin.
41	SM0_CLK	SIM card CLK pin.

42	SM0_RST	SIM card RST pin.
43	SAW	output 3V. Remark: 1. Leave this pin open if not used; 2. The load driving current does not exceed 10mA.
44	GND	feet.
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 of the PCB on the PCB. Use 50 ohm wiring.
46	GND	feet.
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 level 2.8V, compatible with 3.3V, not compatible with 5V GPS serial port TXD pin (A9G internally connected to GPS).
50	(A9) UART2_TXD (A9G)GPS_RXD	UART2 serial port txd pin level 2.8V, compatible with 3.3V, not compatible with 5V GPS serial port RXD pin (A9G is internally connected to GPS).
Notes on pin47.48.49.50 : The pin47.48.49.50 of A9 is UART2; The pin49 of A9 is UART2_RXD, and the pin50 is UART2_TXD; The pin47.48.49.50 of A9G is the GPS serial port; A9G's pin49 is GPS_TXD, 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 Electrical Characteristics

3.1 Limit parameters

Table 3.1 Maximum Ratings

rated value	condition	value	unit
storage temperature		-40~125	°C
soldering temperature	lead-free	245	°C
supply voltage	Vbat	4.6	V

3.2 Recommended work environment

Table 3.2 Recommended working environment

working environment	Min	Typ	Max	Unit
Operating temperature	-20	25	70	°C
storage temperature	-40	25	125	°C
supply voltage	3.8	4.0	4.2	V

3.3 Digital port characteristics

Table 3.3 Digital port characteristics

symbol	illustrate	Min	Typ	Max	Unit
VDD	Digital circuit power supply	VDD-0.2	1.8/2.8	VDD+0.2	V
WILL	input logic low	0	-	0.3*VDD	V
HIV	Input logic high level	0.7*VDD	-	VDD	V

3.4 Contributions

Table 3.4 Power Consumption

state	Base Mean Average	Pulse Peak		one bit
Default state after power on	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 phone (not connected)	63	149	600	mA
Answer the phone (connect)	63	114	420	mA
send and receive text messages	65	-	544	mA
Turn on the GPS to increase the current	39	43	46	mA
Turn on the increased current of GPS+BDS	44	48	51	mA
low power mode	-	1.46	-	mA
shutdown	-	216	-	uA
peak current	-	1.6	2	A

Note 1: The average value of the base represents the average value of the normal base power consumption in this state; the peak value of the pulse represents the state

The current peak value of the instantaneous pulse in the state; the average value represents the average current of the long-term integrated base and pulse (-

Indicates that the integrated average cannot be determined due to the non-periodicity of the pulses

value); 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 Transmission power

Table 3.5 Transmission power parameters

frequency band	minimum value	maximum value
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 time slot transmission mode, the maximum output power is reduced by 2.5dB. The setting
The design complies with the GSM specification described in Section 13.16 of 3GPP TS 51.010-1.

3.6 Receiver sensitivity

Table 3.6 Receive Sensitivity

frequency band	Receiver sensitivity	unit
GSM850	< -108.5	dBm
EGSM900	< -108.5	dBm
DCS1800	< -108.5	dBm
PCS1900	< -108.5	dBm

4 Hardware Guidelines

4.1 Power supply design

Power supply design is the most important link in the application of GSM module, for the convenience of customer hardware design, provide

The following reference designs:

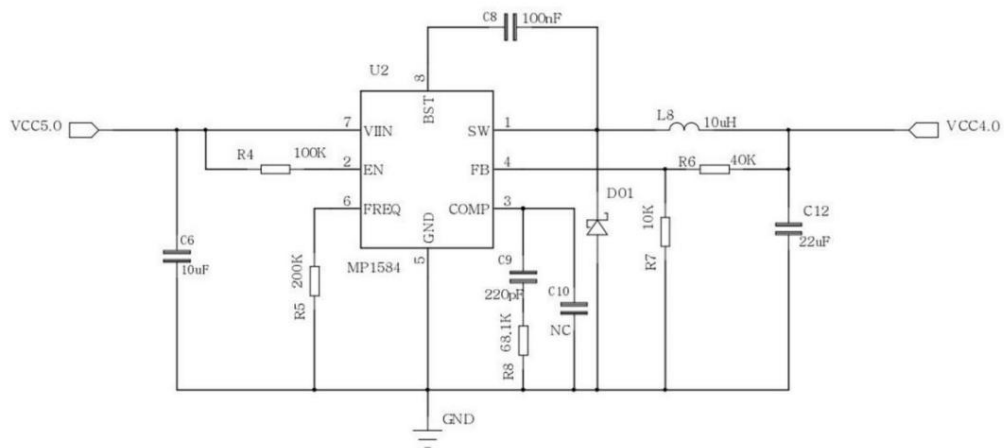


Figure 4.1 A6 power supply circuit reference design

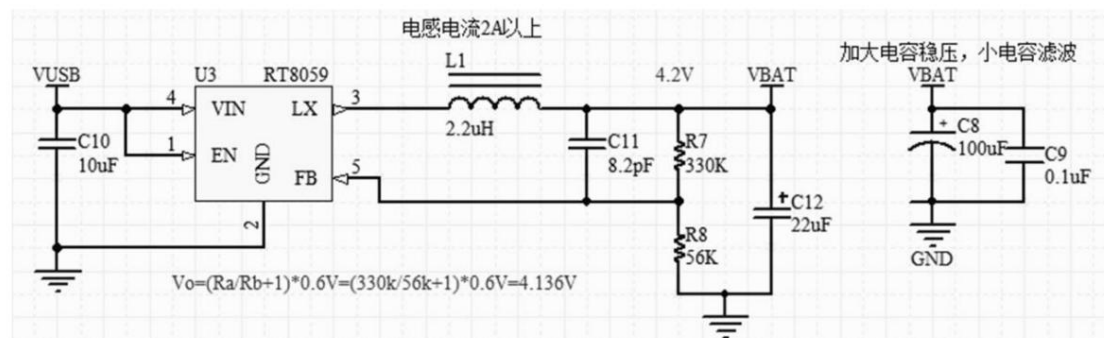


Figure 4.2 A9 power supply circuit

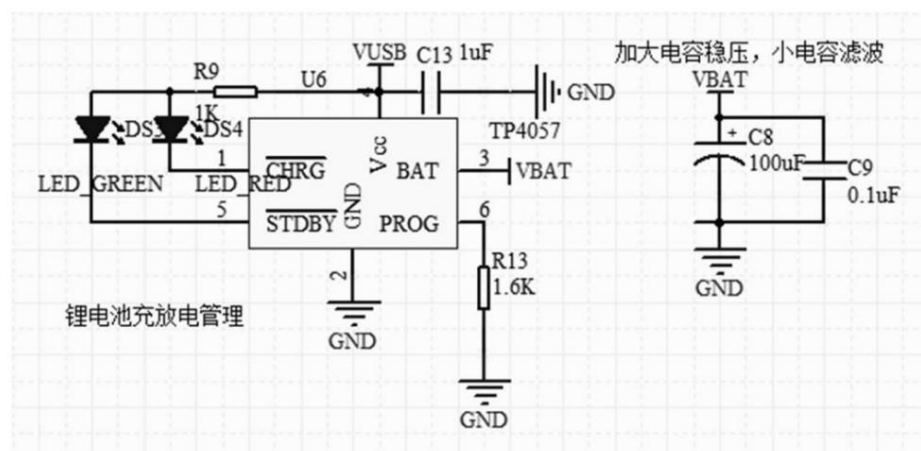


Figure 4.3 A9 battery power supply circuit

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

4.2 Switch Circuit Design

Switch circuit reference design:

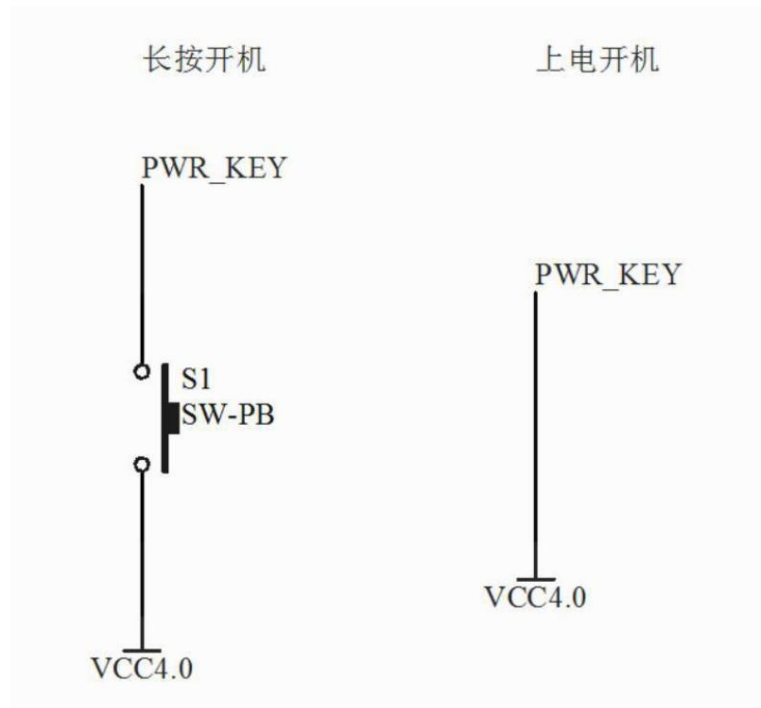


Figure 4.5 A6 switch circuit reference design

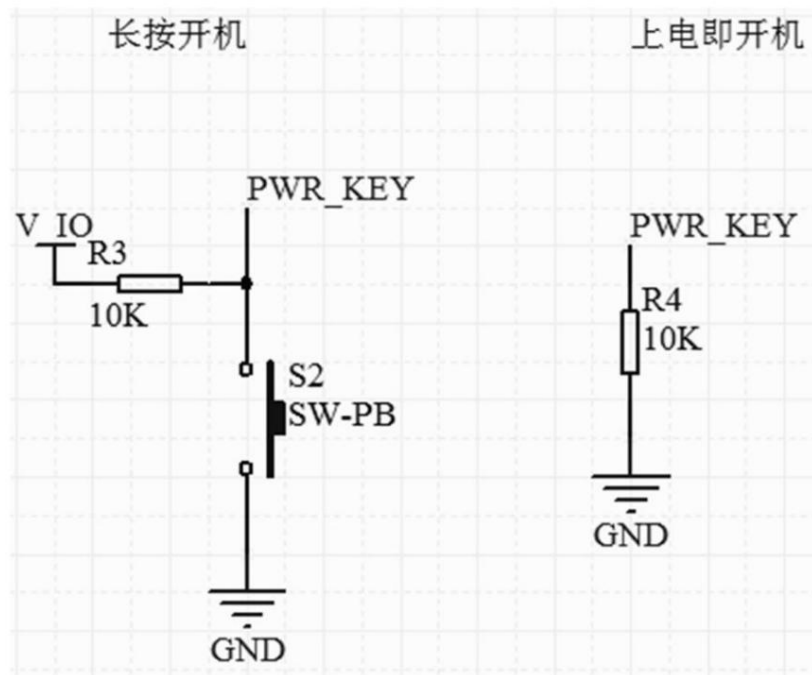


Figure 4.5 A9/A9G switch circuit reference design

Reset circuit reference design:

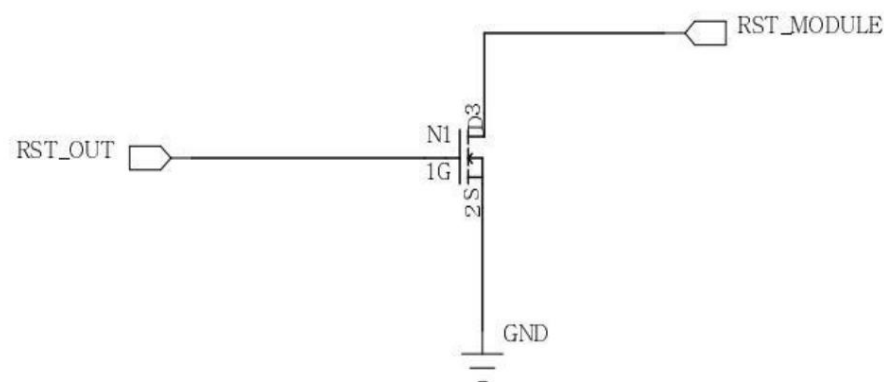


Figure 4.6 A6/A9/A9G IO reset circuit reference design

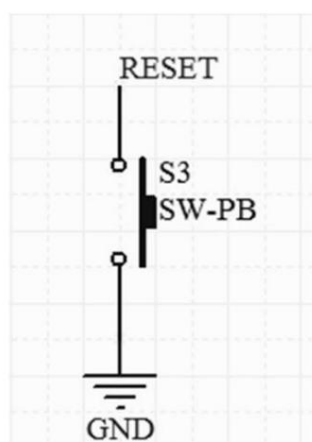


Figure 4.7 A6/A9/A9G reset circuit reference design description: short circuit reset (low power

Flat reset), if the microcontroller pin is used to control the reset, a drive current of more than 70mA is required. establish

It is recommended to connect an external Mos tube (such as AO3400) to drive, please refer to the reset circuit of A6.

4.3 SIM card design

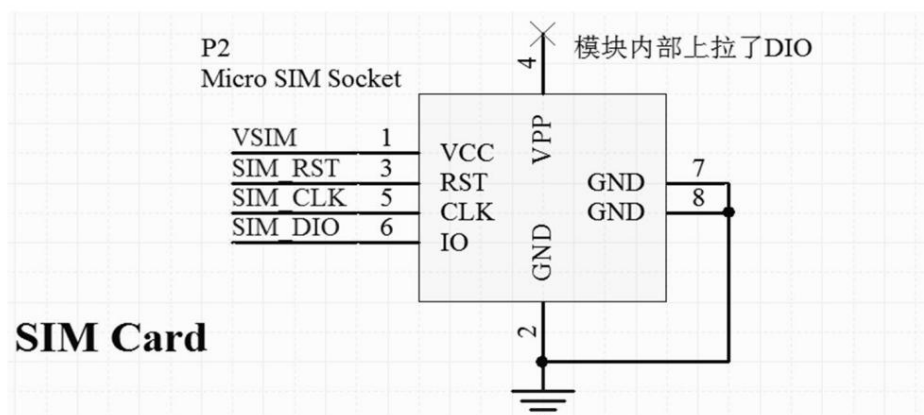


Figure 4.8 SIM card reference design

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

4.4 ADC Reference Design

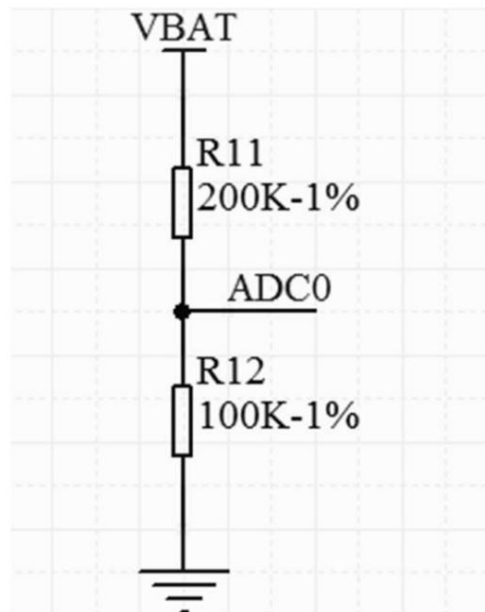


Figure 4.9 A9 ADC design reference diagram

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

4.5 SPEAKER Reference Design

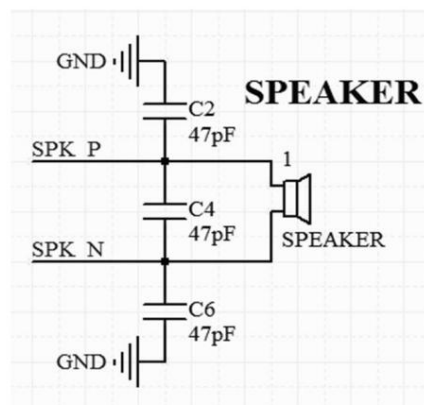


Figure 4.10 SPEAKER reference design

4.6 MIC Reference Design

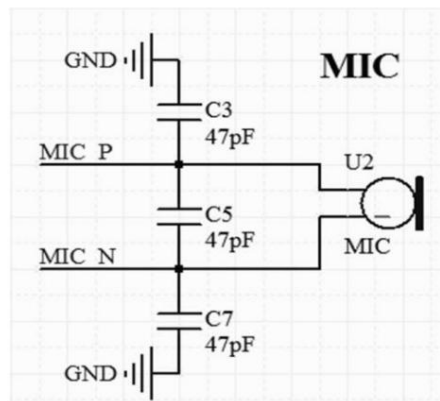


Figure 4.11 MIC Reference Design

4.7 Line design

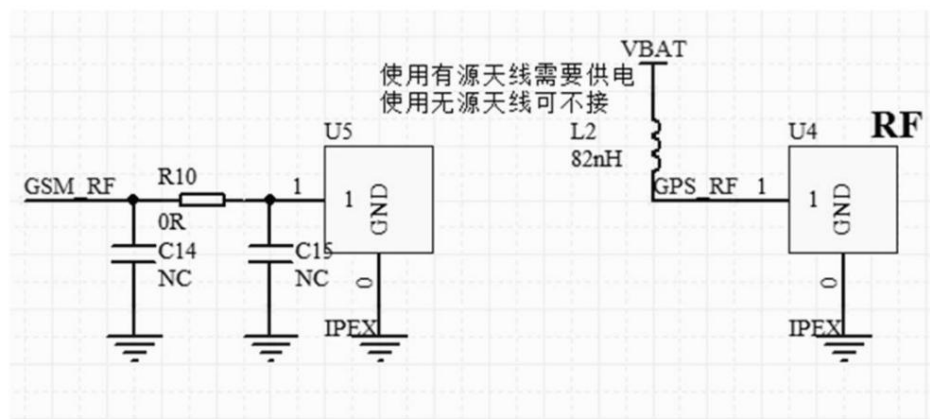


Figure 4.12 Antenna Reference Design

Note: The RF wires are all routed according to 50 ohms.

5 User Guide

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

Serial port and network debugging help [download: https://docs.ai-thinker.com/tools](https://docs.ai-thinker.com/tools)

5.1 Introduction to basic AT commands

This chapter only introduces common AT commands, for more commands, please refer to

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

5.1.1 AT

Command	AT
Description	Test whether AT is OK
example	AT OK

5.1.2 AT+GMR

Command	AT+GMR
Description	returns firmware version information
example	AT+GMR V01.00.2017091118H38 OK

5.1.3 AT+RST=1

Command	AT+RST=1 means
	soft restart module
example	AT+RST=1 Heat... ^ZINIT: 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 +VEIL: READY
--	---

5.1.4 AT+CCID

Instruction	AT+CCID
Description	Query SIM card number
example	AT+CCID +CCID: xxxxxxxxxxxxxxxxxxxx OK

5.1.5 AT+CSQ

Command	AT+CSQ
Instructions	query signal quality
example	AT+CSQ +CSQ: 28.99

	OK
--	----

5.2 Example of use

This chapter explains how the GPRS module establishes TCP communication with the remote server. specific steps as follows:

1. Boot up

The dynamic information is as follows:

Heat...

^ZINIT: 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
```

```
+VEIL: READY
```

2. Check whether the module is registered online

Enter the command AT+CREG?	
returned messages	<pre>AT+CREG?</pre> <pre>+CREG: 1,1</pre> <pre>OK</pre>

3. Query signal quality

Input command AT+CSQ	
returned messages	<pre>AT+CSQ</pre> <pre>+CSQ: 27,99</pre> <pre>OK</pre>

4. Attachment network

Enter command AT+CGATT=1	
returned messages	<pre>AT+CGATT=1</pre> <pre>+CGATT:1</pre>

	OK
--	----

Five, specify the **PDP** context

Input command AT+CGDCONT=1,"IP","CMNET"	
returned messages	AT+CGDCONT=1,"IP","CMNET" OK

6. Activate the specified **PDP** context

Enter command AT+CGACT=1,1	
returned messages	AT+CGACT=1,1 OK

7. Connect server domain name or **IP**

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

8. Send data

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

	3. Send the terminator (hex 1A).
returned messages	<div>1. Return information after sending AT+CIPSEND</div> <div>AT+CIPSEND</div> <div>></div> <div>3. Successful return value</div> <div>OK</div>

9. Receive data

Received data sent by the server:

+CIPRCV:12,Hello, World

More usage examples

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

appendix

appendix-

Replenish

1. Description of GPS and GPRS status indicators

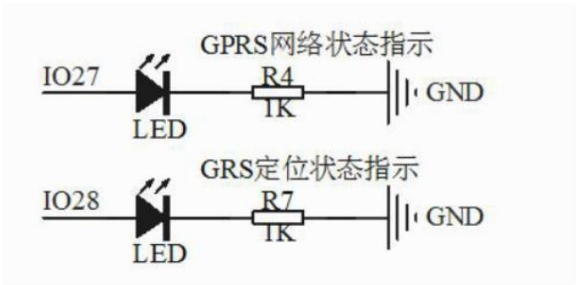


Figure 1.1 Wiring Diagram of Status Indicator

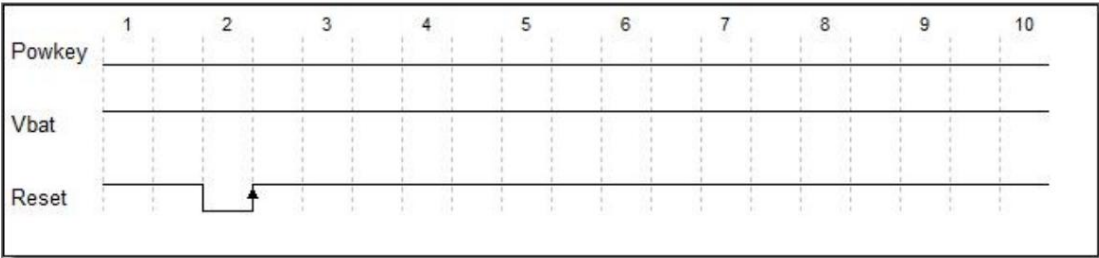
LED status		LED status
GPRS(IO27)	unregistered network off	
	During the process of registering the network, it goes out for 1s and lights up for 10ms	
	registration success	Off for 3s, on for 10ms
GPS(IO28)	If the location indicator is not obtained, the indicator flashes with a time interval of 0.5s	
	get positioned	The indicator light flashes with an interval of 2s

For example, if the registration is successful, light—(after 10ms)—>off—(after 3s)—>light

Appendix 2 A9/A9G reset circuit diagram and description

A9/A9G reset circuit timing diagram

Power-on reset circuit



illustrate

In A9/A9G power-on reset circuit, Powkey is always at low level, Vbat is always at

In the high level state, at this time, directly set the Reset pin level to low level first, then to high level,

The reset is now complete.

Button power on reset circuit

In the A9/A9G button power-on circuit, the Powkey pin is at low level, and it is suspended after the power-on action is completed.

null. To complete the reset action, you need to put the Powkey pin first at high level and then at low level.

Then set the Reset pin level to low level (low level is active), and then set it to high level to complete

into reset.

6 Appendix

Please click on this link for 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, the latest version of the document shall prevail

7 contact us

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

Development Docs: <https://docs.ai-thinker.com>

Official Forum: <http://bbs.ai-thinker.com>

Sample purchase: <https://anxinke.taobao.com>

Business cooperation: sales@aithinker.com

Technical support: support@aithinker.com

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Tel: 0755-29162996



WeChat public account