A7670 & SIM800 & A7672 Series Compatible Design

LTE Module

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Version History

Version	Date	Owner	What is new
V1.00	2021.06.01	Gaochao Li/Xiaojun Guo	First Release
V1.01	2021.09.03	Zhongyou Chen	Add part of description for A7672
V1.02	2022.11.01	Hao Li	GNSS_PWRCTL line adds a series 10K resistor

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1 Introduction

1.1 Purpose of the document

This document is targeted for customers to understand the differences between A7670、SIM800 and A7672.

Users can use A7670、SIM800 or A7672 series module to design and develop applications quickly.

A7670 series include A7670E.
SIM800 series include SIM800, and SIM800F.
A7672 series include A7672E、A7672S and A7672SA.

1.2 Related documents

[1] A7670 Series Hardware Design
[2] SIM800 Hardware Design
[3] SIM800F Hardware Design
[4] A7672 Series Hardware Design

1.3 Conventions and abbreviations

Abbreviation	Description
ESD	Electrostatic Discharge
GSM	Global Standard for Mobile Communications
I2C	Inter-Integrated Circuit
PCB	Printed Circuit Board
PCS	Personal Communication System, also referred to as GSM 1900
RF	Radio Frequency
RTC	Real Time Clock
RX	Receive Direction
SIM	Subscriber Identification Module
UART	Universal Asynchronous Receiver & Transmitter
NC	Not connect
EDGE	Enhanced data rates for GSM evolution
HSDPA	High Speed Downlink Packet Access HSUPA
USIM	Universal subscriber identity module
UMTS	Universal mobile telecommunications system

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SMPS	Switch Mode Power Supply

2 Module Introduction

2.1 Module Overview

The A7670E module supports LTE-FDD /GSM. SIM800series module supports GPRS/GSM. A7672 series module supports LTE-TDD/LTE-FDD/EDGE/GPRS/GSM. Users can choose different types of modules according to their demands to meet diversified market request.

Table 1: Module basic information comparison

Modules	Renderings	Package	Size	Description
A7670E		88 LGA pins	24*24*2.5 mm	LTE-FDD and 2G
SIM800 Series	 	68 LCC pins	24*24*3 mm	2G
A7672X		80 LCC+44 LGA pins	24*24*2.4mm	LTE CAT-1 and 2G

2.2 Features

This chapter lists the functions supported by A7670E、SIM800 and A7672 series, the comparison is as follows:

Table 2: Module function comparison

Function	A7670E	SIM800 series	A7672 series
Power	Power supply range：3.4V~4.2V Typical value：3.8V	SIM800 series Power supply range: 3.4V~4.4V Typical value：4V	Power supply range： 3.4V~4.2V Typical value：3.8V
Peak current	2A	2A	2A
Sleep current	2mA(GSM/GPRS) 2.3mA(LTE-TDD)	SIM800: 1.3mA (GSM/GPRS) SIM800F: 1.2 mA (GSM/GPRS)	3mA(LTE-TDD)
Frequency band	GSM:DCS1800/EGSM900 LTE-FDD: 1/3/5/7/8/20	GSM850/EGSM900/DCS1800/PCS1900.	A7672S： GSM:DCS1800/EGSM900 LTE-FDD: 1/3/5/8 LTE-TDD:34/38/39/40/41 A7672E： GSM:DCS1800/EGSM900 LTE-FDD: 1/3/5/7/8/20 A7672SA： GSM:DCS1800/EGSM900 LTE-FDD:1/2/3/4/5/7/8/28/66
GNSS	NA	NA	Optional
Bluetooth	NA	● Fully compliant with Bluetooth specification3.0 ● Support operation with GPS and GSM/GPRS worldwide radio systems ● Fully integrated PA provides 10dbm output power ● Up to 4 simultaneous active ACL links ● Support sniff mode ● Supports PCM interface and built-in programmable transcoders for liner voice with transmission	Optional
Temperature range	Normal working temperature：-30°C ~ +80°C Extended operating temperature：-40°C ~ +85°C * Storage temperature：-45°C ~	Normal working temperature：-40°C ~ +85°C Storage temperature：-45°C ~ +90°C	Normal working temperature：-30°C ~ +80°C Extended operating temperature：-40°C ~ +85°C * Storage temperature：

	+90°C		-45°C ~ +90°C
UART interface	**Main serial port UART1:** ● For AT command transmission and data transmission ● Baud rate supports from 300bps to 3686400bps ● Support RTS and CTS hardware flow control ● Support serial port multiplexing function conforming to GSM 07.10 protocol **Debug serial port:** ● Support debug usage **UART3 serial port:** ● Ordinary two-wire serial port	**Main serial port UART1:** ● Full modem serial port ● Can be used for AT commands or data stream ● Support RTS/CTS hardware handshake ● Comply with GSM 07.10 Multiplexer Protocol ● Support auto baud detect from 1200 bps to 115200bps	**Main serial port UART1:** ● For AT command transmission and data transmission ● Baud rate supports from 300bps to 3686400bps, the default is 115200bps ● Support RTS and CTS hardware flow control **Debug serial port UART_LOG:** ● Debug port, output log information, default 115200bps **Debug serial port UART3:** Ordinary two-wire serial port
(U)SIM interface	Support SIM card: 1.8V, 3V	Support SIM card: 1.8V, 3V	Support (U)SIM card: 1.8V/3.0V
PCM interface	● For audio use, external Codec chip is required ● Support 16-bit linear encoding format ● Only supports master mode	SIM800: NA SIM800F: ● Support 16-bit linear encoding format ● Only supports master mode	● For audio use, external Codec chip is required ● Support 16-bit linear encoding format ● Support short frame mode Only supports master mode
USB interface	USB2.0, only supports slave mode, the maximum data transfer rate is 480Mbps	USB2.0, only supports slave mode, the maximum data transfer rate is 480Mbps	USB2.0, only supports slave mode, the maximum data transfer rate is 480Mbps
SD Card interface	NA	NA	NA
SGMII interface	NA	NA	NA
ADC interface	● Provide an analog-to-digital conversion interface ● Voltage range: 0~1.3V ● Resolution: 12 bits	● Provide an analog-to-digital conversion interface ● Voltage range: 0~2.8V ● Resolution: 10 bits	● Provide a GPADC interface and a VABT ADC ● Voltage range: 0~1.8V/3.0~4.2V Resolution: 10 bits
Network indication	NETLIGHT: Network indication	NETLIGHT: Network indication	NETLIGHT: Network indication
Diversity antenna interface	No	No	No
Antenna	Main antenna interface:	GSM antenna: GSM_ANT	Main antenna interface:

interface	RF_ANT	Bluetooth antenna: BT_ANT	RF_ANT GNSS antenna interface (Optional):GNSS_ANT BT antenna interface (Optional):BT_ANT
Software upgrade	Upgrade software via USB	Upgrade software via USB and UART	Upgrade software via USB

NOTE

In the extended operating temperature range, the module can work normally, but does not guarantee full compliance with 3GPP test specifications.

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3 Package Introduction

3.1 PIN Assignment Overview

The following figure shows the pin assignment of A7670E、SIM800F、SIM800 and A7672X.

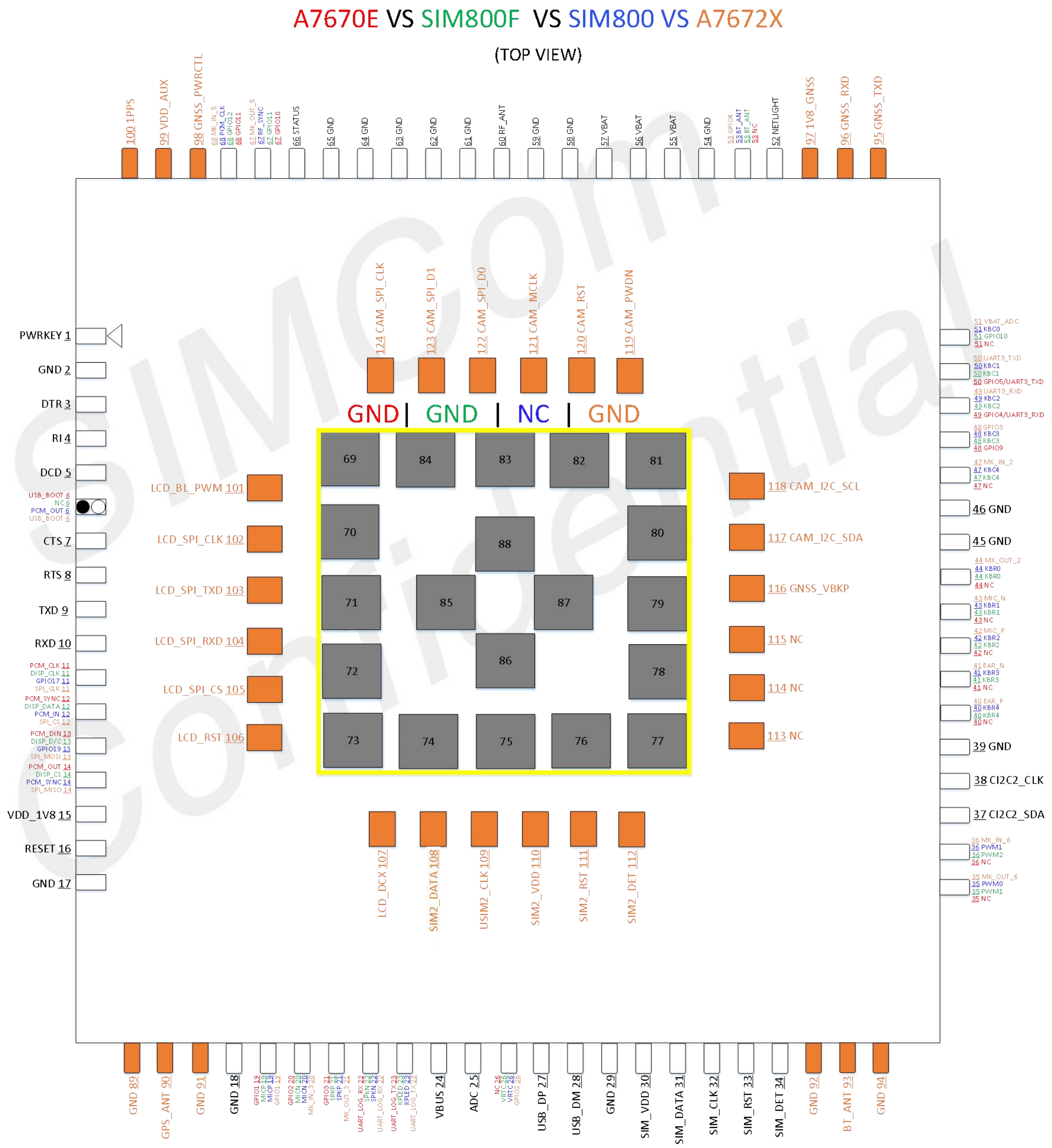

Figure 1: A7670E, SIM800F, SIM800 and A7672X pin assignment (Top view)

3.2 PIN definition

This chapter describes the pin definition and comparison of A7670E, SIM800, SIM800F and A7672X. Table 3 provides the abbreviated definition of module pins:

Table 3: Pin type definition

abbreviation	description
Pin attributes	
PI	Power Input
PO	Power Output
AI	Analog Input
AO	Analog Output
I/O	Input or Output
DI	Digital Input
DO	Digital Output

Table 4 lists all pin names, IO types and power domains of A7670E, SIM800, SIM800F and A7672X.

Table 4: Module pin definition comparison

A7670E				SIM800F				SIM800				A7672X			
No	Name	I/O	Power domain	No	Name	I/O	Power domain	No	Name	I/O	Power domain	No	Name	I/O	Power domain
1	PWRKEY	DI	VBAT	1	PWRKEY	DI	3V	1	PWRKEY	DI	VBAT	1	PWRKEY	DI	VBAT
2	GND	-	GND	2	GND	-	GND	2	GND	-	GND	2	GND	-	GND
3	DTR	DI	1.8V	3	UART1_DTR	DI	2.8V	3	DTR	I	2.8V	3	DTR	DI	1.8V
4	RI	DO	1.8V	4	UART1_RI	DO	2.8V	4	RI	O	2.8V	4	RI	DO	1.8V
5	DCD	DO	1.8V	5	UART1_DCD	DO	2.8V	5	DCD	O	2.8V	5	DCD	DO	1.8V
6	USB_BOOT●	DI	1.8V	6	NC	-	2.8V	6	PCM_OUT	O	2.8V	6	USB_BOOT○	DI	1.8V
7	CTS	DO	1.8V	7	UART1_CTS	DO	2.8V	7	CTS	O	2.8V	7	CTS	DO	1.8V
8	RTS	DI	1.8V	8	UART1_RTS	DI	2.8V	8	RTS	I	2.8V	8	RTS	DI	1.8V
9	TXD	DO	1.8V	9	UART1_TXD	DO	2.8V	9	TXD	O	2.8V	9	TXD	DO	1.8V
10	RXD	DI	1.8V	10	UART1_RXD	DI	2.8V	10	RXD	I	2.8V	10	RXD	DI	1.8V
11	PCM_CLK	IO	1.8V	11	DISP _CLK	O	2.8V	11	GPIO17	I/O	2.8V	11	SPI_CLK	IO	1.8V
12	PCM_SYNC	IO	1.8V	12	DISP_DATA	IO	2.8V	12	PCM_IN	I	2.8V	12	SPI_CS	IO	1.8V
13	PCM_DIN	DI	1.8V	13	DISP_D/C	O	2.8V	13	GPIO19	I/O	2.8V	13	SPI_MOSI	DO	1.8V
14	PCM_OUT	DO	1.8V	14	DISP_CS	O	2.8V	14	PCM_SYNC	O	2.8V	14	SPI_MISO	DI	1.8V
15	VDD_1V8	PO	1.8V	15	VDD_EXT	PO	2.8V	15	VDD_EXT		2.8V	15	VDD_1V8	PO	1.8V
16	RESET	DI	VBAT	16	NRESET	I	2.8V	16	RESET	I	2.8V	16	RESET	DI	VBAT

17	GND	-	GND	17	GND	-	GND	17	GND	-	GND	17	GND	-	GND
18	GND	-	GND	18	GND	-	GND	18	GND	-	GND	18	GND	-	GND
19	GPIO1	IO	1.8V	19	MICP	I	2.8V	19	MICP	I	2.8V	19	GPIO1	IO	1.8V
20	GPIO2	IO	1.8V	20	MICN		2.8V	20	MICN	I	2.8V	20	MK_IN_3	IO	1.8V
21	GPIO3	IO	1.8V	21	SPKP	O	2.8V	21	SPKP	O	2.8V	21	MK_OUT	IO	1.8V
22	UART_LOG_RX	DI	1.8V	22	SPKN		2.8V	22	SPKN	O	2.8V	22	UART_LOG_RX	DI	1.8V
23	UART_LOG_TX	DO	1.8V	23	KPLED	I	2.8V	23	KPLED	I	2.8V	23	UART_LOG_TX	DO	1.8V
24	VBUS	AI	Typical:5V	24	USB_VBUS	AI	Typical:5V	24	USB_VBUS	I	Typical:5V	24	VBUS	AI	Typical:5V
25	ADC	AI	0.1V-1.3V	25	ADC	AI	0V-2.8V	25	ADC	I	0V-2.8V	25	ADC	AI	0V-1.8
26	NC	-	-	26	VRTC	IO	2.8V	26	VRTC		2.8V	26	GPIO2	IO	1.8V
27	USB_DP	IO	-	27	USB_DP	IO	-	27	USB_DP	I/O	-	27	USB_DP	IO	-
28	USB_DM	IO	-	28	USB_DM	IO	-	28	USB_DN	I/O	-	28	USB_DM	IO	-
29	GND	-	GND	29	GND	-	GND	29	GND	-	GND	29	GND	-	GND
30	SIM_VDD	IO	1.8V/3.0V	30	SIM_VDD	IO	1.8V/3.0V	30	SIM_VDD	O	1.8V/3.0V	30	SIM_VDD	IO	1.8V/3.0V
31	SIM_DATA	IO	1.8V/3.0V	31	SIM_DATA	IO	1.8V/3.0V	31	SIM_DATA	I/O	1.8V/3.0V	31	SIM_DATA	IO	1.8V/3.0V
32	SIM_CLK	DO	1.8V/3.0V	32	SIM_CLK	DO	1.8V/3.0V	32	SIM_CLK	O	1.8V/3.0V	32	SIM_CLK	DO	1.8V/3.0V
33	SIM_RST	IO	1.8V/3.0V	33	SIM_RST	IO	1.8V/3.0V	33	SIM_RST	O	1.8V/3.0V	33	SIM_RST	IO	1.8V/3.0V
34	SIM_DET	IO	1.8V/3.0V	34	SIM_DET	I	1.8V/3.0V	34	SIM_DET	I	1.8V/3.0V	34	SIM_DET	IO	1.8V/3.0V
35	NC	-	-	35	PWM1	O	2.8V	35	PWM0	O	2.8V	35	MK_OUT_6	IO	1.8V
36	NC	-	-	36	PWM2	O	2.8V	36	PWM1	O	2.8V	36	MK_IN_6	-IO	1.8V
37	I2C_SDA	IO	1.8V	37	I2C_SDA	IO	2.8V	37	SDA	I/O	2.8V	37	I2C_SDA	IO	1.8V
38	I2C_SCL	DO	1.8V	38	I2C_SCL	DO	2.8V	38	SCL	O	2.8V	38	I2C_SCL	DO	1.8V
39	GND	-	GND	39	GND	-	GND	39	GND	-	GND	39	GND	-	GND
40	NC	-	-	40	KBR4	IO	2.8V	40	KBR4	O	2.8V	40	EAR_P	AIO	1.8V
41	NC	-	-	41	KBR3	IO	2.8V	41	KBR3	O	2.8V	41	EAR_N	AIO	1.8V
42	NC	-	-	42	KBR2	IO	2.8V	42	KBR2	O	2.8V	42	MIC_P	AIO	1.8V
43	NC	-	-	43	KBR1	IO	2.8V	43	KBR1	O	2.8V	43	MIC_N	AIO	1.8V
44	NC	-	-	44	KBR0	IO	2.8V	44	KBR0	O	2.8V	44	MK_OUT_2	IO	1.8V
45	GND	-	GND	45	GND	-	GND	45	GND	-	GND	45	GND	-	GND
46	GND	-	GND	46	GND	-	GND	46	GND	-	GND	46	GND	-	GND
47	NC	-	-	47	KBC4	-	2.8V	47	KBC4	I	2.8V	47	MK_IN_2	IO	1.8V
48	GPIO9	IO	1.8V	48	KBC3		2.8V	48	KBC3	I	2.8V	48	GPIO3	IO	1.8V
49	GPIO4(UART3_RX)	IO	1.8V	49	KBC2		2.8V	49	KBC2	I	2.8V	49	UART3_RXD	IO	1.8V
50	GPIO5(UART3_TX)	IO	1.8V	50	KBC1		2.8V	50	KBC1	I	2.8V	50	UART3_TXD	IO	1.8V
51	NC	-	-	51	GPIO10	-	2.8V	51	KBC0	I	2.8V	51	VBAT_ADC	AI	3.0~4.2v
52	NETLIGHT	DO	1.8V	52	NETLIGHT	DO	2.8V	52	NETLIGHT	O	2.8V	52	NETLIGHT	DO	1.8V
53	NC	-	-	53	BT_ANT	IO	-	53	BT_ANT	IO	-	53	GPIO3	IO	1.8V
54	GND	-	GND	54	GND	-	GND	54	GND	-	GND	54	GND	-	GND
55	VBAT	PI	3.4V~4.2V	55	VBAT	PI	3.4V~4.4V	55	VBAT	PI	3.4V~4.4V	55	VBAT	PI	3.4V~4.2V
56	VBAT	PI	3.4V~4.2V	56	VBAT	PI	3.4V~4.4V	56	VBAT	PI	3.4V~4.4V	56	VBAT	PI	3.4V~4.2V
57	VBAT	PI	3.4V~4.2V	57	VBAT	PI	3.4V~4.4V	57	VBAT	PI	3.4V~4.4V	57	VBAT	PI	3.4V~4.2V
58	GND	-	GND	58	GND	-	GND	58	GND	-	GND	58	GND	-	GND
59	GND	-	GND	59	GND	-	GND	59	GND	-	GND	59	GND	-	GND
60	RF_ANT	AIO	-	60	GSM_ANT	IO	-	60	GSM_ANT	IO	-	60	RF_ANT	AIO	-

61	GND	-	GND	61	GND	-	GND	61	GND	-	GND	61	GND	-	GND
62	GND	-	GND	62	GND	-	GND	62	GND	-	GND	62	GND	-	GND
63	GND	-	GND	63	GND	-	GND	63	GND	-	GND	63	GND	-	GND
64	GND	-	GND	64	GND	-	GND	64	GND	-	GND	64	GND	-	GND
65	GND	-	GND	65	GND	-	GND	65	GND	-	GND	65	GND	-	GND
66	STATUS	DO	1.8V	66	STATUS	DO	2.8V	66	STATUS	O	2.8V	66	STATUS	DO	1.8V
67	GPIO10	IO	1.8V	67	GPIO11		2.8V	67	RF_SYNC	O	2.8V	67	MK_OUT_5	IO	1.8V
68	GPIO11	IO	1.8V	68	GPIO12		2.8V	68	PCM_CLK	I	2.8V	68	MK_IN_5	IO	1.8V
69	GND	-	GND									69	GND	-	GND
70	GND	-	GND									70	GND	-	GND
71	GND	-	GND									71	GND	-	GND
72	GND	-	GND									72	GND	-	GND
73	GND	-	GND									73	GND	-	GND
74	GND	-	GND									74	GND	-	GND
75	GND	-	GND									75	GND	-	GND
76	GND	-	GND									76	GND	-	GND
77	GND	-	GND									77	GND	-	GND
78	GND	-	GND									78	GND	-	GND
79	GND	-	GND									79	GND	-	GND
80	GND	-	GND									80	GND	-	GND
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82	GND	-	GND									82	GND	-	GND
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84	GND	-	GND									84	GND	-	GND
85	GND	-	GND									85	GND	-	GND
86	GND	-	GND									86	GND	-	GND
87	GND	-	GND									87	GND	-	GND
88	GND	-	GND									88	GND	-	GND
												89	GND	-	GND
												90	GNSS_ANT	AIO	-
												91	GND	-	GND
												92	GND	-	GND
												93	BT_ANT	AIO	-
												94	GND	-	GND
												95	GNSS_TXD	IO	1.8V
												96	GNSS_RXD	IO	1.8V
												97	1V8_GNSS	PI	1.8V
												98	GNSS_PWRCTL	IO	1.8V
												99	VDD_AUX	PO	adjustable
												100	1PPS	IO	1.8V
												101	LCD_BL_PWM	IO	1.8V
												102	LCD_SPI_CLK	IO	1.8V
												103	LCD_SPI_TXD	IO	1.8V
												104	LCD_SPI_RXD	IO	1.8V

												105	LCD_SPI_CS	IO	1.8V
												106	LCD_RST	IO	1.8V
												107	LCD_DCX	IO	1.8V
												108	SIM2_DATA	IO	1.8V/3.0
												109	SIM2_CLK	IO	1.8V/3.0
												110	SIM2_VDD	PO	1.8V/3.0
												111	SIM2_RST	IO	1.8V/3.0
												112	SIM2_DET	IO	1.8V
												113	NC		
												114	NC		
												115	NC		
												116	GNSS_VBKP	PI	1.4~3.6V
												117	CAM_I2C_SDA	IO	1.8V
												118	CAM_I2C_SCL	IO	1.8V
												119	CAM_PWDN	IO	1.8V
												120	CAM_RST	IO	1.8V
												121	CAM_MCLK	IO	1.8V
												122	CAM_SPI_D0	IO	1.8V
												123	CAM_SPI_D1	IO	1.8V
												124	CAM_SPI_CLK	IO	1.8V

NOTE

The PIN name highlighted in orange only for A7672X.
The voltage level of the GPIO and UART of the A7670E module is 1.8V; When do compatible design with SIM800 series and A7670E module, a level conversion circuit should be needed.

The PIN Marked '●' cannot be pulled up before the module powered up, otherwise it will affect the normal start-up of the module.

The PIN Marked '○' cannot be pulled down before the module powered up, otherwise it will affect the normal start-up of the module.

4 Physical Size

This chapter introduces the external dimensions of the A7670E, SIM800, SIM800F and A7672X modules, and the recommended packaging.

4.1 Top and Bottom View

The following figures show top and bottom view of A7670E, SIM800, SIM800F and A7672X.

Figure 2: A7670E, SIM800, SIM800F and A7672X series top and bottom view

NOTE

The above is the design effect drawing of the module for reference, and the actual appearance shall prevail in kind.

4.2 Recommended PCB footprint outline

The recommended PCB footprint outline for A7670E, SIM800F, SIM800 and A7672 series is shown as following.

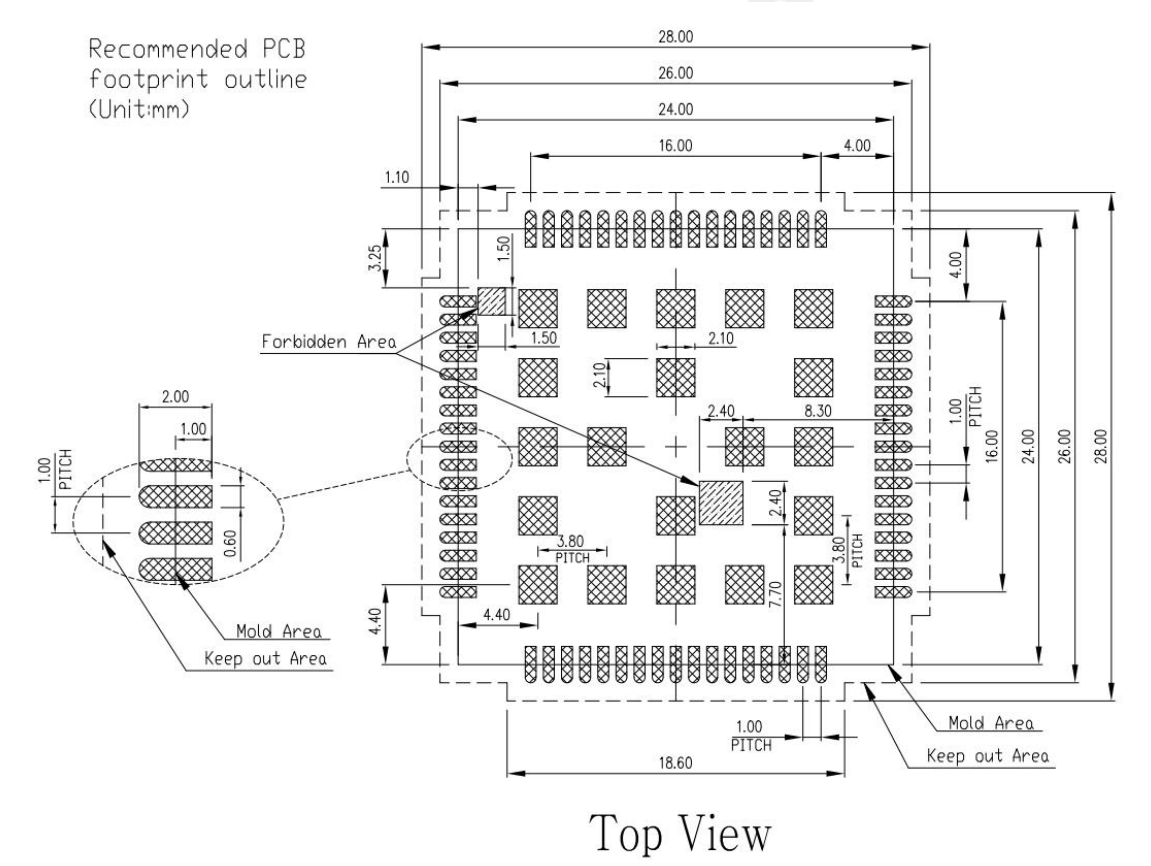

Figure 3: Recommended PCB footprint outline for A7670E (Unit: mm)

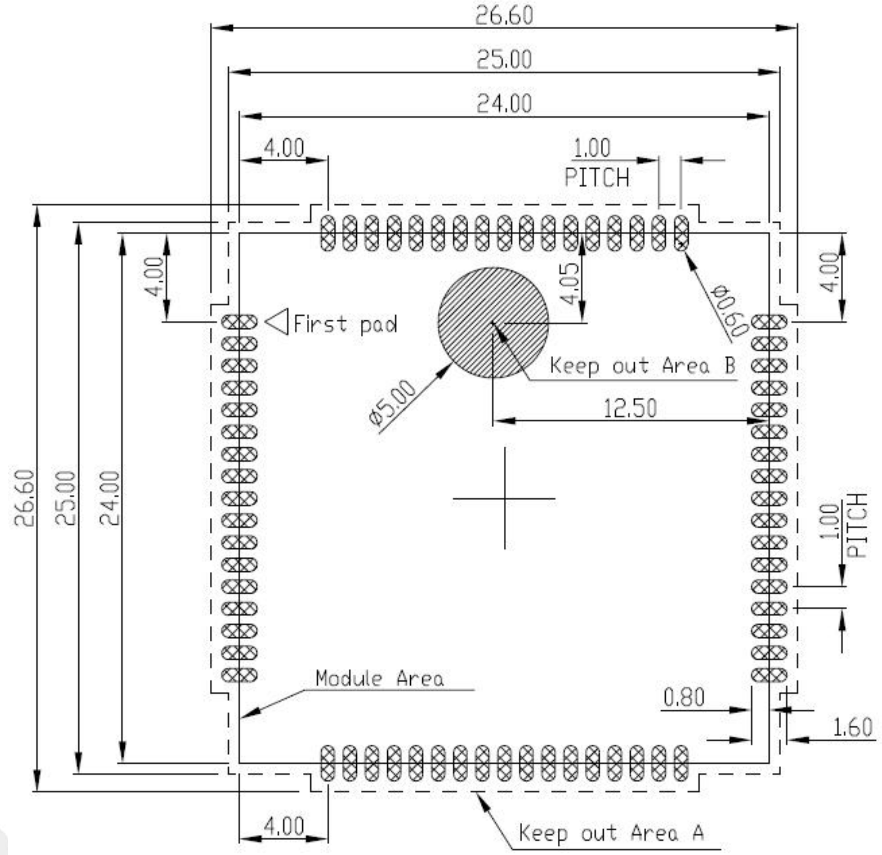

Figure 4: Recommended PCB footprint outline for SIM800F (Unit: mm)

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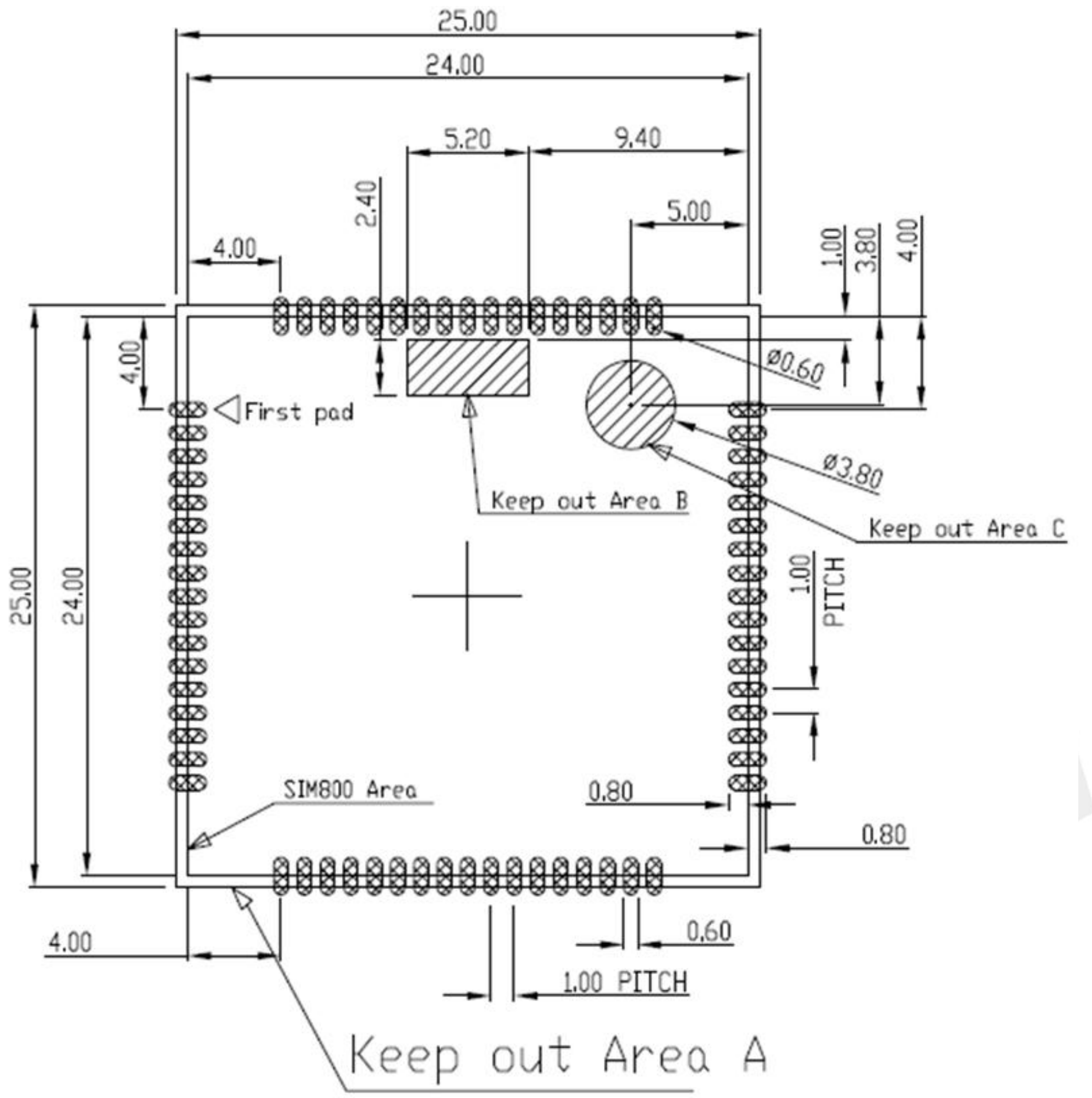

Figure 5: Recommended PCB footprint outline for SIM800 (Unit: mm)

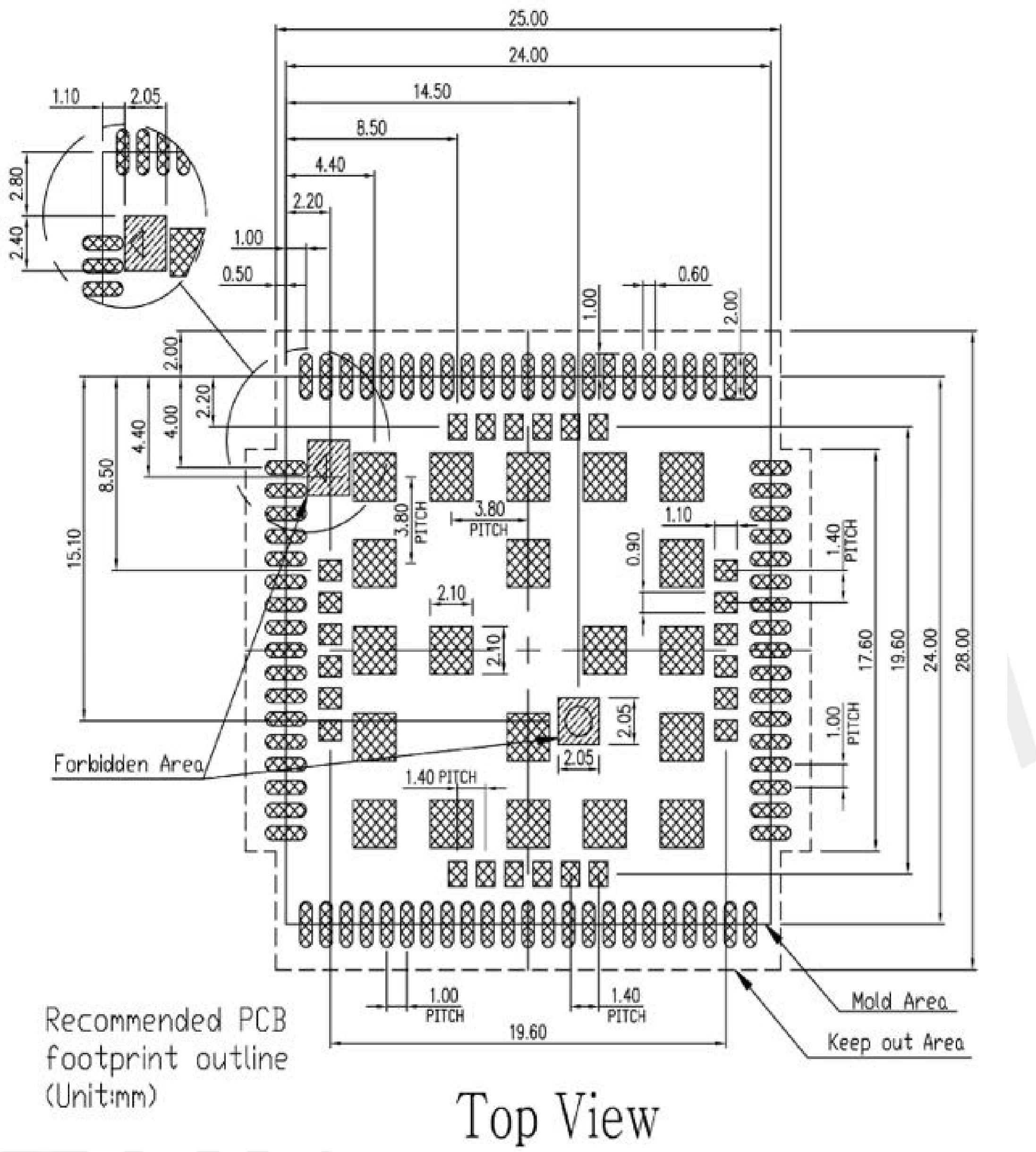

Figure 6: Recommended PCB footprint outline for A7672X (Unit: mm)

NOTE

For detailed information, please refer to HD for each module.

5 Hardware Reference Design

The user interface for A7670, SIM800, SIM800F and A7672X is showing in this chapter.

5.1 Power Supply

5.1.1 Power requirements

The following table shows the supply voltage range of A7670, SIM800, SIM800F and A7672X:

Table 5: Module recommended supply voltage comparison

Modules	Power Pin	Symbol description	Min	Typical	Max	unit
A7670E	VBAT	Power supply range	3.4	3.8	4.2	V
SIM800 series	VBAT	Power supply range	3.4	4	4.4	V
A7672 series	VBAT	Power supply range	3.4	3.8	4.2	V

During 2G transmission, the peak current can be as high as 2A, and the battery terminal burst current and voltage drop model are shown in the figure below:

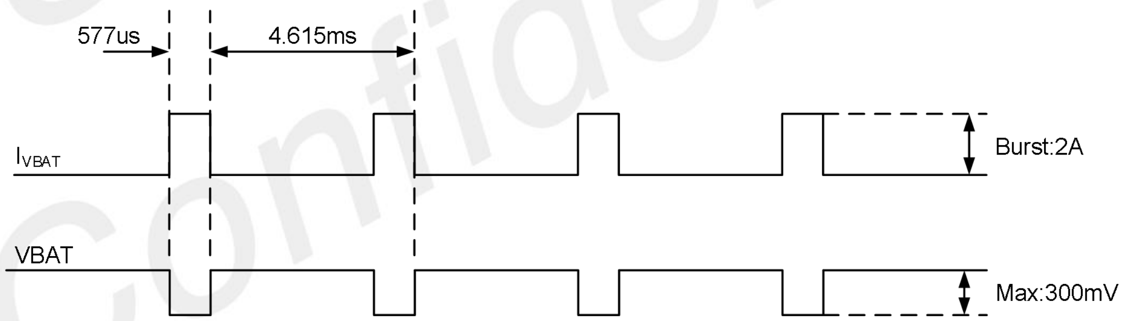

Figure 7: Burst transmission power requirements

In user's design, special attention must be paid to the design of the power supply section to ensure that even when the current consumption of the module reaches 2A, the drop of VBAT does not fall below 3.4V. If the voltage drops below 3.4V, the RF performance of the module will be affected.

NOTE

When the power supply can provide a peak current of 2A, the total capacitance of the external power supply capacitor is recommended not to be less than 330uF.

It is recommended to place four ceramic capacitors of 33pf/10pf/0.1/1μF close to VBAT to improve RF performance and system stability. At the same time, it is recommended that the width of the VBAT trace between the power supply on the PCB and the module is at least 3mm. The reference design recommendations are as follows:

If the VBAT input contains high frequency interference, it is recommended to add magnetic beads for filtering. The recommended models of magnetic beads are BLM21PG300SN1D and MPZ2012S221A.

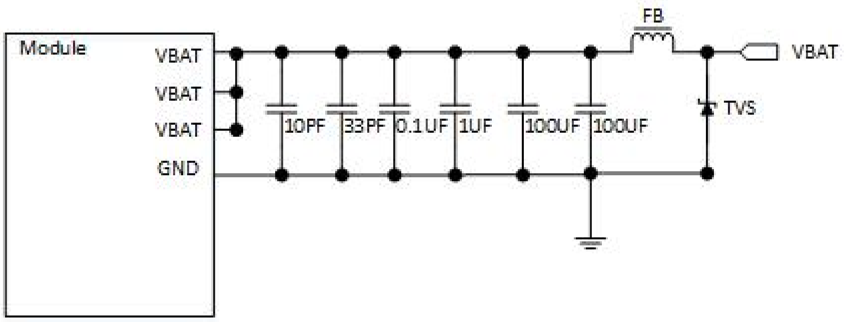

Figure 8: VBAT input reference circuit

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5.1.2 Recommended external power circuit

The module power supply design is the basis for the stable performance of the module. When choosing a power supply, it is necessary to ensure that it has a load capacity of at least 3A. Users can choose LDO or DC-DC power supply according to their needs.

The recommended circuit of linear power supply is shown in the figure below:

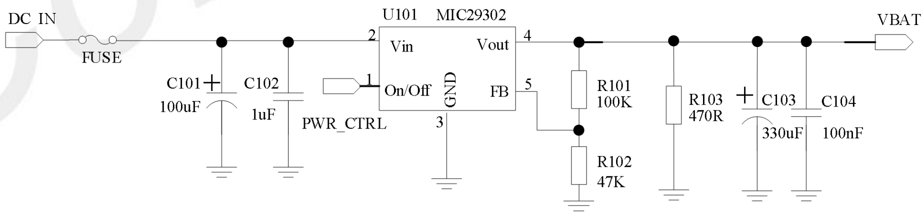

Figure 9: Linear power supply recommended circuit

The recommended circuit of switching power supply is shown in the figure below:

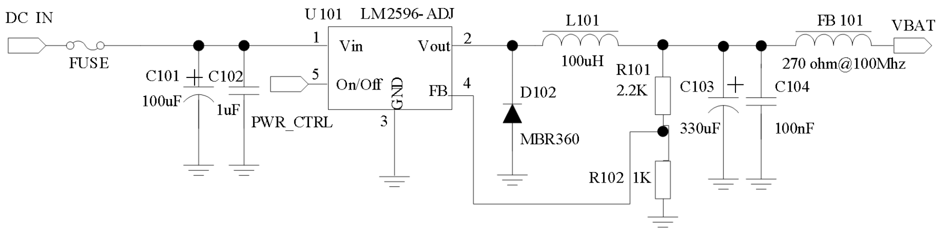

Figure 10: Recommended circuit for switching power supply

5.2 USB Interface

Both A7670, SIM800 and A7672 series module provide a USB2.0 interface, supporting high-speed 480Mbps and full-speed mode 12Mbps, and do not support USB charging function; A7670 and A7672 series does not support USB HOST mode.

USB is the main debugging port and software upgrade interface. It is recommended that customers reserve USB test points during design. If the main control chip is connected, 0R resistors should be reserved for switching external test points during design, as shown in the figure below.

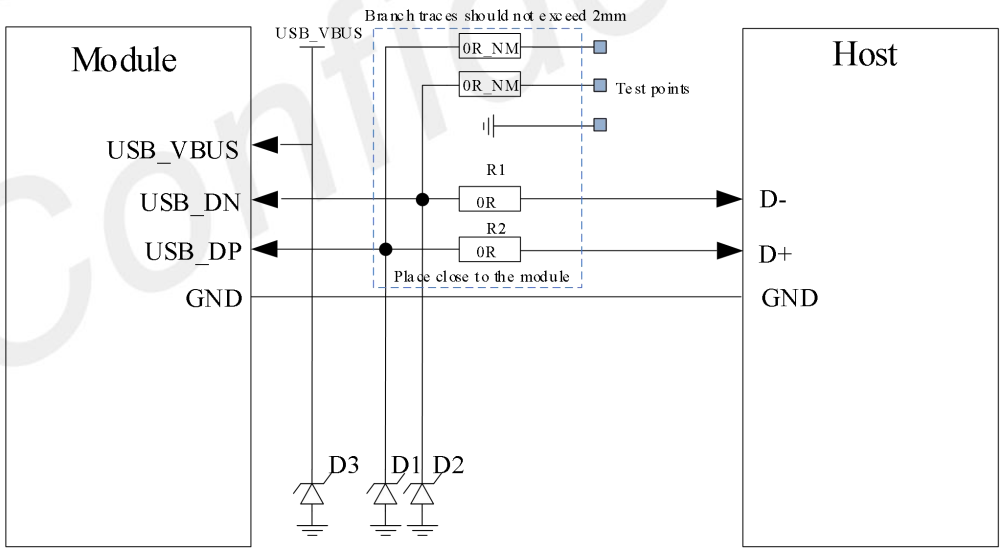

Figure 11: USB reference circuit

Customers can replace R1 and R2 with a common mode inductor to prevent EMI interference, and pay attention to the selection of D3 devices. It is recommended to choose anti-static and anti-surge two-in-one devices, and one TVS tube can be placed. Recommended model ESD5681N07. D+/D- trace impedance is controlled according to 90Ω and covered with ground; D1/D2 select TVS tube with capacitance value <1pf .

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5.3 Network Status Indication

The NETLIGHT/STATUS pins can be used to drive a network status indicator LED. The following circuit is the reference design.

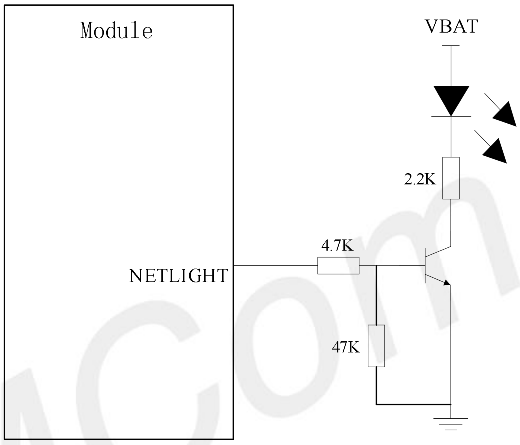

Figure 12: NETLIGHT/STATUS reference circuit

5.4 Power on/off Circuit

A7670、SIM800 and A7672 series can be turned on by driving the PWRKEY pin to a low level for a certain time. It is recommended use an open drain or collector driver to control the PWRKEY. A reference circuit is shown below.

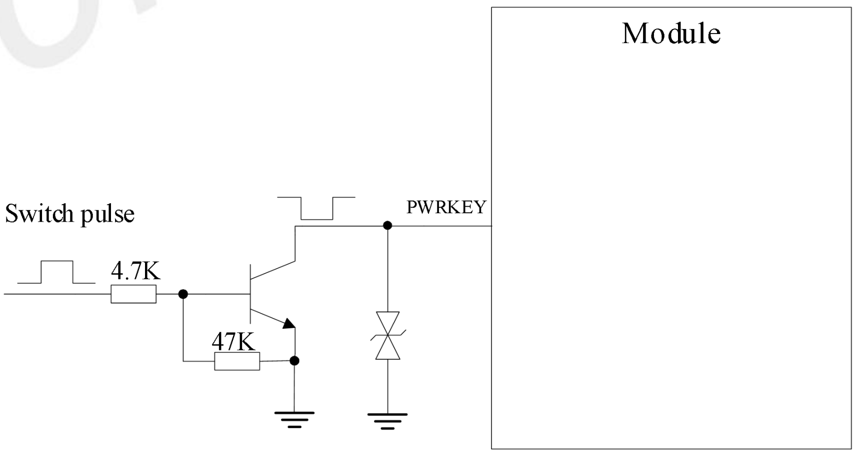

Figure 13: Power on/off reference circuit

The module has the following shutdown methods:

- Use PWRKEY pin to shut down
- Use "AT+CPOF" command to shut down
- High/low voltage overvoltage shutdown, use "AT+CPMVT" (A7670 and A7672 series) to set the voltage range.
- Shutdown at high and low temperature

It is strongly recommended that customers use PWRKEY or AT+CPOF to shut down, and then power off VBAT after shutting down (especially when the module does not need to work at all). In addition, turning off the VBAT directly by disconnecting the VBAT may cause damage to the FLASH.

5.5 Reset Circuit

The A7670E, SIM800 and A7672 series reset circuit is as follows, the user resets the module by pulling down the RESET pin.

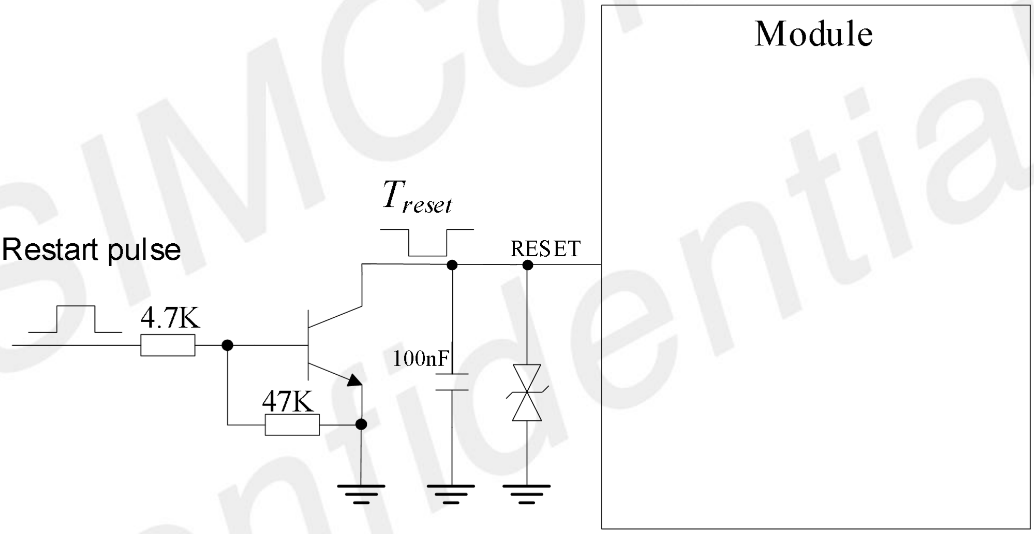

Figure 14: A7670X/SIM800X/A7672X Reset reference circuit

Table 6: Electronic characteristic of the RESET Pin

Function	A7670E	SIM800X	A7672X
RESET	• RESET pin is pulled up to VBAT internally • The reset time is recommended to be 2.5s. • Input low level voltage range:0-0.5V	• RESET pin is pulled up to 2.8V internally • The reset time is recommended to be 105 mS. • Input low level voltage range:0-0.6V	• RESET pin is pulled up to VBAT internally • The reset time is recommended to be 2.5s. Input low level voltage range:0-0.5V

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5.6 USIM Interface

A7670E, SIM800 and A7672 series supports 1.8V/3.0V (U)SIM card by default and supports hot-swappable function. The recommended circuit is as follows:

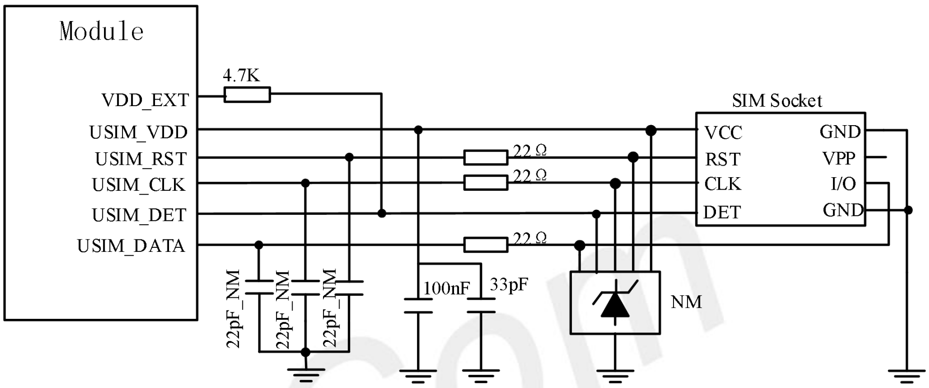

Figure 15: SIM interface reference circuit

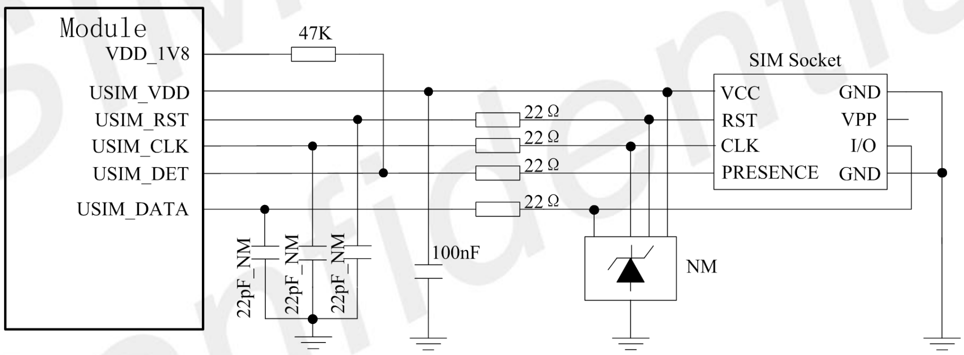

Figure 1: SIM interface reference circuit (8PIN)

5.7 UART Interface

A7670E and A7672X provides 3 serial ports, 1 main full-function communication serial port UART (RTS/CTS flow control function debugging), 1 ordinary two-wire serial port, 1 print LOG serial port, and the module is a DCE (Data Communication Equipment) device.

SIM800F provides 1 full function UART port.

SIM800 provides 1 full function UART port, and can be configured to two independent serial ports.

Below are the reference circuits.

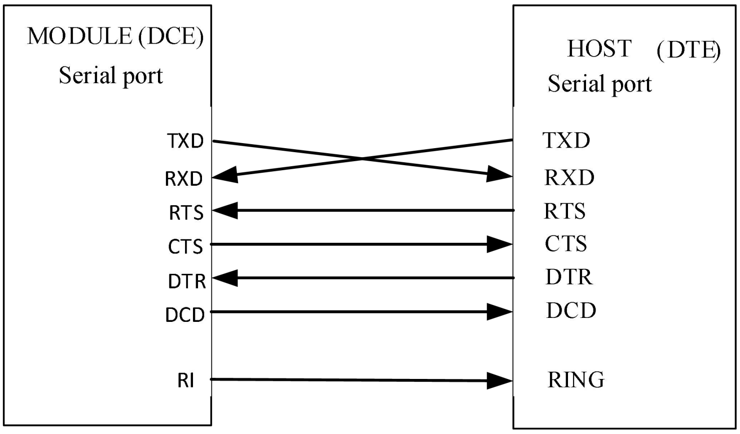

Figure 16: UART Full modem

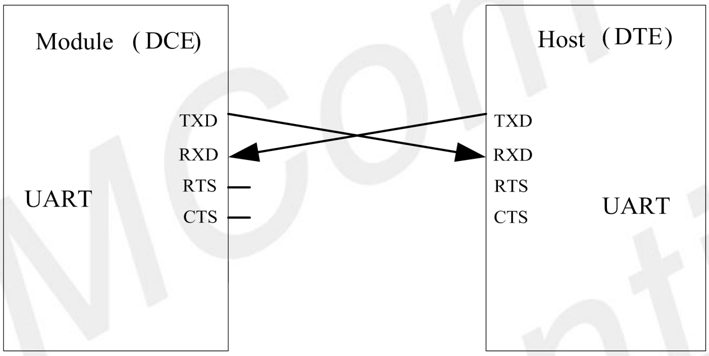

Figure 17: UART Null modem

The following circuit is the reference design.

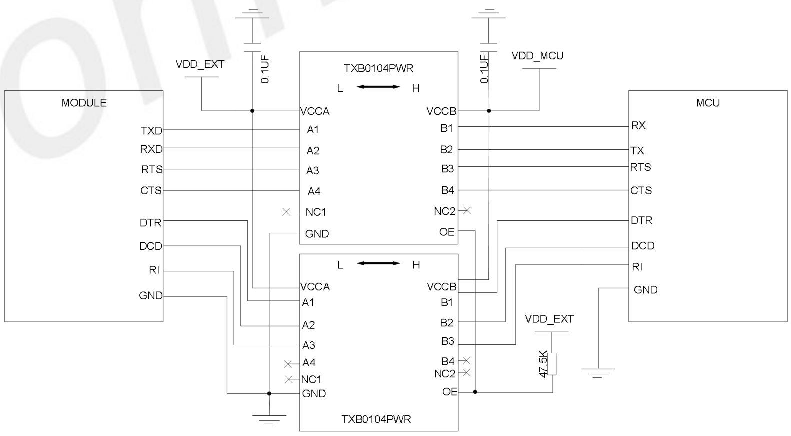

Figure 18: Triode level conversion circuit

NOTE

The VDD_EXT of each project in the diagram is different. For details information, please refer to each HD guide.

5.8 PCM Interface

SIM800F do not provide PCM interface. A7670, SIM800 and A7672X provide a set of PCM audio interfaces, which can be connected to an audio codec chip. Support voice function, customers can plug-in codec on PCM to make voice calls.

Table 7: PCM interface parameters

Function	A7670E	SIM800	A7672X
PCM Interface	● Support 16-bit linear encoding format ● Support short frame mode ● Support master mode	● Support 16-bit linear encoding format ● Support short frame mode ● Support master mode	● Support 16-bit linear encoding format ● Support short frame mode ● Support master mode

The recommended circuit of PCM is as follows:

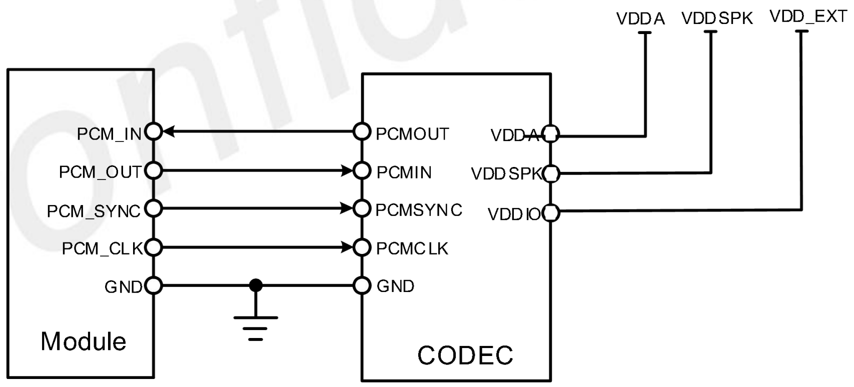

Figure 19: PCM recommended circuit

NOTE

The power domain of codec IO interface must match the power domain of each module's IO interface. For details information, please refer to each HD guide

5.9 RF Interface

The reference circuit of ANT_MAIN antenna connection between A7670, SIM800 and A7672 series is shown in the figure below. In order to ensure the best performance of the output radio frequency, it is recommended to reserve a π-type matching circuit, and the capacitor is not attached by default.

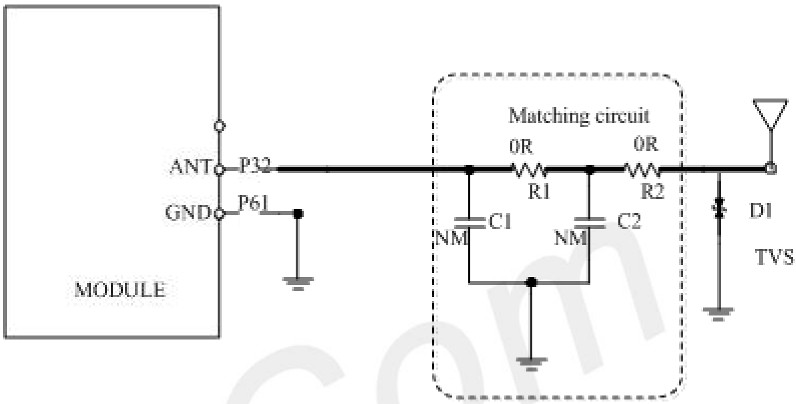

Figure 20: Antenna matching circuit

The capacitors (C1/C2) are not mounted and a 0Ω resistor is mounted on R1 and R2 by default. The component D1 is a TVS for ESD protection, and it is optional for users according to application environment. The RF test connector is used for the conducted RF performance test, and should be placed as close as to the module's RF_ANT pin. Two TVS are recommended in the table below.

Table 8: Recommended TVS

Package	Part Number	Vender
0201	LXES03AAA1-154	Murata
0402	LXES15AAA1-153	Murata

5.10 USB_BOOT Interface

SIM800F does not support the USB force download function.

SIM800 support the USB force download function. When only USB_DP and USB_DN connected, no USB_VBUS, customer need to pull down KBC0 before power on the module, then press the PWRKEY button, the module will enter download mode. The reference circuit is as follows.

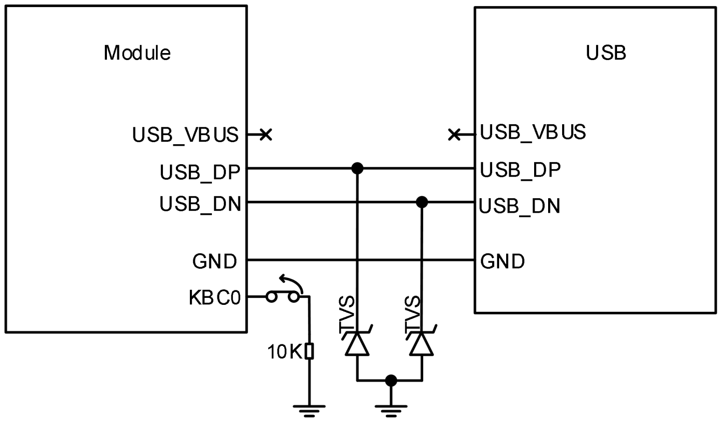

Figure 21: Forced download reference circuit for SIM800

A7670E and A7672X support the USB force download function. User can pull up the USB_BOOT pin to 1.8V for A7670E, pull down USB_BOOT pin to GND for A7672X before powering on, and press the power button to enter the emergency download mode. At this time, the module can download software through the USB port. The reference circuit is as follows. It is recommended that users connect these two signals to test points.

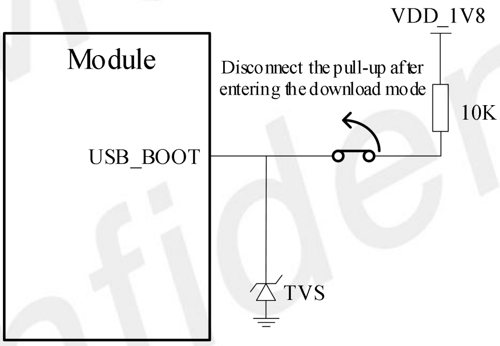

Figure 22: Forced download reference circuit for A7670E

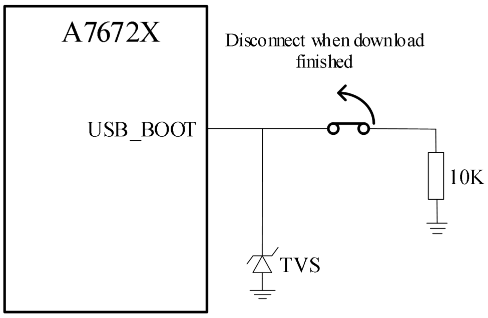

Figure 23: Forced download reference circuit for A7672X

5.11 ADC Interface

Both A7670E and SIM800 series provide 1 GPADC interface. A7672X provide 1 GPADC and 1 VBAT_ADC. The electrical characteristics are compared as follows:

Table 9: ADC interface parameters

Function	A7670 series	SIM800 series	A7672 series
ADC	1： ● GPADC	1： ● GPADC	2： ● GPADC ● VBAT_ADC
ADC resolution	12bits	10bits	9bits
Voltage range	0~1.3V	0~2.8V	GPADC：0~1.8V VBAT_ADC：0~4.4V

NOTE

For A7672 series GPADC, the input voltage range is 0~1.8V, and the value of divider resistance added is recommended not to exceed 10K.
For A7672 series VBAT_ADC, should divide the VBAT using 680k_% and 470k_% resistors then connected to the VBAT_ADC PIN to read the battery voltage by default, the VBAT voltage range is 0~4.2V.

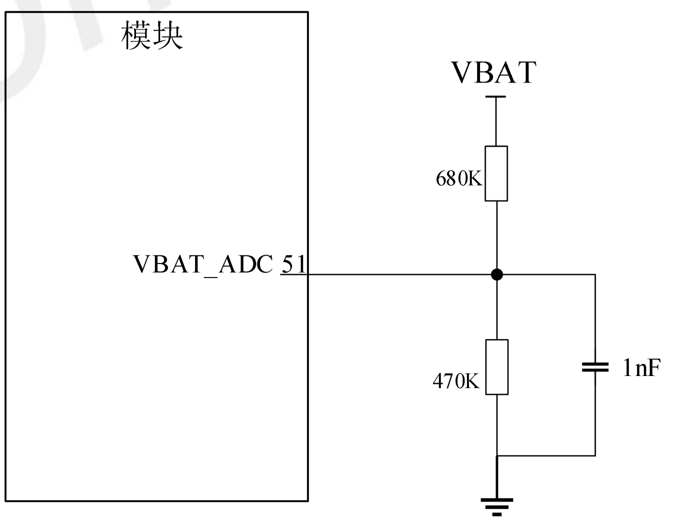

Figure 24: A7672 VBAT_ADC reference circuit

5.12 I2C

A7670E and A7672X provides two sets of I2C interfaces, support standard speed clock frequency 100Kbps, support high speed clock frequency 400Kbps, its operation voltage is 1.8V.

The SIM800 series provides an I2C interface, which supports the master role and conforms to the I2C specification. I2C has been pulled up to 2.8V via 4.7KΩ internally.

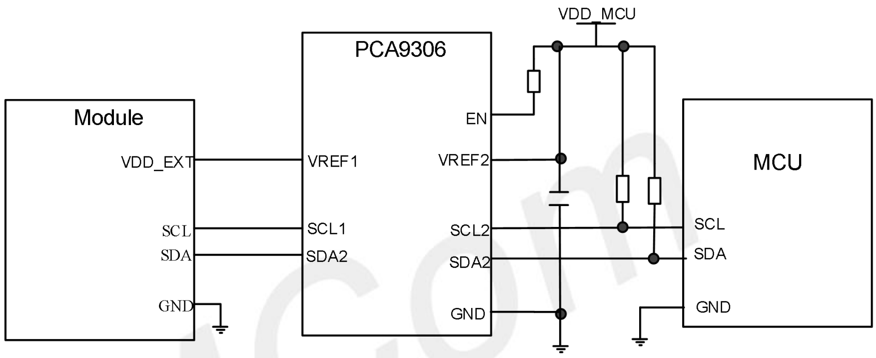

Figure 25: I2C reference circuit

NOTE

The voltage domain of the I2C interface of the A7670E and A7672X is 1.8V; when the SIM800 series module is compatible with the A7670E or A7672X module, a level conversion circuit needs to be added.

5.13 Bluetooth

A7670E does not support Bluetooth function.

SIM800 series and A7672 series (Optional) support Bluetooth function which can be operated by AT commands conveniently. For detail commands about Bluetooth please refer to related documents.

5.14 GNSS

A7672 series(Optional) support GNSS function,the PIN description as follow.

Table 10: A7672 GNSS interface

PIN name	NO.	I/O	Description	Note
GNSS_VBKP	116	PI	GNSS backup power input	Power supply range 1.4V~3.6V。
1V8_GNSS	97	PI	GNSS Vcore、VDDIO input	The supply voltage shall be 1.8V~1.9V, and routing width should more than 0.5mm.
GNSS_PWRCTL	98	DI	GNSS Vcore、VDDIO power enable control	Active high。 Solution 1：Use 10K resistor to Connect to GPIO，recommend use MK_IN_3(PIN20)。 Solution 2：Use 10K resistor to Connect to MCU GPIO。
GNSS_RXD	96	DI	GNSS UART RX	1.8V power domain。 Solution 1：Use 1K resistor to connect UART3_TXD （PIN50）of the module in series。 Solution2:Use 1K resistor to Connect to MCU UART_TX。
GPS_TXD	95	DO	GNSS UART TX	1.8V power domain。 Solution 1：Use 1K resistor to connect UART3_RXD （PIN49）of the module in series。 Solution2：Use 1K resistor to Connect to MCU UART_RX

1PPS	100	DO	GNSS pulse synchronous clock signal	If unused, keep it open.

GNSS recommended reference design solution 1:
A7672 module itself provides power, power enable and UART transmission to GNSS, the recommended reference design as follow:

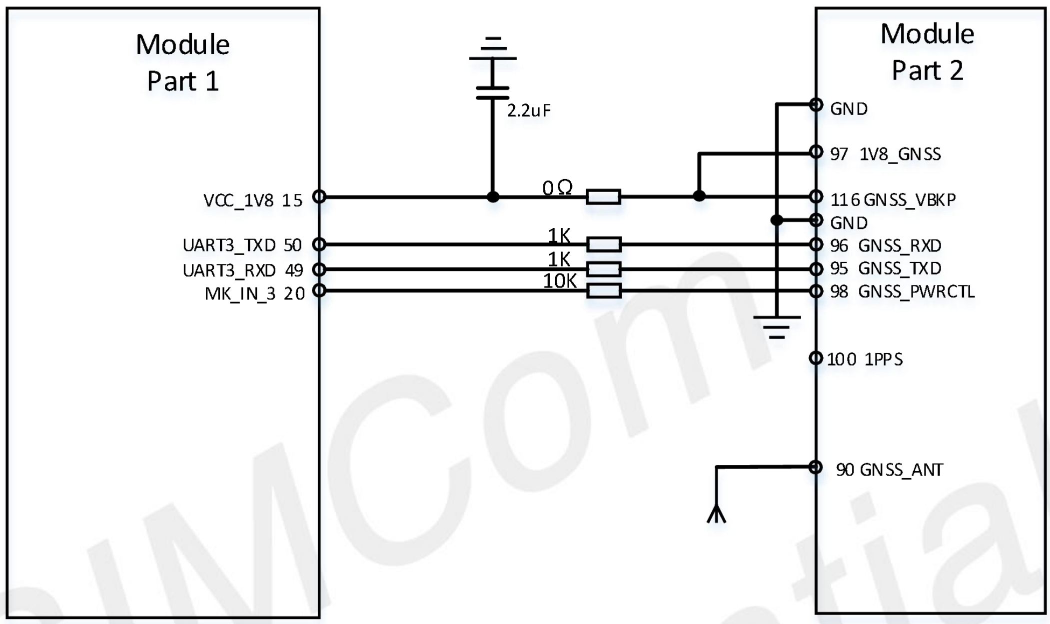

Figure 28: GNSS reference design（Non-standalone GNSS solution）

GNSS recommended reference design solution 2:
The external MCU provides power, power enable and UART transmission to GNSS, this solution is used for scenarios where GNSS can work standalone without the module powering up. The recommended reference design as follow:

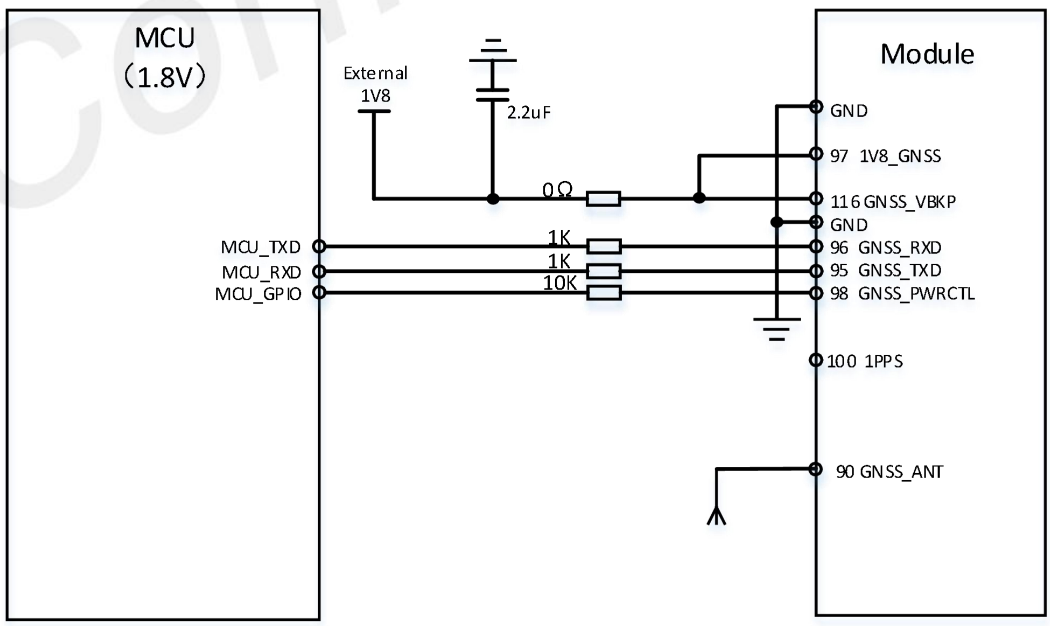

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Figure 29: GNSS reference design（standalone GNSS solution）

NOTE

1. Please series in 1K resistors for serial communication lines with non-standalone GNSS solution to prevent leakage current to the serial ports of GNSS chip.
2. The standalone GNSS reference design is only applicable to 1.8V power domain MCU. If the MCU is not 1.8V power domain, a level shift circuit should be added.
3. The Vcore power for GNSS 1V8_GNSS has higher requirements for power supply, PCB routing should as short as possible, and the routing width is required to be at least 0.5mm
4. The GNSS_VBKP backup power is a necessary condition for hardware hot boot to ensure that the GNSS hot boot performance reaches the optimal state. When the VDD_EXT of the GNSS module is used as the GNSS backup power, the module is shut down, resulting in a power failure of the VDD_EXT, and the hot boot performance cannot be guaranteed. If the customer needs to shut down the module and start the GNSS_VBKP hot at the same time, it is recommended to use an external power source to power GNSS_VBKP.
5. Make sure to connect a 10K resistor to the GNSS_PWRCTL pin in series and then to the external enable signal.