



SIM800F_SIM900_SIM5300E A_Migration to SIM7000 Application Note

LPWA Module

SIMCom Wireless Solutions Limited

Building B, SIM Technology Building, No.633, Jinzhong Road
Changning District, Shanghai P.R.China

Tel: 86-21-31575100

support@simcom.com

www.simcom.com

Document Title:	SIM800F_SIM900_SIM5300EA_Migration to SIM7000_Application Note
Version:	V1.01
Date:	2020-03-25
Status:	Released

GENERAL NOTES

SIMCOM OFFERS THIS INFORMATION AS A SERVICE TO ITS CUSTOMERS, TO SUPPORT APPLICATION AND ENGINEERING EFFORTS THAT USE THE PRODUCTS DESIGNED BY SIMCOM. THE INFORMATION PROVIDED IS BASED UPON REQUIREMENTS SPECIFICALLY PROVIDED TO SIMCOM BY THE CUSTOMERS. SIMCOM HAS NOT UNDERTAKEN ANY INDEPENDENT SEARCH FOR ADDITIONAL RELEVANT INFORMATION, INCLUDING ANY INFORMATION THAT MAY BE IN THE CUSTOMER'S POSSESSION. FURTHERMORE, SYSTEM VALIDATION OF THIS PRODUCT DESIGNED BY SIMCOM WITHIN A LARGER ELECTRONIC SYSTEM REMAINS THE RESPONSIBILITY OF THE CUSTOMER OR THE CUSTOMER'S SYSTEM INTEGRATOR. ALL SPECIFICATIONS SUPPLIED HEREIN ARE SUBJECT TO CHANGE.

COPYRIGHT

THIS DOCUMENT CONTAINS PROPRIETARY TECHNICAL INFORMATION WHICH IS THE PROPERTY OF SIMCOM WIRELESS SOLUTIONS LIMITED. COPYING, TO OTHERS AND USING THIS DOCUMENT, ARE FORBIDDEN WITHOUT EXPRESS AUTHORITY BY SIMCOM. OFFENDERS ARE LIABLE TO THE PAYMENT OF INDEMNIFICATIONS. ALL RIGHTS RESERVED BY SIMCOM IN THE PROPRIETARY TECHNICAL INFORMATION, INCLUDING BUT NOT LIMITED TO REGISTRATION GRANTING OF A PATENT, A UTILITY MODEL OR DESIGN. ALL SPECIFICATION SUPPLIED HEREIN ARE SUBJECT TO CHANGE WITHOUT NOTICE AT ANY TIME.

SIMCom Wireless Solutions Limited

Building B, SIM Technology Building, No.633 Jinzhong Road, Changning District, Shanghai P.R.China
Tel: +86 21 31575100
Email: simcom@simcom.com

For more information, please visit:

<https://www.simcom.com/download/list-863-en.html>

For technical support, or to report documentation errors, please visit:

<https://www.simcom.com/ask/> or email to: support@simcom.com

Copyright © 2020 SIMCom Wireless Solutions Limited All Rights Reserved.

Version History

Date	Version	Description of change	Author
2017-7-31	V1.00	Original	Tu Hong jun
2020-3-25	V1.01	Update documents format	Wang Qing Ling

SIMCom
Confidential

Contents

Table Index	5
Figure Index.....	6
1 Introduction.....	7
1.1 Pin Assignment Overview	7
1.2 Differences of Pin Assignment Overview	9
1.3 Differences of electronic characteristic.....	10
2 Recommended Footprint	12
2.1 Differences of top and bottom view.....	12
2.2 Differences of recommended compatible footprint.....	13
3 Hardware Reference Design	16
3.1 Power Supply.....	16
3.2 USB Interface.....	17
3.3 Network Status Indication	18
3.4 Power on/off circuit	19
3.5 Reset circuit	19
3.6 USIM Interface	20
3.7 UART Interface	21
3.8 Audio Interface.....	22
3.9 2G/3G/4G RF Interface.....	23
3.10 GNSS Application Guide.....	24
3.11 Dedicated Pins.....	24
4 Appendix	25
4.1 Related documents	25
4.2 Terms and Abbreviation	25
4.3 Safety Caution	27

Table Index

Table 1: The Differences Pin Assignment	9
Table 2: The Differences of electronic characteristic.....	10
Table 3: The differences for VBAT power rang	16
Table 4: The differences for VBUS power rang.....	18
Table 5: The differences for UART power level.....	21
Table 6: Dedicated Pins Description for module	24
Table 7: Related documents	25
Table 8: Terms and Abbreviations	25
Table 9: Safety Caution.....	27

SIMCom
Confidential

Figure Index

Figure 1: Pin assignment overview	7
Figure 2: SIM800F pin out diagram (Top view)	8
Figure 3: SIM900 pin out diagram (Top view)	8
Figure 4: SIM5300EA pin out diagram (Top view)	9
Figure 5: Top and bottom view of SIM7000.....	12
Figure 6: SIM800F Top and bottom view	12
Figure 7: SIM900 Top, bottom and side view	13
Figure 8: SIM5300EA Top and bottom view	13
Figure 9: SIM7000 Footprint recommendation (Unit: mm)	14
Figure 10: SIM800F Recommended PCB footprint outline (Unit: mm)	14
Figure 11: SIM900 Recommended PCB footprint outline (Unit: mm)	15
Figure 12: SIM5300EA Recommended PCB footprint outline (Unit: mm)	15
Figure 13: Power supply reference circuit.....	16
Figure 14: Reference circuit of the LDO power supply	17
Figure 15: USB reference circuit.....	17
Figure 16: NETLIGHT/STATUS reference circuit	18
Figure 17: Power on/off reference circuit	19
Figure 18: Reset reference circuit.....	20
Figure 19: SIM interface reference circuit	20
Figure 20: Reference circuit of level shift.....	21
Figure 21 : Speaker reference circuit.....	22
Figure 22 : Microphone reference circuit.....	22
Figure 23: Audio codec reference circuit.....	23
Figure 24: Antenna matching circuit (MAIN_ANT)	23
Figure 25: Active antenna circuit.....	24
Figure 26: Passive antenna circuit (Default)	24

1 Introduction

This document is targeted for customers to understand the differences between SIM7000 and SIM800F/SIM900/SIM5300EA. Users can use SIM7000, SIM800F, SIM900, and SIM5300EA module to design and develop applications quickly.

1.1 Pin Assignment Overview

The following table shows the pin assignment of SIM7000 and SIM800F/SIM900/SIM5300EA.

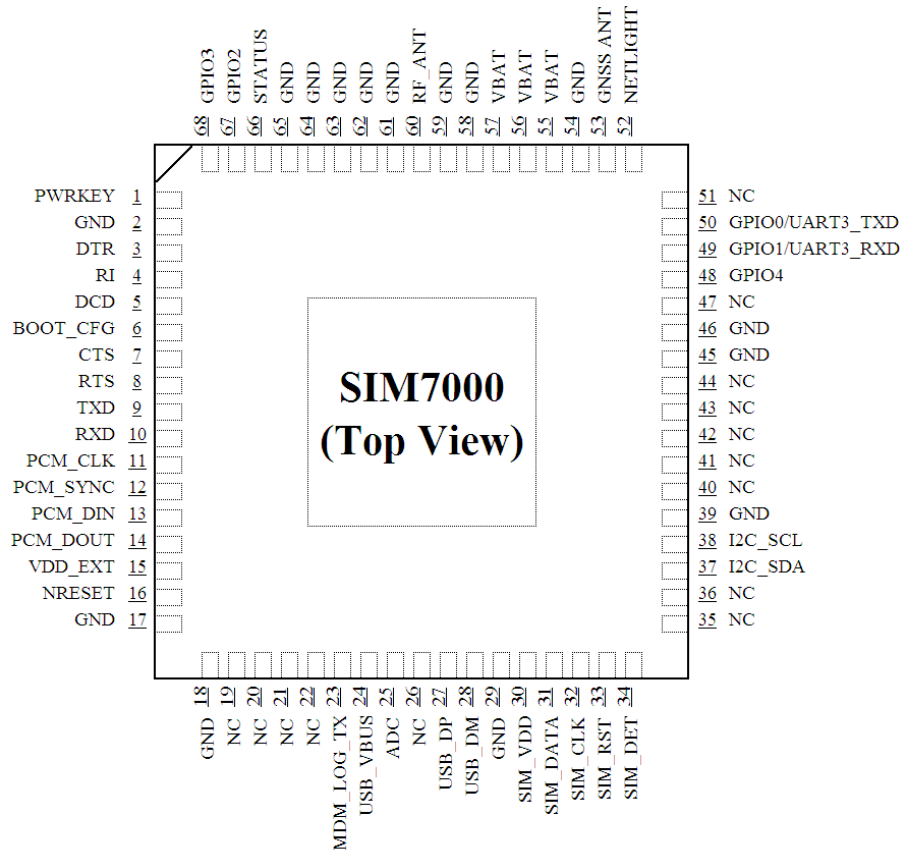


Figure 1: Pin assignment overview

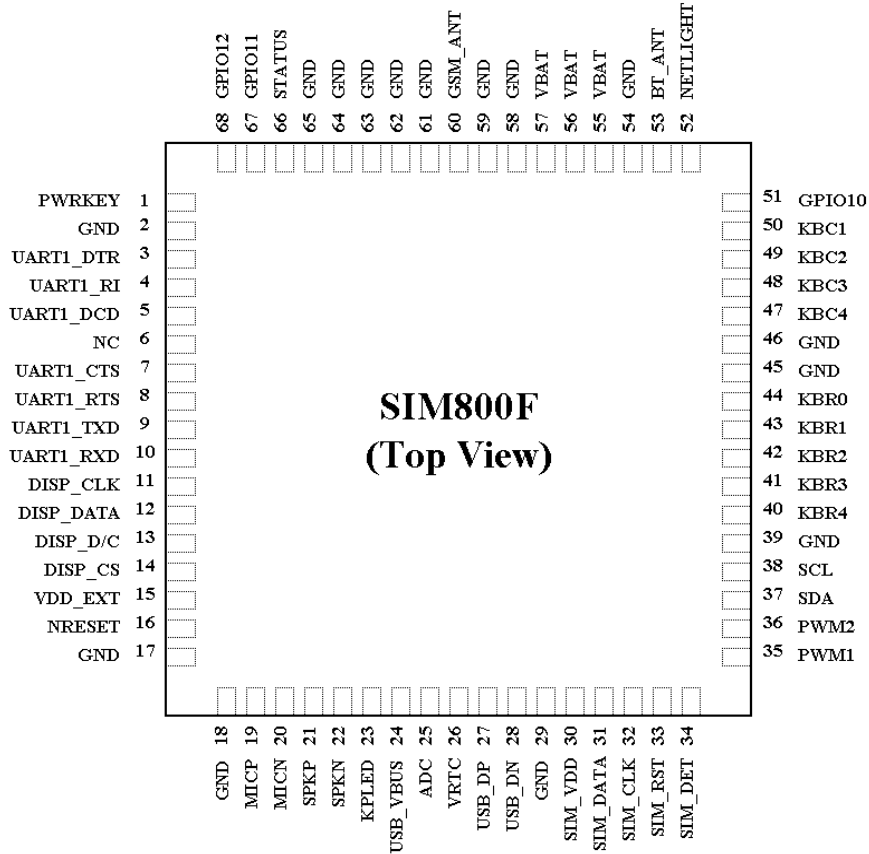


Figure 2: SIM800F pin out diagram (Top view)

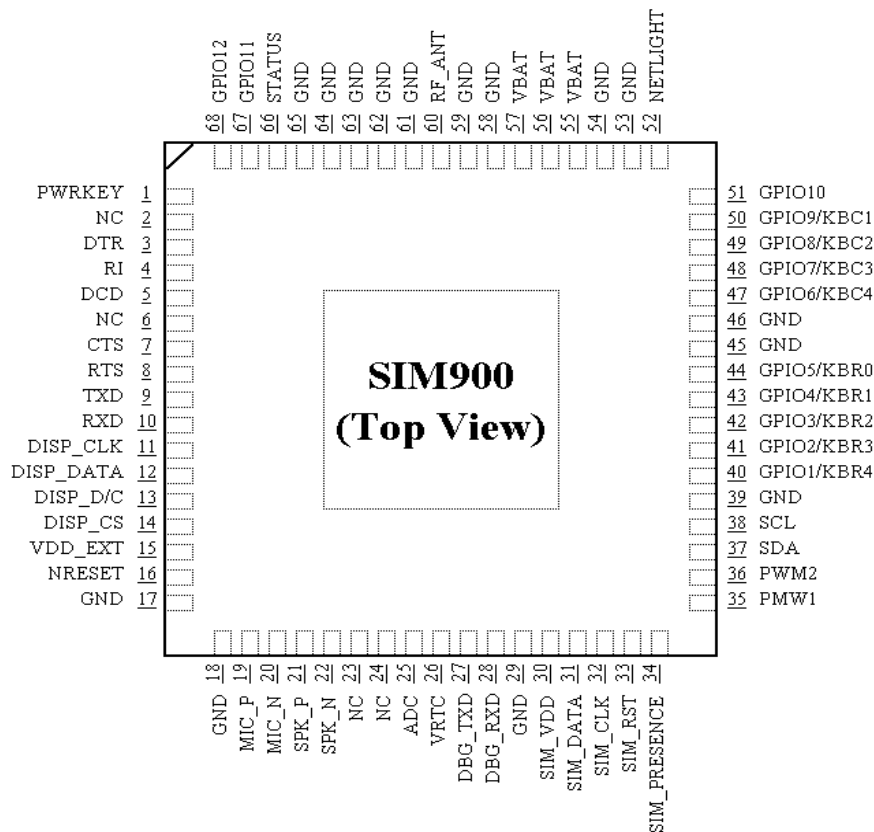


Figure 3: SIM900 pin out diagram (Top view)

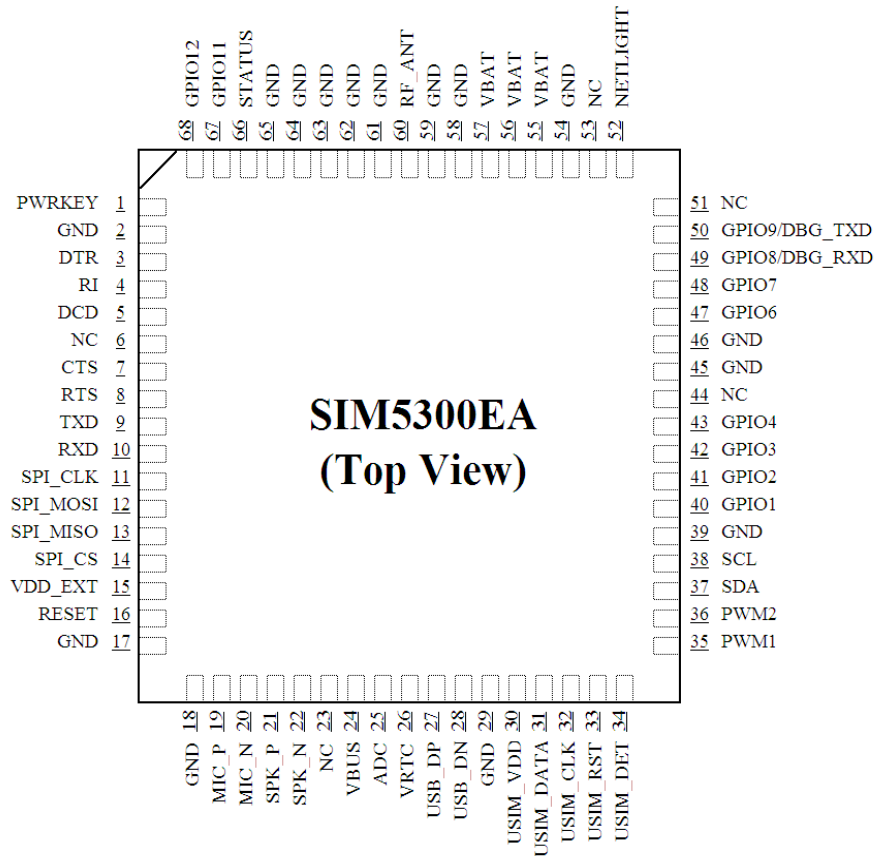


Figure 4: SIM5300EA pin out diagram (Top view)

1.2 Differences of Pin Assignment Overview

Table 1: The Differences Pin Assignment

Pin #	SIM900	SIM800F	SIM5300EA	SIM7000
2	NC	GND	GND	GND
6	NC	NC	NC	BOOT_CFG
11	DISP_CLK	DISP_CLK	SPI_CLK	PCM_CLK
12	DISP_DATA	DISP_DATA	SPI_MOSI	PCM_SYNC
13	DISP_D/C	DISP_D/C	SPI_MISO	PCM_DIN
14	DISP_CS	DISP_CS	SPI_CS	PCM_DOUT
19	MIC_P	MICP	MIC_P	NC
20	MIC_N	MICN	MIC_N	NC
21	SPK_P	SPKP	SPK_P	NC
22	SPK_N	SPKN	SPK_N	NC
23	NC	KPLED	NC	MDM_LOG_TX
24	NC	VBUS	VBUS	VBUS

26	VRTC	VRTC	VRTC	NC
27	DBG_TXD	USB_DP	USB_DP	USB_DP
28	DBG_RXD	USB_DM	USB_DM	USB_DM
35	PWM1	PWM1	PWM1	NC
36	PWM2	PWM2	PWM2	NC
40	GPIO1/KBR4	KBR4	GPIO1	NC
41	GPIO2/KBR3	KBR3	GPIO2	NC
42	GPIO3/KBR2	KBR2	GPIO3	NC
43	GPIO4/KBR1	KBR1	GPIO4	NC
44	GPIO5/KBR0	KBR0	NC	NC
47	GPIO6/KBC4	KBC4	GPIO6	NC
48	GPIO7/KBC3	KBC3	GPIO7	GPIO4
49	GPIO8/KBC2	KBC2	GPIO8/DBG_RXD	GPIO1/UART3_RXD
50	GPIO9/KBC1	KBC1	GPIO9/DBG_TXD	GPIO0/UART3_TXD
51	GPIO10	GPIO10	NC	NC
53	GND	BT_ANT	NC	GNSS_ANT
67	GPIO11	GPIO11	GPIO11	GPIO2
68	GPIO12	GPIO12	GPIO12	GPIO3

1.3 Differences of electronic characteristic

Table 2: The Differences of electronic characteristic

Difference	SIM900	SIM800F	SIM5300EA	SIM7000
Technology	GSM/GPRS	GSM/GPRS	GSM/GPRS/EDGE/ WCDMA/HSPA+	GSM/GPRS/EDGE/eM TC (Cat-M1)/Cat-NB1
VBAT	3.2~4.8V	3.4~4.4V	3.4~4.4V	3.0~4.3V
VBUS	Not support	4.3~7V	4.5~5.25V	3.5~5.25V
VDD_EXT	2.8V/10mA	2.8V/10mA	1.8V/50mA	1.8V/50mA
I/O Level	2.8V	2.8V	1.8V	1.8V
ADC	0~2.8V	0~2.8V	0~1.1V	0.1~1.7V
VRTC	2.0~3.15V	2.0~3.15V	1.2~1.8V	Not support
PCM	Not support	Option	Not support	Support
SPI	Support	Support	Support	Option
GNSS	Not support	Not support	Not support	Support
BT	Not support	Option	Not support	Not support
AT communication interface	UART	UART	UART or USB	UART or USB

**FW update
interface**

UART

UART or USB

USB

USB

NOTE

For details information, please refer to each HD guide

SIMCom
Confidential

2 Recommended Footprint

2.1 Differences of top and bottom view

The following figure shows top and bottom view of SIM7000 and SIM800F/SIM900/SIM5300EA.



Figure 5: Top and bottom view of SIM7000



Figure 6: SIM800F Top and bottom view



Figure 7: SIM900 Top, bottom and side view



Figure 8: SIM5300EA Top and bottom view

2.2 Differences of recommended compatible footprint

The following figure shows each recommended footprint of SIM7000 and SIM800F/SIM900/SIM5300EA. The differences of the recommended footprint are the keep out area and the length of the PINs. In SIM800F/SIM900, the recommendation PIN length is 1.60mm, but it is 2.00mm in SIM7000/SIM5300EA.

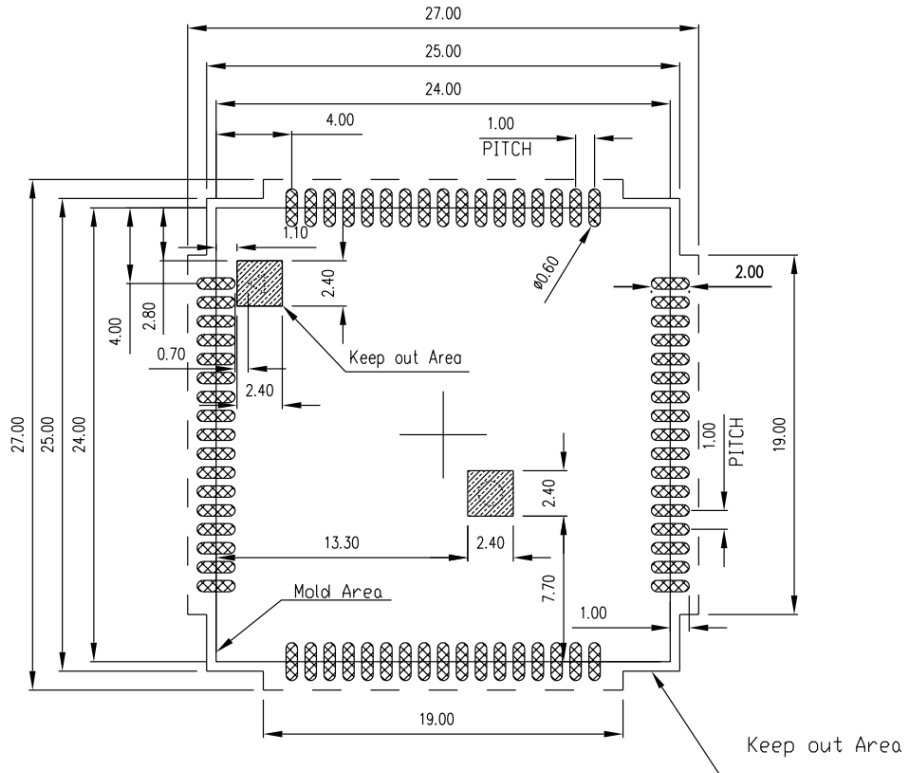


Figure 9: SIM7000 Footprint recommendation (Unit: mm)

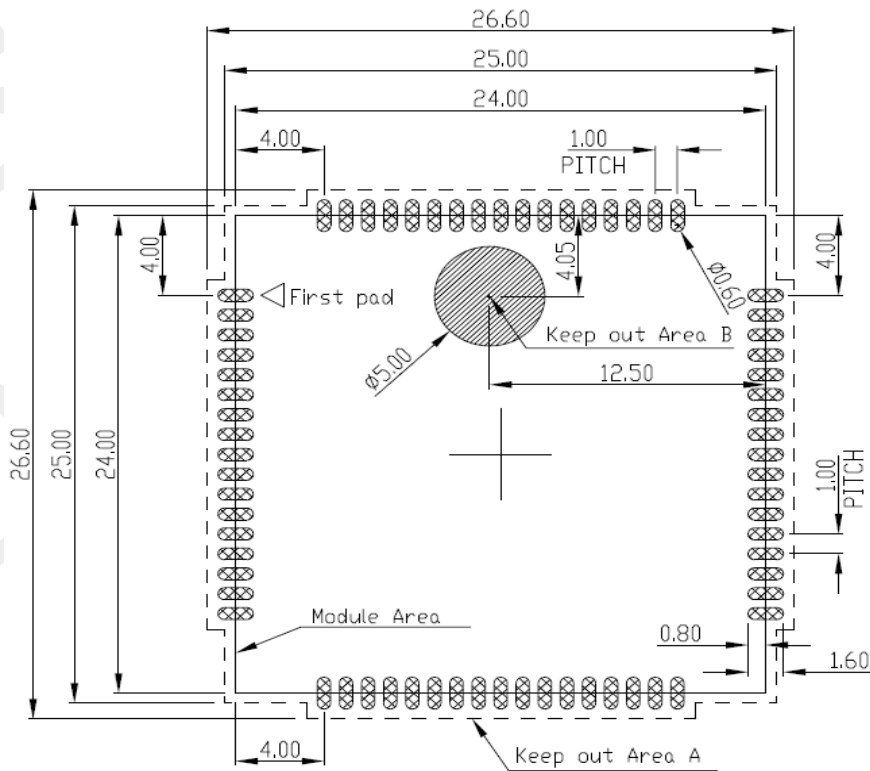


Figure 10: SIM800F Recommended PCB footprint outline (Unit: mm)

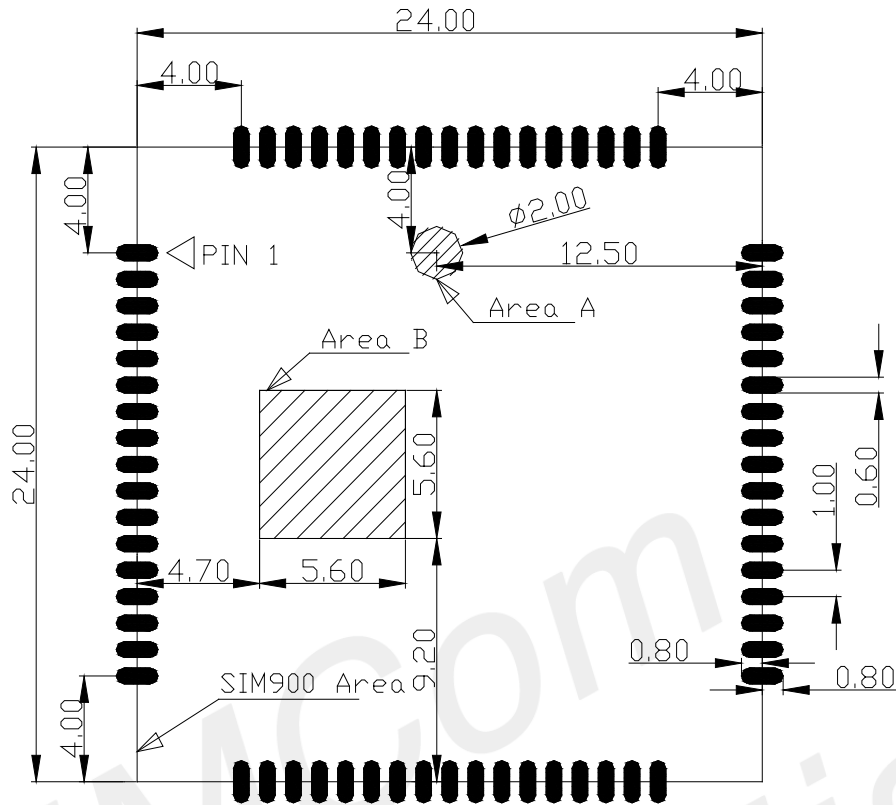


Figure 11: SIM900 Recommended PCB footprint outline (Unit: mm)

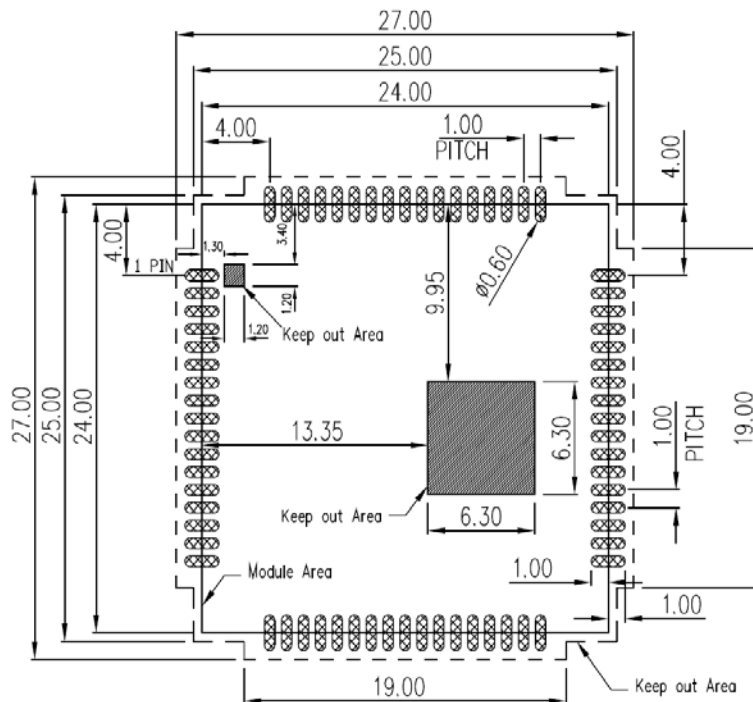


Figure 12: SIM5300EA Recommended PCB footprint outline (Unit: mm)

3 Hardware Reference Design

The following chapters describe compatible design of SIM7000 and SIM800F/SIM900/SIM5300EA on main functionalities.

3.1 Power Supply

The power supply pins of SIM7000 and SIM800F/SIM900/SIM5300EA include three VBAT pins (pin 55, 56&57). VBAT directly supplies the power to RF circuit and baseband circuit. All three VBAT pins of the module must be used together. The following figure is the reference design of the module VBAT power supply.

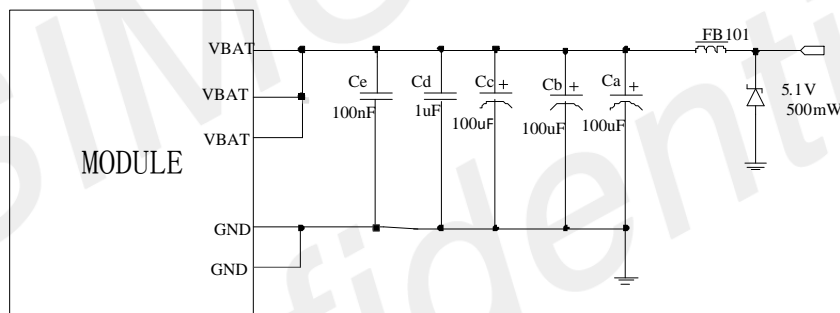


Figure 13: Power supply reference circuit

In addition, in order to get a stable power source, it is suggested to use a zener diode of which reverse zener voltage is 5.1V and dissipation power is more than 500mW.

The VBAT has different input power range for SIM7000 and SIM800F/SIM900/SIM5300EA. Please refer to the following table.

Table 3: The differences for VBAT power rang

Project	VBAT		
	Min	Typ	Max
SIM900	3.2V	3.8V	4.8V
SIM800F	3.4V	3.8V	4.4V
SIM5300EA	3.4V	3.8V	4.4V
SIM7000	3.0V	3.8V	4.3V,

NOTE

AT For details information, please refer to each HD guide

The following figure is the reference design of +5V input power supply. The designed output for the power supply is 3.8V. A linear regulator can be used.

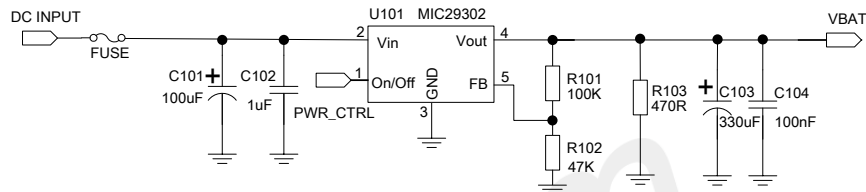


Figure 14: Reference circuit of the LDO power supply

3.2 USB Interface

The modules SIM7000 and SIM800F/ SIM5300EA provide a USB2.0 interface, but SIM900 has no USB interface.

USB device. The following circuit is the reference design of USB interface.

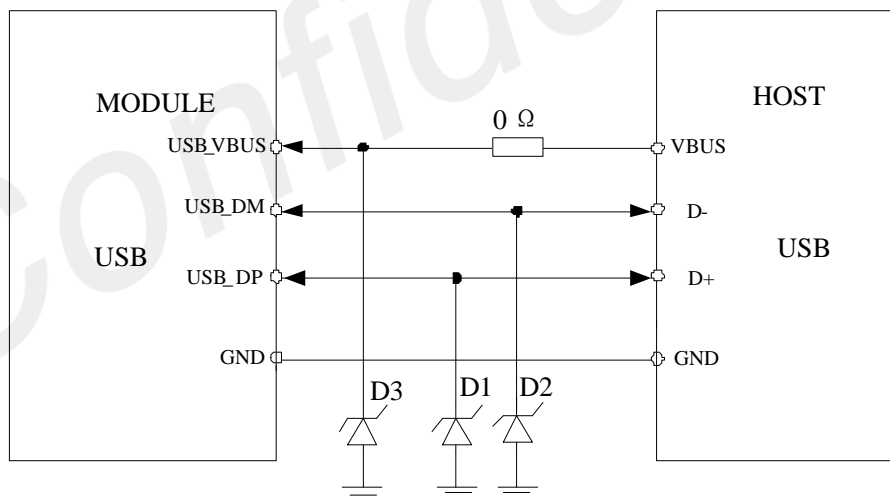


Figure 15: USB reference circuit

Because of the high speed on USB bus, more attention should be paid to the influence of the junction capacitance of the ESD component on USB data lines. Typically, the capacitance of the D1 and D2 should be less than 1pF.

The VBUS has different input power range for SIM7000 and SIM800F/SIM900/SIM5300EA. Please refer to the following table.

Table 4: The differences for VBUS power rang

Project	VBUS		
	Min	Typ	Max
SIM900	Not support	Not support	Not support
SIM800F	4.3V	5.0V	7.0V
SIM5300EA	4.5V	5.0V	5.25V
SIM7000	3.5V	5.0V	5.25V

NOTE

For details information, please refer to each HD guide

3.3 Network Status Indication

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

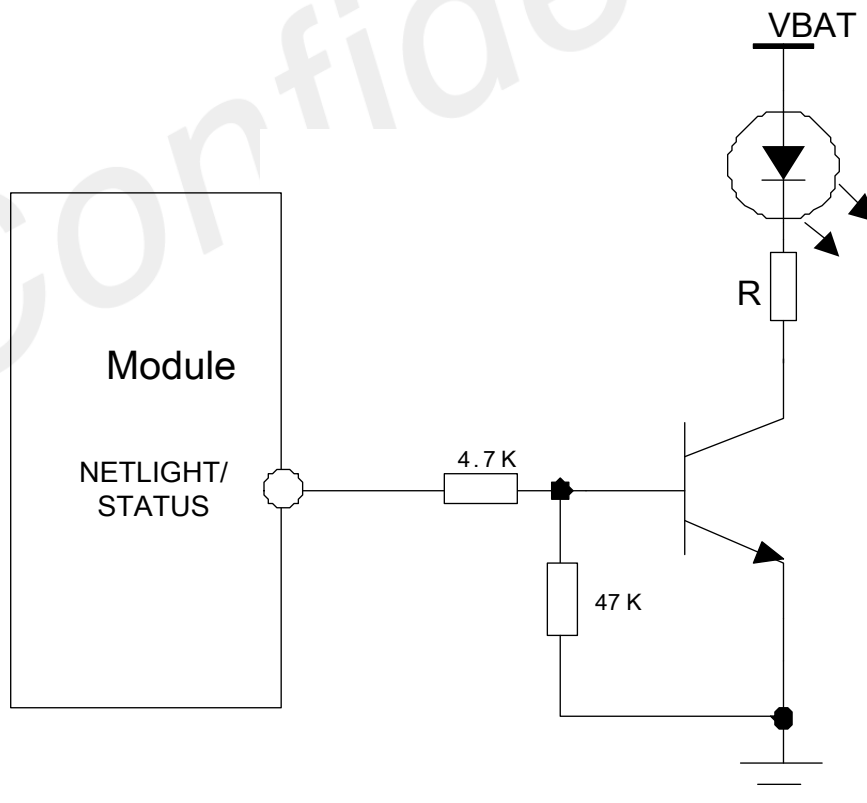


Figure 16: NETLIGHT/STATUS reference circuit

3.4 Power on/off circuit

Each module PWRKEY pin has its different power [level](#) when it is floating.

The following circuit is a reference design for SIM7000 and SIM800F/SIM900/SIM5300EA power-on/off circuit.

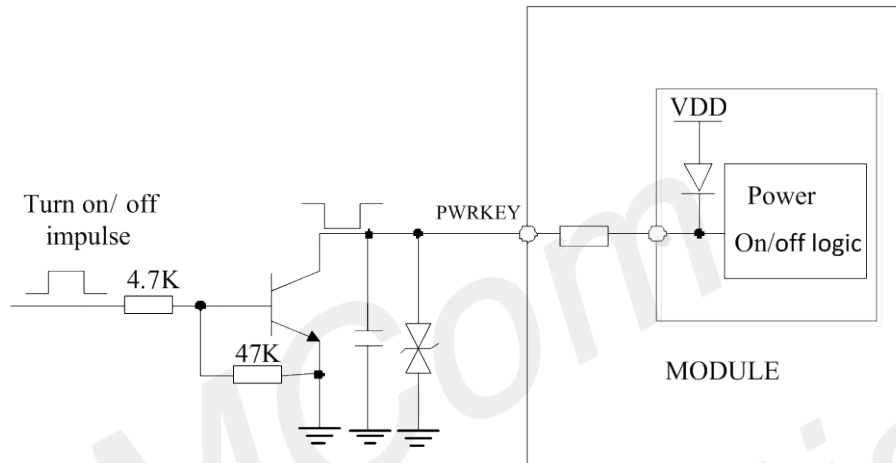


Figure 17: Power on/off reference circuit

NOTE

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

3.5 Reset circuit

Each module RESET pin has its different power level when it is floating.

The RESET pin has been pulled up to VDD with a resistor internally. So it does not need to be pulled up externally. It is strongly recommended to put a 100nF capacitor and an ESD protection diode close to the RESET pin. Please refer to the following figure for the recommended reference circuit.

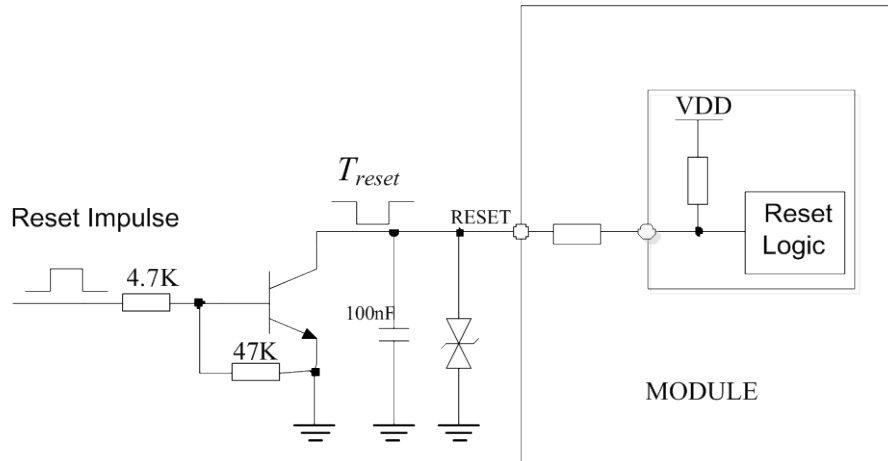


Figure 18: Reset reference circuit

NOTE

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

3.6 USIM Interface

The USIM provides the required subscription verification information to allow the mobile equipment to attach to a GSM or UMTS network. Both 1.8V and 3.0V SIM Cards are supported.

It is recommended to use an ESD protection component such as ST (www.st.com) ESDA6V1W5. The following circuit is a reference design for SIM7000 and SIM800F/SIM900/SIM5300EA USIM circuit.

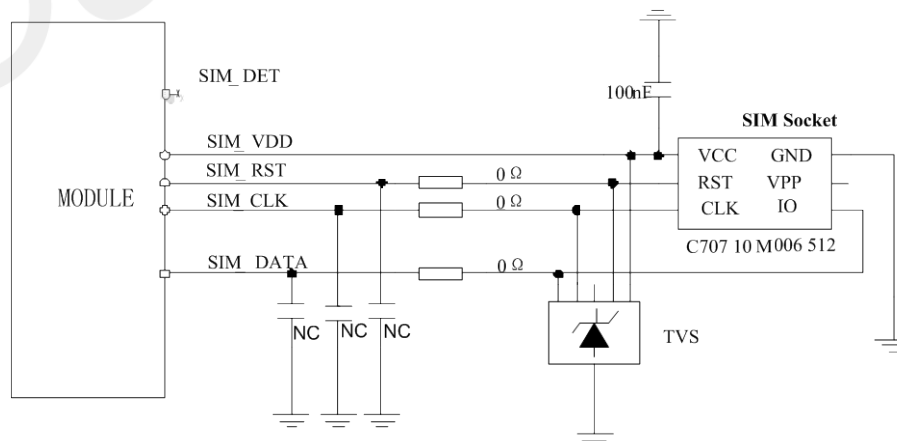


Figure 19: SIM interface reference circuit

NOTE

For details information, please refer to each HD guide

3.7 UART Interface

The power domain of each UART between SIM800F/SIM900/SIM5300EA and SIM7000 are different.

Table 5: The differences for UART power level

PROJECT	UART power domain
SIM900	2.8V
SIM800F	2.8V
SIM5300EA	1.8V
SIM7000	1.8V

NOTE

For details information, please refer to each HD guide

A level shifter should be used if user's application is equipped with a 3.3V UART interface. The level shifter TXB0108RGYR provided by Texas Instruments is recommended. The reference design of the TXB0108RGYR is in the following figures

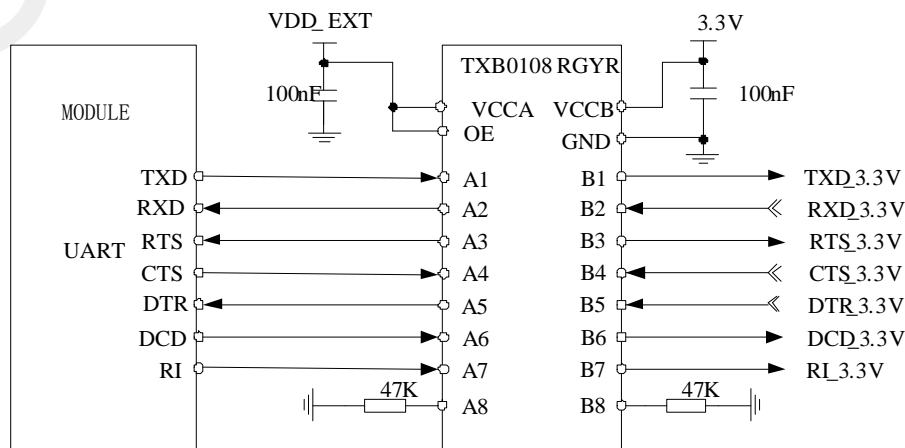


Figure 20: Reference circuit of level shift

NOTE

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

3.8 Audio Interface

SIM800F/SIM900/SIM5300EA provides an analog interface for audio circuit. The following circuit is the reference design.

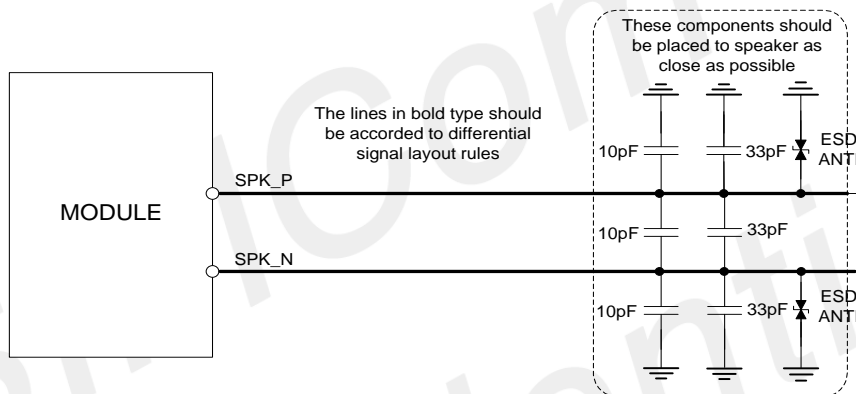


Figure 21 : Speaker reference circuit

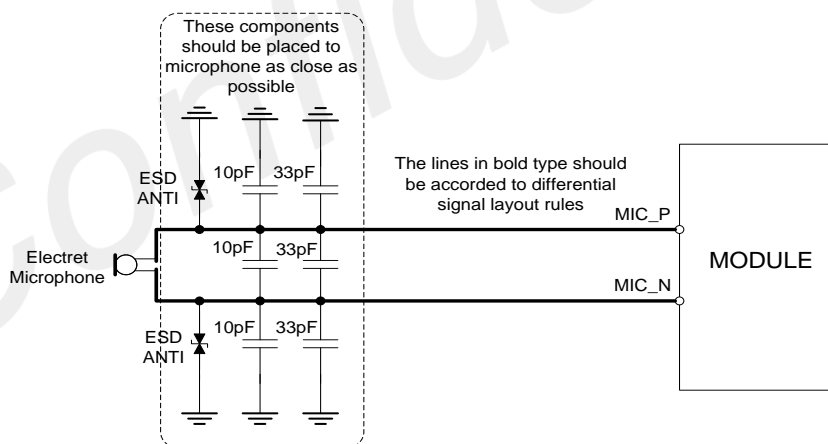


Figure 22 : Microphone reference circuit

SIM7000 provides a [digital](#) interface for audio circuit. And the [digital](#) audio interface is PCM interface, which is provided for external codec.

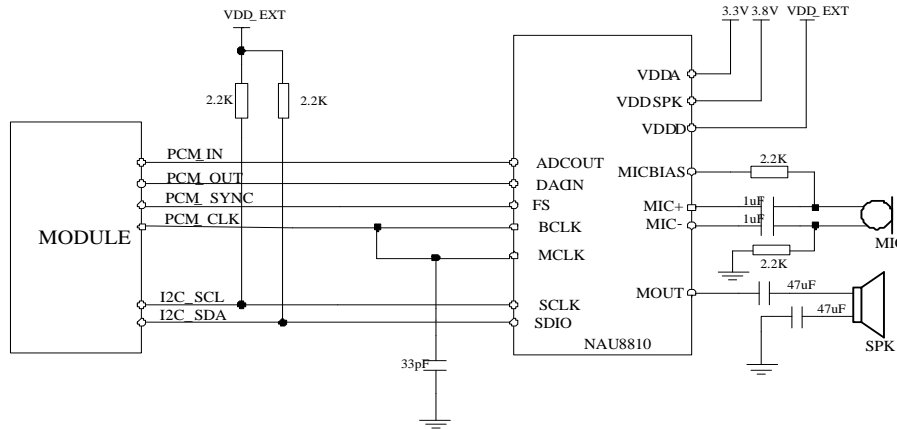


Figure 23: Audio codec reference circuit

NOTE

For details information, please refer to each HD guide.

3.9 2G/3G/4G RF Interface

SIM900 and SIM5300EA provide a main antenna interfaces. SIM7000 and SIM800F provide dual antenna interfaces.

Customer's antennas should be located in the host board and connected to module's antenna pad through micro-strip line or other types of RF trace and the trace impedance must be controlled by 50Ω.

The following circuit is a reference design for SIM800F/SIM900/SIM5300EA and SIM7000 RF antenna circuit.

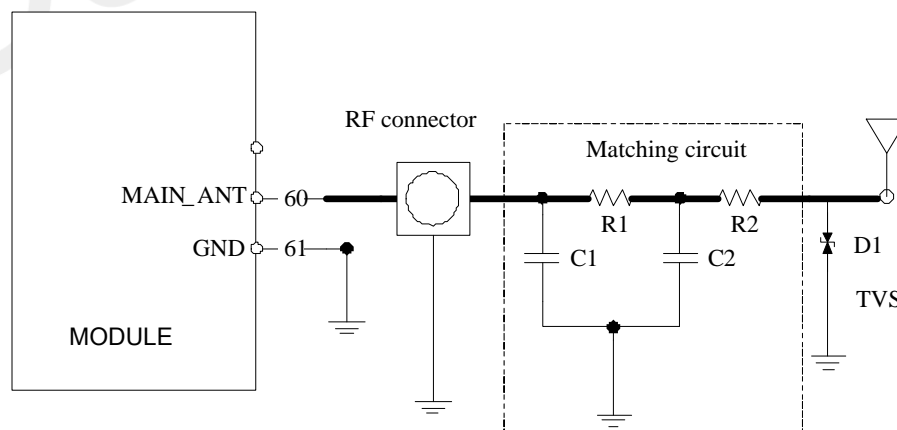


Figure 24: Antenna matching circuit (MAIN_ANT)

3.10 GNSS Application Guide

Users can adopt an active antenna or a passive antenna to SIM7000. If using a passive antenna, an external LNA is a must to get better performance. The following figures are the reference circuits.

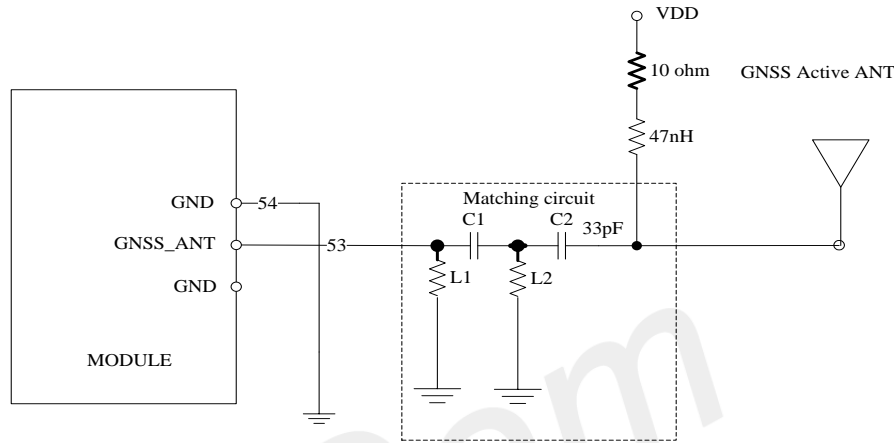


Figure 25: Active antenna circuit

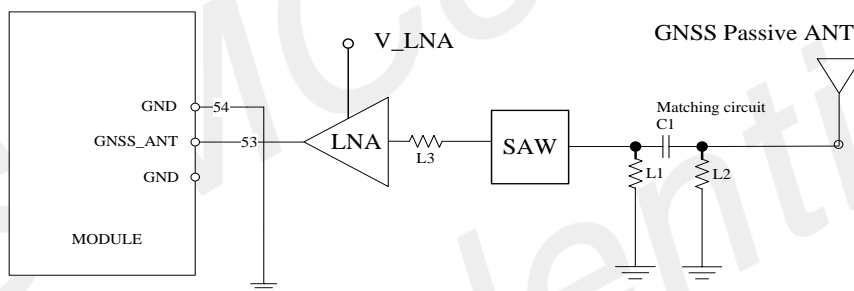


Figure 26: Passive antenna circuit (Default)

3.11 Dedicated Pins

There are some dedicated pins for SIM800F and SIM7000.

Table 6: Dedicated Pins Description for module

SIM800F		
Pin name	Pin No.	Function
KPLED	23	Sink current for keypad LED
KBC1	50	Keypad column 1. It can't be pulled down during power on procedure
SIM7000		
Pin name	Pin No.	Function
BOOT_CFG	6	Boot configuration input. Module will be forced into USB download mode by connect this pin to VDD_EXT during power up.
MDM_LOG_TX	23	Module log output for SW debug. (only used for platform)

4 Appendix

4.1 Related documents

Table 7: Related documents

SN	Document name	Remark
[1]	SIM7000_Hardware_Design	SIM7000 Hardware Design Document
[2]	SIM800F Hardware Design	SIM800F Hardware Design Document
[3]	SIM900 Hardware Design	SIM900 Hardware Design Document
[4]	SIM5300EA Hardware Design	SIM5300EA Hardware Design Document

4.2 Terms and Abbreviation

Table 8: Terms and Abbreviations







Abbreviation	Description
KPLED	Sink current for keypad LED
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
SPI	serial peripheral interface
UART	Universal Asynchronous Receiver & Transmitter
VSWR	Voltage Standing Wave Ratio
NC	Not connect
EDGE	Enhanced data rates for GSM evolution
HSDPA	High Speed Downlink Packet Access HSUPA
HSDPA	High Speed Downlink Packet Access HSUPA
HSDPA	High Speed Downlink Packet Access HSUPA

USIM	Universal subscriber identity module
UMTS	Universal mobile telecommunications system
SMPS	Switch Mode Power Supply
KBC	Keypad Button Column KBR
KBR	Keypad Button Row

SIMCom
Confidential

4.3 Safety Caution

Table 9: Safety Caution

Marks	Requirements
	<p>When in a hospital or other health care facility, observe the restrictions about the use of mobiles. Switch the cellular terminal or mobile off, medical equipment may be sensitive and not operate normally due to RF energy interference.</p>
	<p>Switch off the cellular terminal or mobile before boarding an aircraft. Make sure it is switched off. The operation of wireless appliances in an aircraft is forbidden to prevent interference with communication systems. Forgetting to think much of these instructions may impact the flight safety, or offend local legal action, or both.</p>
	<p>Do not operate the cellular terminal or mobile in the presence of flammable gases or fumes. Switch off the cellular terminal when you are near petrol stations, fuel depots, chemical plants or where blasting operations are in progress. Operation of any electrical equipment in potentially explosive atmospheres can constitute a safety hazard.</p>
	<p>Your cellular terminal or mobile receives and transmits radio frequency energy while switched on. RF interference can occur if it is used close to TV sets, radios, computers or other electric equipment.</p>
	<p>Road safety comes first! Do not use a hand-held cellular terminal or mobile when driving a vehicle, unless it is securely mounted in a holder for hands free operation. Before making a call with a hand-held terminal or mobile, park the vehicle.</p>
	<p>GSM cellular terminals or mobiles operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, especially with a mobile fee or an invalid SIM card. While you are in this condition and need emergent help, please remember to use emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength. Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call. Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.</p>