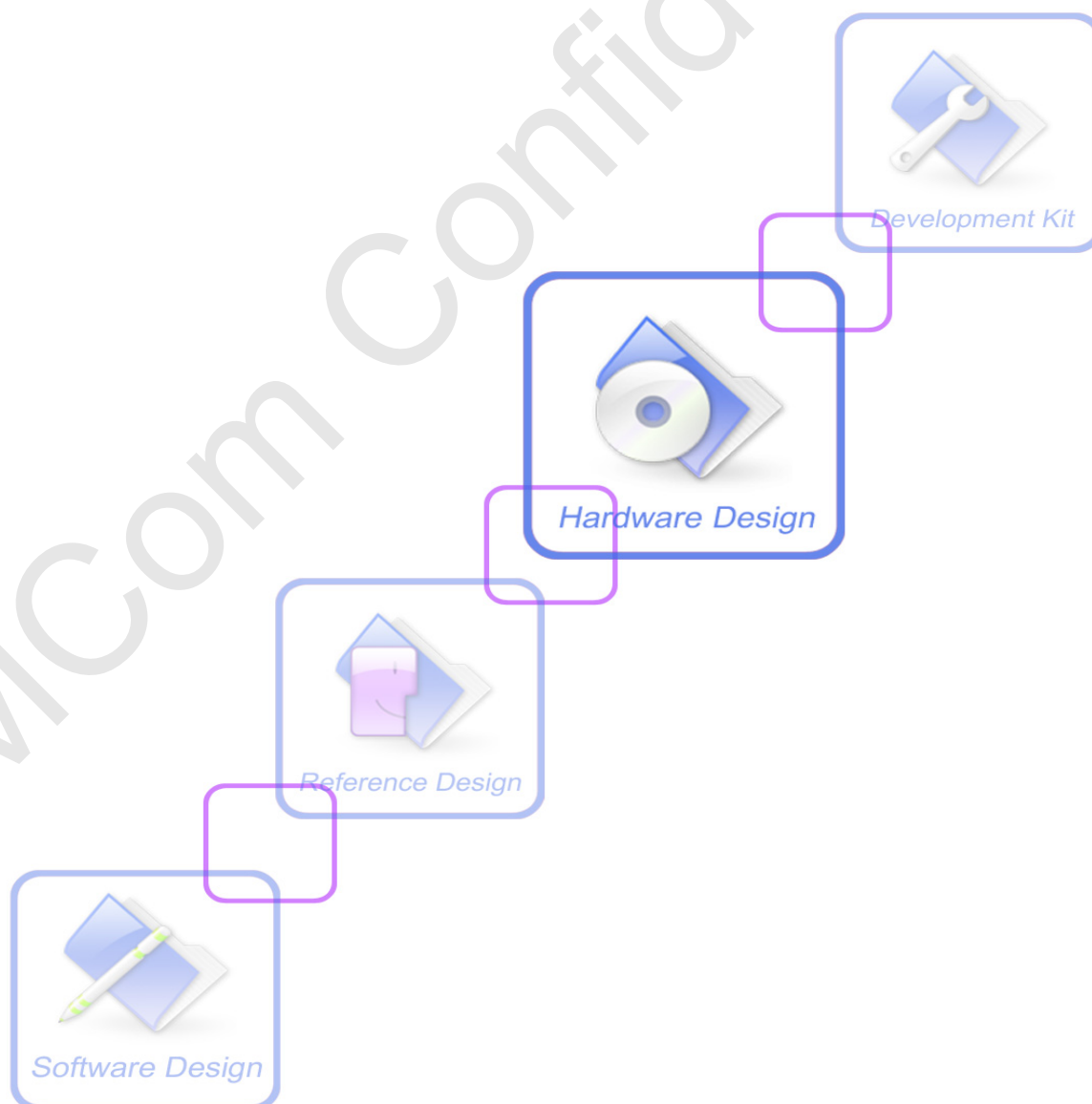




a SUTSEA AUT company

## SIM7070 Series&SIM7000\_Compatible\_Design\_V1.00



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## Revision History

Data	Version	Description of change	Author
2019-8-22	1.00	Original	Zhao sen

## 1 Introduction

This document is targeted for customers to understand the differences between SIM7070 and SIM7000. Users can use SIM7070 or SIM7000 module to design and develop applications quickly.

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## 2 Pin assignment

### 2.1 Pin Assignment Overview

The following table shows the pin assignment of SIM7070 and SIM7000.

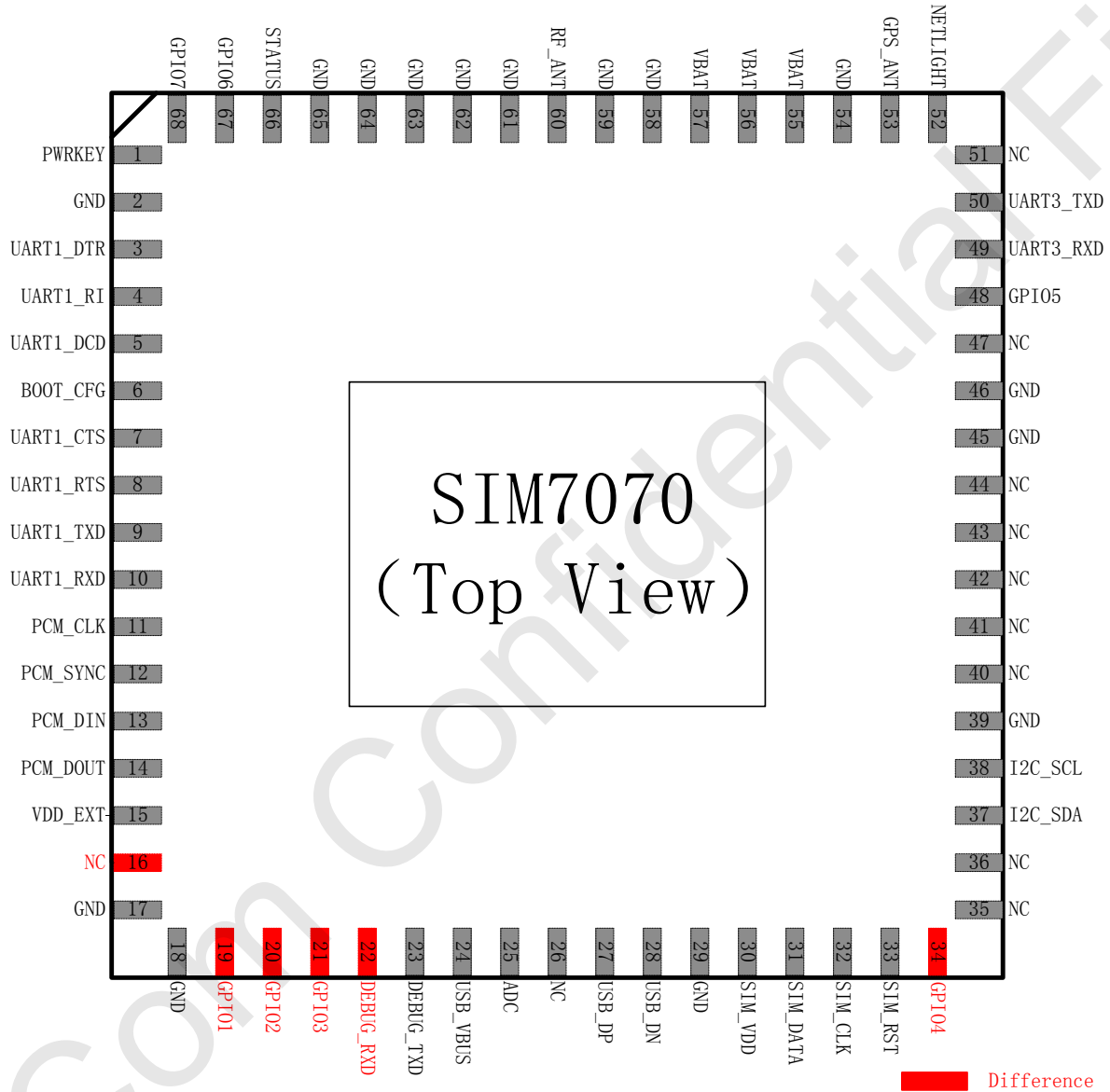


Figure 1: SIM7070 and SIM7000 pin assignment (Top view)



## 2.2 Differences Overview

**Table 1:** The Differences overview

Functions	SIM7000	SIM7070
*PIN Number	68	68
Cellular technology	GSM/GPRS/CAT M/CAT NB1	GSM/GPRS/CAT M1/CAT NB2
GNSS	Support	Support
Audio	Support	Support
PCM	Support	Support
SPI	Not support	Support
I2C	Support	Support
ADC	Support	Support
SIM Card	Support	Support
Download interface	USB	USB
Debug interface	UART2 and USB	DEBUG_UART and USB
IO Power Domain	1.8V	1.8V

## 2.3 Differences of Electronic Characteristic

**Table 2:** Difference in Pin Definitions

Pin #	SIM7000	SIM7070
16	RESET	NC
19	NC	GPIO1
20	NC	GPIO2
21	NC	GPIO3
22	NC	DEBUG_RXD
34	SIM_DET	GPIO4

*\*Note: For details information, please refer to each HD guide*

**Table 3:** The Differences of electronic characteristic

Pin #	SIM7000		SIM7070		
	PIN name	Voltage range	PIN name	Voltage range	
55,56,57	VBAT	3.0-4.3V	VBAT	SIM7070G	3.0~4.6V
				SIM7070E	3.2~4.2V
38	ADC	0~1.8V	ADC	0~1.875V	
39	PWRKEY	0.8V	PWRKEY	1.5V	
16	RESET	1.8V	NC	-	
19	NC	-	GPIO1	1.8V	
20	NC	-	GPIO2	1.8V	
21	NC	-	GPIO3	1.8V	
22	NC	-	DEBUG_RXD	1.8V	
34	SIM_DET	1.8V	GPIO4	1.8V	

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### 3 Recommended Footprint

#### 3.1 Top and Bottom View

SIM7070 Series are fully compatible with SIM7000's pin packages.

The following figures show top and bottom view of SIM7070 and SIM7000.



Figure 2: SIM7070 and SIM7000 top and bottom view



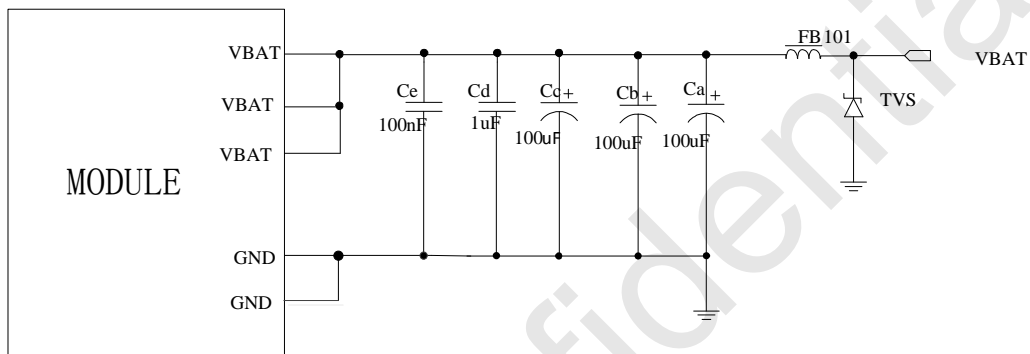


## 4 Hardware Reference Design

This chapter introduces compatible design between SIM7070 and SIM7000 on main functionalities.

### 4.1 Power Supply

The power supply pins of SIM7070 and SIM7000 include three VBAT pins (pin 55, pin 56, pin 57). VBAT pins directly supply the power to RF circuit and baseband circuit. VBAT pins of the module must be used together. The following figure is the reference design of the module VBAT power supply.



**Figure 5:** Power supply reference circuit

The VBAT has different input power range for SIM7070 and SIM7000. Please refer to the following table.

**Table 4:** The differences for VBAT power range

Module	VBAT power supply			VBAT power peak current
	Min.	Typical	Max.	Max.
SIM7000	3.0V	3.8V	4.3V	2000mA
SIM7070G	3V	3.8V	4.6V	2000mA
SIM7070E	3.2V	3.8V	4.2V	

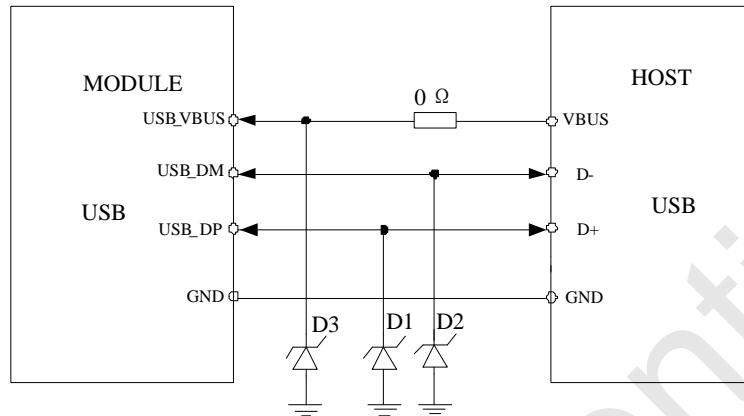
Power design for a module is critical to its performance. The power supply of SIM7070 and SIM7000 should be able to provide sufficient current up to 2.0A.

*\*Note: For details information, please refer to each HD guide*

## 4.2 USB Interface

SIM7070 and SIM7000 provide a USB interface.

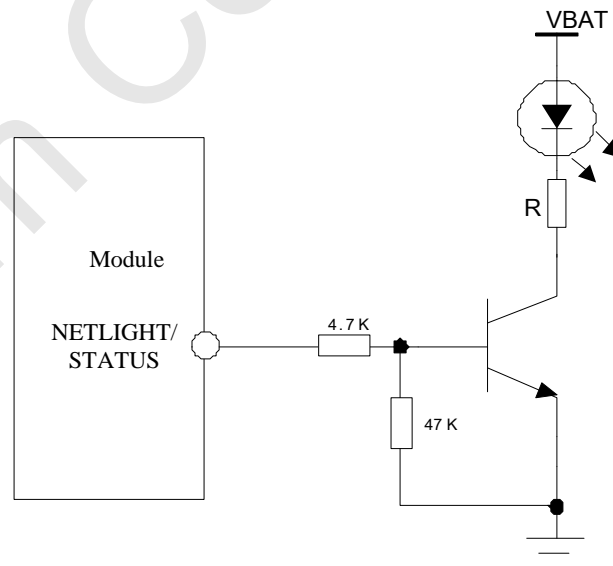
The following circuit is the reference design of USB interface.



**Figure 6:** USB reference circuit

## 4.3 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 7:** NETLIGHT/STATUS reference circuit



### 4.4 Power on/off circuit

SIM7070 and SIM7000 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.

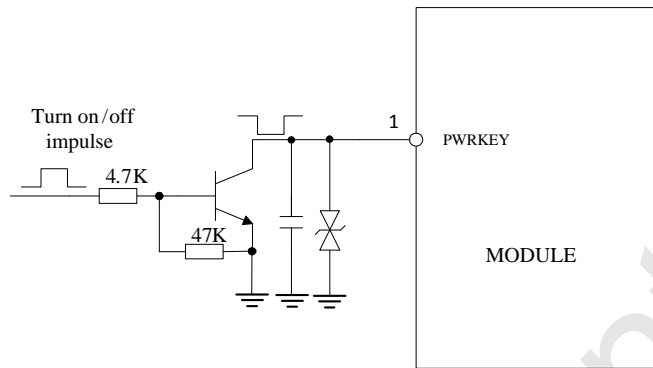


Figure 8: Power on/off reference circuit

Table 5: PWRKEY timing and electronic characteristic

Project	PWRKEY pin voltage When floating	PWRKEY input effective low level voltage For turn on	PWRKEY input low level minimum time For turn on	PWRKEY input low level minimum time For turn off
SIM7000	0.8V	<0.5V	>1s	>1s
SIM7070	1.5V	<0.4	1.2s<t<12s	>1.2s

SIM7070 PWRKEY pin has its own reset function. The reset time is determined by the internal timer (default is 12 seconds). After the PWRKEY is pulled low, the module will be reset after 12 seconds. Therefore, it is not recommended to connect PWRKEY to GND all the time in external circuit design.

*\*Note: For details information, please refer to each HD guide*

### 4.5 USIM Interface

SIM7000 supports 1.8V and 3.0V USIM cards. But SIM7070 supports 1.8V only.

The pin assignment of SIM7000 USIM interface and SIM7070 USIM interface are compatible with each other. A compatible design for 6-pin USIM interface is shown in the figure below:

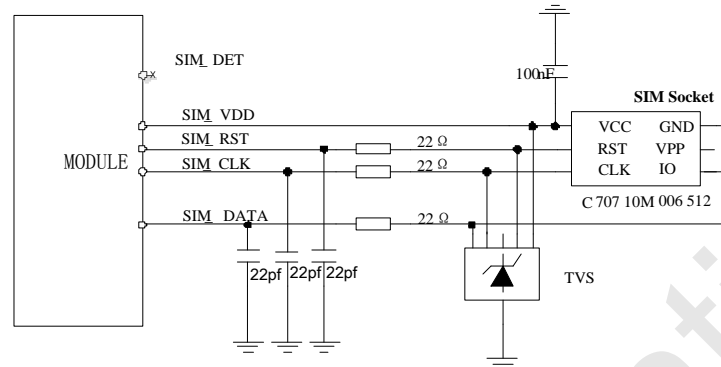


Figure 9: SIM interface reference circuit

*\*Note: For details information, please refer to each HD guide*

### 4.6 UART Interface

The module is as the DCE (Data Communication Equipment) and the client PC is as the DTE (Data Terminal Equipment). AT commands are executed through UART interface.

SIM7000 Series provide 2 channels serial ports. SIM7000 UART1 is used for AT command communication. SIM7000 UART3 interface can't use as AT port or data transmission. It is only used as UART in DAM application when secondary development.

SIM7070 Series provide 3 channels serial ports. UART1 is used for AT command communication. In the second development, DEBUG\_UART can be used for debugging, UART3 can be configured as uart function or GNSS NMEA data output port. However, debug\_UART, UART3 cannot be used for AT communication.

Below are the reference circuits.

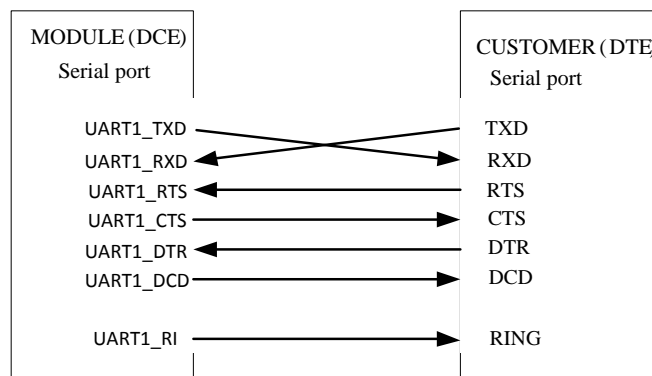
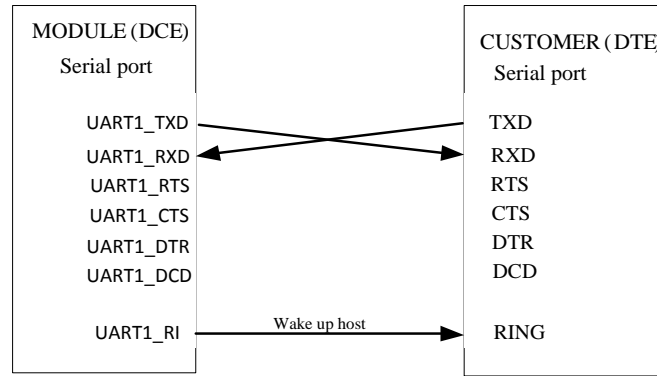


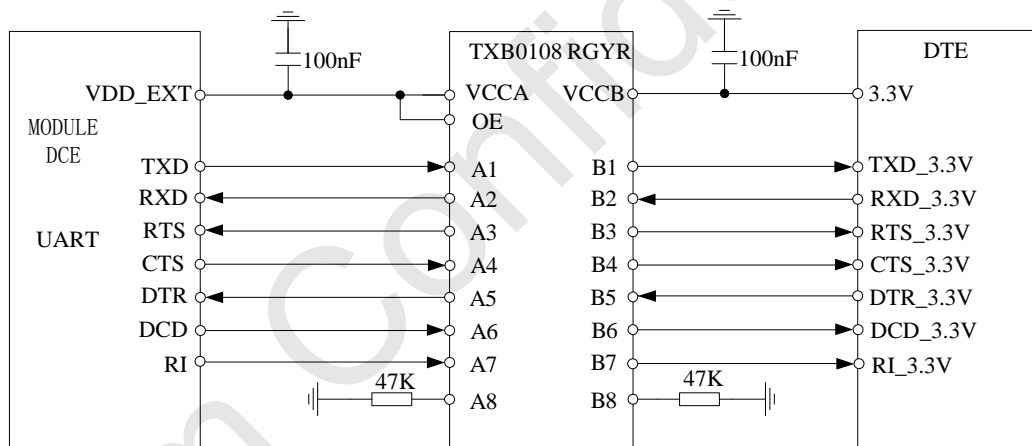
Figure 10: UART Full modem



**Figure 11:** UART Null modem

A level shifter should be used if external host UART interface is 3.3V level. The voltage-level translator TXB0108RGYR provided by Texas Instruments is recommended. The reference design of the TXB0108RGYR is in the following figures.

*\*Note: For details information, please refer to each HD guide*



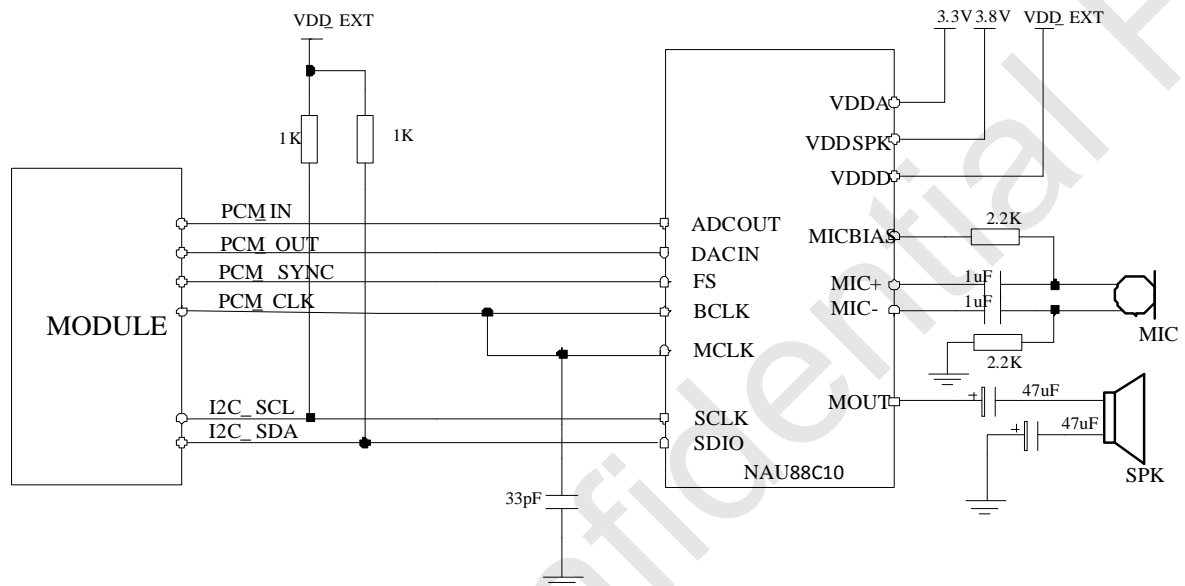
**Figure 12:** Reference circuit of voltage-level translator

*Note: The VDD\_EXT of each project in the diagram is different. For details information, please refer to each HD guide.*

## 4.7 Audio Interface

SIM7070 and SIM7000 provides PCM interface instead of analog audio function.

The following circuit is the reference design.



**Figure 13:** Microphone reference circuit

*Note: For details information, please refer to each HD guide.*

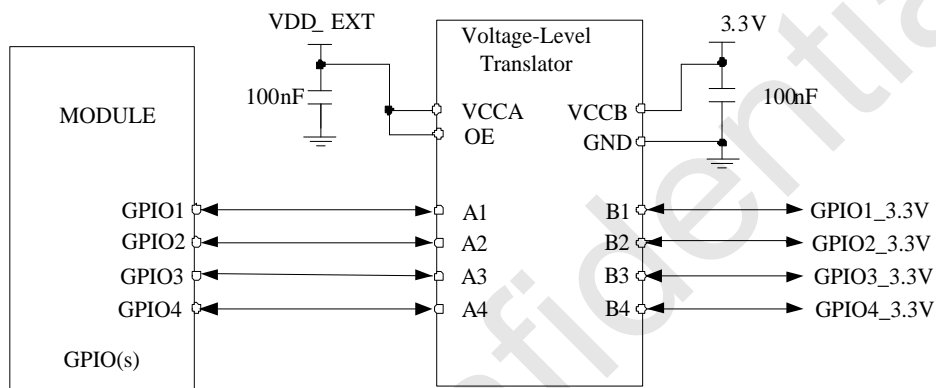
### 4.8 GPIO interface

There are some dedicated GPIO pins for SIM7070 and SIM7000.

**Table 6:** Dedicated Pins Description for module

	SIM7000	SIM7070
GPIO voltage domain	1.8V	1.8V
VDD_EXT	1.8V	1.8V

The following circuit is the reference design.



**Figure 14:** Reference circuit of GPIO voltage-level translator

### 4.9 ADC interface

SIM7070 and SIM7000 modules provide a ADC input channel to read the external voltage value.

They have different sampling scope.

**Table 7:** Module ADC Interface Information

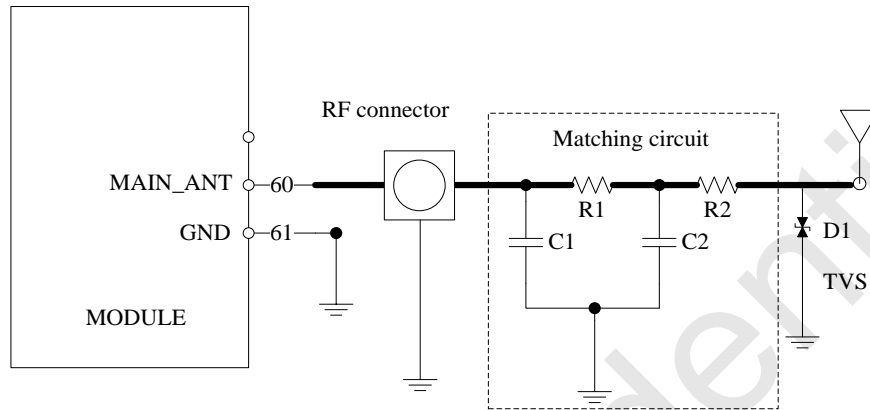
interface	SIM7000	SIM7070
ADC	0~VBAT	0~1.875V

### 4.10 RF Interface

SIM7070 or SIM7000 provide a cellular antenna interface.

External antenna should be placed close to module RF pad through micro-strip line or other types of RF trace, and the trace impedance must be controlled as 50Ω.

The following circuit is a reference design for SIM7070 and SIM7000 RF antenna circuit.



**Figure 15** 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.

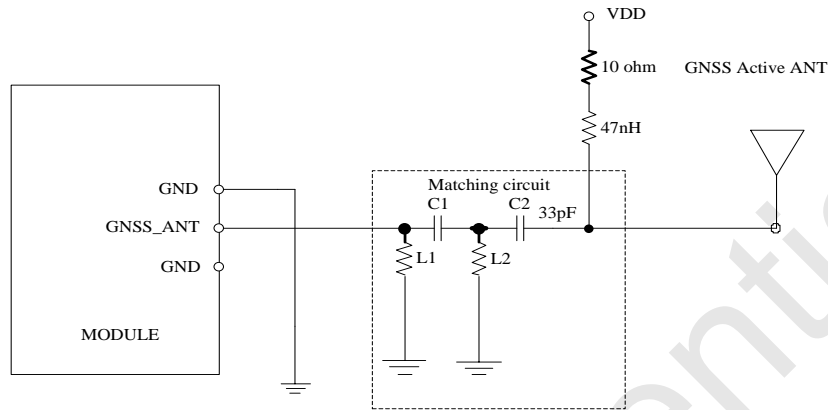
**Table 8:** Recommended TVS

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

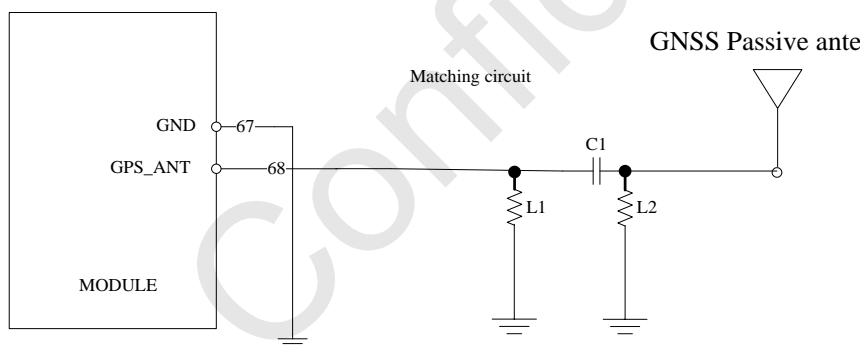
## 4.11 GNSS Interface

Sim7070 and SIM7000 support GNSS function.

Users can adopt an active antenna or a passive antenna to SIM7070. If using a passive antenna, an external LNA is a must to get better performance. The following figures are the reference circuits.



**Figure 16: Active antenna circuit**



**Figure 17: Passive antenna circuit (Default)**

In above figures, the components C1, L1 and L2 are used for antenna matching. Usually, the values of the components can only be achieved after antenna tuning and usually provided by antenna vendor. C2 is used for DC blocking. L3 is the matching component of the external LNA, and the value of L3 is determined by the LNA characteristic and PCB layout. Both VDD of active antenna and V\_LNA need external power supplies which should be considered according to active antenna and LNA characteristic. LDO/DCDC is recommended to get lower current consuming by shutting down active antennas and LNA when GNSS is not working.

GNSS can be tested by NMEA port. NMEA sentences can be obtained through UART or USB automatically. NMEA sentences include GSV, GGA, RMC, GSA, and VTG. Before using GNSS, user should configure SIM7070 in proper operating mode by AT command. Please refer to related documents for details. SIM7070 can also get position location information through AT directly.

**Note:** For details information, please refer to each HD guide.

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## 5 Appendix

### 5.1 Related documents

**Table 9:** Related documents

SN	Document name	Remark
[1]	SIM7070 Series Hardware Design	SIM7070 SeriesHardware Design Document
[2]	SIM7000 Hardware Design	SIM7000 Hardware Design Document

### 5.2 Terms and Abbreviation

**Table 10:** Terms and Abbreviations

Abbreviation	Description
ESD	Electrostatic Discharge
DAM	Downloadable Application Module
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
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

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