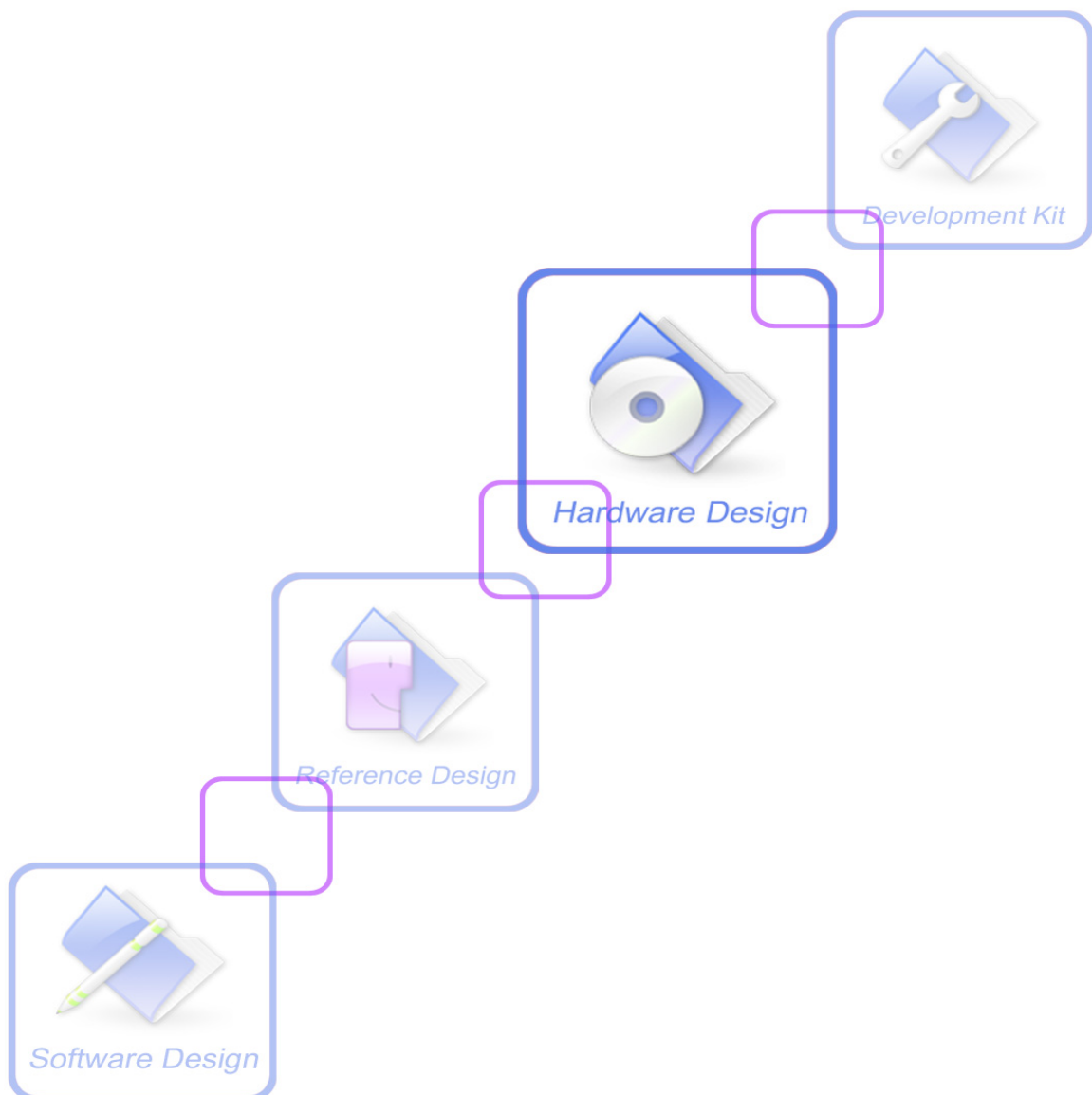




a **SUNSEA** **IoT** company

SIM7080G&SIM7020X_Compatible_Design_V1.00



Document Title	SIM7080G&SIM7020X Compatible Design
Version	1.00
Date	2019-7-24
Status	Released
Document Control ID	SIM7080G&SIM7020X Compatible Design V1.00

General Notes

SIMCom offers this information as a service to its customers to support the application and engineering efforts that use the products designed by SIMCom. The information provided is based on the requirements specifically from 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, the system validation of the 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 without notice.

Copyright

This document contains the proprietary technical information which is the property of SIMCom Limited, copying of this document, giving it to others, the using or communication of the contents thereof are forbidden without the official authority by SIMCom. Offenders are liable to the payment of the damages. All rights are reserved in the event of grant of a patent or the registration of a utility model or design. All specifications supplied herein are subject to change without notice

Copyright © SIMCom Wireless Solutions Co., Ltd. 2019

Contents

Contents	3
Figure Index.....	5
Revision History	6
1 Introduction	7
2 Pin assignment.....	8
2.1 Pin Assignment Overview	8
2.2 Differences Overview	9
2.3 Differences of Electronic Characteristic	10
3 Recommended Footprint	12
3.1 Top And Bottom View.....	12
3.2 Recommended PCB Footprint Outline	13
4 Hardware Reference Design.....	14
4.1 Power Supply	14
4.2 USB Interface.....	15
4.3 Network Status Indication.....	16
4.4 Power On/Off Circuit.....	17
4.5 Reset Circuit.....	18
4.6 USIM Interface	18
4.7 UART Interface.....	19
4.8 PCM Interface	21
4.9 GPIO Interface	22
4.10 ADC interface	22
4.11 RF Interface.....	23
4.12 GNSS Interface	24
4.13 Antenna Control Interface.....	错误!未定义书签。
5 Appendix.....	27
5.1 Related documents	27
5.2 Terms and Abbreviation	27

Table Index

Table 1: The Differences overview	9
Table 2: The Differences of electronic characteristic.....	10
Table 3: Difference in Pin Definitions	11
Table 4: The differences for VBAT power supply range.....	14
Table 5: PWRKEY timing and electronic characteristic.....	17
Table 6: The differences for UART voltage-level	20
Table 7: Dedicated Pins Description for module	22
Table 8: Module ADC Interface Information	22
Table 9: Recommended TVS	23
Table 10: Related documents.....	27
Table 11: Terms and Abbreviations.....	27

Figure Index

Figure 1: SIM7080G and SIM7020X pin assignment (Top view).....	8
Figure 2: SIM7080G and SIM7020X top and bottom view.....	12
Figure 3: Recommended Stencil Design for SIM7080G and SIM7020X (Unit: mm)	13
Figure 4: Power supply reference circuit	14
Figure 5: USB reference circuit	15
Figure 6: NETLIGHT/STATUS reference circuit	16
Figure 7: Power on/off reference circuit	17
Figure 8: Reset reference circuit	18
Figure 9: SIM interface reference circuit.....	18
Figure 10: UART Full modem.....	19
Figure 11: UART Null modem	20
Figure 12: Reference circuit of voltage-level translator.....	20
Figure 13 : PCM reference circuit	21
Figure 14 : PCM reference circuit	21
Figure 15: Reference circuit of GPIO voltage-level translator	22
Figure 16: Antenna matching circuit.....	23
Figure 17: Active antenna circuit.....	24
Figure 18: Passive antenna circuit (Default)	24
Figure 19: Antenna Control Interface reference circuit	26

Revision History

Data	Version	Description of change	Author
2019-7-24	1.00	Original	Tu Hongjun

1 Introduction

This document is targeted for customers to understand the differences between SIM7080G and SIM7020X. Users can use SIM7080G or SIM7020X module to design and develop applications quickly.

The SIM7020X series include SIM7020C, SIM7020E and SIM7020G.

2 Pin assignment

2.1 Pin Assignment Overview

The following table shows the pin assignment of SIM7080G and SIM7020X.

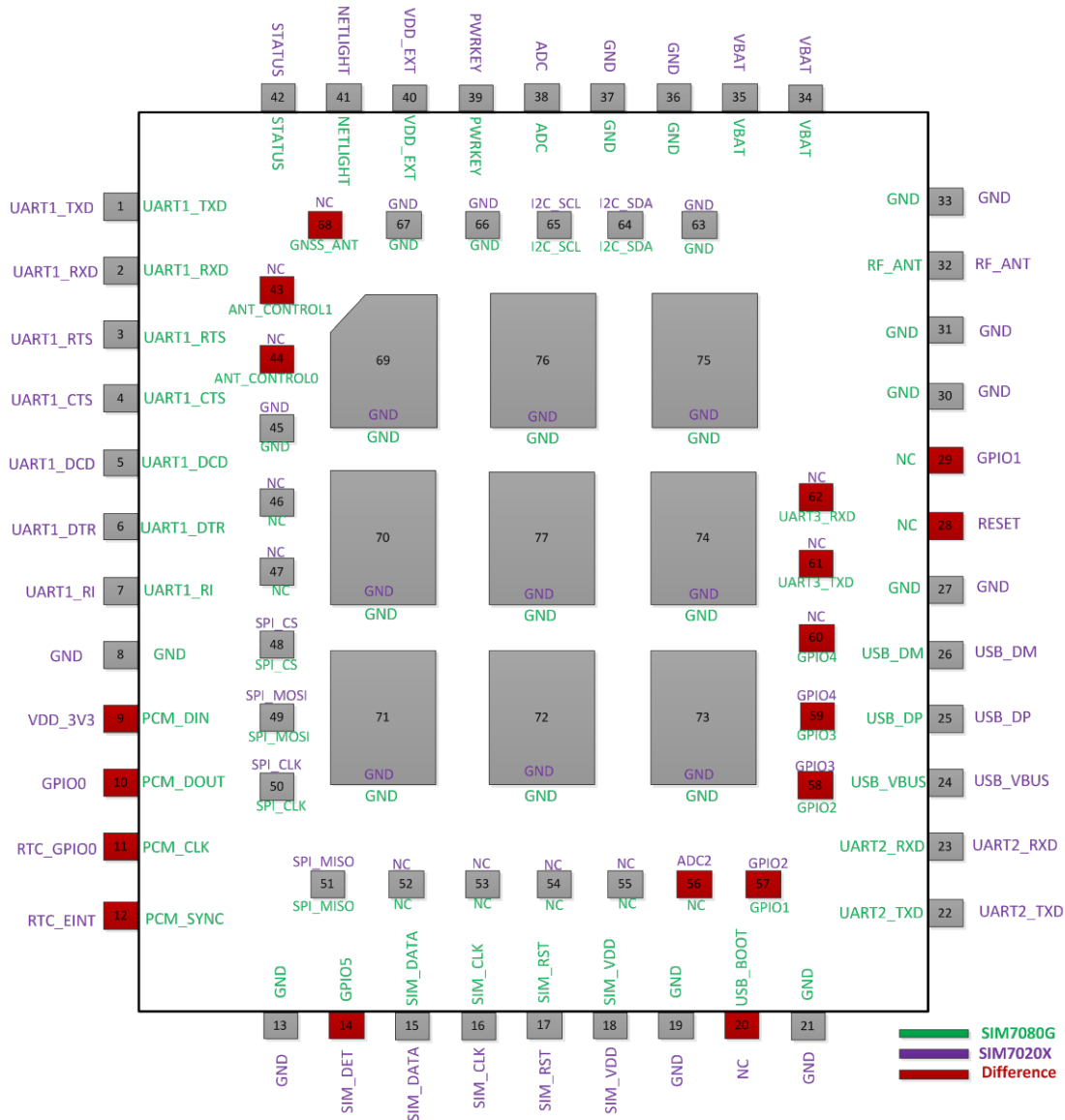


Figure 1: SIM7080G and SIM7020X pin assignment (Top view)

***Note:**

SIM7020C and SIM7020E do not have 43~77 pads on the inner ring. However, the 1~42 pads of the outer ring are identical to the SIM7020G.

2.2 Differences Overview

Table 1: The Differences overview

Functions	SIM7020X	SIM7080G
PIN Number	77*	77
Radio Access Technology	NB-IoT	CAT-M/NB-IoT
GNSS	Not support	Support
RESET	Support	Not support
PCM	Not support	Support
SPI	Support*	Support
Antenna Control Interface	Not support	Support
Download interface	UART2	USB
Debug interface	USB and UART2	USB and UART2

***Note:**

SIM7020C and SIM7020E have only 42 pins. And SIM7020G has 77 pins.

SIM7020G supports SPI interface. But SIM7020C and SIM7020E do not support.

2.3 Differences of Electronic Characteristic

Table 2: The Differences of electronic characteristic

Pin #	SIM7020X		SIM7080G	
	PIN name	Voltage range	PIN name	Voltage range
34,35	VBAT	2.1~3.6V	VBAT	2.7~4.8V
9	VDD_3V3	3.3V	PCM_DIN	1.8V
10	GPIO0	1.8V	PCM_DOUT	1.8V
11	RTC_GPIO0	=VBAT	PCM_CLK	1.8V
12	RTC_EINT	=VBAT	PCM_SYNC	1.8V
38	ADC	0~1.4V	ADC	0~1.875V
39	PWRKEY	=VBAT	PWRKEY	1.5V

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

Table 3: Difference in Pin Definitions

Pin #	SIM7020X	SIM7080G
9	VDD_3V3	PCM_DIN
10	GPIO0	PCM_DOUT
11	RTC_GPIO0	PCM_CLK
12	RTC_EINT	PCM_SYNC
14	SIM_DET	GPIO5
20	NC	USB_BOOT
28	RESET	NC
29	GPIO1	NC
43	NC	ANT_CONTROL1
44	NC	ANT_CONTROL0
56	ADC2	NC
57	GPIO2	GPIO1
58	GPIO3	GPIO2
59	GPIO4	GPIO3
60	NC	GPIO4
61	NC	UART3_TXD
62	NC	UART3_RXD
68	NC	GNSS_ANT

***Note:**

SIM7020C and SIM7020E do not have 43~77 pads on the inner ring. However, the 1~42 pads of the outer ring are identical to the SIM7020G. For details information, please refer to HD separately.

3 Recommended Footprint

3.1 Top And Bottom View

There is no difference in footprint between SIM7080G and SIM7020G.

But SIM7020C and SIM7020E have only 42 pins in the outer ring, there are no pads 43~77 in the inner ring. However, the 1~42 pads of the outer ring are identical to the SIM7020G.

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

The following figures show top and bottom view of SIM7080G and SIM7020X.



Figure 2: SIM7080G and SIM7020X top and bottom view

3.2 Recommended PCB Footprint Outline

SIM7020X and SIM7080G have the same Recommended PCB footprint outline.

The Recommended PCB footprint outline for SIM7080G and SIM7020X is shown as below.

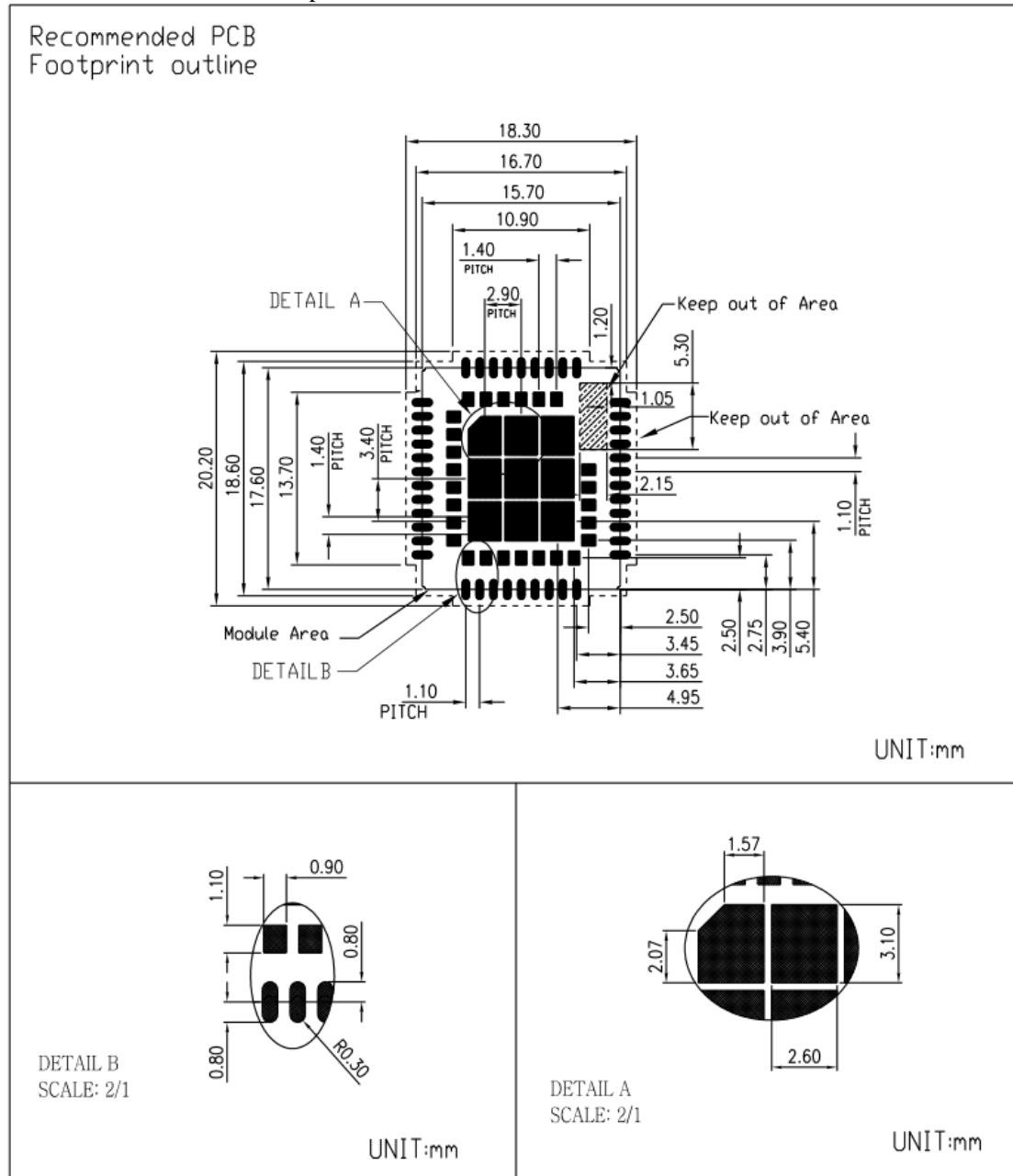


Figure 3: Recommended Stencil Design for SIM7080G and SIM7020X (Unit: mm)

But SIM7020C and SIM7020E have only 42 pins in the outer ring, there are no pads 43~77 in the inner ring. However, the 1~42 pads of the outer ring are identical to the SIM7020G.

***Note:**

For details information, please refer to HD separately.

4 Hardware Reference Design

This chapter introduces compatible design between SIM7080G and SIM7020X on main functionalities.

4.1 Power Supply

The power supply pins of SIM7080G and SIM7020X include two VBAT pins (pin 34 and pin 35). VBAT pins directly supply the power to RF circuit and baseband circuit. Both VBAT pins of the module must be used together. The following figure is the reference design of the module VBAT power supply.

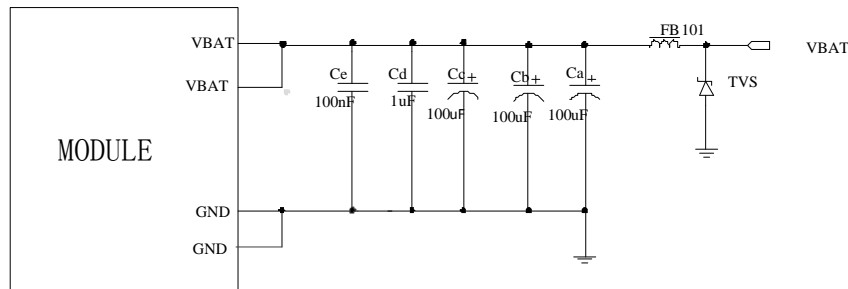


Figure 4: Power supply reference circuit

The VBAT has different input power supply range for SIM7080G and SIM7020X. Please refer to the following table.

Table 4: The differences for VBAT power supply range

Module	VBAT power supply			VBAT power peak current
	Min.	Typical	Max.	Max.
SIM7020X	2.1V	3.3V	3.6V	700mA
SIM7080G	2.7V	3.8V	4.8V	500mA

Power design for a module is critical to its performance. The power supply of SIM7080G and SIM7020X should be able to provide sufficient current up to 700mA.

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

4.2 USB Interface

SIM7080G and SIM7020X provide a USB interface.

The following circuit is the reference design of USB interface.

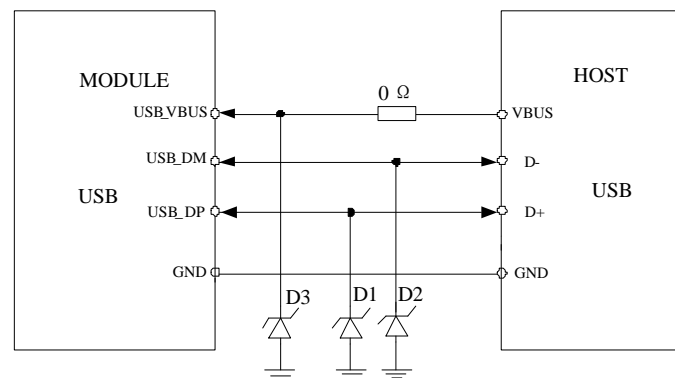


Figure 5: USB reference circuit

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.

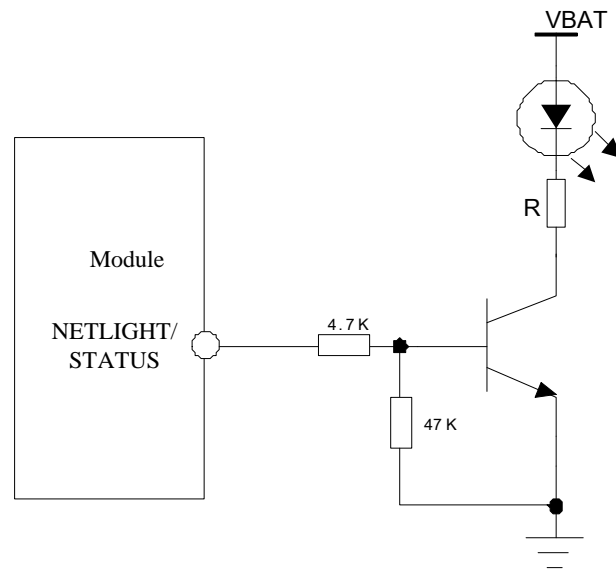


Figure 6: NETLIGHT/STATUS reference circuit

4.4 Power On/Off Circuit

SIM7080G and SIM7020X can be turned on by driving the PWRKEY pin to a low level for a certain time. It is recommended to use an open drain or collector driver to control the PWRKEY. A reference circuit is shown as below.

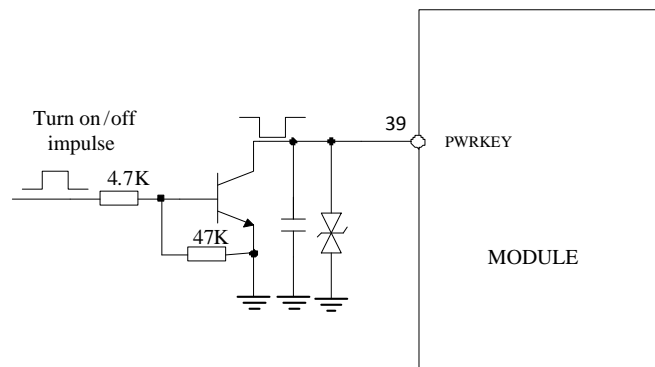


Figure 7: Power on/off reference circuit

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
SIM7020X	=VBAT	$<0.3 \cdot V_{BAT}$	$>1s$	$>1s$
SIM7080G	1.5V	$<0.4V$	$1s < t < 12s$	$>1.2s$

SIM7080G 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 HD separately.*

4.5 Reset Circuit

The 28 pin of SIM7020X is RESET, but it is NC for SIM7080G.

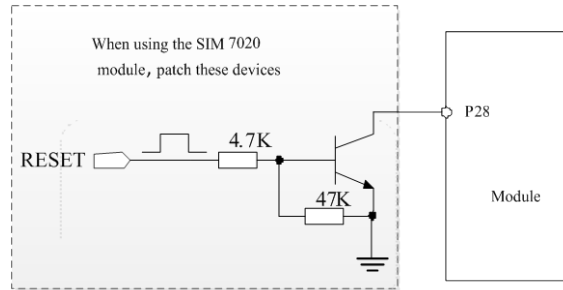


Figure 8: Reset reference circuit

4.6 USIM Interface

SIM7020X supports 1.8V and 3.0V USIM cards. But SIM7080G supports 1.8V only.

The pin assignment of SIM7020X USIM interface and SIM7080G USIM interface are compatible with each other. A compatible design for 6-pin USIM interface is shown in the figure below:

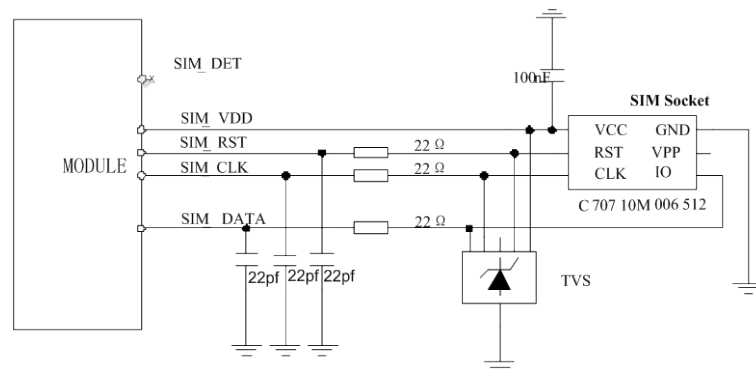


Figure 9: SIM interface reference circuit

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

4.7 UART Interface

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

SIM7020X UART1 is used for AT command communication. And UART2 is used for firmware upgrade and debug.

SIM7080G UART1 is used for AT command communication. And UART2 is only used for debug. UART3 can be configured as a GNSS NMEA data output port. The UART2 and UART3 are only used as UART in DAM (Downloadable Application Module) application.

Below are the reference circuits.

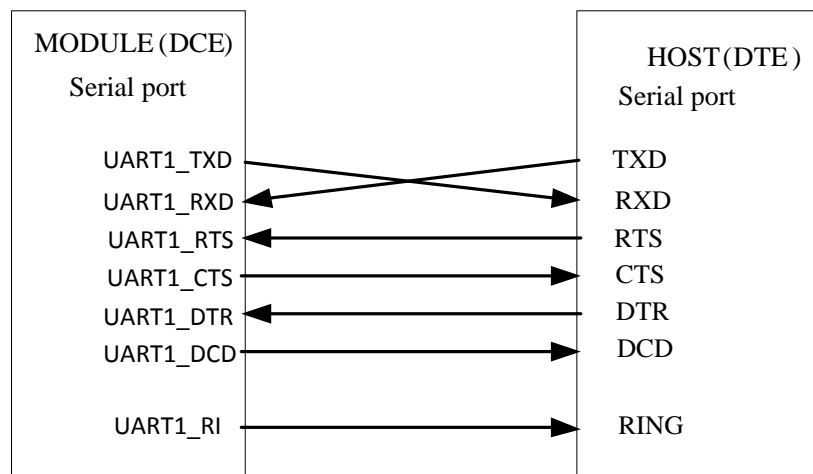


Figure 10: UART Full modem

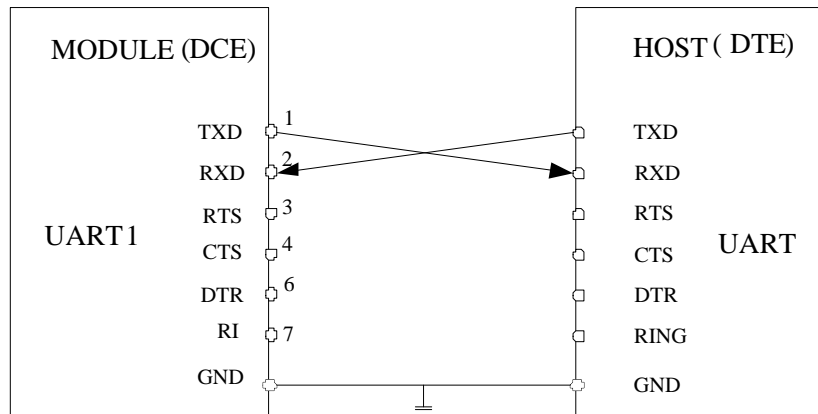


Figure 11: UART Null modem

Table 6: The differences for UART voltage-level

Module	UART voltage-level	VDD_EXT
SIM7020X	1.8V	1.8V
SIM7080G	1.8V	1.8V

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 HD separately.**

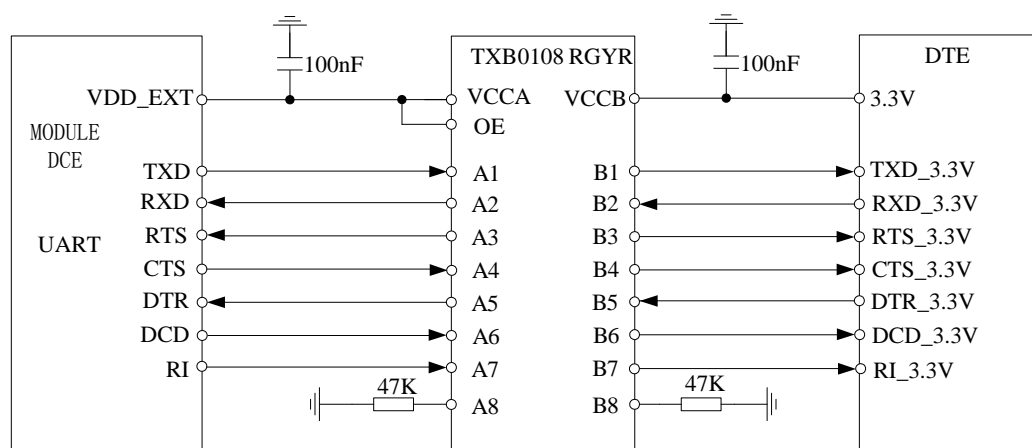


Figure 12: Reference circuit of voltage-level translator

Note: For details information, please refer to HD separately.

4.8 PCM Interface

SIM7080G provides a PCM interface.

But SIM7020X provides other interface instead of PCM function.

The following circuit is the reference design.

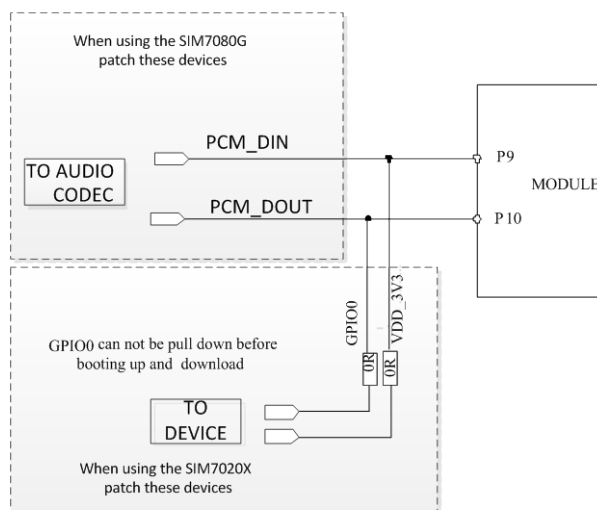


Figure 13 : PCM reference circuit

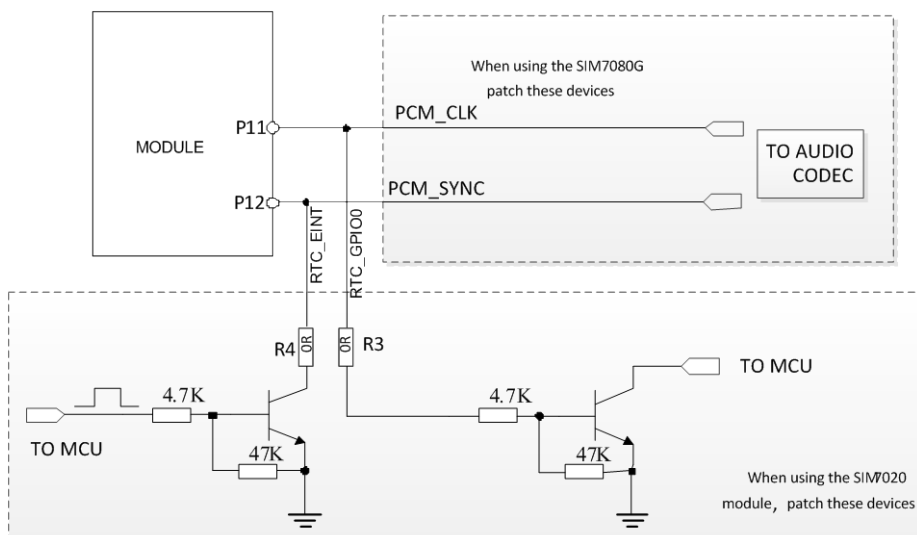


Figure 14 : PCM reference circuit

Note: For details information, please refer to HD separately.

4.9 GPIO Interface

There are some dedicated GPIO pins for SIM7080G and SIM7020X.

Table 7: Dedicated Pins Description for module

	SIM7020X	SIM7080G
GPIO voltage-level	1.8V	1.8V
VDD_EXT	1.8V	1.8V

The following circuit is the reference design.

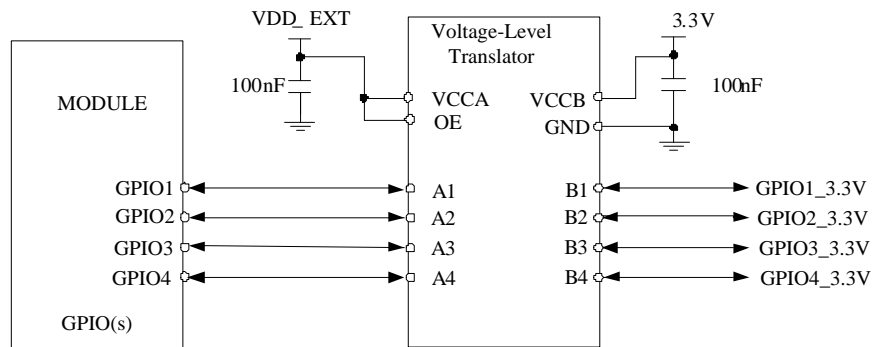


Figure 15: Reference circuit of GPIO voltage-level translator

4.10 ADC interface

SIM7080G provide an ADC input channel to read the external voltage value. But SIM7020X provide two channels.

They have different sampling scope.

Table 8: Module ADC Interface Information

Interface	SIM7020X	SIM7080G
ADC	0~1.4V	0~1.875V

4.11 RF Interface

SIM7080G or SIM7020X 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 SIM7080G and SIM7020X RF antenna circuit.

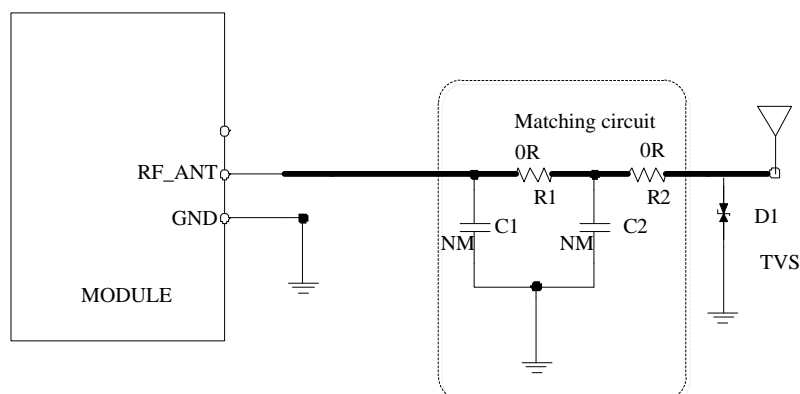


Figure 16: Antenna matching circuit

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 9: Recommended TVS

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

4.12 GNSS Interface

SIM7080G supports GNSS interface. But SIM7020X doesn't support.

Users can adopt an active antenna or a passive antenna to SIM7080G. If using a passive antenna, an external LNA is a must to get better performance. The following figures are the reference circuits.

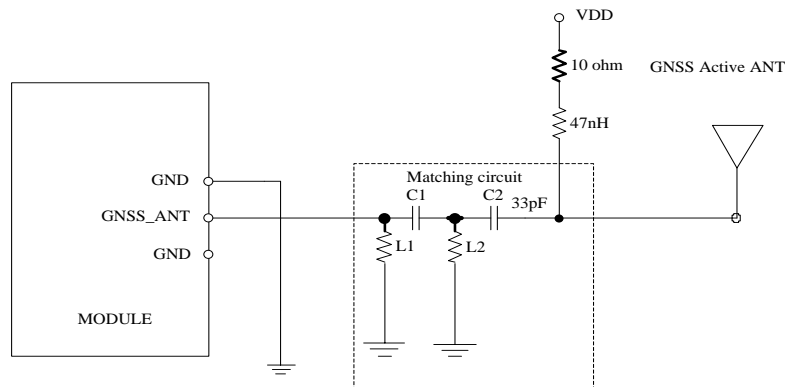


Figure 17: Active antenna circuit

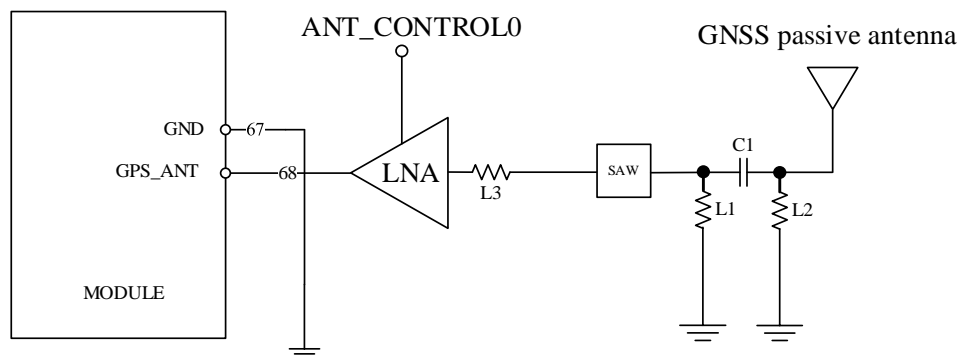


Figure 18: Passive antenna circuit (Default)

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 SIM7080G in proper operating mode by AT command. SIM7080G can also get position location information through AT directly.

Note: For details information, please refer to HD separately.

4.13 Antenna Control Interface

SIM7080G provides a Antenna Control Interface. It can be used to control the antenna tuner to improve antenna performance. But SIM7020X doesn't support.

The reference circuit is shown in the following figure:

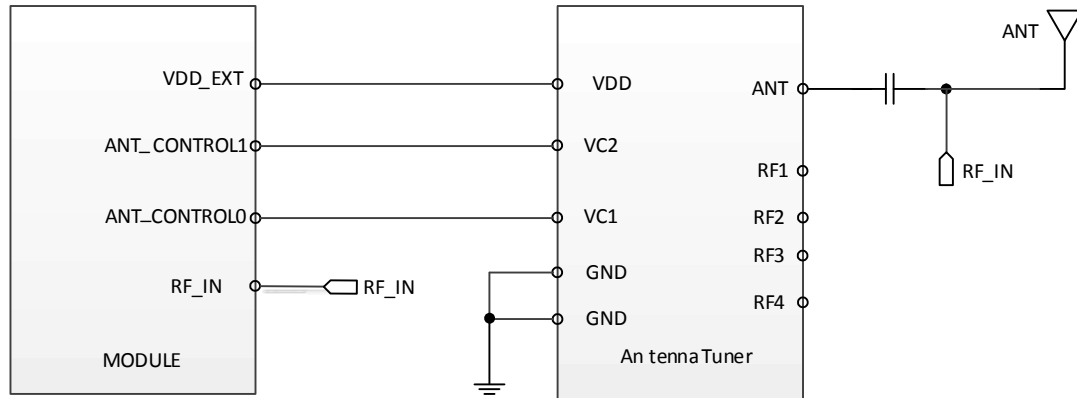


Figure 19: Antenna Control Interface reference circuit

5 Appendix

5.1 Related documents

Table 10: Related documents

SN	Document name	Remark
[1]	SIM7080G Hardware Design_V1.0X	SIM7080G Hardware Design Document
[2]	SIM7020 Hardware Design_V1 0X	SIM7020 Hardware Design Document
[3]	SIM7020G Hardware Design_V1 0X	SIM7020G Hardware Design Document

5.2 Terms and Abbreviation

Table 11: 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

Contact us:

SIMCom Wireless Solutions Ltd.

Add: SIM Technology Building, No.633, Jin zhong Road, Chang ning District, Shanghai P.R.
China 200335

Tel: +86-21-3157 5100, +86-21-3157 5200

URL: www.simcom.com