SIM82X0X and SIM83X0X Series Hardware Design

5G Module

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Version History

Date	Version	Description of change	Author
2021-9-27	1.00	Release	Yaling Wang Yi Zheng Chen Cheng
2021-11-26	1.01	1.Correct the PIN H39 to AH39 in table 5 2.Change some information about the baud rate frequency band supported by the serial port in the NOTE of 3.11 UART Interface. 3.Delete the PIN BA29 of the GND column in Table 5. 4.Add the power consumption current 120uA of the Power off mode in Table 62. 5. Change PIN W1 to RFU and PIN AM7 to GPIO, correct the information about ant interface in table 5 6.Add information about the conditions for the software with chip PM7250B to start up at 3.3V in the note of 3.1 Power Supply. 7.Correct some information about Frequency bands of SIM8260E and SIM8260A in the table, and data transmission throughput of 5G NR in table2. 8.Add the GPIO88 PIN in the GPIO row of Table 5, and add the EBIN2 interface in Table 5. 9.Delete the used RFU PIN, and modify the Pin assignment of Figure 2 accordingly.	Tao yu Yi Zheng Chen Cheng
2021-12-29	1.02	1. Change table 61 GPIO66 not support INT 2. Module pin AH3 change PIN name to RFU, table5, table42 delete this PIN description and change figure2 of the pin assignment of the module. 3.table 5 add notice for EBI2 interface 4.Exchang table5, table49 SIM8260C module ANT1 and ANT2 ant description	Yaling Wang Yi Zheng
2022-03-02	1.03	1. Change Figure 2 pin BA25 TO ANT1, BA33 to ANT2 2. Change table 44 3G net night to 200ms ON/OFF 3. Chane Table 62 power consumption current 135uA of the Power off mode and RF max power 4. Change the definition of GNSS antenna in table5/49/50 5. Updated Figure 46 and 47 6. Updated Figure 50 7. Change PIN AH3 GPIO90 for EBI2_CS	Yaling Wang
2022-05-07	1.04	1.Change the document name to SIM82X0X and	Yaling Wang

		SIM83X0X_Series_Hardware Design 2.Add SIM8360A, SIM8380A and SIM8280A information 3.change table 6: about ANT Pin Frequency Range 4.change Table 13 Power on timing and electronic characteristic and add note 5.change chapter 3.8 about (u)SIM socket model 6.add chapter 3.21 about mmW interface 7.add chapter 6.7 about baking conditions	Shaoxu Hou
2022-09-05	1.05	1. Changed Table about mmW recommended connector type 2. Modify Table, add SIM8380E module information 3. Modify Table, modify the main frequency of the application processor, and add the module weight information 4. Add lines of Ipeak (QTM) related information to the content of Table 5. Increase the minimum output current capability requirement of external DCDC for mmW modules 6. Add module VDD_EXT peripheral reference circuit 7. Changed the content of the PCIe switch chapter, and changed the corresponding recommended material table 8. Add PCIe interface for IPQxxxx related content 9. Change the Codec ALC5616 special attention content 10. Supplement table content of W_DISABLE pin description 11. Change module Figure 12. Increase the content that PCIe_RST needs to be pulled up 13. The ID resistance of the PM7250B interface reference circuit is changed from 100K to 200K 14. Modify the description of pin AF3(SLEEP_OUT) 15. The data transfer throughput of different modules is changed to a table representation 16. Add the antenna port definition table of SIM8380E 17. Modify the Ipeak,Ton (STATUS)value 18. Change the description of module pin D9 19. Added chip junction temperature table in thermal design chapter	Shaoxu Hou Zhongxi Xiang

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1 Introduction

This document describes the electronic specifications, RF specifications, interfaces, mechanical characteristics, and test results of the SIM82X0X and SIM83X0X Series module. With the help of this document，customers can quickly understand SIM82X0X and SIM83X0X Series module.

Associated with other software application notes and user guides, customers can use SIM82X0X and SIM83X0X Series to design and develop mobile and laptop applications easily. SIM82X0X not support mmW but SIM83X0X support mmW.

1.1 Product Outline

SIM82X0X and SIM83X0X Series is a wireless communication module focusing on 5G market; it supports multi-air access technology including 5G NR (NSA/SA), LTE-FDD, LTE-TDD, and WCDMA, can meet the 3GPP R16 NR specification, and integrates GNSS[1] system including dual bands GPS, GLONASS, Beidou, Galileo and QZSS. The module's supported radio frequency bands are shown in the following table.

Table 1: SIM82X0X and SIM83X0X Series frequency bands

Standard	Frequency bands
SIM8260C Module	
5G NR	n1/n3/n28/n41/n78/n79
LTE-FDD	B1/B3/B5/B7/B8/B20/B28
LTE-TDD	B34/B38/B39/B40/B41
WCDMA	B1/B5/B8
GNSS[1]	GPS L1+L5 dual bands/GLONASS/BeiDou/Galileo/QZSS
SIM8260E Module	
5G NR	n1/n3/n5/n7/n8/n20/n26/n28/n38/n40/n41/n48/n77/n78/n79
LTE-FDD	B1/B3/B5/B7/B8/B18/B19/B20/B26/B28/B32
LTE-TDD	B38/B39/B40/B41/B42/B43/B46[2]/B48
WCDMA	B1/B5/B8
GNSS[1]	GPS L1+L5 dual bands/GLONASS/BeiDou/Galileo/QZSS
SIM8260A Module	
5G NR	n1/n2/n5/n7/n12/n13/n14/n25/n26/n29/n30/n38/n41/n48/n66/n71/n77/n78/n79
LTE-FDD	B1/B2/B4/B5/B7/B12/B13/B14/B17/B25/B26/B29/B30/B66/B71
LTE-TDD	B38/B41/B42/B43/B46[2]/B48
WCDMA	B1/B2/B4/B5
GNSS1	GPS L1+L5 dual bands/GLONASS/BeiDou/Galileo/QZSS

SIM8360A Module*	
5G NR	n1/n2/n5/n7/n12/n13/n14/n25/n26/n29/n30/n38/n41/n48/n66/n71/n77/n78/n79
LTE-FDD	B1/B2/B4/B5/B7/B12/B13/B14/B17/B25/B26/B29/B30/B66/B71
LTE-TDD	B38/B41/B42/B43/B46[2]/B48
WCDMA	B1/B2/B4/B5
GNSS[1]	GPS L1+L5 dual bands/GLONASS/BeiDou/Galileo/QZSS
mmW	n257 (28 GHz), n258 (26 GHz) n260 (39 GHz), n261 (28 GHz)
SIM8380E Module*	
5G NR	n78/n79
LTE-FDD	B1/B3/B5/B7/B8
LTE-TDD	-
WCDMA	B1
GNSS1	-
mmW	n257
SIM8280A Module*	
5G NR	n1/n2/n5/n7/n12/n13/n14/n25/n26/n29/n30/n38/n41/n48/n66/n71/n77/n78/n79
LTE-FDD	B1/B2/B4/B5/B7/B12/B13/B14/B17/B25/B26/B29/B30/B66/B71
LTE-TDD	B38/B41/B42/B43/B46[2]/B48
WCDMA	B1/B2/B4/B5
GNSS1	GPS L1+L5 dual bands/GLONASS/BeiDou/Galileo/QZSS
SIM8380A Module*	
5G NR	n1/n2/n5/n7/n12/n13/n14/n25/n26/n29/n30/n38/n41/n48/n66/n71/n77/n78/n79
LTE-FDD	B1/B2/B4/B5/B7/B12/B13/B14/B17/B25/B26/B29/B30/B66/B71
LTE-TDD	B38/B41/B42/B43/B46[2]/B48
WCDMA	B1/B2/B4/B5
GNSS1	GPS L1+L5 dual bands/GLONASS/BeiDou/Galileo/QZSS
mmW	n257 (28 GHz), n258 (26 GHz) n260 (39 GHz), n261 (28 GHz)

NOTE

1. GNSS function is optional. Standard modules do not support L5 by default.
2. B46 is optional. SIM8260A/E has two models:
   product details serial number A0J4**M**000, two transceivers inside the module, supports B46,
   product details serial number A0J4**K**000, one transceiver inside the module, not support B46.
3. "*" means under development.

The data transfer throughput of the module is shown in the table below.

Table 2: SIM82X0X and SIM83X0X data transfer throughput

Standard	Data transfer
SIM8260C Module	
Sub-6G SA	2.1Gbps(DL)/900Mbps(UL)
Sub-6G NSA	2.8Gbps(DL)/600Mbps(UL)
LTE	1Gbps(DL)/150Mbps(UL)
HSPA+	42Mbps(DL)/5.76Mbps(UL)
SIM8260E Module	
Sub-6G SA	2.4Gbps(DL)/1Gbps(UL)
Sub-6G NSA	3.4Gbps(DL)/600Mbps(UL)
LTE	1.6Gbps(DL)/200Mbps(UL)
HSPA+	42Mbps(DL)/5.76Mbps(UL)
SIM8260A Module	
Sub-6G SA	2.4Gbps(DL)/1Gbps(UL)
Sub-6G NSA	3.4Gbps(DL)/600Mbps(UL)
LTE	1.6Gbps(DL)/200Mbps(UL)
HSPA+	42Mbps(DL)/5.76Mbps(UL)
SIM8380E Module*	
mmWave	8.0Gbps(DL)/1.5Gbps(UL)
Sub-6G SA	4.0Gbps(DL)/1.0Gbps(UL)
Sub-6G NSA	4.0Gbps(DL)/600Mbps(UL)
LTE	2.0Gbps(DL)/200Mbps(UL)
HSPA+	42Mbps(DL)/5.76Mbps(UL)

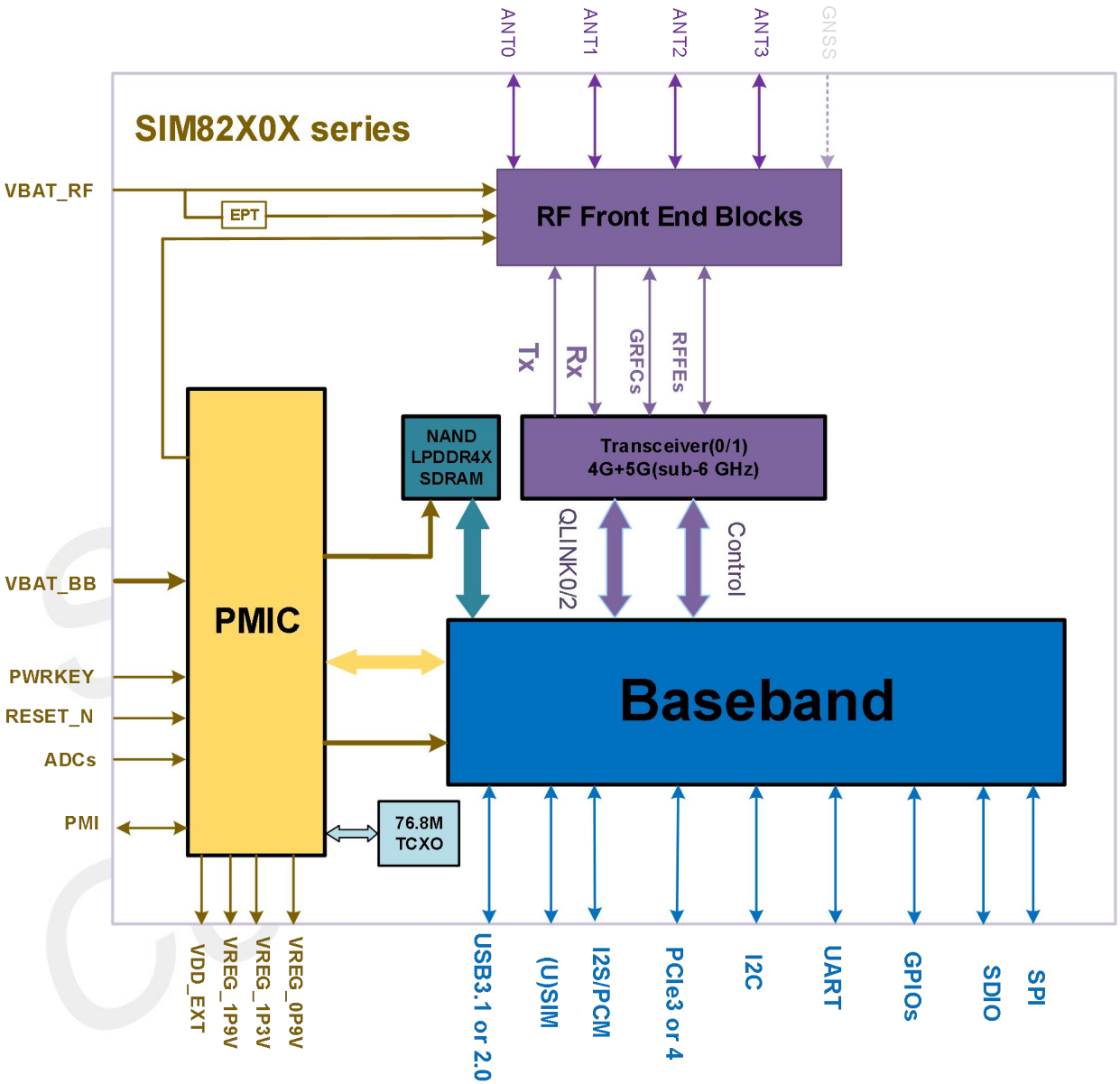
With a physical dimension of 41.0mm*43.6mm*2.8mm, SIM82X0X and SIM83X0X Series can meet almost all requirements of customer's applications.

With the 369 LGA pins, SIM82X0X and SIM83X0X Series owns rich interfaces, includes USB3.1, PCIe3.0/4.0, SDIO3.0, (U)SIM card, digital audio (I2S or PCM), SPI, I2C, UART, GPIOs, four antennas for 3G/4G/5G and GNSS. For more details about the antenna pins, please refer to the pin definition.

With all these interfaces, SIM82X0X and SIM83X0X Series can also be utilized in the handheld terminal, laptop application and especially the 5G CPE.

1.2 Hardware Block Diagram

The block diagram of SIM82X0X and SIM83X0X Series is shown in the following figure.



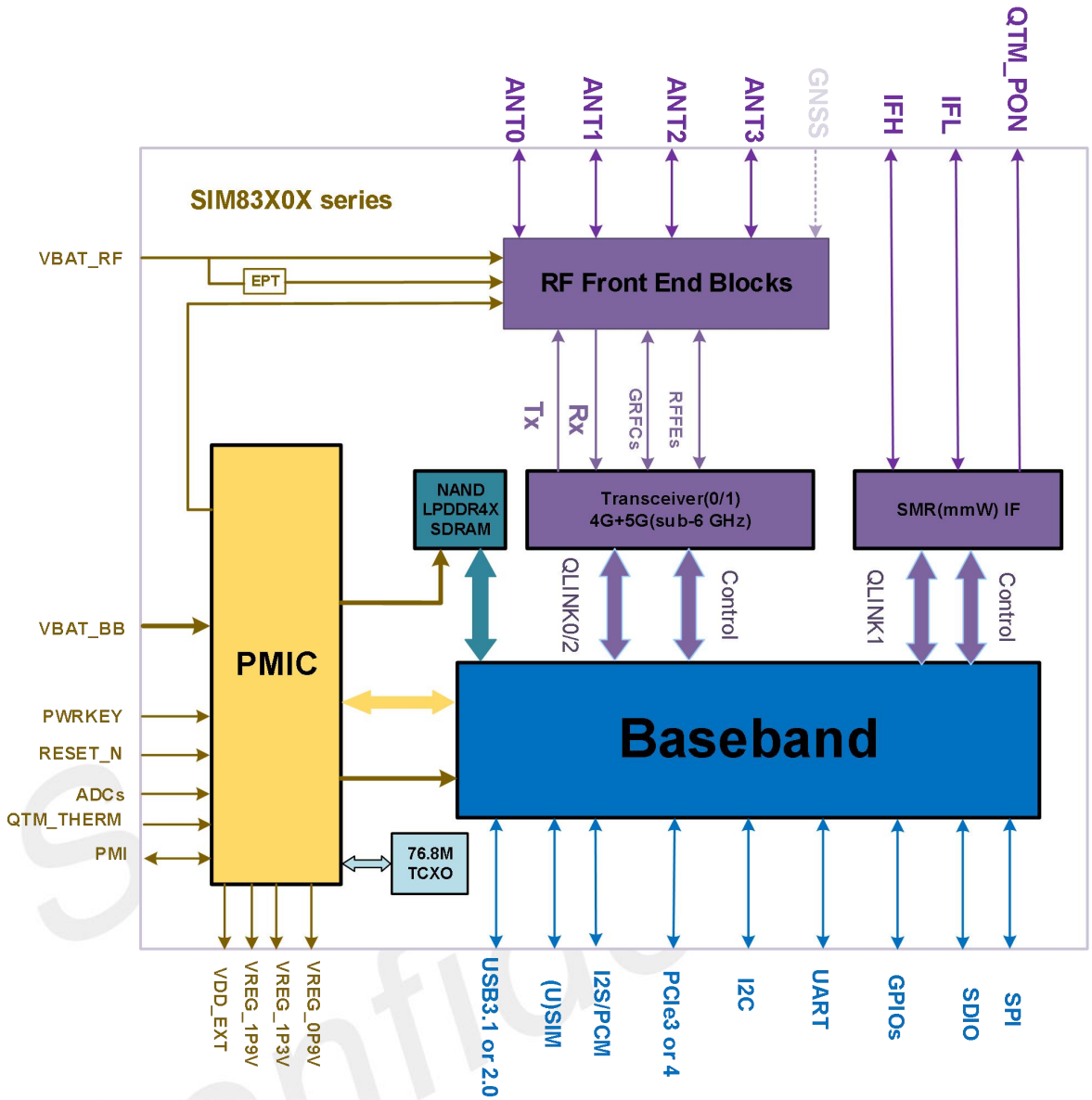


Figure 1: Module block diagram

1.3 Feature Overview

Table 3: Key features

Feature	Implementation
Application processor	Arm Cortex-A7 up to 1.8 GHz
Memory RAM	4Gb 16-bit LPDDR4X at 2.13 GHz, 8Gb optional*
Memory ROM	4Gb 8-bit NAND, 8Gb optional*
Power supply	VBAT:3.3V～4.4V Typical: 3.8V
Power consumption	Typical: 2.6 mA @sleep mode (GNSS off, VBAT=3.8V)
Transmit power	Power Class 3 for WCDMA/LTE/5G NR Power Class 2 for 5G NR(n41/n77/n78/n79)
Antenna	Four antennas for 3G/4G/5G/GNSS(SIM8260C) Five antennas for 3G/4G/5G/GNSS(SIM8260A/E,SIM8380A,SIM8360A) Eight antennas for mmW IF(SIM8380A/E, SIM8360A)
GNSS (optional)	GNSS engine: GPS L1+L5/GLONASS/BeiDou/Galileo/QZSS Protocol: NMEA
SMS	MT, MO, CB, Text and PDU mode SMS storage: (U)SIM card or ME (default) Transmission of SMS alternatively over CS or PS.
(U)SIM interface	Support identity card: 1.8V/ 3.0V Include (U)SIM1 and (U)SIM2 interfaces Support Dual SIM single standby
(U)SIM application toolkit	Support SAT class 3 Support USAT
Phonebook management	Support phonebook types: DC, MC, RC, SM, ME, FD, ON, LD, EN
Digital audio interface	One I2S interface with dedicated main clock for primary digital audio, the I2S also can be configured as PCM ● MCLK frequency: 12.288MHz (default) ● WCDMA AMR-NB ● VoLTE AMR-WB ● Echo cancellation ● Noise suppression
PCIe interface	● Two lane PCIe interfaces, support PCIe Gen 3 (Gen 1/2 compatible), which up to 8Gbps per lane. ● One lane PCIe interfaces, support PCIe Gen 4, which up to 16Gbps per lane.
WLAN/BT interface	Support W82[2] interface, which support 802.11ax with 3.6Gbps, support BT5.2
PMI interface[3]	Support PM7250B interface, which support USB Type-C, QC4.0* and USB-PD3.0*
UART interface	● Default Support up to three UART ● Data rate up to 4 Mbps

I2C interface	● Default Support up to two I2C, meet I2C specification, version 5.0 ● Data rate up to 400 Kbps
SPI interface	● Only support master mode ● Data rate up to 50Mbps
SDIO interface	● Support 4bit SD card or 8bit eMMC, meet SDIO3.0 specification ● 1.8V or 3.0V dual-voltage operation for SD card ● Clock output up to 200 MHz for SD card; up to 100 MHz for eMMC
USB interface	Support one USB controller, USB3.1 Gen2 or USB2.0 USB3.1: super speed, with data rate which up to 10Gbps USB2.0: high speed interface, support USB operations at low-speed and full-speed, which refer to USB1.0 and USB1.1
Firmware upgrade	Firmware upgrade over USB interface
Physical characteristics	Size: 41x43.6x2.8mm SIM8260A weight：11.45g (typical) SIM8260E weight：11.76g (typical) SIM8260C weight：11.96g (typical) SIM8380E weight：11.50g (typical) Other weight: TBD
Temperature range	Normal operation temperature: -30°C to +70°C (3GPP compliant) Extended operation temperature: -40°C to +85°C[3] Storage temperature: -40°C to +90°C

NOTE

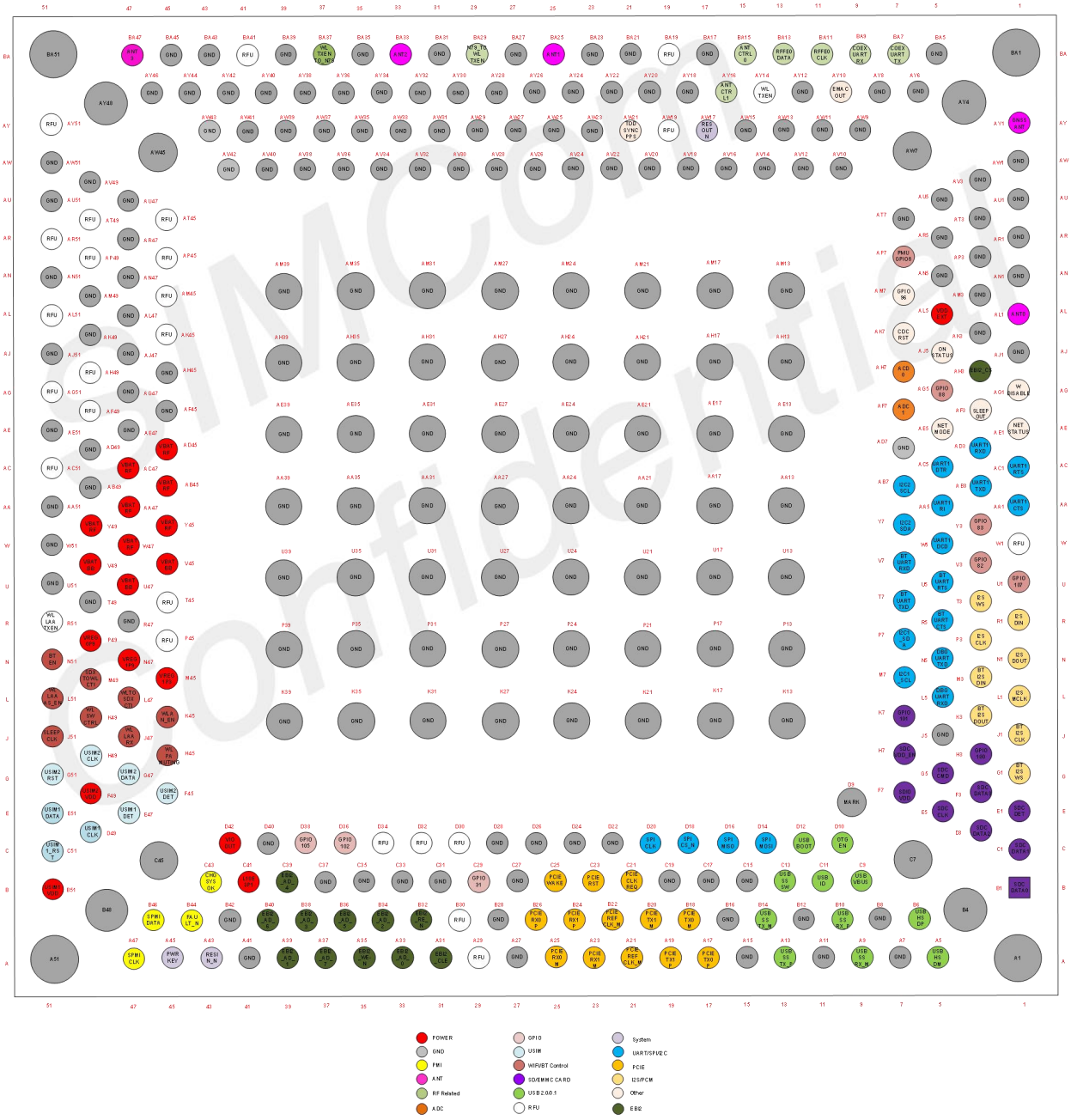
1. “*” means under development,for more information, please connect the SIMCom FAE teams.
2. W82 is SIMCom WiFi-6 module.
3. When Module is within the extended operation temperature range, Module is able to establish and maintain voice, data transmission, SMS and emergency call, etc. The performance may deviate slightly from the 3GPP specifications and will meet 3GPP specifications again when the temperature returns to normal operating temperature levels. It is strongly recommended that customers take heat dissipation measures to ensure that the junction temperature of the chip can’t be exceeded (for example, the temperature of the CPU cannot exceed 105°C).

2 Package Information

2.1 Pin Assignment Overview

All functions of the SIM82X0X and SIM83X0X Series will be provided through 369 LGA pins. The following figure is the pin assignment of the module.

SIM82X0X



SIM83X0X

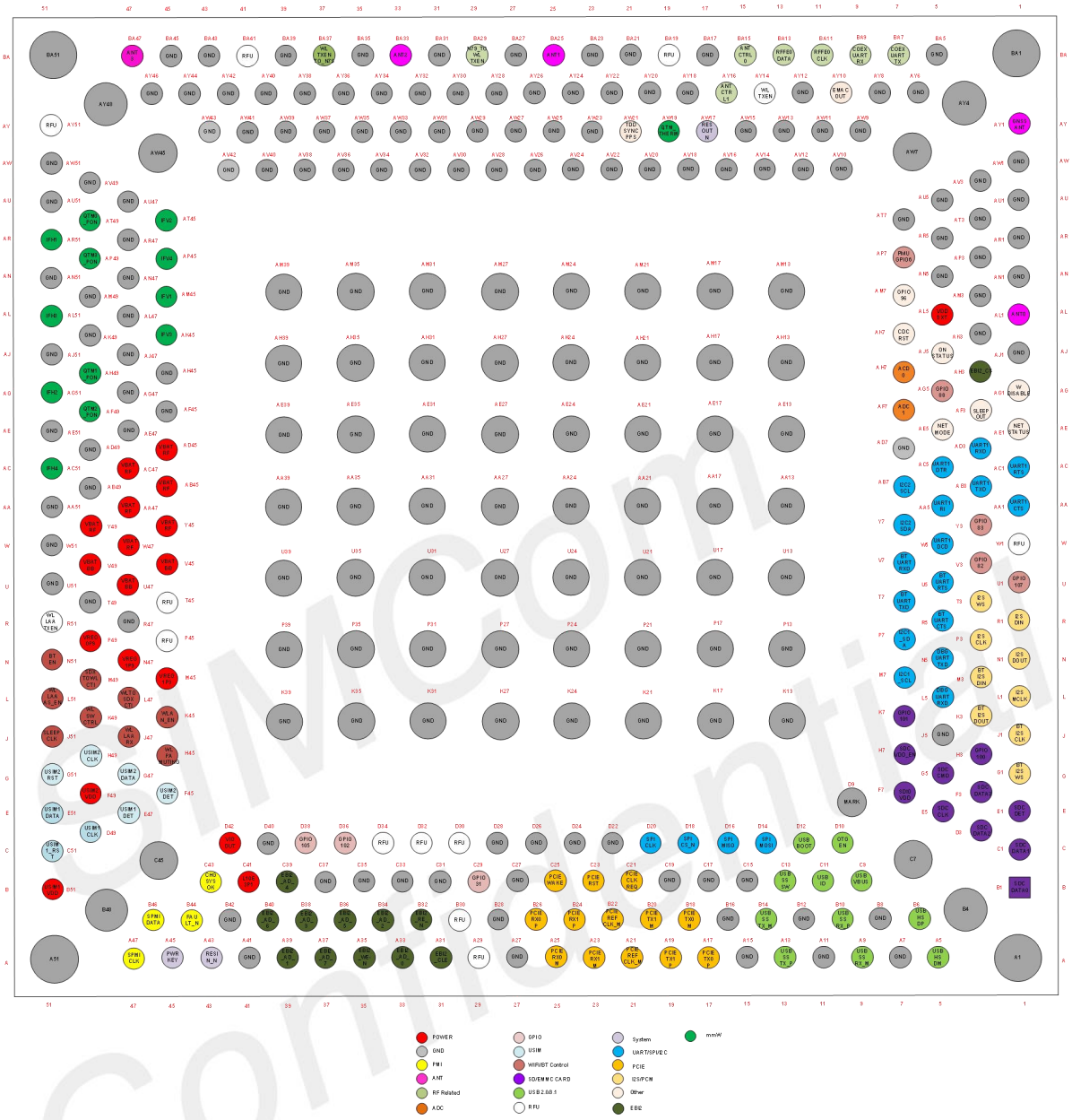


Figure 2: Pin assignment(Top View)

Table 4: Pin differences of SIM82X0X and SIM83X0X

module name / M.2 pin number	SIM8260C	SIM8260A SIM8260E SIM8280A*	SIM8360A* SIM8380E SIM8380A*
AR51	RFU	RFU	IFH1
AG51	RFU	RFU	IFH2
AL51	RFU	RFU	IFH3
AC51	RFU	RFU	IFH4
AM45	RFU	RFU	IFV1
AT45	RFU	RFU	IFV2
AK45	RFU	RFU	IFV3
AP45	RFU	RFU	IFV4
AT79	RFU	RFU	QTM0_PON
AH49	RFU	RFU	QTM1_PON
AF49	RFU	RFU	QTM2_PON
AP49	RFU	RFU	QTM3_PON
AW19	RFU	QTM_THERM	QTM_THERM
BA37	WL_TXEN_TO_N79	RFU	RFU
BA29	N79_TO_WL_TXEN	N79_TO_WL_TXEN	N79_TO_WL_TXEN
AY14	RFU	WL_TX_EN	WL_TX_EN
AY1	RFU	GNSS ANT	GNSS ANT

2.2 Pin Description

Table 5: IO parameters definition

Pin type	Description
PI	Power Input
PO	Power Output
AI	Analog Input
AIO	Analog Input /Output
DIO	Bidirectional Digital Input /Output
DI	Digital Input
DO	Digital Output
PU	Pull Up
PD	Pull Down

Table 6: DC parameters definition

Voltage domain	Parameter		Min	Typ	Max
P2	VDD_P2=1.8V				
	V_{OH}	High level output	1.4V	-	-
	V_{OL}	Low level output	0V	-	0.45V
	V_{IH}	High level input	1.27V	-	2V
	V_{IL}	Low level input	0V	-	0.58V
	R_p	Pull up/down resistor	10K ohm	-	100K ohm
	VDD_P2=3.0V				
	V_{OH}	High level output	2.25V	-	3.0V
	V_{OL}	Low level output	0V	-	0.375V
	V_{IH}	High level input	1.84V	-	3.25V
	V_{IL}	Low level input	0V	-	0.75V
	R_p	Pull up/down resistor	10K ohm	-	100K ohm
P3	VDD_P3=1.8V				
	V_{OH}	High level output	1.35V	-	1.8V
	V_{OL}	Low level output	0V	-	0.45V
	V_{IH}	High level input	1.26V		2.1V
	V_{IL}	Low level input	0V	-	0.6V
	R_p	Pull up/down resistor	20K ohm	-	60K ohm
P4/P5	VDD_P4/P5=1.8V				

	V_{OH}	High level output	1.44V	-	1.8V
	V_{OL}	Low level output	0V	-	0.4V
	V_{IH}	High level input	1.26V	-	2.1V
	V_{IL}	Low level input	0V	-	0.36V
	R_p	Pull up/down resistor	10K ohm	-	100K ohm
	VDD_P4/P5=3.0V				
	V_{OH}	High level output	2.4V	-	3.0V
	V_{OL}	Low level output	0V	-	0.4V
	V_{IH}	High level input	2.1V	-	3.05V
	V_{IL}	Low level input	0V	-	0.6V
	R_p	Pull up/down resistor	10K ohm	-	100K ohm

Table 7: Pin description

Pin name	Pin no.	Electrical description		Description	Comment
Power supply					
VBAT_BB	V45, V49, U47	PI	V_{MAX}= 4.4V V_{TYP} =3.8V V_{MIN}=3 .3V	Input power supply for module's BB part	
VBAT_RF	Y49, AC47, AA47, W47, AD45, AB45, Y45	PI	V_{MAX}= 4.4V V_{TYP} =3.8V V_{MIN}=3 .3V	Input power supply for module's RF part	
VDD_EXT	AL5	PO	V_{TYP} =1.8V	Output power supply for external IO pull up circuits	
VREG_1P3	M45	PO	V_{TYP} =1.28 V	Output power supply for W82 only	
VREG_0P9	P49	PO	V_{TYP} =0.88 V	Output power supply for W82 only	
VREG_1P9	N47	PO	V_{TYP}= 1.88V	Output power supply for W82 and QTM	
L10E_3P1	C41	PO	V_{TYP}= 3.08V	Output power supply for PM7250B USB PD-PHY and USB switch	

VIO_OUT	D42	PO	V_{TYP}= 1.8V	Output power supply for PM7250B IO only	
GND	A7, B8, A11, B12, C15, A15, B16, C17, C19, D22, D24, D26, C27, A27, B28, D28, C31, C33, C35, C37, D40, A41, B42, J5, AD7, AJ1, AK3, AM3, AN1, AN5, AP3, AR1, AR5, AT3, AT7, AU1, AU5, AV3, AW1, R47, T49, U51, W51, AA51, AB49, AD49, AE47, AF45, AH45, AG47, AJ47, AL47, AN47, AR47, AU47, AV49, AW51, AV10, AV12, AV14, AV16, AV18, AV20, AV22, AV24, AV26, AV28, AV30, AV32, AV34, AV36, AV38,A V40, AV42, AW9, AW11, AW13, AW15, AW23, AW25, AW27, AW29, AW31, AW33,AW35, AW37, AW39, AW41, AW43, AY6, AY8, AY12, AY18, AY20, AY22, AY24,AY26, AY28, AY30, AY32, AY34, AY36, AY38, AY40, AY42, AY44, AY46, BA5, BA17, BA21, BA23, BA27, BA31, BA35, BA39, BA43, BA45, AM13, AM17, AM21, AM24, AM27, AM31, AM35, AM39, AH13, AH17, AH21, AH24, AH27, AH31, AH35, AH39, AE13, AE17, AE21, AE24, AE27, AE31, AE35, AE39, AA13, AA17, AA21, AA24, AA27, AA31, AA35, AA39, U13, U17, U21, U24, U27, U31, U35, U39, P13, P17, P21, P24, P27, P31, P35, P39, K13, K17, K21, K24, K27, K31, K35, K39, A1, B4, C7, A51, B48, C45, BA1, AY4, AW7, BA51, AY48, AW45, AM49, AK49, AE51, AJ51, AN51, AU51				
System control					
PWRKEY	A45	DI	1.1V	Power on/off the module, active low	Pull up to 1.2V internally without PM7250B
RESIN_N	A43	DI	P3	Reset the module, active low	Pull up to 1.8V inside the module
Status indicator					
STATUS	AJ5	DO	P3	Indicate Module is on	PMU_GPIO_13
NET_STATUS	AE1	DO	P3	Indicate network activity status of the module	PMU_GPIO_14
TDD_SYNC_PPS	AW21	DO	P3	1.It can generate pulse use for indication NSA and SA sub6 the beginning frame flag of DL-UL 2.TDD_SYNC_PPS Can be Configuration to GPS_1PPS	1.8V voltage domain. The TDD_SYNC_PPS and GPS_1PPS function can't be used at the same time. GPIO_32
USB_BOOT	D12	DI	P3	Module will be forced into USB boot mode by connect to VDD_EXT externally	GPIO_42, this pin can't be pulled up before power on
W_DISABLE	AG1	DI	P3	Flight mode control input active low	GPIO_86
SLEEP_OUT	AF3	DO	P3	Module in Sleep mode output signal to external AP active high	GPIO_97
USB interface					
USB_VBUS	C9	AI		USB VBUS detection	Not support charge
USB_HS_DP	B6	AIO		Differential USB bi-directional data plus	Required 85Ω differential impedance
USB_HS_DM	A5	AIO		Differential USB bi-directional data minus	Compliant with USB 2.0 standard specifications

USB_SS_TX_P	A13	AO		USB3.1 super-speed transmit data plus	Required 85Ω differential Impedance Compliant with USB 3.1 standard specifications
USB_SS_TX_M	B14	AO		USB3.1 super-speed transmit data minus	
USB_SS_ RX_P	B10	AI		USB3.1 super-speed receive data plus	
USB_SS_RX_M	A9	AI		USB3.1 super-speed receive data minus	
USB_ID*	C11	DI	P3	USB ID	If unused, please keep open
OTG_EN*	D10	DO	P3	USB OTG power supply DC-DC enable signal	
USB_SS_SW	C13	DO	P3	USB Type-C switch control signal, Used without PM7250B	
PM7250B interface[2]					
CHG_SYS_OK	C43	DI		When charger input is inserted, PM7250B output signal to Module. When the charging chip is not used, this pin can be connected to GND to realize the power-on function	
FAULT_N	B44	DIO		Used to send/receive the fault condition across all PMICs in the chipset	
SPMI_CLK	A47	DO		SPMI communication bus clock signal	Required 50Ω impedance
SPMI_DATA	B46	DIO		SPMI communication bus data signal	
(U)SIM interface					
(U)SIM1_VDD	B51	PO	P4	Power supply for (U)SIM1 card	1.8/3.0V voltage domain, (U)SIM interface should be protected against ESD. If unused, please keep open
(U)SIM1_DATA	E51	DIO	P4	(U)SIM1 card data signal, which has been pulled up to (U)SIM1_VDD by a 20K resistor in Module	
(U)SIM1_CLK	D49	DO	P4	(U)SIM1 clock signal	
(U)SIM1_RST	C51	DO	P4	(U)SIM1 reset signal	
(U)SIM1_DET	E47	DI	P3	(U)SIM1 card detect signal, which need pulled up to VDD_EXT by a 470K resistor externally	
(U)SIM2_VDD	F49	PO		Power supply for (U)SIM2 card	

(U)SIM2_DATA	G47	DIO	P5	(U)SIM2card data, which has been pulled up to (U)SIM2_VDD by a 20K resistor in Module	
(U)SIM2_CLK	H49	DO	P5	(U)SIM2 clock signal	
(U)SIM2_RST	G51	DO	P5	(U)SIM2 reset signal	
(U)SIM2_DET	F45	DI	P3	(U)SIM2 card detect, which need pulled up to VDD_EXT by a 470K resistor externally	
SPI interface					
SPI_CS_N	D18	DO	P3	SPI chips select	
SPI_CLK	D20	DO	P3	SPI clock	
SPI_MOSI	D14	DO	P3	Master output slaver input	
SPI_MISO	D16	DI	P3	Master input slaver output	
UART1 interface					
UART1_CTS	AA1	DI	P3	Clear to send	Default use for AT command
UART1_RTS	AC1	DO	P3	Request to send	
UART1_TXD	AB3	DO	P3	Transmit data	
UART1_RXD	AD3	DI	P3	Receive data	
UART1_DCD	W5	DO	P3	Carrier detect	If not need 7-wire UART, these signals can be used as GPIO
UART1_RI	AA5	DO	P3	Ring indicator	
UART1_DTR	AC5	DI	P3	Data terminal ready	
BT UART interface					
BT_UART_CTS	R5	DI	P3	Clear to send	Default use for BT
BT_UART_RTS	U5	DO	P3	Request to send	
BT_UART_TXD	T7	DO	P3	Transmit data	
BT_UART_RXD	V7	DI	P3	Receive data	
Debug UART interface					
DBG_UART_RXD	L5	DI	P3	Receive data	Used for debug only
DBG_UART_TXD	N5	DO	P3	Transmit data	
I2C interface[1]					
I2C1_SCL	M7	OD	P3	I2C1 clock signal	I2C1 default use for codec Pull up to VDD_EXT externally
I2C1_SDA	P7	OD	P3	I2C1 data signal	
I2C2_SCL	AB7	OD	P3	I2C2 clock signal	I2C2 default use for sensor Pull up to VDD_EXT Externally FOR EBI LCD PIN AB7 GPIO84 for EBI LCD_TE PIN Y7 GPIO85 for EBI LCD_RESET
I2C2_SDA	Y7	OD	P3	I2C2 data signal	

BT I2S interface					
BT_ I2S_DOUT	K3	DO	P3	I2S data output	Default use for W82
BT_ I2S_DIN	M3	DI	P3	I2S data input	
BT_I2S_CLK	J1	DO	P3	I2S bit clock	
BT_ I2S_WS	G1	DO	P3	I2S word select	
I2S Audio Codec interface					
I2S_DOUT/ PCM_DOUT	N1	DO	P3	I2S/PCM data output	Default is I2S interface, can be configured as PCM interface by software. If unused, please keep open
I2S_DIN/ PCM_DIN	R1	DI	P3	I2S/PCM data input	
I2S_CLK/ PCM_CLK	P3	DO	P3	I2S/PCM clock output	
I2S_WS/ PCM_SYNC	T3	DIO	P3	I2S word select/ PCM synchronous signal	
I2S_MCLK	L1	DO	P3	I2S master clock output	
CDC_RST_N	AK7	DO	P3	Module reset the external codec active low	Soft Default not supported
ADC interface					
ADC0	AH7	AI		Analog to digital converter input0	For EBI LCD_backlight_contrl
ADC1	AF7	AI		Analog to digital converter input1	
PCIe interface					
PCIe_REFCLK_P	B22	AIO		PCIe reference clock plus	Required 85Ω differential impedance
PCIe_REFCLK_M	A21	AIO		PCIe reference clock minus	
PCIe_TX0_M	B18	AO		PCIe transmit0 minus	
PCIe_TX0_P	A17	AO		PCIe transmit0 plus	
PCIe_TX1_M	B20	AO		PCIe transmit1 minus	
PCIe_TX1_P	A19	AO		PCIe transmit1 plus	
PCIe_RX0_M	A25	AI		PCIe receive0 minus	
PCIe_RX0_P	B26	AI		PCIe receive0 plus	
PCIe_RX1_M	A23	AI		PCIe receive1 minus	
PCIe_RX1_P	B24	AI		PCIe receive1 plus	
PCIe_CLKREQ	C21	DIO	P3	PCIe clock request input low	CLKREQ and WAKE need pull up to VDD_EXT externally; When there is an external level conversion chip, CLKREQ,WAKE, RST all need to be pulled up Default as RC mode
PCIe_WAKE	C25	DI	P3	PCIe wake-up input low	
PCIe_RST	C23	DO	P3	PCIe reset output low	

W82 control interface[2]					
WL_SW_CTRL	K49	DI	P3	W82 switch control	If unused, please keep open
SDX_TO_WL_CTI	M49	DO	P3	W82 GPIO	
WL_TO_SDX_CTI	L47	DI	P3	W82 GPIO	
WL_PA_MUTING	H45	DO	P3	WLAN XFEM control for PA mute	
SLEEP_CLK	J51	DO		Sleep clock output for W82 only	
BT_EN	N51	DO	P3	W82 BT enable	If unused, please PD 10k
WL_EN	K45	DO	P3	WLAN enable	
WL_LAA_RX	J47	DO	P3	WLAN XFEM control for LAA receiver	SIM8260C not support LAA, unused please PD 10k to GND
WL_LAA_AS_EN	L51	DO	P3	WLAN LAA AS enable	
COEX_UART_TXD	BA7	DO	P3	LTE&WLAN coexistence data transmit	LTE coexistence signals
COEX_UART_RXD	BA9	DI	P3	LTE&WLAN coexistence data receive	
WL_TXEN_TO_N79	BA37	DI	P3	From Module N79 to the W82	N79 and WIFI coexistence signals SIM8260E/A unused, please keep open
N79_TO_WL_TXEN	BA29	DO	P3	From the W82 to Module N79	
WL_LAA_TX_EN	R51	DO	P3	From Module to the W82	SIM8260C/E/A unused, please keep open
WL_TX_EN	AY14	DI	P3	From the W82 to Module	SIM8260C unused, please keep open
SDIO interface					
SDIO_VDD[3]	F7	PI	1.8/3.0V	Power input for internal SDIO circuit	
SDIO_DATA0	B1	DIO	P2	SDC data bit 0 or eMMC data bit 0	Required 45Ω impedance and length match<1mm Layout bus length <15mm(208MHZ) <100mm(50MHZ) SD card can support 1.8V/3.3V, but eMMC only support 1.8V
SDIO_DATA1	C1	DIO	P2	SDC data bit 1 or eMMC data bit 1	
SDIO_DATA2	D3	DIO	P2	SDC data bit 2 or eMMC data bit 2	
SDIO_DATA3	F3	DIO	P2	SDC data bit 3 or eMMC data bit 3	
SDIO_CMD	G5	DIO	P2	SDC command output	
SDIO_CLK	E5	DO	P2	SDC clock output	
SDIO_VDD_EN	H7	DO	P3	Enable the SD card power or eMMC data bit 4	
SDIO_DET	E1	DI	P3	SD card insertion detect or eMMC data bit 5	

GPIO100	H3	DIO	P3	eMMC data bit 6	
GPIO101	K7	DIO	P3	eMMC data bit 7	
RESOUT_N	AW17	DO	P3	eMMC RST_N	
EBI2 interface					
EBI2_AD_0	A33	DO	P3	EBI2 data0	
EBI2_AD_1	A39	DO	P3	EBI2 data1	Required 50Ω impedance, Standard software not supported EBI2 interface The EBI2 interface and the internal NAND of the module share the interface, there can be no pull-up or pull-down externally, and the external length is preferably less than 100mm
EBI2_AD_2	B34	DO	P3	EBI2 data2	
EBI2_AD_3	B38	DO	P3	EBI2 data3	
EBI2_AD_4	C39	DO	P3	EBI2 data4	
EBI2_AD_5	B36	DO	P3	EBI2 data5	
EBI2_AD_6	B40	DO	P3	EBI2 data6	
EBI2_AD_7	A37	DO	P3	EBI2 data7	
EBI2_WE_N	A35	DO	P3	EBI2_WE_N	
EBI2_ CLE	A31	DO	P3	EBI2_ CLE	
EBI2_RE_N	B32	DI	P3	EBI2_RE_N	
EBI2 _CS	AH3	DI	P3	EBI2_LCD_CS	
mmW interface					
IFH1	AR51	AIO		Horizontal polarization IF output signal and control signal for mmW RFIC device 1	If unused, please keep open
IFH2	AG51	AIO		Horizontal polarization IF output signal and control signal for mmW RFIC device 2	
IFH3	AL51	AIO		Horizontal polarization IF output signal and control signal for mmW RFIC device 3	
IFH4	AC51	AIO		Horizontal polarization IF output signal and control signal for mmW RFIC device 4	
IFV1	AM45	AIO		Vertical polarization IF output signal and local oscillator (LO) signal for mmW RFIC device 1	
IFV2	AT45	AIO		Vertical polarization IF output signal and local oscillator (LO) signal for mmW RFIC device 2	
IFV3	AK45	AIO		Vertical polarization IF output	

				signal and local oscillator (LO) signal for mmW RFIC device 3	
IFV4	AP45	AIO		Vertical polarization IF output signal and local oscillator (LO) signal for mmW RFIC device 4	
QTM0_PON	AT49	DO	P3	Power on/reset 0 for QTM module	
QTM1_PON	AH49	DO	P3	Power on/reset 1 for QTM module	
QTM2_PON	AF49	DO	P3	Power on/reset 2 for QTM module	
QTM3_PON	AP49	DO	P3	Power on/reset 3 for QTM module	
QTM_THERM	AW19	AI		QTM thermal detect	Only QTM547 support thermal detect If unused, please keep open
GPIO interface					
GPIO106	AY10	DIO	P3	Used for GPIO	
GPIO47	AE5	DIO	P3	Used for GPIO	
GPIO105	D38	DIO	P3	Used for GPIO	
GPIO31	C29	DIO	P3	Used for GPIO	
GPIO102	D36	DIO	P3	Used for GPIO	
GPIO107	U1	DIO	P3	Used for GPIO	
GPIO82	V3	DIO	P3	Used for GPIO	
GPIO83	Y3	DIO	P3	Used for GPIO	
GPIO88	AG5	DIO	P3	Used for GPIO	
GPIO96	AM7	DIO	P3	Used for GPIO	
PMU_GPIO6	AP7	DIO	1.8V	Used for GPIO	
Antenna control interface[4]					
RFFE0_CLK	BA11	DO	P3	Antenna tuner MIPI CLK	Required 50Ω impedance
RFFE0_DATA	BA13	DIO	P3	Antenna tuner MIPI DATA	
ANT_CTRL0	BA15	DO	P3	Antenna tuner control0	
ANT_CTRL1	AY16	DO	P3	Antenna tuner control1	
ANT interface					
GNSS ANT	AY1	AI		Receiving GNSS signals 1166MHz~1229MHz 1565MHz~1610MHz	SIM8260E/SIM8260A /SIM8380A/SIM8280A/SIM8360A has independent GNSS antenna
SIM8260C Module					

ANT0	AL1	AIO		4G/5G LB/MHB TRX0, 5G N41 TRX1 5G N78/79 TX1/DRX	617MHz~960MHz 1452MHz~2690MHz 3300MHz~5000MHz
ANT1	BA25	AI		4G/5G LB/MHB DRX, 5G N78/79 DRX_MIMO,	617MHz~960MHz 1710MHz~2690MHz 3300MHz~5000MHz
ANT2	BA33	AI		4G/5G MHB DRX_MIMO, 5G N78/79 PRX_MIMO, GNSS L1	1452MHz~2690MHz 3300MHz~5000MHz
ANT3	BA47	AIO		4G/5G MHB PRX_MIMO, 5G N41/78/79 TRX0	1710MHz~2690MHz 3300MHz~5000MHz
SIM8260E Module					
ANT0	AL1	AIO		4G/5G LB/MHB TX0/DRX, 5G N77/78/79 TX0/DRX_MIMO	703MHz~960MHz 1452MHz~2690MHz 3300MHz~5000MHz
ANT1	BA25	AI		4G/5G MHB DRX_MIMO, 5G N77/78/79 DRX 4G LAA DRX	1805MHz~2690MHz 3300MHz~5925MHz
ANT2	BA33	AI		4G/5G MHB PRX_MIMO, 5G N77/78/79 PRX_MIMO, 4G LAA PRX	1805MHz~2690MHz 3300MHz~5925MHz
ANT3	BA47	AIO		4G/5G LB TX1/PRX, 5G MHB TX1/DRX, 5G N77/78/79 TX1/PRX	703MHz~960MHz 1452MHz~2690MHz 3300MHz~5000MHz
SIM8260A Module					
ANT0	AL1	AIO		4G/5G LB/MHB TX0/DRX, 5G N77/78/79 TX0/DRX_MIMO	617MHz~894MHz 1710MHz~2690MHz 3300MHz~5000MHz
ANT1	BA25	AI		4G/5G MHB DRX_MIMO, 5G N77/78/79 DRX 4G LAA DRX	1930MHz~2690MHz 3300MHz~5925MHz
ANT2	BA33	AI		4G/5G MHB PRX_MIMO, 5G N77/78/79 PRX_MIMO, 4G LAA PRX	1930MHz~2690MHz 3300MHz~5925MHz
ANT3	BA47	AIO		4G/5G LB TX1/PRX, 5G MHB TX1/DRX, 5G N77/78/79 TX1/PRX	617MHz~894MHz 1710MHz~2690MHz 3300MHz~5000MHz
SIM8360A Module					
ANT0	AL1	AIO		4G/5G LB/MHB TX0/DRX, 5G N77/78/79 TX0/DRX_MIMO	617MHz~894MHz 1710MHz~2690MHz 3300MHz~5000MHz
ANT1	BA25	AI		4G/5G MHB DRX_MIMO, 5G N77/78/79 DRX 4G LAA DRX	1930MHz~2690MHz 3300MHz~5925MHz
ANT2	BA33	AI		4G/5G MHB PRX_MIMO, 5G N77/78/79 PRX_MIMO, 4G LAA PRX	1930MHz~2690MHz 3300MHz~5925MHz
ANT3	BA47	AIO		4G/5G LB TX1/PRX, 5G MHB TX1/DRX, 5G N77/78/79 TX1/PRX	617MHz~894MHz 1710MHz~2690MHz 3300MHz~5000MHz
SIM8380E Module*					
ANT0	AL1	AIO		3G MB TRX 4G LB DIV	1920MHz~1980MHz 824MHz~960MHz

				4GMHB TRX 5G N78/N79 UL/DL-MIMO2	1920MHz~2690MHz 3300MHz~5000MHz
ANT1	BA25	AI		4G MHB DL-MIMO2 5G N78/N79 DIV	1920MHz~2690MHz 3300MHz~5925MHz
ANT2	BA33	AI		4G MHB DL-MIMO1 5G N78/N79 DL-MIMO1	1920MHz~2690MHz 3300MHz~5925MHz
ANT3	BA47	AIO		3G MB DIV 4G LB TRX 4G MHB DIV 5G N78/N79 TRX	1920MHz~1980MHz 824MHz~960MHz 1920MHz~2690MHz 3300MHz~5000MHz
SIM8280A Module*					
ANT0	AL1	AIO		4G/5G LB/MHB TX0/DRX, 5G N77/78/79 TX0/DRX_MIMO	617MHz~894MHz 1710MHz~2690MHz 3300MHz~5000MHz
ANT1	BA25	AI		4G/5G MHB DRX_MIMO, 5G N77/78/79 DRX 4G LAA DRX	1930MHz~2690MHz 3300MHz~5925MHz
ANT2	BA33	AI		4G/5G MHB PRX_MIMO, 5G N77/78/79 PRX_MIMO, 4G LAA PRX	1930MHz~2690MHz 3300MHz~5925MHz
ANT3	BA47	AIO		4G/5G LB TX1/PRX, 5G MHB TX1/DRX, 5G N77/78/79 TX1/PRX	617MHz~894MHz 1710MHz~2690MHz 3300MHz~5000MHz
SIM8380A Module*					
ANT0	AL1	AIO		4G/5G LB/MHB TX0/DRX, 5G N77/78/79 TX0/DRX_MIMO	617MHz~894MHz 1710MHz~2690MHz 3300MHz~5000MHz
ANT1	BA25	AI		4G/5G MHB DRX_MIMO, 5G N77/78/79 DRX 4G LAA DRX	1930MHz~2690MHz 3300MHz~5925MHz
ANT2	BA33	AI		4G/5G MHB PRX_MIMO, 5G N77/78/79 PRX_MIMO, 4G LAA PRX	1930MHz~2690MHz 3300MHz~5925MHz
ANT3	BA47	AIO		4G/5G LB TX1/PRX, 5G MHB TX1/DRX, 5G N77/78/79 TX1/PRX	617MHz~894MHz 1710MHz~2690MHz 3300MHz~5000MHz
RFU PIN					
RFU	BA41, AY51, BA19, B30, A29, D32, D30, D34, T45, P45, W1				Reserved for future use
MARK	D9				PIN used inside the module, keep it floating externally

NOTE

1. The I2C signals need pull up to VDD_EXT by 2.2K resistors out of the module.
2. Only used to W82 and PM7250B pins don't use as other circuits.
3. If not use SDIO function, the SDIO_VDD pin should connect to VDD_EXT out of the module.
4. Please confirm with SIMCom for the detail design about Antenna control interface.
5. "*" means under development, for more information, please connect the SIMCom FAE support team.

- RFU pins should keep open.
- Recommend add ESD protect components to the interface that is touched by human hands. (e. g. SIM/SD/USB/BUTTOM/ANT)
- The GPIO MAX voltage is 2.1V, if exceeded, may cause permanent damage to the module.
- All GND pins should be connected to the customer's main PCB.
- For SIM8260C module PIN AY1, AY14 RFU,
  for SIM8260E/ SIM8260A/SIM8360A/SIM8380E/SIM8280A/SIM8380A module BA37 RFU.

2.3 Mechanical Dimensions

The following figure shows the mechanical dimensions of SIM82X0X and SIM83X0X Series.

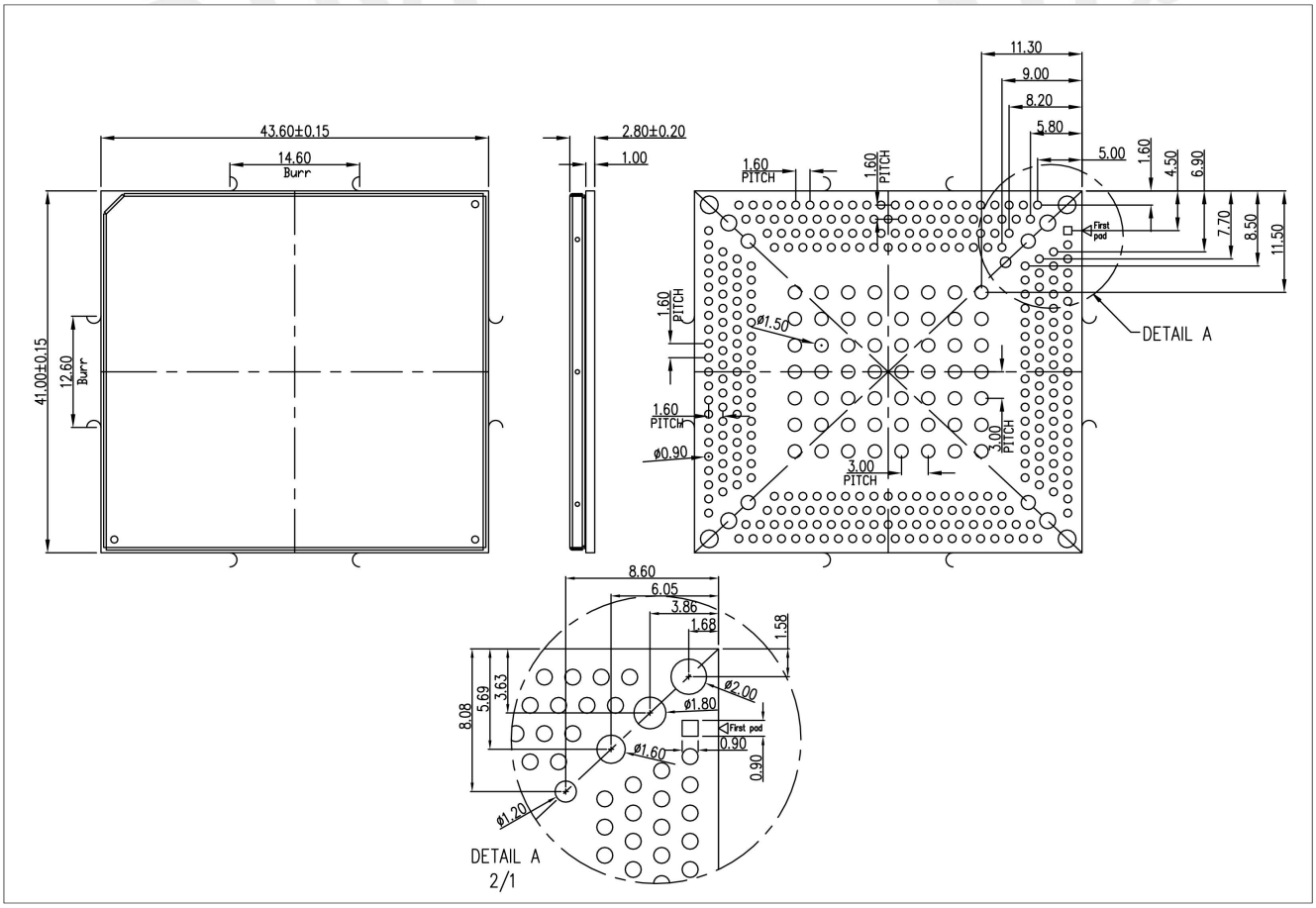


Figure 3: Dimensions of SIM82X0X and SIM83X0X Series (unit: mm)

3 Interface Application

3.1 Power Supply

The recommended power supply for SIM82X0X and SIM83X0X Series is 3.8V and the voltage range from 3.3V to 4.4V. It is necessary to ensure that the voltage of VABT cannot be lower than 3.3V after the maximum voltage drop. the module will be powered off automatically. The max voltage is not higher than 4.4V, otherwise the module may be permanently damaged.
The module has 3 BB power pins, 7 RF power pins and 10 power ground pins, to ensure the module works normally, all power and ground pins should be connected.

Table 8: VBAT pins electronic characteristics

Symbol	Description	Min.	Typ.	Max.	Unit
VBAT[1]	Module power supply voltage	3.3	3.8	4.4	V
I_{peak}	Peak current	-	-	1.8	A
$I_{peak\ (QTM545)}$	Peak current at maximum power	-	-	1.0	A
$I_{peak\ (QTM547)}$	Peak current at maximum power	-	-	TBD	A
I_{sleep}	Current in sleep mode	-	4.5	-	mA
$I_{leakage}$	Current in power off mode	-	135	-	uA

NOTE

1. The VBAT include VBAT_BB and VBAT_RF pins in this document.
2.If the customer uses the charging chip PM7250B and the software with charging function, when the power supply voltage is lower than 3.3V, the module will not be powered on. If the customer wants o power on the module, the charger must be plugged in.

3.1.1 Power Supply Design Guide

When B3(20MHz) and N79(100MHz) ENDC combination are connected under the instrument, the peak current can reach to 1.8A at 3.8V power supply. In order to ensure that the VBAT voltage is no less than required 3.3V when the module at maximum power radio transmission, and considering the voltage drop and conversion efficiency, it is strongly recommended that the DC-DC or LDO output capacity should not be less than 3A.

For the SIM8380X module, when using 3.8V power supply, in order to ensure that the module is in the maximum transmit power mode, the minimum voltage after the power supply voltage drops cannot be lower than 3.3V, If it is matched with QTM545, it is strongly recommended that the DC-DC output current capability selected during design is not less than 5A. If it is matched with QTM547, it is strongly recommended that the DC-DC output current capability selected during design is not less than 16A.

This chapter is under development. The indicated peak power consumption data is an estimated value, not the final measured data. The data will be supplemented by subsequent versions.

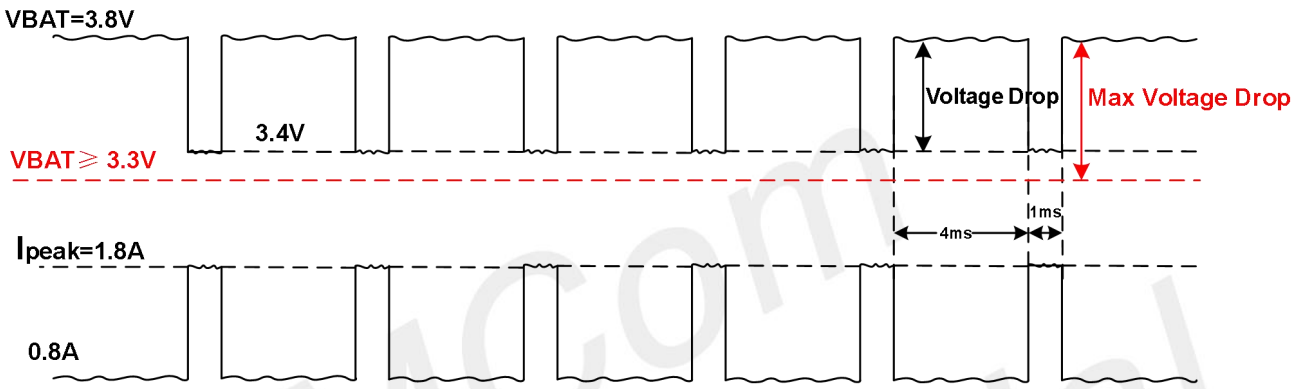


Figure 4: Power consumption at ENDC combination of B3 (20MHz) and N79 (100MHz)

NOTE

Test conditions

- The total capacitors of VBAT net are not less than 640uF.
- The peak current is only the current consumption of the module, don't include the current consumption of other devices outside the module.
- The I_{peak} and voltage drop data in Table and Figure above were tested using SIMCom EVB and connecting instrument at 3.8V power supply, the ENDC combination is B3 (20MHz) and N79 (100MHz), subcarrier spacing is 30KHz.
- The B3 (20MHz) and N79 (100MHz) ENDC combination is the max power consumption of the module.

When WLAN and Ethernet functions are added according to SIMCOM's reference design, the peak current of the entire system can reach 2.6A. For ensure the normal operation of the module and peripherals, it is strongly recommended that the DC-DC or LDO output capacity is not less than 3A.

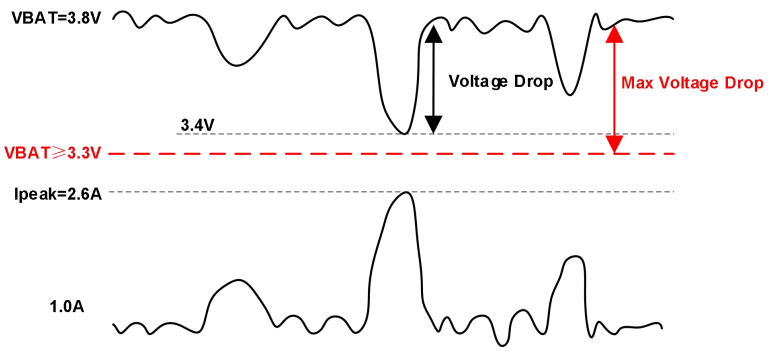


Figure 5: Power consumption of entire systeam

NOTE

Test conditions

- The above current consumption data is measured using SIMCOM EVB.
- The test current consumption data includes SIM82X0X and SIM83X0X Series module, SIMCom WLAN module W82 and Ethernet PHY RTL8125B, to be added in subsequent versions.

To decrease the voltage dropping, make sure that the capacitors of VBAT net must not less than 640uF. The following figure shows the reference circuit of power supply for the VBAT.

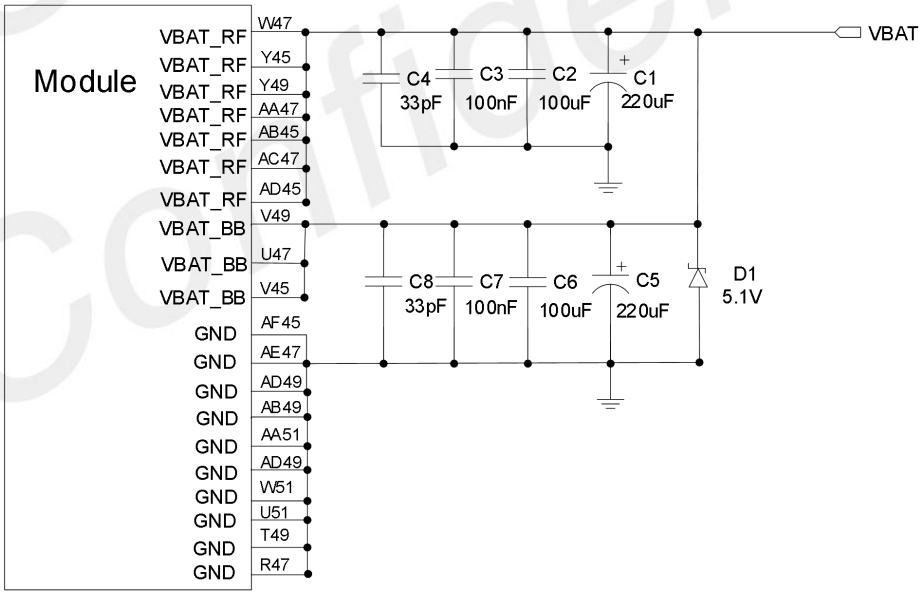


Figure 6: Power supply reference circuit

Table 9: Definition of VBAT and GND pins

Pin name	Pin no.	Electrical description	Description	Comment
VBAT_BB	V45,	PI	V_{MAX}=4.4V	Input power supply

	V49, U47		V_{TYP} =3.8V V_{MIN}=3.3V	for module's BB part
VBAT_RF	Y49, AC47, AA47, W47, AD45, AB45, Y45	PI	V_{MAX}=4.4V V_{TYP} =3.8V V_{MIN}=3.3V	Input power supply for module's RF part
GND	A7,B8,A11,B12,C15,A15,B16,C17,C19,D22,D24,D26,C27,A27,B28,D28,C31,C33,C35,C37,D40,A41,B42,J5,AD7,AJ1,AK3,AM3,AN1,AN5,AP3,AR1,AR5,AT3,AT7,AU1,AU5,AV3,AW1,R47,T49,U51,W51,AA51,AB49,AD49,AE47,AF45,AH45,AG47,AJ47,AL47,AN47,AR47,AU47,AV49,AW51,AV10,AV12,AV14,AV16,AV18,AV20,AV22,AV24,AV26,AV28,AV30,AV32,AV34,AV36,AV38,AV40,AV42,AW9,AW11,AW13,AW15,AW23,AW25,AW27,AW29,AW31,AW33,AW35,AW37,AW39,AW41,AW43,AY6,AY8,AY12,AY18,AY20,AY22,AY24,AY26,AY28,AY30,AY32,AY34,AY36,AY38,AY40,AY42,AY44,AY46,BA5,BA17,BA21,BA23,BA27,BA31,BA35,BA39,BA43,BA45,AM13,AM17,AM21,AM24,AM27,AM31,AM35,AM39,AH13,AH17,AH21,AH24,AH27,AH31,AH35,AH39,AE13,AE17,AE21,AE24,AE27,AE31,AE35,AE39,AA13,AA17,AA21,AA24,AA27,AA31,AA35,AA39,U13,U17,U21,U24,U27,U31,U35,U39,P13,P17,P21,P24,P27,P31,P35,P39,K13,K17,K21,K24,K27,K31,K35,K39,A1,B4,C7,A51,B48,C45,BA1,AY4,AW7,BA51,AY48,AW45,AM49,AK49,AE51,AJ51,AN51,AU51			

NOTE

- Both C1 and C5 are 220 μF tantalum capacitor (ESR=0.7Ω).
- C3, C4, C7 and C8 are multi-layer ceramic chip (MLCC) capacitors from 33pF to 1uF with low ESR in high frequency band, which can be used for EMC performance.
- D1 is used for surge protection.
- Pins AF45, AE47, AD49, AB49, AA51, AD49, W51, U51, T49 and R47 of GND are the main ground for power return.

Table 10: Recommended D1 list

Name	Manufacturer	Part number
D1	LRC	LEDZ5.1BT1G
	Prisemi	PZ5D4V2H

Power supply layout guidelines:

- Both VBAT and return path should be as short and wide as possible to minimize the voltage drop.
- The width of VBAT_BB trace should be no less than 1.5mm, and the width of VBAT_RF trace should be no less than 2mm. ESR<20mΩ
- These capacitors should be placed as closely as possible to the VBAT_BB and VBAT_RF pins.
- The VBAT trace should pass through Zener diode and capacitors, and then pass through the VBAT

pins. The small value capacitors should be placed close to the VBAT pins.

- The customer's PCB design must have a solid ground plane throughout the board as the primary reference plane for most signals.

3.1.2 Recommended Power Supply Circuit

It is recommended to use a switching mode power supply or a linear regulator power supply. Make sure it can provide the current up to 3A at least.

For SIM8380A ,SIM8360A and SIM8380E, it is recommended to use a switching mode power supply, make sure it can provide the current up to 16A at least.

The following figure shows the linear regulator reference circuit with 5V input and 3.8V output.

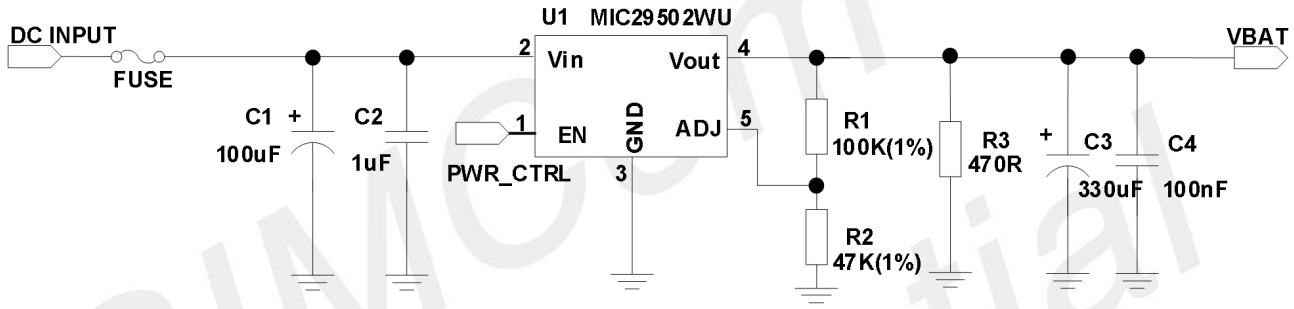


Figure 7: Linear regulator reference circuit

NOTE

- An extra minimum load of R3 is required, to ensure it work properly under light load in sleep mode and power off mode. For the details about minimum load, please refer to specification of MIC29502WU.

Table 11: Recommended power chip list

Name	Manufacturer	Model
U1	MICREL	MIC29502WU

The following figure shows the switching mode power supply reference circuit with 5~12V input and 3.8V output.

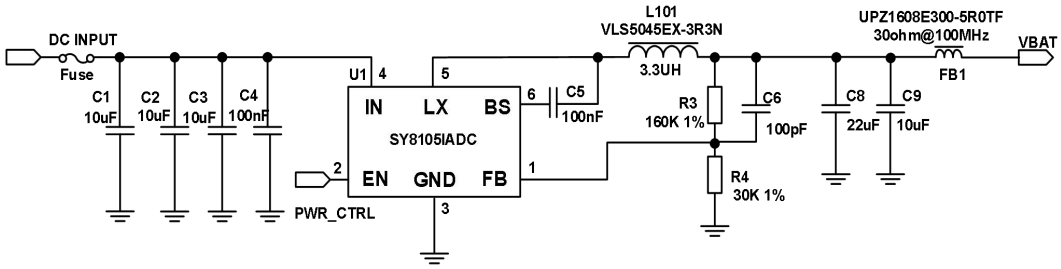


Figure 8: Switching mode power supply reference circuit

The following figure shows the switching mode power supply reference circuit with 8.8~16V input and 3.8V output.

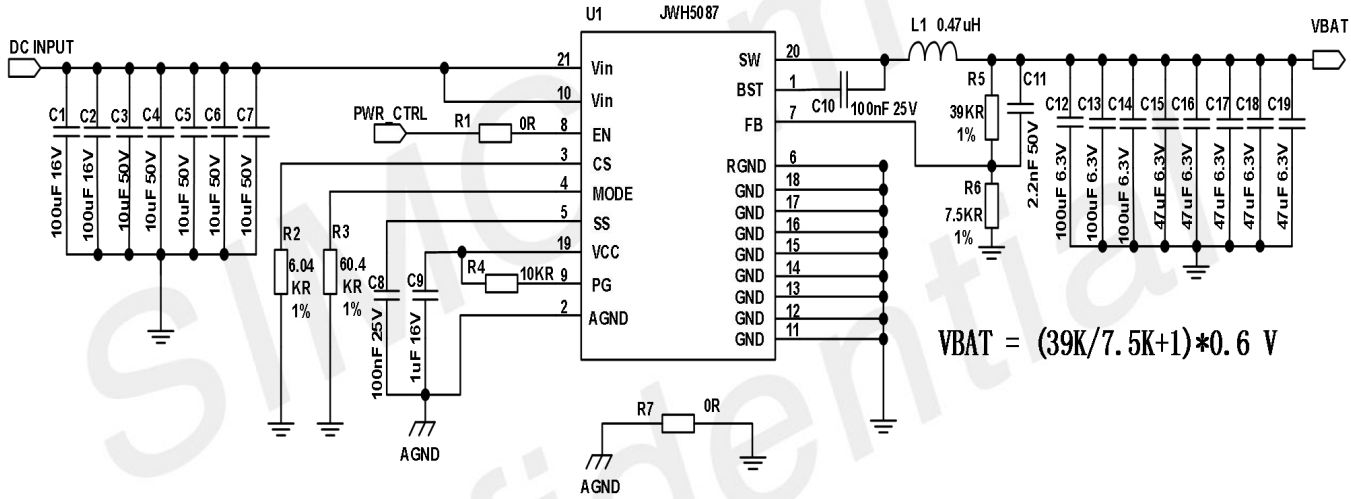


Figure 9: Switching mode power supply reference circuit for mmW

NOTE

- In order to avoid damaging the module, please do not switch off the power supply when module works normally. Only after the module is shut down by PWRKEY or AT command, then the power supply can be cut off.
- It is suggested that customer's design should have the ability to switch off the power supply for module in abnormal state, and then switch on the power to restart the module.
- The PWR_CTRL signal recommend connect to the host and can be controlled.

Table 12: Recommended chip list

Name	Manufacturer	Model
Ferrite bead	Sunlord	UPZ1608E300-5R0TF

Power inductor	Coilcraft	XAL1010-451ME

3.1.3 Voltage Monitor

To monitor the VBAT voltage, the AT command “AT+CBC” can be used.

NOTE

- For more details about voltage monitor commands, please refer to Document [1] in the appendix.

3.2 Power On and Off Module

3.2.1 Power On

Drive the PWRKEY pin to a low level and hold it for 2 seconds, then release, the module will be powered on. This pin is already pulled up internally. The power on timing and electrical characteristics are listed in the following table, and the following figure shows the power on circuit.

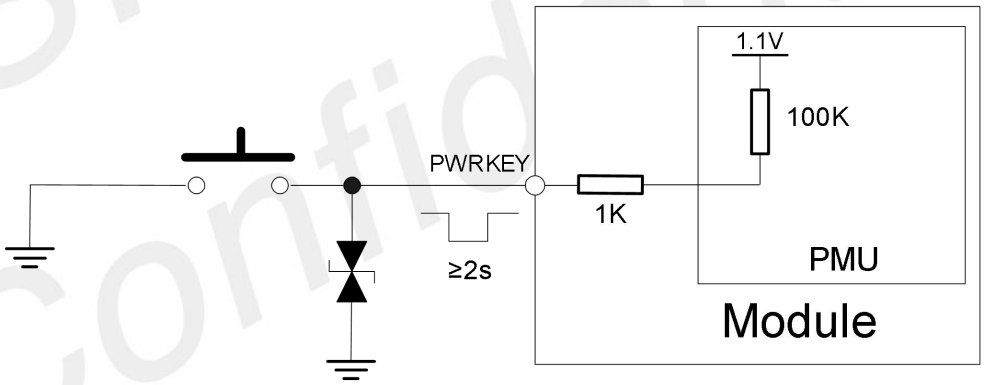


Figure 10: Power on the module use button

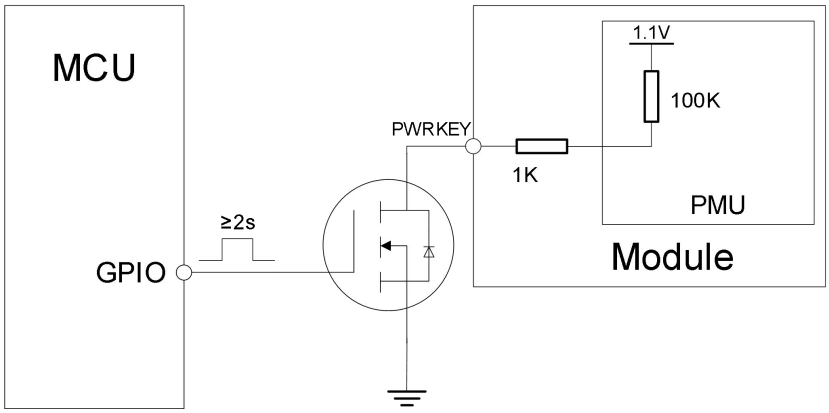


Figure 11: Power on the module use GPIO drive

Table 13: Definition of PWRKEY pin

Pin name	Pin no.	Electrical description	Description	Comment
PWRKEY	A45	DI	Power on/off the module, active low	

The power on sequence is shown in the following figure.

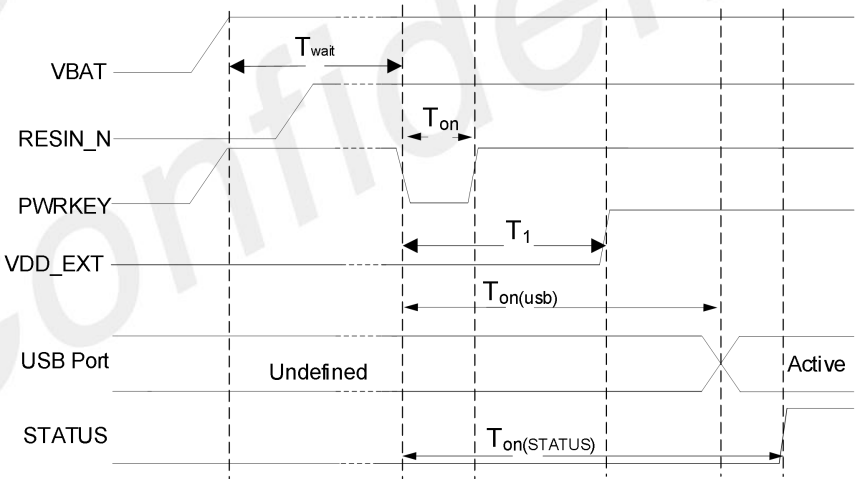


Figure 12: Power on sequence

Table 14: Power on timing and electronic characteristic

Symbol	Parameter	Min.	Typ.	Max.	Unit
T_{wait}	The waiting time from power supply available to power-on action	100	-	-	ms
T_{on}	The time of holding on PWRKEY pin to a low level	2	-	-	s
T_1	The time from power-on action to VDD_EXT ready	-	11.45	12	ms

$T_{on(usb)}$	The time from power-on action to USB port ready	-	20	-	s
$T_{on\ (STATUS)}$	The time from power-on action to STATUS ready	-	55	-	s
V_{IH}	Input high level voltage on PWRKEY pin	1.1	-	2.1	V
V_{IL}	Input low level voltage on PWRKEY pin	0	-	0.3	V

NOTE

- After enter force download mode, the PWRKEY pin need to release and don't pull low always. If not, the module will restart and then cause the download fail.
- The timing of $T_{on(usb)}$ and $T_{on\ (STATUS)}$ is related to the module software. The time here is based on the standard version test and is for reference only.

3.2.2 Power Off

The following methods can be used to power off the module.

- Method 1: Power off the module by holding the PWRKEY to a low level two second then release.
- Method 2: Power off the module by AT command "AT+CPOF".

NOTE

- If the temperature is outside the range of -30~+70°C, some warning will be reported via AT port.
- If the temperature is outside the range of -40~+85°C, module will be powered off automatically.
- For details about "AT+CPOF", please refer to Document [1] in the appendix.

Normal power off action will make the module disconnect from the network, allow the software entered a safe state, and save key data before the module is powered off completely.

The power off sequence is shown in the following figure.

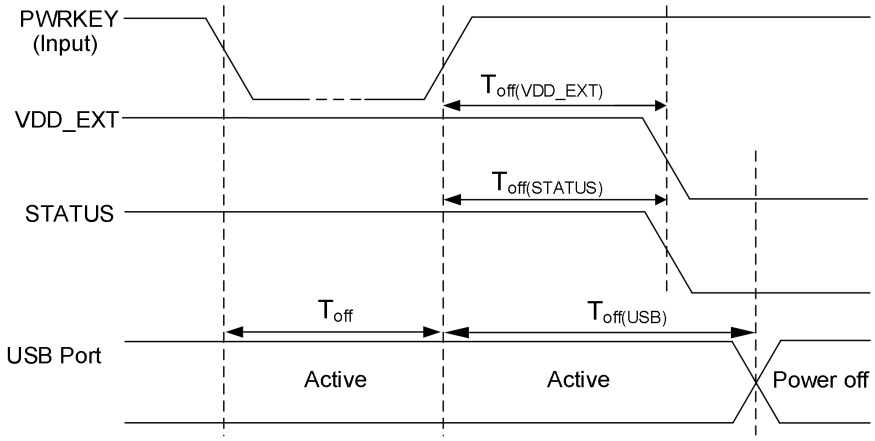


Figure 13: Power off sequence

Table 15: Power off timing and electronic characteristic

Parameter	Description	Time value			Unit
		Min.	Typ.	Max.	
T_{off}	The time of holding on PWRKEY pin to a low level	2	-	-	s
$T_{off(usb)}$	The time from power-off issue to USB port off	-	3.5	-	s
$T_{off(status)}$	The time from power-off issue to STATUS off	-	2.1	-	s

NOTE

- After pressing the PWRKEY button, you must wait for 12S to disconnect the power supply or press the PWRKEY again to turn on the module, otherwise it may damage the module or fail to turn on module.
- The timing of $T_{off(usb)}$and $T_{off(status)}$ is related to the module software. The time here is based on the standard version test and is for reference only.

3.3 Reset Function

Module can be reset by driving the RESIN_N pin down to a low level.

The RESIN_N signal has been internally pulled up to 1.8V, so there is no need to pull it up externally. Please refer to the following figure for the recommended reference circuit.

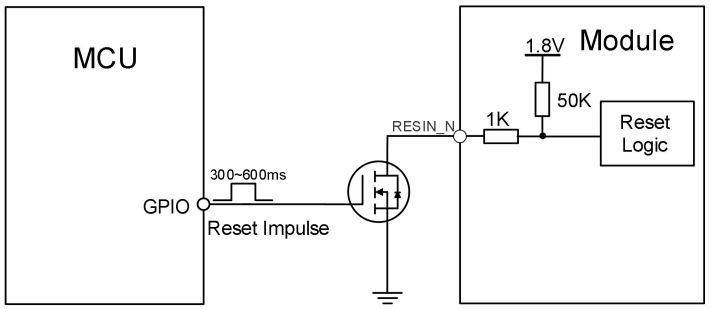


Figure 14: Reset the module use GPIO drive

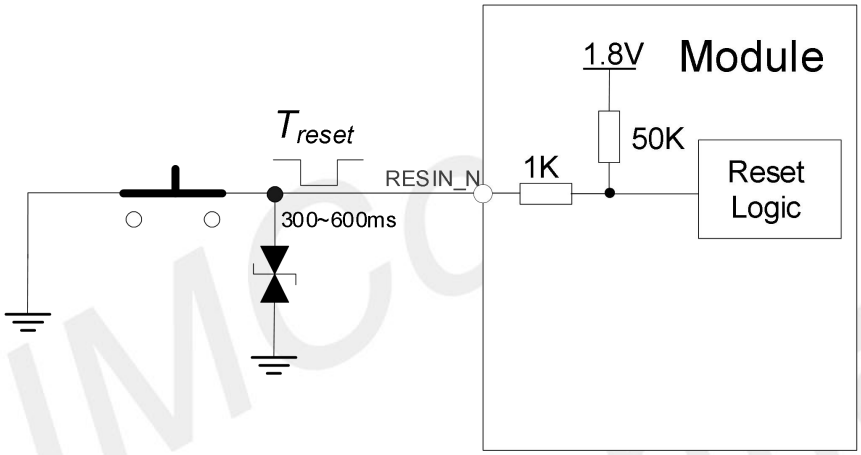


Figure 15: Reset the module use button

Table 16: Definition of RESIN_N pin

Pin name	Pin no.	Electrical description	Description	Comment
RESIN_N	A43	DI	P3	Reset the module, active low

The reset timing sequence of the module is shown in the following figure.

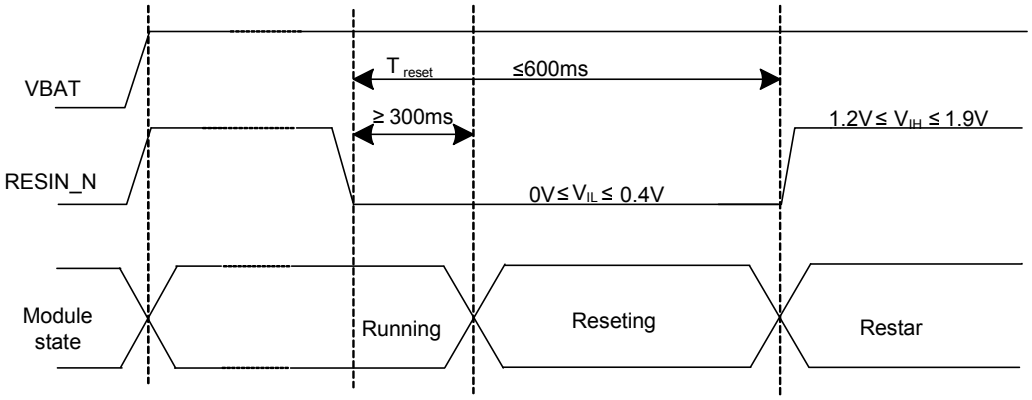


Figure 16: The reset timing sequence of the module

Table 17: RESET electronic characteristics

Symbol	Description	Min.	Typ.	Max.	Unit
T_{reset}	The time of holding on RESIN_N pin to a low level	300	-	600	ms
V_{IH}	Input high level voltage	1.2	-	1.9	V
V_{IL}	Input low level voltage	0	-	0.4	V

NOTE

- Please ensure that there is no capacitance on RESIN_N pin.

3.4 Output Power Management

Table 18: Output power management summary

Pin name	Pin no	Typical voltage (V)	Rated current (mA)	Sleep state	Comment
VDD_EXT	AL5	1.8	50	LPM	Output power supply for external IO pull up circuits
VREG_1P3	M45	1.28	500	retention	Output power supply for W82 only
VREG_0P9	P49	0.88	1500	off	Output power supply for W82 only
VREG_1P9	N47	1.88	500	retention	Output power supply for W82 only
L10E_3P1	C41	3.08	30	off	Output power supply for PM7250B USB PD-PHY and USB switch
VIO_OUT	D42	1.8	0.2	on	Output power supply for PM7250B IO circuit only

3.4.1 VDD_EXT Reference Circuit

The following figure is the reference circuit diagram of the VDD_EXT pin periphery of the module.

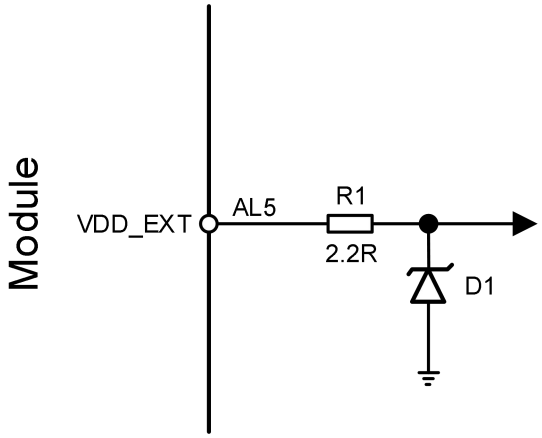


Figure 17: Module VDD_EXT peripheral reference circuit

NOTE

- It is recommended to place a TVS protection tube near the VDD_EXT pin of the module to protect the module pins. The recommended TVS models are shown in the following table.
- It is recommended to connect a 2.2R resistor in series with the VDD_EXT pin close to the module for ESD protection.

Table 19: Module VDD_EXT pin protection tube TVS recommended materials

NO.	Manufacturer	Model	Operating Voltage	package	Name
1	ON	ESD9L5.0ST5G	3.3V	SOD-923	D1
2	YAGEO	RC0402JR072R2L	-	0402	R1

3.5 USB Interface

SIM82X0X and SIM83X0X Series have one USB controller，which complies with USB3.1 and USB2.0 specifications. The high-speed PHY and super-speed PHY share the same USB 3.1 Gen2 controller, customers can choose USB3.1 or USB2.0 for their needs. USB3.1 Gen2 data rate is up to 10Gbps.

The USB interface is used for AT command communication, data transmission, GNSS NMEA output, firmware upgrade and software debugging.

SIM82X0X and SIM83X0X Series supports USB suspend and resume mechanism, which can save power consumption. If there is no data transmission on the USB bus, module will enter suspend mode automatically. The following figure is the USB reference circuit.

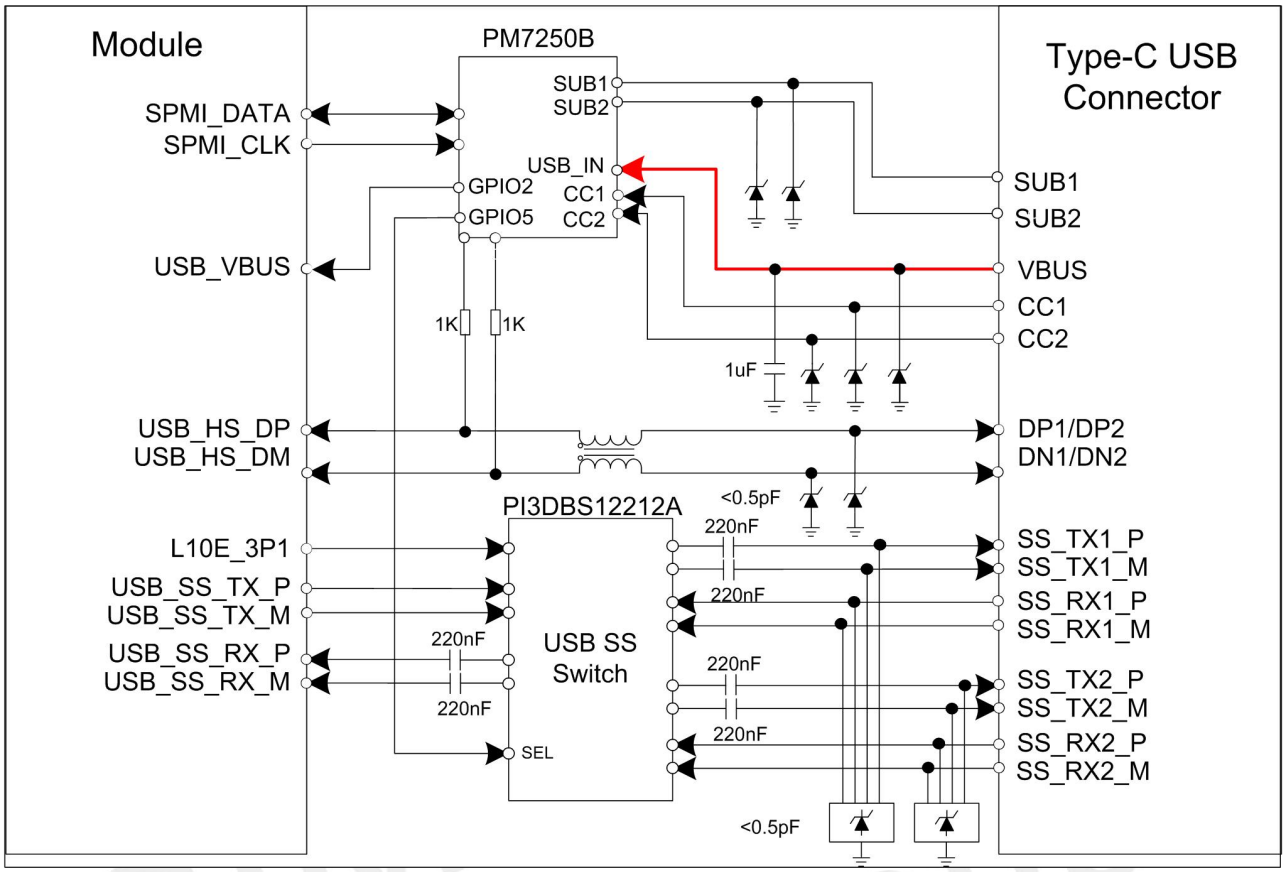


Figure 18: Type-C USB reference circuit with PM7250B

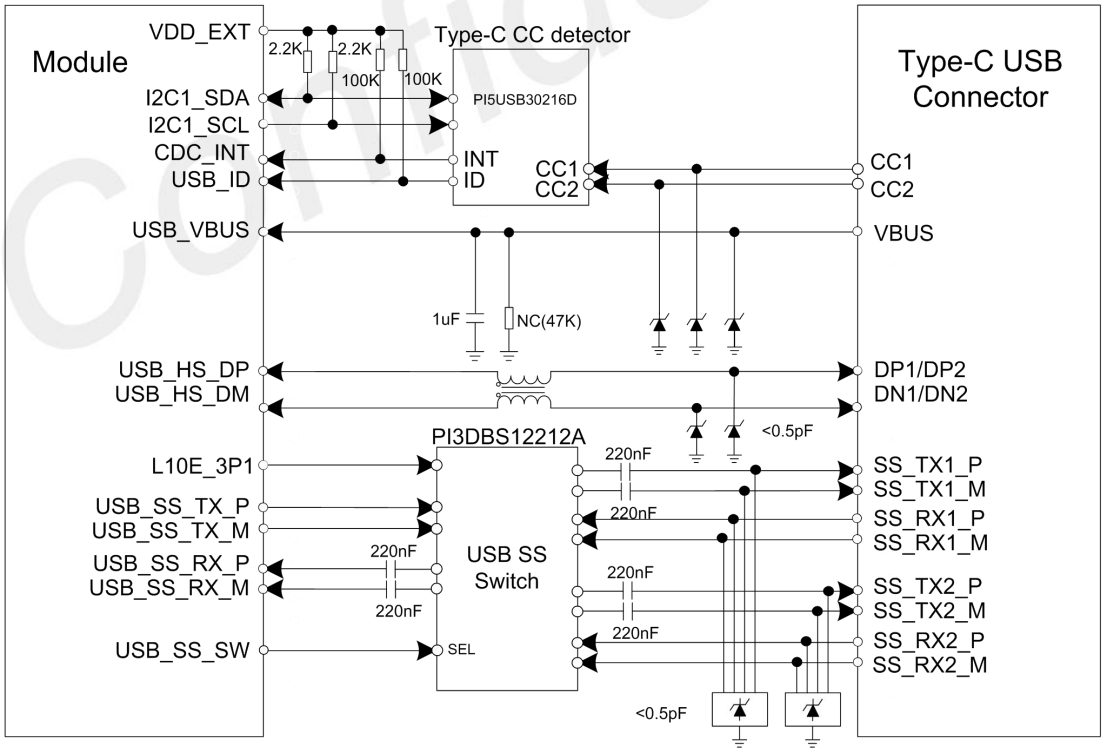


Figure 19: Type-C USB reference circuit with CC detector

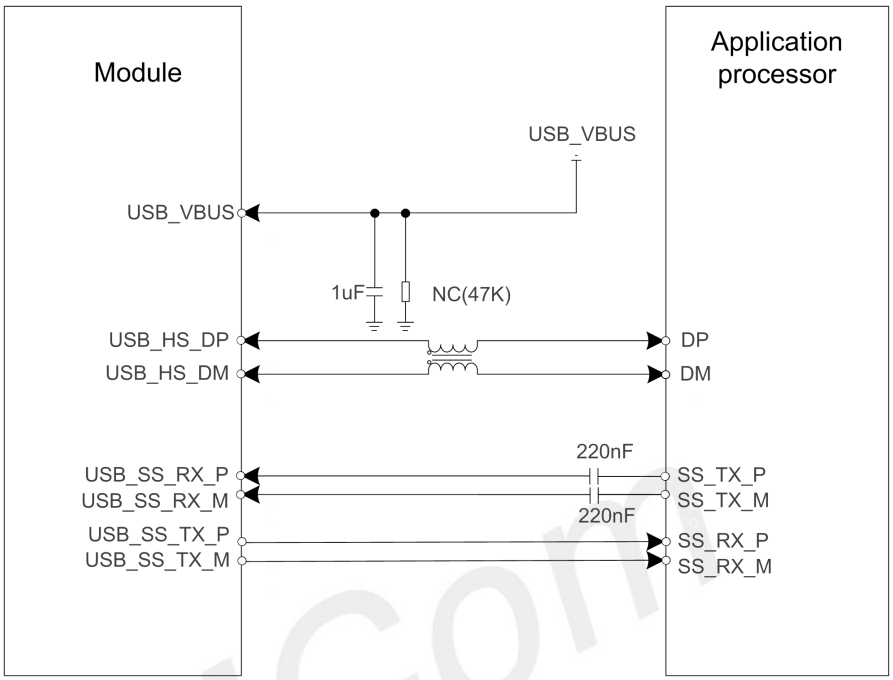


Figure 20: USB3.1 reference circuit

Table 20: Definition of USB interface

Pin name	Pin no.	Pin characteristics		Functional description	Comment
USB_VBUS	C9	AI		USB VBUS detection	Not support charge
USB_HS_DP	B6	AIO		Differential USB bi-directional data plus	Required 85Ω differential impedance Compliant with USB 2.0 standard specifications
USB_HS_DM	A5	AIO		Differential USB bi-directional data minus	
USB_SS_TX_P	A13	AO		USB3.1 super-speed transmit data plus	Required 85Ω differential Impedance Compliant with USB 3.1 standard specifications
USB_SS_TX_M	B14	AO		USB3.1 super-speed transmit data minus	
USB_SS_ RX_P	B10	AI		USB3.1 super-speed receive data plus	
USB_SS_RX_M	A9	AI		USB3.1 super-speed receive data minus	
USB_ID	C11	DI	P3	USB ID	Standard software not supported
OTG_EN	D10	DO	P3	USB OTG power supply DC-DC enable signal	
USB_SS_SW	C13	DO	P3	USB Type-C switch control	

				signal	

Table 21: Recommended CC detector list

Name	Manufacturer	Model
CC Detector	PERICOM	PI5USB30216D

Table 22: Recommended SS USB switch list

Name	Manufacturer	Model
USB Switch	PERICOM	PI3DBS12212A

Table 23: Recommended OTG 5V DC-DC and USB interface TVS list

Name	Manufacturer	Model
OTG	AWINIC	AW3605DNR
TVS	WILL	ESD5302N-3/TR

Please refer to the reference design for the design circuit diagram of OTG.

HS USB DP/DM layout guidelines:

- Require differential trace impedance is 85±10% Ω.

- The intra-lane length mismatch of the differential signal lanes is less than 1mm.
- Gap from other signals keeps 3xline width.
- External TVS or EMI components should be placed near the USB connector.
- Trace routes away from other sensitive signals (RF, audio, and XO).
- Maximum PCB trace length cannot exceed 100mm outside of module, the shorter trace and better.

SS USB TX/RX layout guidelines:

- Require differential trace impedance is 85±10% Ω.
- The intra-lane length mismatch of the differential signal lanes is less than 500um.
- Gap from other signals keeps 4xline width.
- Gap between Rx-to-Tx keeps 4xline width.
- External TVS or EMI components should be placed near the USB connector.
- Trace routes away from other sensitive signals (RF, especially 2.4 GHz).
- Route differential pairs in the inner layers with a solid GND reference to have good impedance control and to minimize discontinuities.
- Keep isolation between the Tx pair, Rx pair, and DP/DM to avoid crosstalk.
- If core vias are used, use no more than two core vias per signal line to limit stubs.

3.6 PCIe Interface

SIM82X0X and SIM83X0X Series support PCIe Gen3 2-lane or PCIe Gen4 1-lane interfaces, which can be used as EP or RC mode. PCIe3 data rate up to 8Gbps per lane, PCIe4 data rate up to 16Gbps per lane. The following figure is the PCIe reference circuit.

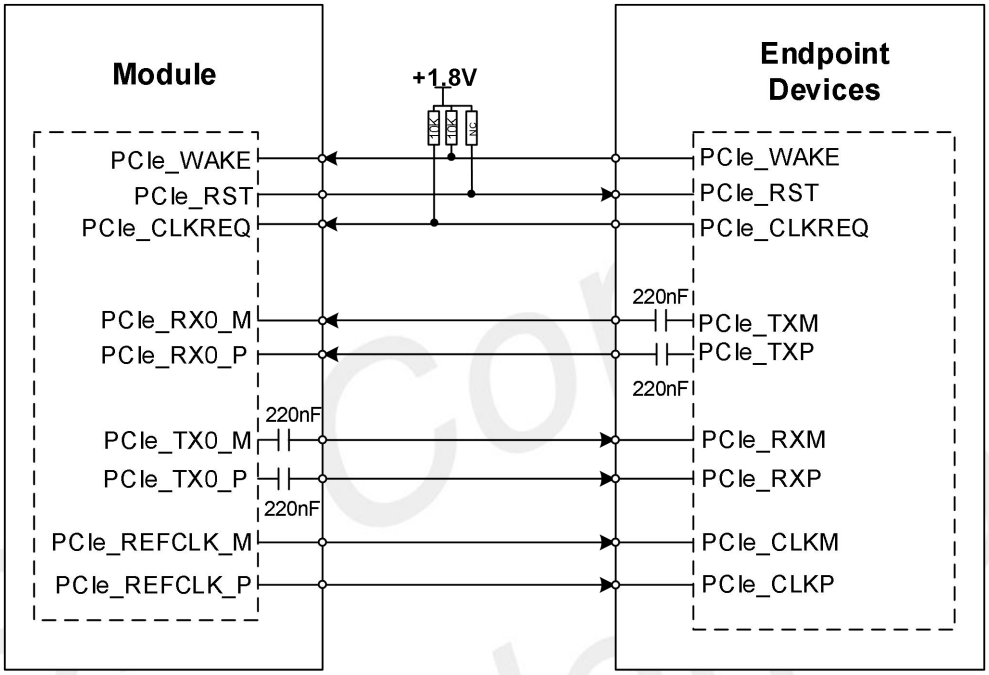


Figure 21: PCIe interface reference circuit (RC)

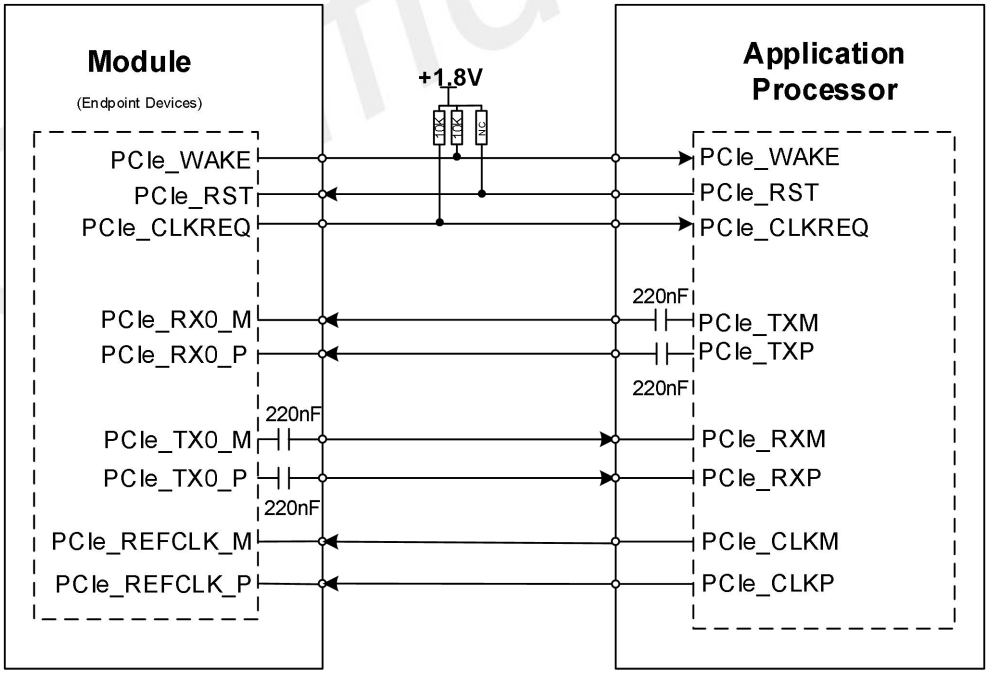


Figure 22: PCIe interface reference circuit (EP)

NOTE

- The 220nF AC capacitors should be placed near the PCIe_TX

Table 24: Definition of PCIe interface

Pin name	Pin no.	Pin characteristics		Functional description	Comment
PCIe_REFCLK_P	B22	AIO		PCIe reference clock plus	Required 85Ω differential impedance
PCIe_REFCLK_M	A21	AIO		PCIe reference clock minus	
PCIe_TX0_M	B18	AO		PCIe transmit0 minus	
PCIe_TX0_P	A17	AO		PCIe transmit0 plus	
PCIe_TX1_M	B20	AO		PCIe transmit1 minus	
PCIe_TX1_P	A19	AO		PCIe transmit1 plus	
PCIe_RX0_M	A25	AI		PCIe receive0 minus	
PCIe_RX0_P	B26	AI		PCIe receive0 plus	
PCIe_RX1_M	A23	AI		PCIe receive1 minus	
PCIe_RX1_P	B24	AI		PCIe receive1 plus	
PCIe_CLKREQ	C21	DI	P3	PCIe clock request	PCIe_CLKREQ and PCIe_WAKE need pull up to VDD_EXT externally, Default as RC mode
PCIe_WAKE	C25	DI	P3	PCIe wake-up	
PCIe_RST	C23	DO	P3	PCIe reset	

PCIe interface layout guidelines:

- All other sensitive/high-speed signals must be far away PCIe signals.
- PCIe signals must be protected be far away noisy signals (clocks, SMPS).
- Each trace needs to be adjacent to a ground plane.
- Require differential trace impedance is 85±10% Ω.
- The intra-lane length mismatch of the differential signal lanes is less than500um.
- Gap from other signals keeps 4xline width.
- Gap between Rx-to-Tx keeps 4xline width.
- Maximum PCB trace length cannot exceed 150mm outside of module, the shorter trace and better.

3.6.1 PCIe for W82

PCIe Gen3 lane0 can be connected to W82 as WLAN data interface, SIM82X0X and SIM83X0X Series module serves as RC and W82 module serves as EP. PCIe_CLKREQ and PCIe_WAKE already be pulled up to 1.8V in W82. The details design please refer to the reference circuit document. The following figure

is the PCIe reference circuit.

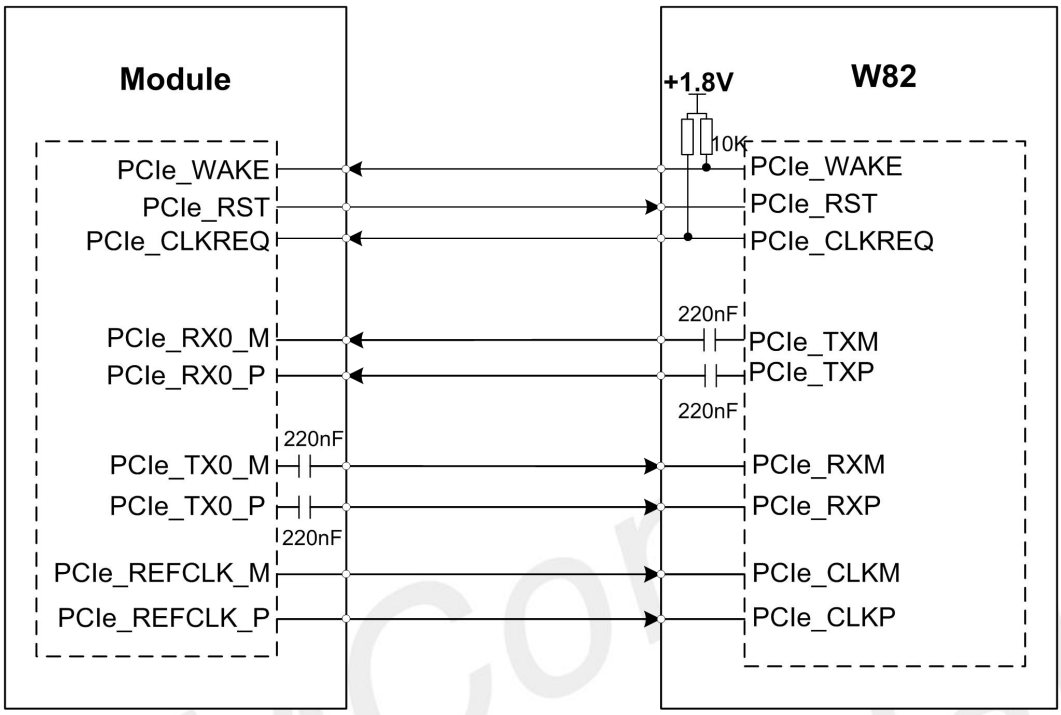


Figure 23: PCIe interface reference circuit (RC) for W82

NOTE

- The PCIe control signal voltage domain of the module and W82 are 1.8V.
- For more details about W82, please refer to Document [20] in the appendix.

Table 25: Recommended W82 list

Name	Manufacturer	Model
W82	SIMCOM	S2-10ADA

3.6.2 PCIe for RTL8125B

PCIe Gen3 lane0 can be connected to RTL8125B-TE as Ethernet data interface. SIM82X0X and SIM83X0X Series module serves as RC and RTL8125B-TE serves as EP. Need to pull up PCIe_CLKREQ, PCIe_WAKE, PCIe_RST from module to 3.3V. The details design please refer to the reference circuit document. The following figure is the PCIe reference circuit.

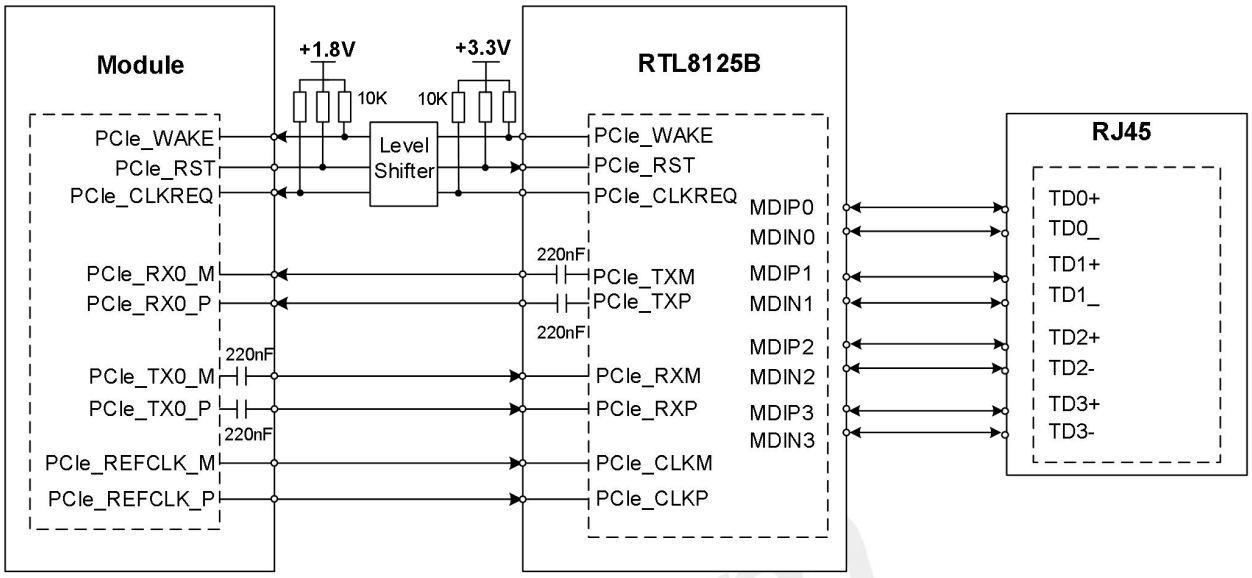


Figure 24: PCIe interface reference circuit (RC) for RTL8125B

NOTE

- The 220nF AC capacitors should be placed near the PCIe_TX
- The PCIe control signal voltage domain of the module is 1.8V, through the level shifter, the RTL8125B is 3.3V.
- For more details about RTL8125B, please refer to Document [17] in the appendix.

Table 26: Recommended RTL8125B and RJ45 list

Name	Manufacturer	Model
RTL8125B	REALTEK	RTL8125B-CG
RJ45	ZhengGu	RJ45-114B4DZ-G020

3.6.3 PCIe Switch

When PCIe switch is added, the module can use W82 and others such as AQR113* at the same time. The details design please refer to the QPS615 reference circuit document. The following figure is the PCIe reference circuit.

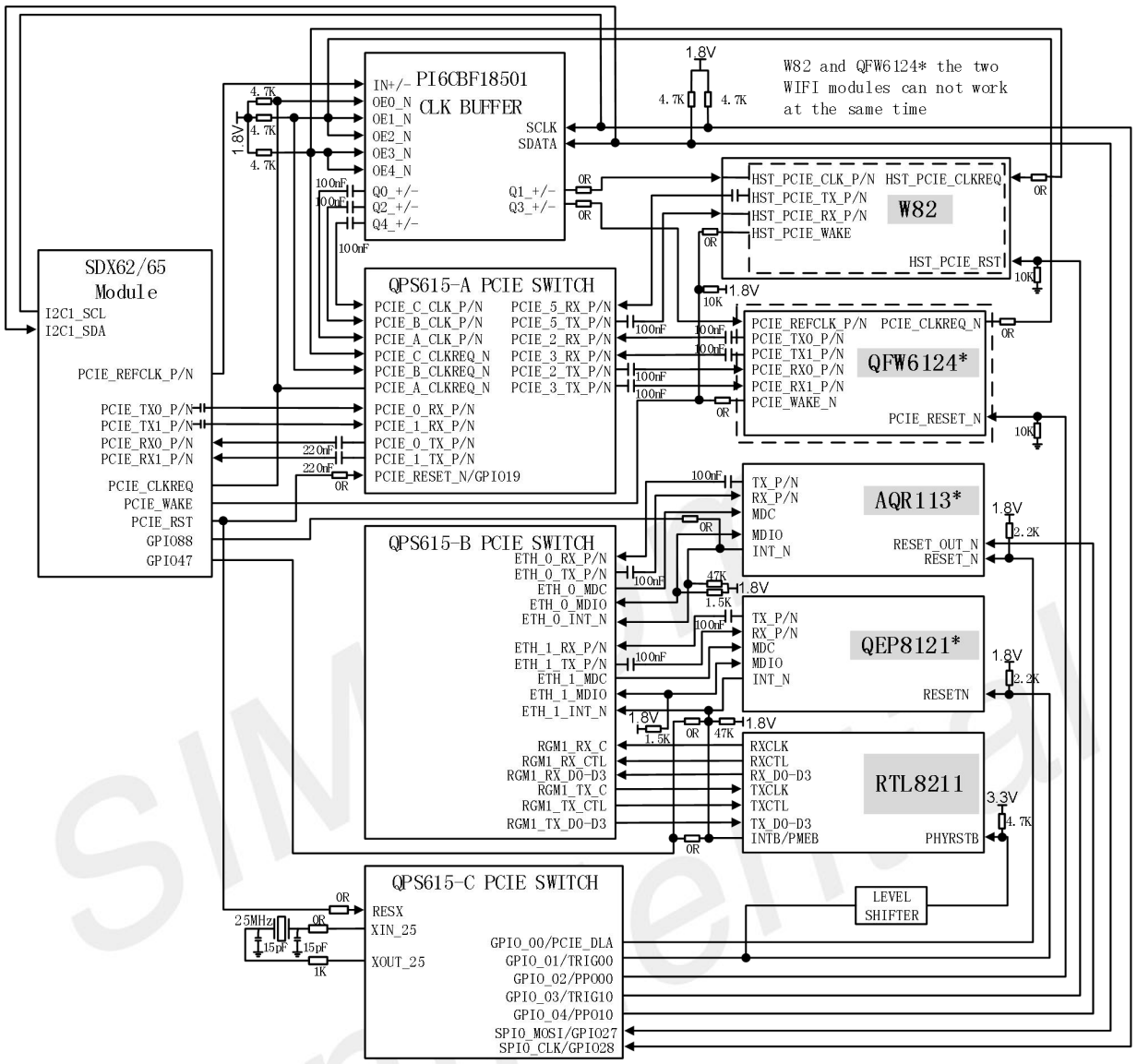


Figure 25: PCIe switch reference circuit

NOTE

- The 220nF AC capacitors should be placed near the PCIe_TX
- "*" means under development.

Table 27: Recommended PCIe SWITCH list

Name	Manufacturer	Model
PCIe Switch	Qualcomm	QPS615
PCIE clock buffer	Diodes	PI6CBF18501ZLAIEX-13R
W82 module	SIMCom	S2-10ADA

AQR113	MARVELL	AQR113C-B0-C
QEP8121	Qualcomm	QEP-8121-1-56MQFN-**-02-0
RTL8211	REALTEK	RTL8211F-CG

3.6.4 PCIe interface for Qualcomm IPQxxxx

PCIe connected to qualcomm IPQxxxx is designed to be used as CPE application, the module does EP and the qualcomm IPQxxxx does RC.

Since the PCIe_WAKE, PCIe_RST, and PCIe_CLKREQ control signals of IPQxxxx are in the voltage domain of 1.8V, on the module side, CLKREQ# and PEWAKE# need to be pulled up to 1.8V externally through 100KR. The following figure is a schematic diagram of the module connected to IPQxxxx.

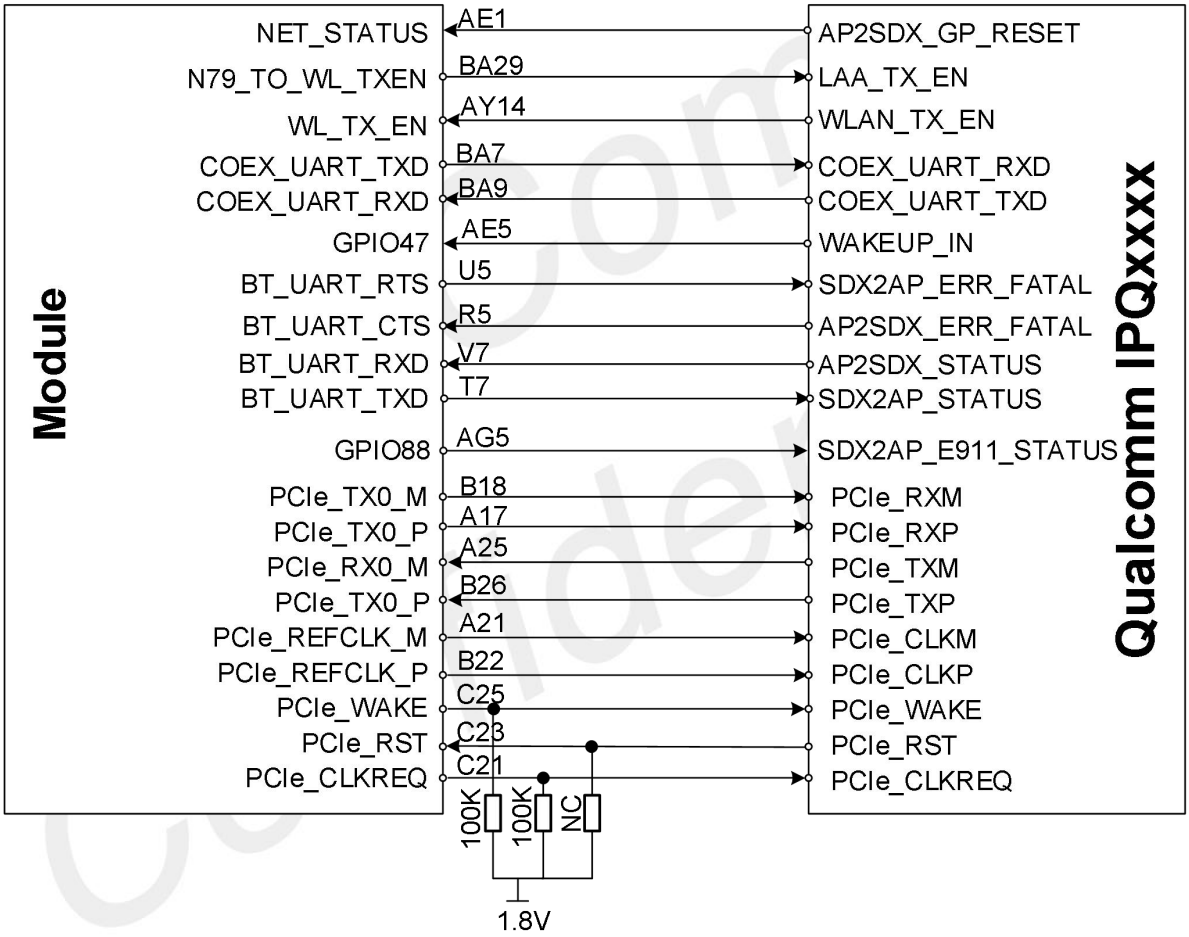


Figure 26: Schematic diagram of module connected to IPQxxxx

3.7 SDIO Interface

SIM82X0X and SIM83X0X Series provide 8-bit SDIO interface, which meets the SDIO3.0 specifications and supports SDIO host mode. The clock output up to 200MHz for SD card, and up to 100MHz for eMMC. Support 4-bit dual-voltage 1.8V or 3.0V SD card or 8-bit 1.8V eMMC.

The SD card and the eMMC reference circuits are shown below.

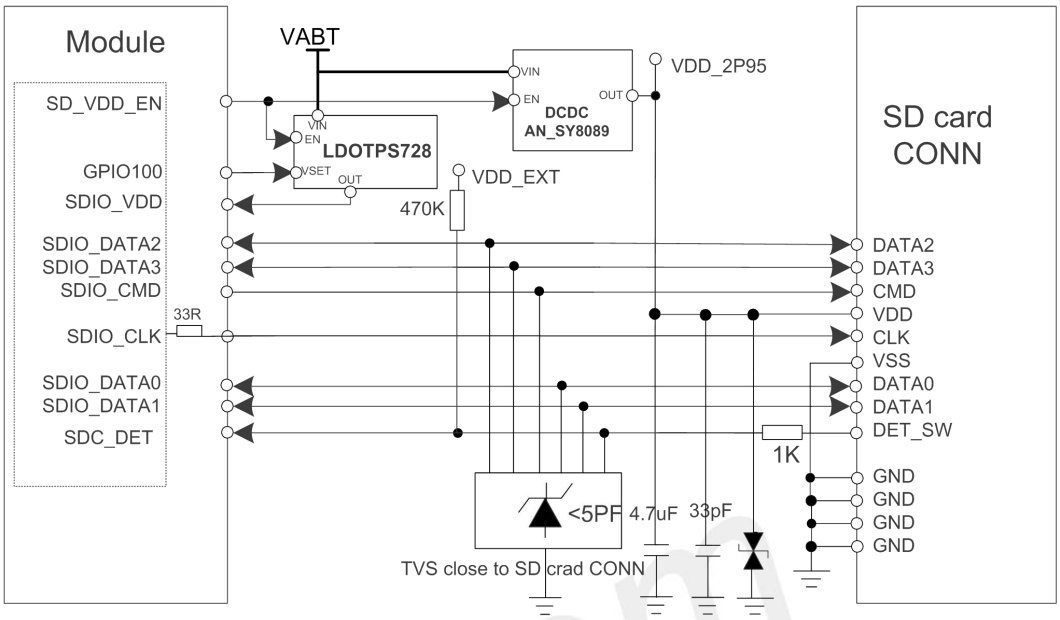


Figure 27: SD card reference circuit

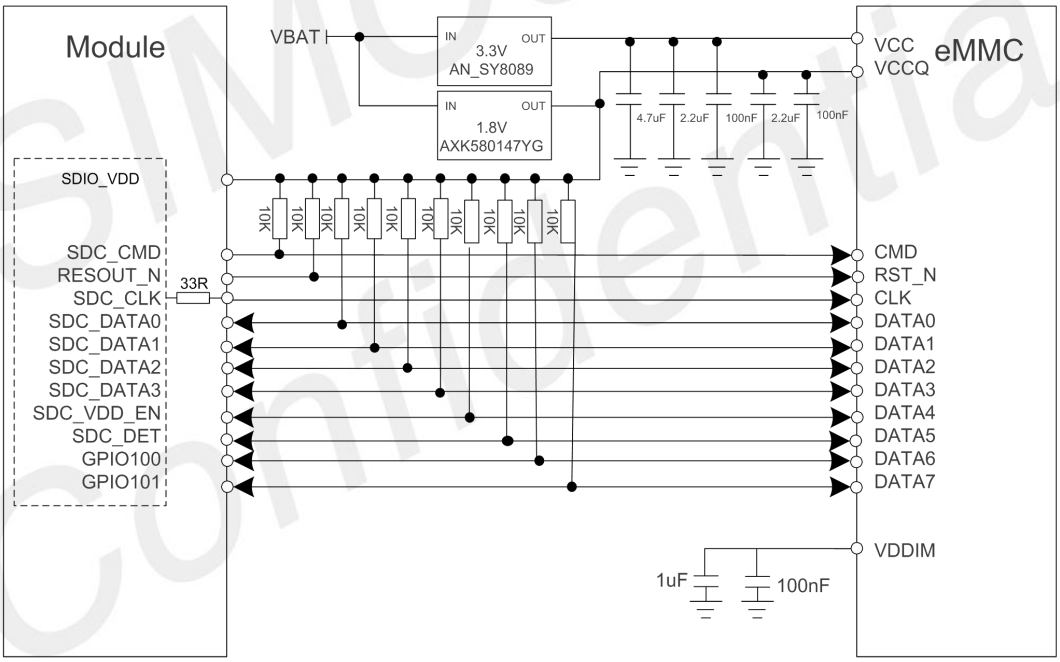


Figure 28: eMMC reference circuit

Table 28: Definition of SDIO interface

Pin name	Pin no.	Pin characteristics		Functional description	Comment
SDIO_VDD[1]	F7	PI	1.8/3.0V	Power input for internal SDIO circuit	
SDIO_DATA0	B1	DIO	P2	SDC data bit 0 or eMMC data bit 0	Required 45Ω impedance

SDIO_DATA1	C1	DIO	P2	SDC data bit 1 or eMMC data bit 1	
SDIO_DATA2	D3	DIO	P2	SDC data bit 2 or eMMC data bit 2	
SDIO_DATA3	F3	DIO	P2	SDC data bit 3 or eMMC data bit 3	
SDIO_CMD	G5	DIO	P2	SDC command output	
SDIO_CLK	E5	DO	P2	SDC clock output	
SD_VDD_EN	H7	DO	P3	Enable the SD card power or eMMC data bit 4	If used as eMMC data signals, required 45Ω impedance
SDIO_DET	E1	DI	P3	SD card insertion detect or eMMC data bit 5	
GPIO100	H3	DIO	P3	eMMC data bit 6	
GPIO101	K7	DIO	P3	eMMC data bit 7	
RESOUT_N	AW17	DO	P3	eMMC RST_N	

NOTE

- If not use SDIO interface, the SD_VDD pin should connect to VDD_EXT out of the module.

Table 29: Recommended TVS and SD card socket list

Name	Manufacturer	Model
TVS	ON	ESD9L5.0ST5G
SD card socket	ALPS	SCHA4B0400
eMMC	SanDisk	SDINBDG4_8G

SDIO interface layout guidelines:

- Require trace impedance is 45Ω.
- CLK to DATA/CMD length mismatch is less than 0.5mm.
- 33Ω termination resistance on clock be placed in module.
- Gap from other signals keeps 1.5xline width.
- Gap lane-to-lane 1.5xline width.
- Bus capacitance load is less than 5pF.
- Trace routes away from other sensitive signals.
- Maximum PCB trace length cannot exceed 30mm out of the module for 104Mbps data rate, the shorter trace and better.
- Maximum PCB trace length cannot exceed 100mm out of the module for 50Mbps data rate, the shorter trace and better.

3.8 (U)SIM Interface

SIM82X0X and SIM83X0X Series supports two (U)SIM cards but single standby. (U)SIM1 and (U)SIM2 are dual-voltage 1.8 V or 3.0 V interfaces.

Table 30: (U)SIM electronic characteristics in 1.8V mode ((U)SIM_PWR=1.8V)

Symbol	Parameter	Min.	Typ.	Max.	Unit
(U)SIM_VDD	Power supply for (U)SIM card	1.65	1.8	1.95	V
V_{IH}	High-level input voltage	1.26	-	1.95	V
V_{IL}	Low-level input voltage	0	-	0.36	V
V_{OH}	High-level output voltage	1.44	-	1.8	V
V_{OL}	Low-level output voltage	0	-	0.4	V

Table 31: (U)SIM electronic characteristics 3.0V mode ((U)SIM_PWR=3.0V)

Symbol	Parameter	Min.	Typ.	Max.	Unit
(U)SIM_VDD	Power supply for (U)SIM card	2.7	3.0	3.05	V
V_{IH}	High-level input voltage	2.1	-	3.05	V
V_{IL}	Low-level input voltage	0	-	0.6	V
V_{OH}	High-level output voltage	2.4	-	3.0	V
V_{OL}	Low-level output voltage	0	-	0.4	V

The module supports (U)SIM card hot-swap function through the (U)SIM_DET pin, which is a level trigger pin and needs to be pulled up externally. The USIM_DET pin requires pull up externally. The following figure shows (U)SIM card reference circuit.

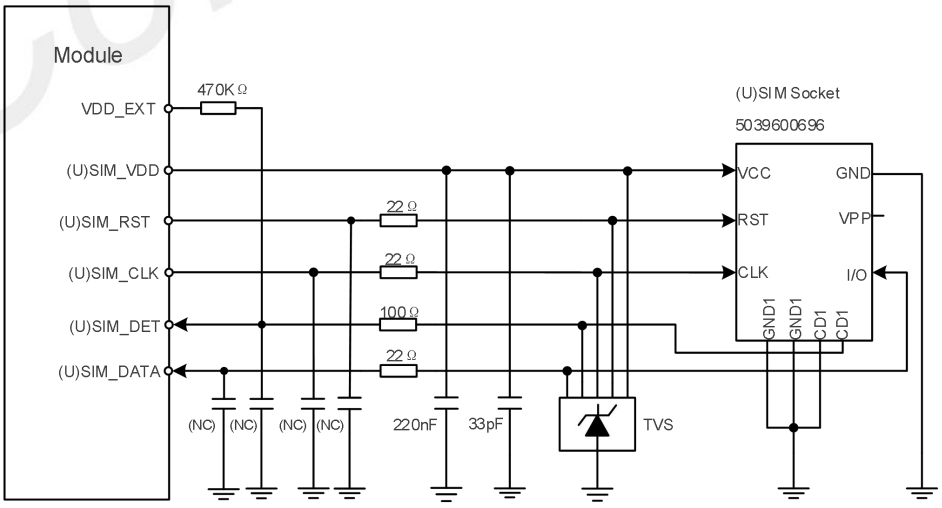


Figure 29: (U)SIM interface reference circuit

After inserting (U)SIM card, the (U)SIM_DET pin will change from low to high level. The rising edge will indicate that the (U)SIM card has been inserted. After removing the (U)SIM card, the (U)SIM_DET pin will change from high to low level. This falling edge will indicate the removal of the (U)SIM card.

Using “AT+UIMHOTSWAPON=0 or 1” and “AT+UIMHOTSWAPLEVEL=0 or 1”AT command to set module SIM card hot swap function enable and SIM card detection level, for more details, please refer to SIM8200 Series_AT Command Manual document.

Using “AT+SMSIMCFG=1,1” and “AT+SMSIMCFG=1,2” AT command to switch (U)SIM1 and (U)SIM2 function, for more details, please refer to SIM8200 Series_AT Command Manual document.

Table 32: Definition of (U)SIM interface

Pin name	Pin no.	Pin characteristics		Functional description	Comment
(U)SIM1_VDD	B51	PO	P4	Power supply for (U)SIM1 card	1.8/3.0V voltage domain, (U)SIM interface should be protected against ESD. If unused, please keep open
(U)SIM1_DATA	E51	DIO	P4	(U)SIM1 card data signal, which has been pulled up to (U)SIM1_VDD by a 20K resistor internally	
(U)SIM1_CLK	D49	DO	P4	(U)SIM1 clock signal	
(U)SIM1_RST	C51	DO	P4	(U)SIM1 reset signal	
(U)SIM1_DET	E47	DI	P3	(U)SIM1 card detect signal, which need pulled up to VDD_EXT by a 470K resistor externally	
(U)SIM2_VDD	F49	PO	P5	Power supply for (U)SIM2 card	
(U)SIM2_DATA	G47	DIO	P5	(U)SIM2 card data, which has been pulled up to (U)SIM2_VDD by a 20K resistor internally	
(U)SIM2_CLK	H49	DO	P5	(U)SIM2 clock signal	
(U)SIM2_RST	G51	DO	P5	(U)SIM2 reset signal	
(U)SIM2_DET	F45	DI	P3	(U)SIM2 card detect, which need pulled up to VDD_EXT by a 470KR resistor externally	

The following table shows recommended TVS of ESD protect and (U)SIM socket.

Table 33: Recommended TVS and (U)SIM socket list

Name	Manufacturer	Model
TVS	ST	ESDA6V1-5W6
(U)SIM socket	Suntech	5039600696

If the (U)SIM card hot-swap function is not used, customers should keep the (U)SIM_DET pin open.

The (U)SIM card layout guidelines:

- Make sure that the (U)SIM card socket should be far away from the antennas.
- (U)SIM traces should be away from RF, VBAT and high-speed signals.
- The traces should be as short as possible.
- Keep (U)SIM socket's GND pin directly connect to the main ground.
- Shielding the (U)SIM card signals by ground.
- Recommended to place a 33pF～1uF capacitor on (U)SIM_VDD net and place close to the holder.
- The rise/fall time of (U)SIM_CLK should not exceed 40ns.
- The parasitic capacitance of TVS should not exceed 60pF, and the TVS should be placed close to the (U)SIM socket.

3.9 I2S Interface

SIM82X0X and SIM83X0X Series supports one I2S/PCM interface for external codec, which meets the requirements in the Phillips I2S bus specification.

Table 34: I2S format

Characteristics	Specification
Line interface format	Linear(fixed)
Data length	16bits(fixed)
I2S flock/sync source	Master mode(fixed)
I2S clock sate	1.536 MHz (default)
I2S MCLK rate	12.288MHz (default)
Data ordering	MSB

NOTE

- For more details about I2S AT commands, please refer to document [1] in the appendix.

3.9.1 I2S Timing

The module supports I2S sampling rate of 48 KHz and 32bit coding signal (16bit length), the timing sequence is shown in the following figure.

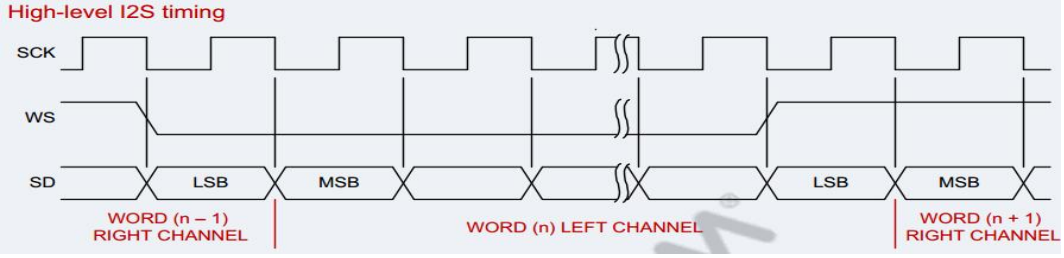


Figure 30: I2S timing

Table 35: I2S timing parameters

Signal	Parameter	Description	Min.	Typ.	Max.	Unit
I2S_MCLK	Frequency	Frequency	–	12.288	12.288	MHz
	T	Clock period	81.380	81.380	–	ns
	t(HC)	Clock high	0.45T	–	0.55T	ns
	t(LC)	Clock low	0.45T	–	0.55T	ns
I2S_CLK	Frequency	Frequency	8	48	48	KHz
	T	Clock period	20.83	20.83	125	us
	t(HC)	Clock high	0.45T	–	0.55T	ns
	t(LC)	Clock low	0.45T	–	0.55T	ns
I2S_WS	t(sr)	DIN/DOUT and WS input setup time	16.276	–	–	ns
	t(hr)	DIN/DOUT and WS input hold time	0	–	–	ns
	t(dtr)	DIN/DOUT and WS output delay	–	–	65.10	ns
	t(htr)	DIN/DOUT and WS output hold time	0	–	–	ns

3.9.2 I2S Reference Circuit

The following figure shows the external codec reference design.

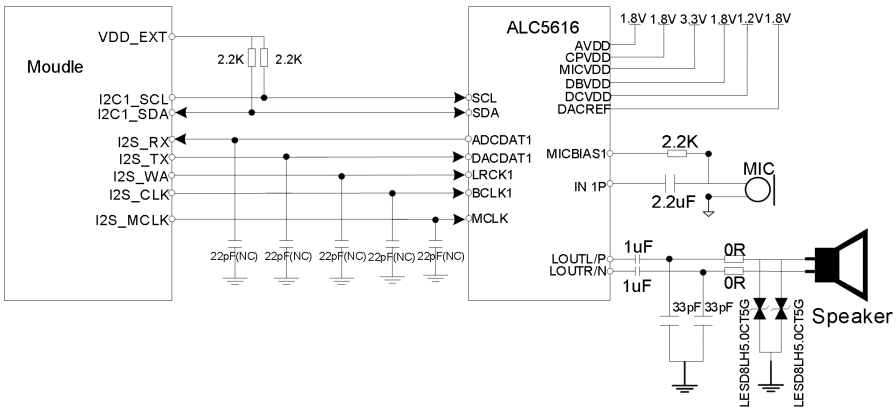


Figure 31: Audio codec reference circuit

The PCM interface is multiplexing with I2S interface. The default audio interface of the module is I2S.

Table 36: The PCM interface is multiplexing with I2S interface

Pin name	Pin no.	Electrical description		Description	Comment
I2S_DOUT/ PCM_DOUT	N1	DO	P3	I2S/PCM data output	Default is I2S interface, can be configured as PCM interface by software, If unused, please keep open
I2S_DIN/ PCM_DIN	R1	DI	P3	I2S/PCM data input	
I2S_CLK/ PCM_CLK	P3	DO	P3	I2S/PCM clock output	
I2S_WS/ PCM_SYNC	T3	DIO	P3	I2S word selection/ PCM synchronization signal	
I2S_MCLK	L1	DO	P3	I2S master clock output	

NOTE

- For more details about audio function, please refer to Document [19] in the appendix.
- Codec ALC5616 supports 5-wire I2S by default. Software can configure the internal registers of ACL5616 to configure 4-wire I2S (without I2S_MCLK signal) or 5-wire I2S (with I2S_MCLK signal) interface.

Table 37: Recommended audio list

Name	Manufacturer	Model
ALC5616	REALTEK	ALC5616-CGT

Audio layout guidelines:

Analog input

- 0.2mm trace widths; 0.2mm spacing between traces.
- Pseudo differential route for MIC.
- Isolate from noise sources, such as antenna, RF signals, SMPS, clocks, and other high speeding signals.

Analog output

- Isolate from noise sources such as antenna, RF signals, SMPS, clocks, and other digital signals with fast transients.
- Speaker output signal – route as differential pair with 0.5mm trace widths.

3.10 I2C Interface

SIM82X0X and SIM83X0X Series default support two I2C interfaces, meet I2C specification version 5.0, and data rate up to 400 Kbps. The following figure shows the I2C bus reference circuit.

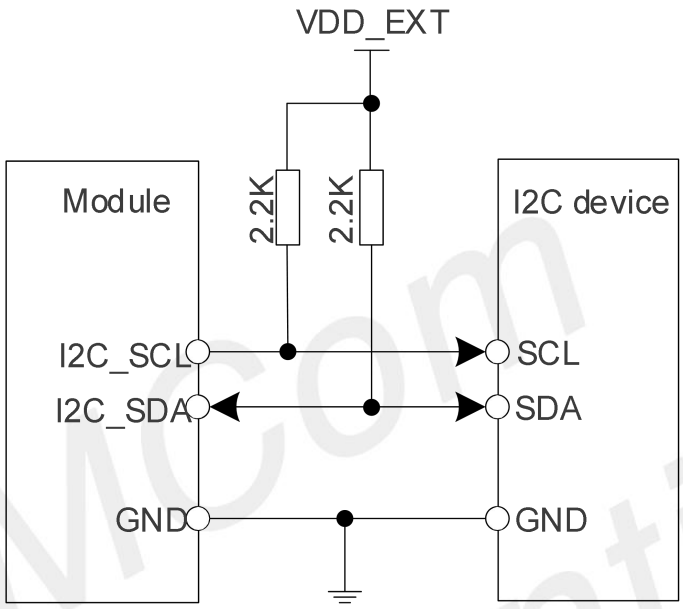


Figure 32: I2C reference circuit

Table 38: Definition of I2C interface

Pin name	Pin no.	Electrical description	description	Comment
I2C1_SCL	M7	OD	P3	I2C1 default use for codec Pull up to VDD_EXT externally
I2C1_SDA	P7	OD	P3	
I2C2_SCL	AB7	OD	P3	I2C2 default use for sensor Pull up to VDD_EXT externally
I2C2_SDA	Y7	OD	P3	

NOTE

- SDA and SCL need to pull up to VDD_EXT by a 2.2K resistor externally.
- For more details about AT commands please refer to document [1] in the appendix.

3.11 UART Interface

SIM82X0X and SIM83X0X Series default supports 3 UART ports for communication, which data rate up to 4Mbps. All the UART level of SIM82X0X and SIM83X0X Series is 1.8V. If it communicates with the 3.3V serial port level, a level conversion chip needs to be added in the middle. It is recommended to use TXS0104EPWR level shift of TI, the reference circuit is as follows.

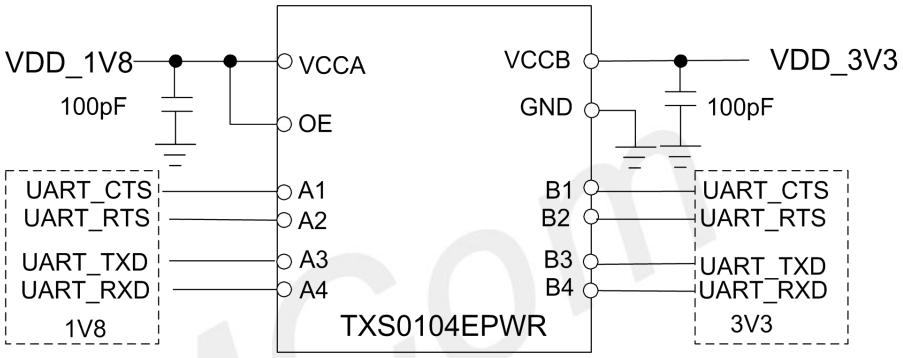


Figure 33: UART level conversion circuit

The following level shifting circuits can also be used:

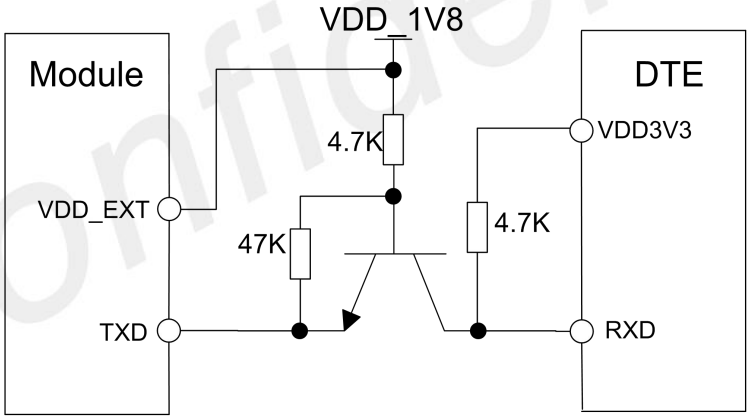


Figure 34: UART TX level conversion circuit

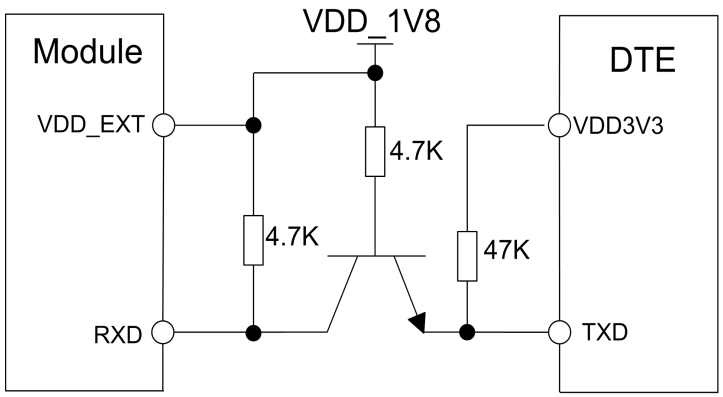


Figure 35: UART RX level conversion circuit

Table 39: Definition of UART interface

Pin name	Pin no.	Electrical description		description	Comment
UART1_CTS	AA1	DI	P3	Clear to send	Default use for AT command
UART1_RTS	AC1	DO	P3	Request to send	
UART1_TXD	AB3	DO	P3	Transmit data	
UART1_RXD	AD3	DI	P3	Receive data	
UART1_DCD	W5	DO	P3	Carrier detect	
UART1_RI	AA5	DO	P3	Ring indicator	
UART1_DTR	AC5	DI	P3	Data terminal ready	
BT_UART_CTS	R5	DI	P3	Clear to send	Default use for BT
BT_UART_RTS	U5	DO	P3	Request to send	
BT_UART_TXD	T7	DO	P3	Transmit data	
BT_UART_RXD	V7	DI	P3	Receive data	
DBG_UART_RXD	L5	DI	P3	Receive data	Used for debug only
DBG_UART_TXD	N5	DO	P3	Transmit data	

NOTE

- The 4-wire UART interface support flow control function.
- The baud rate frequency band supported by the serial port: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600,115200,203400,460800,921600. The UART rate is as high as 4MHZ. When the baud rate is greater than 460bps, it is not recommended to use a transistor for level conversion.
- The UART rate is as high as 4MHZ. When the baud rate is greater than 460Kbps, it is not recommended to use a transistor for level conversion.
- UART1 is used as AT command and DTR detection by default, it is not recommended to be used for other functions

3.12 SPI Interface

SIM82X0X and SIM83X0X Series SPI interface only supports master mode, data rate up to 50MHz. Usually, SPI interface is used to connect ROM or LCD and other devices. The SPI reference circuit is shown as follows:

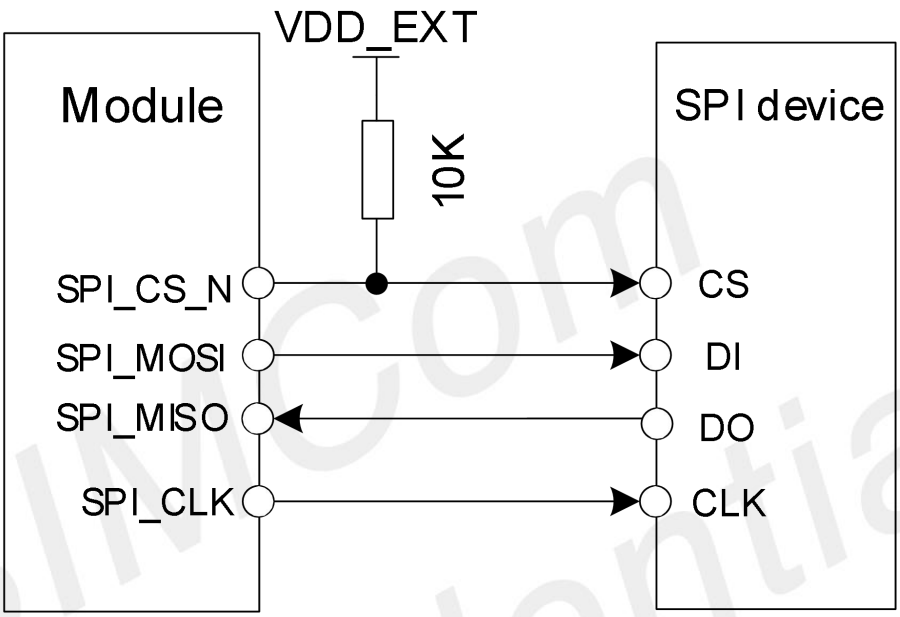


Figure 36: SPI reference circuit

Table 40: Definition of SPI interface

Pin name	Pin no.	Electrical description	description	Comment
SPI_CS_N	D18	DO	SPI chip select	
SPI_CLK	D20	DO	SPI clock	
SPI_MOSI	D14	DO	Master output slaver input	
SPI_MISO	D16	DI	Master input slaver output	

3.13 ADC Interface

SIM82X0X and SIM83X0X Series supports two 16bits ADC interfaces. Its performance parameters are shown as follows:

Table 41: Definition of ADC interface

Pin name	Pin no.	Electrical description	description	Comment
ADC0	AH7	AI	Analog to digital converter input0	
ADC1	AF7	AI	Analog to digital converter input1	

Table 42: ADC performance parameters

Parameter	Comments	Min	Typ	Max	Unit
Input voltage range	Programmable	0	-	1.875	V
Resolution		-	16	-	bits
Analog input bandwidth		-	500	-	KHz
Sample rate		-	4.8	-	MHz
Accuracy		-	20	-	mV

3.14 WLAN/BT Interface

SIM82X0X and SIM83X0X Series supports W82 interface including PCIe, UART, GPIOs, and customers can connect to the W82 WLAN/BT module through this interface. The reference circuit is as follows:

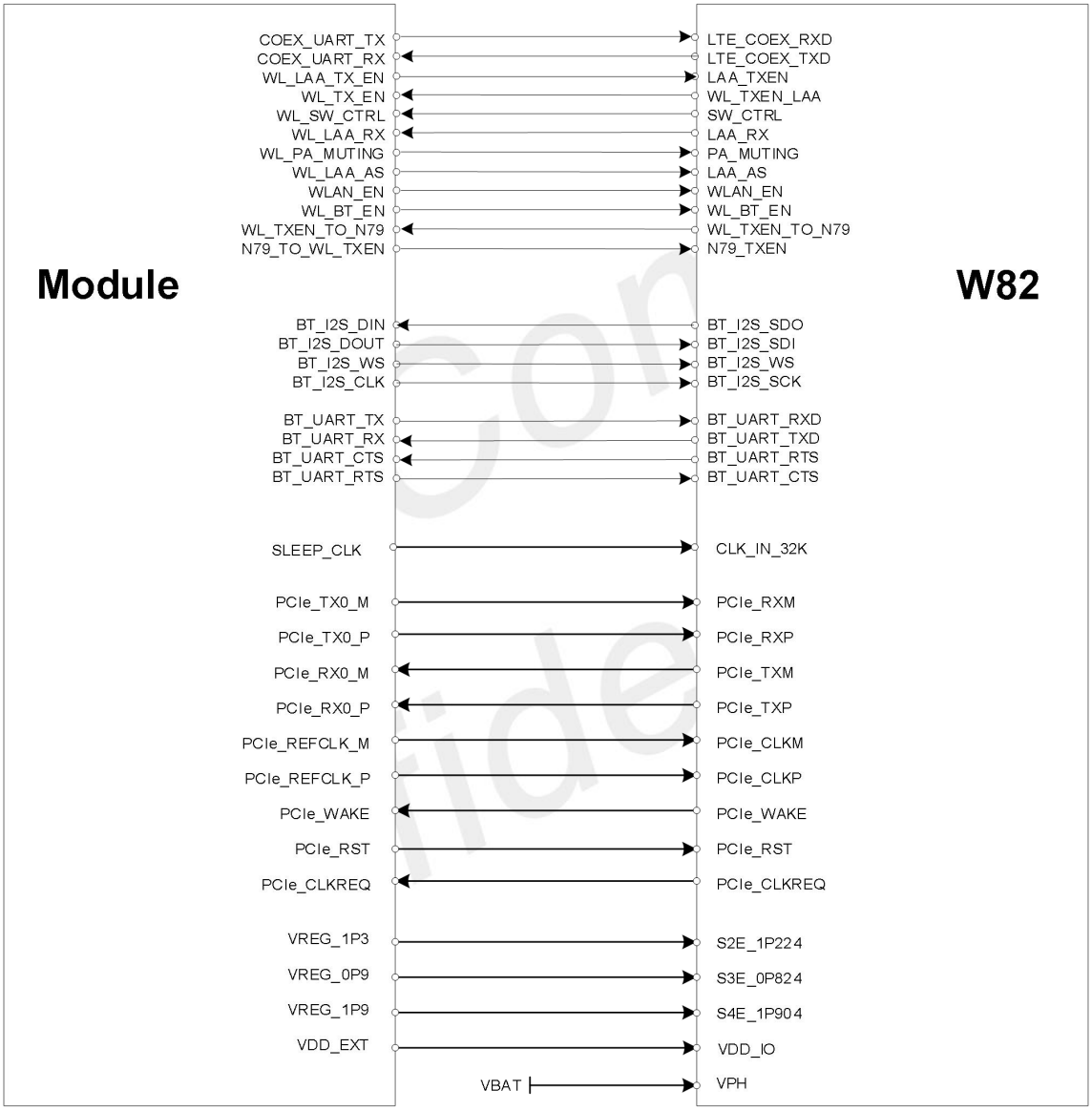


Figure 37: SIM82X0X and SIM83X0X Series and W82 connect circuit

Table 43: Definition of WLAN/BT interface

Pin name	Pin no.	Electrical description	description	Comment
WL_SW_CTRL	K49	DO	W82 switch control	If unused, please keep open
SDX_TO_WL_CTI	M49	DO	W82 GPIO	

WL_TO_SDX_CTI	L47	DI	W82 GPIO	
WL_PA_MUTING	H45	DO	WLAN XFEM control for PA mute	
SLEEP_CLK	J51	DO	Sleep clock output for W82 only	
BT_EN	N51	DO	W82 BT enable	If unused, please PD 10k
WL_EN	K45	DO	WLAN enable	
WL_LAA_RX	J47	DI	WLAN XFEM control for LAA receiver	SIM8260C not support LAA, unused please PD 10k
WL_LAA_AS_EN	L51	DO	WLAN LAA AS enable	
COEX_UART_TXD	BA7	DO	LTE&WLAN coexistence data transmit	LTE coexistence signals
COEX_UART_RXD	BA9	DI	LTE&WLAN coexistence data receive	
WL_TXEN_TO_N79	BA37	DI	From Module N79 to the W82	SIM8260E/A，unused, please keep open
N79_TO_WL_TXEN	BA29	DO	From the W82 to Module N79	
WL_LAA_TX_EN	R51	DO	From Module to the W82	SIM8260C/E/A not supported, unused please keep open
WL_TX_EN	AY14	DI	From the W82 to Module	SIM8260C not supported.

NOTE

- For more details about WIFI function, please refer to Document [20] in the appendix.
- BT is under development.

W82 performance as follows, details please refer to the W82 hardware design.

- Compliant with IEEE 802.11a/b/g/n/ac/ax.
- Supports 2x2 Multi-User Multiple-Input Multiple-Output (MU-MIMO.)
- Tri band 2.4G/5G/6G chains.
- 20/40 MHz channel bandwidth for 2.4 GHz and 20/40/80/160 MHz channel bandwidth for 5 GHz and 6 GHz
- Dynamic Frequency Selection (DFS, radar detection).
- Offloading traffic for minimal host utilization at 11ac/ax speeds.
- Low power PCIe interface.
- Support BT 5.2

3.15 PM7250B Interface

SIM82X0X and SIM83X0X Series supports PM7250B interface, customers can use PM7250B to manage the charge of the module. The reference circuits as follows:

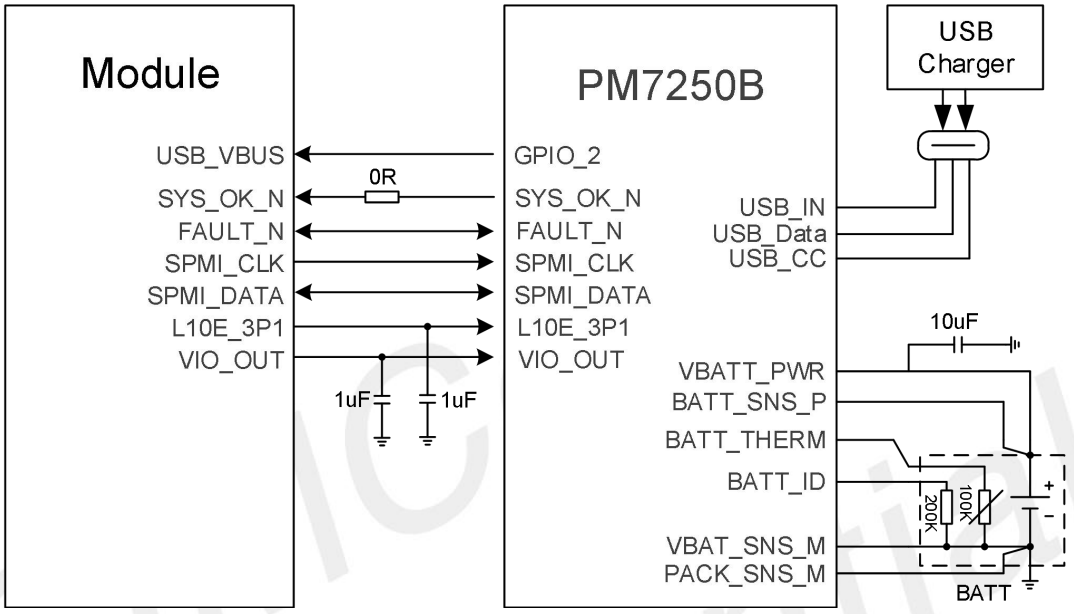


Figure 38: PM7250B interface diagram circuit

Table 44: Definition of PM7250B interface

Pin name	Pin no.	Pin characteristics		Functional description	Comment
USB_VBUS	C9	AI		USB VBUS detection	Not support charge
CHG_SYS_OK	C43	DI		When charger input is inserted PM7250B output signal to PMU. When the charging chip is not used, this pin can be connected to GND to realize the power-on function	
FAULT_N	B44	DIO		Used to send/receive the fault condition across all PMICs in the chipset	
SPMI_CLK	A47	DO		SPMI communication bus clock signal	Required 50Ω impedance
SPMI_DATA	B46	DIO		SPMI communication bus data signal	
L10E_3P1	C41	PO		Output power supply for PM7250B USB PD-PHY and USB switch	
VIO_OUT	D42	PO		Output power for PM7250B IO circuit	

PM7250B performance as follows: please refer to SIM82X0X and SIM83X0X Series reference design for details

- Supports USB Type-C specification Rev. 3.1 and USB power delivery specification Rev. 3.0.
- Supports Qualcomm Quick Charge 2.0, Quick Charge 3.0, and Quick Charge 4.0* technology.

NOTE

- "*"means Indicates to be updated.
- For more details about charge function, please refer to Document [17] in the appendix.

SPMI interface layout guidelines:

- Require single-ended trace impedance is 50Ω ±10%.
- CLK to DATA length mismatch is less than 0.5mm.
- Bus capacitance load is less than 10PF.
- Gap to other signals keeps 3xline width.
- Gap clock-to-data keeps 2xline width.
- Trace routes away from sensitive signals.
- Maximum PCB trace length can't exceed 50mm out of the module， The shorter trace and better.

3.16 GPIOs Interface

The follow pins of SIM82X0X and SIM83X0X Series can be used as GPIO function, If the customer does not want to use the GPIO default configuration, they can choose the Alternate option in the table below, but they need to contact our company for confirmation.

Table 45: GPIO list

PIN Name	PIN No.	GPIO	Default function	Alternate function 1	Alternate function 2	interrupt
I2S_WS	T3	GPIO12	I2S_WS	PCM_SYNC		✓
I2S_DIN	R1	GPIO13	I2S_DIN	PCM_DIN		✓
I2S_DOUT	N1	GPIO14	I2S_DOUT	PCM_DOUT		✓
I2S_CLK	P3	GPIO15	I2S_SCK	PCM_CLK		✓
BT_I2S_WS	G1	GPIO16	BT_I2S_WS	SPI_MOSI	UART_TX	✓
BT_I2S_DIN	M3	GPIO17	BT_I2S_DIN	SPI_MISO	UART_RX	✓
BT_I2S_DOUT	K3	GPIO18	BT_I2S_DOUT	SPI_CS_N	UART_CTS	✓
BT_I2S_CLK	J1	GPIO19	BT_I2S_SCK	SPI_CLK	UART_RTS	✓
UART1_TXD	AB3	GPIO48	UART1_TX			✓
UART1_RXD	AD3	GPIO49	UART1_RX			✓
UART1_CTS	AA1	GPIO80	UART1_CTS		SPI_MOSI	
UART1_RTS	AC1	GPIO81	UART1_RTS		SPI_MISO	✓
BT_UART_TXD	T7	GPIO63	BT_UART_TX			
BT_UART_RXD	V7	GPIO64	BT_UART_RX			✓
BT_UART_CTS	R5	GPIO65	BT_UART_CTS	I2C_SDA		✓
BT_UART_RTS	U5	GPIO66	BT_UART_RTS	I2C_SCL		
SPI_MOSI	D14	GPIO4	SPI_MOSI		UART_TX	
SPI_MISO	D16	GPIO5	SPI_MISO		UART_RX	✓
SPI_CS_N	D18	GPIO6	SPI_CS	I2C_SDA	UART_CTS	✓
SPI_CLK	D20	GPIO7	SPI_CLK	I2C_SCL	UART_RTS	
GPIO107	U1	GPIO107	GPIO107			
GPIO82	V3	GPIO82	GPIO82	I2C_SDA	SPI_CS_N	
GPIO83	Y3	GPIO83	GPIO83	I2C_SCL	SPI_CLK	✓
GPIO31	C29	GPIO31	GPIO31			
TDD_SYNC_PPS	AW21	GPIO32	TDD_SYNC_PPS			✓
GPIO47	AE5	GPIO47	ETH_1_INTN_WOL			✓
W_DISABLE	AG1	GPIO86	W_DISABLE			✓
GPIO88	AG5	GPIO88	ETH_0_INTN_WOL			✓

GPIO92	AK7	GPIO92	GPIO92			
GPIO96	AM7	GPIO96	GPIO96			✓
SLEEP_OUT	AF3	GPIO97	SLEEP_OUT			
GPIO102	D36	GPIO102	GPIO102			
GPIO105	D38	GPIO105	GPIO105			
GPIO106	AY10	GPIO106	GPIO106			
PMU_GPIO6	AP7	PMU_GPIO6	PMU_GPIO6			
STATUS	AJ5	PMU_GPIO13	STATUS			
NET_STATUS	AE1	PMU_GPIO14	NET_STATUS			

NOTE

- "✓" means the GPIO support interrupt function.
- GPIO default state is B-PD, GPIO66 cannot be pulled up externally.
- UART1 is used as AT command by default, it is not recommended to be used for other functions

3.17 Network Status

The NET_STATUS pin is used to control network status LED, its reference circuit is shown in the following figure.

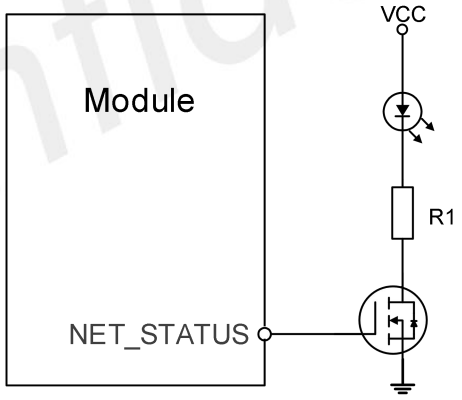


Figure 39: NET_STATUS reference circuit

Table 46: Definition of NET_STATUS pin

Pin Name	Pin No.	Electrical Description		Description	Comments
NET_STATUS	AE1	DO	P3	Indicate network activity status of the module	

NOTE

- The value of the resistor R1 depends on the LED characteristics.

The timing parameters are shown in the following table.

Table 47: NET_STATUS pin status

NET_STATUS pin status	Module status
Always On	Searching network; call connection (including 5G, VOLTE)
100ms ON, 100ms OFF	5G Data transmitting; 5G registered on network
200ms ON, 200ms OFF	3G/4G Data transmitting; 4G registered on network
800ms ON, 800ms OFF	3G registered on network
OFF	Power off; in sleep mode

3.18 Flight Mode Control

The W_DISABLE pin can be used to control SIM82X0X and SIM83X0X Series to enter or exit the flight mode. In flight mode, the RF circuit is closed to prevent interference with other equipment's and minimize current consumption. Its reference circuit is shown in the following figure.

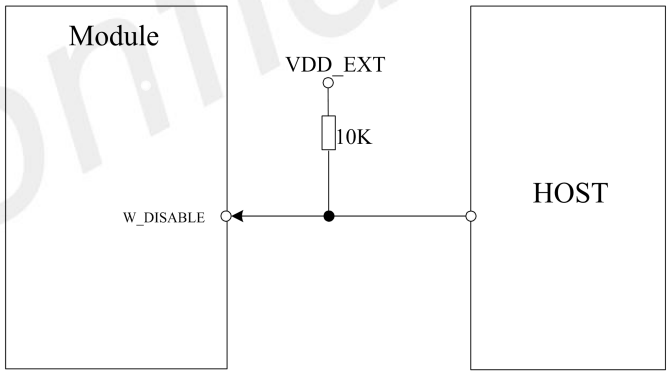


Figure 40: W_DISABLE pin reference circuit

Table 48: Definition of W_DISABLE pin

Pin Name	Pin No.	Electrical Description		Description	Comments
W_DISABLE	AG1	DI	P3	Flight mode control input active low	

Table 49: W_DISABLE pin status

W_DISABLE pin status	Module operation
Input low level	Flight mode: RF is disabled
Input high level	AT+CFUN=0: Minimal functional mode (SIM card function is off) AT+CFUN=4: Flight mode (SIM card function is on) AT+CFUN=1: RF is enabled (Default)

Both W_DISABLE and AT commands can change the working mode of the module, but W_DISABLE has a higher priority. When W_DISABLE is low, it is forced to enter flight mode. When W_DISABLE is high, it can enter different working modes by sending AT commands.

3.19 TDD_SYNC_PPS

SIM82X0X and SIM83X0X Series support TDD_SYNC_PPS signal, it can generate pulse use for indication NSA and SA sub6 the beginning frame flag of DL-UL, the pin level is 1.8V, customers can direct connect this pin to TDD synchronous input circuit.
Recommended reference circuit is shown in the following figure.

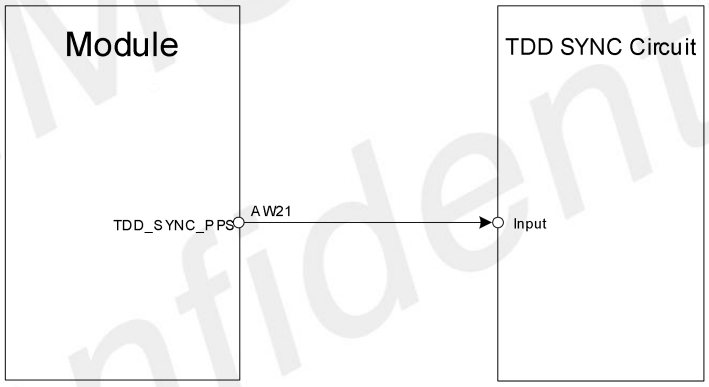


Figure 41: TDD_SYNC_PPS pin reference circuit

Table 50: Definition of TDD_SYNC_PPS pin

Pin name	Pin no.	Electrical description	Description	Comments
TDD_SYNC_PPS	AW21	DO	1. It can generate pulse use for indication NSA and SA sub6 the beginning frame flag of DL-UL 2. The TDD_SYNC_PPS pin also can be configured GPS_1PPS signal output by software	1.8V voltage domain. The TDD_SYNC_PPS and GPS_1PPS function can't be used at the same time.

NOTE

- The TDD_SYNC_PPS pin also can be configured GPS_1PPS signal output by software, the TDD_SYNC_PPS and GPS_1PPS function can't be used at the same time.

The following is TDD_SYNC_PPS signal design guidelines：

- This signal trace should be treated as a data transmission line, required impedance is 50 Ω.
- This signal trace should as short as possible and cannot exceed 40mm out of the module.
- This signal trace should far away from RF, power and high-speed signals.
- This signal trace should be protected completely by GND.
- The rising slew rate is no poor than 3ns, falling slew rate is no poor than 5ns, even with default lowest drive strength (2mA) being selected.

3.20 Antenna Control Interface*

ANT_CTL [0:1] and RFFE0 signals are used for tunable antenna control and should be routed to an appropriate antenna control circuitry.
The following table are the definitions for antenna control interfaces.

Table 51: Definition of antenna control interface through GPIOs

Pin Name	Pin No.	Electrical Description	Description	Comments
RFFE0_CLK	BA11	DO	Antenna tuner MIPI CLK	1.8V voltage domain. If unused, please keep open
RFFE0_DATA	BA13	DIO	Antenna tuner MIPI DATA	
ANT_CTRL0	BA15	DO	Antenna tuner control0	
ANT_CTRL1	AY16	DO	Antenna tuner control1	

NOTE

- "*" means under development, for details please contact SIMCom support teams.
- The RFFE0 signals are multiplexed with ANTCTL2 and ANTCTL3.

3.21 mmW Interface*

Only SIM83X0X serices supports mmW, and its PIN definition is designed on the following Table .

The size of QTM 545 23.80 mm × 3.50 mm × 2.15 mm (maximum) ,RF operating bands n258 (24.25 – 27.50 GHz), n257(26.50 – 29.50 GHz), n261 (27.50 – 28.35 GHz), and n260 (37.00 – 40.00 GHz)

The size of QTM 547 LGA package (16.8 mm × 16.8 mm × 2.11 mm) ,RF operating bands n258 (24.25 – 27.50 GHz), n257(26.50 – 29.50 GHz), n261 (27.50 – 28.35 GHz), and n260 (37.00 – 40.00 GHz)

Table 52: mmW PIN Interface

Pin name	Pin no.	Electrical description	Description
IFH1	AR51	AIO	Horizontal polarization IF output signal and control signal for mmW RFIC device 2
IFH2	AG51	AIO	Horizontal polarization IF output signal and control signal for mmW RFIC device 3
IFH3	AL51	AIO	Horizontal polarization IF output signal and control signal for mmW RFIC device 1
IFH4	AC51	AIO	Horizontal polarization IF output signal and control signal for mmW RFIC device 4
IFV1	AM45	AIO	Vertical polarization IF output signal and local oscillator (LO) signal for mmW RFIC device 3
IFV2	AT45	AIO	Vertical polarization IF output signal and local oscillator (LO) signal for mmW RFIC device 2
IFV3	AK45	AIO	Vertical polarization IF output signal and local oscillator (LO) signal for mmW RFIC device 4
IFV4	AP45	AIO	Vertical polarization IF output signal and local oscillator (LO) signal for mmW RFIC device 1
QTM0_PON	AT49	DO	Power on/reset 1 for QTM module
QTM1_PON	AH49	DO	Power on/reset 2 for QTM module
QTM2_PON	AF49	DO	Power on/reset 3 for QTM module
QTM3_PON	AP49	DO	Power on/reset 4 for QTM module
QTM_THERM	AW19	AI	QTM_thermal detect
VREG_1P9	N47	PO	Power for QTM VDD

Recommended reference circuit is shown in the following figure.

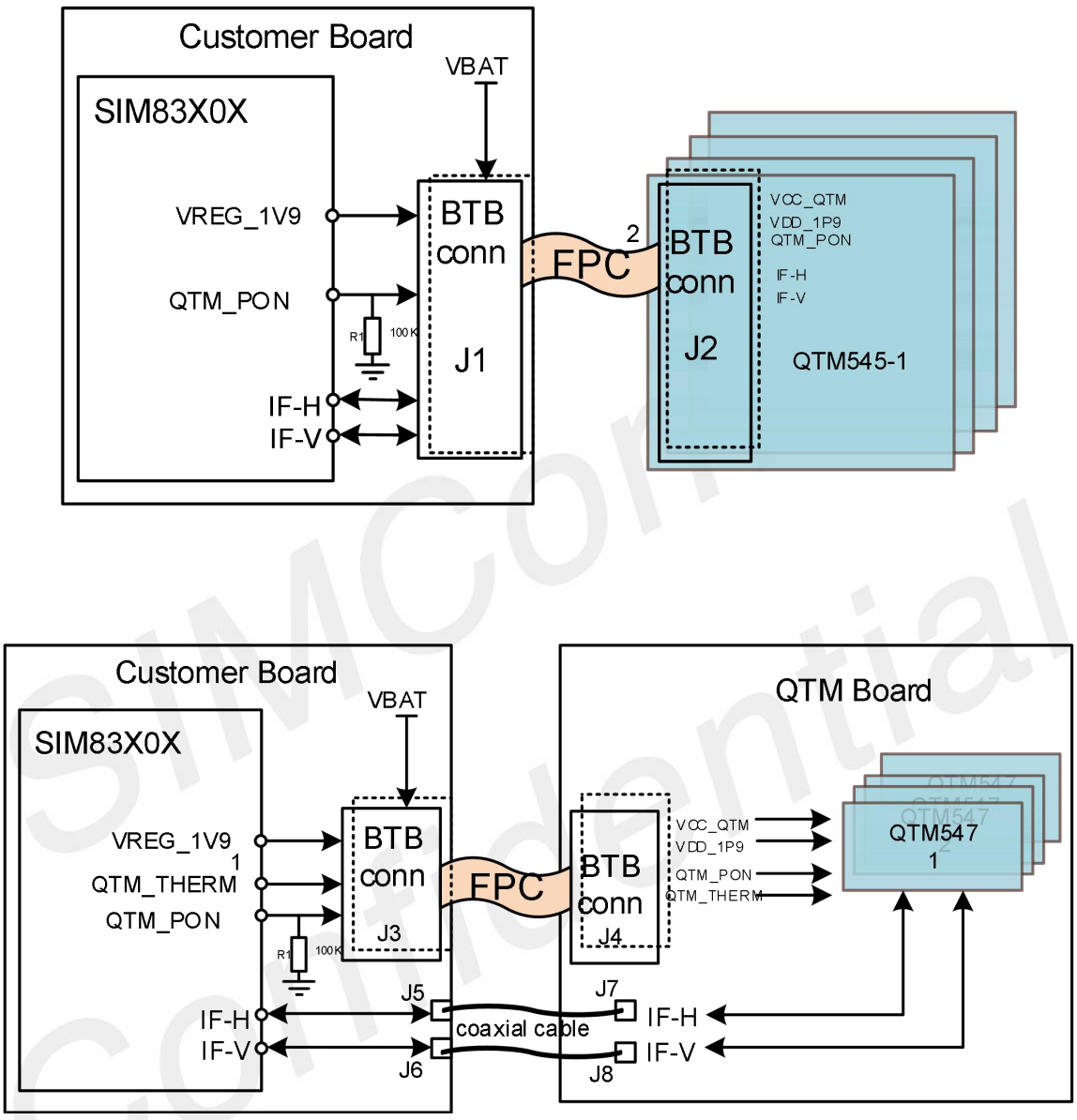


Figure 42: The connection diagram of module and mmW module

NOTE

- Only QTM547 support QTM_THERM
- The QTM545 module can be directly buckled on the customer board, or can be extended through FPC

Table 53: Recommended mmW module connector list

Name	Manufacturer	Part number	Position number
Connector	Panasonic	AXG3B0612DJ1	J1
Connector	Panasonic	AXG4B0612DJ1	J2, Connector on QTM545 module or matching connectors on the FPC
Connector	IPEX	20865-030E-03	J3 J4
Connector	IPEX	20864-010E-01	J3, J4 matching connectors on the FPC
Connector	IPEX	20981-001E-02	J5 J6 J7 J8
Connector	IPEX	20980-001R-13	J5 J6 J7 J8 matching connectors on the coaxial cable

QTM design guidelines：

logic design

- A 100PF capacitor needs to be added to the VDD_1P9 power supply of each QTM545 module
- A 22PF and 4.7UF capacitor needs to be added to the VDD_1P9 power supply of each QTM547 module
- 100PF capacitor needs to be added to the VCC_QTM power supply of each QTM545 module
- 100PF adn 10UF capacitor needs to be added to the VCC_QTM power supply of each QTM547module
- If the QTM_PON signal is not used, add a 100 resistor to GND Isolate from noise sources, such as antenna, RF signals, SMPS, clocks, and other high speeding signals.

IF cable isolation recommendation to avoid LTE de-sense in co-existence mode.

- 0.5 GHz – 1.7 GHz: 70 dB
- 1.7 GHz – 3.0 GHz: 60 dB
- 3.0 GHz – 6.0 GHz: 65 dB
- 6.0 GHz – 10 GHz: 65 dB
- 10.0 GHz – 15 GHz: 55 dB

layout design

- VCC_QTM Maximum allowed DC resistance <=90 (mΩ)
- VDD_1P9 Maximum allowed DC resistance <=150 (mΩ)

4 Antenna Interfaces

SIM82X0X and SIM83X0X Series provides four antennas for 3G/4G/5G and GNSS. The antenna ports have an RF impedance of 50Ω.

4.1 Antenna Definitions

For detailed designs about antenna and if there is a requirement for minimum antennas, please refer to the antenna design guide “SIM8200 Series_LGA Antenna Port Mapping and Design Guide”.

Table 54: The Antenna port definitions of SIM8260C

Frequency band \ Antenna			ANT0	ANT1	ANT2	ANT3	GNSS
3G/4G/5G	LB	TRX0	✓				
3G/4G/5G	MHB	TRX0					
5G	n41	TRX1					
5G	n78/n79	DRX					
3G/4G/5G	LB	DRX		✓			
3G/4G/5G	MHB	DRX					
5G	n78/n79	DRX_MIMO					
4G/5G	MHB	DRX_MIMO			✓		
5G	n78/n79	PRX_MIMO					
GNSS	L1						
4G/5G	MHB	PRX_MIMO				✓	
5G	n41/n78/n79	TRX0					

Table 55: The Antenna port definitions of SIM8380E*

Frequency band \ Antenna			ANT0	ANT1	ANT2	ANT3
3G	MB	TRX	✓			
4G	LB	DIV				
4G	MHB	TRX				
5G	n78/n79	UL/DL-MIMO2				
4G	MHB	DL-MIMO2		✓		
5G	n78/n79	DIV				

4G 5G	MHB n78/n79	DL-MIMO1 DL-MIMO1			✓	
3G 4G 4G 5G	MB LB MHB n78/n79	DIV TRX DIV TRX				✓

※ 特别注意

- 4G LB 只有 DL 2mimo
- n78/n79 支持 UL 2mimo

Table 56: The Antenna port definitions of SIM8260E, SIM8260A SIM8360A SIM8380A SIM8280A

Frequency band / Antenna			ANT0	ANT1	ANT2	ANT3	GNSS
3G/4G/5G 3G/4G/5G 5G	LB MHB n77/n78/n79	TX0/DRX TX0/PRX TX0/DRX_MIMO	✓				
3G/4G/5G 5G 4G	MHB n77/n78/n79 LAA	DRX_MIMO DRX DRX		✓			
3G/4G/5G 5G 4G GNSS	MHB n77/n78/n79 LAA L1	PRX_MIMO PRX_MIMO PRX			✓		
3G/4G/5G 3G/4G/5G 5G	LB MHB n77/n78/n79	TX1/PRX TX1/DRX TX1/PRX				✓	
GNSS	L1 L5*						✓

※ NOTE

- 4G LB only support 2*2 DL-MIMO, the detailed information reference document [14].
- "*" means not supported by default.

4.1.1 3G/4G/5G Operating Frequency

Table 57: 3G/4G band frequency

Frequency band	Uplink (UL)	Downlink (DL)	Duplex mode
WCDMA B1	1920 MHz ~ 1980 MHz	2110 MHz ~ 2170 MHz	WCDMA
WCDMA B2	1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz	WCDMA
WCDMA B4	1710 MHz ~ 1755 MHz	2110 MHz ~ 2155 MHz	WCDMA
WCDMA B5	824 MHz ~ 849 MHz	869 MHz ~ 894MHz	WCDMA
WCDMA B8	880 MHz ~ 915 MHz	925 MHz ~ 960 MHz	WCDMA
LTE B1	1920 MHz ~ 1980 MHz	2110 MHz ~ 2170 MHz	FDD
LTE B2	1850 MHz ~ 1910 MHz	1930 MHz ~ 1990 MHz	FDD
LTE B3	1710 MHz ~ 1785 MHz	1805 MHz ~ 1880 MHz	FDD
LTE B4	1710 MHz ~ 1755 MHz	2110 MHz ~ 2155 MHz	FDD
LTE B5	824 MHz ~ 849 MHz	869 MHz ~ 894MHz	FDD
LTE B7	2500 MHz ~ 2570MHz	2620 MHz ~ 2690MHz	FDD
LTE B8	880 MHz ~ 915 MHz	925 MHz ~ 960 MHz	FDD
LTE B12	698 MHz ~ 716 MHz	728MHz ~ 746 MHz	FDD
LTE B13	777 MHz ~ 787 MHz	746 MHz ~ 756 MHz	FDD
LTE B14	788 MHz ~ 798 MHz	758 MHz ~ 768 MHz	FDD
LTE B18	815 MHz ~ 830 MHz	860 MHz ~875 MHz	FDD
LTE B19	830 MHz ~ 845 MHz	975 MHz ~ 890 MHz	FDD
LTE B20	832 MHz ~ 862MHz	791 MHz ~ 821MHz	FDD
LTE B26	814 MHz ~ 849 MHz	859 MHz ~ 894 MHz	FDD
LTE B28	703 MHz ~ 748MHz	758 MHz ~ 803MHz	FDD
LTE B29	N/A	717 MHz ~ 728 MHz	FDD
LTE B30	2305MHz ~ 2315MHz	2350 MHz ~ 2360 MHz	FDD
LTE B32	N/A	1452 MHz ~ 1496 MHz	FDD
LTE B66	1710 MHz ~ 1780 MHz	2110 MHz ~ 2220 MHz	FDD
LTE B71	663 MHz ~ 698 MHz	617 MHz ~ 652 MHz	FDD
LTE B34	2010 MHz ~ 2025MHz	2010 MHz ~ 2025MHz	TDD
LTE B38	2570 MHz ~ 2620 MHz	2570 MHz ~ 2620 MHz	TDD
LTE B39	1880 MHz ~ 1920MHz	1880 MHz ~ 1920MHz	TDD
LTE B40	2300 MHz ~ 2400 MHz	2300 MHz ~ 2400 MHz	TDD
LTE B41	2496 MHz ~ 2690 MHz	2496 MHz ~ 2690 MHz	TDD
LTE B42	3400MHz ~ 3600MHz	3400 MHz ~ 3600MHz	TDD
LTE B43	3600MHz ~ 3800MHz	3600MHz ~ 3800MHz	TDD
LTE B46	5150MHz ~ 5925MHz	5150MHz ~ 5925MHz	TDD
LTE B48	3550 MHz ~ 3700MHz	3550 MHz ~ 3700MHz	TDD

Table 58: NR band frequency

Frequency band	Uplink (UL)	Downlink (DL)	Duplex mode
NR n1	1920MHz ~ 1980MHz	2110MHz ~ 2170MHz	FDD
NR n2	1850MHz ~ 1910MHz	1930MHz ~ 1990MHz	FDD
NR n3	1710MHz ~ 1785MHz	1805MHz ~ 1880MHz	FDD
NR n5	824MHz ~ 849MHz	869MHz ~ 894MHz	FDD
NR n7	2500MHz ~ 2570MHz	2620MHz ~ 2690MHz	FDD
NR n8	880MHz ~ 915 MHz	925MHz ~ 960 MHz	FDD
NR n12	698MHz ~ 716MHz	728MHz ~ 746MHz	FDD
NR n14	788MHz ~ 798MHz	758MHz ~ 768MHz	FDD
NR n20	832MHz ~ 862MHz	791MHz ~ 821MHz	FDD
NR n25	1850MHz ~ 1915MHz	1930MHz ~ 1995MHz	FDD
NR n28	703MHz ~ 748MHz	758MHz ~ 803MHz	FDD
NR n30	2305MHz ~ 2315MHz	2350MHz ~ 2360MHz	FDD
NR n38	2570MHz~2620MHz	2570MHz~2620MHz	TDD
NR n40	2300MHz ~ 2400MHz	2300MHz ~ 2400MHz	TDD
NR n41	2496MHz ~ 2690MHz	2496MHz ~ 2690MHz	TDD
NR n48	3550MHz ~ 3700MHz	3550MHz ~ 3700MHz	TDD
NR n66	1710MHz ~ 1780MHz	2110MHz ~ 2220MHz	FDD
NR n77	3300MHz ~ 4200MHz	3300MHz ~ 4200MHz	TDD
NR n78	3300MHz ~ 3800MHz	3300MHz ~ 3800MHz	TDD
NR n79	4400MHz ~ 5000MHz	4400MHz ~ 5000MHz	TDD

4.1.2 GNSS Frequency

The following table shows frequency specification of GNSS antenna interface.

Table 59: GNSS frequency

Type	Frequency
GPS L1/Galileo/QZSS	1575.42±1.023MHz
GPS L5	1176.45±10.23MHz
GLONASS	1597.5~1605.8MHz
BeiDou/Compass	1561.098±2.046MHz

4.2 Antenna Installation

4.2.1 PCB Layout Guidelines

To avoid interference, minimalize the insertion loss of the RF trace, the PCB should follow below rules:

- The coaxial cable PCB pads, RF antenna connector and other connectors which used to test contact performance of module should place as close as to the module antenna pads.
- The antenna matching network should place to antenna feed port.
- The RF trace should be as short and straight as possible, and do not routing as perpendicular line, we recommend do it as 45° corner trace.
- The RF traces should be grounded.
- RF device should place grounding wire on the nearest grounding surface.
- Between RF trace and below should avoid other signal trace or parallel trace to the RF signal.
- Recommend to more ground vias near the RF traces.

4.2.2 Antenna Tuner

When the device supports 700MHz low frequency(B12\B13\B28), it is recommended to add antenna tuner to improve RF performance. Antenna tuner contains antenna aperture tuner, antenna impedance tuner an d hybrid tuner of the two. Aperture tuning optimizes the total antenna efficiency from the free space of the antenna terminal, and can optimize antenna efficiency across multiple frequency bands. Impedance tuner adjusts the mismatch between the RF front end and the antenna to achieve maximum transmission power. Hybrid tuner combines the advantages of the two to maximize antenna RF performance. Customers can choose according to specific needs, according to the recommendations from the antenna vendor.

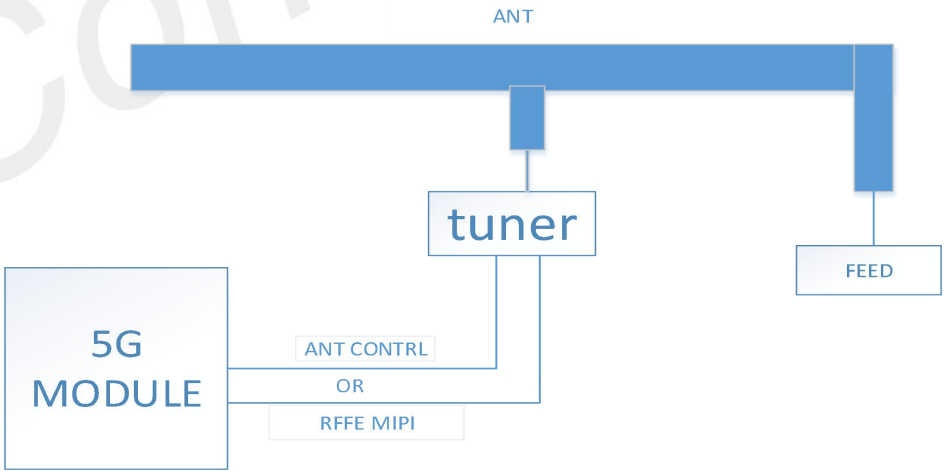


Figure 43: Aperture tuner reference block diagram

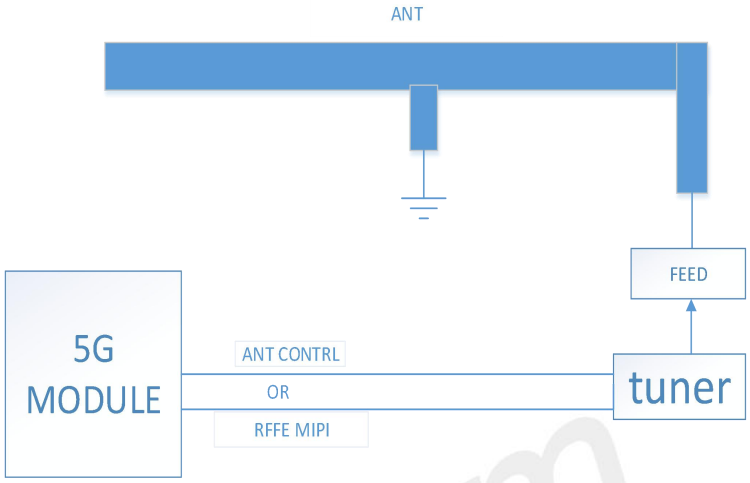


Figure 44: Impedance tuner reference block diagram

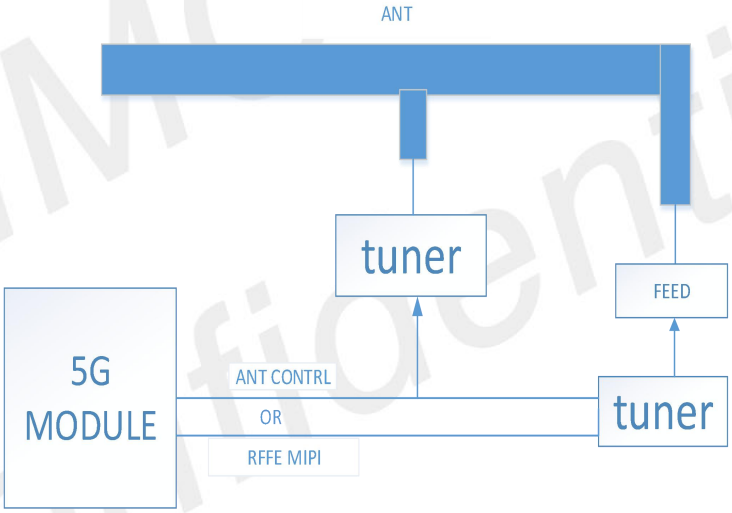


Figure 45: Hybrid tuner reference block diagram

The antenna control Tuner mipi interface of different package modules are as follows.

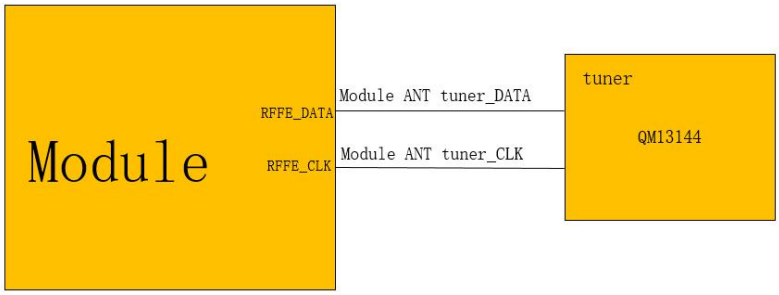


Figure 46: LGA package Tuner mipi interface

NOTE

- When multiple Tuners are needed, pay attention to the distinction of the same device USID under the same group of mipi.
- For details, please refer to the Antenna Tuner Reference Design document and contact SIMCom support teams.

4.2.3 Antenna Requirements

The following table shows the requirements on 3G/4G/5G antennas and GNSS antenna.

Table 60: 3G/4G/5G/GNSS antennas

Parameter	Requirement
Operating Frequency	See Table 7 for each antenna
Direction	Omni Directional
Gain	> -3dBi (Avg)
Impedance	50 Ω
Efficiency	> 50 %
Max. Input Power	50W
VSWR	< 2
Isolation	20dB is preferred
Cable Insertion Loss <1GHz	<1dB
Cable Insertion Loss 1GHz~2.2GHz	<1.5dB
Cable Insertion Loss 2.3GHz~2.7GHz	<2dB
Cable Insertion Loss 3.3GHz~6GHz	<2.5dB

Table 61: GNSS antenna (for dedicated GNSS antenna only)*

Parameter	Requirement
Operating Frequency	L1: 1559~1609MHZ L5: 1166~1187MHz
Direction	Hemisphere, face to sky
Antenna Gain	> 2 dB_{ic}
Impedance	50 Ω
Efficiency	> 50 %
Max. Input Power	50W
VSWR	< 2

Polarization	RHCP or Linear
Noise Figure for Active Antenna	< 1.5
Total Gain for Active Antenna	< 17 dB
Cable Insertion Loss	<1.5dB

NOTE

*: These recommendations are for dedicated GNSS antenna which the application need best of class GNSS tracking performance.

4.2.4 RF Plug Recommendation

SIM82X0X and SIM83X0X Series is mounted with I-PEX's receptacle RF connectors 20449-001E-03, which size is 2.0mm*2.0mm*0.6mm. The connector dimensions are shown as below.

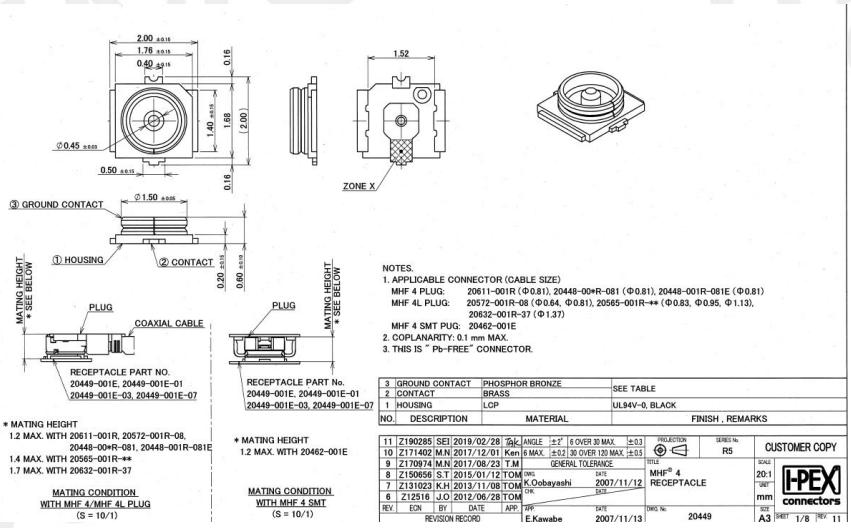


Figure 47: 3D view of 20449-001E-03

The following table shows the RF connector's electrical specifications.

Table 62: Electrical Specifications of 20449-001E-03

Item	Specification
Voltage Rating	60V r.m.s. maximum
Nominal Frequency Range	DC to 6GHz
Nominal Impedance	50Ω

Temperature Rating	-40°C to +90°C
Insulation Resistance	500 MΩ minimum
Withstanding Voltage	No evidence of breakdown
Initial Contact Resistance (Without conductor resistance)	Center contact 20.0mΩmax. Outer contact 20.0mΩmax.
Voltage Standing Wave Ratio (V.S.W.R.)	Meet the requirements of 1.3 max. (DC~3GHz) 1.45 max. (3GHz~6GHz)

To get best RF performance, the RF plug connector should be designed to match the receptacle 20449-001E-03, and the parts come from I-PEX is the recommended.
The following is the mechanical information of the I-PEX's RF coaxial cable GLJ-RH120-1901 for reference, for further technical support, the customer could visit the I-PEX's website or contact the local sales team.

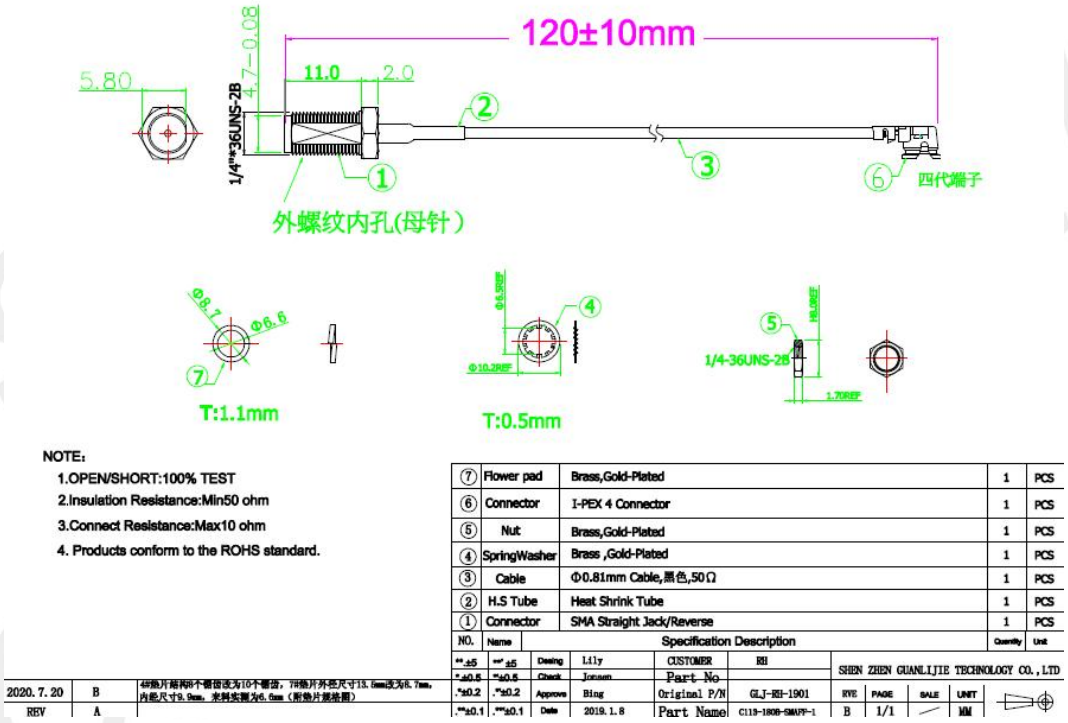


Figure 48: 3D view of 20449-001E-0

5 Electrical Specifications

5.1 Absolute Maximum Ratings

Absolute maximum rating for digital and analog pins of module are listed in the following table:

Table 63: Absolute maximum ratings

Parameter	Min.	Typ.	Max.	Unit
Voltage at VBAT[1] pins	-	-	4.8	V
Voltage at USB_VBUS	-	-	6	V
Voltage at PWRKEY	-	-	2.1	V
Voltage at RESIN_N	-	-	1.9	V
Voltage at digital pins (GPIO, I2C, UART, I2S)	-	-	2.1	V
Voltage at digital pins (U)SIM	-	-	3.05	V

NOTE

1.The VBAT include VBAT_BB and VBAT_RF pins.

5.2 Operating Conditions

Table 64: VBAT recommended operating ratings

Parameter	Min.	Typ.	Max.	Unit
Voltage at VBAT[1] pins	3.3	3.8	4.4	V

NOTE

1. The VBAT include VBAT_BB and VBAT_RF pins.

Table 65: 1.8V digital I/O characteristics

Parameter	Description	Min.	Typ.	Max.	Unit
V_{IH}	High-level input voltage	1.17	-	2.1	V
V_{IL}	Low-level input voltage	0	-	0.63	V
V_{OH}	High-level output voltage	1.35	-	1.8	V
V_{OL}	Low-level output voltage	0	-	0.45	V
I_{OZH}	High-level, tri-state leakage current (No pull-down resistor)	-	-	1	uA
I_{OZL}	Low-level, tri-state leakage current (No pull up resistor)	-1	-	-	uA
I_{IH}	Input high leakage current (No pull-down resistor)	-	-	1	uA
I_{IL}	Input low leakage current (no pull up resistor)	-1	-	-	uA

NOTE

- These parameters are for digital interface pins, such as UART, I2C, I2S, SPI, and GPIOs (SIM_DET, SD_DET).

Table 66: Operating temperature

Parameter	Min.	Typ.	Max.	Unit
Normal operation temperature (3GPP compliant)	-30	-	70	°C
Extended operation temperature	-40	-	85	°C
Storage temperature	-40	-	90	°C

5.3 Operating Mode

5.3.1 Operating Mode Definition

The table below summarizes the various operating modes of module.

Table 67: Operating mode definition

Mode		Function
Normal operation	UMTS/LTE/5G Sleep	AT command “AT+CSCLK=1” can be used to set the module to a sleep mode. In this case, the current consumption of module will be reduced to a very low level and the module can still receive paging message and SMS.
	UMTS/LTE/5G Idle	Software is active. Module is registered to the network and ready to communicate.
	UMTS/LTE/5G Talk	Connection between two subscribers is in progress. In this case, the power consumption depends on network settings such as DTX off/on, FR/EFR/HR, hopping sequences and antenna.
	UMTS/LTE/5G Standby	Module is ready for data transmission, but no data is currently sent or received. In this case, power consumption depends on network settings.
	UMTS/LTE/5G Data transmission	There is data transmission in progress. In this case, power consumption is related to network settings (e. g. power control level); uplink/downlink data rates, etc.
Minimum functionality mode		AT command “AT+CFUN=0” can be used to set the Module to a minimum functionality mode without removing the power supply. In this mode, the RF part of the Module will not work and the (U)SIM card will not be accessible, but the serial port and USB port are still accessible. The power consumption in this mode is lower than normal mode.
Flight mode		AT command “AT+CFUN=4” or pulling down the W_disable1# pin can be used to set the Module to flight mode without removing the power supply. In this mode, the RF part of the Module will not work, but the serial port and USB port are still accessible. The power consumption in this mode is lower than normal mode.
Power off		Normally module will go into power off mode by sending the AT command “AT+CPOF” or pull down the FUL_CARD_POWER_OFF# pin. In this mode the power management unit shuts down the power supply, and software is not active. The serial port and USB are not accessible.

5.3.2 Sleep Mode

In sleep mode, the current consumption of module will be reduced to a very low level.

Several hardware and software conditions must be satisfied in order to let module enter sleep mode:
1. UART condition
2. USB condition
3. Software condition

NOTE

- Before designing, pay attention to how to realize sleeping/waking function.

5.3.3 Minimum Functionality Mode and Flight Mode

Minimum functionality mode ceases a majority function of Module, in order to minimizing the power consumption. This mode is set by the AT command which provides a choice of 3 different functionality levels.

- AT+CFUN=0: Minimum functionality
- AT+CFUN=1: Full functionality (Default)
- AT+CFUN=4: Flight mode

If module has been set to minimum functionality mode, the RF (U)SIM card function will be closed while the serial port and USB are still available.

If module has been set to flight mode, the RF function will be closed, while the (U)SIM card, the serial port and USB are still available.

When module is in minimum functionality or flight mode, it can return to full functionality by the AT command “AT+CFUN=1”.

5.4 Current Consumption

The current consumptions are listed in the follows table.

Table 68: Current consumption on VBAT pins (VBAT=3.8V)

Description	Condition.	Typical	Unit
Power off mode	Power off	135*	uA
GNSS mode	(AT+CFUN=0, connection USB)	TBD	mA
Sleep mode (GNSS off, without connection USB)	WCDMA(AT+CFUN=0)	2.6	mA
	WCDMA DRX=1.28s	4.5	mA
	WCDMA DRX=2.56s	3.5	mA
	LTE-FDD(AT+CFUN=0)	2.6	mA
	LTE-FDD DRX=0.32s	10.5	mA
	LTE-FDD DRX=0.64s	6.5	mA
	LTE-FDD DRX=1.28s	4.5	mA
	LTE-FDD DRX=2.56s	4	mA
	LTE-TDD(AT+CFUN=0)	2.6	mA
	LTE-TDD DRX=0.32s	10.5	mA
	LTE-TDD DRX=0.64s	6.5	mA
	LTE-TDD DRX=1.28s	4.5	mA
	LTE-TDD DRX=2.56s	4	mA
	NR* (AT+CFUN=0)	2.6	mA
	NR DRX=0.32s	10.5	mA
	NR DRX=0.64s	6.5	mA
	NR DRX=1.28s	4.5	mA
	NR DRX=2.56s	4	mA
Idle mode (GNSS off, without connection USB)	WCDMA	28	mA
	LTE FDD	28	mA
	LTE TDD	28	mA
	5G SA	28	mA
HSDPA data*			
WCDMA B1	Max 865mA		
WCDMA B2	/		
WCDMA B3	/		
WCDMA B4	/		
WCDMA B5	Max 865mA		
WCDMA B8	Max 865mA		
LTE data			
LTE-FDD B1	Max 865mA		

LTE-FDD B2	/	
LTE-FDD B3	Max 865mA	
LTE-FDD B4	/	
LTE-FDD B5	Max 765mA	
LTE-FDD B7	Max 965mA	
LTE-FDD B8	Max 765mA	
LTE-FDD B12	/	
LTE-FDD B13	/	
LTE-FDD B14	/	
LTE-FDD B18	/	
LTE-FDD B19	/	
LTE-FDD B20	Max 765mA	
LTE-FDD B26	/	
LTE-FDD B28	Max 765mA	
LTE-FDD B29	/	
LTE-FDD B30	/	
LTE-FDD B32	/	
LTE-FDD B66	/	
LTE-FDD B71	/	
LTE-TDD B34	Max 765mA	
LTE-TDD B38	Max 865mA	
LTE-TDD B39	Max 765mA	
LTE-TDD B40	Max 865mA	
LTE-TDD B41	Max 865mA	
LTE-TDD B42	/	
LTE-FDD B43	/	
LTE-FDD B46	/	
LTE-TDD B48	/	
5G NR data		
5G n1	Max 865mA	
5G n2	/	
5G n3	Max 865mA	
5G n5	Max 765mA	
5G n7	/	
5G n8	Max 765mA	
5G n12	/	
5G n14	/	
5G n20	/	
5G n25	/	
5G n28	Max 765mA	
5G n30	/	

5G n38	/	
5G n40	Max 865mA	
5G n41	Max 1700mA	
5G n66	/	
5G n77	Max 1700mA	
5G n78	Max 1700mA	
5G n79	Max 1700mA	

NOTE

- The VBAT include VBAT_BB and VBAT_RF pins.
- The current consumption of the above table only for reference, please refer to actual current consumption.
- "*"means the typical shutdown current with PM7250B charging chip is 165uA
- Use BAND N78 for 5G NR current test,
- RF current consumption data is based on maximum power 22±0.5dBm test

5.5 RF Output Power

The RF output power is shown in the following table.

Table 69: Conducted output power

Frequency	Max	Min
WCDMA Bands	24dBm + 1/-3dB	< -50dBm
LTE-FDD Bands	23dBm + 2/-2dB	< -40dBm
LTE-TDD Bands	23dBm + 2/-2dB	< -40dBm
NR Bands	23dBm + 2/-3dB	< -40dBm
NR Bands(n38/n40/n41/n77/n78/n79)	26dBm + 2/-3dB	< -40dBm

NOTE

- The NR Bands(n38/n40) SIM8260C is not supported.

5.6 Conducted Receive Sensitivity

SIM82X0X and SIM83X0X Series conducted RF receiving sensitivity is fully meet 3GPP specification. Customers can get more details by check 3GPP official website http://www.3gpp.org.

The following tables show conducted RF receiving sensitivity of SIM82X0X and SIM83X0X Series module.

Table 70: Conducted RF Receiving Sensitivity

SIM82X0X and SIM83X0X Series				
	Frequency	Primary (Typ.)	Diversity (Typ.)	SIMO1(Typ.)
WCDMA	WCDMA B1	-111.5dBm	-113.0dBm	TBD
	WCDMA B5	-113.0dBm	-117.5dBm	TBD
	WCDMA B8	-112.0dBm	-116.0dBm	TBD
LTE	LTE-FDD B1(10M)	-97.5dBm	-98.5dBm	-101.0dBm
	LTE-FDD B3(10M)	-98.0dBm	-98.0dBm	-101.5dBm
	LTE-FDD B5(10M)	-99.0dBm	-100.0dBm	-103.5dBm
	LTE-FDD B7(10M)	-96.5dBm	-98.5dBm	-100.5dBm
	LTE-FDD B8(10M)	-99.0dBm	-98.5dBm	-103.0dBm
	LTE-FDD B20(10M)	-99.5dBm	-98.5dBm	-103.0dBm
	LTE-FDD B28(10M)	-100.0dBm	-98.5dBm	-103.0dBm
	LTE-TDD B34(10M)	-100.5dBm	-99.5dBm	-102.5dBm
	LTE-TDD B38(10M)	-99.0dBm	-99.0dBm	-101.5dBm
	LTE-TDD B39(10M)	-101.0dBm	-98.5dBm	-102.5dBm
	LTE-TDD B40(10M)	-99.0dBm	-97.5dBm	-101.0dBm
	LTE-TDD B41(10M)	-98.5dBm	-98.5dBm	-101.0dBm
5G NR	5G NR-FDD N1(20M SCS:15kHz)	-94.6dBm	TBD	-98.3dBm
	5G NR-FDD N3(15M SCS:15kHz)	-97.3dBm	TBD	-100.5dBm
	5G NR-FDD N28(20M SCS:15kHz)	-96.4dBm	TBD	-99.3dBm
	5G NR-TDD N41(20M SCS:30kHz)	TBD	TBD	-98.8dBm
	5G NR-TDD N78(20M SCS:30kHz)	-95.9dBm	TBD	-98.9dBm
	5G NR-TDD N79(40M SCS:30kHz)	-93.7dBm	TBD	-95.2dBm

5.7 Thermal Design

Make sure that the SIM82X0X and SIM83X0X Series can reach maximum work performance under extended temperature or extreme conditions for a long time, thermal dissipation design is very important.

The thermal dissipation design of LGA is described in Figure as follows:

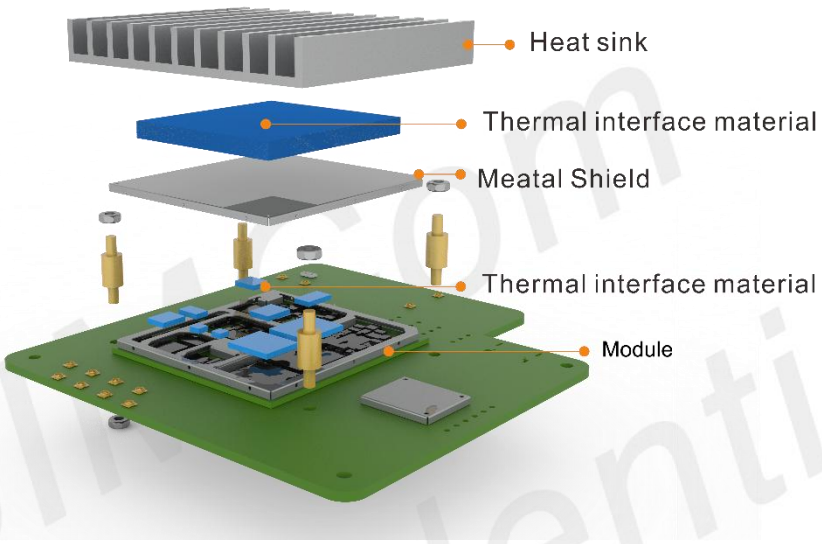


Figure 49: 3D drawing of LGA thermal dissipation design

There are some design rules to enhance thermal dissipation performance:

- Keep the module away from other heat sources such as battery, power, AP, etc.
- All the GND pins of the module should be connected.
- Add enough through GND via on the main PCB. Via material is very important solid copper and stacked via is better.
- Make sure maximize airflow around the module.
- Recommend use heat dissipation material connect to the customers' device on the top side of the module to enhance the heat dissipation. Large heat dissipation area is better.
- Chose a high effective heat dissipation material is better such as heat pipe, graphite sheets.

Table 71: Chip junction temperature table

Chip model	Junction temperature
NM4484NSPAXAE-3F	85℃
PMK65	125℃
PMX65	125℃
SDX65/SDX62	105℃
QET7100	115℃

QPM6679	85℃
QPM6375	85℃
QPM6621	85℃
S55643-11	85℃
SDR735	105℃
SMR546	105℃
QTM545	85℃
QTM547	105℃

5.8 ESD

Module is sensitive to ESD in the process of storage, transporting, and assembling. When module is mounted on the customers' main board, the ESD components should be placed closed to the connectors which human body may touch, such as (U)SIM card socket, SD card socket, audio jacks, switches, USB interface, etc. The following table shows the module ESD measurement performance.

Table 72: The ESD performance measurement table (temperature: 25°C, humidity: 45%)

Part	Contact discharge	Air discharge
VBAT, GND	± 5kV	± 10 kV
Antenna	± 5 kV	± 10 kV
PWRKEY	± 4 kV	± 8 kV
USB	± 4 kV	± 8 kV
RESET_N	± 3 kV	± 6 kV
(U)SIM	± 3 kV	± 6 kV
Other PADs	± 3 kV	± 6 kV

NOTE

Test conditions:

- The external of the module has surge protection diodes and ESD protection diodes.
- The data in table above were tested using SIMCom EVB.

6 Manufacturing

6.1 Top and Bottom View of SIM8XX0X

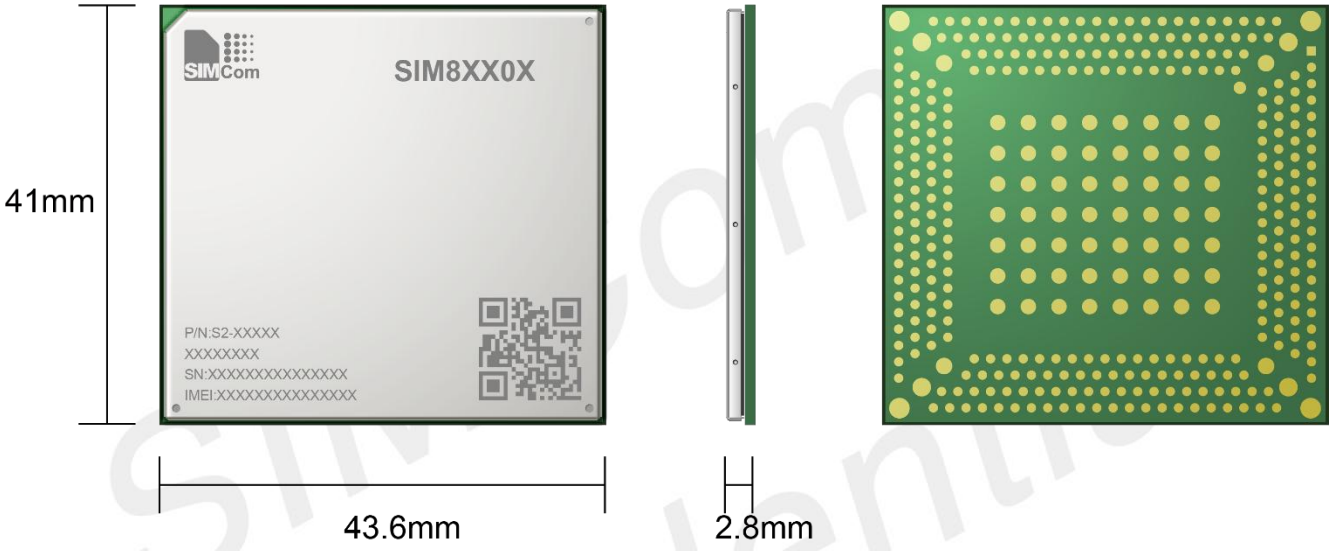


Figure 50: Top and bottom view of SIMXX0X

6.2 Label Description Information

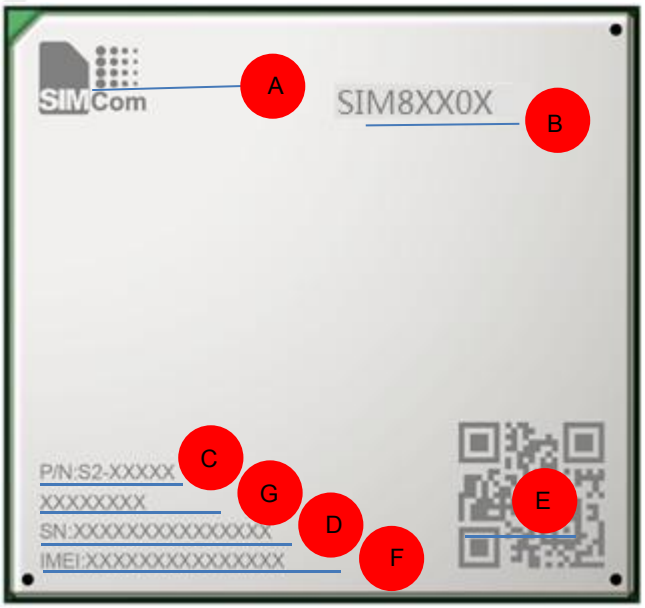


Figure 51: Label description of module

Table 73: Label description of module information

No.	Description
A	LOGO
B	Project name
C	Product code
D	Serial number
E	QR code
F	International mobile equipment identity
G	Product Details Serial Number

NOTE

- The Figure above are the effect diagrams of the module, for reference only. Please refer to the actual product for appearance.
- SIM8XX0X is Project name, Include these product names SIM8380A, SIM8280A, SIM8260C, SIM8260E, SIM8260A. For more detailed product differences, please consult the SIMCom FAE teams.

6.3 Recommended PCB Footprint

The following figure shows the PCB footprint of SIM82X0X and SIM83X0X Series.

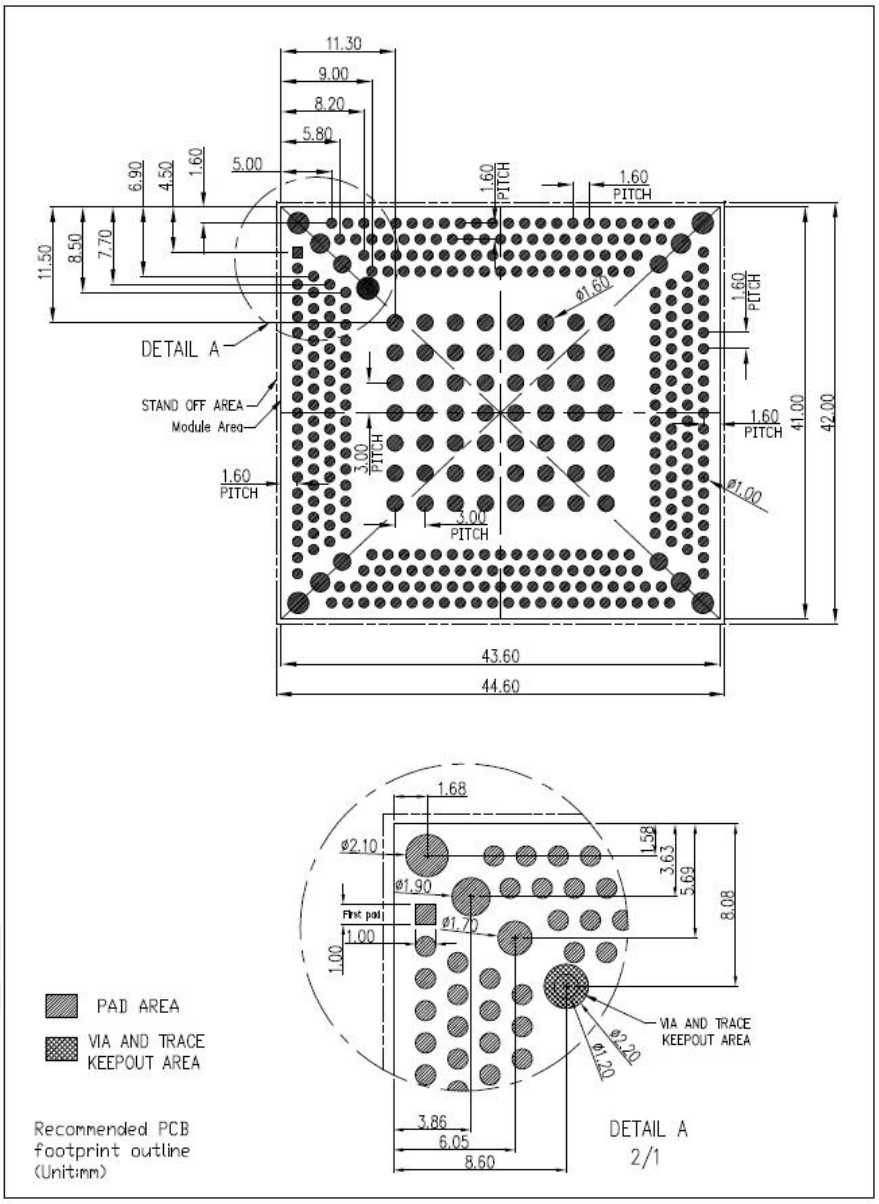


Figure 52: Recommended PCB footprint

NOTE

- Keep out Area is used for internal testing of the module; customers do not need to leave pads. See module recommended package for details

6.4 Recommended SMT Stencil

The following figure shows the SMT stencil of SIM82X0X and SIM83X0X Series.

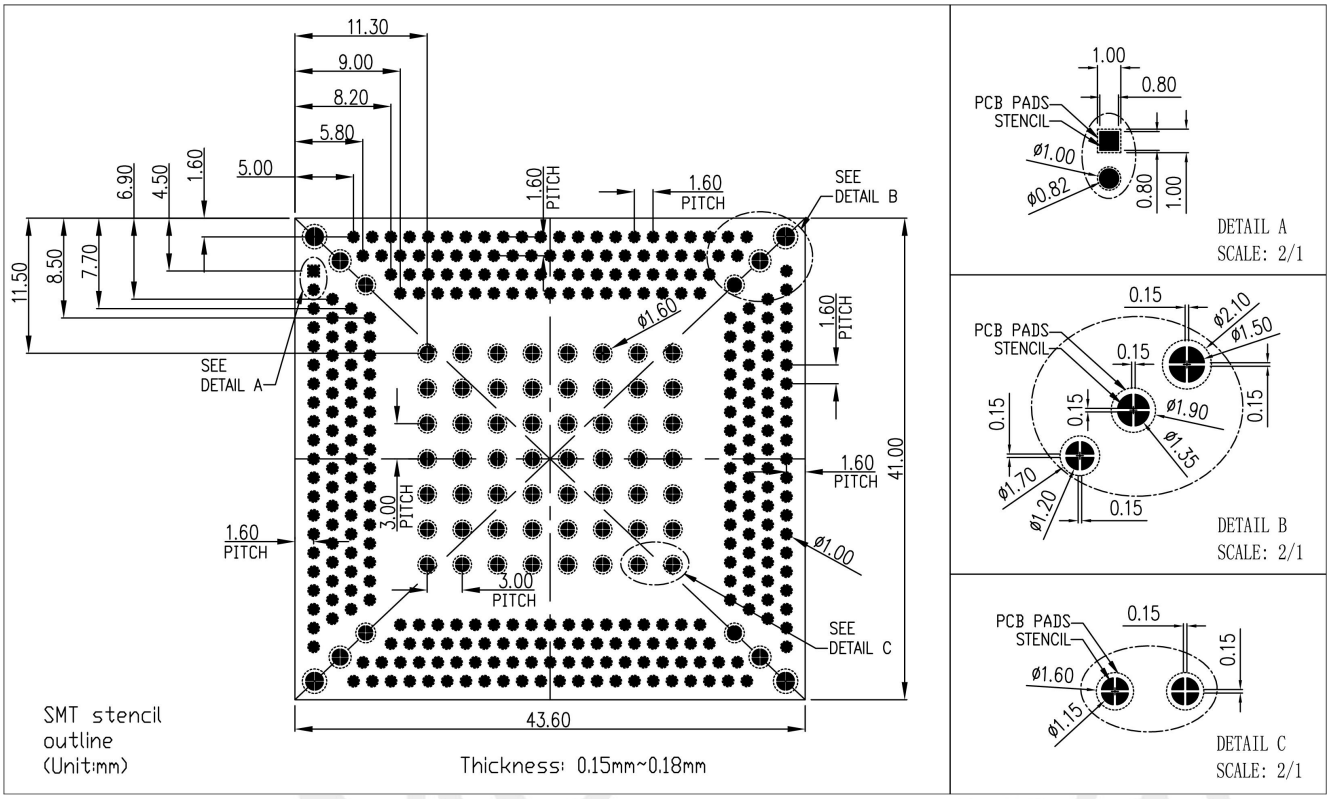


Figure 53: Recommended SMT stencil

6.5 Recommended SMT Reflow Profile

The following figure shows the SMT reflow profile of SIM82X0X and SIM83X0X Series.

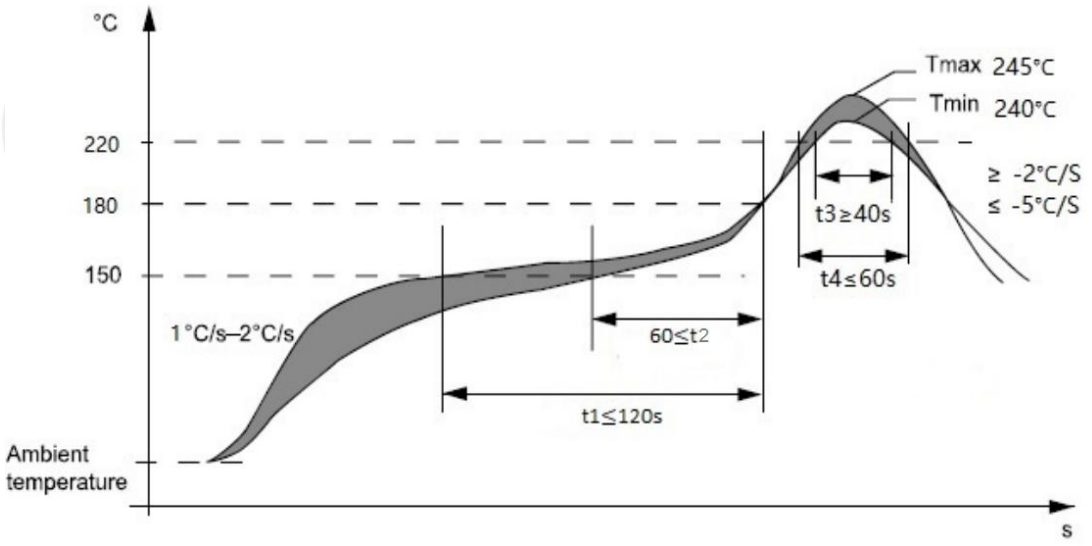


Figure 54: Recommended SMT reflow profile

NOTE

- Refer to “Module secondary-SMT-UGD” for more information about the module shipping and manufacturing.

6.6 Moisture Sensitivity Level (MSL)

SIM82X0X and SIM83X0X Series is susceptible to damage induced by absorbed moisture and high temperature. A package’s moisture-sensitivity level (MSL) indicates its ability to withstand exposure after it is removed from its shipment bag, while it is on the factory floor awaiting PCB installation. A low MSL rating is better than a high rating; a low MSL device can be exposed on the factory floor longer than a high MSL device. All pertinent MSL ratings are summarized as follows.

Table 74: MSL ratings summary

MSL	Out-of-bag floor life	Comments
1	Unlimited	≤+30°C /85% RH
2	1 year	≤+30°C /60% RH
2a	4 weeks	≤+30°C /60% RH
3	168 hours	≤+30°C /60% RH
4	72 hours	≤+30°C /60% RH
5	48 hours	≤+30°C /60% RH
5a	24 hours	≤+30°C /60% RH
6	Mandatory bake before use. After bake, it must be reflowed within the time limit specified on the label.	≤+30°C /60% RH

The SIM82X0X and SIM83X0X Series device samples are currently classified as MSL3 at 255 (+5, -0) °C, following the latest IPC/JEDEC J-STD-020 standard revision for moisture-sensitivity qualification This qualification temperature (255°C) should not be confused with the peak temperature within the recommended solder reflow profile.

6.7 Baking Requirements

It is necessary to bake modules if the prescribed time limit has been exceeded. The baking conditions are specified in Table 71. Note that if baking is required, the devices must be transferred into trays that can be baked to at least 125°C.

The module is vacuum-packed and has a shelf life of 6 months when the temperature is less than 40 degrees and the relative humidity is less than 90%.

If any of the following three conditions are met, the module should be thoroughly baked before reflow welding, as shown in Table 71. Otherwise, the module may be permanently damaged during reflow welding.

- Vacuum packing damaged or air leakage.
- When vacuum packing is opened in good condition, the storage time is more than 6 months (from the date of packing).
- When the vacuum packaging is intact, the storage time of the vacuum packaging is not more than 6 months (calculated from the date of packaging), but the storage time of the vacuum packaging is more than 168 hours in the workshop with temperature <30° C and relative humidity <60%.

Table 75: Baking requirements

Baking conditions options	Duration	Note
40°C±5°C, <5% RH	192 hours	
120°C±5°C, <5% RH	8 hours	Original pallet is not applicable

NOTE

The tray is not resistant to high temperature. If the customer's baking temperature is 120° C, the module should be taken out of the tray for baking, otherwise the tray may be damaged by high temperature

7 Packaging

SIM82X0X and SIM83X0X Series module supports tray packaging. The packaging process is shown in the following figures.

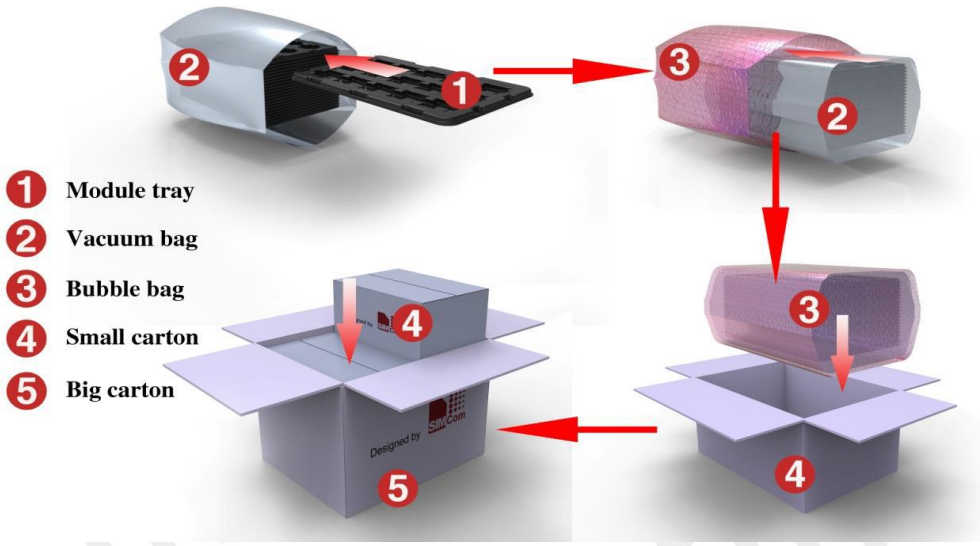


Figure 55: Packaging process

Module tray drawing：

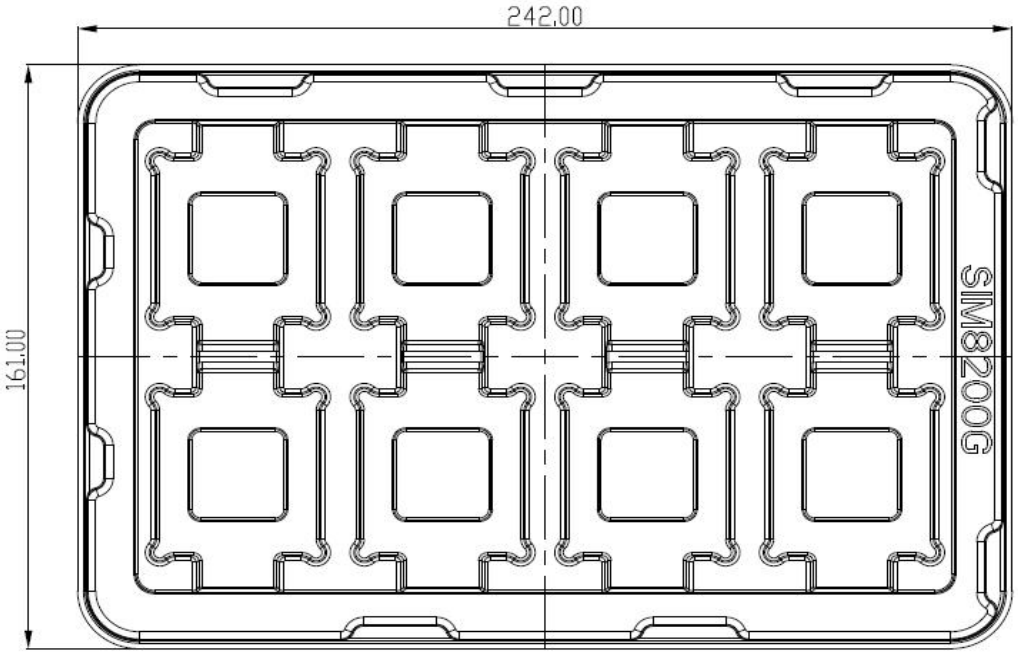


Figure 56: Module tray drawing

Table 76: Tray size

Length（±3mm）	Width（±3mm）	Number
242.0	161.0	8

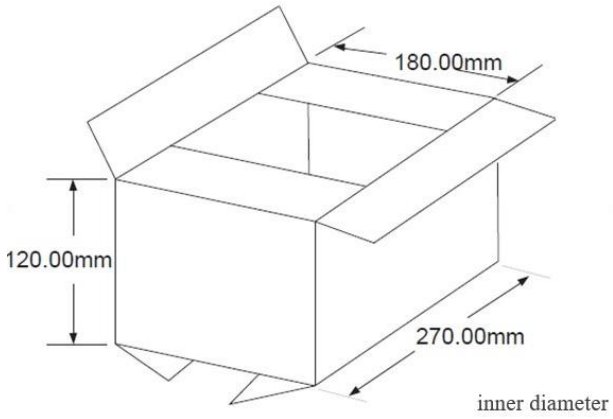


Figure 57: Small carton drawing

Table 77: Small carton size

Length（±10mm）	Width（±10mm）	Height（±10mm）	Number
270	180	120	8*19-2=150

Big carton drawing：

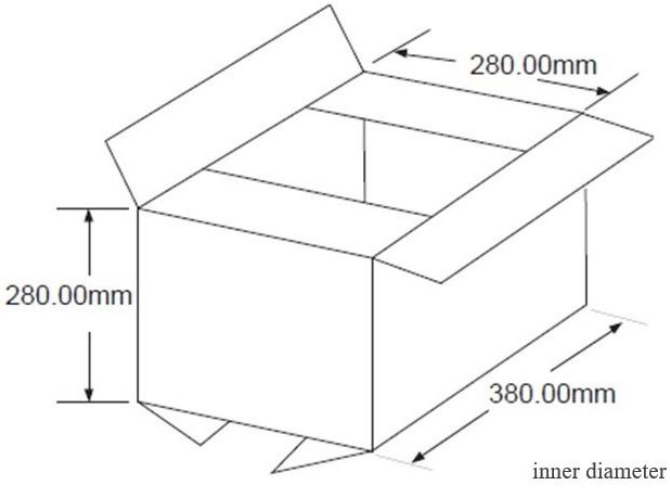


Figure 58: Big carton drawing

Table 78: Big carton size

Length（±10mm）	Width（±10mm）	Height（±10mm）	Number
380	280	280	150*4=600

8 Appendix

8.1 Coding Schemes and Maximum Net Data Rates over Air Interface

Table 79: Coding schemes and maximum net data rates over air interface

HSDPA device category	Max data rate（peak）	Modulation type
Category 1	1.2Mbps	16QAM, QPSK
Category 2	1.2Mbps	16QAM, QPSK
Category 3	1.8Mbps	16QAM, QPSK
Category 4	1.8Mbps	16QAM, QPSK
Category 5	3.6Mbps	16QAM, QPSK
Category 6	3.6Mbps	16QAM, QPSK
Category 7	7.2Mbps	16QAM, QPSK
Category 8	7.2Mbps	16QAM, QPSK
Category 9	10.2Mbps	16QAM, QPSK
Category 10	14.4Mbps	16QAM, QPSK
Category 11	0.9Mbps	QPSK
Category 12	1.8Mbps	QPSK
Category 13	17.6Mbps	64QAM
Category 14	21.1Mbps	64QAM
Category 15	23.4Mbps	16QAM
Category 16	28Mbps	16QAM
Category 17	23.4Mbps	64QAM
Category 18	28Mbps	64QAM
Category 19	35.5Mbps	64QAM
Category 20	42Mbps	64QAM
Category 21	23.4Mbps	16QAM
Category 22	28Mbps	16QAM
Category 23	35.5Mbps	64QAM
Category 24	42.2Mbps	64QAM
HSUPA device category	**Max data rate（peak）**	**Modulation type**
Category 1	0.96Mbps	QPSK
Category 2	1.92Mbps	QPSK
Category 3	1.92Mbps	QPSK
Category 4	3.84Mbps	QPSK

Category 5	3.84Mbps	QPSK
Category 6	5.76Mbps	QPSK
LTE-FDD device category (Downlink)	**Max data rate（peak）**	**Modulation type**
Category 1	10Mbps	QPSK/16QAM/64QAM
Category 2	50Mbps	QPSK/16QAM/64QAM
Category 3	100Mbps	QPSK/16QAM/64QAM
Category 4	150Mbps	QPSK/16QAM/64QAM
Category 5	300Mbps	QPSK/16QAM/64QAM
Category 6	300Mbps	QPSK/16QAM/64QAM
LTE-FDD device category (Uplink)	**Max data rate（peak）**	**Modulation type**
Category 1	5Mbps	QPSK/16QAM
Category 2	25Mbps	QPSK/16QAM
Category 3	50Mbps	QPSK/16QAM
Category 4	50Mbps	QPSK/16QAM
Category 5	75Mbps	QPSK/16QAM/64QAM
Category 6	50Mbps	QPSK/16QAM

8.2 Related Documents

Table 80: Related documents

NO.	Title	Description
[1]	SIM8200 Series_AT Command Manual	AT Command Manual
[2]	3GPP TS 51.010-1	Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification
[3]	3GPP TS 34.124	Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment.
[4]	3GPP TS 34.121	Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment.
[5]	3GPP TS 34.123-1	Technical Specification Group Radio Access Network; Terminal conformance specification; Radio transmission and reception (FDD)
[6]	3GPP TS 34.123-3	User Equipment (UE) conformance specification; Part 3: Abstract Test Suites.
[7]	EN 301 908-02 V2.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (U IMT-2000. Third Generation cellular networks; Pa Harmonized EN for IMT-2000, CDMA Direct Sprea (UTRA FDD) (UE) covering essential requirements article 3.2 of the R&TTE Directive
[8]	EN 301 489-24 V1.2.1	Electromagnetic compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EM standard for radio equipment and services; Part 24 Specific conditions for IMT-2000 CDMA Direct Spre (UTRA) for Mobile and portable (UE) radio and anc equipment
[9]	IEC/EN60950-1(2001)	Safety of information technology equipment (2000)
[10]	3GPP TS 51.010-1	Digital cellular telecommunications system (Releas Mobile Station (MS) conformance specification
[11]	GCF-CC V3.23.1	Global Certification Forum – Certification Criteria
[12]	2002/95/EC	Directive of the European Parliament and of the Co 27 January 2003 on the restriction of the use of cer hazardous substances in electrical and electronic equipment (RoHS)
[13]	SIM82X0X and SIM83X0X Series_LGA Antenna Port Mapping and Deign Guide	Antenna design guidelines
[14]	NSA_ENDC_For_8260	ENDC list for SIM82X0X and SIM83X0X Series
[15]	SIM82X0X and SIM83X0X SeriesEA&SIM82 and SIM83X0X Series_CA COMBO list	EA &CA list for SIM82X0X and SIM83X0X Series
[16]	Antenna Tuner reference design	Antenna tuning method and antenna tuning referer design example
[17]	SIM8200 Series Ethernet RTL8125_HDK	Documents about RTL8125B

[18]	SIM8X60X Series PM7250B_HDK	Documents about charge
[19]	SIM8200 Series CODEC ALC5616_HDK	Documents about audio
[20]	SIM82X0X and SIM83X0X Series WIFI-6 W82_HDK	Documents about W82
[21]	SIM8260 Series_KDL	SIM8260 Series LGA module reference design
[22]	SIM82X0X and SIM83X0X LGA Series_OPEN_GPIOs List	Documents about GPIO configuration
[23]	SIMCOM_Module_Thermal_Design_Guide	Documents about thermal design
[24]	SIM8260 Series QPS615_HDK	Documents about QPS615
[25]	SIM8260 Series QEP8121_HDK	Documents about QEP8121
[26]	SIM8260 Series RTL8367_HDK	Documents about RTL8367

8.3 Terms and Abbreviations

Table 81: Terms and abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
CS	Coding Scheme
CTS	Clear to Send
DRX	Discontinuous Reception
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
FDD	Frequency Division Dual
FR	Full Rate
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HR	Half Rate
I2C	Inter-Integrated Circuit
I2S	Inter-IC Sound
IMEI	International Mobile Equipment Identity
LTE	Long Term Evolution
MDIO	Management Data Input/Output
MMD	MDIO manageable device
MO	Mobile Originated
MSB	Most Significant Bit
PCB	Printed Circuit Board
PCIe	Peripheral Component Interface Express
RF	Radio Frequency
RGMII	Reduced Gigabit Media Independent Interface
SDIO	Secure Digital Input and Output
SIM	Subscriber Identification Module
SMS	Short Message Service
SPI	serial peripheral interface
TDD	Time Division Dual
TX	Transmit Direction
UART	Universal Asynchronous Receiver & Transmitter
VSWR	Voltage Standing Wave Ratio

SM	SIM phonebook
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
WCDMA	Wideband Code Division Multiple Access
(U)SIM	Universal subscriber identity module
UMTS	Universal mobile telecommunications system
UART	Universal asynchronous receiver transmitter
LB	Low Frequency Band
MHB	Middle and High Frequency Band
UHB	Ultra-High Frequency Band
LAA	Limited Access Authorization
TRX	Transmit and Receive signal
UL-MIMO	Uplink- Multiple Input Multiple Output
DL-MIMO	Downlink- Multiple Input Multiple Output

8.4 Safety Caution

Table 82: Safety caution

Marks	Requirements
	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.
	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.
	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.
	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.
	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.
	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 (U)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 (U)SIM card be properly inserted in the cellular terminal or mobile.