SIM6600-M2 Hardware Design

LTE Module

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Version History

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2022-02-28	V1.00	Released	Wu yingchun Rong min

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1 Introduction

This document describes the electronic specifications, RF specifications, interfaces, mechanical characteristics and testing results of the SIMCom M.2 card. With the help of this document and other software application notes/user guides, users can understand and use SIM6600-M2 to design and develop mobile and laptop applications quickly.

1.1 Product Outline

Aimed at the global market, SIM6600-M2 supports WCDMA, LTE-TDD and LTE-FDD, support DL 2CA . The supported radio frequency bands are described in the table1.

Table 1: SIM6600-M2 frequency bands

Standard	Frequency bands
WCDMA	B1/B2//B4/B5/B8
LTE(TDD)	B34/B38/B39/B40/B41
LTE(FDD)	B1/B2/B3/B4/B5/B7/B8/B12/B13/B17/B18/B19/B20/B25/B26/B28/B29/B30/B66/B71
2CA	B1+B3/5/7/8/18/19/20/26/28/40; B2+B2/4/5/12/13/17/28/29/66/71; B3+B3/5/7/8/19/20/28/40; B4+B4/5/12/13/17/28/29/66/71; B5+B5/7/30/40/66; B7+B7/8/20/28; B8+B38/40/41; B12+B30/66; B13+B66; B20+B28; B25+B25/26; B26+B41; B28+B41; B29+B30/66; B40+B40; B41+B41; B66+B66/71; (Note: B29 is only for secondary component carrier)

With a physical dimension of 30.0*42.0*2.3 mm, SIM6600-M2 can meet PCI Express M.2 Specification, and can meet almost any space requirement in users' applications.
With M.2 Type 3042-S3-B, SIM6600-M2 had almost all common interface integrated, such as USB2.0, UIM card, digital audio(I2S or PCM), UART, I2C, GPIOs, MAIN ANT and DIV ANT , etc.

With all the interfaces, SIM6600-M2 can also be utilized in the industrial handheld, machine-to-machine laptop application and especially the router.

1.2 Hardware Block Diagram

The block diagram of SIM6600-M2 is shown as below:

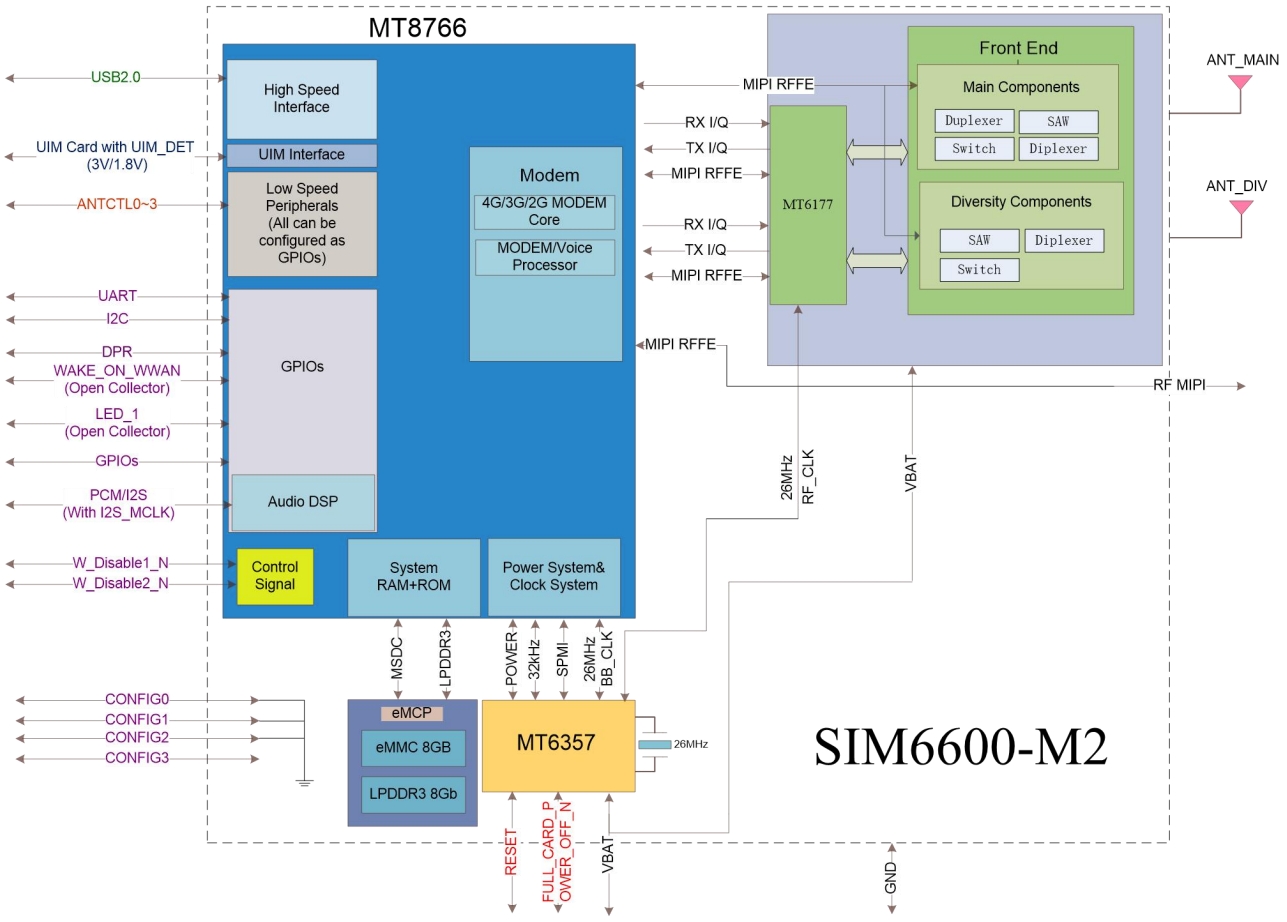


Figure 1: Standard Module block diagram

1.3 Functional Overview

Table 2: General features

Feature	Implementation
Power supply	VBAT:3.135～4.4V Typical supply voltage: 3.7V
Power consumption	Current in sleep mode : <5mA
Radio frequency bands	Please refer to the table 1
Transmitting power	WCDMA power class: 3 (0.25W) LTE power class: 3 (0.25W)
Data Transmission Throughput	UMTS R99 speed: 384 kbps DL/UL HSPA+: 5.76 Mbps(UL), 42 Mbps(DL) FDD-LTE :Max 300Mbps (DL Category7), 150Mbps (UL Category 13) TDD-LTE :Max 200Mbps (DL Category7), 84Mbps (UL Category 13)
Antenna	WCDMA/LTE main antenna. LTE diversity antenna
SMS	MT, MO, CB, Text and PDU mode SMS storage: USIM card or ME(default) Transmission of SMS alternatively over CS or PS.
USIM interface	Support identity card: 1.8V/ 3V
USIM application toolkit	Support SAT class 3, GSM 11.14 Release 98 Support USAT
Phonebook management	Support phonebook types: DC,MC,RC,SM,ME,FD,ON,LD,EN
Digital Audio feature	One I2S interface with dedicated main-clock for primary digital audio, the I2S also can be configured as PCM ● Half Rate (ETS 06.20) ● Full Rate (ETS 06.10) ● MCLK frequency: 12.288MHz (default) ● Enhanced Full Rate (ETS 06.50 / 06.60 / 06.80) ● WCDMA AMR-NB ● VoLTE AMR-WB ● Echo Cancellation ● Noise Suppression
UART interface	UART: ● Baud rate: 300bps to 921600bps(default:115200bps) ● Can be used as the AT commands or data stream channel ● Multiplex ability according to GSM 07.10 Multiplexer Protocol ● Could be configured as GPIOs.
I2C interface	I2C: ● Apply to the “I2C Specification, version 3.0” ● Clock up to 400Kbps

USB	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 or FOTA
Physical characteristics	Size:30*42*2.3mm Weight:TBD
Temperature range	Operation temperature: -25°C to +75°C

2 Package Information

2.1 Pin Assignment Overview

All functions of the M.2 card will be provided through 75 (including 8 notch pins) pads that will be connected to the customers' platform. The following table is the high-level view of the pin assignment of the card.

Table 3: Pin map

		CONFIG_2	75
74	VBAT	GND	73
72	VBAT	GND	71
70	VBAT	CONFIG_1	69
68	I2C_SDA(1.8V)	RESET#(I)(1.8V)	67
66	UIM1_DET (1.8V)	ANTCTL3(O)(1.8V)	65
64	UART_TXD(1.8V)	ANTCTL2(O)(1.8V)	63
62	UART_RXD(1.8V)	ANTCTL1(O)(1.8V)	61
60	I2S_MCLK(1.8V)	ANTCTL0(O)(1.8V)	59
58	MIPI_DATA(1.8V)	GND	57
56	MIPI_CLK(1.8V)	NC	55
54	I2C_IRQ#(1.8V)	NC	53
52	I2S_WS(1.8V)	GND	51
50	I2S_TX/ANT_TUNER_CFG(1.8V)	NC	49
48	UIM2_PWR	NC	47
46	UIM2_RESET	GND	45
44	UIM2_CLK	NC	43

42	UIM2_DATA		
40	UIM2_DET (1.8V)	NC	41
38	I2C_SCL(1.8V)	GND	39
36	UIM1_PWR	NC	37
34	UIM1_DATA	NC	35
32	UIM1_CLK	GND	33
30	UIM1_RESET	NC	31
28	PCI_DPR2# (I)(1.8V/3.3V)	NC	29
26	W_DISABLE2#(3.3/1.8V)	GND	27
24	MIPI_1V8	PCI_DPR1# (I)(1.8V/3.3V)	25
22	I2S_DIN(1.8V)	WoWWAN#(OD)(1.8V/3.3V)	23
20	I2S_CLK (1.8V)	CONFIG_0	21
	Notch	Notch	
	Notch	Notch	
	Notch	Notch	
	Notch	Notch	
	Notch	GND	11
10	LED1# (3.3V OD)	USB D-	9
8	W_DISABLE1# (3.3/1.8V)	USB D+	7
6	FULL_CARD_POWER_OFF#(3.3/1.8V)	GND	5
4	VBAT	GND	3
2	VBAT	CONFIG_3	1

2.2 Pin Description

Table 4: 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
DOH	Digital output with high level
DOL	Digital output with low level
PU	Pull up
PD	Pull down
OD	Open Drain

Table 5: IO parameters definition

Voltage domain	Parameter		Min	Typ	Max
P3	VDD_P3=1.8V DVDD18				
	VOH	High level output	1.35V	-	1.8V
	VOL	Low level output	0V	-	0.4V
	VIH	High level input	1.2V	1.8V	2.1V
	VIL	Low level input	-0.3V	-	0.63V
P4	VDD_P4=1.8V				
	VOH	High level output	1.4V	-	1.8V
	VOL	Low level output	-	0V	0.22V
	VIH	High level input	1.4V	1.8V	-
	VIL	Low level input	-	0V	0.27V
	VDD_P4=3.0V				
	VOH	High level output	2.7V	3.0V	3.1V
	VOL	Low level output	-	0V	0.36V
	VIH	High level input	2.0V	-	3.15V
	VIL	Low level input	-	0V	0.4V

Table 6: Pin description

Pin name	Pin No.	Electrical Description		Description	Comment
Power supply					
VBAT	2,4,70, 72,74		PI	M,2 card power supply, voltage range: 3.135 ～ 4.4V, typical 3.7V.	User should connect these pins together.
GND	3,5,11, 27,33, 39,45, 51,57, 71,73			Ground	
System Control					
FULL_CARD_POWER_ OFF#	6		DI,PD	H: WWAN powers on. L: WWAN go to sleep mode.	It's internally pulled to Low. It's 3.3V tolerant but can be driven by either 1.8V or 3.3V GPIO.
Reset#	67	P3	DI,PU	System reset control input, active low.	RESET_N has been pulled up to 1.8V via resistor internally.
W_DISABLE1#	8		DI	WWAN RF Disable, active low.	It's 3.3V tolerant but can be driven by either 1.8V or 3.3V GPIO.
W_DISABLE2#	26		DI	GNSS disable, active low.Reserved.	It's 3.3V tolerant but can be driven by either 1.8V or 3.3V GPIO.
WoWWAN#	23		OD	Wake on the host.Active low.	
Configuration pins					
CONFIG0	21		GND	Connect to ground	SIM6600-M2 module is configured as the WWAN USB2.0 interface type.
CONFIG1	69		GND	Connect to ground	
CONFIG2	75		GND	Connect to ground	
CONFIG3	1		NC	Not connected	
USB2.0/USB3.0					
USB_D+	7		AIO	Positive line of the differential, bi-directional USB signal.	Main communication interface. USB2.0 data rate up to 480Mbps.
USB D-	9		AIO	Negative line of the differential, bi-directional USB signal.	
UIM interface					
UIM1_PWR	36		PO	Power supply for UIM1 card.	1.8V/3.0V voltage domain,all lines
UIM1_DATA	34	P4	DIO	UIM1 Card data I/O, which no need reserve Pull up	

				resistor to UIM1_PWR.	of UIM interface should be protected against ESD. If unused,please keep open.
UIM1_CLK	32	P4	DO	UIM1 clock signal.	
UIM1_RESET	30	P4	DO	UIM1 Reset control.	
UIM1 DET	66	P3	DI	UIM1 card detect.	
UIM2_PWR	48		PO	Power supply for UIM2 card.	
UIM2_DATA	42	P4		UIM2 Card data I/O, which no need reserve Pull up resistor to UIM2_PWR.	
UIM2_CLK	44	P4		UIM2 clock signal.	
UIM2_RESET	46	P4		UIM2 Reset control.	
UIM2_DET	40	P4		UIM2 card detect.	
Antenna control interface*					
ANTCTL0	59	P3	DO	Antenna tuner control 0	1.8V voltage domain. If unused, please keep open.
ANTCTL1	61	P3	DO	Antenna tuner control 1	
ANTCTL2	63	P3	DO	Antenna tuner control 2	
ANTCTL3	65	P3	DO	Antenna tuner control 3	
MIPI_DATA	58	P3	DIO	MIPI interface tunable ANT, MIPI data	
MIPI_CLK	56	P3	DO	MIPI interface tunable ANT, MIPI clock	
MIPI_1V8	24	P3	PO	1.8V power output for antenna tuner	
I2S interface*					
I2S_CLK	20	P3	DI	I2S serial clock,Reserved	1.8V voltage domain. If unused, keep them open.
I2S_RX	22	P3	DO	I2S Serial receive data,Reserved	
I2S_TX/ANT_TUNER_CFG	50	P3	DO	I2S Serial transmit data,can mux as ANT_TUNER_CFG or GPIO,reserved	
I2S_WS	52	P3	DO	I2S word alignment/select,Reserved	
I2S_MCLK	60	P3	DO	I2S main clock,Reserved	
I2C interface					
I2C_SDA	68	P3	DIO	I2C data signal	1.8V voltage domain.Internal pulled up to 1.8V. If unused, please keep open.
I2C_SCL	38	P3	DO	I2C clock signal	
I2C_IRQ#	54	P3	DI	I2C interrupt request,can mux as GPIO	
UART interface					
UART_RXD	62	P3		UART receive data,can mux as GPIO.	1.8V voltage domain.
UART_TXD	64	P3		UART transmit data,can mux as GPIO.	
Other pins					
LED1#	10		OD		The module

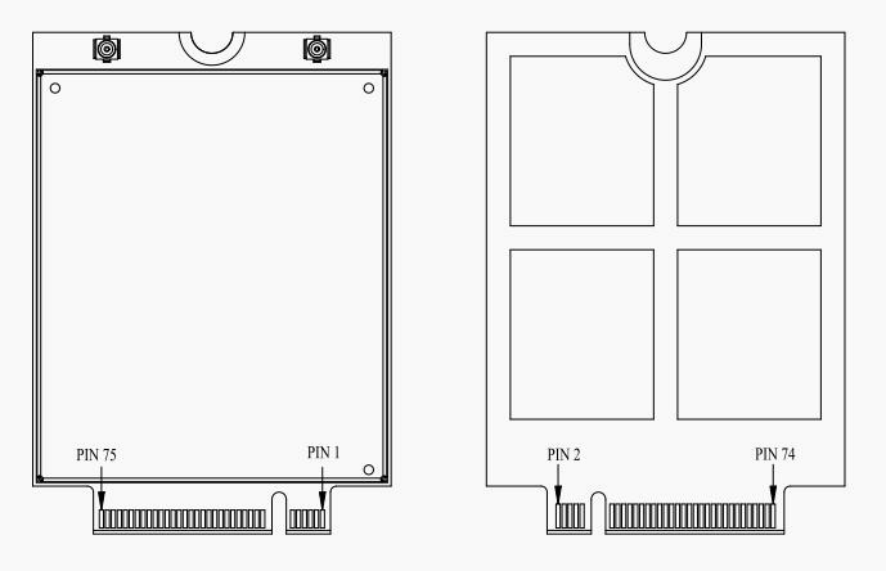
					status indicator via LED devices Active low
PCI_DPR1#*	25		DI	Dynamic power reduction - Body SAR control signal1#	It's 3.3V tolerant but can be driven by either 1.8V or 3.3V GPIO.
PCI_DPR2#*	28		DI	Dynamic power reduction - Body SAR control signal2#	
NC					
NC	29,31, 35,37, 41,43, 47,49, 53,55			NC	NC pins,please keep open.
Notch					
Notch	12,13, 14,15, 16,17, 18,19			Notch	

NOTE

"*"means under development.

2.3 Mechanical Information

The following figure shows the package outline drawing of the M.2 card.



TOP View BOT View

Figure 2: Pin out diagram

2.4 Package Dimensions

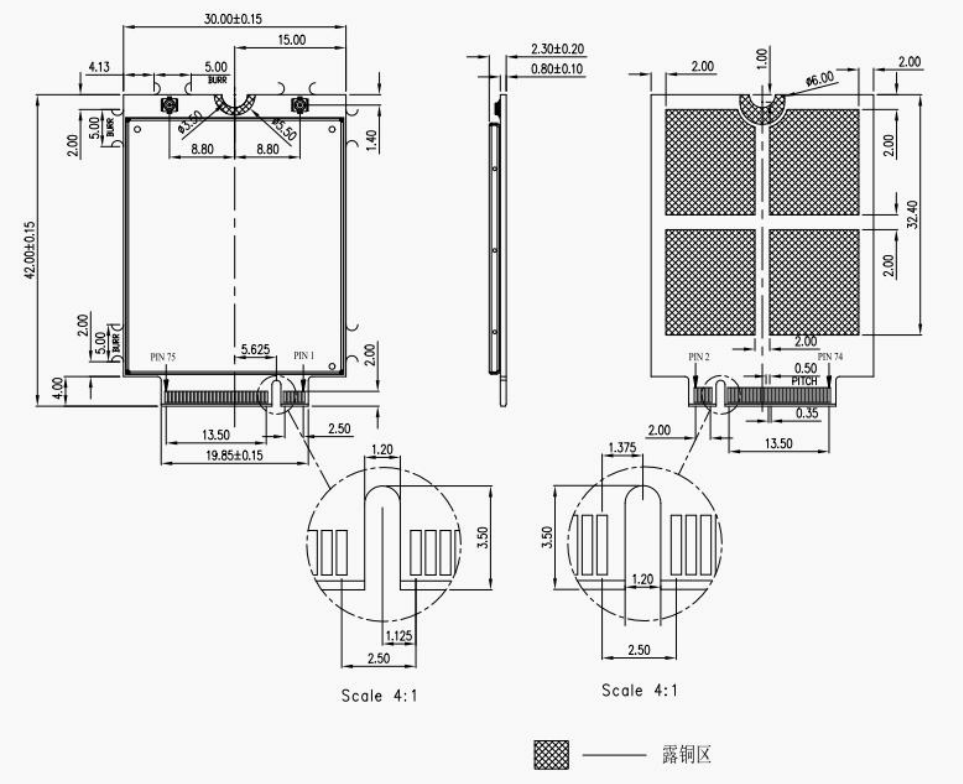


Figure 3: Dimensions of SIM6600-M2 (Unit: mm)

3 Interface Application

3.1 Power Supply

The recommended power supply of SIM6600-M2 is 3.7V and the voltage ranges from 3.135 V to 4.4 V. The SIM6600-M2 has 5 power pins and 11 Ground pins, to ensure the SIM6600-M2 card works normally, all the pins must be connected. The connector pin is defined to support 500mA current per pin continuously.

Table 7: VBAT pins electronic characteristic

Symbol	Description	Min.	Typ.	Max.	Unit
VBAT	Module power voltage	3.135	3.7	4.4	V
$I_{VBAT(peak)}$	Module power peak current in normal mode.	-	-	1	A
$I_{VBAT(power-off)}$	Module power current in power off mode.	-	TBD	-	uA

3.1.1 Power Supply Design Guide

Make sure that the voltage on the VBAT pins will never drop below 3.135V, even during a transmit event, when current consumption may rise up to 1.0A. If the voltage drops below 3.135V, the module will be powered off automatically.

NOTE

Be sure the power supply for VBAT pins can support more than1.0A, using a total of more than 100uF capacitors is recommended, in order to avoid the voltage drop to lower than 3.135V.

Some multi-layer ceramic chip (MLCC) capacitors (0.1/1uF) with low ESR in high frequency band can be used for EMC.
These capacitors should be put as close as possible to VBAT pads. Also, users should keep VBAT trace on circuit board wider than 1.0 mm to minimize PCB trace impedance. The following figure shows the recommended circuit.
If the VBAT generated by a switch mode power supply,it is suggested to add a bead to suppress the

Interference.Recommend part of FB101 is BLM21PG300SN1D or MPZ2012S221A.

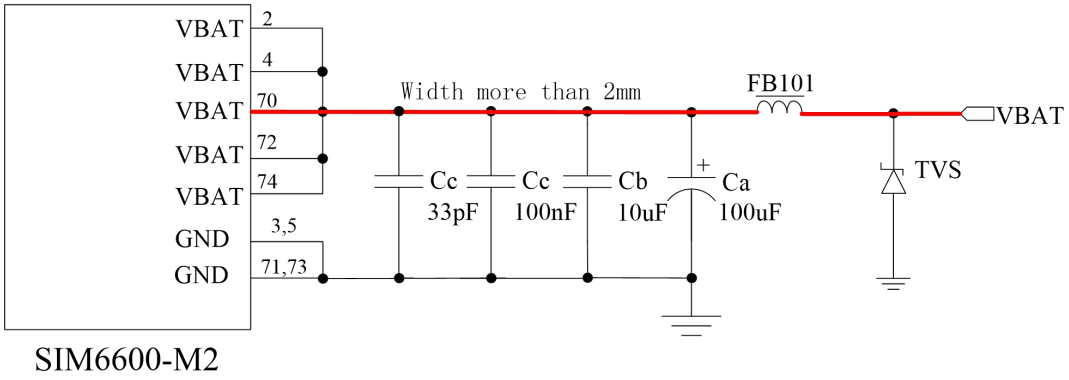


Figure 4: Power supply application circuit

NOTE

1. The test condition: The voltage of power supply for VBAT is 3.7V, Ca is 100 μF tantalum capacitor (ESR=0.7Ω).
2. PIN3,5,71,73 are the main return current path of module,these pins should be coppered by a ground plane to main ground.
3. All other GND pins also need connect to ground.

In addition, in order to guard for over voltage protection, it is suggested to use a TVS diode to protect the M.2 card.TVS diode should be placed near VBAT pins.

Table 8: Recommended TVS diode list

No.	Manufacturer	Part Number	VRWM	Package
1	JCET	ESDBW5V0A1	5V	DFN1006-2L
2	WAYON	WS05DPF-B	5V	DFN1006-2L
3	WILL	ESD5611N	5V	DFN1006-2L
4	WILL	ESD56151W05	5V	SOD-323

3.1.2 Recommended Power Supply Circuit

It is recommended that a switching mode power supply or a linear regulator power supply is used. It is important to make sure that all the components used in the power supply circuit can resist the current which could be more than 1A.

The following figure shows the linear regulator reference circuit with 5V input and 3.7V output.

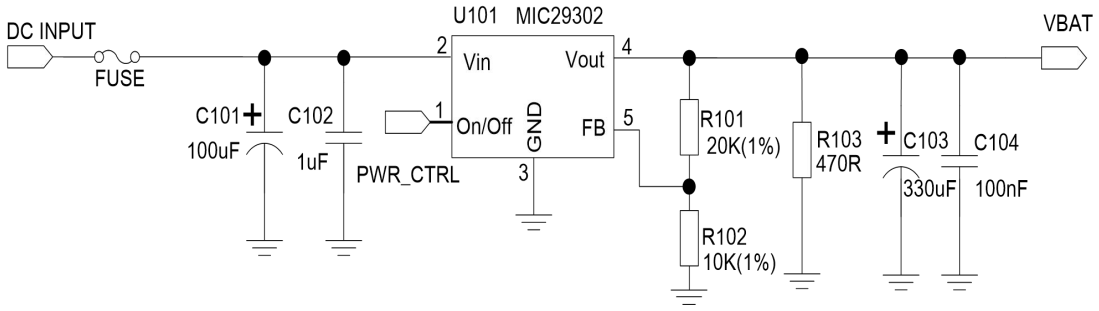


Figure 5: Linear regulator reference circuit

If there is a high dropout between input and VBAT, or the efficiency is extremely important, then a switching mode power supply will be preferable. The following figure shows the switching mode power supply reference circuit with 12V input and 3.7V output.

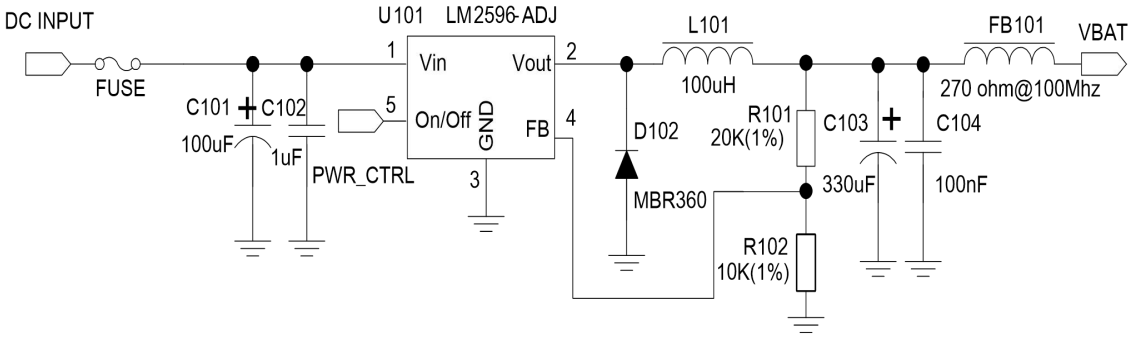


Figure 6: Switching mode power supply reference circuit

NOTE

1. The Switching Mode power supply solution for VBAT must be chosen carefully against Electro Magnetic Interference and ripple current from depraving RF performance.
2. PWR_CTRL must connect to host in case that the module system crash.

3.2 FULL_CARD_POWER_OFF#

Module can be powered on by pulling the FULL_CARD_POWER_OFF# pin up to high level through GPIO, which is 5V tolerant.

FULL_CARD_POWER_OFF# signal is an active low input signal and will turn the module on when asserted high (≥1.7 V) and module will disconnect usb and go to sleep mode when asserted low (≤0.2 V). This pin is 3.3V tolerant and can be driven by either 1.8V or 3.3V GPIO .

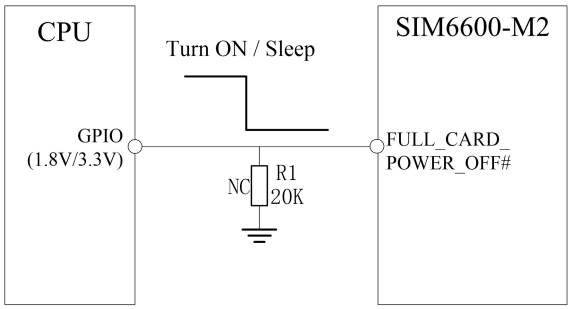


Figure 7: Reference power on/sleep circuit

NOTE

Note: Module could be automatically power on by connecting FULL_CARD_POWER_OFF# pin to 3V3 via 0R resistor directly.

3.2.1 Power on

The power-on scenarios are illustrated in the following figure.

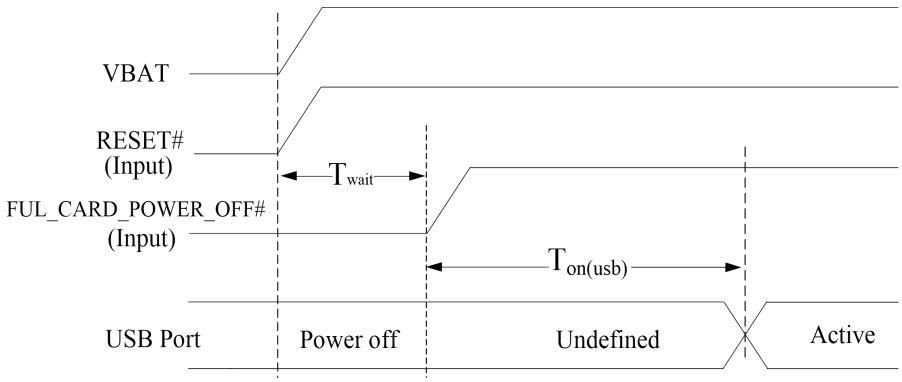


Figure 8: Power on timing sequence

Table 9: Power on timing and electronic characteristic

Symbol	Parameter	Min.	Typ.	Max.	Unit
T_{wait}	The time which is used to wait the VBAT to be stable.	TBD	-	-	ms
$T_{on(usb)}$	The time from power-on issue to USB port ready	-	TBD	-	s
V_{IH}	Input high level voltage on FUL_CARD_POWER_OFF# pin	1.0	1.8	4.4	V
V_{IL}	Input low level voltage on FUL_CARD_POWER_OFF# pin	-0.3	0	0.2	V

3.2.2 Power off

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

- Method 1: Power off Module by AT command .
- Method 2: over-voltage or under-voltage automatic power off.
- Method 3: over-temperature or under-temperature automatic power off.

NOTE

1.The over-temperature and over-voltage function is disable by default.
2. If the temperature is outside the range of -25~+75℃, some warning will be reported via AT port. If the temperature is outside the range of -40~+85℃, Module will be powered off automatically.(if the function is enabled).

3.The power off AT command is being developed.

These procedures will make the M.2 card disconnect from the network and allow the software to enter a safe state, and save data before the card be powered off completely.

3.2.3 Sleep mode

When FULL_CARD_POWER_OFF# is pulled down,module will go to sleep mode,system will save power. The power off scenario by pulling down the FULL_CARD_POWER_OFF# pin is illustrated in the following figure.

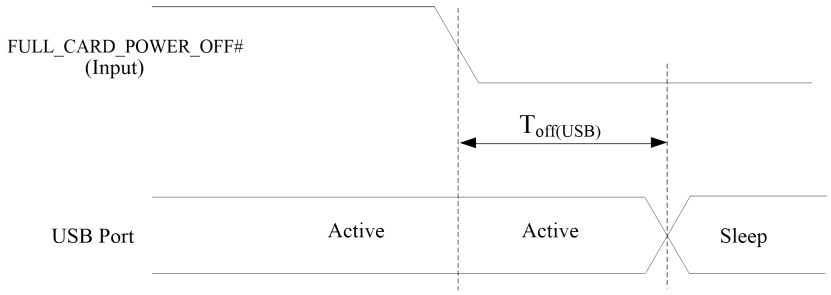


Figure 9: Sleep timing sequence

Table 10: Sleep timing and electronic characteristic

Symbol	Parameter	Time value			Unit
		Min.	Typ.	Max.	
$T_{off(usb)}$	The time from sleep issue to USB disconnect	-	TBD	-	s

3.3 Reset Function

Module can be reset by pulling the RESET# pin down to ground.

NOTE

This function is only used as an emergency reset, when power off AT command have lost efficacy.

The RESET# pin has been pulled up with a resistor to 1.8V internally, so it does not need to be pulled up externally. It is strongly recommended to put a100pF capacitor and an ESD protection diode close to the RESET# pin. Please refer to the following figure for the recommended reference circuit.

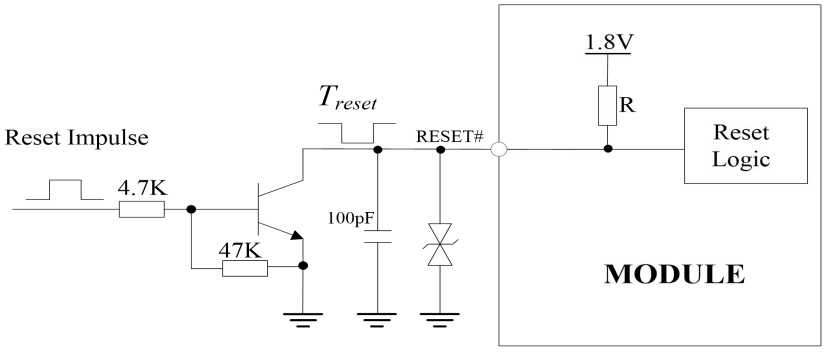


Figure 10: Reference reset circuit

Table 11: RESET pin electronic characteristic

Symbol	Description	Min.	Typ.	Max.	Unit
T_{reset}	The active low level impulse time on RESET_N pin to reset Module	100	150	500	ms
V_{IH}	Input high level voltage	1.2	1.8	2.1	V
V_{IL}	Input low level voltage	-0.3	0	0.4	V

3.4 UART interface

Module provides a 2-wire UART (universal asynchronous serial transmission) interface as DCE (Data Communication Equipment). AT commands and data transmission can be performed through UART interface.

The following figures show the reference design.

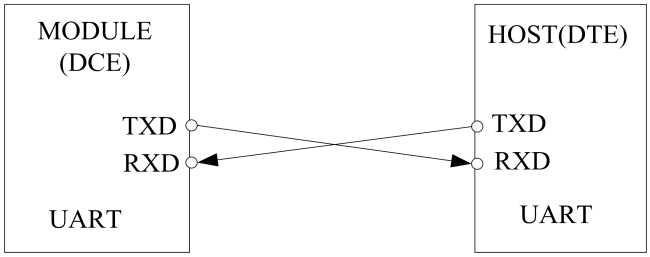


Figure 11: UART modem

The Module UART is 1.8V voltage interface. If user's UART application circuit is 3.3V voltage interface, the level shifter circuits should be used for voltage matching. The TXB0102RGYR provided by Texas Instruments is recommended. The following figure shows the voltage matching reference design.

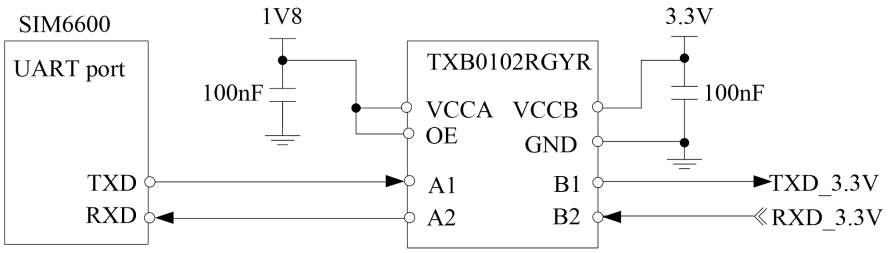


Figure 12: Reference circuit of level shift

NOTE

Module supports the following baud rates: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600. The default band rate is 115200bps.

3.5 I2C Interface

Module provides an I2C interface compatible with I2C specification, version 3.0, with clock rate up to 400 kbps. Its operation voltage is 1.8V.

The following figure shows the I2C bus reference design.

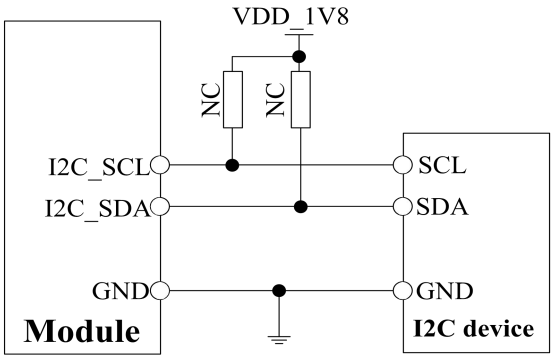


Figure 13: I2C reference circuit

NOTE

SDA and SCL have pull-up resistors in Module,2 external pull up resistors are reserved.

3.6 WoWWAN#

The WoWWAN# pin is an open drain signal which can be used as an interrupt signal to the host. Normally it will keep high logic level until certain conditions such as receiving SMS, voice call (CSD, video) or URC reporting, then WoWWAN# will change to low logic level to inform the host (client PC), the pulse time is 1 second.

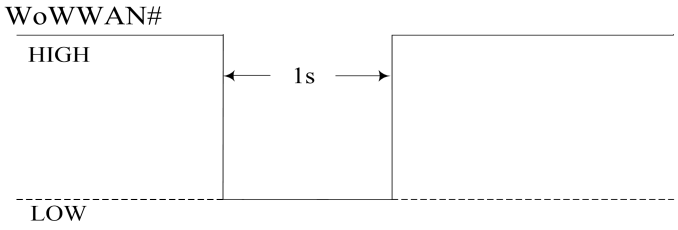


Figure 14: WOWWAN# behaviour（SMS and URC report）

WAKE_ON_WWAN Reference circuit is recommended in the following figure.

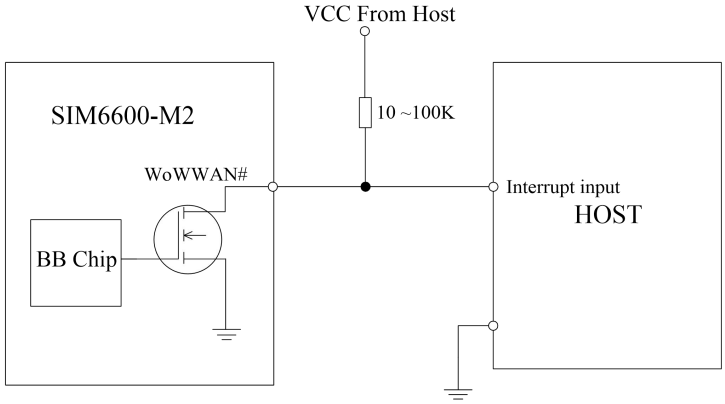


Figure 15: WOWWAN# reference circuit

3.7 USB2.0 Interface

SIM6600-M2 supports one USB2.0 interface. The module supports three USB speeds: low-speed (1.5Mbps), full-speed (12Mbps) and high-speed (480Mbps).

NOTE

1. The USB_DN and USB_DP nets must be traced by 90Ohm+/-10% differential impedance.
2. USB NOT support OTG function and USB charging function.

Module is used as a USB device by default. When FULL_CARD_POWER_OFF# is pulled down,USB will disconnect ,module will go to sleep mode which can reduce power consumption.Pull high the FULL_CARD_POWER_OFF#,USB will reconnection.
The reference schematic is as following:

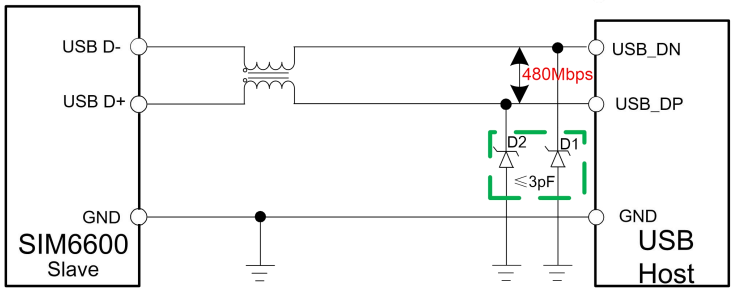


Figure 16: USB reference circuit

Because of the high bit rate on USB bus, more attention should be paid to the influence of the junction capacitance of the ESD component on USB data lines.
Typically, for the USB2.0 signals (USB D- and USB D+), the capacitance should not be more than 3pF. It is recommended to use an ESD protection component such as ESD9M5.0ST5G provided by On Semiconductor (www.onsemi.com).

3.8 UIM Interface

Module supports both 1.8V and 3.0V UIM Cards.

Table 13: UIM electronic characteristic in 1.8V mode (UIM-PWR=1.8V)

Symbol	Parameter	Min.	Typ.	Max.	Unit
UIM-PWR	LDO power output voltage	1.75	1.8	1.95	V
V_{IH}	High-level input voltage	0.65*UIM-PWR	-	UIM-PWR +0.3	V
V_{IL}	Low-level input voltage	-0.3	0	0.35*UIM-PWR	V
V_{OH}	High-level output voltage	UIM-PWR -0.45	-	UIM-PWR	V
V_{OL}	Low-level output voltage	0	0	0.45	V

Table 14: UIM electronic characteristic 3.0V mode (UIM-PWR=2.85V)

Symbol	Parameter	Min.	Typ.	Max.	Unit
UIM-PWR	LDO power output voltage	2.75	2.85	3.05	V
V_{IH}	High-level input voltage	0.65*UIM-PWR	-	UIM-PWR +0.3	V
V_{IL}	Low-level input voltage	-0.3	0	0.25*UIM-PWR	V
V_{OH}	High-level output voltage	UIM-PWR -0.45	-	UIM-PWR	V
V_{OL}	Low-level output voltage	0	0	0.45	V

3.8.1 USIM Application Guide

It is recommended to use an ESD protection component such as ESDA6V1-5W6 produced by ST (www.st.com) or SMF12C produced by ON SEMI (www.onsemi.com). Note that the USIM peripheral circuit should be close to the USIM card socket. The following figure shows the 6-pin SIM card holder reference circuit.

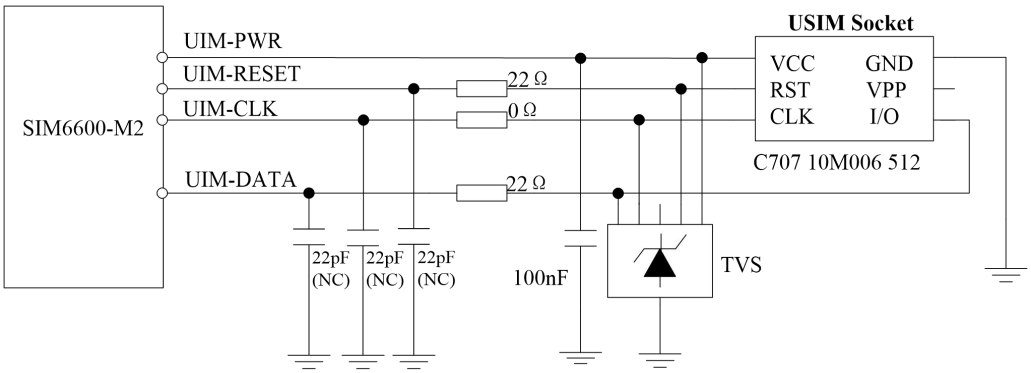


Figure 17: USIM interface reference circuit

The SIM Detect pin is used for detection of the UIM card hot plug in. User can select the 8-pin UIM card holder to implement UIM card detection function.

The following figure shows the 8-pin SIM card holder reference circuit.

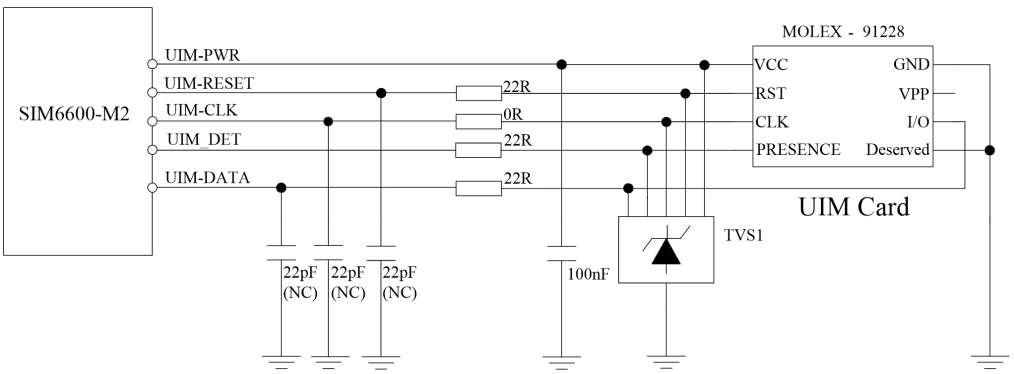


Figure 18: UIM interface reference circuit with UIM_DET

If the UIM card detection function is not used, user can keep the SIM Detect pin open.

3.8.2 USIM layout guide

SIM card circuit is susceptible, the interference may cause the SIM card failures or some other situations, so it is strongly recommended to follow these guidelines while designing:

- Make sure that the SIM card holder should be far away from the antenna while in PCB layout.
- SIM traces should keep away from RF lines, VBAT and high-speed signal lines.

- The traces should be as short as possible.
- Keep SIM holder's GND connect to main ground directly.
- Shielding the SIM card signal by ground.
- Recommended to place a 0.1～1uF capacitor on UIM-PWR line and keep close to the holder.
- The rise/fall time of UIM-CLK should not be more than 40ns.
- Add some TVS and the parasitic capacitance should not exceed 60pF.

3.9 I2S Interface*

Module provides an I2S interface for external codec, which comply with the requirements in the Phillips I2S Bus Specifications.

NOTE

"*"means the I2S function is under developing.

3.10 DPR*

DPR (Dynamic Power Reduction) signal is used by SIM6600-M2 to assist in meeting regulatory SAR (Specific Absorption Rate) requirements for RF exposure. The signal is provided by a host system proximity sensor to the wireless device to provide an input trigger causing a reduction in the radio transmit output power. The module have 2 DPR pins.

User can use AT command to active this function, if do not need this function, this pin can be keep floating.

Table 17: DPR interface

Pin no	Pin Name	Pin status	Function
25	PCI_DPR1#	Low	Max transmitting power will be reduced
		High	Max transmitting power will not be reduced (default)
28	PCI_DPR2#	Floating	Max transmitting power will not be reduced

NOTE

"*" means the DRP function is under developing.

3.11 CONFIG Pins

These signals provide the means to indicate the specific configuration of the module. SIM6600-M2 is configured as WWAN-USB2.0.

Table 18: CONFIG Pins

Pin no	Pin Name	Description
21	CONFIG_0	Connected to GND internally.
69	CONFIG_1	Connected to GND internally.
75	CONFIG_2	Connected to GND internally.
1	CONFIG_3	No Connect internally.

In the M.2 specification, the 4 pins are defined as below:

Table 19: Config interface

Config_0 (Pin 21)	Config_1 (Pin 69)	Config_2 (Pin 75)	Config_3 (Pin 1)	Module type and Main host interface	Comments
GND	GND	GND	NC	WWAN – USB 2.0	Vender defined

3.12 LED1#

LED1# is open drain output and is used to allow SIM6600-M2 to provide network status via LED which will be provided by the host.

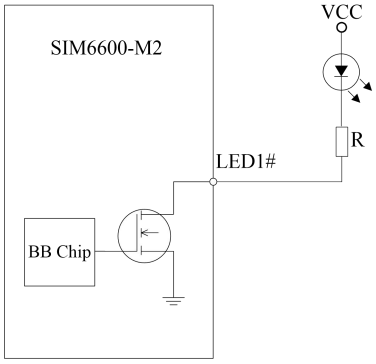


Figure 19: LED1# reference circuit

NOTE

The value of the resistor named “R” depends on the LED characteristic.

Table 20: LED1# pin status

NETLIGHT pin status	Module status
Always On	Searching Network; Call Connect(include VOLTE,SRLTE)
200ms ON, 200ms OFF	Data Transmit; 4G registered;
800ms ON, 800ms OFF	3G registered network
OFF	Power off ;Sleep

3.13 W_DISABLE1#

The W_DISABLE1# pin controls SIM6600-M2 to enter or exit the flight mode, when the W_DISABLE1# signal is asserted to low level, all RF functions would be disabled. When the W_DISABLE1# signal is not asserted, the RF function will be active if it was not disabled by other means such as software.
Its reference circuit is shown in the following figure.

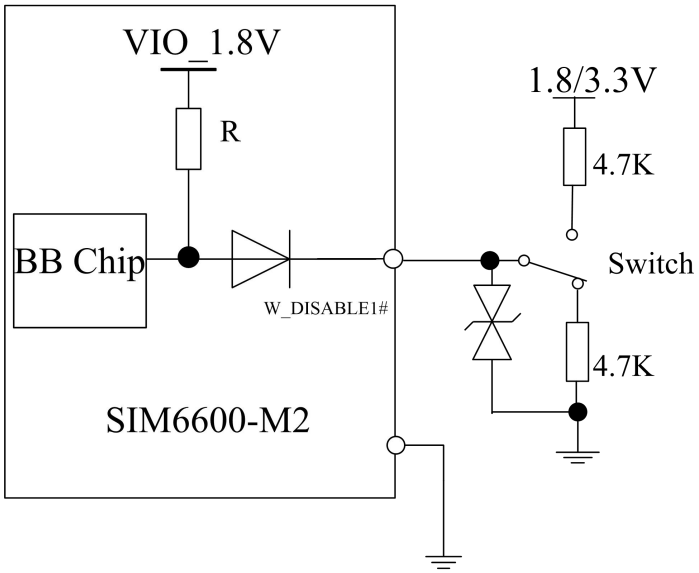


Figure 20: Flight mode switch reference circuit

W_DISABLE1# pin status as below:

Table 21: FLIGHTMODE pin status

FLIGHTMODE pin status	Module operation
Input Low Level	Flight Mode: RF is closed
Input High Level	RF is working

3.14 ANTCTRL interface

ANTCTL[0:3] are used for tunable antenna control and should be routed to anappropriate antenna control circuitry.
The following table are the definitions for antenn control interfaces.

Table 22: Definition of antenna control interface

Pin Name	Pin No.	Electrical Description	Description	Comments
ANTCTL0	59	DO	Antenna tuner control0	1.8V voltage domain.If unused,please keep open
ANTCTL1	61	DO	Antenna tuner control1	
ANTCTL2	58	DO	Antenna tuner control2	
ANTCTL3	56	DO	Antenna tuner control3	

NOTE

This function is under development,for details please contact SIMCom support teams.

3.15 W_DISABLE2#

The W_DISABLE2# pin controls SIM6600-M2 to disable the GNSS function.When the W_DISABLE2# signal is pulled to low level, the GNSS function would be disabled. SIM6600-M2 have no GNSS function,this pin is reserved.

4 Antenna Interfaces

SIM6600-M2 provides a main antenna interface, a diversity antenna interface . The antenna ports have an RF impedance of 50Ω.

4.1 Operating Frequency

Table 22: SIM6600-M2 Operating frequencies

WCDMA Band	Uplink (UL)	Downlink (DL)	Duplex Mode
WCDMA B1	1920 ~1980 MHz	2110 ~2170 MHz	FDD
WCDMA B2	1850 ~1910 MHz	1930 ~1990 MHz	FDD
WCDMA B4	1710 ~1755 MHz	2110 ~2155 MHz	FDD
WCDMA B5	824～849 MHz	869～894MHz	FDD
WCDMA B8	880 ~915 MHz	925 ~960 MHz	FDD
LTE B1	1920 ~1980 MHz	2110 ~2170 MHz	FDD
LTE B2	1850 ~1910 MHz	1930 ~1990 MHz	FDD
LTE B3	1710 ~1785 MHz	1805 ~1880 MHz	FDD
LTE B4	1710 ~1755 MHz	2110 ~2155 MHz	FDD
LTE B5	824～849 MHz	869～894MHz	FDD
LTE B7	2500~2570MHz	2620~2690MHz	FDD
LTE B8	880 ~915 MHz	925 ~960 MHz	FDD
LTE B12	699 ~716 MHz	729 ~746 MHz	FDD
LTE B13	777 ~787 MHz	746 ~756 MHz	FDD
LTE B17	704 ~716 MHz	734 ~746 MHz	FDD
LTE B18	815 ~830 MHz	860 ~875 MHz	FDD
LTE B19	830 ~845 MHz	875 ~890 MHz	FDD
LTE B20	832~862MHz	791~ 821MHz	FDD
LTE B25	1850 ~1915 MHz	1930 ~1995 MHz	FDD
LTE B26	814 ~849 MHz	859 ~894 MHz	FDD
LTE B28	703~748MHz	758~803MHz	FDD
LTE B29	N/A	717 ~728 MHz	FDD
LTE B30	2305 ~2315 MHz	2350 ~2360 MHz	FDD
LTE B66	1710 ~1780 MHz	2110 ~2200 MHz	FDD
LTE B71	663 ~698 MHz	617 ~652 MHz	FDD
LTE B34	2010 ~2025 MHz	2010 ~2025 MHz	TDD

LTE B38	2570 ~2620 MHz	2570 ~2620 MHz	TDD
LTE B39	1880 ~1920 MHz	1880 ~1920 MHz	TDD
LTE B40	2300 ~2400 MHz	2300 ~2400 MHz	TDD
LTE B41	2496 ~2670 MHz	2496 ~2670 MHz	TDD

NOTE

LTE-FDD B29 supports Rx only and is only for secondary component carrier.

4.2 Antenna Installation

4.2.1 Antenna Requirements

The following table shows the requirements on main antenna and Diversity antenna.

Table 24:WCDMA/LTE antenna

Passive	Recommended standard
Direction	Omni directional
Gain	> -3dBi (Avg)
Input impedance	50 Ω
Efficiency	> 30 %
VSWR	< 2
Cable insertion Loss <1GHz	<1dB
Cable insertion Loss 1GHz~2.2GHz	<1.5dB
Cable insertion Loss 2.3GHz~2.7GHz	<2dB

4.2.2 Recommended RF Connector for Antenna Installation

When choosing antennas, user should pay attentions to the connector on antenna which should match with the connector on the module.

The standard 2x2 mm size RF receptacle connectors have been used on SIM6600-M2. The dimension of the connector on SIM6600-M2 is 2.0*2.0*0.6mm.

Shows the RF connector dimension in the following figure:

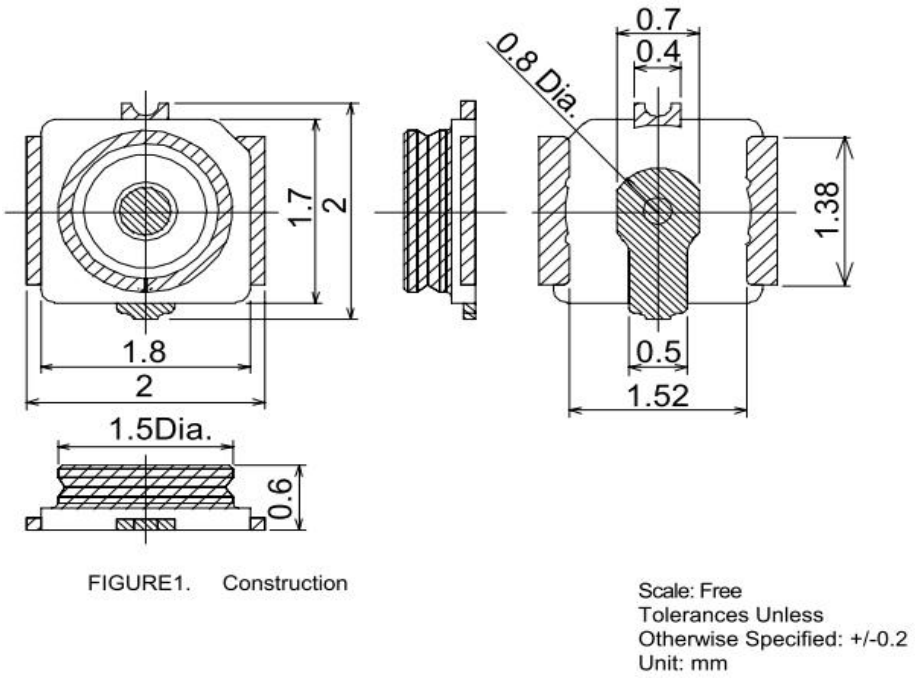


Figure 21: Antenna connector

The major specifications of the RF connector as below:

Table 26: the major specifications of the RF connector

Item	Specification
Nominal Frequency Range	DC to 6 GHz
Nominal Impedance	50Ω
Temperature Rating	-40℃ to + 85℃
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 1.3max.(DC~3GHz) 1.45max.(3GHz~6GHz)

There are two kinds of coaxial cables mating the RF connector in the SIM6600-M2, SIMCom recommend use Murata and SUZHOU KELI, and the Part Number is MXFR32HP1000 of the Murata and KLC-2058 of the KELI.

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 27:Absolute maximum ratings

Parameter	Min.	Typ.	Max.	Unit
Voltage at VBAT pins	-0.3	-	4.7	V
Voltage at digital pins (GPIO,I2C,UART, I2S)	-0.3	-	2.1	V
Voltage at digital pins (UIM)	-0.3	-	3.05	V
Voltage at FULL_CARD_POWER_OFF#	-0.3	-	4.7	
Voltage at RESET#	-0.3	-	2.1	

5.2 Operating conditions

Table 28: Recommended operating ratings

Parameter	Min.	Typ.	Max.	Unit
Voltage at VBAT	3.135	3.7	4.4	V

Table 29: 1.8V Digital I/O characteristics*

Parameter	Description	Min.	Typ.	Max.	Unit
V_{IH}	High-level input voltage	1.17	1.8	2.1	V
V_{IL}	Low-level input voltage	-0.3	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_{OH}	High-level output current(no pull down resistor)	-	TBD	-	mA
I_{OL}	Low-level output current(no pull up resistor)	-	TBD	-	mA
I_{IH}	Input high leakage current (no pull down resistor)	-	-	TBD	uA

I_{IL}	Input low leakage current(no pull up resistor)	TBD	-	-	uA

NOTE

These parameters are for digital interface pins, such as UART, I2C, I2S, RESET#, ANTCTL and GPIOs (DPR, SIM DETECT).

The operating temperature of Module is listed in the following table.

Table 30:Operating temperature

Parameter	Min.	Typ.	Max.	Unit
Normal operation temperature(3GPP compliant)	-25	25	75	℃
Extended operation temperature*	TBD	TBD	TBD	℃
Storage temperature	-40	25	80	℃

NOTE

Module is able to make and receive voice calls, data calls, SMS and make UMTX/LTE traffic in extended operation temperature. The performance will be reduced slightly from the 3GPP specifications if the temperature is outside the normal operating temperature range and still within the extreme operating temperature range.

5.3 Operating Mode

5.3.1 Operating Mode Definition

The table below summarizes the various operating modes of Module product.

Table 31: Operating mode Definition*

Mode		Function
Normal operation	**UMTS/LTE 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 Idle	Software is active. Module is registered to the network, and the Module is ready to communicate.
	UMTS/LTE 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 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 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 USIM 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		Module will go into power off mode by sending the AT command “AT+CPOF” or pull down the FUL_CARD_POWER_OFF# pin, normally. In this mode the power management unit shuts down the power supply, and software is not active. The serial port and USB are is not accessible.

NOTE

These AT Command is under development,for details please contact SIMCom support teams.

5.3.2 Sleep mode

In sleep mode, the current consumption of Module will be reduced to a very low level, and Module can still receive paging message and SMS.
Several hardware and software conditions must be satisfied in order to let Module enter into sleep mode:
1. UART condition
2. USB condition
3. Software condition

NOTE

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

5.4 Current Consumption

The current consumption is listed in the table below.

Table 32:Current consumption on VBAT Pins (VBAT=3.7V)

UMTS sleep mode	
WCDMA supply current (without USB connection)	Sleep mode @DRX=9 Typical: TBD mA Idle mode@DRX=9 Typical: TBD mA
LTE sleep mode	
LTE FDD supply current (without USB connection)	Sleep mode Typical: TBD mA Idle mode Typical:TBD mA
LTE TDD supply current (without USB connection)	Sleep mode Typical: TBD mA Idle mode Typical:TBD mA
UMTS Talk	
WCDMA B1	@Power 23dBm Typical: TBD mA
WCDMA B2	@Power 23dBm Typical: TBD mA
WCDMA B4	@Power 23dBm Typical: TBD mA
WCDMA B5	@Power 23dBm Typical: TBD mA
WCDMA B8	@Power 23dBm Typical: TBD mA
HSDPA data	
WCDMA B1	@Power 23dBm Typical: TBD mA
WCDMA B2	@Power 23dBm Typical: TBD mA
WCDMA B4	@Power 23dBm Typical: TBD mA
WCDMA B5	@Power 23dBm Typical: TBD mA
WCDMA B8	@Power 23dBm Typical: TBD mA
LTE data	
LTE-FDD B1	@5MHz 23dBm Typical: TBD mA @10MHz 23dBm Typical: TBD mA @20MHz 23dBm Typical: TBD mA
LTE-FDD B2	@5MHz 23dBm Typical: TBD mA @10MHz 23dBm Typical: TBD mA @20MHz 23dBm Typical: TBD mA
LTE-FDD B3	@5MHz 23dBm Typical: TBD mA @10MHz 23dBm Typical: TBD mA @20MHz 23dBm Typical: TBD mA
LTE-FDD B4	@5MHz 23dBm Typical: TBD mA @10MHz 23dBm Typical: TBD mA @20MHz 23dBm Typical: TBD mA
LTE-FDD B5	@5MHz 23dBm Typical: TBD mA @10MHz 23dBm Typical: TBD mA
LTE-FDD B7	@5MHz 23dBm Typical: TBD mA @10MHz 23dBm Typical: TBD mA

	@20MHz	23dBm	Typical: TBD mA
LTE-FDD B8	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-FDD B12	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-FDD B13	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-FDD B17	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-FDD B18	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-FDD B19	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-FDD B20	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA
LTE-FDD B25	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA
LTE-FDD B26	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-FDD B28	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA
LTE-FDD B29	N/A		
LTE-FDD B30	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA
LTE-FDD B66	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA
LTE-FDD B71	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-TDD B34	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
LTE-TDD B38	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA
LTE-TDD B39	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA
LTE-TDD B40	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA
LTE-TDD B41	@5MHz	23dBm	Typical: TBD mA
	@10MHz	23dBm	Typical: TBD mA
	@20MHz	23dBm	Typical: TBD mA

5.5 RF Output Power

The following table shows the RF output power of SIM6600-M2 module.

Table 33: Conducted Output Power

Frequency	Max	Min
WCDMA Bands	23dBm + 2/-2dB	< -50dBm
LTE-FDD Bands	23dBm + 2/-2dB	< -40dBm
LTE-TDD Bands	23dBm + 2/-2dB	< -40dBm

5.6 Conducted Receive Sensitivity

The following tables show conducted RF receiving sensitivity of SIM6600-M2 module.

Table 34:SIM6600-M2 Conducted RF Receiving Sensitivity

Frequency	Primary (Typ.)	Diversity (Typ.)
WCDMA B1	TBD	NA
WCDMA B2	TBD	NA
WCDMA B4	TBD	NA
WCDMA B5	TBD	NA
WCDMA B8	TBD	NA
LTE-FDD B1(10M)	TBD	TBD
LTE-FDD B2(10M)	TBD	TBD
LTE-FDD B3(10M)	TBD	TBD
LTE-FDD B4(10M)	TBD	TBD
LTE-FDD B5(10M)	TBD	TBD
LTE-FDD B7(10M)	TBD	TBD
LTE-FDD B8(10M)	TBD	TBD
LTE-FDD B12(10M)	TBD	TBD
LTE-FDD B13(10M)	TBD	TBD
LTE-FDD B17(10M)	TBD	TBD
LTE-FDD B18(10M)	TBD	TBD
LTE-FDD B19(10M)	TBD	TBD
LTE-FDD B20(10M)	TBD	TBD
LTE-FDD B25(10M)	TBD	TBD
LTE-FDD B26(10M)	TBD	TBD
LTE-FDD B28(10M)	TBD	TBD
LTE-FDD B29(10M)	TBD	TBD
LTE-FDD B30(10M)	TBD	TBD
LTE-FDD B66(10M)	TBD	TBD
LTE-FDD B71(10M)	TBD	TBD
LTE-FDD B34(10M)	TBD	TBD
LTE-FDD B38(10M)	TBD	TBD

LTE-FDD B39(10M)	TBD	TBD
LTE-FDD B40(10M)	TBD	TBD
LTE-FDD B41(10M)	TBD	TBD

NOTE

The data in above table are gotten at static condition.
Per 3GPP specification.

5.7 ESD

Module is sensitive to ESD in the process of storage, transporting, and assembling. When Module is mounted on the users' mother board, the ESD components should be placed beside the connectors which human body may touch, such as USIM card holder, SD card holder, audio jacks, switches, USB interface, etc. The following table shows the Module ESD measurement performance without any external ESD component.

Table 35: The ESD performance measurement table (Temperature: 25℃, Humidity: 45%)

Part	Contact discharge	Air discharge
VBAT, GND	TBD	TBD
Antenna port	TBD	TBD
FUL_CARD_POWER_OFF#	TBD	TBD
USB	TBD	TBD
RESET_N	TBD	TBD
UIM Card	TBD	TBD
Other PADs	TBD	TBD

6 Appearance

6.1 Top and Bottom View of Module

Figure 22: Top and bottom view of Module

NOTE

The above is the design effect diagram of the module for reference. The actual appearance is subject to the actual product.

7 Packaging

Module support tray packaging.

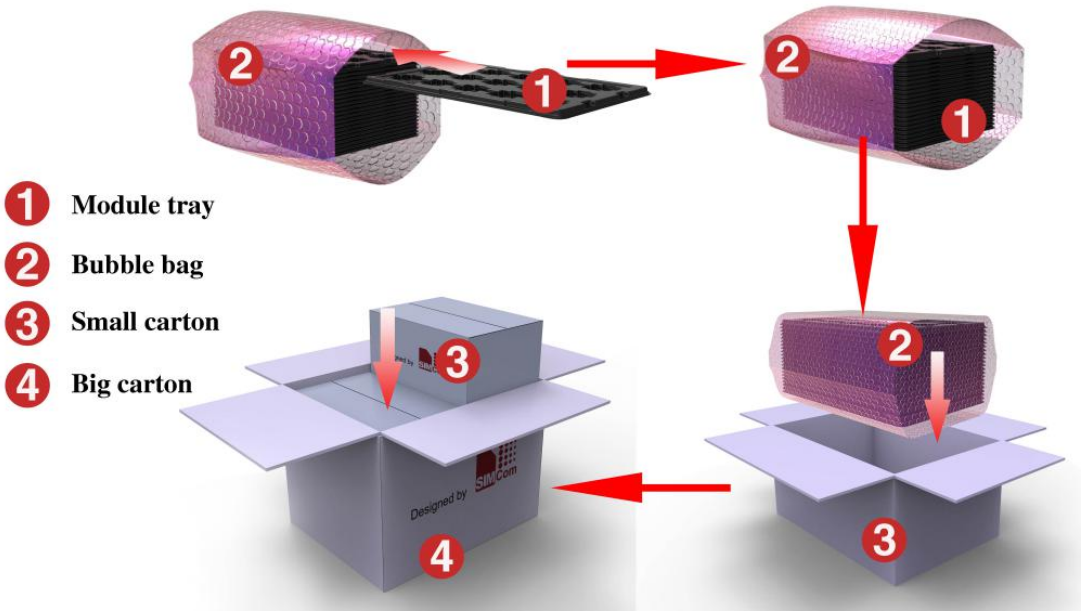


Figure 23: Packaging diagram

Module tray drawing：

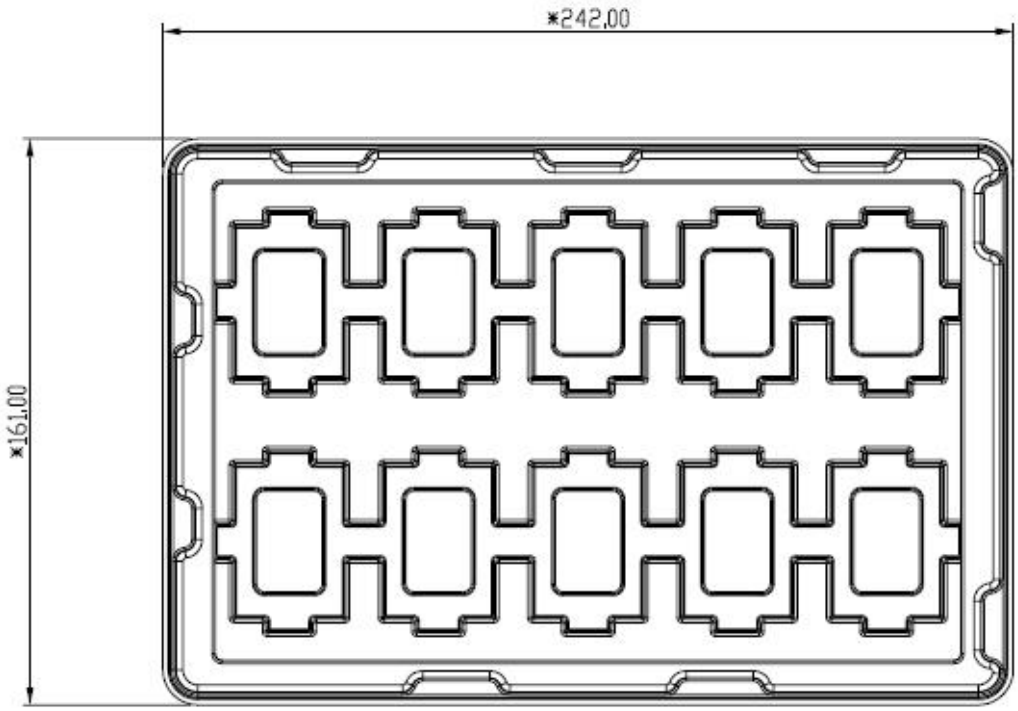


Figure 24: Tray drawing

Table 36: Tray size

Length（±3mm）	Width（±3mm）	Number
245.0	165.0	10

Small carton drawing：

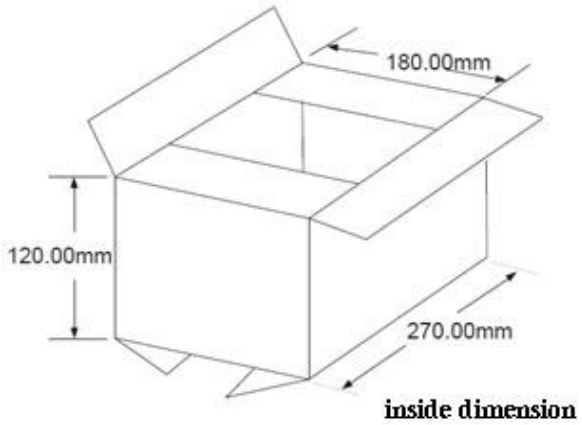


Figure 25: Small carton drawing

Table 37: Small Carton size

Length（±10mm）	Width（±10mm）	Height（±10mm）	Number
270	180	120	10*20=200

Big carton drawing：

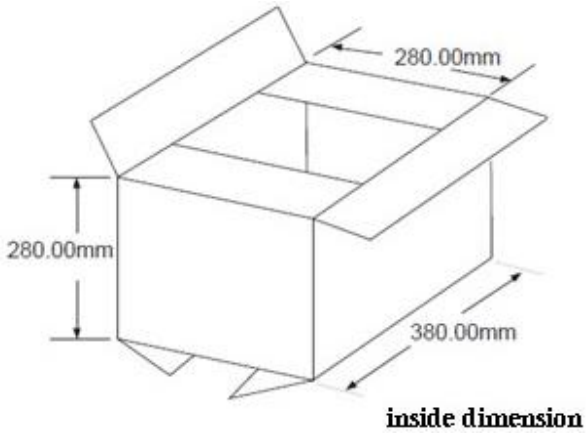


Figure 26: Big carton drawing

Table 38:Big Carton size

Length（±10mm）	Width（±10mm）	Height（±10mm）	Number
380	280	280	200*4=800

8 Appendix

8.1 Coding Schemes and Maximum Net Data Rates over Air Interface

Table 39: 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		
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
Category 7	300Mbps	QPSK/16QAM/64QAM
Category 8	300Mbps	QPSK/16QAM/64QAM
Category 9	450Mbps	QPSK/16QAM/64QAM
Category 10	600Mbps	QPSK/16QAM/64QAM
Category 11	600Mbps	QPSK/16QAM/64QAM/256QAM
Category 12	600Mbps	QPSK/16QAM/64QAM/256QAM
Category 13	600Mbps	QPSK/16QAM/64QAM/256QAM
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
Category 7	150Mbps	QPSK/16QAM

8.2 Related Documents

Table 40: Related Documents

NO.	Title	Description
[1]	ITU-T Draft new recommendationV.25ter	Serial asynchronous automatic dialing and control
[2]	GSM 07.07	Digital cellular telecommunications (Phase 2+); AT command set for GSM Mobile Equipment (ME)
[3]	GSM 07.10	Support GSM 07.10 multiplexing protocol
[4]	GSM 07.05	Digital cellular telecommunications (Phase 2+); Use of Data Terminal Equipment – Data Circuit terminating Equipment (DTE – DCE) interface for Short Message Service (SMS) and Cell Broadcast Service (CBS)
[5]	GSM 11.14	Digital cellular telecommunications system (Phase 2+); Specification of the SIM Application Toolkit for the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface
[6]	GSM 11.11	Digital cellular telecommunications system (Phase 2+); Specification of the Subscriber Identity Module – Mobile Equipment (SIM – ME) interface
[7]	GSM 03.38	Digital cellular telecommunications system (Phase 2+); Alphabets and language-specific information
[8]	GSM 11.10	Digital cellular telecommunications system (Phase 2)； Mobile Station (MS) conformance specification； Part 1: Conformance specification
[9]	3GPP TS 51.010-1	Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification
[10]	3GPP TS 34.124	Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment.
[11]	3GPP TS 34.121	Electromagnetic Compatibility (EMC) for mobile terminals and ancillary equipment.
[12]	3GPP TS 34.123-1	Technical Specification Group Radio Access Network; Terminal conformance specification; Radio transmission and reception (FDD)
[13]	3GPP TS 34.123-3	User Equipment (UE) conformance specification; Part 3: Abstract Test Suites.
[14]	EN 301 908-02 V2.2.1	Electromagnetic compatibility and Radio spectrum Matters (ERM); Base Stations (BS) and User Equipment (UE) for IMT-2000. Third Generation cellular networks; Part 2: Harmonized EN for IMT-2000, CDMA Direct Spread (UTRA FDD) (UE) covering essential requirements of article 3.2 of the R&TTE Directive
[15]	EN 301 489-24 V1.2.1	Electromagnetic compatibility and Radio Spectrum Matters (ERM); Electromagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA) for Mobile and portable (UE) radio and ancillary equipment
[16]	IEC/EN60950-1(2001)	Safety of information technology equipment (2000)

[17]	**3GPP TS 51.010-1**	Digital cellular telecommunications system (Release 5); Mobile Station (MS) conformance specification
[18]	**GCF-CC V3.23.1**	Global Certification Forum - Certification Criteria
[19]	**2002/95/EC**	Directive of the European Parliament and of the Council of 27 January 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS)
[20]	**SIM7X00 Series_UART_Application Note_V1.xx**	This document describes how to use UART interface of SIMCom modules.
[21]	**SIM7X00 Series_GPS_Application Note_V1.xx**	GPS Application Note
[22]	**Antenna design guidelines for diversity receiver system**	Antenna design guidelines for diversity receiver system

8.3 Terms and Abbreviations

Table 41:Terms and Abbreviations

Abbreviation	Description
ADC	Analog-to-Digital Converter
ARP	Antenna Reference Point
BER	Bit Error Rate
BTS	Base Transceiver Station
CS	Coding Scheme
CSD	Circuit Switched Data
CTS	Clear to Send
DAC	Digital-to-Analog Converter
DRX	Discontinuous Reception
DSP	Digital Signal Processor
DTE	Data Terminal Equipment (typically computer, terminal, printer)
DTR	Data Terminal Ready
DTX	Discontinuous Transmission
EFR	Enhanced Full Rate
EGSM	Enhanced GSM
EMC	Electromagnetic Compatibility
ESD	Electrostatic Discharge
ETS	European Telecommunication Standard
EVDO	Evolution Data Only
FCC	Federal Communications Commission (U.S.)
FD	SIM fix dialing phonebook
FDMA	Frequency Division Multiple Access
FR	Full Rate
GMSK	Gaussian Minimum Shift Keying
GNSS	Global Navigation Satellite System
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global Standard for Mobile Communications
HR	Half Rate
HSPA	High Speed Packet Access
HSIC	High-speed Inter-chip
I2C	Inter-Integrated Circuit
IMEI	International Mobile Equipment Identity
LTE	Long Term Evolution
MDIO	Management Data Input/Output

MMD	MDIO manageable device
MO	Mobile Originated
MS	Mobile Station (GSM engine), also referred to as TE
MT	Mobile Terminated
NMEA	National Marine Electronics Association
PAP	Password Authentication Protocol
PBCCH	Packet Switched Broadcast Control Channel
PCB	Printed Circuit Board
PCS	Personal Communication System, also referred to as GSM 1900
RF	Radio Frequency
RMS	Root Mean Square (value)
RTC	Real Time Clock
SIM	Subscriber Identification Module
SMS	Short Message Service
SPI	serial peripheral interface
SMPS	Switched-mode power supply
TDMA	Time Division Multiple Access
TE	Terminal Equipment, also referred to as DTE
TX	Transmit Direction
UART	Universal Asynchronous Receiver & Transmitter
VSWR	Voltage Standing Wave Ratio
SM	SIM phonebook
SGMII	Serial gigabit media independent interface
NC	Not connect
EDGE	Enhanced data rates for GSM evolution
HSDPA	High Speed Downlink Packet Access
HSUPA	High Speed Uplink Packet Access
ZIF	Zero intermediate frequency
WCDMA	Wideband Code Division Multiple Access
VCTCXO	Voltage control temperature-compensated crystal oscillator
USIM	Universal subscriber identity module
UMTS	Universal mobile telecommunications system
UART	Universal asynchronous receiver transmitter

8.4 Safety Caution

Table 42: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.
	GSM cellular terminals or mobiles operate over radio frequency signals and cellular networks and cannot be guaranteed to connect in all conditions, especially with a mobile fee or an invalid SIM card. While you are in this condition and need emergent help, please remember to use emergency calls. In order to make or receive calls, the cellular terminal or mobile must be switched on and in a service area with adequate cellular signal strength. Some networks do not allow for emergency call if certain network services or phone features are in use (e.g. lock functions, fixed dialing etc.). You may have to deactivate those features before you can make an emergency call. Also, some networks require that a valid SIM card be properly inserted in the cellular terminal or mobile.

FCC Statement

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions: (1) thi s device may not cause harmful interference, and (2) this device must accept any interference received, incl uding interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user' s authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursua nt to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful inte rference in a residential installation. This equipment generates uses and can radiate radio frequency energy a nd, if not installed and used in accordance with the instructions, may cause harmful interference to radio com munications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turn ing the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help important announcement

Important Note:

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,

As long as the three conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following" Contains FCC ID: **2AJYU-8MH0011**"

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

2.7 Antennas

This radio transmitter **FCC ID: 2AJYU-8MH0011** has been approved by Federal Communications Commission to operate with the
antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)	Frequency range:
WCDMA	/	External Antenna	1.00dBi for WCDMA Band 2/4/5;	
LTE	/	External Antenna	1.00dBi for LTE Band 2, 4, 5, 7, 12, 13, 17, 25, 26, 30,38, 40, 41, 66, 71	

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID: 2AJYU-8MH0011**".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.