



# W58

## Hardware Design

WIFI Module

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2018-04-10	V1.01	Change the description of BT; Add ESD testing result	Pengcheng.shen
2020-03-30	V1.02	Change document structure	Changwen.wei
2020-8-24	V1.03	Add 5G WIFI information	Honggang.Ma Lijuan.Yin

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# 1 Introduction

This document describes the electronic specifications, RF specifications, interfaces, mechanical characteristics and testing results of the W58 module. With the help of this document, in combination with our application manual and user guide, customers can quickly apply W58 module into wireless applications.

The W58 is a small, low-power, low-cost WIFI module based on Qualcomm QCA-9377-3 chipset. The module can be used in car networking, wireless routing, and other wireless terminals. The module conforms to IEEE Standard protocol of 802.11b/g/n. The module is integrated with the baseband, PA and 2.4G/5G RF transceivers, and supports data communications between SIMCom SIM7600 series modules through SDIO3.0 interface. SIM7600 series modules should support SDIO function, and software should support MIFI function.

## 1.1 W58 Function Diagram

**W58 support following features:**

- One SDIO3.0 interface
- One WIFI antenna interface
- Two LTE synchronization interface
- One 32KHz clock input
- One PCM interface
- One UART interface
- One WLAN\_EN interface
- One BT\_EN interface

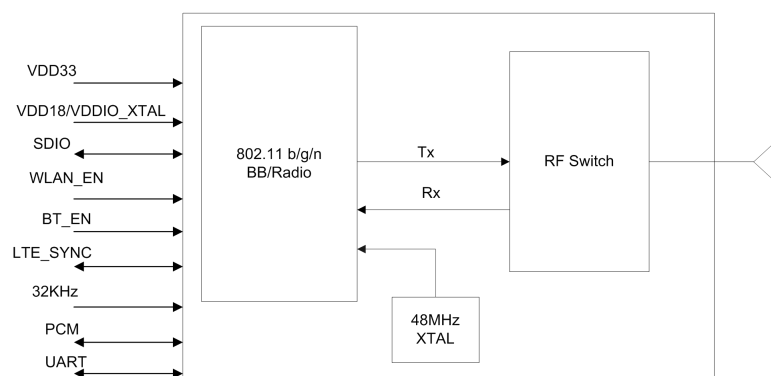


Figure 1: W58 function diagram

## 1.2 W58 Key Features

Table 1: W58 key features

Feature	Implementation
Power Supply	3.2~3.4V
Max Date Rate	802.11b: 1, 2, 5.5, 11Mbps 802.11g/a: 6, 9, 12, 18, 24, 36, 48, 54Mbps 802.11n_HT20: MCS0~7 802.11n_HT40: MCS0~7 802.11ac_HT20: MCS0~8 802.11ac_HT40: MCS0~9 802.11ac_HT80: MCS0~9
WLAN Standard	IEEE 802.11b/g/n/a/ac
Modulation Method	DSSS (1/2Mbps), CCK(1/2/5.5/11Mbps), OFDM (6/9/12/18/24/36/48/54Mbps) , HT20 (MCS0~MCS7) OFDM technology combined with BPSK, QPSK, 16-qam and 64-qam,820.11b adopts CCK and DSSS modulation technology
SDIO	Support 4 bit SDIO 3.0, Max 208MHz
Antenna Interface	1x1
Physical characteristics	Size: 16.6* 13* 2.1mm Weight: 1g
Temperature range	Normal operation: -40°C ~ +85°C Storage temperature: -45°C ~ +90°C



## 2 Package Information

### 2.1 Pin Out Diagram

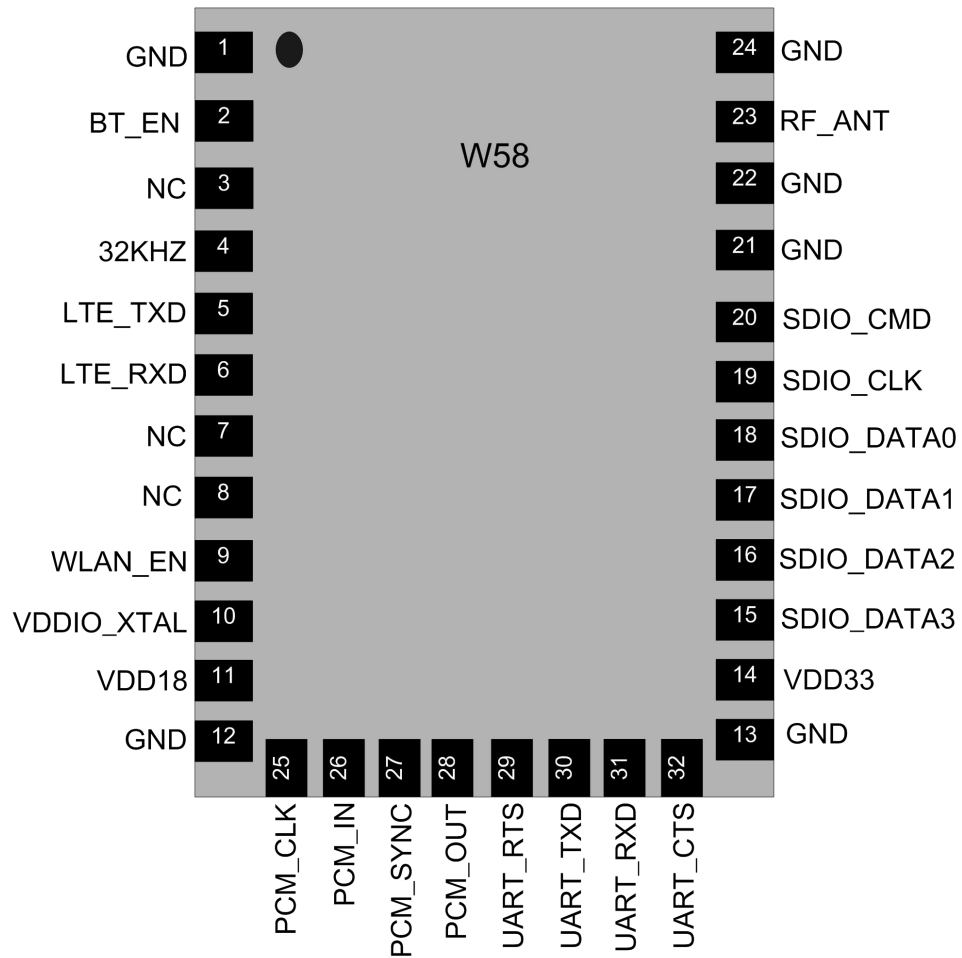


Figure 2: W58 Pin out diagram

## 2.2 Pin Description

Table 2: Pin Description

Pin name	Pin number	I/O	Description	Comment
<b>Power Supply</b>				
VDD33	14	PI	Main Power supply	
VDD18	11	PI	Power supply for I/O	
VDDIO_XTAL	10	PI	Power supply for clock	
GND	1,12,13,21,22,24		GND	
<b>GPIO</b>				
LTE_TXD	5	DO	LTE TX	
LTE_RXD	6	DI	LTE RX	
BT_EN	2	DI	EN for BT	keep open if unused BT
WLAN_EN	9	DI	EN for WLAN	
<b>SDIO3.0</b>				
SDIO_CLK	19	DI	SDIO CLK	
SDIO_CMD	20	IO	SDIO CMD	
SDIO_DATA0	18	IO	SDIO DATA0	
SDIO_DATA1	17	IO	SDIO DATA1	
SDIO_DATA2	16	IO	SDIO DATA2	
SDIO_DATA3	15	IO	SDIO DATA3	
<b>PCM</b>				
PCM_CLK	25	DI	PCM CLK	
PCM_IN	26	DI	PCM IN	
PCM_SYNC	27	DO	PCM SYNC	keep open if unused BT
PCM_OUT	28	DO	PCM OUT	
<b>UART</b>				
UART_RTS	29	DO	UART RTS	
UART_TXD	30	DO	UART TXD	
UART_RXD	31	DI	UART RXD	keep open if unused BT
UART_CTS	32	DI	UART CTS	
<b>Clock Input</b>				
32KHz	4	I	For BT sleep mode	
<b>RF Antenna</b>				
RF_ANT	23	IO		
<b>Others</b>				
NC	3,7,8			Keep open

## 2.3 Package Dimensions

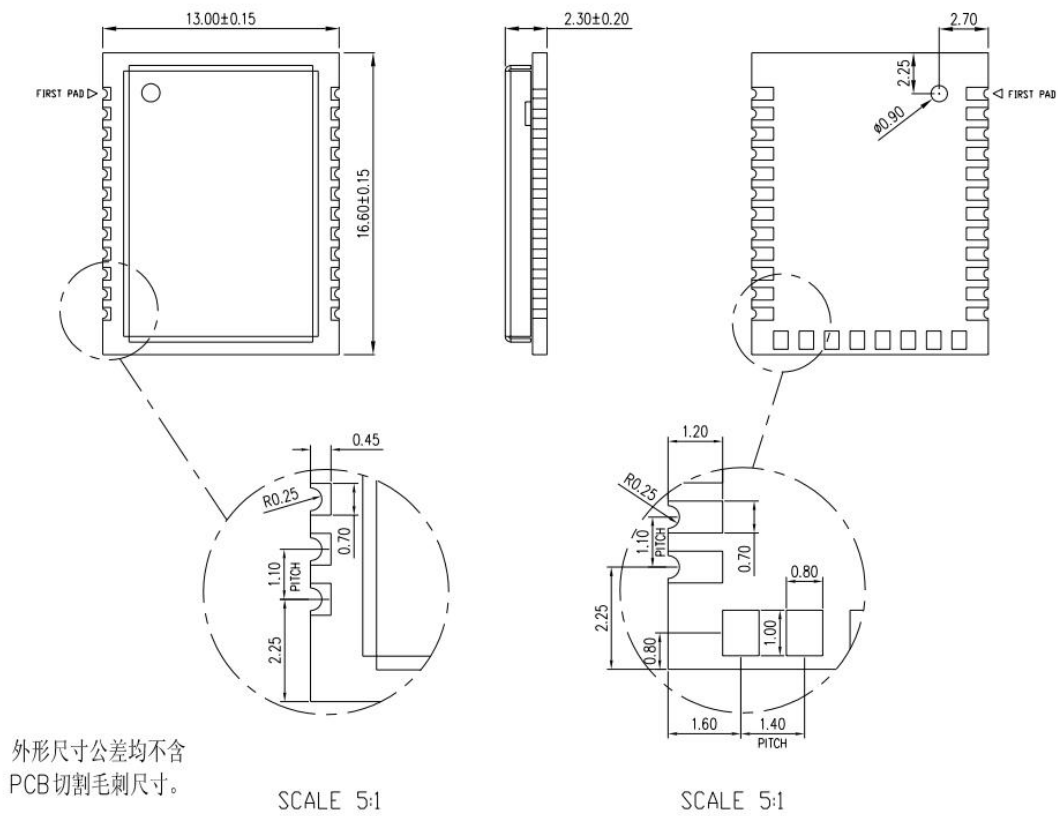


Figure3: Dimensions of W58 (Unit: mm)

## 2.4 Recommended PCB footprint

Recommended PCB footprint outline (Unit:mm)

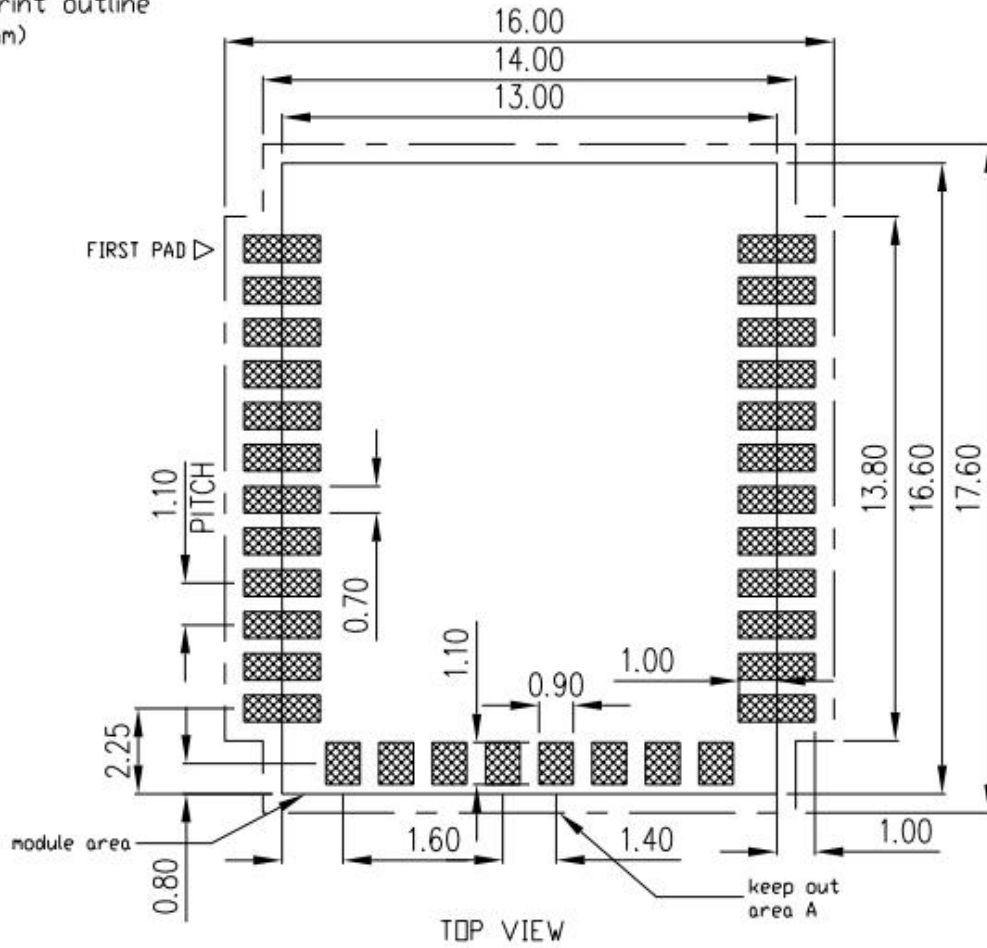


Figure4: Recommended PCB footprint (Unit: mm)

## 3 Application Interface

### 3.1 Power Supply

There are 3 parts of power supply for W58. VDD33 is main power supply, The transmitting burst will cause voltage drop and the power supply must be able to provide sufficient current up to 700mA; VDD18 is for GPIO and can be supplied by module's VDD\_1V8, the routing line of VDD18 needs to meet the width of at least 300mA current, and the parallel capacitance is not greater than 10uF; VDD\_XTAL is for XTAL and can be supplied by SIM7600 series module's VDD\_1V8. When all power are supplied W58 will work well together with SIM7600 series modules.

Timing of power on/off :

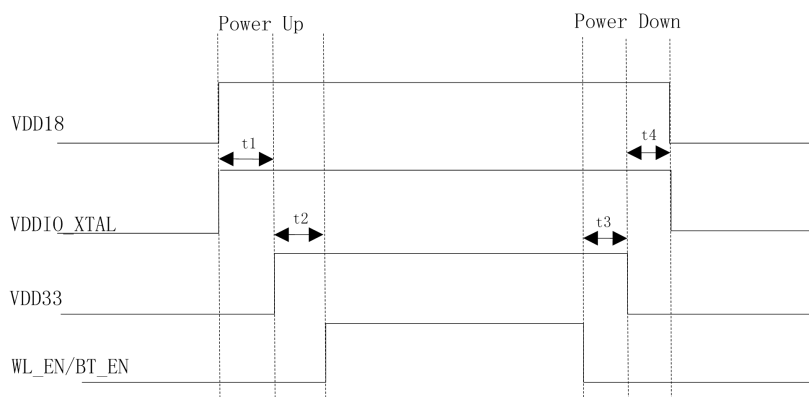


Figure5: Timing of power on/off

Table 3: Parameter on timing of power on/off

Parameter	Description	Min	Type	Max	Unit
t1	1.8V to 3.3V	0	2.2	-	s
t2	3.3V to WLAN_EN	-	244	-	ms
t3	WLAN_EN to 3.3V	-	0	-	ms
t4	3.3V to 1.8V	-	0	-	s

Reference design of VDD33 power supply is as following, PWR\_CTL must be connected to pin33 of SIM7600 series modules.

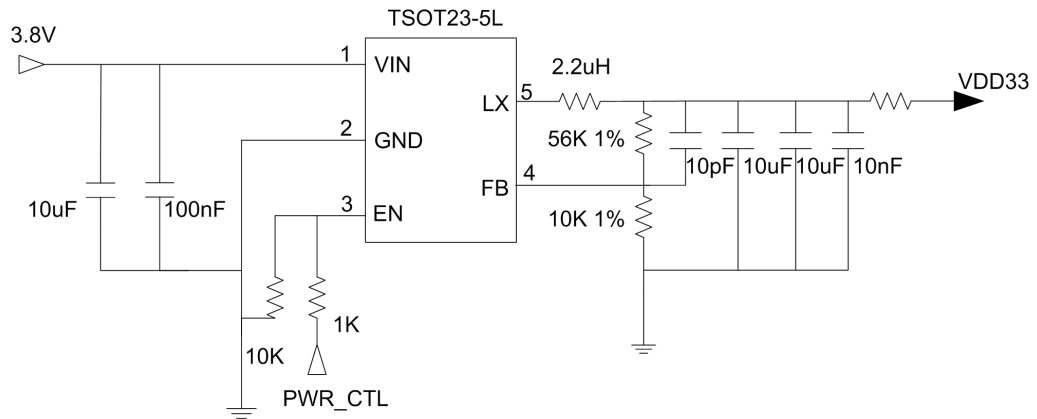


Figure6: Reference design of VDD33

## 3.2 SDIO

The SDIO3.0 interface supports 208MHz maximum clock frequency. As its speed rate is too high, more sensitive to interference, so need routing GND protection, SDIO go online ground plane for the bottom of the need to continuously complete, and isometric and 50Ω impedance control, the length of SDIO bus should be no more than 8.4 cm long, online capacitance does not exceed 20pf, line spacing for the line width of 2 ~ 3 times, and other devices and lines near SDIO should keep 0.5 mm.

In order to facilitate the commissioning of SDIO, the resistor between W58 and SIM7600 series modules can be concatenated with 0 ohms, and the resistance is close to W58.

The connection between W58 and SIM7600 series modules through SDIO.

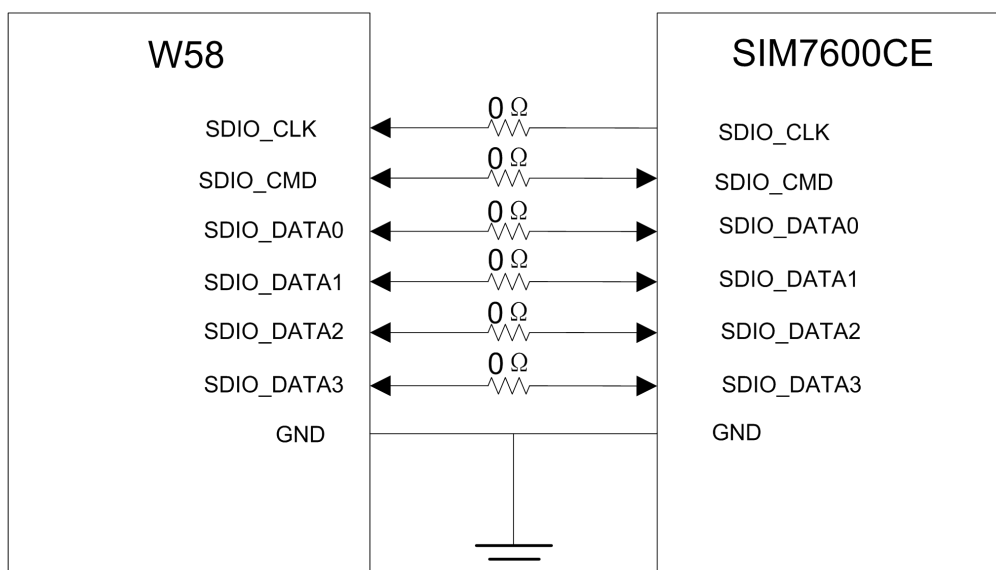


Figure7: SDIO connection

W58 supports 4 bit SDIO3.0 mode:

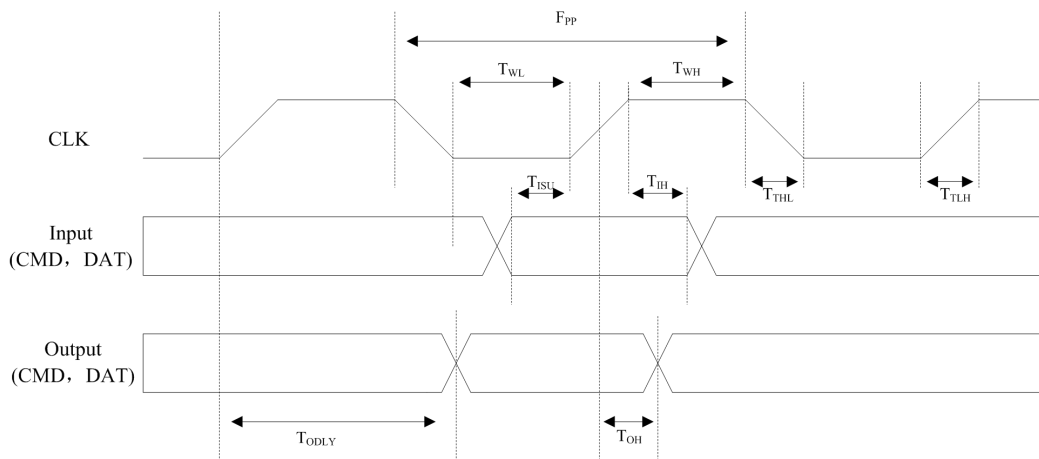


Figure8: SDIO Timing

Table 4: SDIO Timing

Parameter	Description	Min	Max	Unit	Comment
$F_{PP}$	Clock frequency	0	208	MHz	$C_L \leq 10\text{pF}$
$T_{WL}$	Active low level	2.5	-	ns	$C_L \leq 10\text{pF}$
$T_{WH}$	Active high level	2.5	-	ns	$C_L \leq 10\text{pF}$
$T_{TLH}$	Active low to high	-	1.8	ns	$C_L \leq 10\text{pF}$
$T_{TLLH}$	Active high to low	-	1.8	ns	$C_L \leq 10\text{pF}$

**NOTE**

In order to enhance the anti-static ability, the parasitic capacitance of TVS should not be greater than 0.5PF at the indirect TVS of the SDIO interface between W58 and SIM7600 series modules.

### 3.3 32KHz

The 32KHz clock is for sleep mode of Bluetooth, the routing line of it should be as short as possible and also need GND protection.

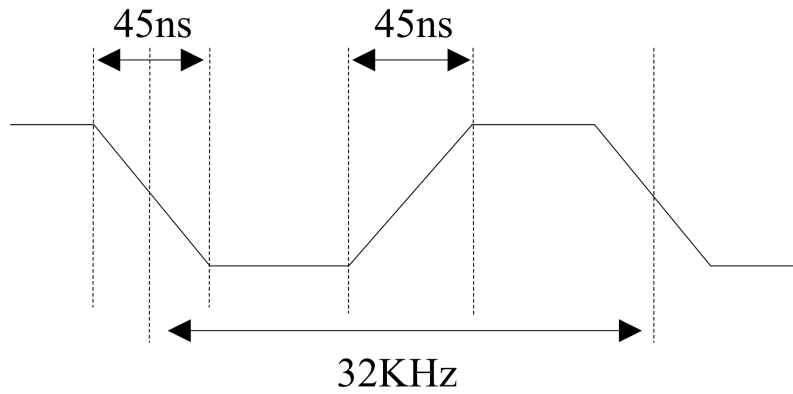


Figure9: Timing of 32KHz

Table 5: 32KHz

Description	Min	Typ	Max	Unit
Frequency	-	32.768	-	KHz
Active low level		15.26	-	us
Active high level		15.26	-	us
Active low to high	--	45	--	ns
Active high to low	--	45	--	ns
Input high voltage	1.44	1.8	2	V
Input low voltage	-0.3	0	0.36	V

### 3.4 WLAN\_EN

WLAN\_EN control signal are applied from SIM7600 series modules, effective when high level.

### 3.5 BT\_EN

BT\_EN control signal is applied from SIM7600 series modules, effective when high level, under developing now.

### 3.6 LTE SYNC

To reduce the mutual interference between LTE and WIFI, please connect LTE\_TXD to pin85 of SIM7600 series modules, and LTE\_RXD to pin50 of SIM7600 series modules.



## 3.7 PCM

PCM is for audio feature with BT module, under developing now.

## 3.8 UART

UART is for communication with SIM7600 series modules for BT feature, under developing now.

## 3.9 Antenna

Pin23 is for antenna, the characteristic impedance is 50Ω.

### 3.9.1 Frequency band

Table 6: Frequency band

Parameter	Value	Unit
Frequency range	2412~2484	MHz
	5170~5825	

### 3.9.2 Reference design for RF

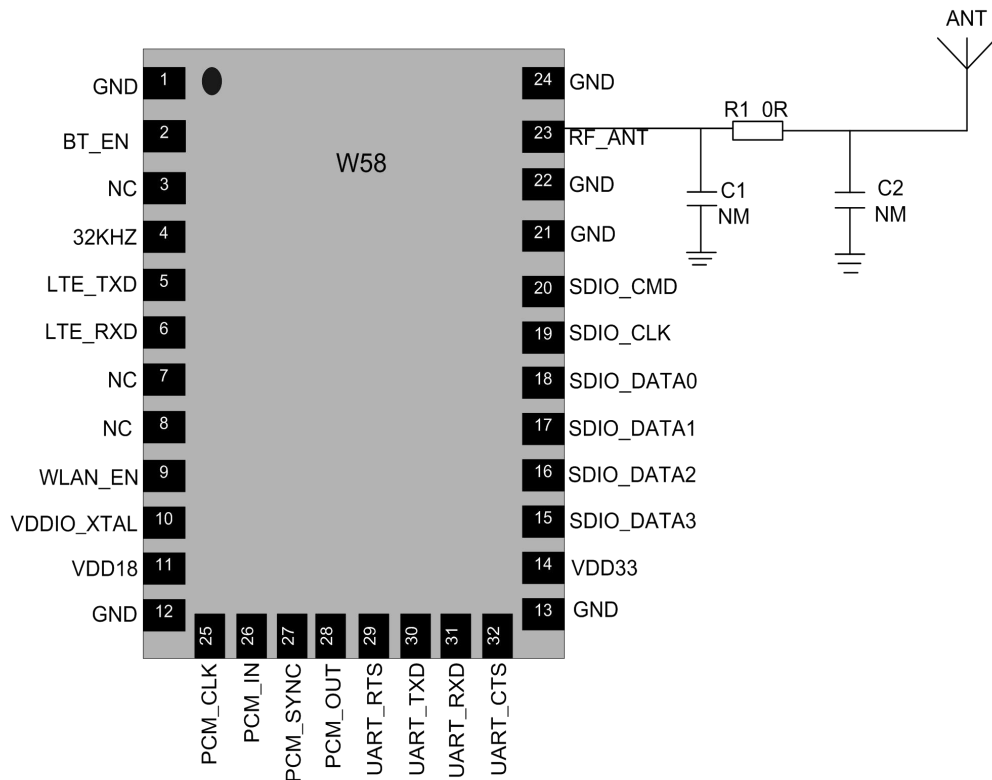


Figure10: Reference design of RF

W58 provides an RF welding disc interface for connecting external antennas. The RF wiring connected to the module RF antenna welding disc is made with a micro-strip line or other type impedance line. The impedance must be controlled at about 50 ohms, and the routing line is as short as possible. In order to obtain better RF performance, two GND pads on each side of the RF interface are needed.

### 3.9.3 Requirement for antenna installation

Table 7: Requirement for antenna installation

Parameter	Requirement
Frequency range	2412~2484MHz
SWR	≤2:1
Line loss	<1dB
Gain (dBi)	1
Input impedance (Ω)	50
Direction	Vertical

## 4 Electrical and Radio Characteristics

### 4.1 Power supply Characteristics

Table 8: Absolute maximum ratings

Parameter	Description	Min	Type	Max	Unit
VDD33	Main power supply	-0.3	-	3.65	V
VDD18	Power for IO	-0.3	-	4	V
VDDIO_XTAL	Power for XTAL	-0.3	-	4	V
VIH	Input high level voltage	-0.3	-	2	V

Table 9: Input range

Parameter	Description	Min	Type	Max	Unit
VDD33	Main power supply	3.2	3.3	3.4	V
VDD18	Power for IO	1.71	1.8	-	V
VDDIO_XTAL	Power for XTAL	1.71	1.8	-	V

### 4.2 IO Characteristics

Table 10: IO characteristics

Parameter	Description	Min	Type	Max	Unit
VIH	Input high level	1.26	1.8	2.0	V
VIL	Input low level	-0.3	0	0.54	V
VOH	Output high level	1.4	1.8	1.8	V
VOL	Output low level	0	0	0.4	V

## 4.3 RF Characteristics

**Table 11: Transmit power**

Band	Type	Unit
2.4G 802.11b @11Mbps	18.0	dBm
2.4G 802.11g @6Mbps	17.0	dBm
2.4G 802.11n, HT20 @MCS0	17.0	dBm
2.4G 802.11n, HT40 @MCS0	16.0	dBm
2.4G 802.11g @54Mbps	15.0	dBm
2.4G 802.11n, HT20 @MCS7	15.0	dBm
2.4G 802.11n, HT40 @MCS7	14.0	dBm
5G 802.11a @54Mbps	12	dBm
5G 802.11n-HT20 @MCS7	11	dBm
5G 802.11n-HT40 @MCS7	10	dBm
5G 802.11ac-HT20 @MCS8	13	dBm
5G 802.11ac-HT40 @MCS9	9	dBm
5G 802.11ac-HT80 @MCS9	8	dBm

**Table 12: Receive Sensitivity**

Band	Type	Unit
2.4G 11b@1Mbps	-95	dBm
2.4G 11b@11 Mbps	-94	dBm
2.4G 11g@6Mbps	-91	dBm
2.4G 11g@54Mbps	-78	dBm
2.4G 11n@HT20-MCS0	-90	dBm
2.4G 11n@HT20-MCS7	-75	dBm
5G 802.11a @54Mbps	TBD	dBm
5G 802.11n-HT20 @MCS7	TBD	dBm
5G 802.11n-HT40 @MCS7	TBD	dBm
5G 802.11ac-HT20 @MCS8	TBD	dBm
5G 802.11ac-HT40 @MCS9	TBD	dBm
5G 802.11ac-HT80 @MCS9	TBD	dBm

## 4.4 ESD

**Table 13: ESD (Temperature: 25°C, humidity: 45%)**

Parameter	Connect (±kv)	Air (±kv)
-----------	---------------	-----------

GND	3	6
Power	2	4
CLK input	1	2
GPIO	1	2
SDIO interface	1	2
RF interface	3	6

**NOTE**

ALL SDIO testing results were added TVS(ESD5301N-2/TR).

## 4.5 Power consumption

In sleep mode, the power consumption of W58 is 30uA.

**Table 14: Power consumption for continuous 2.4 GHz Tx at 3.3 V**

2.4G	Rate	Band width	Average current	TX power (dBm)
802.11b	11Mbps	20MHz	TBD	18
802.11g	54Mbps	20MHz	TBD	15
802.11n	MCS0	40MHz	TBD	16
	MCS7	40MHz	TBD	14

**Table15: Power consumption for continuous 5 GHz Tx at 3.3 V**

5G	Rate	Band width	Average current	TX power (dBm)
802.11a	54Mbps	20MHz	TBD	12
802.11n	MCS7	40MHz	TBD	10
802.11ac	MCS8	20MHz	TBD	13
	MCS9	40MHz	TBD	9
	MCS9	80MHz	TBD	8

## 5 SMT Production Guide

### 5.1 Moisture Sensitivity Level (MSL)

Module is qualified to Moisture Sensitivity Level (MSL) 3 in accordance with JEDEC J-STD-033. If the prescribed time limit is exceeded, users should bake module for 192 hours in drying equipment (<5% RH) at 40+5/-0°C, or 72 hours at 85+5/-5°C. Note that plastic tray is not heat-resistant, and only can be baked at 45° C.

**Table 16: Moisture Sensitivity Level and Floor Life**

Moisture Sensitivity Level (MSL)	Floor Life (out of bag) at factory ambient $\leq 30^{\circ}\text{C}/60\% \text{ RH}$ or as stated
1	Unlimited at $\leq 30^{\circ}\text{C}/85\% \text{ RH}$
2	1 year
2a	4 weeks
3	168 hours
4	72 hours
5	48 hours
5a	24 hours
6	Mandatory bake before use. After bake, it must be reflowed within the time limit specified on the label.

#### NOTE

IPC / JEDEC J-STD-033 standard must be followed for production and storage.

### 5.2 SMT Reflow Profile

SIMCom provides a typical soldering profile. Therefore, the soldering profile shown below is only a generic recommendation and should be adjusted to the specific application and manufacturing constraints.

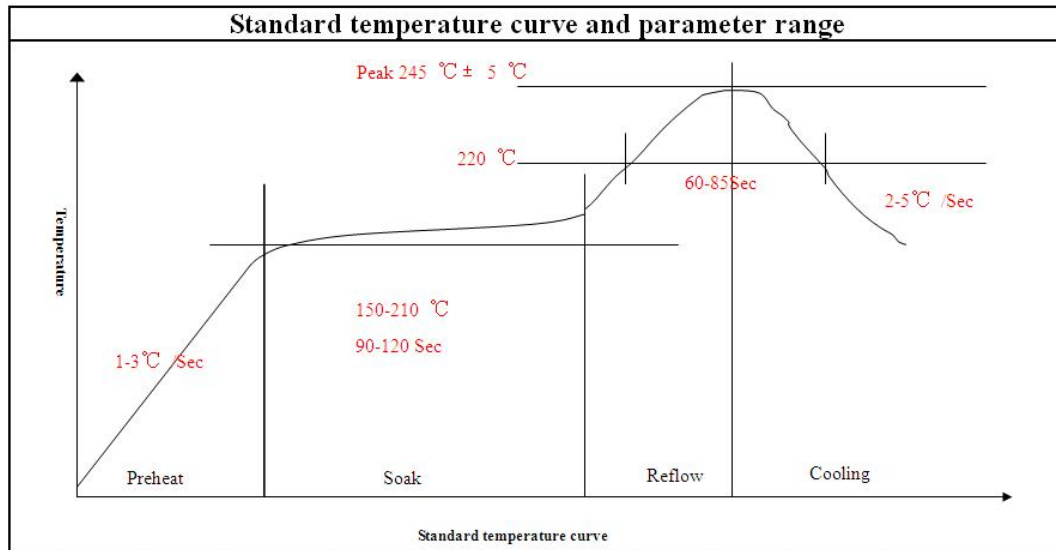


Figure 11: The ramp-soak-spike reflow profile of module

## 6 Packaging

Module support tray packaging.

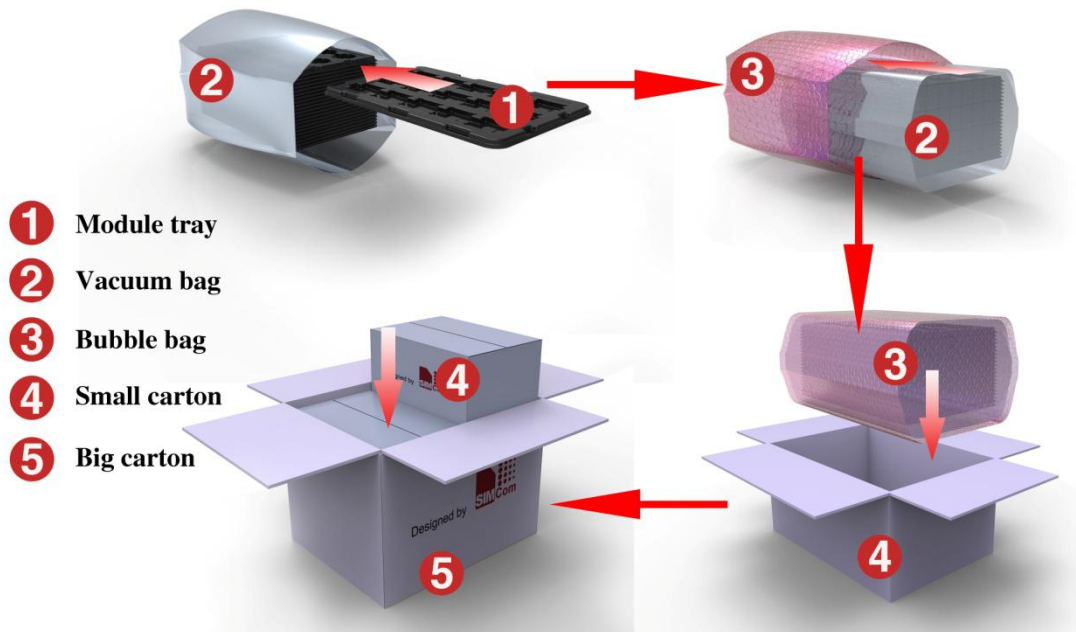


Figure 12: packaging diagram

Module tray drawing:

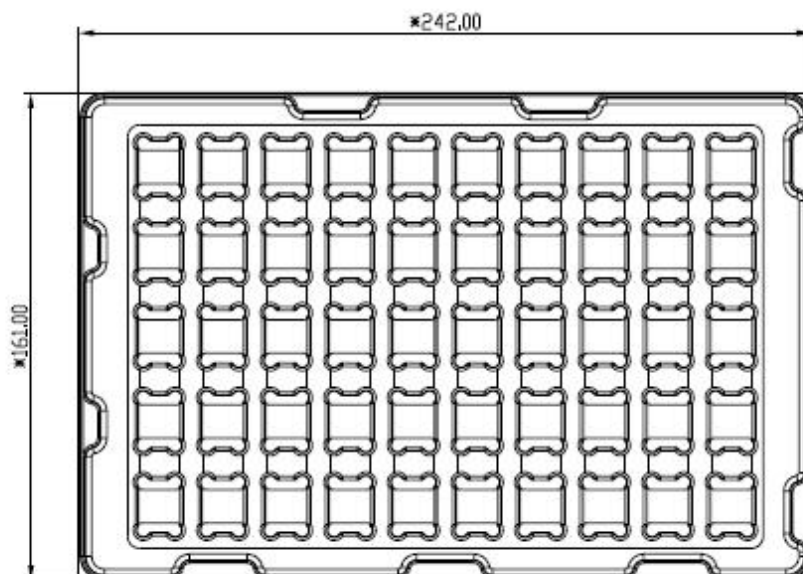


Figure 13: Tray drawing



Table 17: Tray size

Length ( $\pm 3\text{mm}$ )	Width ( $\pm 3\text{mm}$ )	Number
242.0	161.0	50

Small carton drawing :

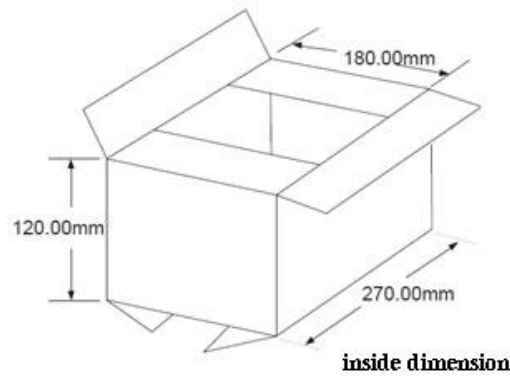


Figure 14: Small carton drawing

Table 18: Small Carton size

Length ( $\pm 10\text{mm}$ )	Width ( $\pm 10\text{mm}$ )	Height ( $\pm 10\text{mm}$ )	Number
270	180	120	50*20=1000

Big carton drawing :

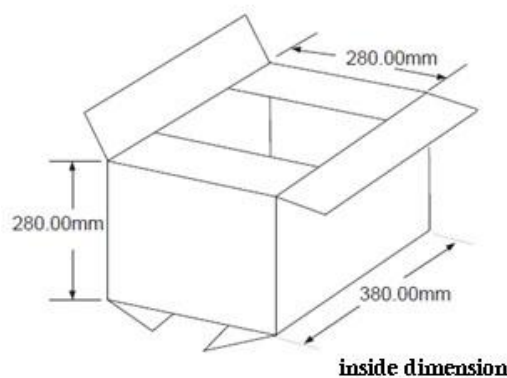


Figure 15: Big carton drawing

Table 19: Big Carton size

Length ( $\pm 10\text{mm}$ )	Width ( $\pm 10\text{mm}$ )	Height ( $\pm 10\text{mm}$ )	Number
380	280	280	1000*4=4000

## 7 Appendix

### 7.1 Related Documents

Table 20: Related Documents

NO	Title	Description
[1]	SIM7600+W58Reference Design	







### 7.2 Terms and Abbreviations

Table 21: Terms and Abbreviations

Abbreviation	Description
BPSK	Binary Phase Shift Keying
B	Bidirectional digital input
CCK	Complementary Code Keying
DSSS	Direct Sequence Spread Spectrum
ESD	Electrostatic Discharge
I/O	Input/Output
LTE	Long Term Evolution
Mbps	Millio n Bits Per Second
MCS	Modulation and Coding Scheme
OFDM	Orthogonal Frequency Division Multiplexing
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RF	Radio Frequency
RX	Receive Direction
SDIO	Secure Digital Input and Output Card
TX	Transmitting Direction
VSWR	Voltage Standing Wave Ratio
WLAN	Wireless Local Area Networks

## 7.3 Safety Caution

Table 22: 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.