

Datasheet

Wi-Fi Module

W603C



Document information

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Revision History

Version	Date	Note
1.0	2022-08-02	Created
1.1	2022-08-04	Pin description modified
1.2	2022-10-27	Size updated
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Aim of this Document

The aim of this document is to give a detailed product description and product application including features and performance of the W603C.

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1. Introduction

W603C modules designed base on NXP 88W8987eWLP chip solution, Module contains a low-power Wi-Fi connectivity solution on one package.

1.1. Key Features

- Processor: NXP 88W8987
- ✓ Security: AES, WAPI
- Wi-Fi
- ✓ IEEE802.11a/b/g/n/ac
- ✓ Bluetooth
- ✓ 2.4GHz and 5 GHz Dual Band
- ✓ Bluetooth V5.0 supported
- ✓ Up to MCS9 data rates
- ✓ PCM Audio interface
- ✓ Support WPS
- ✓ Security: AES

1.2. Application

- ✓ Network Consumer Device
- ✓ Smart City
- ✓ Building Automation
- ✓ Industry Control

2. Module Overview

W603C is a highly integrated Wi-Fi module which is based on the NXP SoC 88W8987eWLP, featuring a 1x1 a/b/g/n/ac dual band Wi-Fi, and a Bluetooth v5.2 subsystems.

The finely tuned hardware architecture and baseband algorithms provide superlative RF performance, as well as low power consumption. It supports standard features of higher level of security, performance, and conforms most international regulations, offering the great performance at any time, in any circumstance.

2.1. Product Overview

Table 2-1 Specification of W603C

Wi-Fi	
Standard	IEEE 802.11 a/b/g/n/ac
RF	
Frequency	2.400GHz to 2.4835GHz 5.150GHz to 5.850GHz
Modulation	802.11b: CCK, DQPSK, DBPSK 802.11g: 64-QAM,16-QAM,QPSK, BPSK 802.11a: 64-QAM,16-QAM,QPSK, BPSK 802.11n: 64-QAM,16-QAM, QPSK, BPSK 802.11ac: 256QAM, 64-QAM,16-QAM, QPSK, BPSK
Transmit Rate	802.11b: 1,2,5.5,11 Mbps 802.11g: 6,9,12,18,24,36,48,54 Mbps 802.11a: 6,9,12,18,24,36,48,54 Mbps 802.11n: MCS0~7, up to 150 Mbps 802.11ac: MCS0~9, BW=80MHz up to 433Mbps
Electrical Character	
Interfaces	WIFI @ SDIO BT @ UART
Power supply	3.07V to 3.53V
Operation Temperature	-30 to +85°C

2.2. Electrical specifications

2.2.1. Absolute maximum ratings

Table 2-2 Absolute maximum rating

Symbol	Description	Min	Max	Unit
VBAT	Voltage	-0.3	4.0	V
Power_ANT	Maximum power at receiver		+7	dBm
Temp_Storage	Storage temperature	-55	+125	°C

2.2.2. Maximum ESD rating

Table 2-3 Maximum ESD rating

Parameter	Min	Type	MAX	Unit	Remarks
Electrostatic discharge	-	-	±1.5	KV	Human body model
	-	-	±0.5	KV	Charged device model

2.3. Electrical Characteristics

2.3.1. VIO DC characteristics

Table 2-4 Recommended operation conditions

Name	Parameter	Condition	Min	Typ	Max	Units
VIO=1.8V	1.8V power supply	-	1.67	1.8	1.92	V
VIO=3.3V	3.3V power supply	-	3.07	3.3	3.53	V
TA	Ambient operating temperature	-	-30	-	+85	°C
TJ	Maximum Junction Temperature	-	-	-	+125	°C

Note:

VIO: Digital I/O power supply

2.3.2. GPIO Interface Specification

Table 2-5 DC electrical characteristics at VIO=1.8V

Symbol	Parameter	Min	Typ	Max	Unit
VIH	Input high voltage	0.7*VIO	-	VIO+0.4	V
VIL	Input low voltage	-0.4	-	0.3*VIO	V
VHYS	Input hysteresis	100	-	-	mV
VOH	Output high voltage	VIO-0.4	-	-	V
VOL	Output low voltage	-	-	0.4	V

Table 2-6 DC electrical characteristics at VIO=3.3V

Symbol	Parameter	Min	Typ	Max	Unit
V _{IH}	Input high voltage	0.7*VIO	-	VIO+0.4	V
V _{IL}	Input low voltage	-0.4	-	0.3*VIO	V
V _{HYS}	Input hysteresis	100	-	-	mV
V _{OH}	Output high voltage	VIO-0.4	-	-	V
V _{OL}	Output low voltage	-	-	0.4	V

2.4. RF Characteristics

2.4.1. Wi-Fi subsystem

Table 2-7 Wi-Fi Specification

Item	Specification
Modulation Type	IEEE 802.11 a/b/g/n/ac
Frequency range	2.400GHz to 2.4835GHz 5.150GHz to 5.850GHz
Channel	CH1 to CH11 @2.4G CH36, CH40, CH44, CH48; CH52~CH64; CH100~CH140; CH149~CH165 @5G
Modulation	802.11b: CCK, DQPSK, DBPSK 802.11g: 64-QAM,16-QAM,QPSK, BPSK 802.11a: 64-QAM,16-QAM,QPSK, BPSK 802.11n: 64-QAM,16-QAM, QPSK, BPSK 802.11ac: 256QAM, 64-QAM,16-QAM,QPSK,BPSK

2.4.1.1. IEEE 802.11 b mode

Table 2-8 IEEE802.11b Mode RX Characteristic

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
11Mbps (FER≤8%) @2.4G	-	-	-85	dBm

2.4.1.2. IEEE 802.11 g mode

Table 2-9 IEEE802.11g Mode Specification

Item	Specification
Modulation Type	64-QAM,16-QAM, QPSK, BPSK
Frequency range	2.400GHz to 2.4835GHz
Channel	CH1 to CH11
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps

Table 2-10 IEEE802.11g Mode RX Characteristic

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
54Mbps (FER \leq 8%)		-	-69	dBm

2.4.1.3. IEEE 802.11 a mode

Table 2-11 IEEE802.11a Mode Specification

Item	Specification
Modulation Type	64-QAM,16-QAM, QPSK, BPSK
Frequency range	5.150GHz to 5.850GHz
Channel	CH36, CH40, CH44, CH48; CH52~CH64; CH100~CH140; CH149~CH165
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps

Table 2-12 IEEE802.11g Mode RX Characteristic

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
54Mbps (FER \leq 8%)		-	-68	dBm

2.4.1.4. IEEE 802.11n HT20 section

Table 2-13 IEEE802.11n Mode Specification

Item	Specification
Modulation Type	64-QAM,16-QAM, QPSK, BPSK
Frequency range	2.400GHz to 2.4835GHz 5.150GHz to 5.850GHz
Channel	CH1 to CH11 @2.4G CH36, CH40, CH44, CH48; CH52~CH64; CH100~CH140; CH149~CH165 @5G
Data rate	MCS0/1/2/3/4/5/6/7

2.4.1.5. IEEE 802.11n HT40 section

Table 2-14 IEEE802.11n Mode Specification

Item	Specification
Modulation Type	64-QAM,16-QAM, QPSK, BPSK
Frequency range	2.400GHz to 2.4835GHz

	5.150GHz to 5.850GHz
Channel	CH1 to CH11 @2.4G CH36, CH40, CH44, CH48; CH52~CH64; CH100~CH140; CH149~CH165 @5G
Data rate	MCS0/1/2/3/4/5/6/7

2.4.1.6. IEEE 802.11ac VHT20 section

Table 2-15 IEEE802.11ac Mode Specification

Item	Specification
Modulation Type	256QAM, 64-QAM,16-QAM,QPSK,BPSK
Frequency range	5.150GHz to 5.850GHz
Channel	CH36, CH40, CH44, CH48; CH52~CH64; CH100~CH140; CH149~CH165 @5G
Data rate	MCS0/1/2/3/4/5/6/7/8

2.4.1.7. IEEE 802.11ac VHT40 section

Table 2-16 IEEE802.11ac Mode Specification

Item	Specification
Modulation Type	256QAM, 64-QAM,16-QAM,QPSK,BPSK
Frequency range	5.150GHz to 5.850GHz
Channel	CH36, CH40, CH44, CH48; CH52~CH64; CH100~CH140; CH149~CH165 @5G
Data rate	MCS0/1/2/3/4/5/6/7/8/9

2.4.1.8. IEEE 802.11ac VHT80 section

Table 2-17 IEEE802.11ac Mode Specification

Item	Specification
Modulation Type	256QAM, 64-QAM,16-QAM,QPSK,BPSK
Frequency range	5.150GHz to 5.850GHz
Channel	CH36, CH40, CH44, CH48; CH52~CH64; CH100~CH140; CH149~CH165 @5G
Data rate	MCS0/1/2/3/4/5/6/7/8/9

2.4.2. Bluetooth subsystem

Table 2-18 Bluetooth subsystem Characteristic

Item	Specification
Modulation Type	GFSK, $\pi/4$ -DQPSK,8PSK

Frequency range	2402MHz~2480MHz
Channel	BR,EDR CH0 TO CH78 LE: CH0 to CH39

2.5. Power up Timing Sequence

2.5.1. Power-up sequence

No specific time requirement for VBAT, just need to follow up the power on sequence waveform of VIO/VIORE.

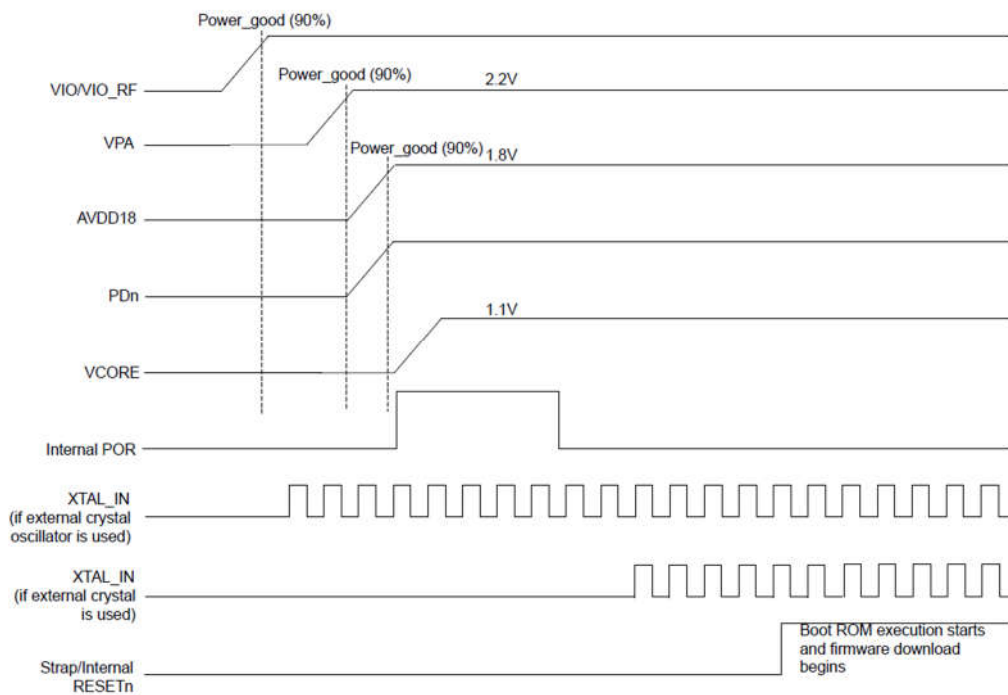


Figure 2-1 Power-up sequence

Note:

1. VPA, PDn, AVDD18, VCORE, Internal POR, XTAL_IN, RESETn power on sequence will be controlled by internal circuit in module.

2.5.2. Power-down Sequence

No specific time requirement for VBAT.

The maximum ramp-down time for PDn from VBAT assertion is 10ms. VBAT must be asserted a minimum of 100 ms to guarantee that PDn are discharged to less than 0.2V for the POR generate properly after VBAT is reasserted.

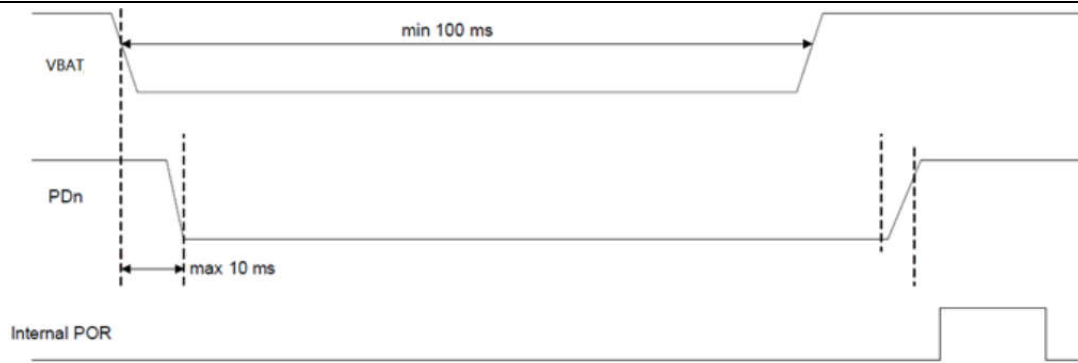


Figure 2-2 Power-down sequence

Note:

PDn, Internal POR power down sequence will be controlled by internal circuit in module.

2.6. SDIO

This module supports a SDIO device interface that conforms to the industry SDIO Full-Speed card specification and allows a host controller using the SDIO bus protocol to access the Wireless SoC device.

The W603C acts as the device on the SDIO bus. The host unit can access registers of the SDIO interface directly and can access shared memory in the device through the use of BARs and a DMA engine..

- Support SDIO 3.0 standard;
- On-chip memory used for CIS;
- Supports 4- bits SDIO and 1-bit SDIO transfer modes;
- Special interrupt register for information exchange;

Table 2-19 SDIO interface signals

SDIO Pin Name	Type	Description
SDIO_DATA_CLK	I	SDIO 4-Bits mode: clock SDIO 1-Bit mode: clock
SDIO_DATA_CMD	I/O	SDIO 4-Bits mode: Command Line SDIO 1-Bit mode: Command Line
SDIO_DATA3	I/O	SDIO 4-Bits mode: Data Line Bit [3] SDIO 1-Bit mode: Not used
SDIO_DATA2	I/O	SDIO 4-Bits mode: Data Line Bit [2] SDIO 1-Bit mode: Read wait(optional)
SDIO_DATA1	I/O	SDIO 4-Bits mode: Data Line Bit [1] SDIO 1-Bit mode: Interrupt
SDIO_DATA0	I/O	SDIO 4-Bits mode: Data Line Bit [0] SDIO 1-Bit mode: Data Line

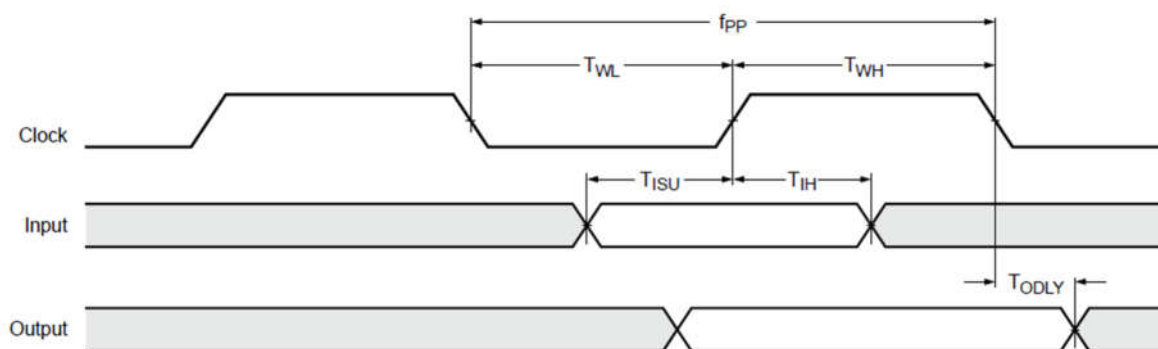


Figure 2-3 Default Speed Mode (3.3V)

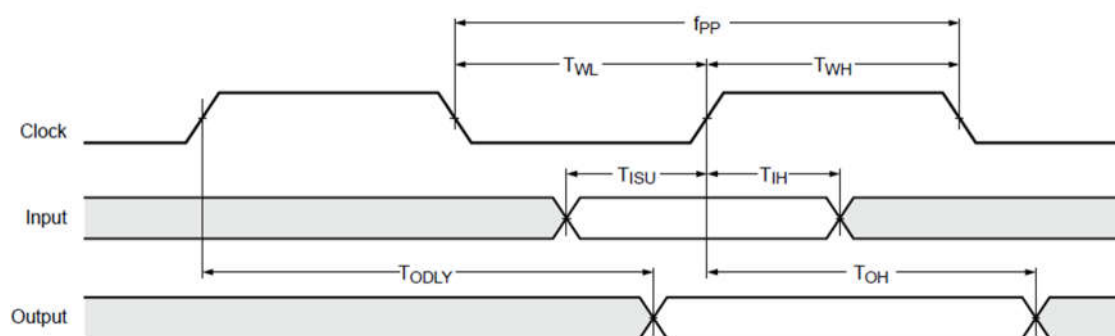


Figure 2-4 High Speed Mode (3.3V)

Table 2-20 SDIO Timing Data

Symbol	Parameter	Condition	Min	Max	Unit
f _{pp}	CLK frequency	Normal	0	25	MHz
		High Speed	0	50	
t _{wL}	CLK low time	Normal	10	-	
		High Speed	7	-	
t _{wH}	CLK high time	Normal	10	-	
		High Speed	7	-	
t _{ISU}	Input setup Time	Normal	5	-	
		High Speed	6	-	
t _{IH}	Input hold time	Normal	5	-	
		High Speed	2	-	
t _{ODLY}	Output Delay time	Normal	-	-	
		High Speed	-	14	
T _{OH}	Output hold time	High Speed	2.5	14	

Note:

1. SDIO 2.0 running at 50MHz clock frequency, only 1.8V is supported.
2. SDIO 2.0 running at 25MHz clock frequency, 1.8V or 3.3V is supported.

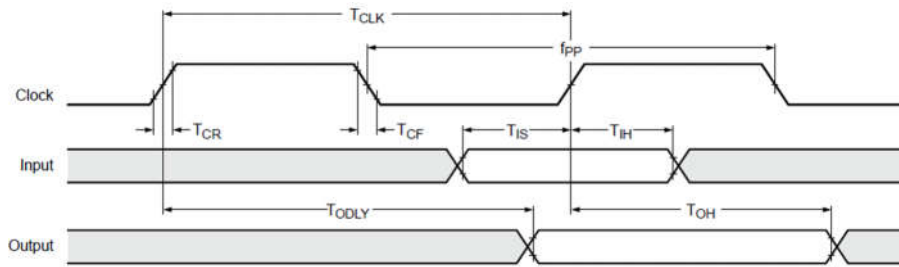


Figure 2-5 SDR12, SDR25, SDR50 Modes

Table 2-21 SDR12, SDR25, SDR50 modes (up to 100MHz) (1.8V)

Symbol	Parameter	Condition	Min	Typ	Max	Units
f _{pp}	CLK frequency	SDR 12/25/50	25	-	100	MHz
T _{IS}	Input setup time	SDR 12/25/50	3	-	-	ns
T _{IH}	Input hold time	SDR 12/25/50	0.8	-	-	ns
T _{CLK}	Clock time	SDR 12/25/50	10	-	40	ns
T _{CR} , T _{CF}	Rise time	SDR 12/25/50	-	-	0.2* T _{CLK}	ns
T _{ODLY}	Output delay time	SDR 12/25/50	-	-	7.5	ns
T _{OH}	Output hold time	SDR 12/25/50	1.5	-	-	ns

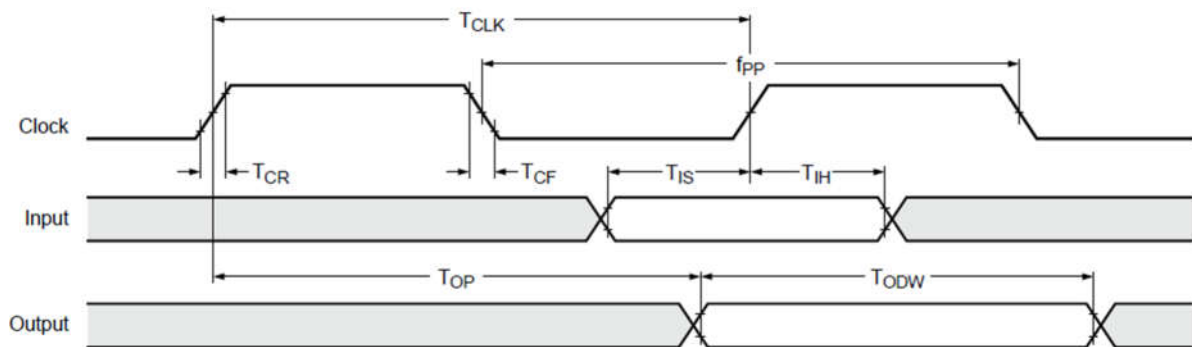


Figure 2-6 SDR104 Modes (208MHz)

Table 2-22 SDR104 modes

Symbol	Parameter	Condition	Min	Typ	Max	Units
f _{pp}	CLK frequency	SDR 104	0	-	208	MHz
T _{IS}	Input setup time	SDR 104	1.4	-	-	ns
T _{IH}	Input hold time	SDR 104	0.8	-	-	ns
T _{CLK}	Clock time	SDR 104	4.8	-	-	ns
T _{CR} , T _{CF}	Rise time	SDR 104	-	-	0.2* T _{CLK}	ns
T _{ODLY}	Output delay time	SDR 104	0	-	10	ns
T _{OH}	Output hold time	SDR 104	2.88	-	-	ns

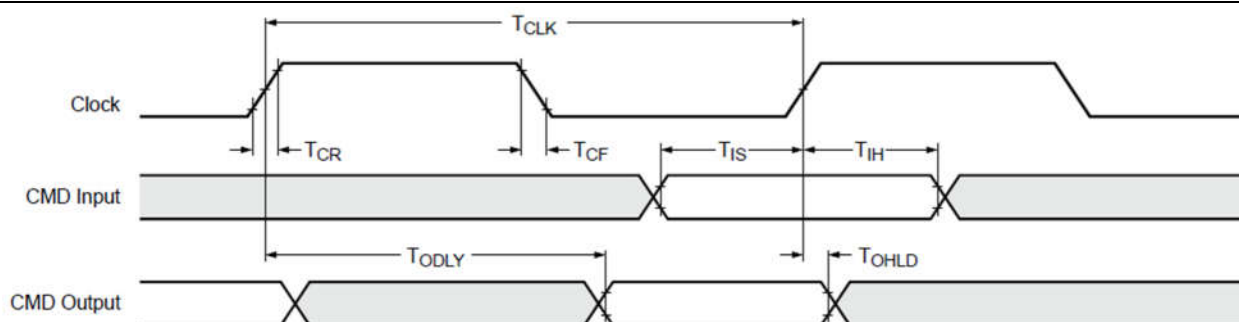


Figure 2-7 SDIO CMD Timing - DDR 50 MODE (50MHz)

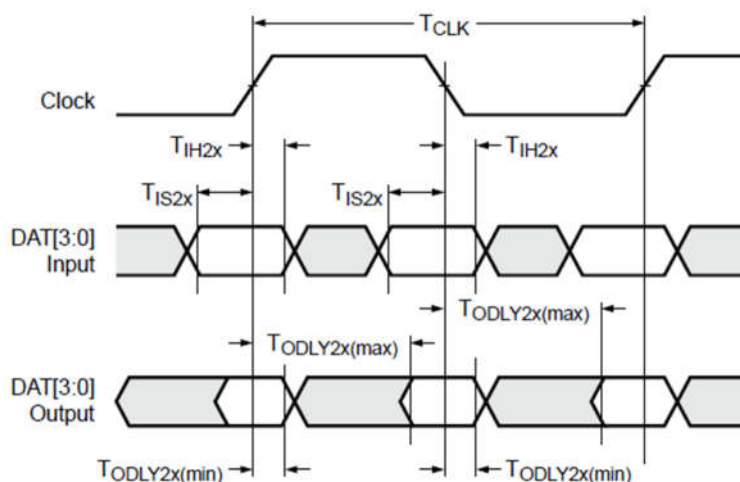


Figure 2-8 SDIO DAT[3 : 0] Timing Diagram -DDR 50 mode (50MHz)

Table 2-23 SDIO timing data – DDR50 Mode

Symbol	Parameter	Condition	Min	Typ	Max	Units
Clock						
T _{CLK}	Clock time	DDR50	20	-	-	ns
T _{CR} , T _{CF}	Rise time	DDR50	-	-	0.2*T _{CLK}	ns
Clock Duty		DDR50	45	-	55	%
CMD Input						
T _{IS}	Input setup time	DDR50	6	-	-	ns
T _{IH}	Input hold time	DDR50	0.8	-	-	ns
CMD Output						
T _{ODLY}	Output delay time	DDR50	-	-	13.7	ns
T _{OH}	Output hold time	DDR50	1.5	-	-	ns
DAT[3:0] Input						
T _{IS2X}	Input setup time	DDR50	3	-	-	ns
T _{IH2X}	Input hold time	DDR50	0.8	-	-	ns
DAT[3:0] Output						
T _{ODLY2X}	Output delay time	DDR50	-	-	7	ns
T _{OH2X}	Output hold time	DDR50	1.5	-	-	ns

2.7. UART

- FIFO mode permanently selected for transmit and receive operations;
- 2 pins for transmit and receive operations;
- 2 flow control pins;
- Interrupt triggers for low-power, internal CPU (for debug purposes);
- Support diagnostic tests;
- Support data input/ output operations for peripheral devices connected through a standard UART interface;

Signals

Pin Number	Signal Name	Standard Name	Type	Description
22	UART_SOUT	SOUT	O	Serial data
32	UART_SIN	SIN	I	Serial data
36	UART_CTSn	CTS _n	I	Clear to Send
34	UART_RTSn	RTS _n	O	Request to Send

Table 2-24 UART Baud rates supported (Default = 115200)

Baud Rate				
1200	38400	460800	1500000	3000000
2400	57600	500000	1843200	3250000
4800	76800	921600	2000000	3692300
9600	115200	1000000	2100000	4000000
19200	230400	1382400	2764800	

UART TX and RX pins are powered from VDDIO:

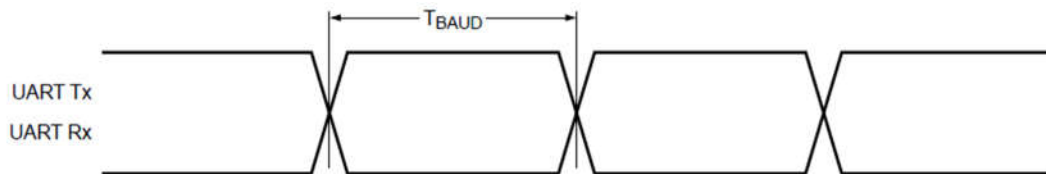


Figure 2-9 UART Timing Diagram

Table 2-25 UART Timing Data

Symbol	Parameter	Condition	Min	Typ	Max	Units
TBAUD	Baud Rate	38.4MHz input clock	250	-	-	ns

3. Software Information

3.1. RF Driver

“SD-WLAN-UART-BT-8987-U16-MMC-W16.68.1.p195-16.26.1.p195-C4X16623-MGPL”

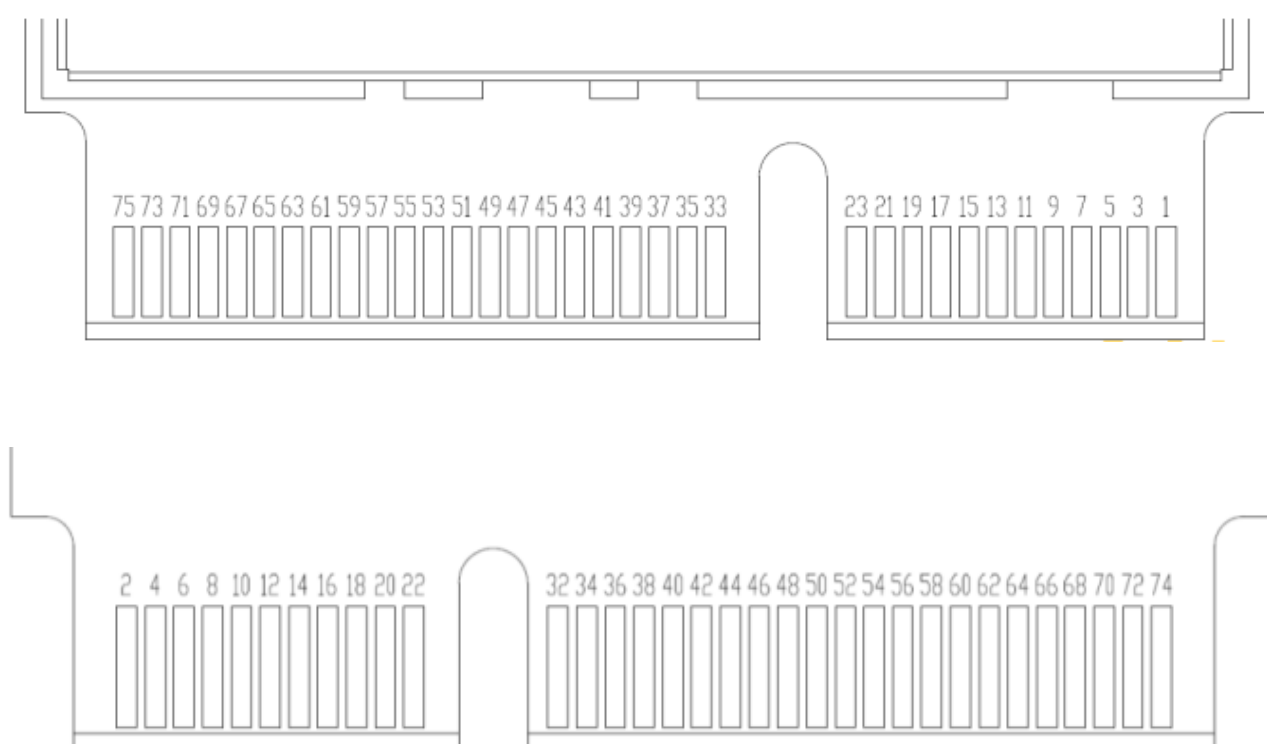
3.2. Normal Driver

“SD-WLAN-SD-BT-8987-U16-MMC-W16.197.21.p23-16.198.21.p23-C4X16705-MGPL”

Note:

The software (driver) package version is subject to change without notice because it may encounter several updates. It is advised to consult with Amphenol for the best right driver package.

4. Pin Description



- Will be updated by real product t in next version

Figure 4-1: W603C Pin_out description

Table 4-1 PIN Definition

Pin Number	Definition	Voltage	TYPE	Description
1	GND		Ground	Ground
2	VBAT	3.3V	Power	3.3V POWER SUPPLY
3	NC			
4	VBAT	3.3V	Power	3.3V POWER SUPPLY
5	NC			

6	NC			
7	GND		Ground	Ground
8	BT_PCM_CLK	0/1.8V	I/O	PCM CLOCK
9	SDIO_CLK	0/1.8V	I	SDIO CLOCK
10	BT_PCM_SYNC	0/1.8V	O	PCM SYNC Control
11	SDIO_CMD	0/1.8V	I/O	SDIO Command input
12	BT_PCM_OUT	0/1.8V	O	PCM Data output
13	SDIO_DATA0	0/1.8V	I/O	SDIO Data line 0
14	BT_PCM_IN	0/1.8V	I	PCM Data input
15	SDIO_DATA1	0/1.8V	I/O	SDIO Data line 1
16	NC			
17	SDIO_DATA2	0/1.8V	I/O	SDIO Data line 2
18	GND		Ground	Ground
19	SDIO_DATA3	0/1.8V	I/O	SDIO Data line 4
20	UART_WAKE	0/3.3V	O	Bluetooth device to wakeup Host
21	SDIO_WAKE	0/1.8V	O	WAN to wakeup Host
22	UART_TXD	0/1.8V	O	UART_TXD
23	SDIO RESET	0/1.8V	I	Power up/down internal regulators. 0= Full power,1= Normal
32	UART_RXD	0/1.8V	I	UART_RXD
33	GND		Ground	Ground
34	UART_RTS_N	0/1.8V	O	UART_RTS
35	NC			
36	UART_CTS_N	0/1.8V	I	UART_CTS
37	NC			
38	NC			
39	GND		Ground	Ground
40	NC			
41	NC			
42	NC			
43	NC			
44	NC			

45	GND		Ground	Ground
46	NC			
47	NC			
48	NC			
49	NC			
50	SUSCLK_IN	0/3.3V	I	External 32K or RTC CLK
51	GND		Ground	Ground
52	NC			
53	NC			
54	W_Disable2	0/3.3V	I	Host Wake-up Bluetooth device
55	NC			
56	W_Disable1	0/3.3V	I	0= Full power,1= Normal
57	GND		Ground	Ground
58	NC			
59	NC			
60	NC			
61	NC			
62	NC			
63	GND		Ground	Ground
64	NC			
65	NC			
66	NC			
67	NC			
68	NC			
69	GND		Ground	Ground
70	NC			
71	NC			
72	VBAT	3.3V	Power	3.3V POWER SUPPLY
73	NC			
74	VBAT	3.3V	Power	3.3V POWER SUPPLY
75	GND		Ground	Ground

Note:

1) Pin types:

- ♦ I/O – Digital input/output;
- ♦ I – Digital Input;
- ♦ O – Digital Output;
- ♦ Power – Power Supply;
- ♦ Ground –Ground;
- ♦ NC – No connect;

2) PIN23 SDIO Reset:

Power up/ down internal regulators. 0 = full power-down mode1 = normal mode. Default pull high in module internal, this pin has an internal 4.02k pull-high resistor. For external pull-low setting, suggest to use 1.6k resistor or below to pull-low.

3) PIN56 W_Disable1:

Power up/ down internal regulators. 0 = full power-down mode, 1 = normal mode. Default pull high in module internal, this pin has an internal 4.02k pull-high resistor. For external pull-low setting, suggest to use 1.6k resistor or below to pull-low.

4) Pull-up/down circuits reserved

Pull-up or Pull down circuit -1.8V should be reserved for the following Pins:

- ♦ PIN21: SDIO_WAKE
- ♦ PIN23: SDIO-RESET

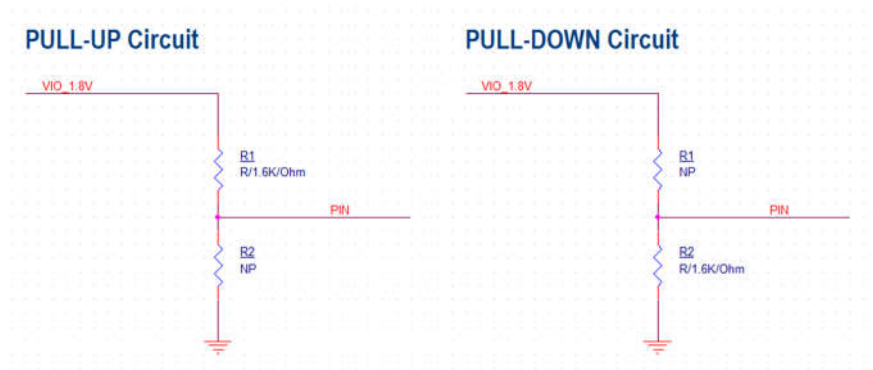


Figure 4-2 Pull up and Pull down circuits-1.8V

Pull-up or Pull down circuit -3.3V should be reserved for the following Pins:

- ♦ PIN20: UART_WAKE
- ♦ PIN54: W_Disable2
- ♦ PIN56: W_Disable1

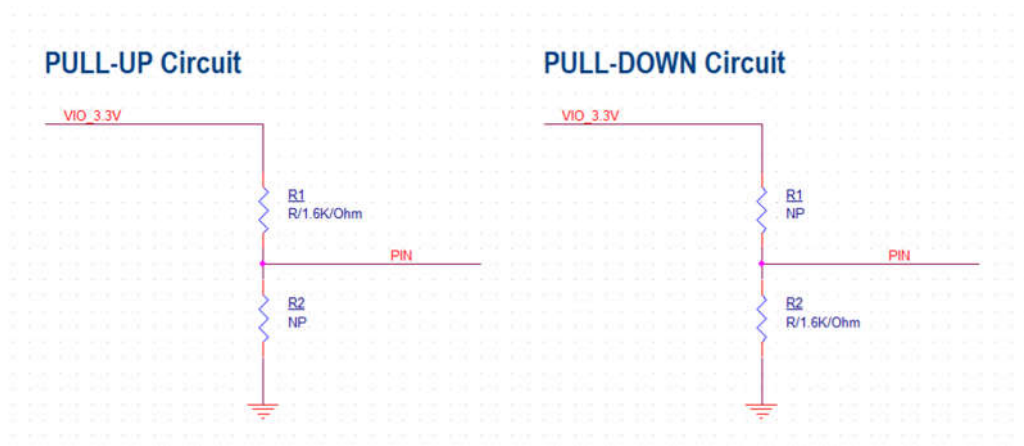
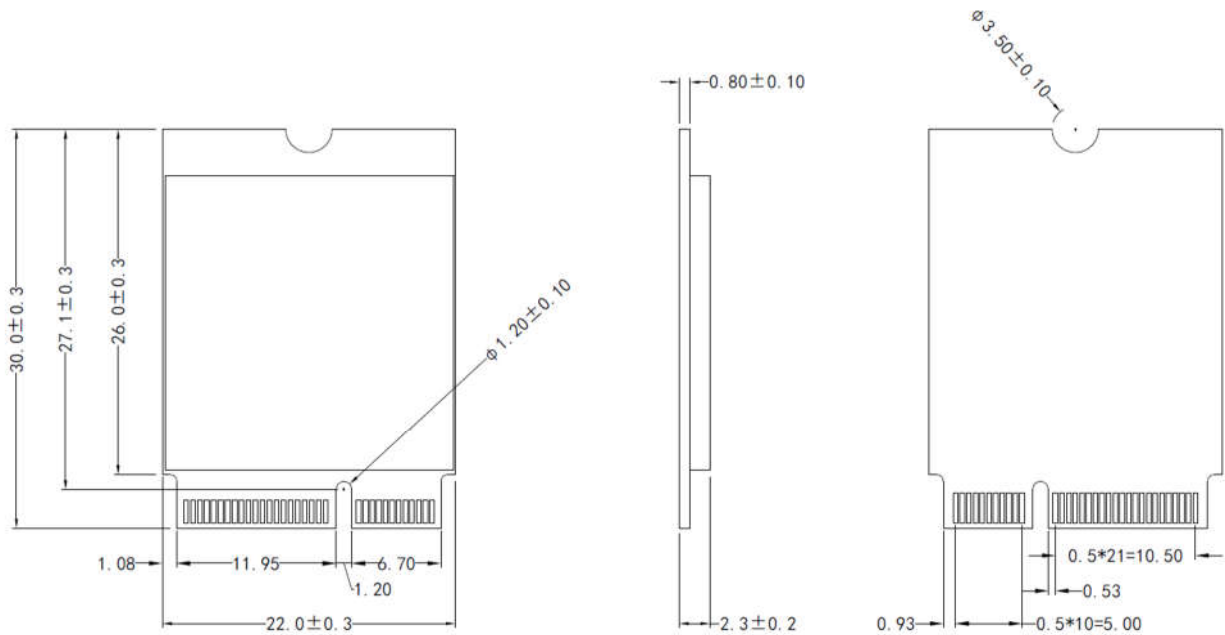


Figure 4-3 Pull up and Pull down adjustable circuit-3.3V

5. Mechanical

5.1. Size



Unit:mm

Figure 5-1 Size

5.1.1. Use guidelines

A. Baking need equipment:

- Cabinet baking box
 - ◆ The antistatic, high temperature resistant tray
 - ◆ The antistatic high temperature resistant gloves
- Storage conditions as follows
 - ◆ Moisture bag must be stored in a temperature $< 30^{\circ} \text{C}$, humidity 85% RH of the environment.
 - ◆ Dry packaging products, the guarantee period should be from 6 months from the date of packing seal.
 - ◆ Sealed packaging is equipped with humidity indicator card, as shown in Figure 6-2.
- Humidity indicator CARDS and baking several ways as follows:



Figure 5-2 Temperature and humidity indicator CARDS

- When opened, if the temperature and humidity indicator CARDS read 10%, 20%, 30%, 40% three color ring are blue, to continue to bake for 2 hours for module;
- When opened, if the humidity indicator CARDS read 10% color ring into pink, need to continue to bake module 4 hours;
- When opened, if the humidity indicator CARDS read into 10%, 20%, color ring into pink, need to continue to bake for 6 hours module;
- When opened, if the humidity indicator CARDS read into 10%, 20%, 30% are pink color ring, need to continue to bake for 12 hours module;
- When opened, if the humidity indicator CARDS read into 10%, 20%, 30%, 40% are pink color ring, need to continue to bake for 14 hours module;
- Baking parameters are as follows:
 - ◆ Baking temperature: $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$;
 - ◆ Set the alarm temperature as 130°C ;
 - ◆ Under the condition of natural cooling $< 36^{\circ}\text{C}$, SMT placement can be made;
 - ◆ Dry times: 1 times;
- Please to ESD (static discharge, static electricity discharge) protection module before usage;

B. The matters needing attention

- In the entire production, Each station of the operator must wear anti-static gloves;
- When baking, no more than baking time;
- When roasting, it is forbidden to join explosive, flammable, corrosive substances;
- When baking, high temperature module application tray in the oven, keep the air circulation between each module, at the same time avoid direct contact with the oven wall module;
- Baking, please will bake the door is closed, the guarantee baking box sealing, prevent leakage, temperature influence the baking effect;
- Don't open the door, as far as possible when baking box running if must open, shortening the time of can open the door as far as possible;
- After baking, must be natural cooling modules to $< 36^{\circ}\text{C}$ before wear anti-static gloves out, so as not to burn.
- Operation, forbidden module bottom touch water or dirt;
- Temperature and humidity control level for Level3, storage and baking conditions based on IPC/JEDEC J-STD-020.
-

5.1.2. MSL/Storage Condition

Moisture Sensitivity level 3

1. Calculated shelf life in sealed bag is 12 months at $<40^{\circ}\text{C}$ and $< 90\%$ relative humidity(RH);
2. Peak Package body temperature: 260°C ;
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must:
Mounted within: 168 hours of factory conditions $< 30^{\circ}\text{C}/60\%\text{RH}$, or stored at $<10\%\text{RH}$;
If both of these conditions are not met, baking is required before mounting;
4. Devices require bake, before mounting if:
 - a) Humidity indicator card is $>10\%$ when read at $23 \pm 5^{\circ}\text{C}$
 - b) 3a or 3b not met.
5. If baking is required, devices may be baked for 48 hours at $125 \pm 5^{\circ}\text{C}$

6. Package Information

Production modules are delivered in plate, 160 modules in each plate, minimum package will be 2 plates

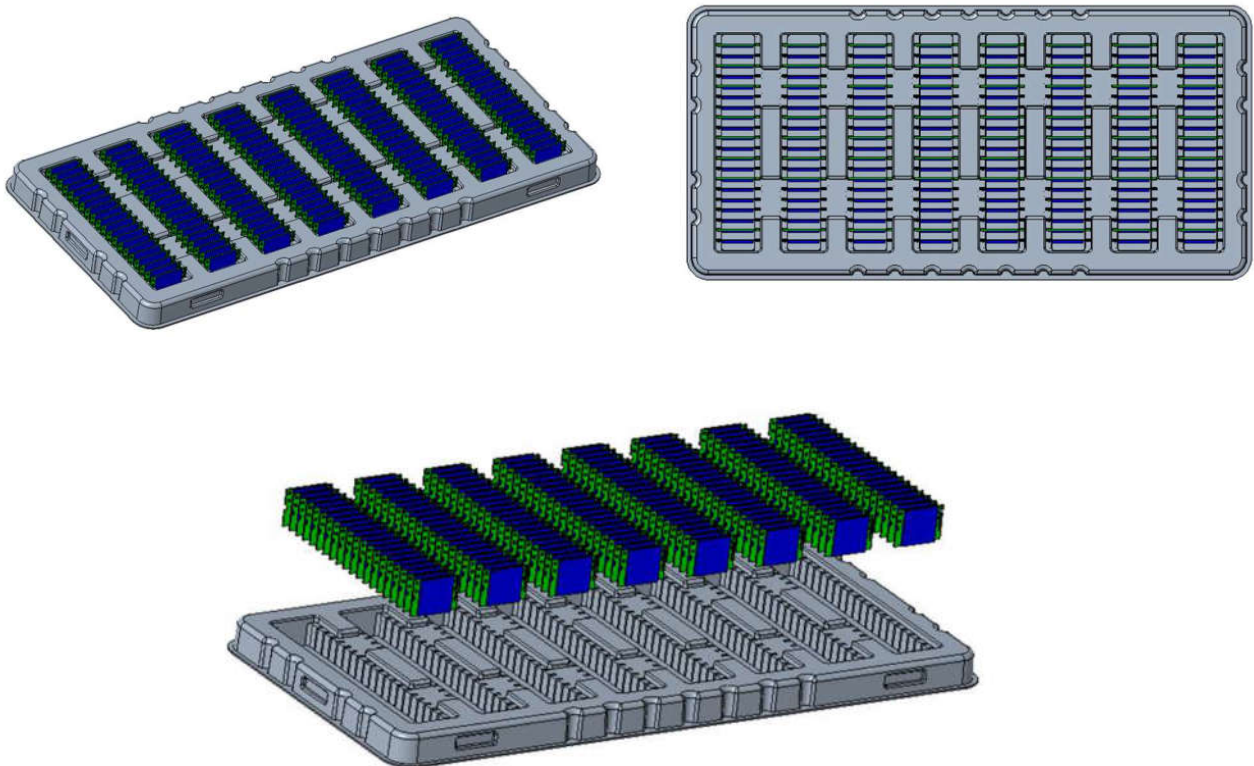


Figure 6-1 20PCS per column X 8 columns

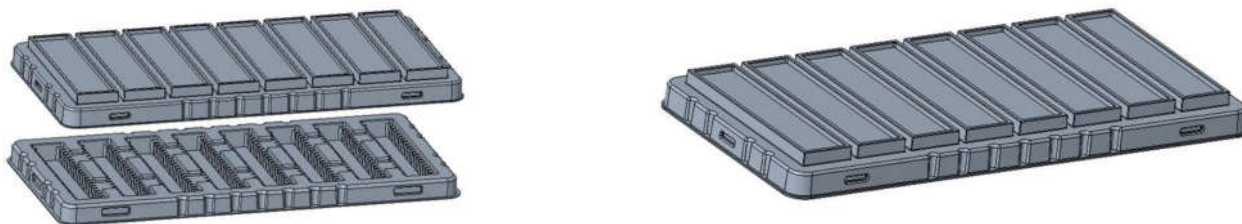


Figure 6-2 Top Plate as a protection cover

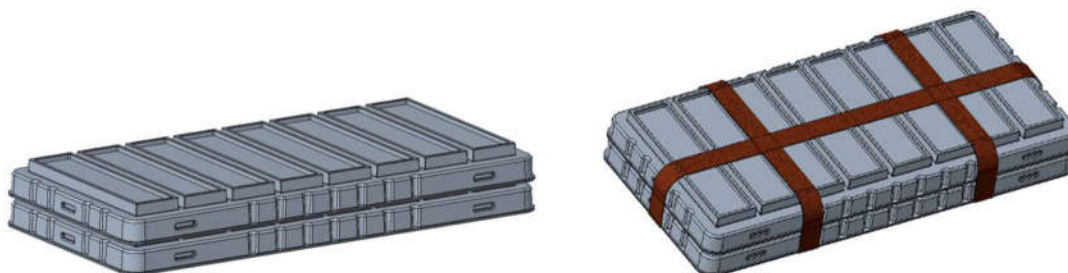


Figure 6-3 A stack with 2 plates

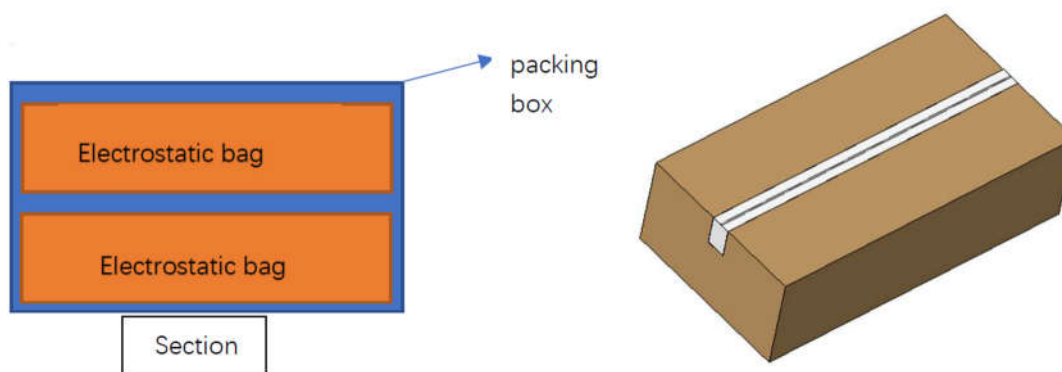


Figure 6-4 Putting 2 wrapped plates into an inner box

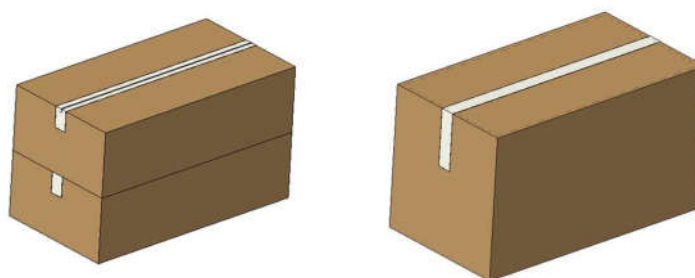


Figure 6-5 Putting 2 pcs of inner boxes into a carton box

Table 6-1 Package list

Product Quantity	Plates	Electrostatic bags	Inner Boxes	Carton Box
1,280 PCS	2 PCS	4 PCS	2 PCS	1 PCS

7. Regulatory approval

W603C module has received regulatory approval from the following countries:

United States/FCC ID: 2BAG9-W603C00101

Europe: CE

Japan/MIC: 020-240266

7.1. FCC Regulations:

OEM/Integrators Installation Manual

Important Notice to OEM integrators

1. This module is limited to OEM installation ONLY.
2. This module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
3. The separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations
4. For FCC Part 15.31 (h) and (k): The host manufacturer is responsible for additional testing to verify compliance as a composite system. When testing the host device for compliance with Part 15 Subpart B, the host manufacturer is required to show compliance with Part 15 Subpart B while the transmitter module(s) are installed and operating. The modules should be transmitting and the evaluation should confirm that the module's intentional emissions are compliant (i.e. fundamental and out of band emissions). The host manufacturer must verify that there are no additional unintentional emissions other than what is permitted in Part 15 Subpart B or emissions are complaint with the transmitter(s) rule(s).
The Grantee will provide guidance to the host manufacturer for Part 15 B requirements if needed.

Important Note

Notice that any deviation(s) from the defined parameters of the antenna trace, as described by the instructions, require that the host product manufacturer must notify to Amphenol that they wish to change the antenna trace design. In this case, a Class II permissive change application is required to be filed by the USI, or the host manufacturer can take responsibility through the change in FCC ID (new application) procedure followed by a Class II permissive change application.

End Product Labeling

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: 2BAG9-W603C00101"

The FCC ID can be used only when all FCC compliance requirements are met.

Antenna Installation

- (1) The antenna must be installed such that 20 cm is maintained between the antenna and users,
 - (2) The transmitter module may not be co-located with any other transmitter or antenna.
 - (3) Only antennas of the same type and with equal or less gains as shown below may be used with this module.
- Other types of antennas and/or higher gain antennas may require additional authorization for operation.

Antenna type	2.4GHz band Peak Gain (dBi)	5.2GHz band Peak Gain (dBi)	5.3GHz band Peak Gain (dBi)	5.5GHz band Peak Gain (dBi)	5.8GHz band Peak Gain (dBi)
PCB Antenna	1.62	2.29	2.29	2.39	2.39

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC/IC authorization is no longer considered valid and the FCC ID/IC 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/IC authorization.

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.

Federal Communication Commission Interference Statement

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

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. 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 turning the equipment off and on, the user is encouraged to try to correct the interference by one 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.

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. This transmitter must not be co-located or operating in conjunction

with any other antenna or transmitter.

List of applicable FCC rules

This module has been tested and found to comply with part 22, part 24, part 27, part 90, 15.247 and 15.407 requirements for Modular Approval.

The modular transmitter is only FCC authorized for the specific rule parts (i.e., FCC transmitter rules) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuitry), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 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 2 conditions above are met, further transmitter test 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.

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 20 cm between the radiator & your body.

7.2. Europe

The W603C modules is/are a Radio Equipment Directive (RED) assessed radio module that is CE marked and has been manufactured and tested with the intention of being integrated into a final product.

The W603C modules has/have been tested to RED 2014/53/EU Essential Requirements mentioned in the following European Compliance table.

The device could be used with a separation distance of 20cm to the human body

European Compliance

Certification	Standards	Article
Safety	EN 62368	3.1 a
Health	EN 62311	

EMC	EN 301 489-1	3.1 b
	EN 301 489-17	
Radio	EN 300 328	3.2

The ETSI provides guidance on modular devices in the “*Guide to the application of harmonised standards covering articles 3.1b and 3.2 of the RED 2014/53/EU (RED) to multi-radio and combined radio and nonradio equipment*” document available at http://www.etsi.org/deliver/etsi_eg/203300_203399/203367/01.01.01_60/eg_203367v010101p.pdf.

7.2.1. Labeling and User Information Requirements

The label on the final product that contains W603C modules must follow CE marking requirements.

7.2.2. Conformity Assessment

From ETSI Guidance Note EG 203367, section 6.1, when non-radio products are combined with a radio product:

If the manufacturer of the combined equipment installs the radio product in a host non-radio product in equivalent assessment conditions (i.e. host equivalent to the one used for the assessment of the radio product) and according to the installation instructions for the radio product, then no additional assessment of the combined equipment against article 3.2 of the RED is required.

7.2.3. Simplified EU Declaration of Conformity


Hereby, Shanghai Amphenol Airwave Communication Electronics Co. Ltd. declares that the radio equipment type W603C is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address:

<https://www.amphenol-cs.com/product-series/wi-fi-ble-module-W603C.html>

7.2.4. WIFI 5G watchwords and restricted use country codes:

The device is restricted to indoor use only when operating in the 5250 to 5350 MHz frequency range.

	AT	BE	BG	HR	CY	CZ	DK
	EE	FI	FR	DE	EL	HU	IE
	IT	LV	LT	LU	MT	NL	PL
	PT	RO	SK	SI	ES	SE	UK(N I)

7.2.5. Distance rules

The device could be used with a separation distance of **20cm** to the human body.

7.3. Japan

5GHz band (W52,W53): Indoor use only (except communicate to W52 high power radio)

5GHz 帯 (W52、W53)は屋内利用限定です。(5.2GHz 帯高出力データ通信システムの基地局や中継局との通信を除く)

The W603C module has received type certification and is required to be labeled with its own technical conformity mark and certification number as required to conform to the technical standards regulated by the Ministry of Internal Affairs and Communications (MIC) of Japan pursuant to the Radio Act of Japan.

Integration of this module into a final product does not require additional radio certification provided installation instructions are followed and no modifications of the module are allowed. Additional testing may be required:

- If the host product is subject to electrical appliance safety (for example, powered from an AC mains), the host product may require Product Safety Electrical Appliance and Material (PSE) testing. The integrator should contact their conformance laboratory to determine if this testing is required;

- There is an voluntary Electromagnetic Compatibility (EMC) test for the host product administered by VCCI:

www.vccj.jp/vccj_e/index.html;

7.3.1. Labeling and User Information Requirements

The label on the final product, which contains W603C, must follow Japan marking requirements. The integrator of the module should refer to the labeling requirements for Japan available at the Ministry of Internal Affairs and Communications (MIC) website.

For W603C module/s, due to a limited module size, the technical conformity logo and ID is displayed in the data sheet and/or packaging and cannot be displayed on the module label. The final product in which this module is being used must have a label referring to the type certified module inside:

