

# **SPECIFICATION**

**IEEE 802.11 B/G/N 2.4GHz 1T1R WiFi with Bluetooth2.1/3.0/4.0,  
and FM controller with SDIO interface,  
and HS-UART mixed interface**

**NT-SM02BD-8723BS-12**

**WF+BT+FM Combo Module**

Version 1.0

## PRODUCT DESCRIPTION

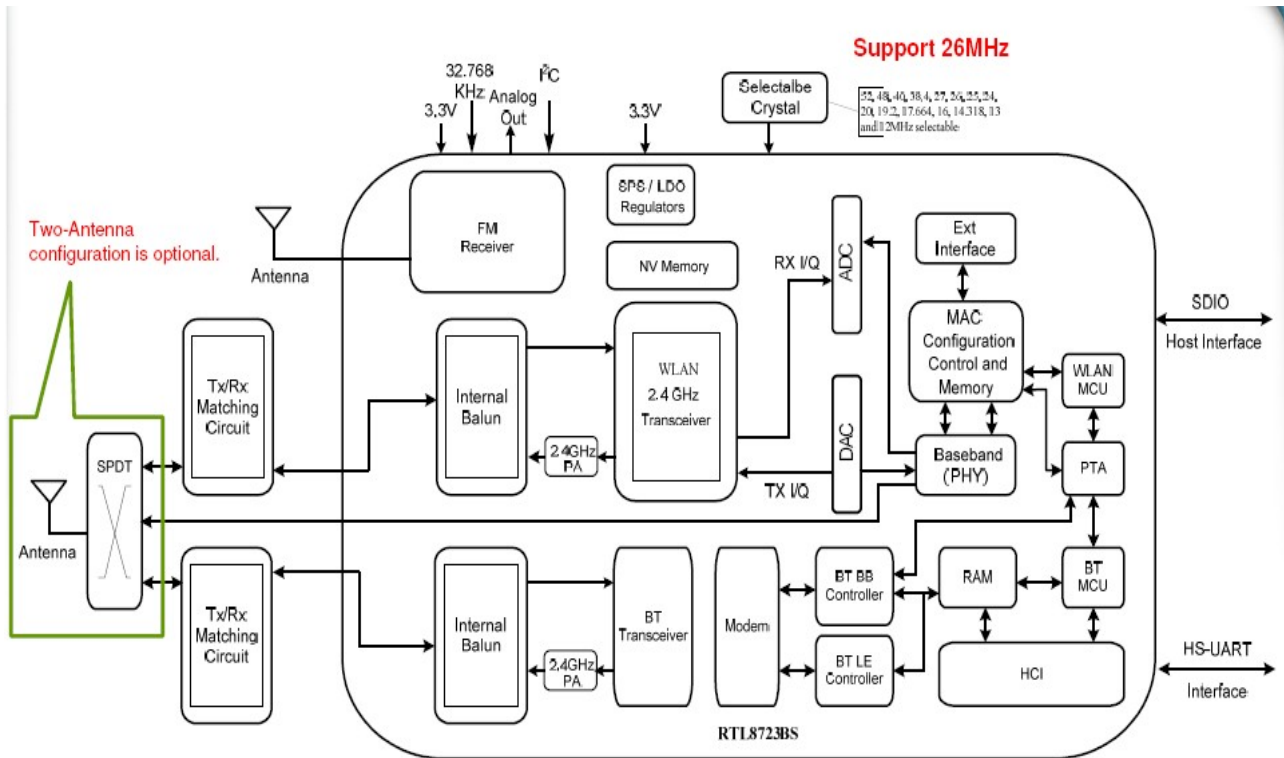
SM02BD is a small size and low profile of WF+BT+FM combo module with LGA (Land-Grid Array) footprint, board size is 12mm\*12mm with module height of 2mm. It can be easily manufactured on SMT process and highly suitable for tablet PC, ultra book, mobile device and consumer products. It provides GSPI/SDIO interface for WiFi to connect with host processor and high speed UART interface for BT. It also has a PCM interface for audio data transmission with direct link to external audio codec via BT controller. The WiFi throughput can go up to 150Mbps in theory by using 1x1 802.11n b/g/n MIMO technology and Bluetooth can support BT2.1+EDR/BT3.0 and BT4.0.

SM02BD uses Realtek RTL8723BS, a highly integrated WiFi/BT single MODULE based on advanced COMS process. RTL8723BS integrates whole WiFi/BT function blocks into a chip, such as SDIO/UART, MAC, BB, AFE, RFE, PA, EEPROM and LDO/SWR, except fewer passive components remained on PCB.

## PRODUCT FEATURES

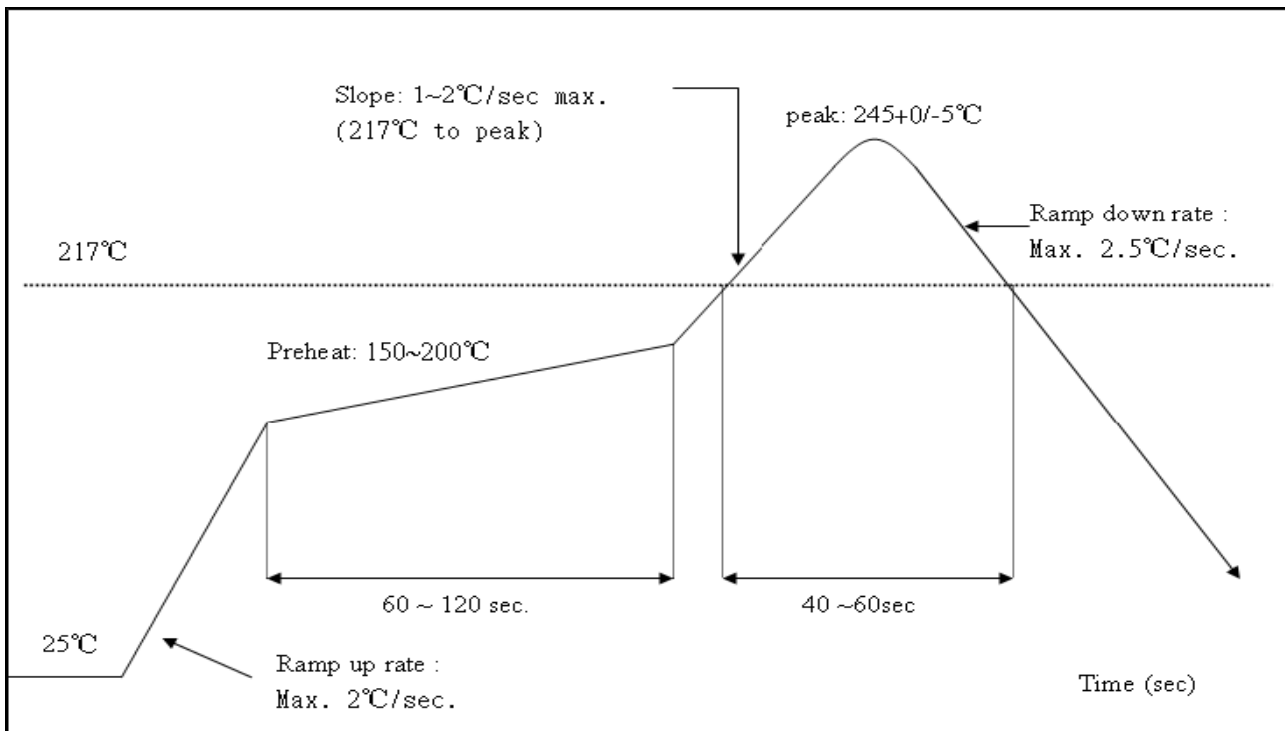
- ◆ Operate at ISM frequency bands (2.4GHz)
- ◆ GSPI/SDIO for WiFi and UART for Bluetooth
- ◆ IEEE standards support: IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11d, IEEE802.11e, IEEE 802.11h, IEEE 802.11i
- ◆ Fully Qualified for Bluetooth 2.1 + EDR specification including both 2Mbps and 3Mbps modulation mode
- ◆ Fully qualified for Bluetooth 3.0
- ◆ Fully qualified for Bluetooth 4.0 Dual mode
- ◆ Full -speed Bluetooth operation with Piconet and Scatternet support.
- ◆ Enterprise level security which can apply WPA/WPA2 certification for WiFi.
- ◆ WiFi 1 transmitter and 1 receiver allow data rates supporting up to 150 Mbps downstream and 150 Mbps upstream PHY rates
- ◆ For WiFi/BT, it uses fixed path for WiFi and BT, which means one antenna assigned for WiFi and the other is assigned for BT.
- ◆ Support Bluetooth adaptive power management mechanism
- ◆ Full-featured software utility for easy configuration and management
- ◆ RoHS compliance
- ◆ Low Halogen compliance

# Diagram



## Recommended Reflow Profile

Referred to IPC/JEDEC standard.  
 Peak Temperature : <250°C  
 Number of Times : ≤2 times

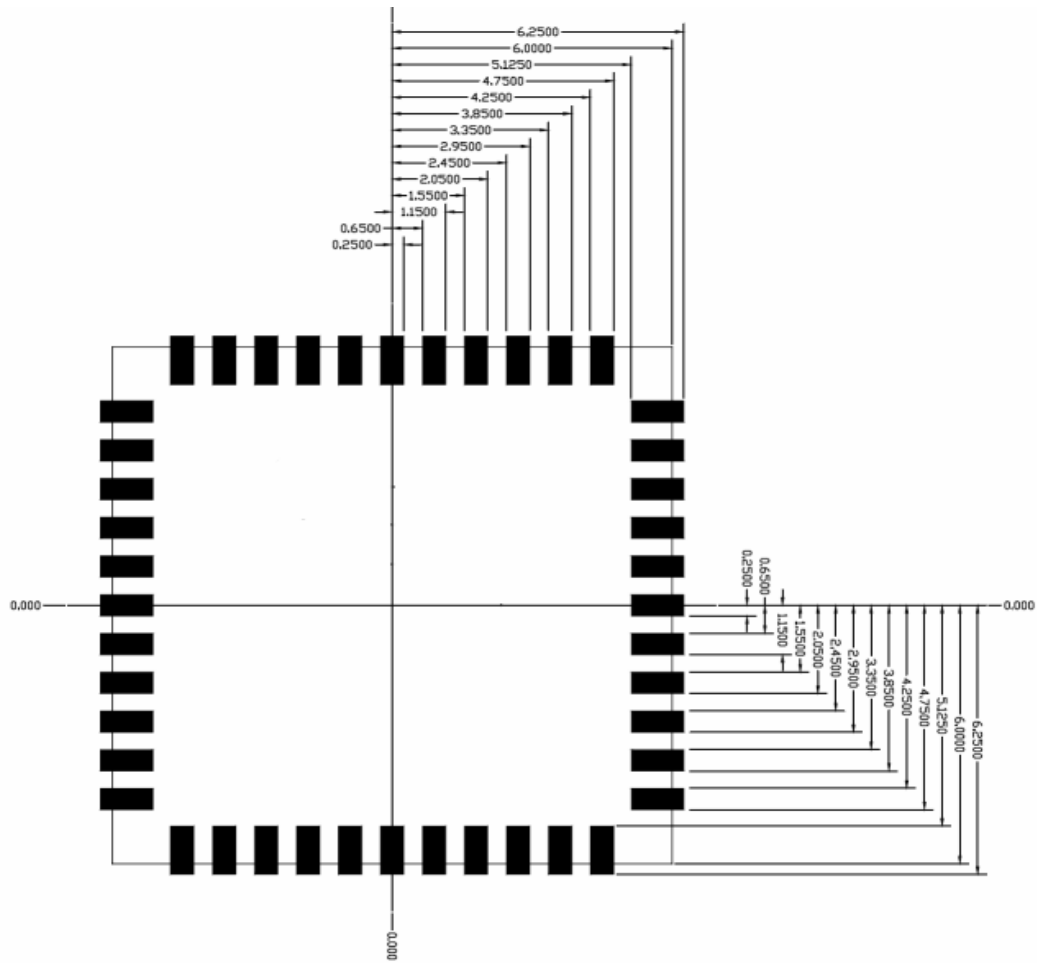


# PRODUCT SPECIFICATIONS

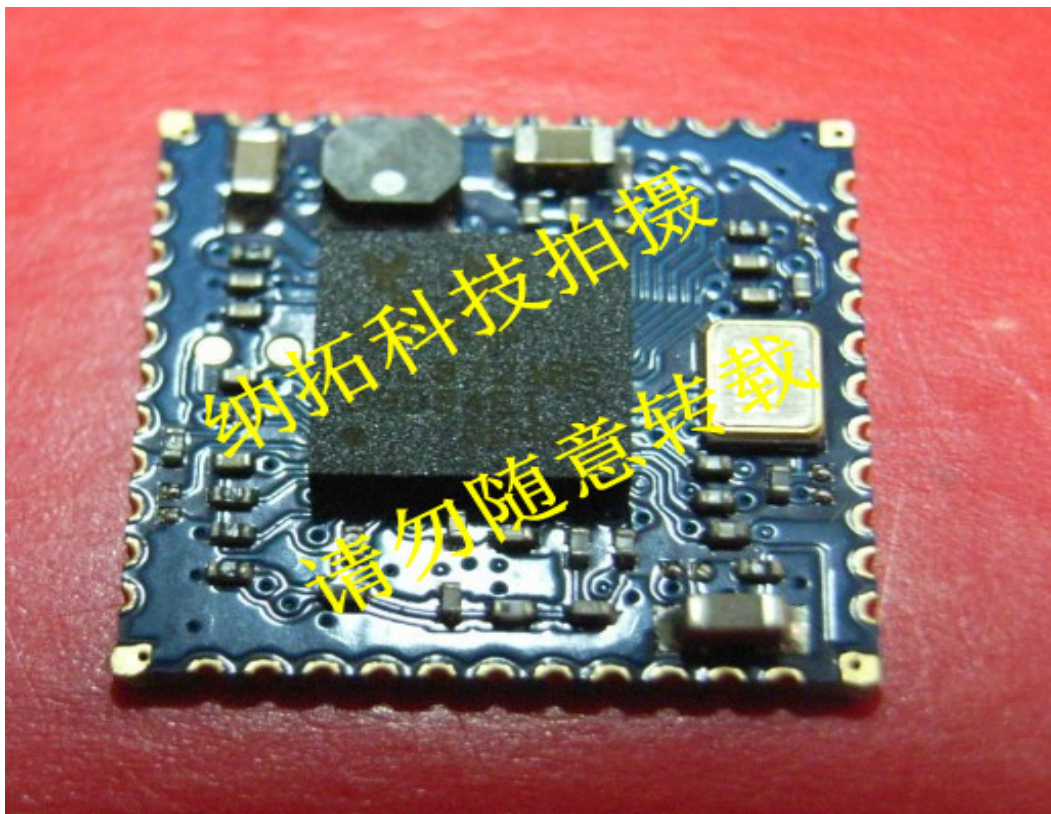
Module Name	NT-SM02BS-8723BS-12		
Main chipset	RTL8723BS (WiFi/BT/FM Single Chips)		
Standards	<b>WiFi:</b> IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11d, IEEE 802.11e, IEEE 802.11h, IEEE 802.11i <b>BT:</b> V2.1+EDR/BT v3.0/BT v3.0+HS/BT v4.0		
Bus Interface	<b>WiFi:</b> GSPI/SDIO <b>BT:</b> UART		
Data Rate	<b>WiFi: 802.11b:</b> 11, 5.5, 2, 1 Mbps <b>802.11g:</b> 54, 48, 36, 24, 18, 12, 9, 6 Mbps <b>802.11n:</b> MCS 0 to 7 for HT20MHz MCS 0 to 7 for HT40MHz <b>BT:</b> 1 Mbps for Basic Rate 2,3 Mbps for Enhanced Data Rate 6,9,12,18,24,36,48,54 Mbps for High Speed		
Media Access Control	<b>WiFi:</b> CSMA/CA with ACK <b>BT:</b> AFH, Time Division		
Modulation Techniques	<b>WiFi: 802.11b:</b> CCK, DQPSK, DBPSK <b>802.11g:</b> 64 QAM, 16 QAM, QPSK, BPSK <b>802.11n:</b> 64 QAM, 16 QAM, QPSK, BPSK <b>BT:</b> 8DPSK, $\pi/4$ DQPSK, GFSK		
Network Architecture	<b>WiFi:</b> Ad-hoc mode (Peer-to-Peer ) Infrastructure mode Software AP WiFi Direct <b>BT:</b> Pico Net Scatter Net		
OS supported	Linux/Android		
Frequency Range	2.400GHz ~ 2.4835 GHz		
Operating Channel	<b>WiFi 2.4GHz:</b> 11: (Ch. 1-11) – United States 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan <b>BT 2.4GHz:</b> Ch. 0 ~78		
Operating Voltage	3.3 V $\pm$ 9% I/O supply voltage		
Transmit Output Power – 1x1 (Tolerance: $\pm$ 1.5dBm)	<b>802.11b@11Mbps</b> 16dBm	<b>802.11g@6Mbps</b> 15dBm <b>802.11g@54Mbps</b> 14dBm	<b>802.11n</b> 13dBm (MCS 0_HT20) 13dBm (MCS 7_HT20) 12dBm (MCS 0_HT40) 12dBm (MCS 7_HT40)
	<b>BT:</b> Max +10 dBm		
Receiver Sensitivity	<b>802.11b@11Mbps</b> -82dBm	<b>802.11g@54Mbps</b> -71dBm	<b>802.11n</b> -67dBm (MCS 7_HT20) -64dBm (MCS 7_HT40)
	<b>BT:</b> -89dBm@1Mbps, -90dBm@2Mbps, -83dBm@3Mbps		
Security	<b>WiFi :</b> WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit & 128bit, IEEE 802.11x, IEEE 802.11i <b>BT:</b> Simple Paring		
Power Consumption (3.3V) (Typical)	<b>WiFi only TX Mode: (Conituous mode)</b> 85mA(MCS7/BW40/13dBm) <b>RX Mode: (Conituous mode)</b> 75mA(MCS7/BW40/-60dBm) <b>Associated Idle with DTIM=1</b> 2.1mA <b>Unassociated Idle:</b> 0.1mA <b>RF disable Mode:</b> 0.1mA  <b>BT : Inquiry &amp; Page Scan:</b> 0.9 mA <b>ACL no traffic:</b> 7.5mA <b>SCO HV3:</b> 15 mA		
Storage Temperature	-55-+120 °C		
Ambient Operating Temperature	0-70 °C		
Junction Temperature	0-125 °C		

# Mechanical

Dimensions (mm)	Length	Width	Height
	12 (Tolerance: $\pm 0.2\text{mm}$ )	12 (Tolerance: $\pm 0.2\text{mm}$ )	1.6 (Tolerance: $\pm 0.2\text{mm}$ )



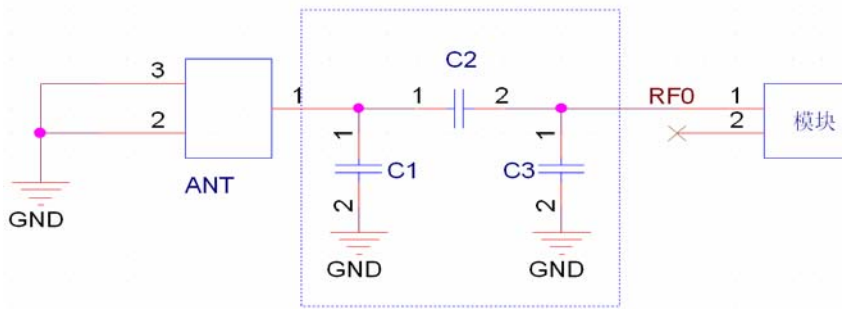
## Module Picture



## Pin Description

PIN	Function	Description
1	GND	Grond
2	WiFi/BT_ANT	RF I/O Port
3	NC	NC
4	NC	NC
5	NC	NC
6	BT_WAKE	HOST wake-up Bluetooth device
7	BT_HOST_WAKE	Bluetooth device to wake-up HOST
8	NC	NC
9	VABT	3.3V±0.1V(Main power voltage source input)
10	NC	NC
11	NC	NC
12	WL_DSI	Shared with GPIO9 This Pin Can Externally Shutdown the RTL8723BS WLAN function when BT_DISn is Pulled Low. When this pin deasserted, SDIO interface will be disabled. This pin can also support the WLAN Ra dio-off function with host interface remaining connected.
13	WL_HOST_WAKE	WLAN to wake-up HOST
14	SDIO_Data_2	SDIO data line 2
15	SDIO_Data_3	SDIO data line 3
16	SDIO_CMD	SDIO command line
17	SDIO_CLK	SDIO CLK line
18	SDIO_Data_0	SDIO data line 0
19	SDIO_Data_1	SDIO data line 1
20	GND	Grond
21	NC	NC
22	VDD_IO	3.3V±0.1V
23	NC	NC
24	SUSCLK_IN	Shared with GPIO6. External 32K or RTC clock input with 1.8V ~ 3.3V swing. This clock source is configured by BT and WL FW, respectively.
25	PCM_DOUT	PCM Data output
26	PCM_CLK	PCM Clock
27	PCM_DIN	PCM data input
28	PCM_SYNC	PCM sync signal
29	NC	NC
30	26MHz_IN	Reference clock input 26MHz Active Crystals (or if pin10/11 input ,pin30 NC )
31	GND	Grond
32	NC	NC
33	GND	Grond
34	BT_DIS#	General Purpose Input/Output Pin
35	NC	NC
36	GND	Grond
37	NC	NC
38	NC	NC
39	NC	NC
40	NC	NC
41	GND	Grond
42	UART_OUT	HOST Data output
43	UART_IN	HOST Data input
44	UART_CTS	HOST_CTS

## WIFI\BT RF Circuit reference pictures

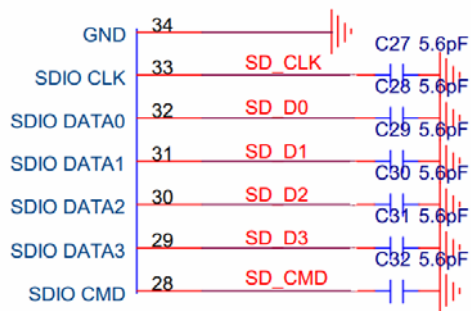


注:1.以上虚线框的部分需要进行天线匹配,以实际天线匹配的电子元件参数为准.

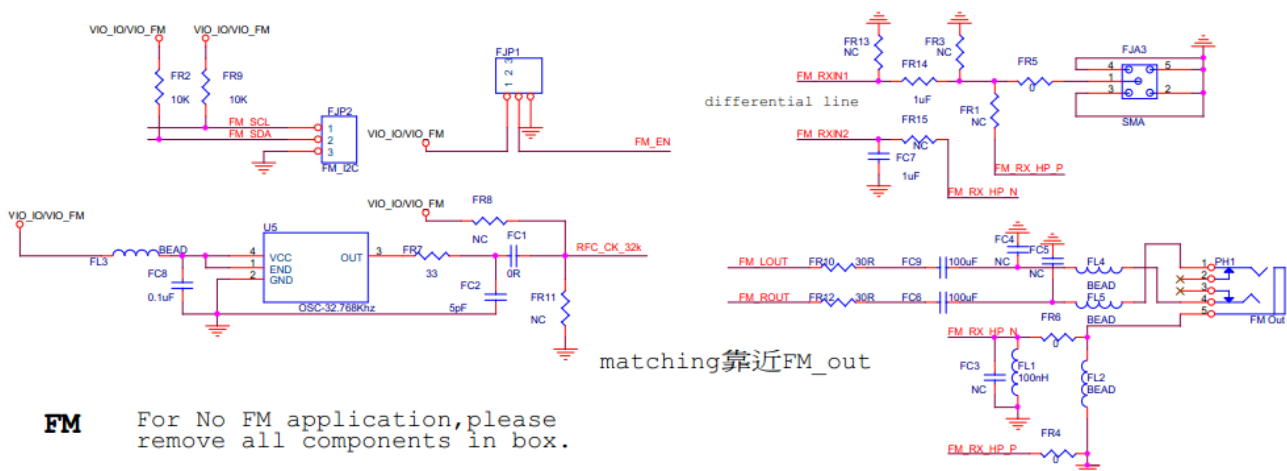
2.以上为 RF 走线要做 50 欧姆阻抗,走线不能走 90 度,走线长度不能超过 15mm.

Note: The RF part layout must do 50  $\Omega$  impedance., can't get the line go 90°, can't get the line longer than 15mm.

## SDIO interface Circuit reference pictures



## FM interface Circuit reference pictures



<p><b>Wireless module before the SMT note:</b></p> <p>1.When customers Open stencil must be sure the hole bigger to the Wireless module plate, please press 1 to 1 and 0.7 mm is widened to open outward, the thickness of 0.12 mm.</p> <p>2.Can't get the wifi module bare hands when needs,must we wear the gloves and static ring.</p> <p>3.The furnace temperature according to the size of the customer the mainboard ,generally like to stick on a tablet standard temperature of 250 + - 5,can do 260 + - 5.</p> <p><b>Storage and use Wifi module control should pay attention to the following matters:</b></p> <p><b>1.Module of the storage life of vacuum packaging:</b></p> <p>1-1.Storage life: 12 months. Storage conditions:&lt;40℃. Relative humidity:&lt;90%R.H.</p> <p>1-2.After this bag is opened , devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing must be :</p> <p>1-3.Check the humidity card :stored at <math>\leq 20\%RH</math>.If :30%~40%(pink)or greater than 40%(red).Labeling module has moisture absorption.</p> <p>① Mounthed within 168 hours at factory conditions of: <math>t \leq 30\% \text{℃}</math>, <math>\leq 60\%R.H</math>.</p> <p>② Once opened, the workshop the preservation of life for 168 hours.</p> <p>1-4.If baking is required,devices may be baked for:</p> <p>① Modules must be to remove module moisture problem.</p> <p>② Baking temperature: 125 ℃, 8 hours.</p> <p>③ After baking, put proper amount of desiccant to seal packages.</p> <p>1-5.Module vacuum packing 2000 PCS per disc.</p> <p><b>2.Module reel packaging items as follows.</b></p> <p>2-1.Storage life: 12 months. Storage conditions:&lt;40℃. Relative humidity:&lt;90%R.H.</p> <p>2-2.Module apart packing after 168 hours, To launch patch need to bake, to remove the module hygroscopic, baking temperature conditions: 125℃, 8hours.</p> <p>2-3.Reel packing 2000 PCS or 1000 PCS per disc.</p> <p><b>3.Module pallet packaging items as follows:</b></p> <p>3-1.Storage life : 3 months. Storage conditions:&lt;40℃. Relative humidity:&lt;90%R.H.</p> <p>3-2.Module if not used within 48 hours, before launch the need for baking, baking temperature: 125 ℃, 8 hours.</p> <p>3-3.Pallet packaging each plate is 100 PCS to 1000 PCS or 2000 PCS shipment.</p>	<p><b>Wifi 模块贴片装机前注意事项:</b></p> <p>1.客户在开钢网时一定要将 wifi 模块焊盘的孔开大, 请按 1 比 1 再向外扩大 0.7mm 比例开钢网, 厚度按 0.12mm.</p> <p>2.有需要拿 wifi 模块时不可以光手去拿, 一定要戴上手套以及静电环.</p> <p>3.过炉温度要根据客户主板的大小而定, 一般像平板电脑上的标准温度为250+-5°, 也可以做到260+-5°</p> <p><b>Wifi 模块储存及使用管制应注意事项如下:</b></p> <p>1.模块的真空包装之储存期限:</p> <p>1-1.保存期限: 12个月, 储存环境条件: 温度在: &lt;40℃, 相对湿度: &lt;90%R.H.</p> <p>1-2.模块包装被拆后, SMT 组装之时限:</p> <p>1-3.检查湿度卡: 显示值应小于30% (蓝色), 如: 30%~40%(粉红色) 或者大于40% (红色) 表示模块已吸湿气.</p> <p>① 工厂环境温度湿度管制: <math>\leq 30\% \text{℃}</math>, <math>\leq 60\%R.H</math>.</p> <p>② 拆封后, 车间的保存寿命为 168 小时.</p> <p>1-4.如在拆封后的 168 个小时内未使用完, 需要烘烤, 烘烤条件如下:</p> <p>① 模块须重新烘烤, 以除去模块吸湿问题.</p> <p>② 烘烤温度条件: 125℃, 8 小时.</p> <p>③ 烘烤后, 放入适量的干燥剂再密封包装.</p> <p>1-5.模块真空包装每盘 2000pcs, 真空包装图片&lt;1&gt;</p> <p>2.模块卷盘包装事项如下:</p> <p>2-1.保存期限: 12个月, 储存环境条件: 温度在: &lt;40℃, 相对湿度: &lt;90%R.H.</p> <p>2-2.模块拆开包装168小时后, 如要上线贴片需要重新烘烤, 以除去模块吸湿问题, 烘烤温度条件25℃, 8小时.</p> <p>2-3.卷盘包装标准为每盘 2000pcs, 也可以 1000pcs.</p> <p>3.模块托盘包装事项如下:</p> <p>3-1.保存期限: 3个月, 储存环境条件: 温度在: &lt;40℃, 相对湿度: &lt;90%R.H.</p> <p>3-2.模块如在 48 小时内未使用, 在上线之前需要进行烘烤, 烘烤温度条件: 125℃, 8 小时.</p> <p>3-3.托盘包装每盘为 100pcs, 以 1000pcs 或 2000pcs 出货.</p>
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