Module Specification

Module Name	RL-NM02-8723BS-V1.1		
Module Description	IEEE 802.11b/g/n (1T1R) WiFi+BT Combo Module		
	SDIO /Uart Mixed Interface Support BT2.1/3.0/4.0		
Reversion	V2.1		
Date			
Nater Approve Field			
Engineer	**QC**	**Sales**	
Cruz.Zeng	**Mike.Liu**	**Lingo.Wang 13510620050**	
Customer Approve Field			
Engineer	**Purchasing**	**Manufactory**	**QC**

Customer:
Add:
Tel:
Fax:
Attn:
E-mail:

Provider：HK NATER TECH LIMITED
Add： 2F,NO.27,2 Baomin Rd.,Baoan Dist.SZ City,China
Tel：+86-755-85250145/13510620050
Fax：+86-755-61522172
Attn：Lingo
E-mail：hsdgood@163.com

Web: http://www.natertech.com

1. PRODUCT DESCRIPTION

The Realtek RTL8723BS-CG is a highly integrated 802.11b/g/n 1T1R WLAN , an integrated Bluetooth 2.1/3.0/4.0 and single chip . It combines a WLAN MAC, a 1T1R capable WLAN baseband, BT Protocol Stack (LM, LL, and LE), BT Baseband, modem, and WLAN/BT RF in a single chip. The RTL8723BS provides a complete solution for a high throughput performance integrated wireless LAN, Bluetooth.

The RTL8723BS WLAN baseband implements Orthogonal Frequency Division Multiplexing (OFDM) with 1 transmit and 1 receive path and is compatible with the 802.11n specification. Features include one spatial stream transmission, short guard interval (GI) of 400ns, spatial spreading, and transmission over 20MHz and 40MHz bandwidth.

For legacy compatibility, Direct Sequence Spread Spectrum (DSSS), Complementary Code Keying (CCK) and OFDM baseband processing are included to support all 802.11b and 802.11g data rates. Differential phase shift keying modulation schemes, DBPSK and DQ PSK with data scrambling capability, are available, and CCK provides support for legacy data rates, w ith long or short preamble. The high-speed FFT/IFFT paths, combined with BPSK, QPSK, 16QAM, and 64 QAM modulation of the individual subcarriers and rate compatible punctured convolutional coding with coding rate of 1/2, 2/3, 3/4, and 5/6, provide higher data rates of 54Mbps and 150Mbps for 802.11g and 802.11n OFDM respectively.

A built-in enhanced signal detector, adaptive frequency domain equalizer, and a soft-decision Viterbi decoder help to alleviate multi-path effects and mutu al interference in the reception of multiple streams. Robust interference detection and suppression are provided to protect agains t Bluetooth, cordless phone, and microwave oven interference.

Efficient IQ-imbalance, DC offset, phase noise, frequency offset, and timing offset compensations are provided for the radio frequency front-end. Selectable digital transmit and receive FIR filters are provided to meet transmit spectrum mask requirements and to reject adjacent channel interference, respectively.

The RTL8723BS WLAN Controller supports fast r eceiver Automatic Gain Control (AGC) with synchronous and asynchronous control loops among antennas, antenna diversity functions, and adaptive transmit power control function to obtain better perfor mance in the analog portions of the transceiver.The RTL8723BS WLAN MAC supports 802.11e for multimed ia applications, 802.11i for security, and 802.11n for enhanced MAC protocol e fficiency. Using packet aggrega tion techniques such as A-MPDU with BA and A-MSDU, protocol efficiency is signi ficantly improved. Power saving mechanisms such as Legacy Power Save, and U-APSD, reduce the power wasted during idle time, and compensate for the extra power required to transmit OFDM. The RTL8723B S provides simple legacy and 20MHz/40MHz co-existence mechanisms to ensure backward and network compatibility.

The RTL8723BS Bluetooth controller complies with Bluetooth core specifica tion v4.0, and supports dual mode (BR/EDR + AMP + Low Energy Controllers). It is compatible with previous versions, including v2.1 + EDR and v3.0 + HS. For BR/EDR, it supports scatternet topology and allows four active links in slave mode, and seven active links in master mode. For Low Energy, it supports multiple states and allows eight active links in master mode. The links in BR/EDR and LE can be active simultaneously.

2. Features

General

- 802.11b/g/n 1T1R WLAN, Bluetooth

Host Interface

- Complies with SDIO 1.1/2.0/3.0 for WLAN with clock rate up to 100MHz (SDR50 and DDR50)
- GSPI interface for configurable endian for WLAN
- Complies with HS-UART with configurable baud rate for Bluetooth

WLAN Controller

- CMOS MAC, Baseband PHY, and RF in a single chip for 802.11b/g/n compatible WLAN
- Complete 802.11n solution for 2.4GHz band
- 72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth
- 150Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth
- Compatible with 802.11n specification
- Backward compatible with 802.11b/g devices while operating in 802.11n mode
- 802.11b/g/n compatible WLAN
- 802.11e QoS Enhancement (WMM)
- 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services

WLAN MAC Features

- Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)
- Low latency immediate High-Throughput Block Acknowledgement (HT-BA)
- PHY-level spoofing to enhance legacy compatibility
- Power saving mechanism
- Channel management and co-existence
- Transmit Opportunity (TXOP) Short Inter-Frame Space (SIFS) bursting for higher multimedia bandwidth

WLAN PHY Features

- 802.11n OFDM
- One Transmit and one Receive path (1T1R)
- 20MHz and 40MHz bandwidth transmission
- Short Guard Interval (400ns)
- DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble
- OFDM with BPSK, QPSK, 16QAM, and 64QAM modulation

  Convolutional Coding Rate: 1/2, 2/3, 3/4, and 5/6
- Maximum data rate 54Mbps in 802.11g; and 150Mbps in 802.11n
- Switch diversity for DSSS/CCK
- Packet based hardware antenna diversity
- Selectable receiver FIR filters
- Programmable scaling in transmitter and receiver to trade quantization noise against increased probability of clipping
- Fast receiver Automatic Gain Control (AGC)
- On-chip ADC and DAC

Bluetooth Controller

- Compatible with Bluetooth v2.1+EDR and v3.0+HS Systems
- Supports Bluetooth 4.0 Low Energy(BLE)
- HS-UART interface for Bluetooth data transmission compliant with H4 and H5 specification
- PCM interface for audio data transmission via Bluetooth controller
- Integrated MCU to execute Bluetooth protocol stack
- Supports all packet types in basic rate and enhanced data rate
- Supports SCO/eSCO link (allows one link for PCM interface and three links for HS-UART)
- Supports 4 piconets in a scatternet
- Supports Secure Simple Pairing
- Supports Low Power Mode (Sniff/Sniff Sub-rating/Hold/Park)
- Enhanced BT/WIFI Coexistence Control to improve transmission quality in different profiles
- Bluetooth 4.0 Dual Mode support: Simultaneous LE and BR/EDR
- Supports multiple Low Energy states

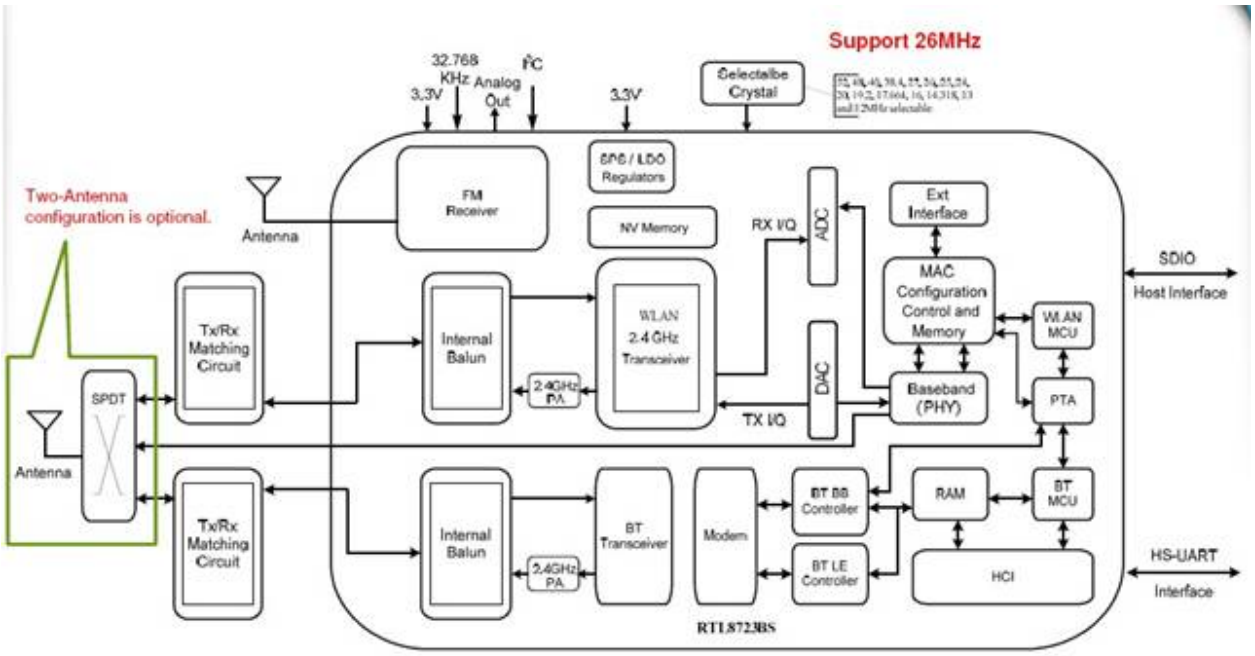
Bluetooth Transceiver

- Fast AGC control to improve receiving dynamic range
- Supports AFH to dynamically detect channel quality to improve transmission quality
- Integrated internal Class 1, Class 2, and Class 3 PA
- Bluetooth 3.0+HS compliant
- Supports Power Control/Enhanced Power Control
- Bluetooth Low Energy Support
- Integrated 32K oscillator for power management

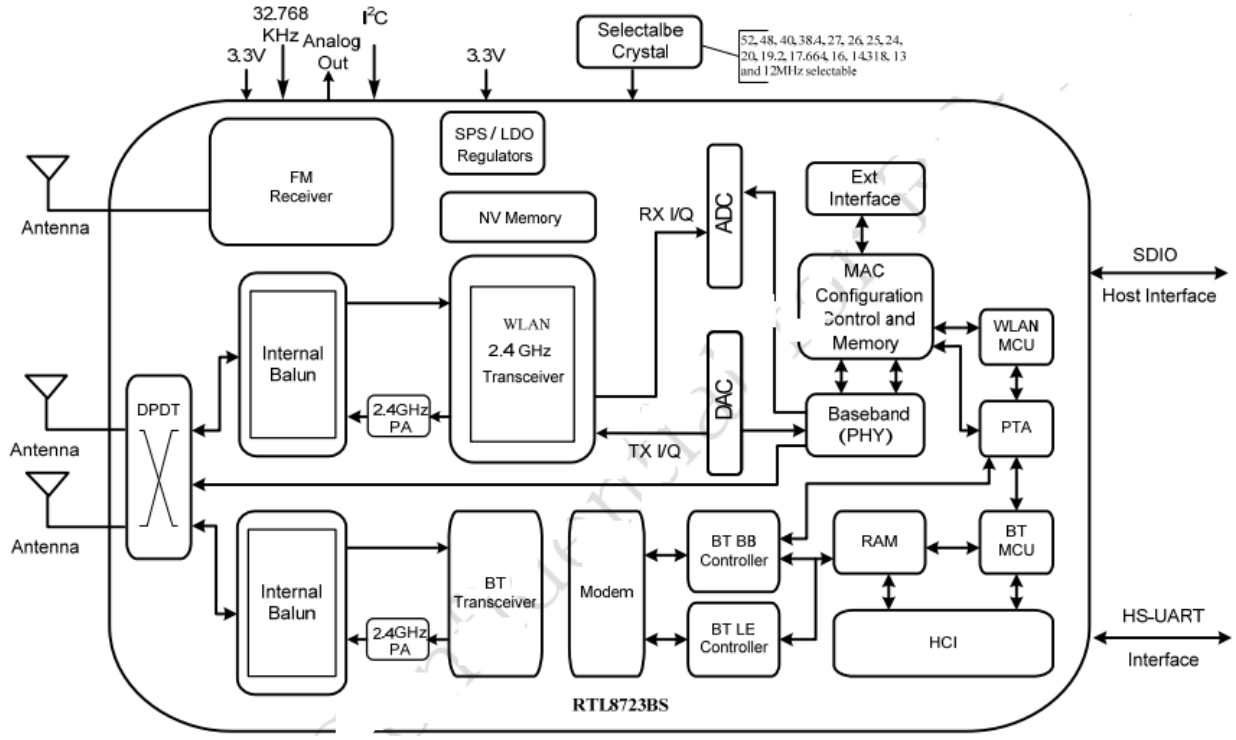
Peripheral Interfaces

- General Purpose Input/Output (15 pins)
- 4-wire EEPROM control interface (93C46)
- Three configurable LED pins

3.Diagram



RTL8723BS with shared antenna between WLAN and Bluetooth



RTL8723BS with antenna diversity

4.PRODUCT SPECIFICATIONS

Main chipset :WiFi/BT Single Chip: Realtek RTL8723BS

Functional Specifications

Standards	***WiFi:*** EEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11d, IEEE 802.11e, IEEE 802.11h, IEEE 802.11i
	BT: V2.1+EDR/BT v3.0/BT v3.0+HS/BT v4.0
Bus Interface	***WiFi:*** GSPI/SDIO ***BT:*** UART
Data Rate	**802.11b:** 11, 5.5, 2, 1 Mbps **802.11g:** 54, 48, 36, 24, 18, 12, 9, 6 Mbps **802.11n:** MCS 0 to 7 for HT20MHz ;MCS 0 to 7 for HT40MHz **BT:** 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	**WiFi:** CSMA/CA with ACK **BT:** AFH, Time Division
Modulation Techniques	**802.11b:** CCK, DQPSK, DBPSK **802.11g:** 64 QAM, 16 QAM, QPSK, BPSK **802.11n:** 64 QAM, 16 QAM, QPSK, BPSK **BT:** 8DPSK, π/4 DQPSK, GFSK
Network Architecture	**WiFi:** Ad-hoc mode (Peer-to-Peer) Infrastructure mode Software AP WiFi Direct **BT:** Pico Net Scatter Net
Operating Channel	**WiFi 2.4GHz:** 11: (Ch. 1-11) – United States 13: (Ch. 1-13) – Europe 14: (Ch. 1-14) – Japan **BT 2.4GHz:** Ch. 0 ~78
Frequency Range	**2.400GHz ~ 2.4835 GHz**
Transmit Output Power	**BT:** Max +10dBm
Receiver Sensitivity	**BT:** -89dBm@1Mbps, -85dBm@2Mbps, -83dBm@3Mbps
Security	**WiFi :** WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit & 128bit, IEEE 802.11x, IEEE 802.11i **BT:** Simple Paring
Operating Voltage	3.3 V ±9% I/O supply voltage
OS supported	Linux/Android

5.Power Supply DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Units
VBAT_LDO_IN	Battery Supply Voltage	2.8	3.7~5	5.5	V
VA33, VD33IO, SW_HV3,	3.3V Supply Voltage	3.0	3.3	3.6	V
VDD_IO, VDIO_SDIO	Digital IO Supply Voltage	1.62	1.8~3.3	3.6	V
VA12, VA12_BT, VA12_WLG, VD12D	1.2V Core Supply Voltage	1.08	1.2	1.32	V
IDD33	3.3V Rating Current	-	-	600	mA

DC Characteristics

Module	Voltage	Current Consumption (linking)
RL-NM02-8723BS-V1.0	3.3V	160mA(上网或者看电影时的功耗)

6. Electrical Specifications

1) RF Characteristics for IEEE802.11b (11Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11b			
Mode	CCK 11 Mbps			
Channel frequency	2412 ~ 2484 MHz			
RX (per≤85 dBm@8%)	-85 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (17±2 dBm)		17		dBm
EVM (≤-18)		-18		dB

2) RF Characteristics for IEEE802.11g (54Mbps mode unless otherwise specified)

Items	Contents			
Specification	IEEE802.11g			
Mode	OFDM 54 Mbps			
Channel frequency	2412 ~ 2484 MHz			
RX (per≤70 dBm@10%)	-70 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (14±2dBm)		14		dBm
EVM (≤-28)		-28		dB

3) RF Characteristics for IEEE802.11n (BW20_MCS7)

Items	Contents
Specification	IEEE802.11n (BW20_MCS7)
Mode	OFDM 65 Mbps

Channel frequency	2412 ~ 2484 MHz			
RX (per≤65 dBm@10%)	-65 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (13±2 dBm)		13		dBm
EVM (≤-28)		-28		dB

4) RF Characteristics for IEEE802.11n (BW40_MCS7)

Items	Contents			
Specification	IEEE802.11n (BW40_MCS7)			
Mode	OFDM 135 Mbps			
Channel frequency	2412 ~ 2484 MHz			
RX (per≤65 dBm@10%)	-65 dBm			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (13±2 dBm)		13		dBm
EVM (≤-28)		-28		dB

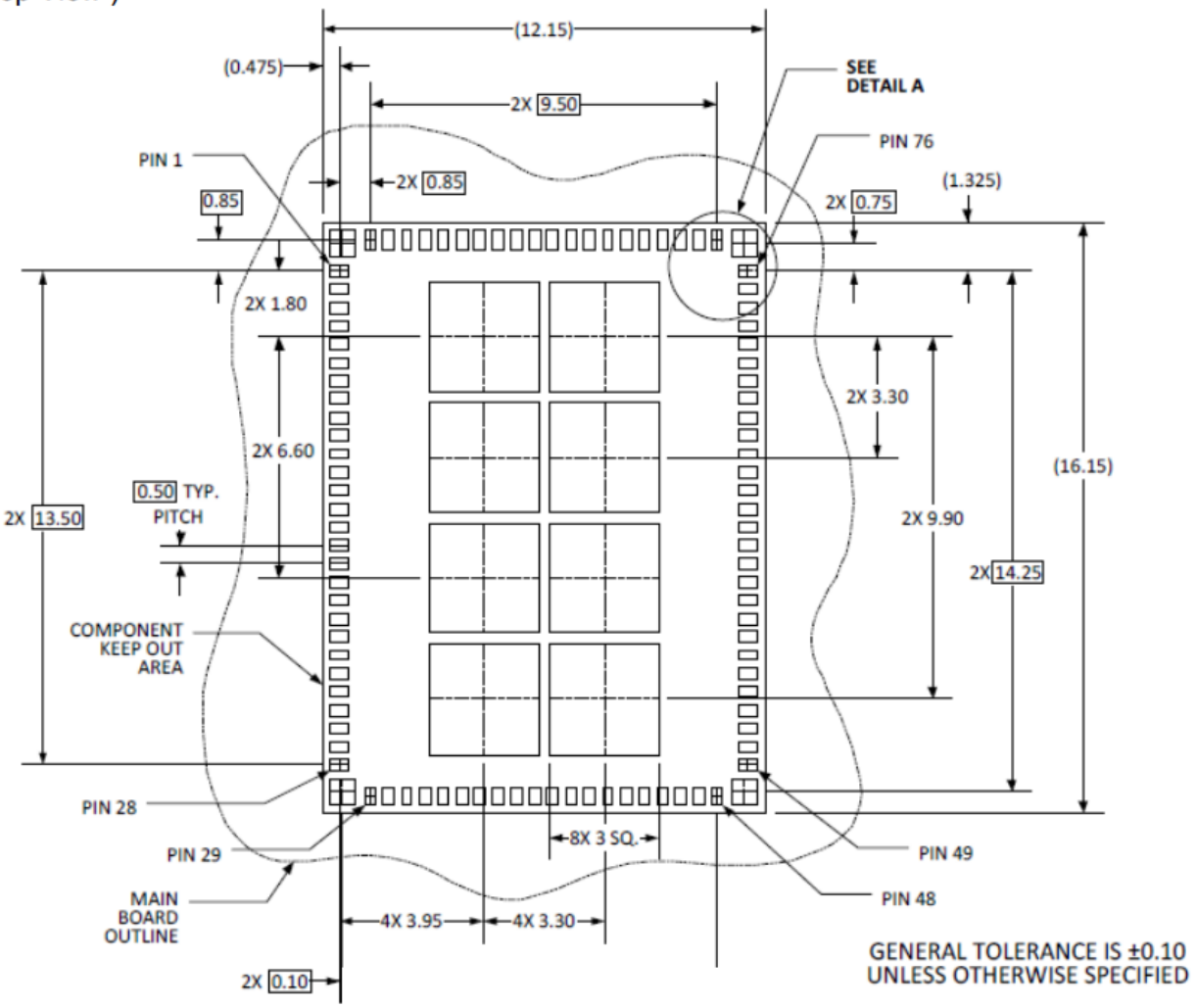
7.Bluetooth Specification

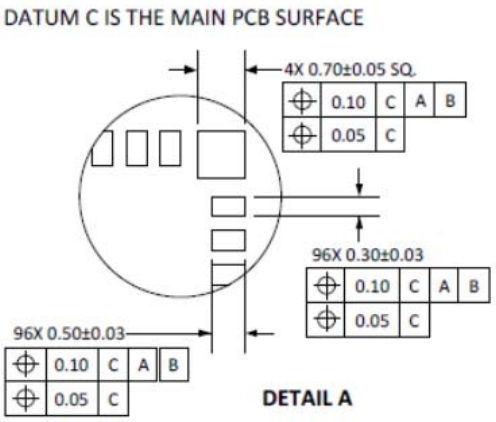
Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth V3.3 of 1, 2 and 3 Mbps.		
Host Interface	UART		
Antenna Reference	Small antennas with 0~2 dBi peak gain		
Frequency Band	2.400 GHz ~ 2483.5 GHz		
Number of Channels	79 channels		
Modulation	FHSS, GFSK, DPSK, DQPSK		
RF Specification			
	Min	Typical	Max
Output Power (Class 1.5)		10	
Output Power (Class 2)		2	
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-89	
Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps)		-85	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-83	
Maximum Input Level	GFSK (1Mbps):-20dBm		
	π/4-DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

9.Mechanical

Dimensions (mm)	Length	Width	Height
	16.15 (Tolerance:±0.2mm)	12.15 (Tolerance:±0.2mm)	2.1 (Tolerance:±0.2mm)

-Footprint suggestion:
(Top View)





10.MODULE PIN ASSIGNMENT

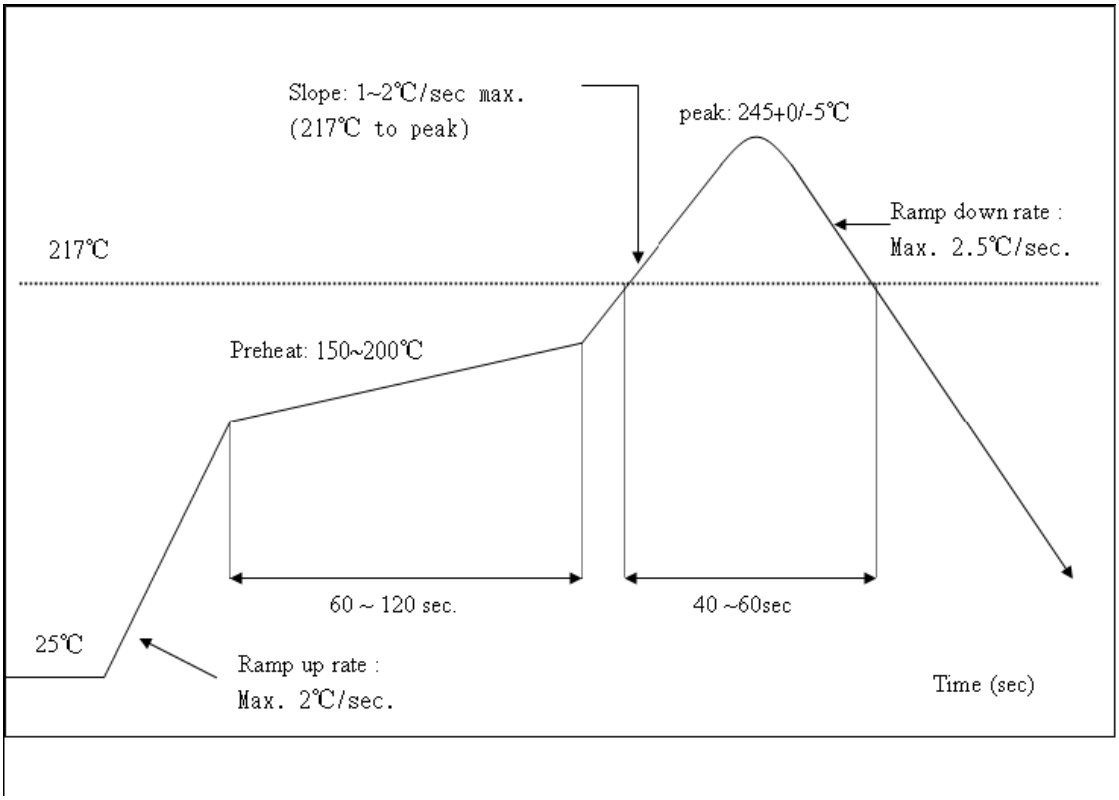
		96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79	78	77		
	GND(G1)	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND	GND(G3)	
1	NC																					GND	76
2	NC																					GND	75
3	NC																					GND	74
4	3.3V																					3.3V	73
5	3.3V			GND(G9)									GND(G5)									3.3V	72
6	GND																					GND	71
7	NC																					NC	70
8	NC																					NC	69
9	NC																					GND	68
10	NC																					GPIO13	67
11	GPIO15			GND(G10)									GND(G6)									NC	66
12	NC																					LED_WLAN	65
13	NC																					LED_BT	64
14	NC																					GPIO11	63
15	NC																					GND	62
16	NC																					PCM_CLK	61
17	GND			GND(G11)									GND(G7)									PCM_OUT	60
18	NC																					PCM_IN	59
19	NC																					PCM_SYNC	58
20	GND																					GND	57
21	NC																					UART_IN	56
22	NC																					UART_OUT	55
23	GND			GND(G12)									GND(G8)									UART_CTS	54
24	GPIO13																					GPIO14	53
25	CHIP_EN																					SD_CLK	52
26	GND																					SD_CMD	51
27	SUSCLK_IN																					SD_D0	50
28	GPIO6																					SD_D1	49
	GND(G2)	NC	NC	NC	GND	NC	NC	GND	NC	NC	GND	NC	NC	GND	NC	NC	NC	GPIO9	GPIO12	SD_D3	SD_D2	GND(G4)	
		29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48		

PIN	Function	Description	Remark
1	NC	NC	
2	NC	NC	
3	NC	NC	
4	3.3V	3.3V	
5	3.3V	3.3V	
6	GND	Ground	
7	NC	NC	
8	NC	NC	
9	NC	NC	
10	NC	NC	
11	GPIO15	General Purpose Input/Output Pin	High level: 1.8V
12	NC	NC	
13	NC	NC	
14	NC	NC	
15	NC	NC	
16	NC	NC	
17	GND	Ground	
18	NC	NC	
19	NC	NC	
20	GND	Ground	
21	NC	NC	
22	NC	NC	
23	GND	Ground	
24	GPIO13	Host wake up BT, active high,	High level: 1.8V
25	CHIP_EN	Enable the module, active high	High level: 1.8V
26	GND	Ground	
27	SUSCLK_IN	External sleep clock input(32.768kHz)	
28	GPIO6	GPIO Default high. Require pulled up	High level: 1.8V
29	NC	NC	
30	NC	NC	
31	NC	NC	
32	GND	Ground	
33	NC	NC	
34	NC	NC	
35	GND	Ground	
36	NC	NC	

37	NC	NC	
38	GND	Ground	
39	NC	NC	
40	NC	NC	
41	GND	Ground	
42	NC	NC	
43	NC	NC	
44	NC	NC	
45	GPIO9	GPIO reset the WIFI function, active low, require pulled up	High level: 1.8V
46	GPIO12	WLAN wake up host, active high	High level: 1.8V
47	SD_D3	SDIO Data Line 3 High level: 1.8V	High level: 1.8V
48	SD_D2	SDIO Data Line 2 High level: 1.8V	High level: 1.8V
49	SD_D1	SDIO Data Line 1 High level: 1.8V	High level: 1.8V
50	SD_D0	SDIO Data Line 0 High level: 1.8V	High level: 1.8V
51	SD_CMD	SDIO Command Input	
52	SD_CLK	SDIO Clock Input	
53	GPIO14	BT wake up the host, active low	High level: 1.8V
54	UART_CTS	High-Speed UART CTS	
55	UART_OUT	High-Speed UART Data Out	High level: 1.8V
56	UART_IN	High-Speed UART Data In	High level: 1.8V
57	GND	Ground	
58	PCM_SYNC	PCM_SYNC	
59	PCM_IN	PCM data Input, shared with GPIO0	High level: 1.8V
60	PCM_OUT	PCM data Out, shared with GPIO1	High level: 1.8V
61	PCM_CLK	PCM Synchronization control, shared with GPIO2	
62	GND	Ground	
63	GPIO11	Externally shut down BT, active low. Require pulled up	High level: 1.8V
64	LED_BT	Shared with LED1. BT UART Data In	High level: 1.8V
65	LED_WLAN	LED Pin (Active Low), shared with GPIO8	High level: 1.8V
66	NC	NC	
67	GPIO13	Host wake up BT, active high	High level: 1.8V
68	GND	Ground	
69	NC	NC	
70	NC	NC	
71	GND	Ground	
72	3.3V	3.3V	
73	3.3V	3.3V	
74~96	GND	Ground	
G6~G12	GND	Ground	

11.Recommended Reflow Profile

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



12.Wireless module before the SMT note:

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.

2.Can't get the wifi module bare hands when needs,must we wear the gloves and static ring.

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.

Storage and use Wifi module control should pay attention to the following matters:

1.Module of the storage life of vacuum packaging：

1-1.Storage life ： 12 months. Storage conditions:<40℃. Relative humidity:<90%R.H.

1-2.After this bag is opened , devices that will be subjected to infrared reflow, vapor-phase reflow, or equivalent processing must be :

1-3.Check the humidity card :stored at ≦20%RH.If :30%~40%(pink)or greater than 40%(red).Labeling module has moisture absorption.

1.Mounthed within 168 hours at factory conditions of: t≦30%℃，≦60%R.H.

2.Once opened, the workshop the preservation of life for 168 hours.

1-4.If baking is required,devices may be baked for:

① Modules must be to remove module moisture problem.
② Baking temperature: 125 ℃, 8 hours.
③ After baking, put proper amount of desiccant to seal packages.

1-5. The actual number of module vacuum packing which is based on the actual number of packages to the customer requirements.

2.Module reel packaging items as follows.

2-1.Storage life ： 12 months. Storage conditions:<40℃. Relative humidity:<90%R.H.

2-2.Module apart packing after 168 hours，To launch patch need to bake, to remove the module hygroscopic, baking temperature conditions：125℃，8hours.

2-3. The actual number of module reel packing which is based on the actual number of packages to the customer requirements.

3.Module pallet packaging items as follows：

3-1.Storage life ： 3 months. Storage conditions:<40℃. Relative humidity:<90%R.H.

3-2.Module if not used within 48 hours, before launch the need for baking,

baking temperature: 125 ℃, 8 hours.

3-3. Pallet packaging each plate is 100 PCS.The actual number of module pallet packing which is based on the actual number of packages to the customer requirements

12.Wifi 模块贴片装机前注意事项：

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.

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.

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°

Wifi 模块储存及使用管制应注意事项如下：

1.模块的真空包装之储存期限：

1-1.保存期限：12个月，储存环境条件：温度在：<40℃，相对湿度：<90%R.H.

1-2.模块包装被拆后，SMT 组装之时限：

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.

① 工厂环境温度湿度管制：≦30%℃，≦60%R.H。
② 拆封后，车间的保存寿命为 168 小时.

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：

2.模块须重新烘烤，以除去模块吸湿问题.
3.烘烤温度条件：125℃，8 小时.
4.烘烤后，放入适量的干燥剂再密封包装.

1-5. 模块真空包装数量以客户要求的实际包装数量为准

2.模块卷盘包装事项如下：

2-1.保存期限：12个月，储存环境条件：温度在：<40℃，相对湿度：<90%R.H.

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：125℃，8小时。

2-3. 模块卷盘包装以客户要求的实际包装数量为准

3.模块托盘包装事项如下：

3-1.保存期限：3个月，储存环境条件：温度在：<40℃，相对湿度：<90%R.H.

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。

3-3. 托盘包装每盘为 100pcs，模块托盘包装以客户要求的实际包装数量为准.

注：以上包装方式根据客户要求而定，包装以实际出货为准。