SPECIFICATIONS

IEEE 802.11a/b/g/n/ac 2T2R WLAN USB 2.0 CONTROLLER

RL-UM02SPC-8812BU-V1.0
USB Interface MODULE

Version 1.0（朗国专用）

Contents

Change History of Revision

Revisio	Date	Contents of Revision Change	Remark
V1.0	2017-03-17	首次发布产品规格书	2017-03-17
V1.0	2017-07-13	修改第1Pin脚定义描述	2017-07-13
V1.0	2017-12-28	修改模组尺寸	2017-12-28
V1.0	2018-04-02	修改模组射频参数	2018-04-02
V1.0	2018-04-21	按客户需求更改内容	2018-04-21

1.General

1.1 The General of WIFI

General

- CMOS MAC,Baseband PHY and RF in a single chip for IEEE 802.11a/b/g/n/ac Draft 2.0 compatible WLAN
- 802.11ac MIMO solution for 5G band
- Complete 802.11n MIMO solution for 2.4GHz and 5GHz band
- 2×2 MIMO technology for extended reception robustness and exceptional throughput
- Maximun PHY data rate up to173.3Mbps using 20Mhz bandwidth, 400Mbps using 40MHz bandwidth, and 866.7Mbps using 80MHz bandwidth
- Backward compatible with 802.11a/b/g devices while operating at 802.11n data rates
- Backward compatible with 802.11a/n devices while operating at 802.11ac data rates.

Host Interface

- Complies with USB Specification Revision 2.0

Standards Supported

- IEEE 802.11a/b/g/n/ac Draft 2.0 compatible WLAN
- IEEE 802.11e QoS Enhancement (WMM)
- IEEE 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services
- IEEE 802.11h TPC, Spectrum Measurement
- IEEE 802.11k Radio Resource Measurement
- WAPI (Wireless Authentication Privacy Infrastructure) certified.
- Cisco Compatible Extensions (CCX) for WLAN devices

MAC Features

- Frame aggregation for increased MAC efficiency (A-MSDU, A-MPDU)
- Low latency immediate High-Throughput Block Acknow ledgement (HT-BA)
- Long NAV for media reservation with CF-End
- OFDM with BPSK, QPSK, 16QAM,64QAM and 256QAM modulation.Convolutional
- for NAV release
- PHY-level spoofing to enhance legacy compatibility
- MIMO power saving mechanism
- Channel management and co-existence
- Multiple BSSID feature allows the RTL8812AU-VS to assume multiple MAC identities when used as a wireless bridge
- Transmit Opportunity (TXOP) Short Inter-Frame Space (SIFS) bursting for higher multimedia bandwidth
- WiFi Direct supports wireless peer to peer applications

Other Features

- Supports Wake-On-WLAN via Magic Packet and Wake-up frame
- Transmit Beamforming
- CCA on secondary through RTS/CTS handshake.
- Support TCP/UDP/IP checksum offload
- We don't have user interface to modify DFS. Th us the DFS cannot be changed by users.
- The device shall automatically discontinue transmission in cases of absence of information to transmit, or operational failure. Then it will scan the available radio signals. If this signal is connected before, it will be automatically connected, otherwise manual connections will be necessary

Peripheral Interfaces

- Up to 12 General Purpose Input/Output pins
- Three configurable LED pins (mux with GPIO pins)
- Configurable Bluetooth Coexistence Interface (mux with GPIO pins)
- Generates 40MHz clock for peripheral chip
- Single external power source 3.3V only

PHY Features

- IEEE 802.11ac MIMO OFDM
- IEEE 802.11n MIMO OFDM

Coding Rate: 1/2, 2/3, 3/4, and 5/6
- Maximum data rate 54Mbps in 802.11g, 300Mbps in 802.11n and 866.7Mbps in 802.11ac.
- OFDM receive diversity with MRC using up to 2 receive paths. Switch diversity used for DSSS/CCK
- Support STBC
- Support LDPC
- Hardware antenna diversity
- Two Transmit and Two Receive paths
- 5MHz / 10MHz / 20MHz / 40MHz / 80MHz bandwidth transmission
- Support 2.4Ghz and 5Ghz band channels
- Short Guard Interval (400ns)
- Sounding packet.
- DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble

- Selectable digital transmit and 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
- Build-in both 2.4GHz and 5GHz PA
- Build-in both 2.4GHz and 5GHz LNA

2.PRODUCT SPECIFICATIONS

Main chipset :WiFi Single Chip: Realtek RTL8812BU-CG unctional Specifications

Main chipset	RTL8812BU-CG
Standards	***WiFi:*** IEEE 802.11a,IEEE 802.11b, IEEE 802.11g, IEEE 802.11n, IEEE 802.11ac, IEEE 802.11e,, IEEE 802.11i
Bus Interface	***WiFi:*** USB2.0
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 **802.11ac:** 866.7Mbps
Modulation Techniques	IEEE 802.11b: DSSS(CCK, DQPSK, DBPSK) IEEE 802.11g: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT20: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11n-HT40: OFDM(64-QAM, 16-QAM, QPSK, BPSK) IEEE 802.11a: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM(256QAM, 64QAM, 16QAM, QPSK, BPSK)

Operating Channel	2400MHz to 2483.5MHz: 11 for IEEE 802.11b/g/n20, 7 for IEEE 802.11n40 **5150 MHz to 5250 MHz:** 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40)/ac-VHT40 1 for IEEE 802.11acVHT80 **5250 MHz to 5350 MHz:** 4 for IEEE 802.11a/n-HT20/ac-VHT20 2 for IEEE 802.11n-HT40)/ac-VHT40 1 for IEEE 802.11acVHT80 **5470 MHz to 5725 MHz:** 8 for IEEE 802.11a/n-HT20/ac-VHT20 3 for IEEE 802.11n-HT40/ac-VHT40 1 for IEEE 802.11ac-VHT80
Frequency Range	2400MHz to 2483.5MHz: 5150 MHz to 5250 MHz: 5250 MHz to 5350 MHz: 5470 MHz to 5725 MHz:
Security	WPA, WPA-PSK, WPA2, WPA2-PSK, WEP 64bit & 128bit,WMM, IEEE 802.11e, IEEE 802.11i
OS supported	Linux/Android/Windows

The frequency band 5600-5650MHz wass disabled by software, transmitter not operatess iin 5600-5650 MHz
A channel/frequency plan for the device showing the channels that have active scanning or passive scanning.The active scanning in frequency band: 2412MHz to 2462MHz and 5180MHz to 5240MHz. The passive scanning in frequency band: 5260MHz to 5320MHz and 5500MHz to 5700MHz

3.Temperature Limit Ratings

Parameter	Minimum	Maximum	Units
Storage Temperature	-20	+85	℃
Ambient Operating Temperature	0	70	℃
Junction Temperature	0	125	℃

4.Diagram

Dual-Band 11ac (1x1) Solution with Single Antenna

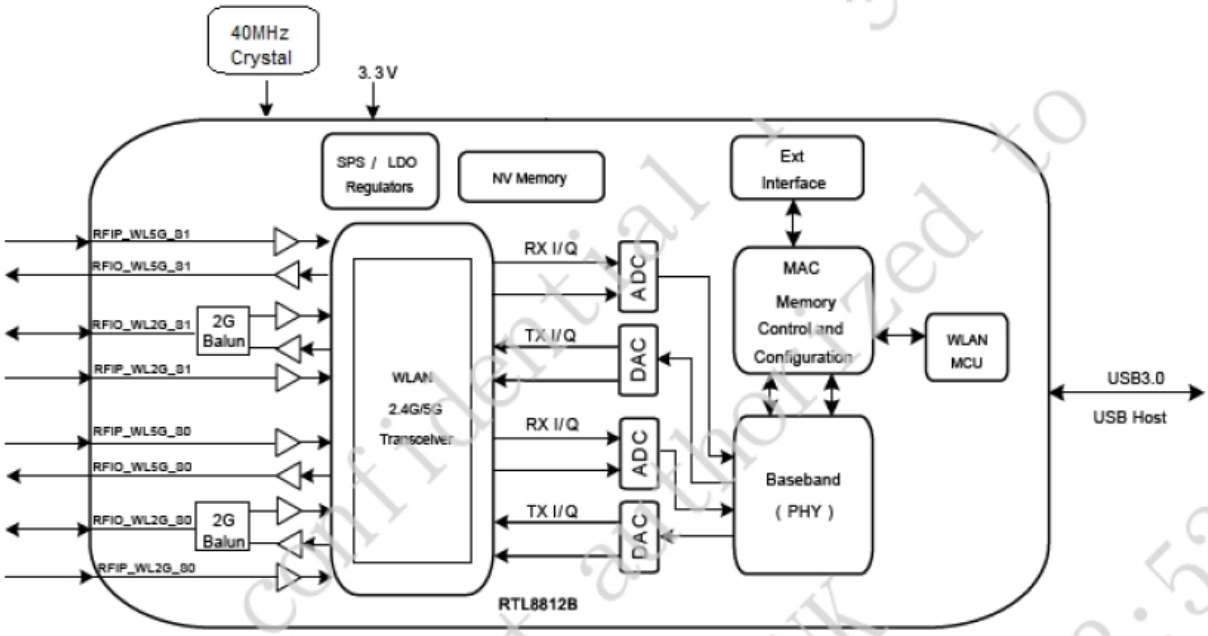


Figure 1. Dual-Band MIMO 2x2 Solution --- RTL8812BU-CG

5.Power Supply DC Characteristics

Symbol	Parameter	Minimum	Typical	Maximum	Units
WLA_VD33_PA,WLA_VD33_PAD, WLG_VD33_PAD,WL_VD33_SYN, VD33IO,SW_HV3,V33USB,VD33A	3.3V I/O and RFAFE Supply Voltage	3.0	3.3	3.6	V

DC Characteristics

Module	Voltage	Current Consumption (linking)
RL-UM02SPC-8812BU-V1.0	3.3V	

6. Electrical Specifications

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

Items	Contents
Specification	IEEE802.11b
Channel frequency	2412 ~ 2462 MHz
RX (per≤-85 dBm@8%)	-85 dBm

Freq err Limit	±13PPM			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2 dBm)		12		dBm
EVM (≤-18)		-18		dB

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

Items	**Contents**			
Specification	IEEE802.11g			
Channel frequency	2412 ~ 2462MHz			
RX (per≤-70 dBm@10%)	-70 dBm			
Freq err Limit	±13PPM			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2dBm)		12		dBm
EVM (≤-25)		-27		dB

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

Items	**Contents**			
Specification	IEEE802.11n (BW20_MCS7)			
Channel frequency	2412 ~ 2462 MHz			
RX (per≤-65 dBm@10%)	-65 dBm			
Freq err Limit	±13PPM			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2 dBm)		9.5		dBm
EVM (≤-28)		-28		dB

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

Items	**Contents**			
Specification	IEEE802.11n (BW40_MCS7)			
Channel frequency	2412 ~ 2462 MHz			
RX (per≤-65 dBm@10%)	-65 dBm			
Freq err Limit	±13PPM			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2 dBm)		9.5		dBm
EVM (≤-28)		-28		dB

5) RF Characteristics for IEEE802.11AC (BW40_MCS7)

Items	**Contents**
Specification	IEEE802.11AC (BW40_MCS7)
Channel frequency	4.9GHz ~ 6.0GHz
RX (per≤-65 dBm@10%)	-63 dBm
Freq err Limit	±10PPM

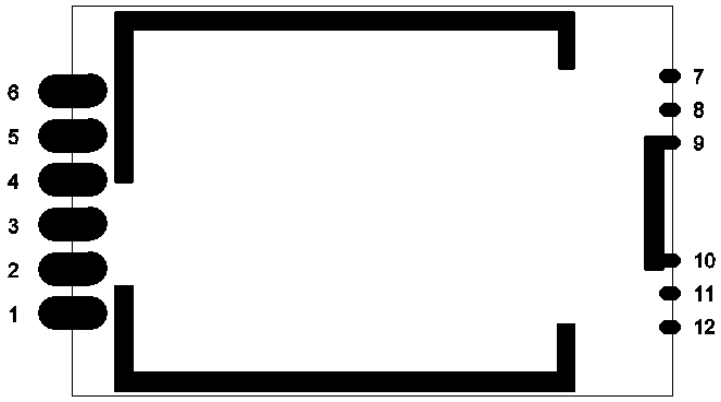
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2 dBm)		10		dBm
EVM (≤-32)		-32		dB

6) RF Characteristics for IEEE802.11AC (BW80_MCS9)

Items	**Contents**			
Specification	IEEE802.11AC (BW80_MCS9)			
Channel frequency	4.9GHz ~ 6.0GHz			
RX (per≤-60 dBm@10%)	-60 dBm			
Freq err Limit	±10PPM			
TX Characteristics	Min.	Typ.	Max.	Unit
Power Level (±2 dBm)		10		dBm
EVM (≤-32)		-32		dB

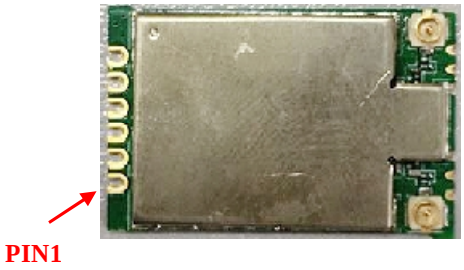
The transmitter not operates in 5600-5650 MHz

7.MODULE PIN ASSIGNMENT



PIN	Function	Type	Description
1	WL_DIS_N	I	Shared with GPIO9. This pin can externally shut down the RTL8812BU-CG WLAN function when WL_DIS# is pulled low. This pin can also be configured as the WLAN Radio-off function with host interface remaining connected.
2	VDD33		3.3V
3	HSDM	I/O	USB D-
4	HSDP	I/O	USB D+
5	GND		Ground
6	WL_WAKE_HST	I/O	General Purpose Input/Output Pin

7	GND		Ground
8	RF_0		ANT RF0
9	GND		Ground
10	GND		Ground
11	RF_1		ANT RF1
12	GND		Ground



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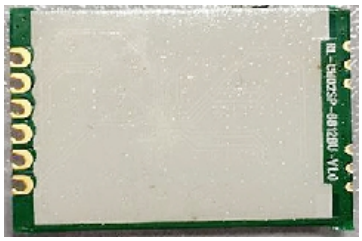

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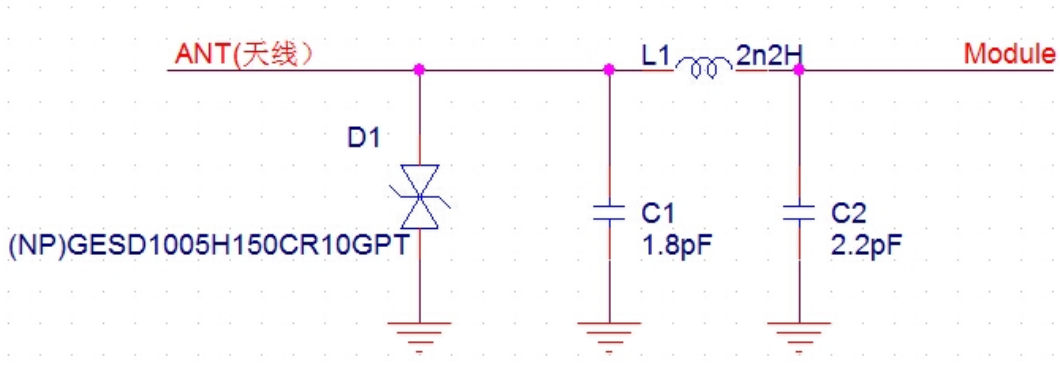
8. Size reference

Dimensions (mm)	Length	Width	Height
	27.149 (Tolerance:±0.2mm)	**17.56** (Tolerance:±0.2mm)	**2.6** (Tolerance:±0.3mm)

9.1.WIFI/BT RF Circuit reference pictures

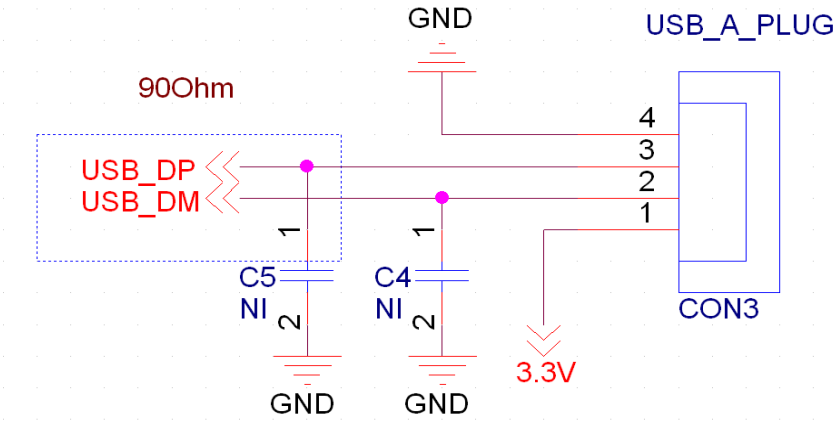


1. Above the dotted box part of the antenna matching is needed, the actual antenna matching electronic parameters shall prevail.

2.For RF part layout to do 50 ohm impedance. can't go on 90° of layout .The line length can't more than 20 mm.

注明：请一定要在焊天线端加一个 TVS 管，防止 ESD 静电打坏 WIFI 模组（如上图参考电路）.

9.2. USB interface electrical characteristics



注：1.USB 数据线需要做 90Ohm 的阻抗。
2.建议电源输入端留一个电源开关，每次开关卡时可以做一个上电断电的作用
可以使用 wifi 复位，就不会有打不开 wifi 的错误现象出现。

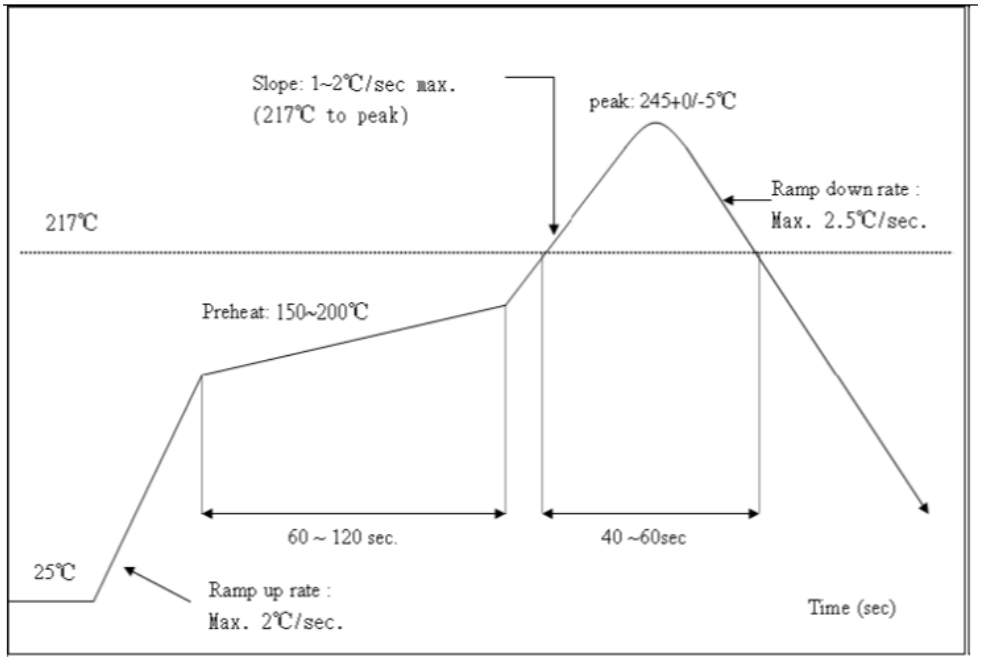
Note:1.Two root go line do difference , but also required to make 90Ohm the impedance test.e get lock can do

2.Suggested that leave a power switch power supply input terminal ,every tim a electric power is on

10.Recommended Reflow Profile

Referred to IPC/JEDEC standard.
Peak Temperature : <250°C

Number of Times : ≤2 times



ENVIRONMENTAL

Operating

Operating Temperature: 0°C to +70 °C
Relative Humidity: 5-90% (non-condensing)

Storage

Temperature: -20°C to +85°C (non-operating)
Relevant Humidity: 5-95% (non-condensing)

11. RoHS compliance.

This product is RoHS compliance.

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：

① 模块须重新烘烤，以除去模块吸湿问题.

② 烘烤温度条件：125℃，8 小时.

③ 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.