



WBR3 模组规格书

设备接入 > 联网模组 > WiFi&BLE 双模模组

文档版本: 20200312

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1 产品概述

WBR3 是由杭州涂鸦信息技术有限公司开发的一款低功耗嵌入式 Wi-Fi+BT 模块。它由一个高集成度的无线射频芯片 RTL8720CF 构成，内置了 Wi-Fi 网络协议栈和丰富的库函数。WBR3 还包含低功耗的 KM4 MCU，WLAN MAC，1T1R WLAN，最高主频 100MHz，内置 256K SRAM，芯片内置 2Mbyte flash 和丰富的外设资源。WBR3 是一个 RTOS 平台，集成了所有 Wi-Fi MAC 以及 TCP/IP 协议的函数库。用户可以基于这些开发满足自己需求的嵌入式 Wi-Fi 产品。

1.1 特性

1. 内置低功耗 KM4 MCU，可以兼作应用处理器主频 100MHz
2. 工作电压：3V-3.6V
3. 外设：9×GPIOs, 1×UART, 1×Log_Tx
4. Wi-Fi/BT 连通性
 - 802.11 B/G/N20
 - 通道 1-14@2.4GHz(CH1-11 for US/CA, CH1-13 for EU/CN)
 - 支持 WPA/WPA2 安全模式
 - 支持 Bluetooth 4.2 Low Energy
 - 802.11b 模式下 +20dBm 的输出功率
 - 支持 SmartConfig 功能（包括 Android 和 IOS 设备）
 - 板载 PCB Onboard 天线
 - 通过 CE,FCC 认证
 - 工作温度：-20°C to 85°C

1.2 应用领域

- 智能楼宇
- 智慧家居/家电
- 智能插座、智慧灯
- 工业无线控制
- 婴儿监控器
- 网络摄像头
- 智能公交

2 版本更新说明

序号	更新日期	更新内容	更新后版本
1	2019-10-21	新建文档	V1.0

3 模块接口

3.1 尺寸封装

WBR3 共有 2 排引脚 (2×8)，引脚间距为 2mm。WBR3 尺寸大小: 16 ± 0.35 mm (W)× 24 ± 0.35 mm (L) × 2.9 ± 0.15 mm (H)。WBR3 尺寸图如下图所示:

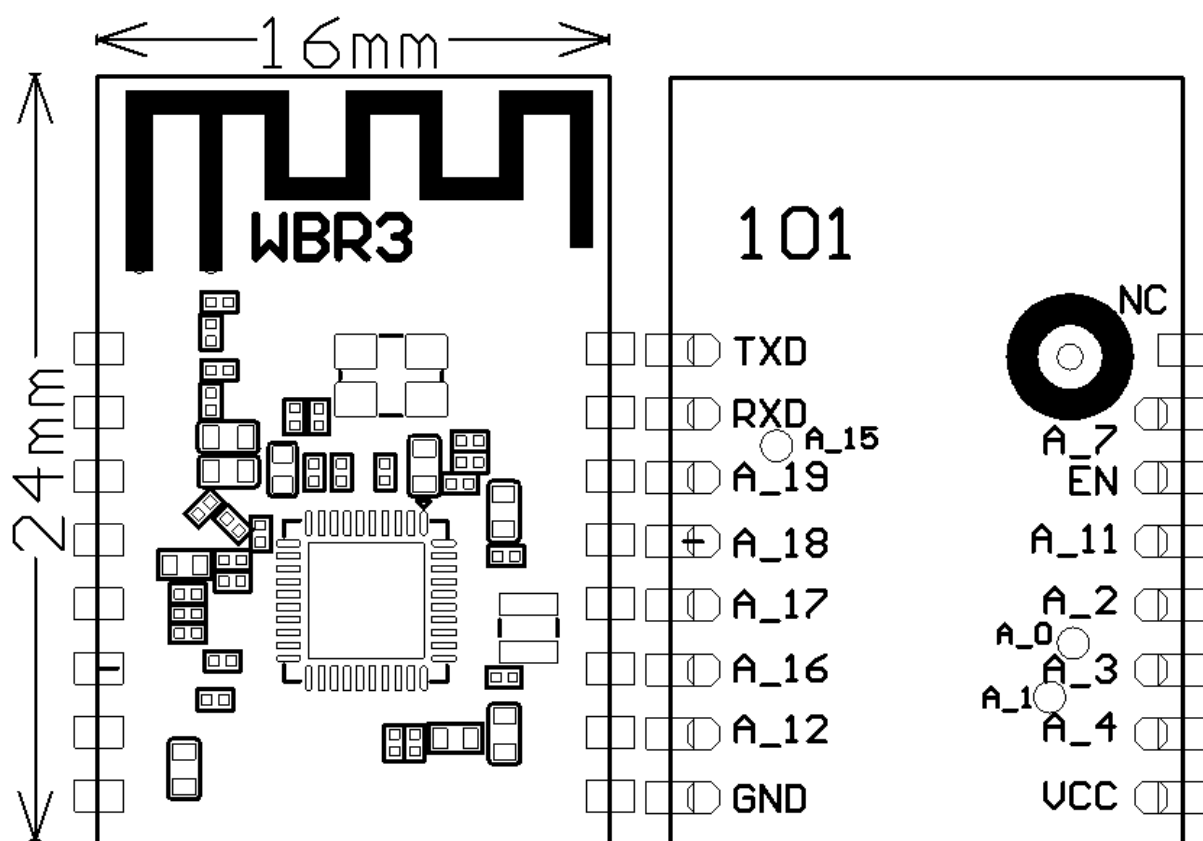


Figure 1: WBR3.png

3.2 引脚定义

引脚	符号	IO 类	
		型	功能
1	NC	/	悬空不接，为了兼容其他模组
2	A_7	I/O	GPIOA_7，硬件 PWM，IC Pin21

引脚	符号	IO 类型	功能
3	EN	I/O	模块使能引脚，高电平有效，模块已上拉高电平，用户可外部控制该引脚
4	A_11	I/O	GPIOA_11，硬件 PWM，IC Pin25
5	A_2	I/O	GPIOA_2，硬件 PWM，IC Pin18
6	A_3	I/O	GPIOA_3，硬件 PWM，IC Pin19
7	A_4	I/O	GPIOA_4，硬件 PWM，IC Pin20
8	VCC	P	模块电源引脚（3.3V）
9	GND	P	电源参考地
10	A_12	I/O	GPIOA_12，硬件 PWM，IC Pin26
11	A_16	I/O	GPIOA_16，UART_Log_TXD(用于打印模块内部信息)，可配置成普通 GPIO
12	A_17	I/O	GPIOA_17，硬件 PWM，IC Pin38
13	A_18	I/O	GPIOA_18，硬件 PWM，IC Pin39
14	A_19	I/O	GPIOA_19，硬件 PWM，IC Pin40
15	RXD	I/O	GPIOA_13，UART0_RXD（用户串口）
16	TXD	I/O	GPIOA_14，UART0_TXD（用户串口）

说明：P 表示电源引脚，I/O 表示输入输出引脚

4 电气参数

4.1 绝对电气参数

参数	描述	最小值	最大值	单位
Ts	存储温度	-40	105	°C
VDD	供电电压	-0.3	3.6	V
静电释放电压（人体模型）	TAMB-25°C	-	2	KV
静电释放电压（机器模型）	TAMB-25°C	-	0.5	KV

4.2 工作条件

参数	描述	最小值	典型值	最大值	单位
Ta	工作温度	-20	-	85	°C
VDD	工作电压	3.0	-	3.6	V
VIL	IO 低电平输入	-	-	0.8	V
VIH	IO 高电平输入	2.0	-	-	V
VOL	IO 低电平输出	-	-	0.4	V
VOH	IO 高电平输出	2.4	-	-	V
I _{max}	IO 驱动电流	-	-	16	mA
C _{pad}	输入引脚电容	-	2	-	pF

4.3 射频功耗

1. TX 连续发送时功耗

符号	模式	功率	平均值	峰值 (典型值)	单位
IRF	11b 11Mbps	17dBm	217	268	mA
IRF	11b 11Mbps	18dBm	231	283	mA
IRF	11g 54Mbps	15dBm	159	188	mA
IRF	11g 54Mbps	17.5dBm	177	213	mA
IRF	11n BW20 MCS7	13dBm	145	167	mA
IRF	11n BW20 MCS7	16.5dBm	165	193	mA

2.RX 连续接收时功耗

符号	模式	平均值	峰值 (典型值)	单位
IRF	11B 11M	63	65	mA
IRF	11G 54M	65	67	mA
IRF	11N HT20 MCS7	65	67	mA

4.4 工作功耗

工作模式	工作状态, TA=25℃	平均值	峰值 (典型值)	单位
快连配网状态	模块处于快连配网状态, WIFI 指示灯快闪	75	324	mA
网络连接空闲状态	模块处于联网工作状态, WiFi 指示灯常亮	64	314	mA
网络连接操作状态	模块处于联网工作状态, WiFi 指示灯常亮	66	305	mA
断网状态	模块处于断网工作状态, WiFi 指示灯常灭	66	309	mA



5 射频参数

5.1 基本射频特性

参数项	详细说明
频率范围	2.400~2.4835GHz
Wi-Fi 标准	IEEE 802.11b/g/n(通道 1-14)
BLE 标准	蓝牙 4.2
数据传输速率	11b:1,2,5.5, 11 (Mbps)
数据传输速率	11g:6,9,12,18,24,36,48,54(Mbps)
数据传输速率	11n:HT20 MCS0~7
天线类型	PCB 天线, 增益 2.5dBi

5.2 发射性能

1. TX 连续发送性能

参数项	最小值	典型值	最大值	单位
RF 平均输出功率, 802.11b CCK Mode 1M	-	17.5	-	dBm
RF 平均输出功率, 802.11g OFDM Mode 54M	-	14.5	-	dBm
RF 平均输出功率, 802.11n OFDM Mode MCS7	-	13.5	-	dBm
RF 平均输出功率, BLE 4.2 1M	-	6.5	-	dBm
频率误差	-20	-	20	ppm
EVM@802.11b CCK 11Mbps Mode 17.5dBm	-	-	-10	dB
EVM@802.11g OFDM 54Mbps Mode 14.5dBm	-	-	-29	dB
EVM@802.11n OFDM MCS7 Mode 13.5dBm	-	-	-30	dB

2. 接收性能

参数项	最小 值	典型 值	最大 值	单位
PER<8%, RX 灵敏度, 802.11b CCK Mode 1M	-	-91	-	dBm
PER<10%, RX 灵敏度, 802.11g OFDM Mode 54M	-	-75	-	dBm
PER<10%, RX 灵敏度, 802.11n OFDM Mode MCS7	-	-72	-	dBm
PER<10%, RX 灵敏度, BLE 4.2 1M	-	-93	-	dBm

6 天线信息

6.1 天线类型

只有 PCB 板载天线接入方式，天线增益 2.5dBi。

6.2 降低天线干扰

在 Wi-Fi 模块上使用 PCB 板载天线时，为确保 Wi-Fi 性能的最优化，建议模块天线部分和其他金属件距离至少在 15mm 以上。

7 封装信息及生产指导

7.1 机械尺寸

WBR3 的 PCB 机械尺寸大小： 16 ± 0.35 mm (W) $\times$ 24 ± 0.35 mm (L) $\times$ 0.8 ± 0.1 mm (H)。
WBR3 的机械尺寸如下图所示。

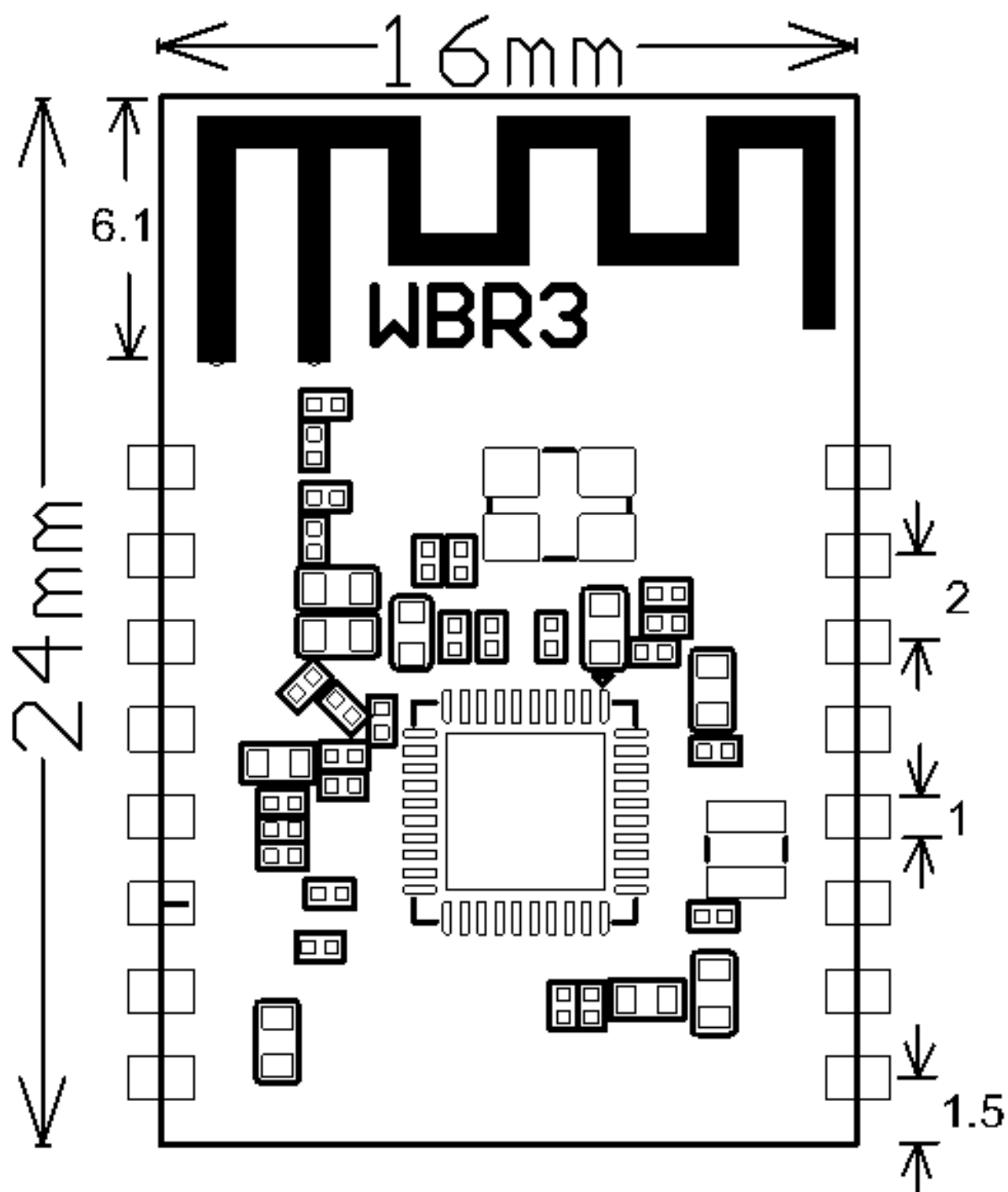


Figure 2: WBR31.png

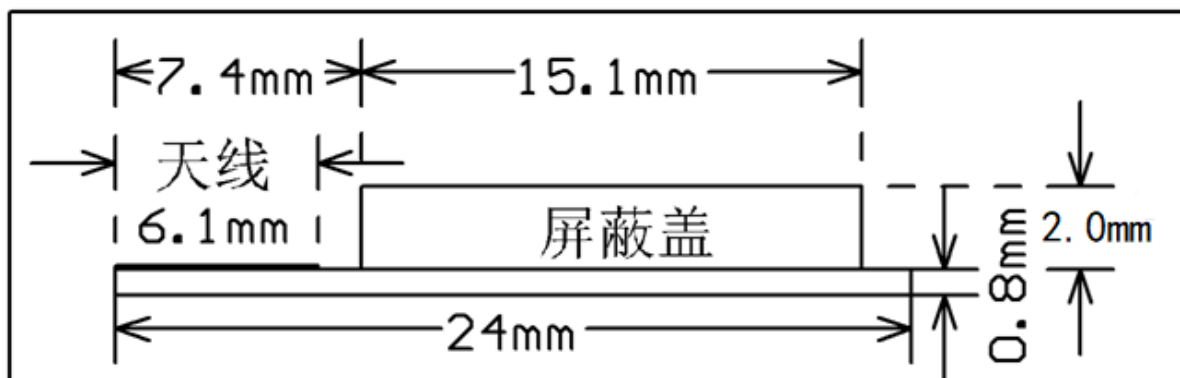


Figure 3: WBR32.png

备注：默认的尺寸公差为 $\pm 0.35\text{mm}$ ，关键尺寸如果客户有明确要求，请沟通后在规格书中进行明确的标定。

7.2 PCB 推荐封装

WBR3 原理图引脚对应图

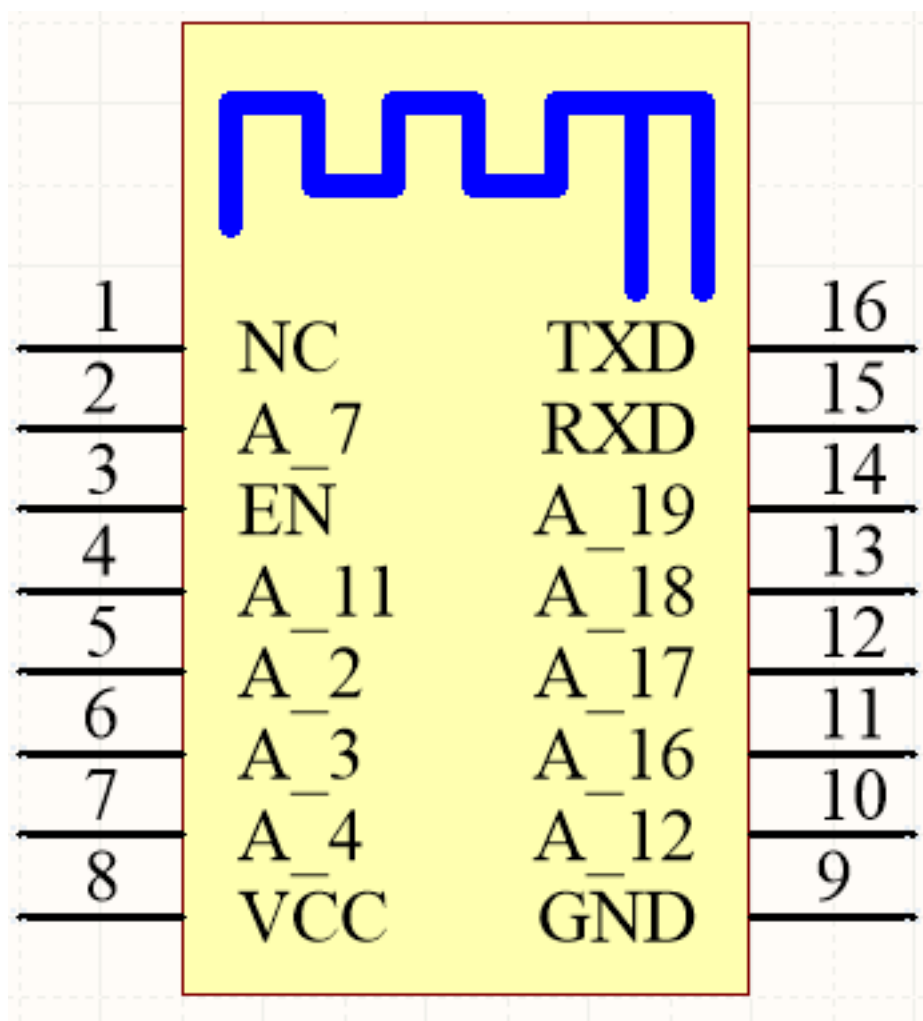


Figure 4: WBR33.png

WBR3 PCB 封装

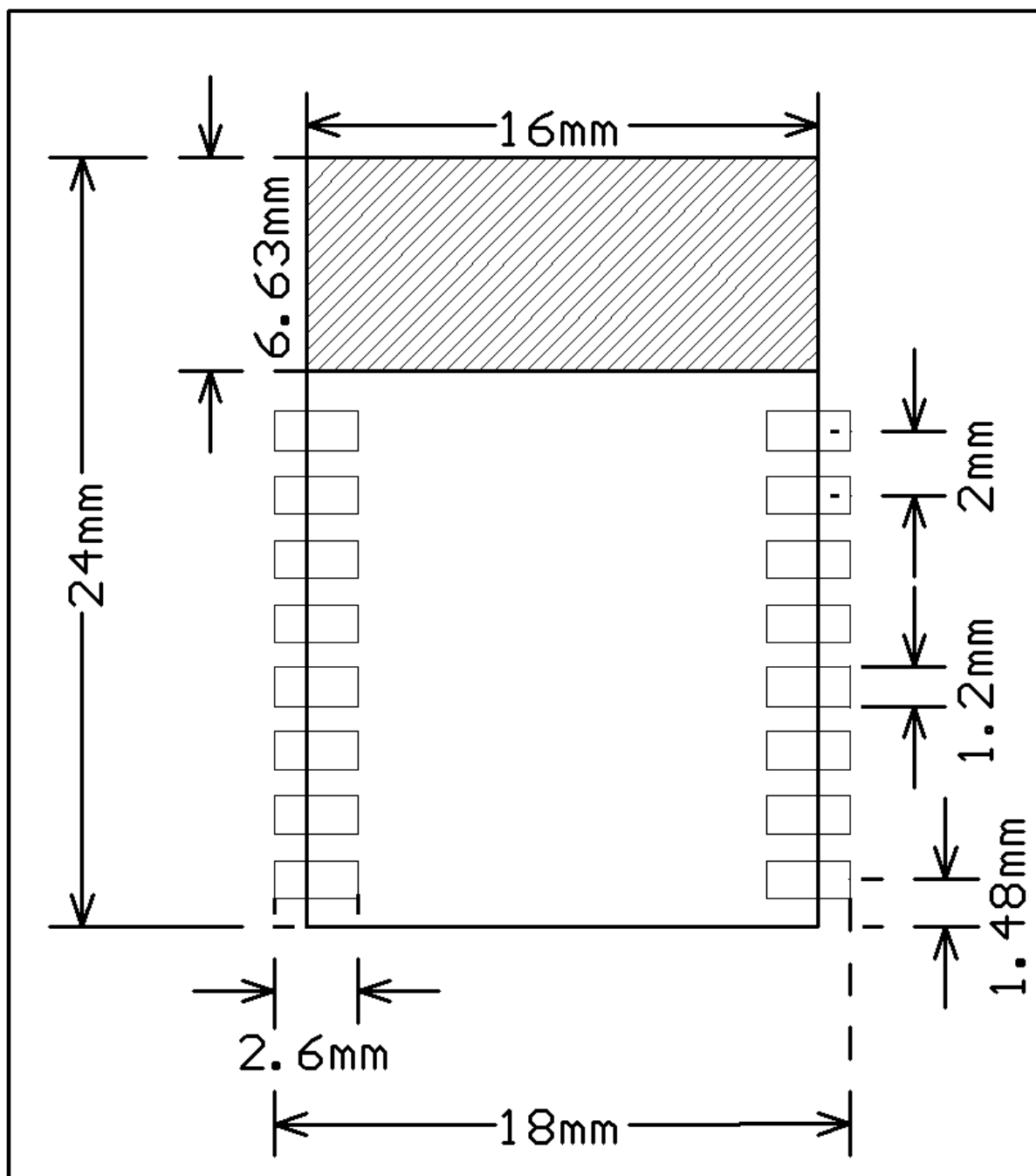


Figure 5: WBR34.png

7.3 生产指南

1. 涂鸦出厂的邮票口封装模块必须由 SMT 机器贴片，并且拆开包装烧录固件后必须 24 小时内完成贴片，否则要重新抽真空包装，贴片前要对模块进行烘烤。

A. SMT 贴片所需仪器或设备：

- 回流焊贴片机；
- AOI 检测仪；
- 口径 6-8mm 吸嘴；

B. 烘烤所需仪器或设备：

- 柜式烘烤箱；
- 防静电耐高温托盘；
- 防静电耐高温手套；

2. 涂鸦出厂的模块存储条件如下：

- 防潮袋必须储存在温度 $< 30^{\circ}\text{C}$ 、湿度 $< 70\%\text{RH}$ 的环境中。
- 干燥包装的产品，保质期为从包装密封之日起 6 个月的时间。
- 密封包装内装有湿度指示卡：

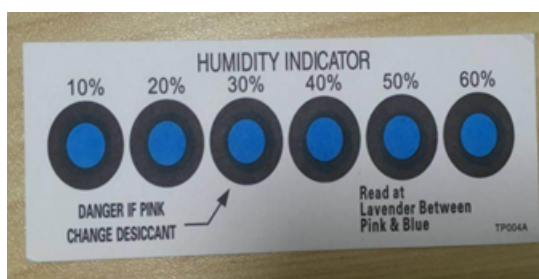


Figure 6: 湿度指示卡.png

3. 涂鸦出厂的模块需要烘烤，湿度指示卡及烘烤的几种情况如下所述：

- 拆封时如果湿度指示卡读值 30%、40%、50% 色环均为蓝色，需要对模块进行持续烘烤 2 小时；
- 拆封时如果湿度指示卡读取到 30% 色环变为粉色，需要对模块进行持续烘烤 4 小时；
- 拆封时如果湿度指示卡读取到 30%、40% 色环变为粉色，需要对模块进行持续烘烤 6 小时；
- 拆封时如果湿度指示卡读取到 30%、40%、50% 色环变为粉色，需要对模块进行持续烘烤 12 小时；

4. 烘烤参数如下:

- 烘烤温度: $125 \pm 5^{\circ}\text{C}$;
- 报警温度设定: 130°C ;
- 自然条件下冷却 $< 36^{\circ}\text{C}$ 后, 即可进行 SMT 贴片;
- 干燥次数: 1 次;
- 若烘烤后超过 12 小时没有焊接, 请再次进行烘烤;

5. 如果拆封时间超过 3 个月, 禁止使用 SMT 工艺焊接此批次模块, 因为此 PCB 为沉金工艺, 超过 3 个月后焊盘氧化严重, SMT 贴片时极有可能导致虚焊、漏焊, 由此带来的种种问题我司不承担相应责任;

6. SMT 贴片前, 请对模块进行 ESD (静电放电、静电释放) 保护;

7. 为了确保回流焊合格率, 首次贴片请抽取 10% 产品进行目测、AOI 检测, 以确保炉温控制、器件吸附方式、摆放方式的合理性; 之后的批量生产建议每小时抽取 5-10 片进行目测、AOI 检测。

7.4 推荐炉温曲线

请根据回流焊曲线图进行 SMT 贴片, 峰值温度 245°C , 回流焊温度曲线如下图所示: Refer to IPC/JEDEC standard; Peak Temperature: $< 245^{\circ}\text{C}$; Number of Times: ≤ 2 times

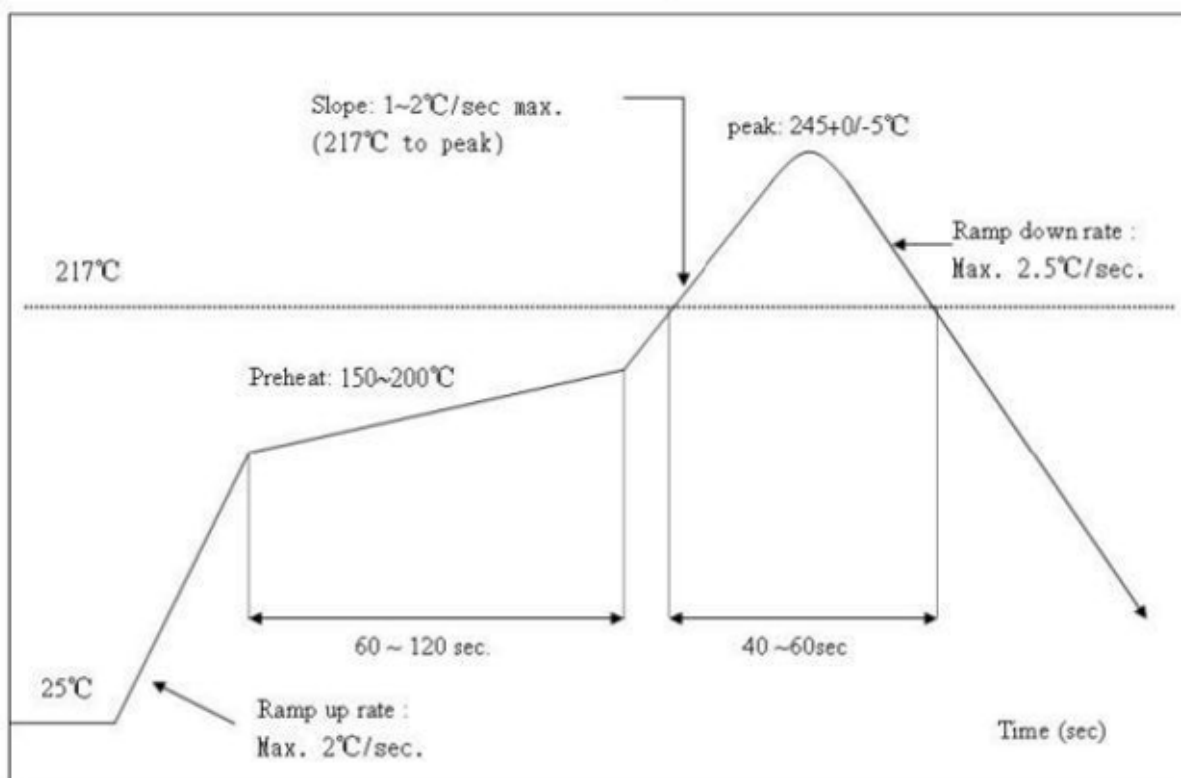


Figure 7: 炉温.png

7.5 储存条件

	CAUTION	LEVEL
	This bag contains MOISTURE-SENSITIVE DEVICES	3
If Blank, see adjacent bar code label		
1. Calculated shelf life in sealed bag: 12 months at $< 40^{\circ}\text{C}$ and $< 90\%$ relative humidity (RH)		
2. Peak package body temperature: <u>260</u> $^{\circ}\text{C}$ If Blank, see adjacent bar code label		
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must		
a) Mounted within: <u>168</u> hrs. of factory conditions If Blank, see adjacent bar code label		
$\leq 30^{\circ}\text{C}/60\%\text{RH}$, OR		
b) Stored at $<10\%$ RH		
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 hrs. at $125 \pm 5^{\circ}\text{C}$		
Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure		
Bag Seal Date: _____ If Blank, see adjacent bar code label		
Note: Level and body temperature defined by IPC/JEDEC J-STD-020		

Figure 8: 储存条件.png

8 模块 MOQ 与包装信息

产品型号	MOQ (pcs)	出货包装方式	出货包装方式	每箱包装卷盘数 (盘)
WBR3	3600	载带卷盘	900	4

9 附录—声明

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. 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. Note: 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 or more 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. Radiation Exposure Statement This equipment complies with FCC radiation exposure limits set forth for an uncontrolled rolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. Important Note This radio module must not installed to co-locate and operating simultaneously with other radios in host system except in accordance with FCC multi-transmitter product procedures. Additional testing and equipment authorization may be required to operating simultaneously with other radio. The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user. 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. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. The end user manual shall include all required regulatory information/warning as shown in this manual, including: This product must be installed and operated with a minimum distance of 20 cm between the radiator and user body. This device have got a FCC ID: 2ANDL-WBR3. The final

end product must be labeled in a visible area with the following: “Contains Transmitter Module FCC ID: 2ANDL-WBR3” This device is intended only for OEM integrators under the following conditions: 1)The antenna must be installed such that 20cm 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. Declaration of Conformity European notice



Figure 9: CE.png

Hereby, Hangzhou Tuya Information Technology Co., Ltd declares that this module product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU, 2011/65/EU. A copy of the Declaration of conformity can be found at <https://www.tuya.com>



Figure 10: 声明标识.png

This product must not be disposed of as normal household waste, in accordance with EU directive for waste electrical and electronic equipment (WEEE- 2012/19/EU). Instead, it should be disposed of by returning it to the point of sale, or to a municipal recycling collection point.