BT3L 模组规格书

设备接入 > 云模组 > 蓝牙模组

文档版本: 20200929

查看在线版本

目录

1 产品概述

BT3L 是由涂鸦智能开发的一款低功耗嵌入式的蓝牙模块。它主要由一个高集成度的蓝牙芯片 TLSR8250F512ET32 和少量的外围电路构成，内置了蓝牙网络通信协议栈和丰富的库函数。BT3L 还包含低功耗的 32 位 MCU，BLE5.0/2.4G Radio，4Mbits flash，48Kbyte SRAM，9 个可复用的 IO 口。

1.1 特点

- 内置低功耗 32 位 MCU，可以兼作应用处理器。
  - 主频支持 48 MHz
- 工作电压：1.8V-3.6V，在 1.8V 到 2.7V 之间，模块可以启动，但是无法保证最优射频性能；在 2.8V-3.6V 之间，模块整体性能正常。
- 外设：5xPWM
- BLE RF 特性
  - BLE 4.2/5.0
  - 射频数据速率高达 2Mbps
  - TX 发射功率：+10dBm
  - RX 接收灵敏度：-94.5dBm@BLE 1Mbps
  - 内嵌硬件 AES 加密
  - 搭配板载 PCB 天线，天线增益 2.5dBi
  - 工作温度：-40℃ to +85℃

1.2 主要应用领域

- 智能 LED
- 智能家居
- 智能低功耗传感器

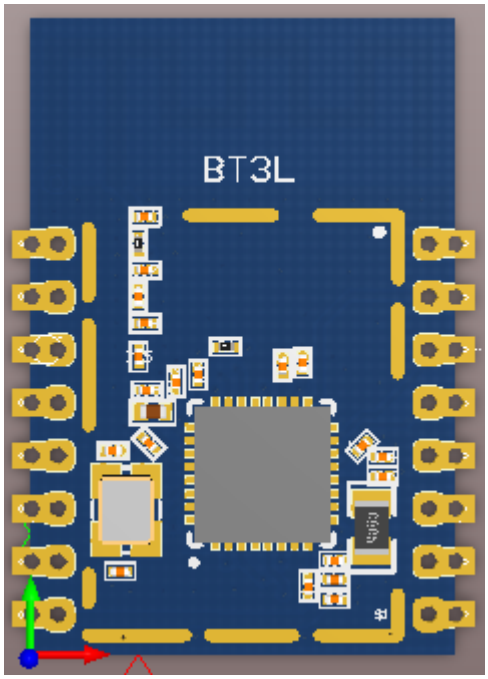
2 版本更新说明

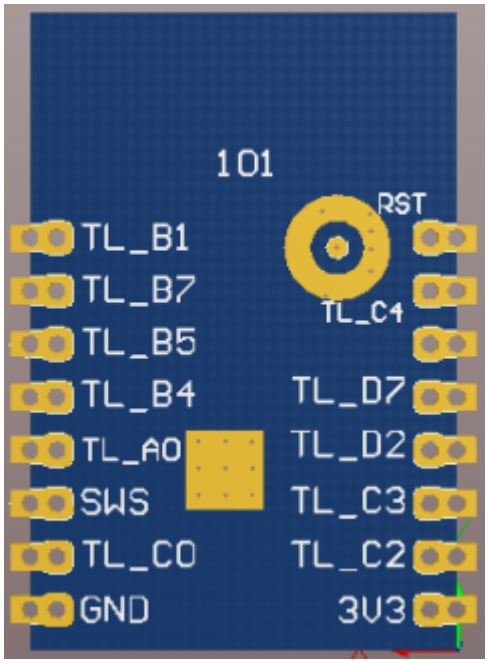
更新日期	更新内容	更新后版本
20190309	新建文档	V1.0.0
20190723	完善引脚定义，规范尺寸公差，更新温度范围及炉温参数，添加包装方式，更新工作电压设定	V2.0.0
20191012	删除框图	V2.0.1

3 模块接口

3.1 尺寸封装

BT3L 共有 2 排引脚，引脚间距 2mm。BT3L 尺寸大小：16±0.35 mm (W)×24±0.35mm (L) ×3.3±0.15mm(H)，其中 PCB 厚度 0.8mm±0.1 mm，封装如图所示





3.2 引脚定义

接口引脚定义如下表所示：

序号	符号	IO 类型	功能
1	RST	I/O	硬件复位引脚（低电平有效），对应 IC 的 RESETB
2	ADC	AI	ADC 端口，12bits ADC，对应 IC 的 TL_C4
3	NC	NC	NC
4	TL_D7	I/O	普通 IO 口，对应 IC 的 TL_D7
5	TL_D2	I/O	普通 IO 口，可做 LED 的驱动 PWM 输出，对应 IC 的 TL_D2

序号	符号	IO 类型	功能
6	TL_C3	I/O	普通 IO 口，可做 LED 的驱动 PWM 输出，对应 IC 的 TL_C3
7	TL_C2	I/O	普通 IO 口，可做 LED 的驱动 PWM 输出，对应 IC 的 TL_C2
8	VDD_BAT	P	模块电源引脚（3.3V）
9	GND	P	电源参考地
10	TL_C0	I/O	普通 IO 口，对应 IC 的 TL_C0
11	SWS	I	模块烧录脚，对应 IC 的 TL_A7
12	TL_A0	I/O	普通 IO 口，对应 IC 的 TL_A0
13	TL_B4	I/O	普通 IO 口，可做 LED 的驱动 PWM 输出，对应 IC 的 TL_B4
14	TL_B5	I/O	普通 IO 口，可做 LED 的驱动 PWM 输出，对应 IC 的 TL_B5
15	TL_B7	I/O	串口接收引脚 UART RX，对应 IC 的 TL_B7
16	TL_B1	I/O	串口发送引脚 UART TX，对应 IC 的 TL_B1

说明：P 表示电源引脚，I/O 表示输入输出引脚，AI 表示模拟输入。如对 PWM 输出控制的灯色有自己的需求，请与我司商务联系。

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	-65	150	℃
VCC	供电电压	-0.3	3.9	V
静电释放电压（人体模型）	TAMB-25℃	-	2	kV
静电释放电压（机器模型）	TAMB-25℃	-	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	-40	-	85	℃
VCC	工作电压	2.8	3.3	3.6	V
VIL	IO 低电平输入	VSS	-	VCC*0.3	V
VIH	IO 高电平输入	VCC*0.7	-	VCC	V
VOL	IO 低电平输出	VSS	-	VCC*0.1	V
VOH	IO 高电平输出	VCC*0.9	-	VCC	V

4.3 工作模式下功耗

符号	条件	最大值（典型值）	单位
Itx	连续发送，10.5dBm 输出功率	23	mA
Irx	连续接收	6.3	mA
IDC	Mesh 联网工作状态下 Average 值	6.7	mA
IDC	Mesh 联网工作状态下 Peak 值	24.9	mA
$I_{deepsleep1}$	深度休眠模式（保留 16KBRAM）	1.2	μA
$I_{deepsleep2}$	深度休眠模式（不保留 RAM）	0.4	μA

5 射频参数

5.1 基本射频特性

参数项	详细说明
工作频率	2.4GHz ISM band
无线标准	BLE 4.2/5.0
数据传输速率	1Mbps，2Mbps
天线类型	板载 PCB 天线

5.2 RF 输出功率

参数项	最小值	典型值	最大值	单位
RF 平均输出功率	-22	10	10.5	dBm
20dB 调制信号带宽 (1M)	-	2500	-	KHz
20dB 调制信号带宽 (2M)	-	1400	-	KHz

5.3 RF 接收灵敏度

参数项	最小值	典型值	最大值	单位
RX 灵敏度 1Mbps	-	-94.5	-	dBm
RX 灵敏度 2Mbps	-	-91	-	dBm
频率偏移误差 1Mbps	-250	-	+300	KHz
频率偏移误差 2Mbps	-300	-	+200	KHz
同信道干扰抑制	-	-10	-	dB

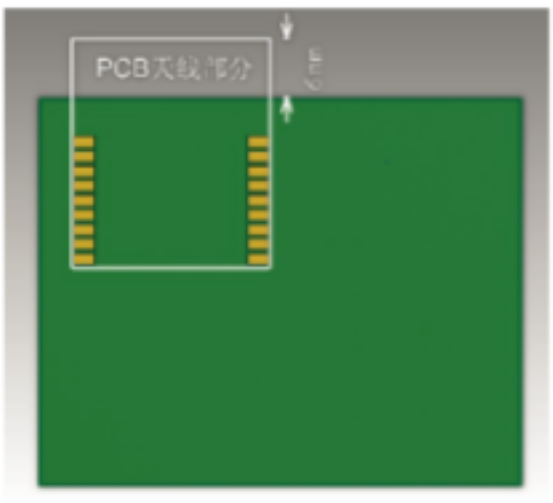
6 天线信息

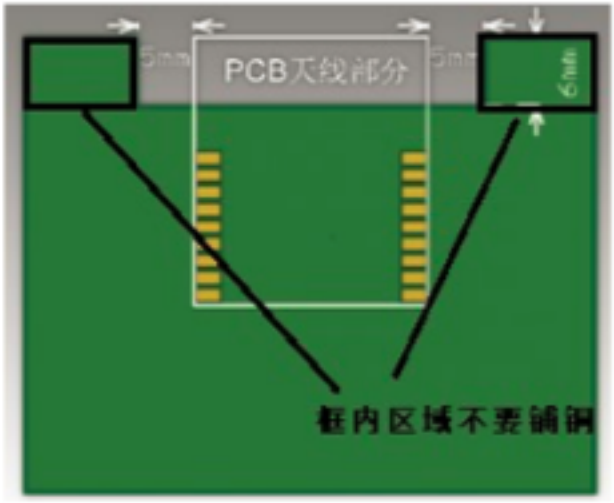
6.1 天线类型

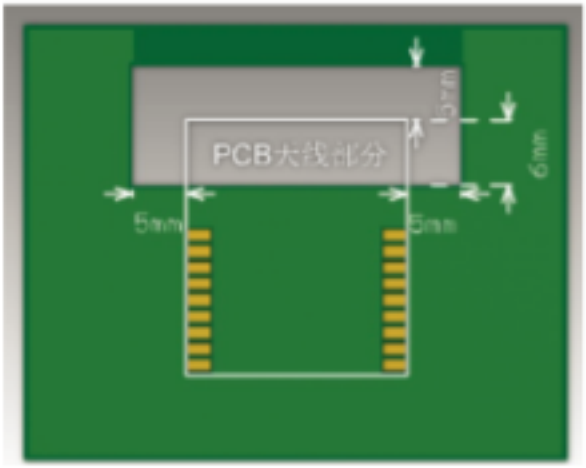
BT3L 使用的是板载 PCB 天线，天线增益 2.5dBi。

6.2 降低天线干扰

为确保 RF 性能的最优化，建议模块天线部分和其他金属件的距离至少保持 15mm 以上。如果使用环境的天线周边包裹金属材料等，会极大地衰减无线信号，进而恶化射频性能。成品设计时，注意给天线区域预留出足够的空间。

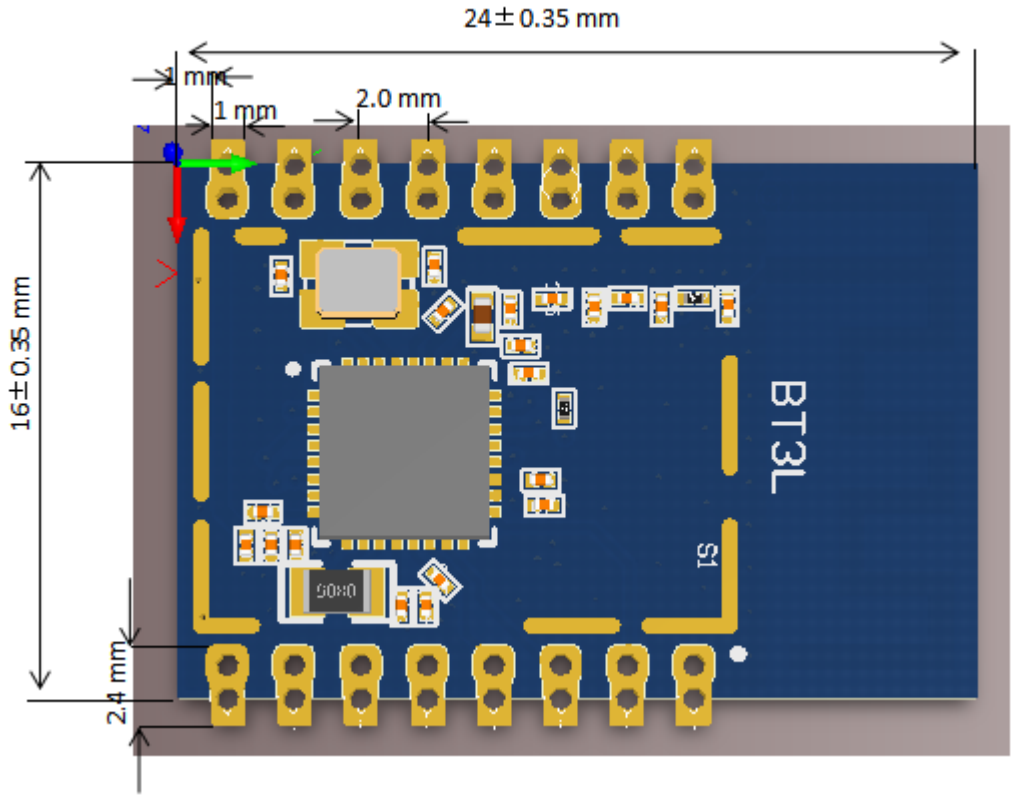






7 封装信息及生产指导

7.1 机械尺寸和背面焊盘尺寸



备注：默认的模组外形尺寸公差为 ±0.35 mm，关键尺寸公差 ±0.1 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 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：

   a) 回流焊贴片机

b) AOI 检测仪

c) 口径 6-8 mm 吸嘴

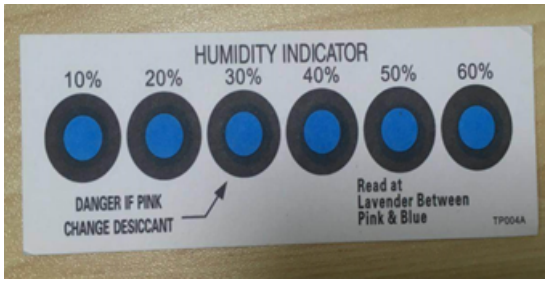
B. 烘烤所需仪器或设备：

d) 柜式烘烤箱

e) 防静电耐高温托盘

f) 防静电耐高温手套

2. 涂鸦出厂的模块存储条件如下：
   A. 防潮袋必须储存在温度＜ 30℃、湿度＜ 70%RH 的环境中。
   B. 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。
   C. 密封包装内装有湿度指示卡。



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：
   A. 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。
   B. 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。
   C. 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。
   D. 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：
   A. 烘烤温度：125±5℃。
   B. 报警温度设定：130℃。
   C. 自然条件下冷却＜ 36℃ 后，即可进行 SMT 贴片。
   D. 干燥次数：1 次。
   E. 若烘烤后超过 12 小时没有焊接，请再次进行烘烤。

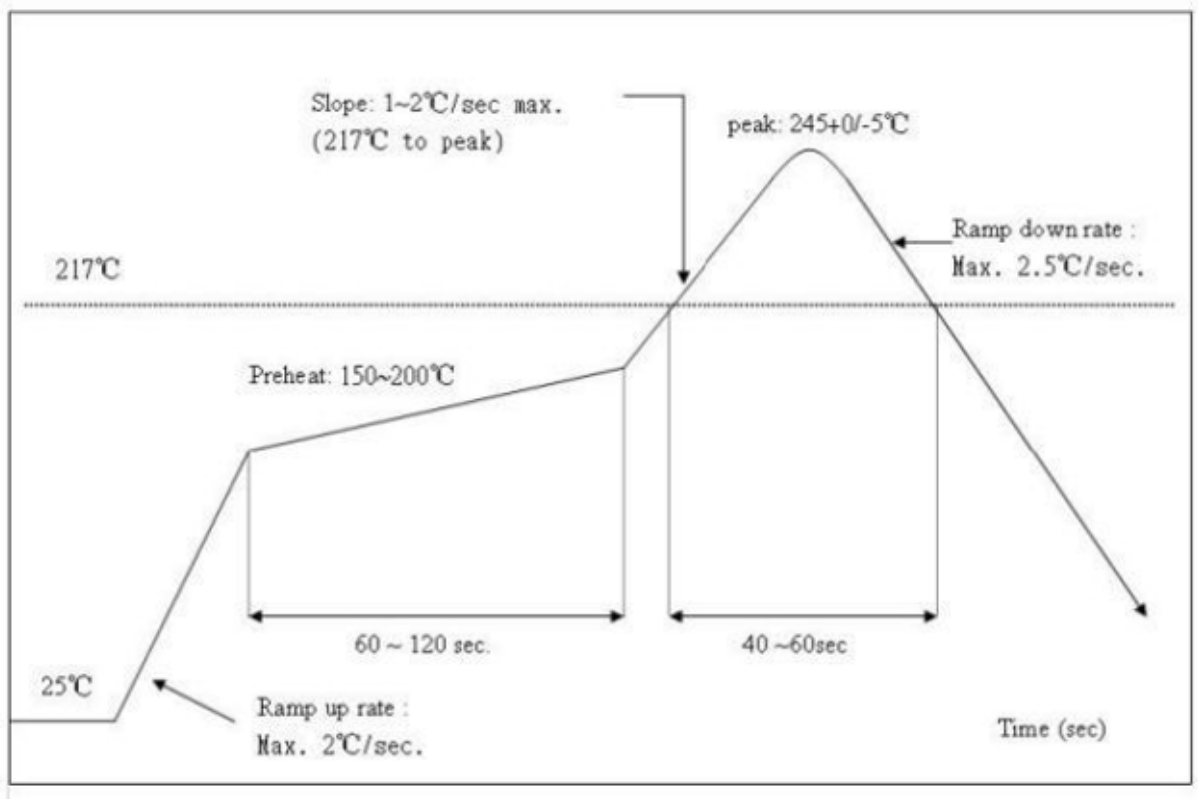
5. 如果拆封时间超过 3 个月，禁止使用 SMT 工艺焊接此批次模块，因为此 PCB 为沉金工艺，超过 3 个月后焊盘氧化严重，SMT 贴片时极有可能导致虚焊、漏焊，由此带来的种

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。

7.3 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℃ ，回流焊温度曲线如下图所示：Refer to IPC/JEDEC standard；Peak Temperature:<245℃；Number of Times：≤2 times



7.4 储存条件

CAUTION

This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL 3

If Blank, see adjacent bar code label

1. Calculated shelf life in sealed bag: 12 months at < 40°C and < 90% relative humidity (RH)
2. Peak package body temperature: 260 °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: 168 hrs. of factory conditions
      If Blank, see adjacent bar code label
      ≤ 30°C/60%RH, OR
   b) Stored at <10% RH
4. Devices require bake, before mounting, if:
   a) Humidity Indicator Card is > 10% when read at 23 ± 5°C
   b) 3a or 3b not met.
5. If baking is required, devices may be baked for 48 hrs. at 125 ± 5°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

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）
BT3L	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.

9.1 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.

9.2 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-BT3L.The final end product must be labeled in a visible area with the following: “Contains Transmitter Module FCC ID: 2ANDL-BT3L” 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

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

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.

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