



# TB-02 Specification

Version V1.0

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## 1.INTRODUCTION

The TB-02 intelligent lighting module is a Bluetooth module based on the TLSR8250F512 chip and compatible with BT 5.0 low-power Tmall Genie Mesh. This module supports the Bluetooth module directly controlled by Tmall Genie and has a Bluetooth mesh networking function. Peer-to-peer network communication, using Bluetooth broadcast for communication, can ensure timely response in the case of multiple devices. It is mainly used in intelligent light control, which can meet the requirements of low power consumption, low latency, and short-range wireless data communication.

### Features

- Can be directly controlled by Tmall Elf without a gateway
- 1.6mm pitch pin vertical solder DIP18 or SMD-13 package
- 6 PWM outputs
- With on-board antenna, no need to design antenna
- Brightness (duty cycle) adjustment range 5% -100%
- Factory default 50% duty cycle for cool and warm colors
- PWM output power 1KHz
- With night light function
- With wall switch to switch color temperature function

LIST 1 Main Parameters

<b>Model Name</b>	TB-02
<b>Size</b>	18.0*18.0*2.8(±0.2)MM
<b>Package</b>	DIP-18 or SMD-13
<b>Wireless Standard</b>	Bluetooth V5.0
<b>Frequency Range</b>	2400 ~ 2483.5MHz
<b>Output Power</b>	10dBm
<b>Max Sensitivity</b>	-93.2dBm
<b>Interface</b>	GPIO/PWM/SPI/ADC
<b>Work Temperature</b>	-20℃ ~ 70 ℃
<b>Store Temperature</b>	-40 ℃ ~ 125 ℃ , < 90%RH
<b>Voltage Range</b>	Voltage 2.7V ~ 3.6V, Current ≥ 50mA
<b>Power</b>	Deep Sleep Mode: 0.8uA
	Sleep Mode: 1.8uA
	TX: 12.62mA
<b>Transmission distance</b>	80m ~ 150m

## 2.SPECIFICATION

### Electrical characteristics

#### Absolute Maximum Rating

*Any exceeding the following absolute maximum ratings may cause damage to TLSR8250F512*

Item	Min	Typical	Max	Unit
Voltage	2.7	3.3	3.6	V
I/O Voltage (VCCIO)	-0.3	-	3.6	V
Work Temperature	-20	-	+70	°C
Store Temperature	-40	-	+125	°C

### RF Specification

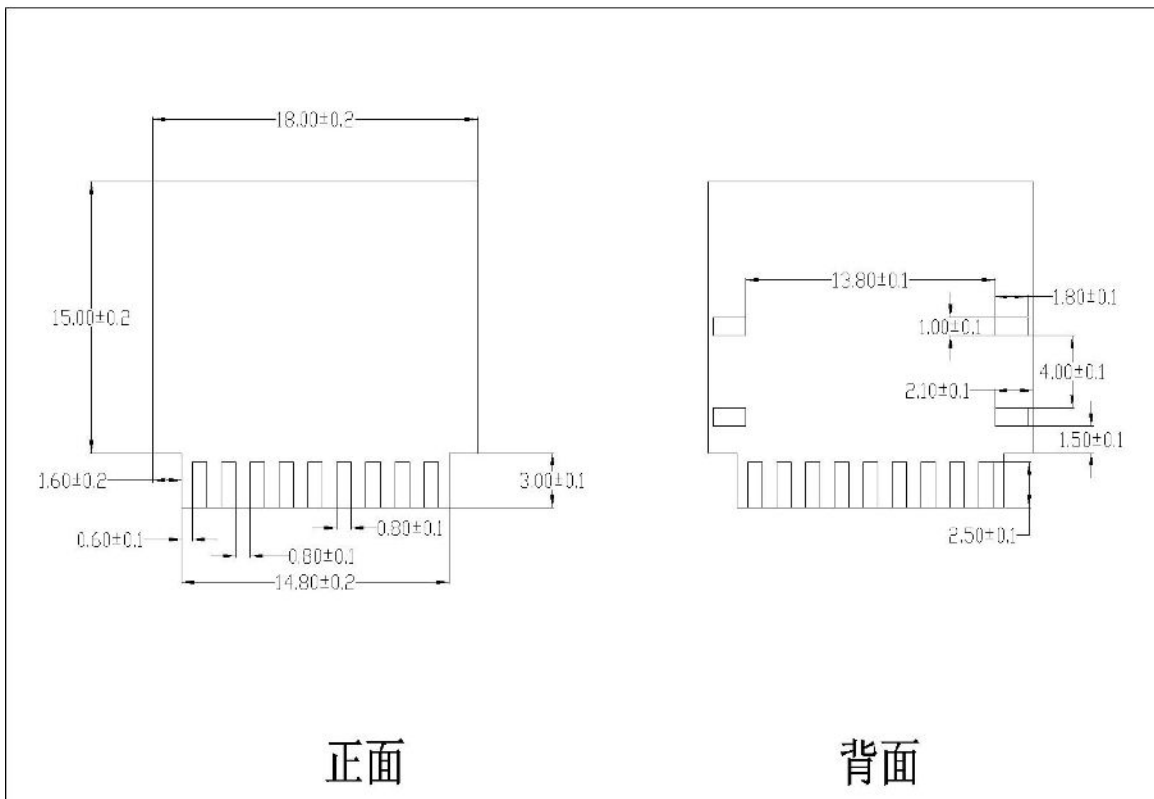
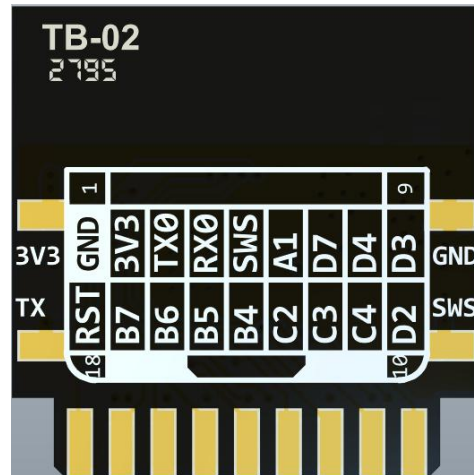
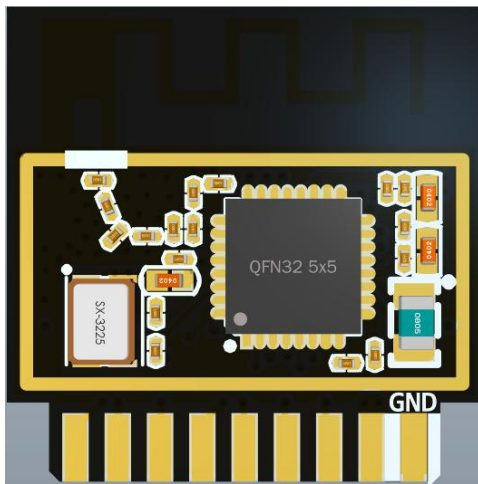
#### Output Power

Item	Min	Typical	Max	Unit
Average Power	8.5dBm	9.5dBm	10dBm	dBm

#### Sensitivity

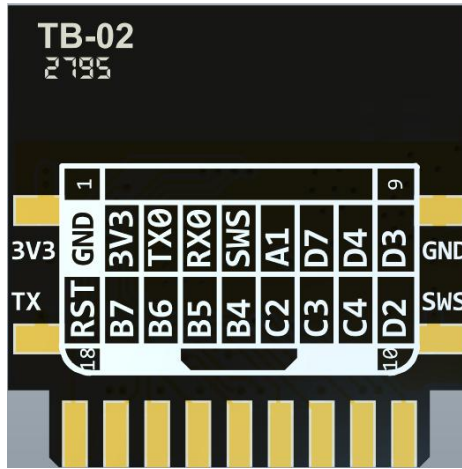
Item	Min	Typical	Max	Unit
Sensitivity	-92dBm	-91dBm	-90dBm	dBm

### 3.DIMENSION



## 4. PIN DEFINITION

The TB-02 module has a total of 22 interfaces. For example, the pin diagram, the pin function definition table is the interface definition.



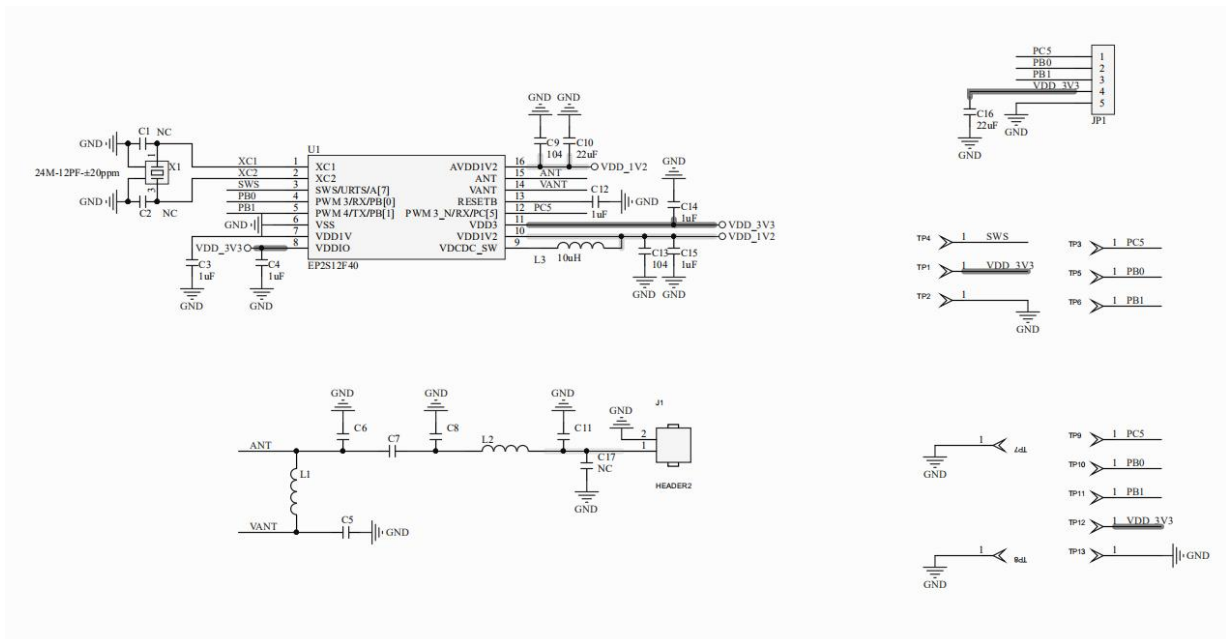
TB-02 Pin diagram

PIN function definition sheet

No.	Item	Function Description
1	GND	Ground
2	3V3	Electricity supply
3	TX0	PWM4 output/UART_TX/SAR ADC input/GPIO PB1
4	RX0	PWM0 inverting output/UART_RX/GPIO PA0
5	SWS	Single wire slave/UART_RTS/GPIO PA7
6	A1	GPIO PA1
7	D7	GPIO PD7/SPI clock (I2C_SCK)
8	D4	GPIO PD4/Single wire master/PWM2 inverting output
9	D3	PWM1 inverting output/GPIO PD3
10	D2	SPI chip select (active low) /PWM3 output/GPIO PD2
11	C4	PWM2 output/UART_CTS/PWM0 inverting output /SAR ADC input/GPIO PC4
12	C3	PWM1 output/UART_RX/I2C serial clock/32kHz crystal input (optional) /GPIO PC3
13	C2	PWM0 output/I2C serial data/32kHz crystal output (optional) /GPIO PC2

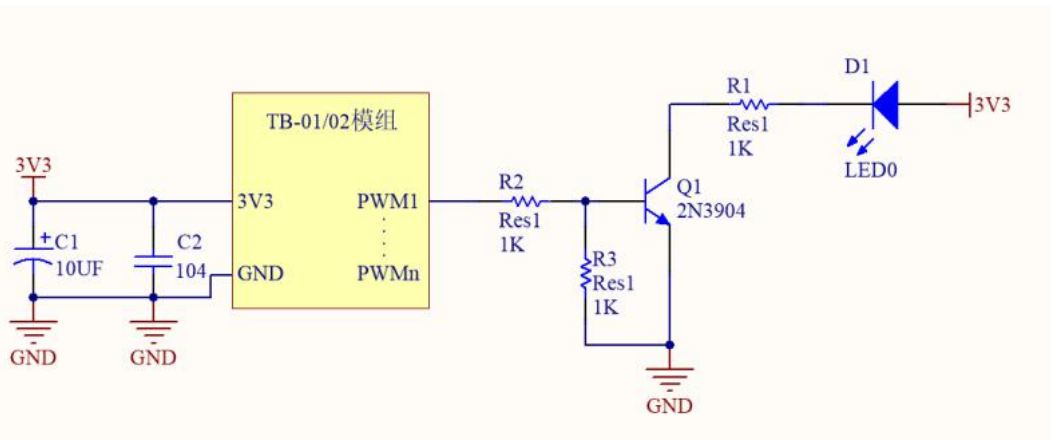
14	B4	PWM4 output/SAR ADC input/GPIO PB4
15	B5	PWM5 output/SAR ADC input/GPIO PB5
16	B6	SPI data input ( I2C_SDA ) /UART_RTS/SAR ADC input/GPIO PB6
17	B7	SPI data output/UART_RX/SAR ADC input/GPIO PB7
18	RST	RESET
19	3V3	Electricity supply
20	TX	UART_TX
21	GND	Ground
22	SWS	Single wire slave

## 5.SCHEMATIC



## 6.DESIGN GUIDE

### 1、Application circuit



### 2、Antenna layout requirements

(1) Place the module on the edge of the motherboard, and the antenna area extends beyond the edge of the motherboard.

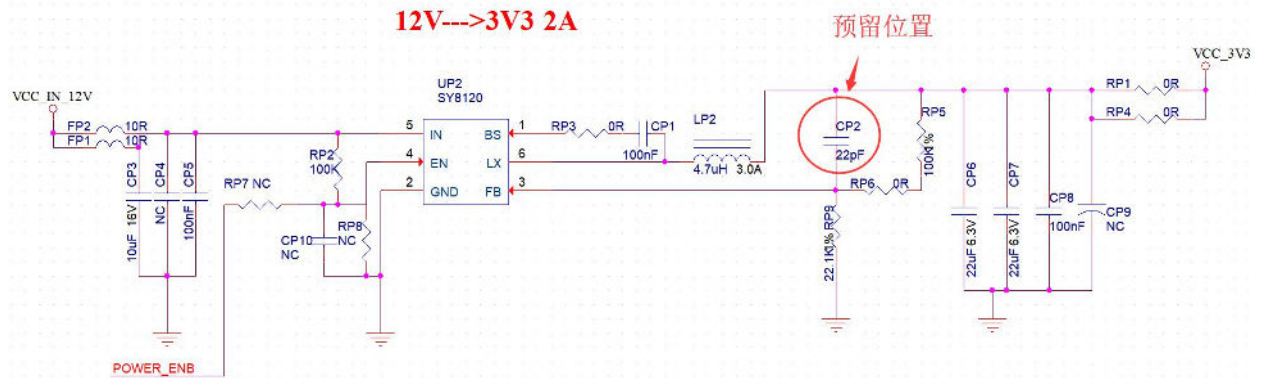
### 3、Electricity Supply

(1) Recommended 3.3V voltage, peak current above 50mA

(2) It is recommended to use LDO power supply; if using DC-DC, it is recommended to control the ripple within 30mV.

(3) The DC-DC power supply circuit is recommended to reserve the position of the dynamic response capacitor, which can optimize the output ripple when the load changes greatly.

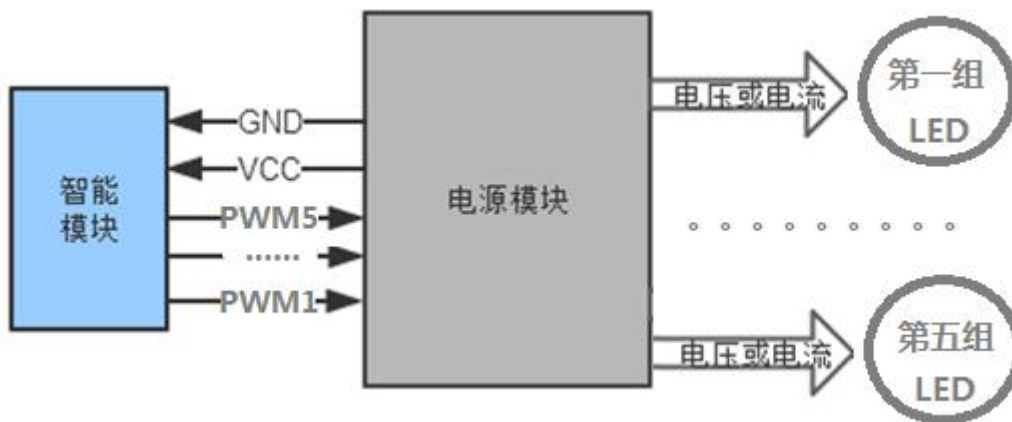
(4) 3.3V power interface is recommended to add ESD devices.



#### 4、PWM Dimming Solution Design Instructions

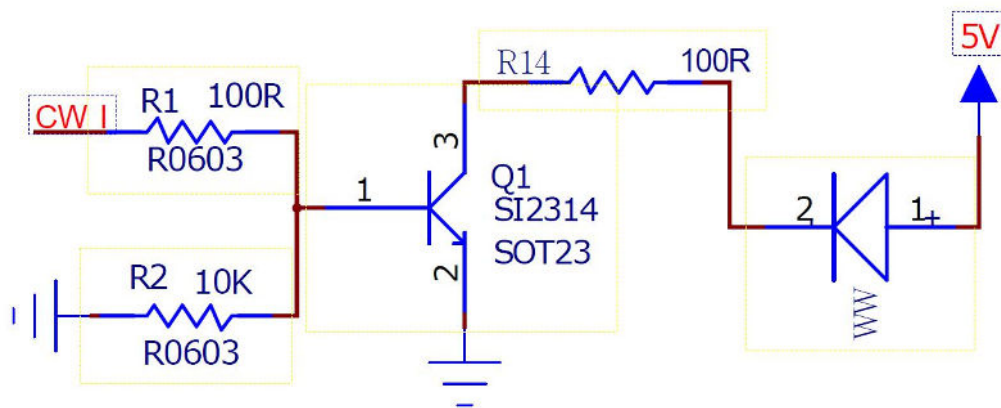
For lamps that require dimming, you only need to connect the PWM pins of the corresponding color to the control end of the subsequent stage drive circuit; the PWM independently outputs a 100-level adjustable digital signal, and the subsequent stage circuit can be voltage The driving type may be a current driving type.

*Connection diagram*



#### 5、LED Drive Reference Design

TB-02 module application only needs 3.3V power supply and simple driving circuit to achieve intelligent light control. Take MOS tube to drive a channel of white light as an example, the design reference is as follows; CW\_I is the module's positive white light PWM output , Q1 is MOS tube, WW is LED lamp beads, the other 4 road lamp driving circuit is the same as this road design method.



## 6、Secondary development

The TB-02 module supports users to write their own firmware programs to achieve customized functions.

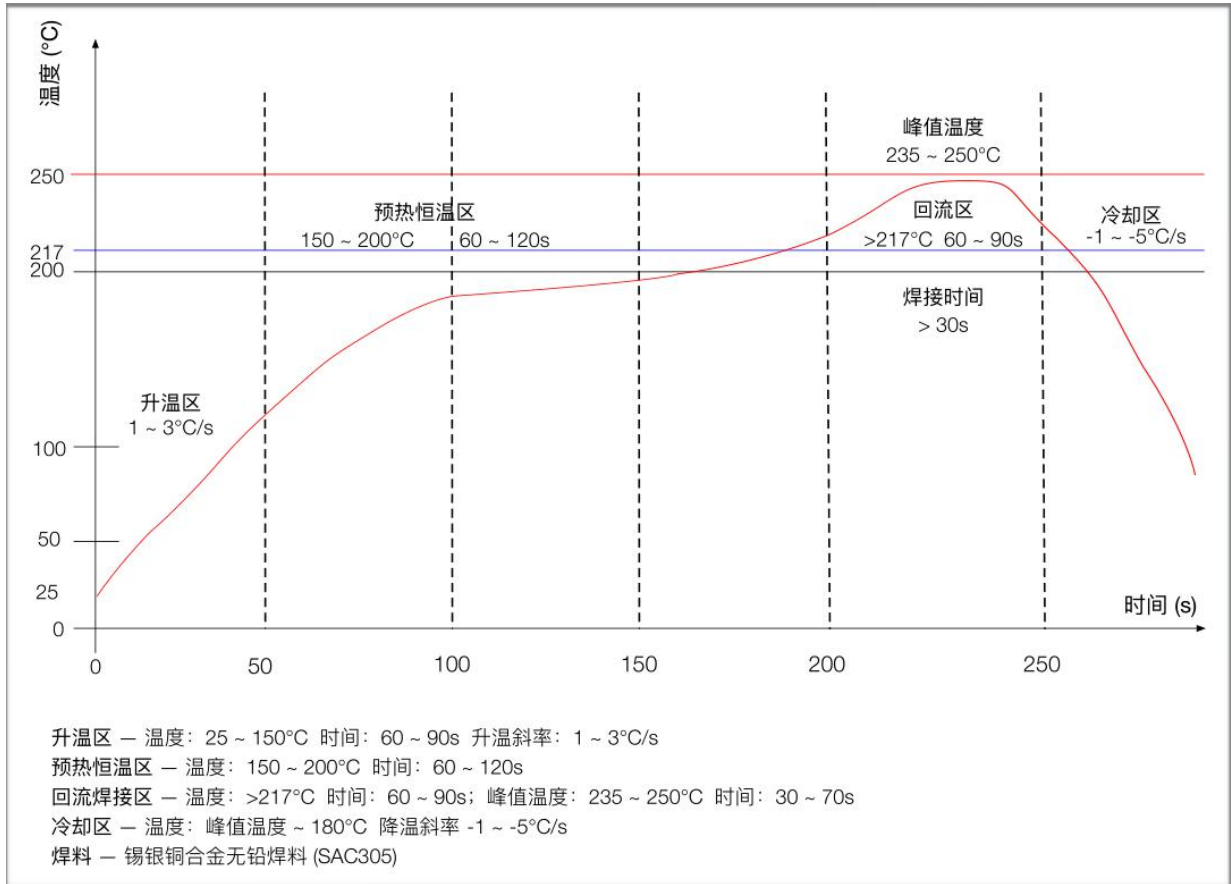
If you use a Linux machine to develop the firmware, you can refer to the SDK, documentation and source address of Anxin's collation:

[https://github.com/Ai-Thinker-Open/Telink\\_825X\\_SDK](https://github.com/Ai-Thinker-Open/Telink_825X_SDK).

If you use Windows development, you can refer to the original SDK provided by the chip manufacturer. Download address:

<http://wiki.telink-semi.cn>.

## 7. REFLOW PROFILE



## 8.PACKAGING

As shown below, the packaging of TB-02 is taping packaging.



## 9.CONTACT US

Company Website: <https://www.ai-thinker.com>

Development DOCS: <https://docs.ai-thinker.com>

Official Forum: <http://bbs.ai-thinker.com>

Sample Purchase: <https://anxinke.taobao.com>

Business: [sales@aithinker.com](mailto:sales@aithinker.com)

Technical Support: [support@aithinker.com](mailto:support@aithinker.com)

Company Address: 410, Building C, Gufeng Huafeng Smart Innovation Port, Xixiang, Baoan District,

Shenzhen

Tel: 0755-29162996

