TB-03F SPECIFICATION

Version V1.1

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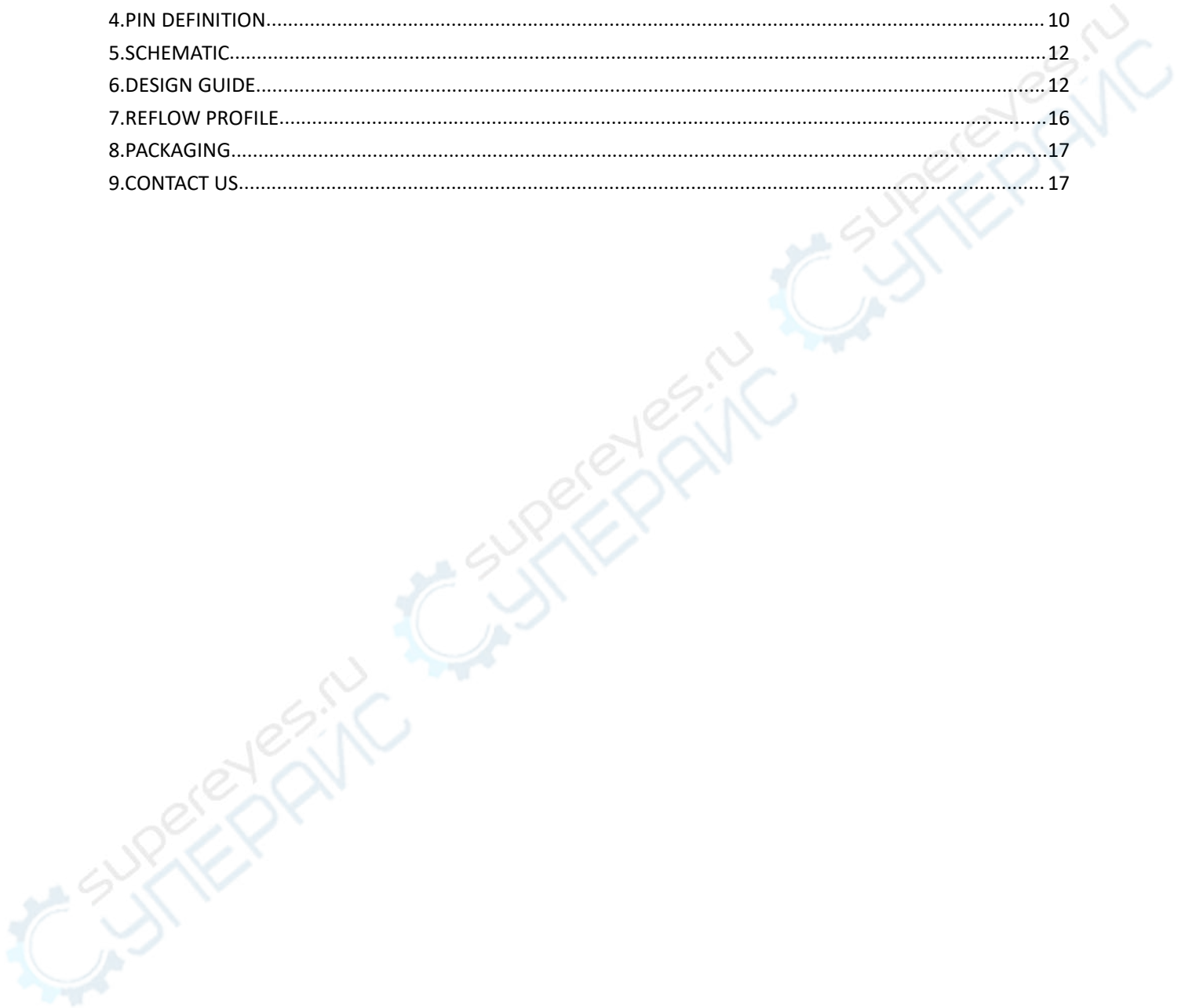
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Document development / revision / revocation resume

Version	Date	Develop / revise content	Maker	Verify
V1.0	2020.03.28	Develop at first time	Yiji Xie	Xu hong
V1.1	2021.01.04	Update database	Xu hong	Xu hong

CONTENT

1.PRODUCT DESCRIPTION

TB-03F intelligent lighting module is a Bluetooth module designed based on the TLSR8250F512ES16 chip and conforming to BT 5.0 low power Tmall Genie Mesh. This module supports the direct control of Tmall Genie and has the Bluetooth mesh networking function. The devices are peered through Star network communication, using Bluetooth broadcast for communication, can ensure timely response in the case of multiple devices. This module is applied to 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
- SMD-22 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 frequency 1KHz
- Support multiple sleep modes, deep sleep current as low as 0.4uA
- With wall switch to switch color temperature function
- Support secondary development

Main parameters

List 1 Main parameter description

Module model	TB-03F
Dimension	24*16*3($\pm$0.2)MM
Package	SMD-22
Wireless standard	BT 5.0
Frequency range	2400～2483.5MHz
Transmit power	Maximum 10dBm
Receive sensitivity	-93dBm$\pm$2
Interface	GPIO/PWM/SPI/ADC/I2S
Operating temperature	-40℃～85 ℃
Storage environment	-40 ℃～125 ℃，< 90%RH
Power supply range	Voltage 2.7V～3.6V, current≥50mA
Power consumption	deep sleep mode：0.4uA
	Standby mode：2.51mA
	TX(PRBS9)@10dBm:6.36mA
	TX(CarrierData)@10dBm:20.54mA
Transmission distance	Open Line of Sight：80m～150m

2.ELECTRICAL PARAMETERS

Electrical characteristics

Absolute Maximum Rating

Any damage exceeding the following absolute maximum ratings may cause chip damage

Item	Min	Typical	Max	Unit
Power supply voltage	2.7	3.3	3.6	V
I/O voltage (VCCIO)	-0.3	-	3.6	V
Operating temperature	-40	-	+85	℃
Storage temperature	-40	-	+125	℃

Power consumption

Item	Typical	Unit
Transmit power（10dBm）	20.54	mA
Receive power	6.36	mA
Standby power consumption	2.51	mA
Light sleep	1.5	uA
Deep sleep	0.4	uA

RF Parameters

Transmit power

Item	Min	Typical	Max	Unit
Average power	-	9.5	10	dBm

Receive sensitivity

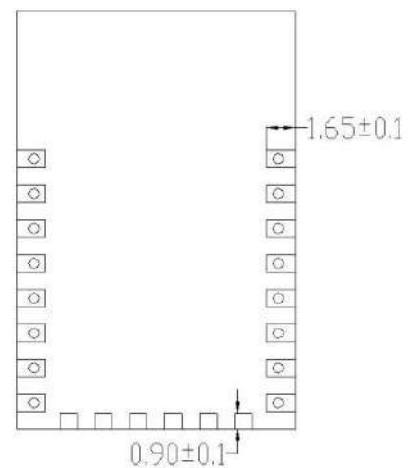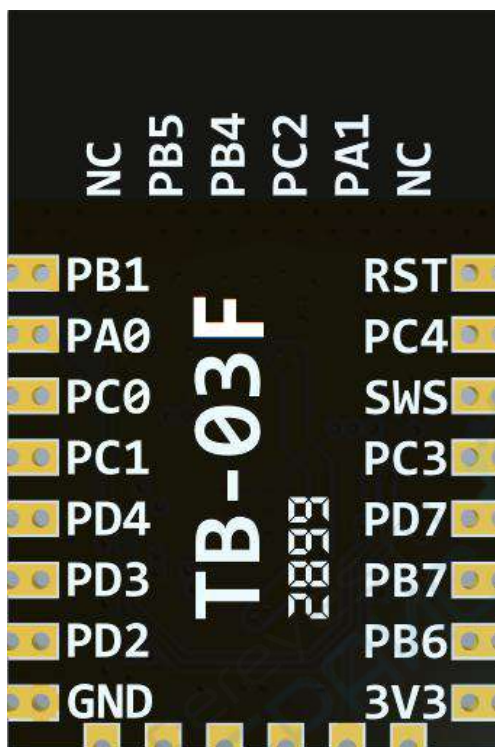| Item	Min	Typical	Max	Unit
Receive sensitivity	-94	-93	-	dBm

3.PHYSICAL DIMENSION
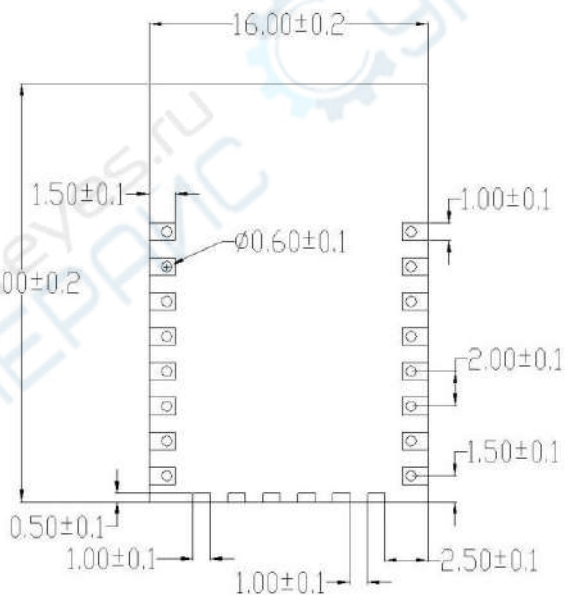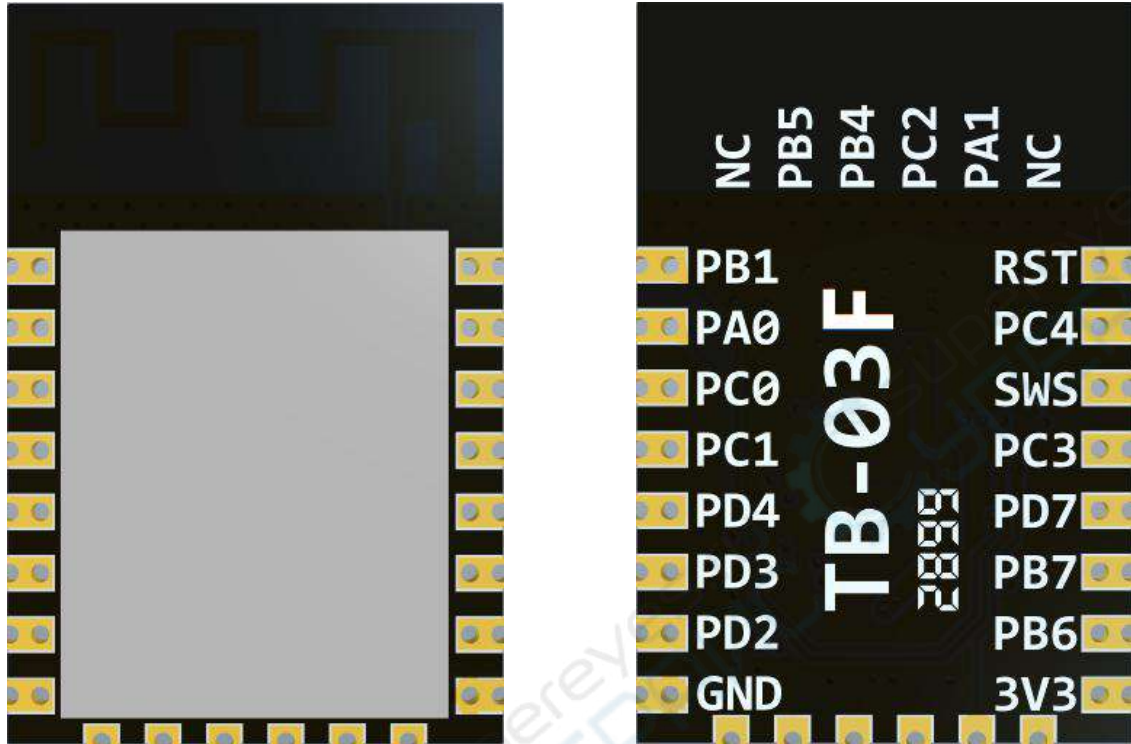
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4.PIN DEFINITION

The TB-03F module has a total of 22 interfaces. For example, the pin diagram, the pin function definition table is the interface definition.


TB-03F PIN diagram

PIN definition list

| No.	Name	Function description
1	RST	Reset active low
2	PC4	PWM2 output/UART_CTS/PWM0 Inverted output/SAR ADC input /GPIO PC4
3	SWS	Single line slave/UART_RTS/GPIO PA7
4	PC3	PWM1 output/UART_RX/I2C Serial clock/32kHz Crystal input (optional)/GPIO PC3
5	PD7	GPIO PD7/SPI clock（I2C_SCK）
6	PB7	SPI_DO Data output/UART_RX/SAR ADC input/GPIO PB7
7	PB6	SPI_DI data input（I2C_SDA）/UART_RTS/SAR ADC input/GPIO PB6

| 8	3V3	Power supply
9	NC	Blank
10	PA1	GPIO PA1/ I2S_clock
11	PC2	PWM0 output/I2C serial data/32kHz Crystal output (optional）/GPIO PC2
12	PB4	PWM4 output/SAR ADC input/GPIO PB4
13	PB5	PWM5 output/SAR ADC input/GPIO PB5
14	NC	Blank
15	GND	Ground
16	PD2	GPIO PD2/PWM3 output/SPI Chip selection (active low)/I2S_LR
17	PD3	GPIO PD3/PWM1 Inverted output/I2S_SDI
18	PD4	GPIO PD4/Single line host SWM/PWM2 Inverted output/I2S_SDO
19	PC1	I2C_CLK/PWM1 Inverted output/PWM0 output/GPIO PC1
20	PC0	I2C_SDA/PWM4 Inverted output/UART_RTS /GPIO PC0
21	PA0	UART_RX/GPIO PA0/PWM0 Inverted output
22	PB1	UART_TX/GPIO PB1/PWM4 output/SAR ADC input

5.SCHEMATIC
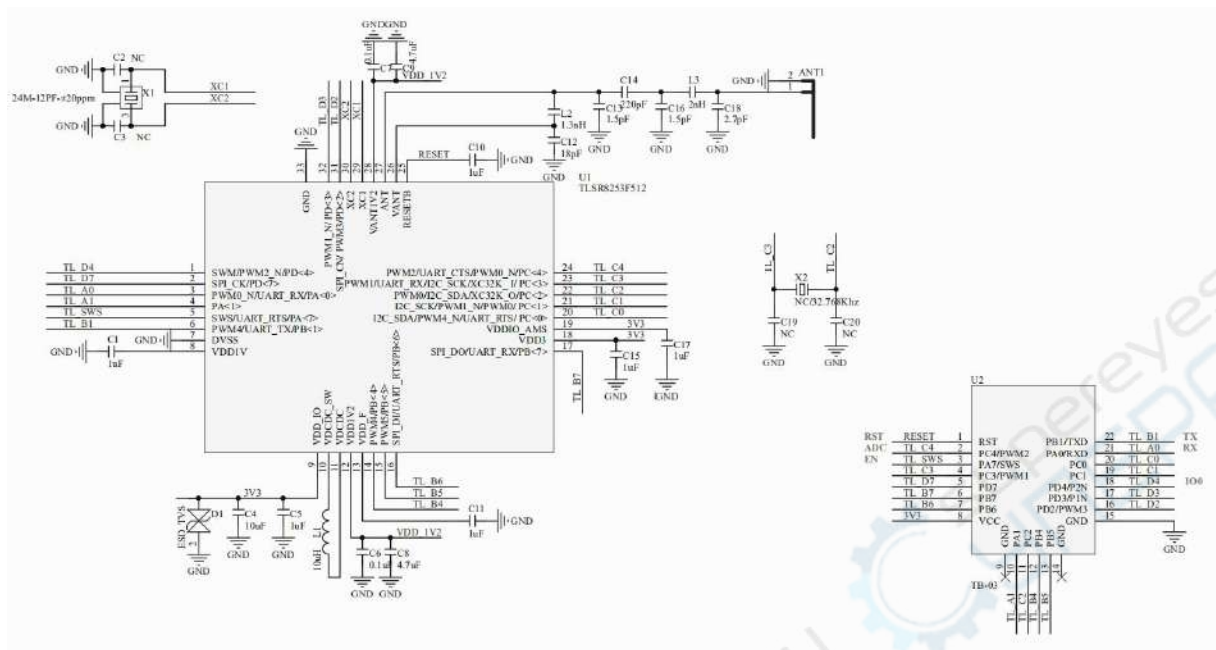
6.DESIGN GUIDE

1、Application circuit
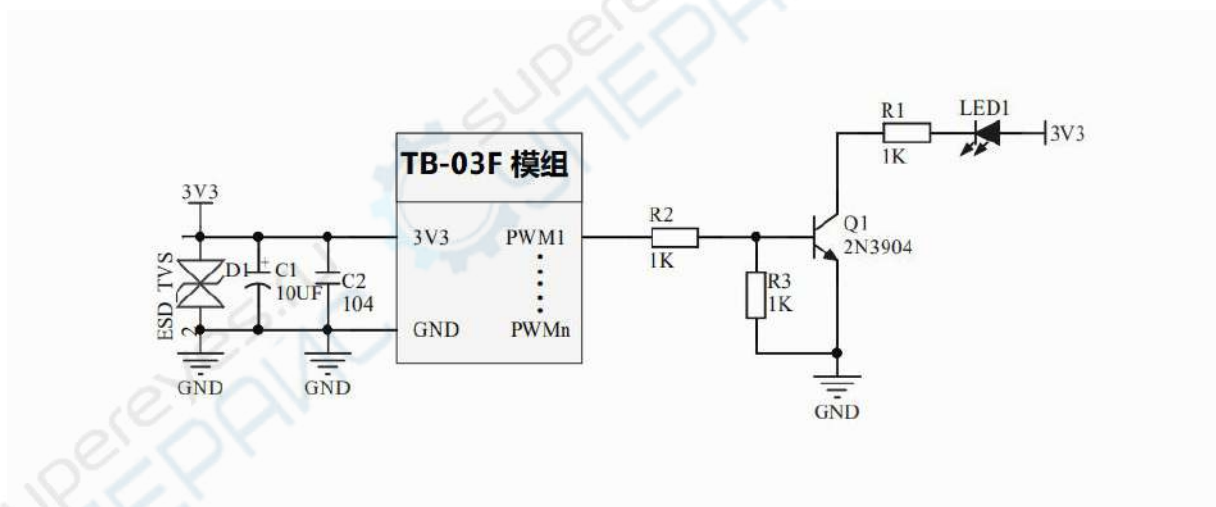
2、Recommended module package design size

Note: Below is the TB-03F module package diagram, it is recommended to design the PCB board according to this diagram, so that the module can work normally on the PCB board; and pay attention to the design of the pad, the design of the pads on the PCB can not be offset from the corresponding pads of the module, and the expansion of the PCB pads relative to the module pads does not affect the use of the module.
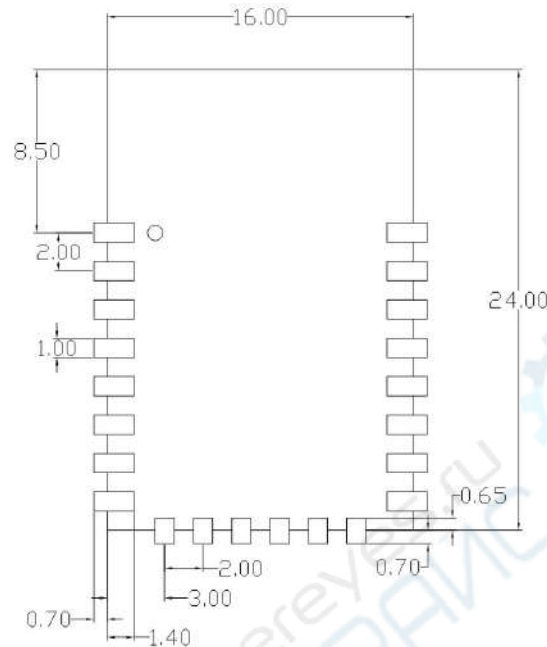

3、Antenna layout requirements

(1) For the installation position on the motherboard, the following two methods are recommended:

Solution 1: Place the module on the edge of the motherboard, and the antenna area extends beyond the edge of the motherboard.

Solution 2: Place the module on the edge of the motherboard, and the edge of the motherboard hollows out an area at the antenna position.

(2) In order to meet the performance of the on-board antenna, it is forbidden to place metal parts around the antenna and keep it away from high-frequency devices.

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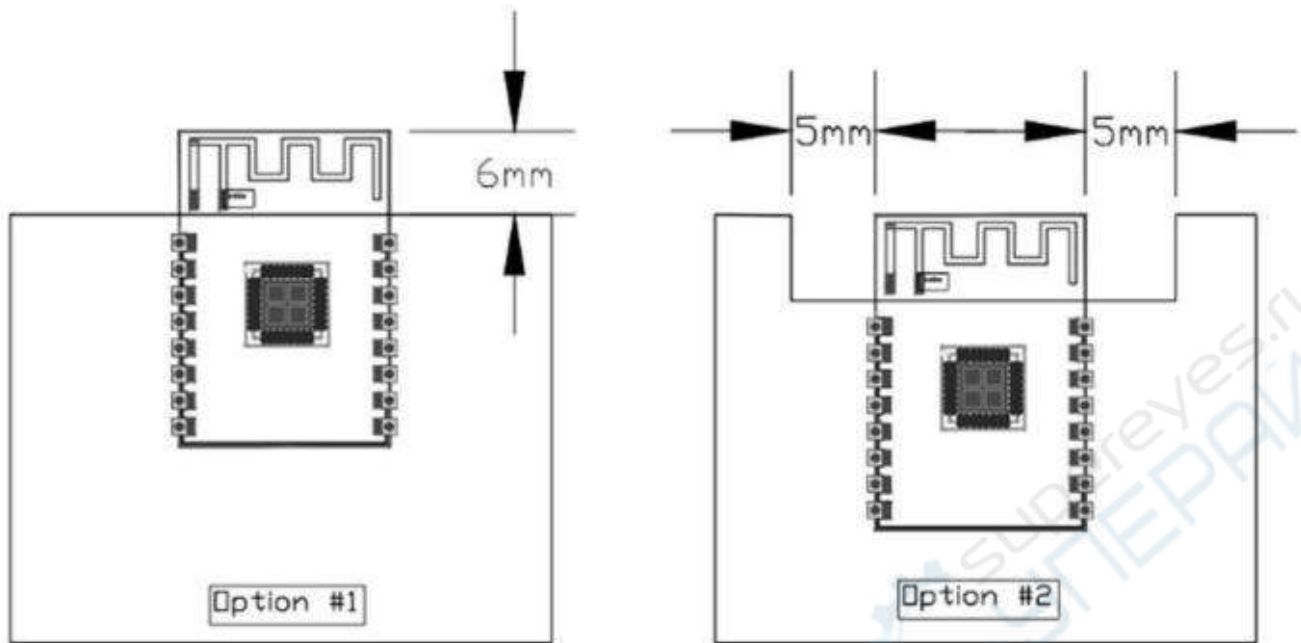
4、Power supply

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

(2) It is recommended to use LDO power supply; if DC-DC is used, it is recommended that the ripple be controlled 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.
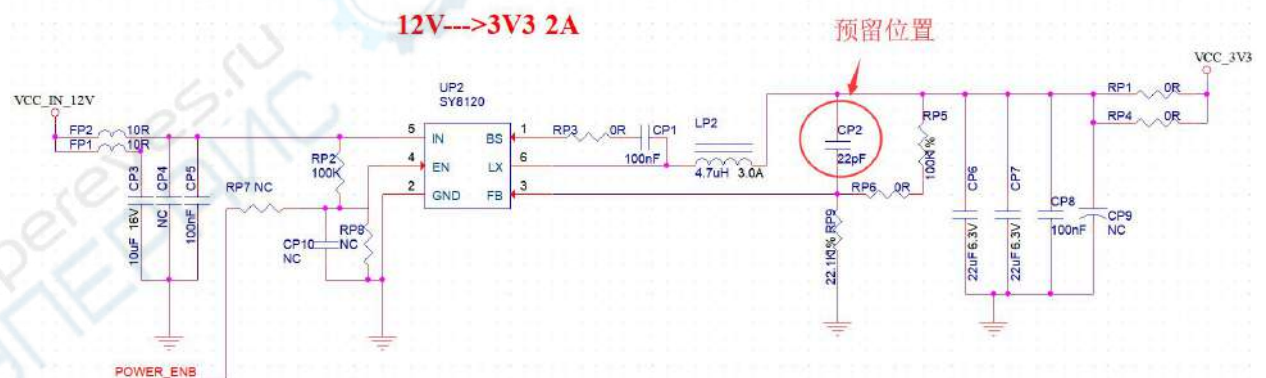
**5、Design description of PWM dimming scheme**

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

Connection diagram
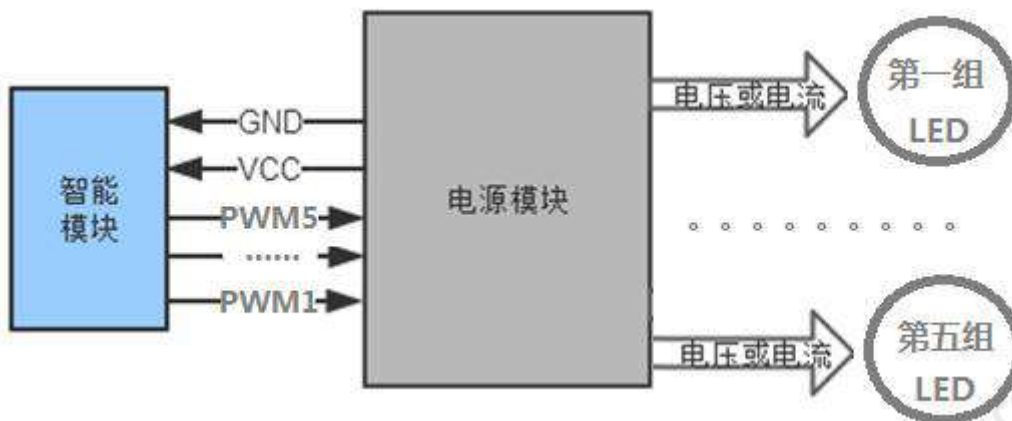
6、LED Drive Reference Design

TB-03F 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 pin , Q1 is MOS tube, WW is LED lamp bead, the other 4 road lamp driving circuit is the same as this road design method.
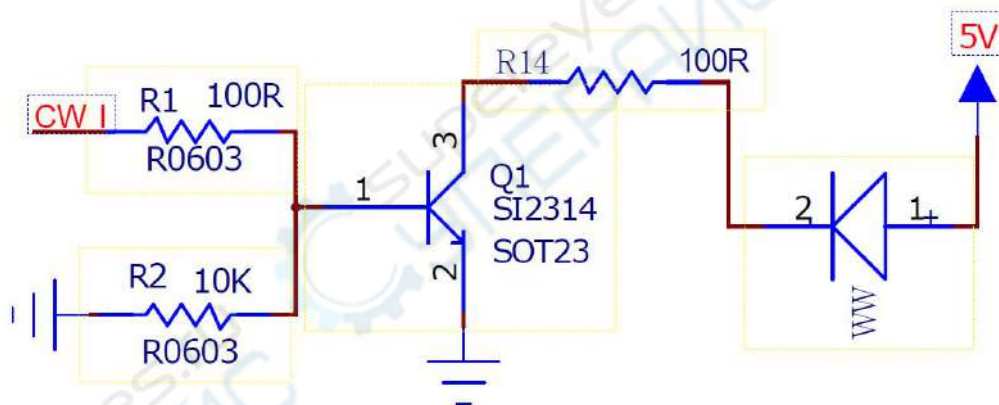
7、SECENDORY DEVELOPMENT

The TB-03F module supports users to write 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.

If you use Windows development, please refer to the original SDK provided by the chip manufacturer, download address:

http://wiki.telink-semi.cn

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7.REFLOW PROFILE
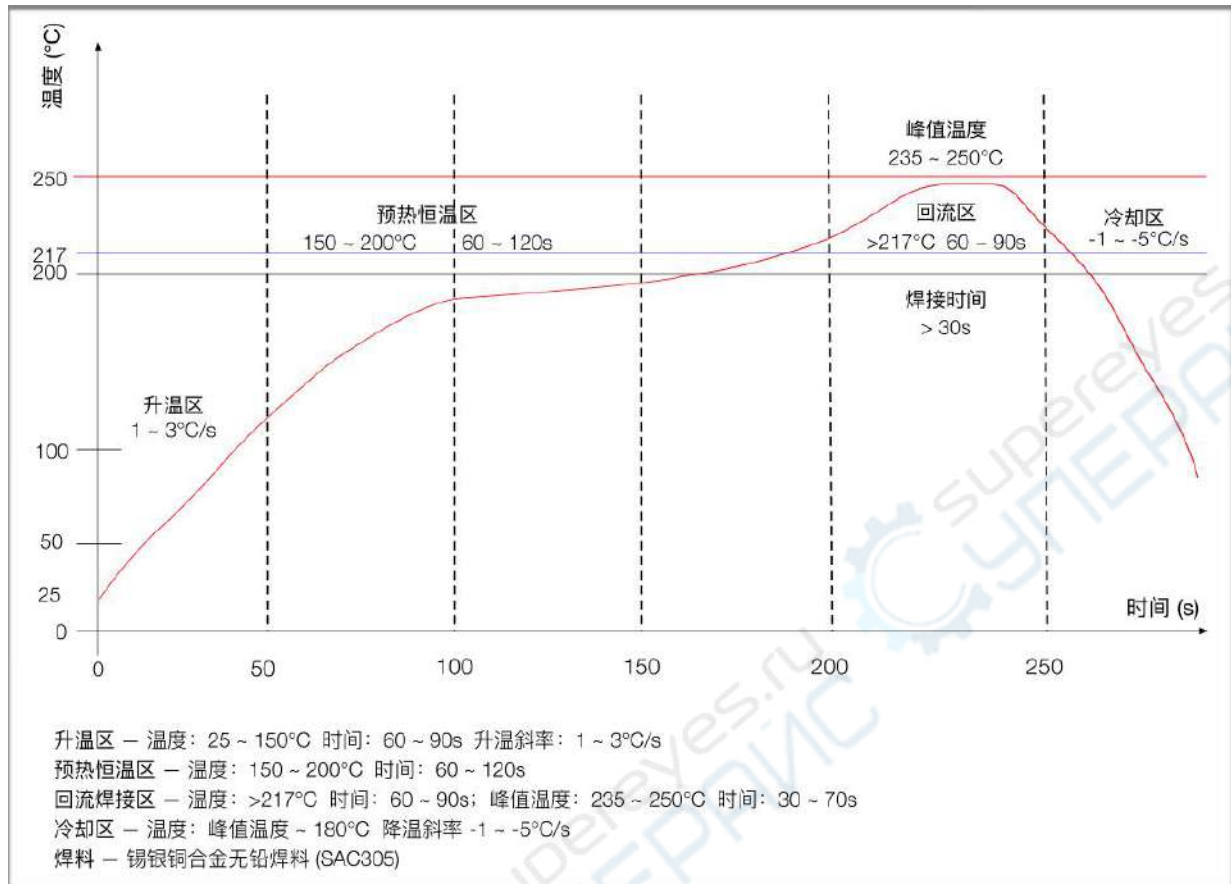
8.PACKAGING

As shown in the figure below, the packaging of TB-03F is taping packaging.

9.CONTACT US

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

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