



TB-02 Specification

Version V1.0

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Document development/revision/revocation resume

Version	Date	Revised content	Maker	Approve
V1.0	2019.11.25	First developed	Yiji Xie	

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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 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

Model Name	TB-02
Size	18.0*18.0*2.8(± 0.2)MM
Wireless Standard	Bluetooth V5.0
Frequency Range	2402 ~ 2480MHz
Max Sensitivity	-93.2dBm
Interface	GPIO/PWM/SPI/ADC
Work Temperature	-20℃ ~ 70 ℃
Store Temperature	-40 ℃ ~ 125 ℃ , < 90%RH
Voltage Range	Voltage 2.7V ~ 3.6V, Current ≥ 50 mA
Power	Deep Sleep Mode: 0.8uA
	Sleep Mode: 1.8uA
	TX: 12.62mA
Transmission distance	80m ~ 150m

2.SPECIFICATION

Electrical characteristics

Absolute Maximum Rating

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

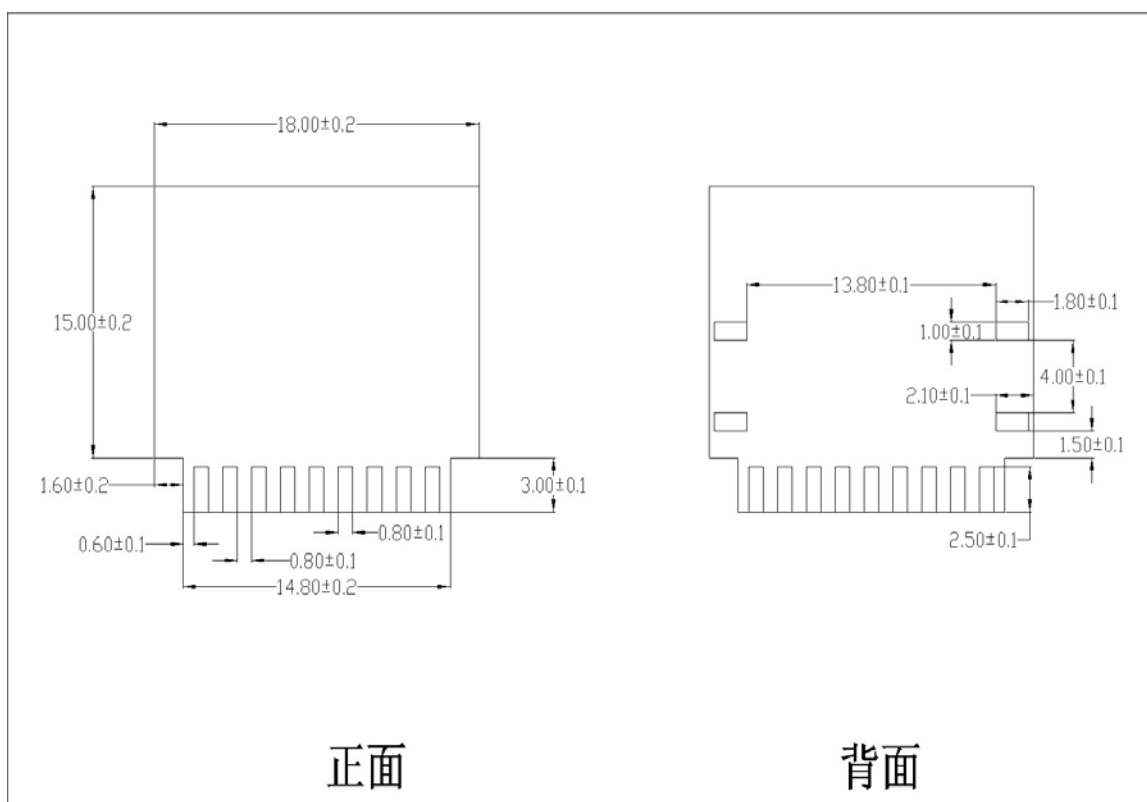
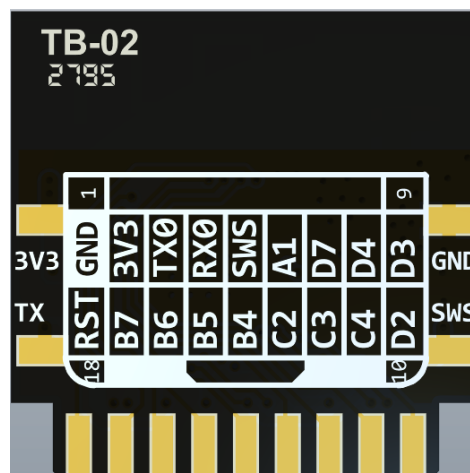
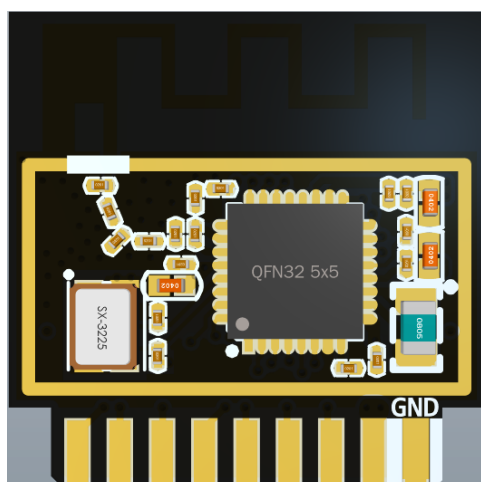
Item	Min	Typical	Max	Unit
Voltage	2.7	3.3	3.6	V
I/O Voltage (VCCIO)	-0.3	-	3.6	V
Work Temperature	-20	-	+70	°C
Store Temperature	-40	-	+125	°C

RF Specification

Sensitivity

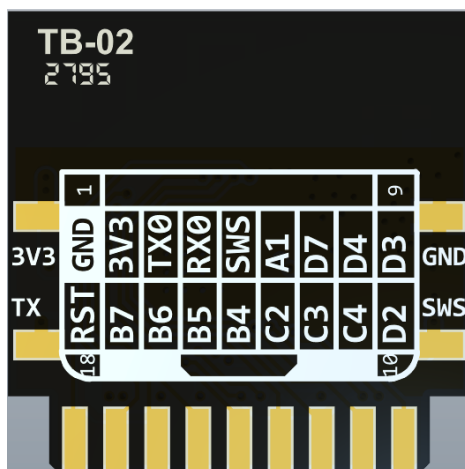
Item	Min	Typical	Max	Unit
Sensitivity	-92dBm	-91dBm	-90dBm	dBm

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.



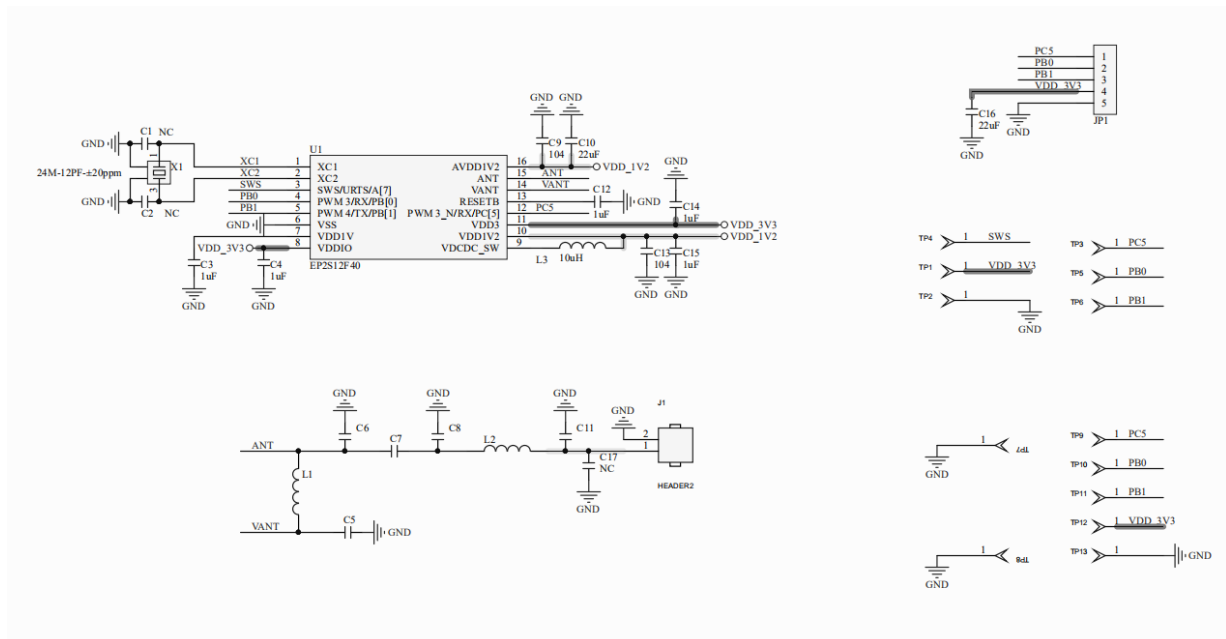
TB-02 Pin diagram

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

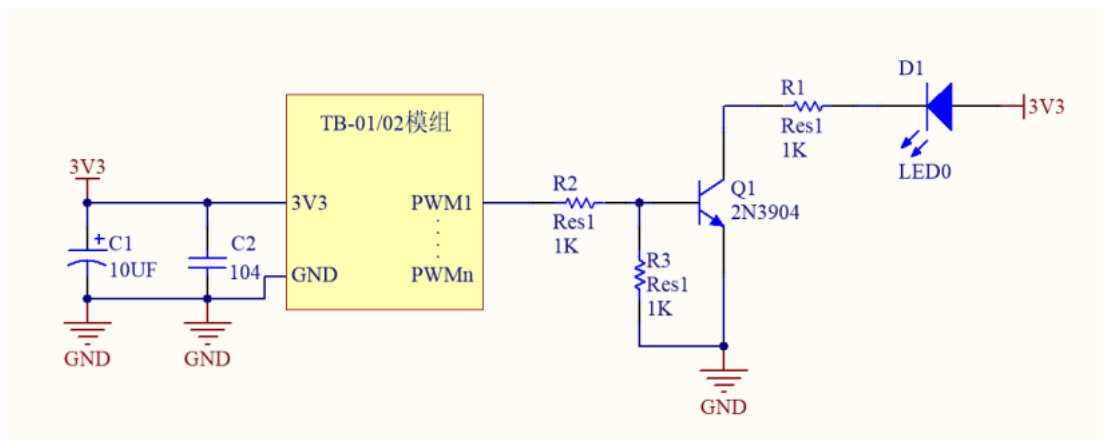
14	B4	PWM4 output/SAR ADC input/GPIO PB4
15	B5	PWM5 output/SAR ADC input/GPIO PB5
16	B6	SPI data input (I2C_SDA) /UART_RTS/SAR ADC input/GPIO PB6
17	B7	SPI data output/UART_RX/SAR ADC input/GPIO PB7
18	RST	RESET
19	3V3	Electricity supply
20	TX	UART_TX
21	GND	Ground
22	SWS	Single wire slave

5.SCHEMATIC



6.DESIGN GUIDE

1、Application circuit



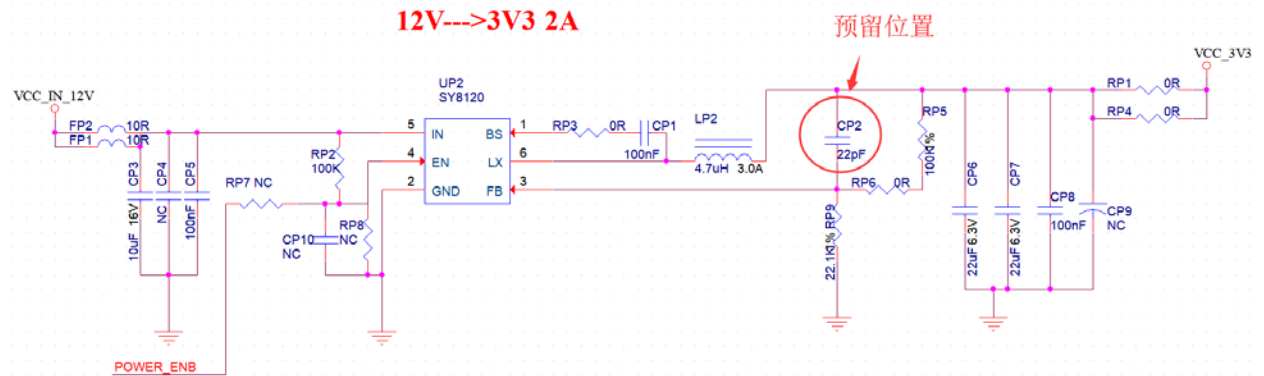
2、Antenna layout requirements

(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.

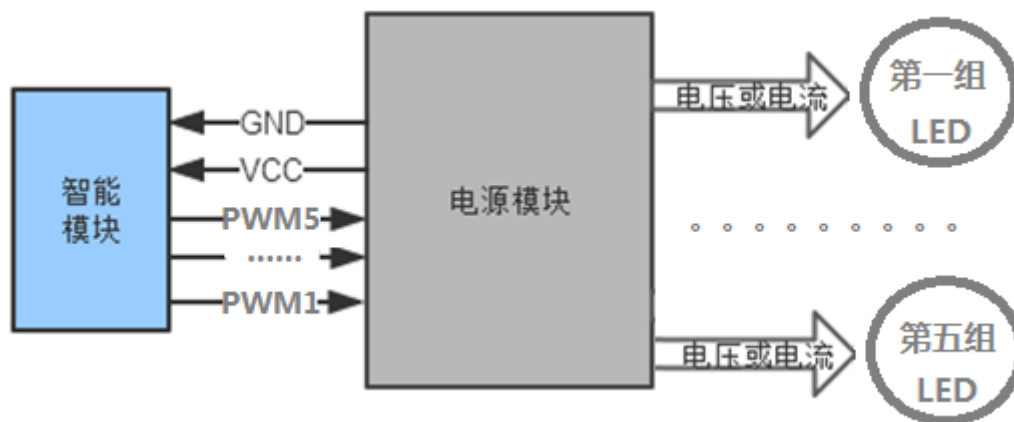
(4) 3.3V power interface is recommended to add ESD devices.



4、PWM Dimming Solution Design Instructions

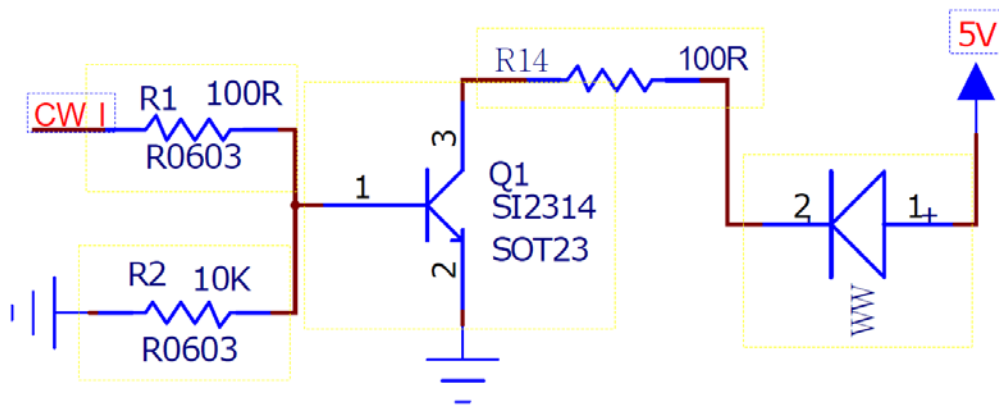
For lamps that require dimming, you only need to connect the PWM pins of the corresponding color to the control end of the subsequent stage drive circuit; the PWM independently outputs a 100-level adjustable digital signal, and the subsequent stage circuit can be voltage. The driving type may be a current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

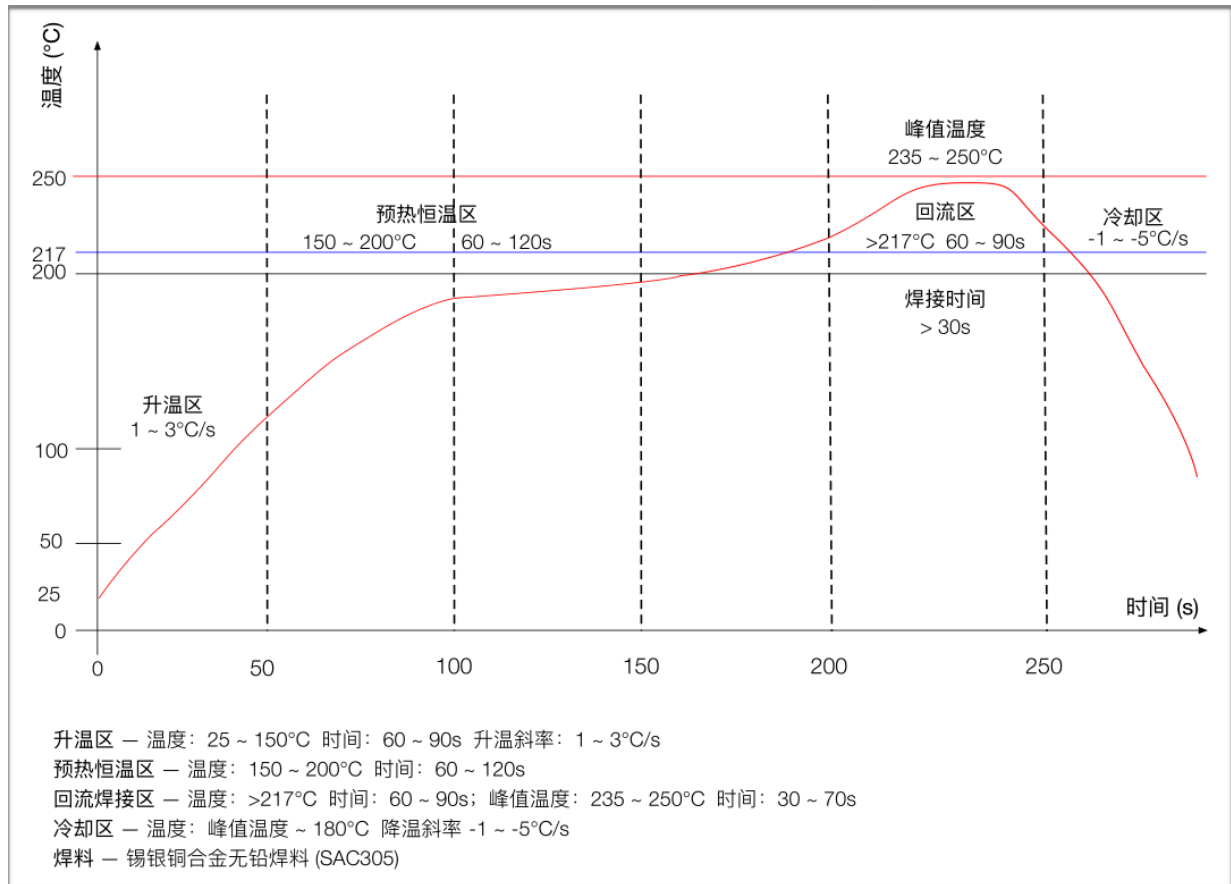
If you use a Linux machine to develop the firmware, you can refer to the SDK, documentation and source address of Anxin's collation:

https://github.com/Ai-Thinker-Open/Telink_825X_SDK.

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

Technical Support: support@aithinker.com

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

Tel: 0755-29162996



FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Integral antenna with antenna gain 2.0dBi

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

We will retain control over the final installation of the modular such that compliance of the end product is assured. In such cases, an operating condition on the limit modular approval for the module must be only approved for use when installed in devices produced by a specific manufacturer. If any hardware modify or RF control software modify will be made by host manufacturer, C2PC or new certificate should be apply to get approval, if those change and modification made by host manufacturer not expressly approved by the party responsible for compliance, then it is illegal.

FCC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device.

This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: "Contains Transmitter Module FCC ID:2ATPO-TB-02 Or Contains FCC ID:2ATPO-TB-02"

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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.

(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.

2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.

Any company of the host device which install this modular with limit modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C : 15.247 and 15.209 & 15.207, 15B Class B requirement, Only if the test result comply with FCC part 15C : 15.247 and 15.209 & 15.207, 15B Class B requirement, then the host can be sold legally.