Tuya Smart BLE Module

1. Product Overview

TYBT5 is a Bluetooth (BLE) module designed by Hangzhou Tuya Information Technology Co., Ltd. The BLE Module consists of a highly integrated wireless Bluetooth chipTLSR8267 and some extra electric circuits that have been programed with Bluetooth network protocol and plenty of software examples. TYBT5 include a 32-bit MCU, BLE，512K byte flash，16K byte SRAM and 9 multiplex IO pins. Users can customize their LED products by using these PWM signals.

1.1 Features

✧ Integrated low power consumption 32-bit MCU, also known as application processor
✧ Basic frequency of the CPU can support 48 MHz
✧ Supply voltage range: 1.9V to 3.6V
✧ Peripherals: 5*PWM,1*I2C, 1*UART
✧ BLE RF features:
- Compatible with BLE 4.2
- Transmitting data rate can go up to 2Mbps
- TX transmitting power: +6.46dBm
- RX receiving sensitivity: -92dBm
- AES hardware encryption
- On-board PCB antenna
- Operating temperature range: -40℃ to 105℃

1.2 Main Application Fields

✧   Intelligent LED
✧   Intelligent household applications
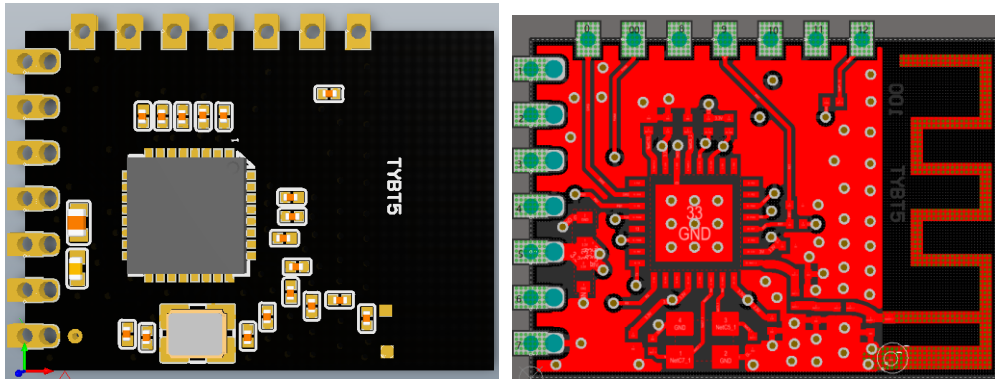✧   Intelligent low-power sensors

2. Dimensions and Footprint

2.1 Dimensions

TYBT5 have double sides of golden finger pins. The distance between each Pin is 2.0mm.

Size of TYBT5: 14.8mm(W)*20.4mm(L)*1.8mm(H).

Figure 2 shows the dimensions of TYBT5.

Figure 2. The dimensions of TYBT5

2.2 Pin Definition

Table 1 shows the general pin attributes of TYBT5

Table 1. The typical pin definition of TYBT5

PIN No.	NAME	I/O TYPE	DESCRIPTION
1	PWM1	I/O	PWM output pin, default for LED line
2	PWM0	I/O	PWM output pin, default for LED line
3	I2C_SDA	I/O	I2C, data interface
4	I2C_SCL	I/O	I2C, clock interface
5	3.3V	P	Supply voltage
6	PB1	I/O	PWM output pin, default for LED line
7	GND	P	Ground
0	SWS	I/O	Bluetooth chipset burning pin
00	PWM4	I/O	PWM output pin, default for LED line
8	RX	I/O	UART RX
9	RST	I	Reset pin for the module
10	3.3V	P	Supply voltage for the module
11	TX	I/O	UART TX
12	PWM5	I/O	PWM output pin, default for LED line

Note: P: Power supply pins; I/O: Digital input or output pins.

SWS is only for Bluetooth chipset burning.

If there's any customization needed for PWM output, please contact our BD manager.

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Table 2. Absolute Maximum Ratings

PARAMETERS	DESCRIPTION	MIN	MAX	UNIT
Ts	Storage temperature	-20	125	℃
VCC	Supply voltage	-0.3	3.9	V
Electrostatic release quantity (Human body model)	TAMB-25℃	-	2	KV
Electrostatic release quantity (Machine model)	TAMB-25℃	-	0.5	KV

3.2 Electrical Conditions

Table 3. Electrical Conditions

PARAMETERS	DESCRIPTION	MIN	TYPICAL	MAX	UNIT
Ta	Temperature for Commercial grade	-20	-	105	℃
VCC	Supply voltage	1.9	3.3	3.6	V
VIL	IO negative level input	-0.3	-	VCC*0.3	V
VIH	IO positive level input	VCC*0.7	-	VCC	V
VOL	IO negative level output	VSS	-	0.3	V
VoH	IO positive level output	VCC-0.3	-	VCC	V

3.3 Transmitting Current Consumptions

Table 4. TX current consumption

PARAMETERS	MODE	TYPICAL	UNIT
Itx	Continuously transmitting, 0dBm power output	15	mA
Irx	Continuously receiving	12	mA
IDC	Normal working mode	27	mA
Ideepsleep	Hibernation	18	uA

4. Radio Specification

4.1 Basic Radio Frequency Characteristics

Table 5. Basic Radio frequency characteristics

PARAMETERS	DESCRIPTION
Working Frequency	2402-2480MHz
Radio standard	BLE 4.2
Data transmitting rate	1Mbps
Type of Antenna	On-board PCB Antenna(default)

4.2 Transmitting Power

Table 6. Transmitting power

PARAMETERS	
RF output power	6.46dBm
20dB bandwidth （1M）	1300KHz

4.3 Receiving Sensitivity

Table 7. Receiving sensitivity

PARAMETERS		MIN	TYPICAL	MAX	UNIT
RX sensitivity	1Mbps	-93	-92	-90	dBm
	2Mbps	-90	-89	-86	dBm
Frequency bias error	1Mbps	-300	-	+300	KHz
	2Mbps	-200	-	+200	KHz
Co-channel interference Restrain	-	-	-7	-	dB

5. Antenna Information

5.1 Antenna Type

Antenna can be connected using On-board PCB antenna only.

5.2 Reduce Antenna Interference

In order to have the best RF performance, It's recommended to keep a minimum 15mm distance between the antenna part and the other metal pieces.

Since PCBA manufacture use SMT process to weld TYBT5 module and other electrical components onto the PCB board, RF performance will depend on the layout location and pattern of the On-board PCB antenna. The following figures are some recommended and dis-recommended demonstrations from out R&D team.

In demonstration 1 and 2 of figure 3, the on-board PCB antenna lays outside of the PCB frame directly or PCB frame. It's recommended to use layout pattern shown in demonstration 1 and 2. Either the on-board PCB antenna lays outside of the PCB frame directly or PCB frame carve out a certain area for the antenna. The overall PCBA performance for these two ways will be the same as testing the module independently.

Restricted due to some reason, if the on-board PCB antenna layout has to be inside the PCB frame, it's suggested to refer to demonstration 3. The antenna lays inside the PCB frame, but no copper or wire beneath the antenna. RF performance will have some loss, approximately 1~2 dBm.
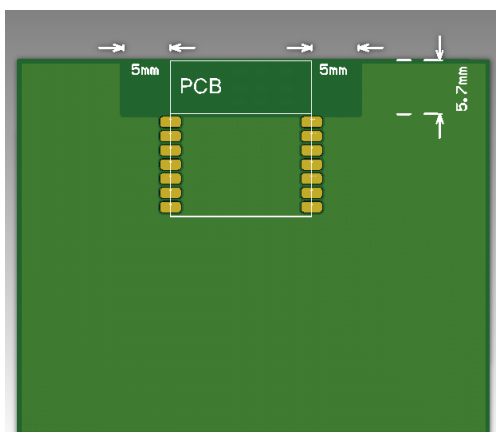
It's NOT recommended to use demonstration 4, the antenna lays inside the PCB frame, and there are copper and wire beneath it. RF performance will have significant attenuation.
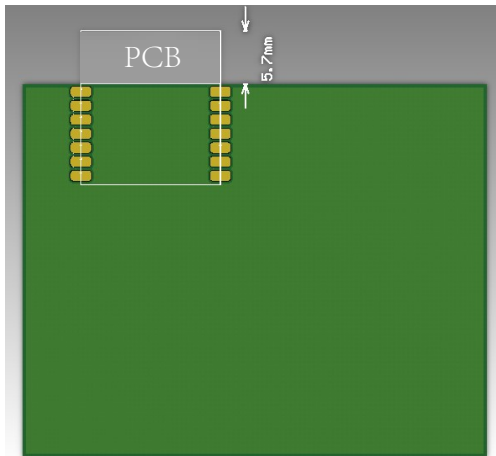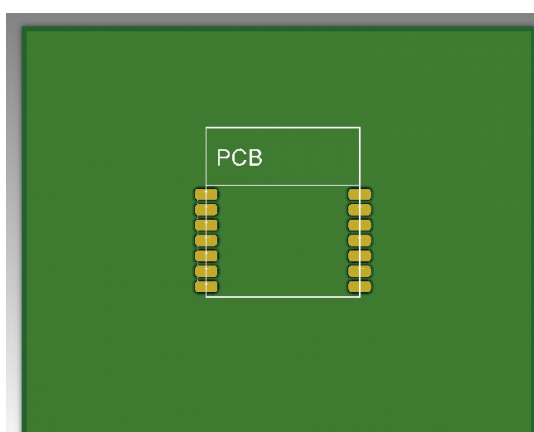

Demonstration 1: Antenna lay outside the PCB frame
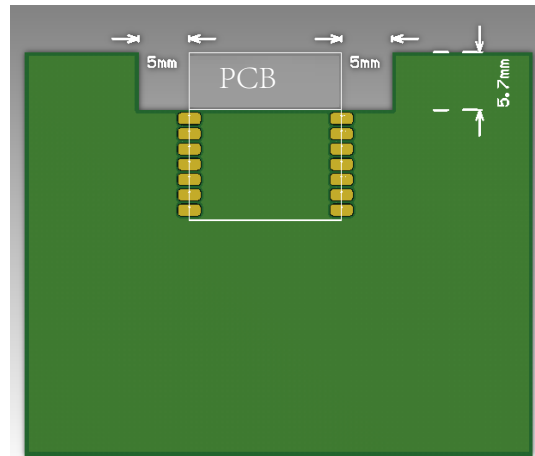
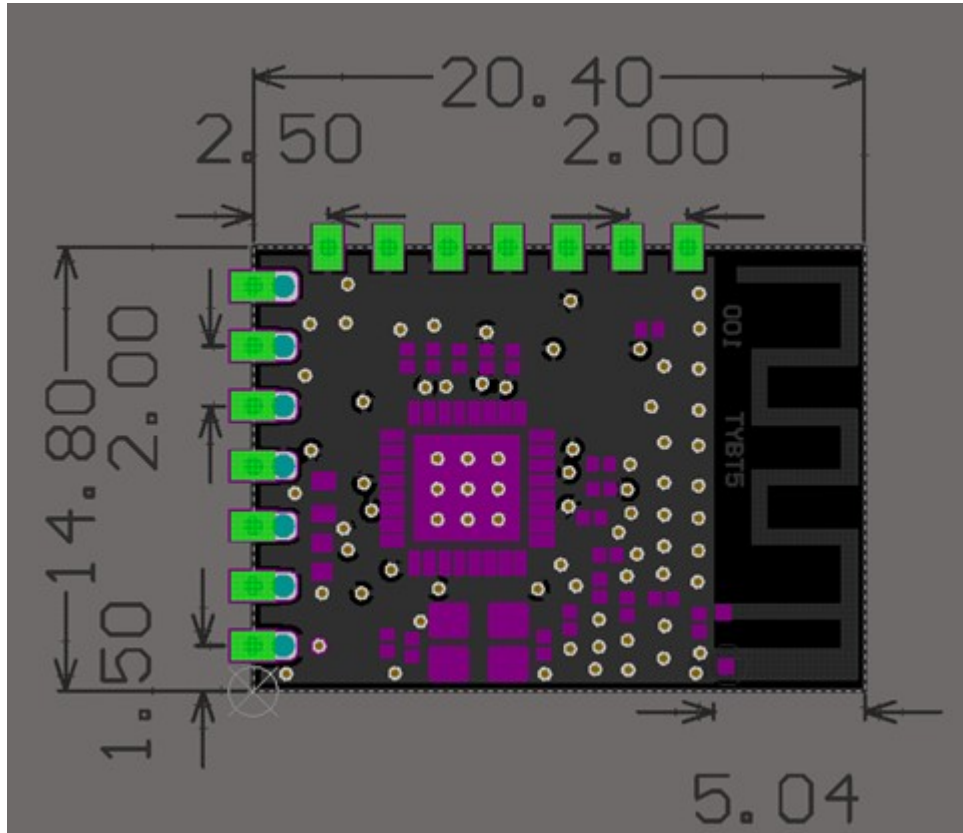Demonstration 2: Antenna lay outside the PCB frame with carved area

Demonstration 3: Antenna lay inside the PCB frame without copper or wire beneath it

Demonstration 4: Antenna lay inside the PCB frame with copper or wire beneath it

6. Packaging Information And Production Guide

6.1 Mechanical Dimensions

6.2 Production Guide

✦ The storage for the delivered module should meet the following condition:

1. The anti-moisture bag should be kept in the environment with temperature < 30℃ and humidity < 85% RH.

2. The expiration date is 6 months since the dry packaging products was sealed.

✦ Cautions:

1. All the operators should wear electrostatic ring in the whole process of production.

2. While operating, water and dirt should not have any contact with the modules.

FCC Statement:

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

FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment .This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

FCC Label Instructions:

The outside of final products that contains this module device must display a label

referring to the enclosed module. This exterior label can use wording such as: "Contains

Transmitter Module FCC ID: 2ANDL-TYBT5",or "Contains FCC ID: 2ANDL-TYBT5 ", Any similar wording that expresses the same meaning may be used.