

TuYa Smart BLE Module-TYBT2 Contents

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1. Product Overview

TYBT2 is a Bluetooth (BLE) module designed by Hangzhou Tuya Information Technology Co., Ltd. The BLE Module consists of a highly integrated wireless Bluetooth chip TLSR8266 and some extra electric circuits that have been programed with Bluetooth network protocol and plenty of software examples. TYBT2 include a 32-bit CPU, 512K byte flash, 16k SRAM, and 9 multiplex IO pins.

1.1 Features

Integrated low power consumption 32-bit CPU, also known as application processor

Basic frequency of the CPU can support 48 MHz

Supply voltage range: 1.9V to 3.6V

Peripherals: 5PWM,1I2C, 1*UART

BLE RF features:

- Compatible with BLE 4.0
- Transmitting data rate can go up to 1Mbps
- RX receiving sensitivity: -92dBm
- AES hardware encryption
- On-board PCB antenna/IPEX connector Antenna
- Operating temperature range: -20°C to 85°C

1.2 Main Application Fields

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

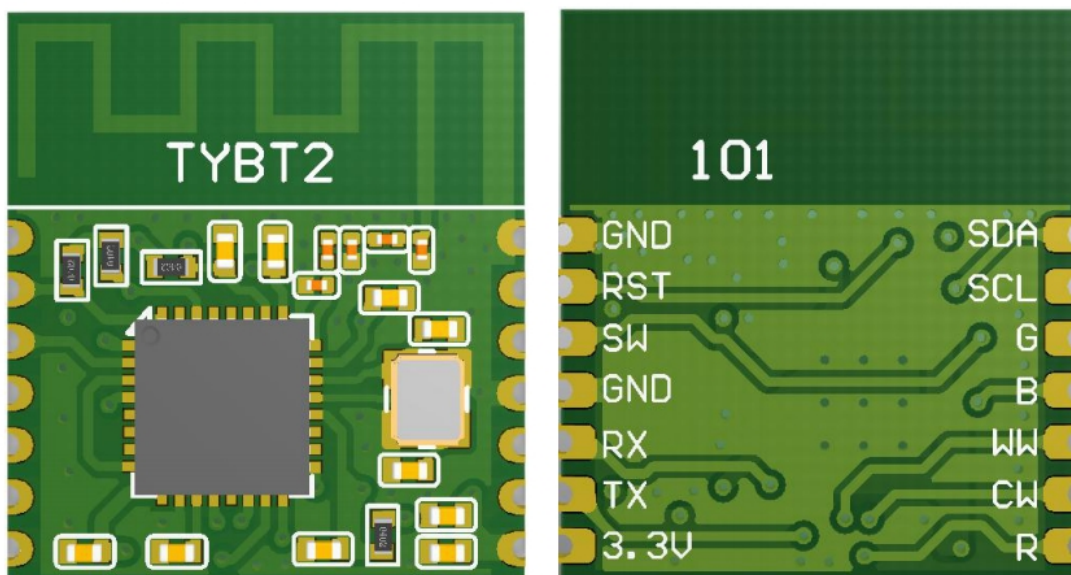
2. Dimensions and Footprint

2.1 Dimensions

TYBT2 have double sides of pins. The distance between each Pin is 2.0mm.

Size of TYBT2: 15mm(W)*16.5mm(L).

Figure 2 shows the dimensions of TYBT2.



2.2 Pin definition

Table 1. The typical pin definition of TYBT2

PIN NO.	NAME	TYPE	DESCRIPTION
1	SDA	I/O	I2C, data interface, internal pull-up 4.7k resistance
2	SCL	I/O	I2C, clock interface, internal pull-up 4.7k resistance
3	G	I/O	normal IO pin, can be used as PWM output pin, default for Green LED line
4	B	I/O	normal IO pin, can be used as PWM output pin, default for Blue LED line
5	WW	I/O	normal IO pin, can be used as PWM output pin, default for Warm White LED line
6	CW	I/O	normal IO pin, can be used as PWM output pin, default for Cold White LED line
7	R	I/O	normal IO pin, can be used as PWM output pin, default for Red LED line
8	3.3V	P	Supply voltage
9	TX	I/O	UART TX,can be used as normal IO pin
10	RX	I/O	UART RX,can be used as normal IO pin
11	GND	P	Ground
12	SW	I/O	Bluetooth chipset burning pin
13	RST	I	reset pin for the module,internal pull-up 4.7k
14	GND	P	Ground

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

SW pin is ONLY used for burning firmware, Can NOT be used for other functions.

While Pin4 and Pin12 are used for I2C functions, external 4.7k pull-up resistances are necessary.

When WW pin is outputting PWM signal, It has opposite phase comparing the PWM signal from R/G/B/CW pin.

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	DESCRIPTI ON	MIN	MAX	UNIT
Ts	Storage temperature	-20	85	°C
VCC	Supply voltage	-0.3	3.9	V
Electrostatic release quantity (Human body model)	TAMB-25°C	-	2	KV
Electrostatic release quantity (Machine model)	TAMB-25°C	-	0.5	KV

3.2 Electrical Conditions

Table 3. Electrical Conditions

Paramet ers	Description	Min	Typ	Max	Unit
Ta	Temperature for Commercial grade	-20	-	85	°C
VCC	Supply voltage	2.5	3.3	3.6	V
VIL	IO negative level input	-0.3	-	VCC*0.25	V
VIH	IO positive level input	VCC*0.75	-	VCC	V
VOL	IO negative level output	-	-	VCC*0.1	V
VoH	IO positive level	VCC*0.8	-	VCC	V

	output				
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3.3 Transmitting Current Consumptions

Table 4. TX current consumption

PARAMETERS	MODE	TYPICAL	UNIT
Irx	Continuously receiving	13	mA
IDC	Normal working mode	80	uA

4. Radio Specification

4.1 Basic Radio Frequency Characteristics

Table 5. Basic Radio frequency characteristics

Parameter	Description
Working Frequency	2.4GHz ISM band
Radio standard	BLE 4.0
Data transmitting rate	1Mbps
Type of Antenna	On-board PCB Antenna and IPEX connector Antenna

4.2 Transmitting Power

Table 6. Transmitting power

PARAMETERS	MIN	TYPICAL	MAX	UNIT
RF output power consumption	-	6.45	-	dBm
20dB bandwidth	-	1000	-	KHz

4.3 Receiving Sensitivity

Table 7. Receiving sensitivity

Parameter		Min	Typ	Max	Unit
RX sensitivity	1Mbps	-93	-92	-90	dBm
Frequency bias error	-	-300	-	300	KHz
Co-channel interference Restrain	-	-	-7	-	dB

5. Antenna Information

5.1 Antenna type

Antenna for TYBT2 module is using On-board PCB antenna

Antenan for TYBT2-IPEX module is using IPEX connector Antenna

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.

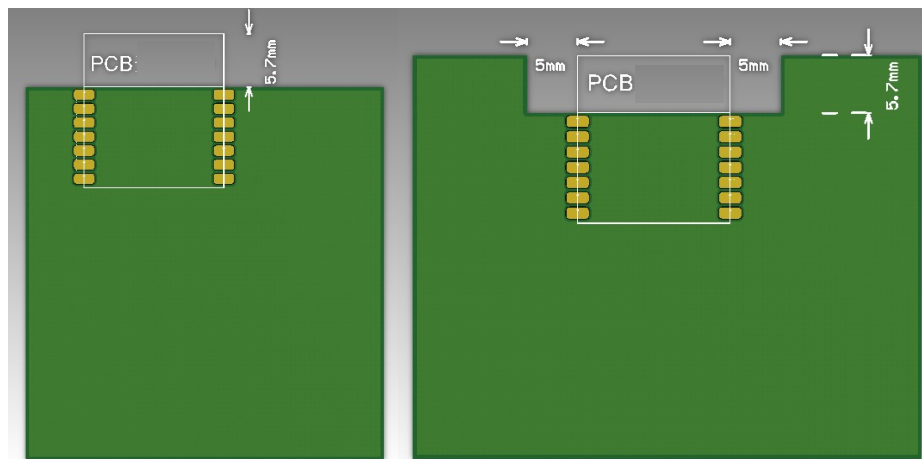
Since PCBA manufacture use SMT process to weld TYBT2 module and other electrical components onto the PCB board, RF performance will depend on the layout location and pattern of the On-board PCB antenna. The following figures are some recommended and dis-recommended demonstrations from our R&D team.

In demonstration 1 and 2 of figure 3, the on-board PCB antenna lays outside of the 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.

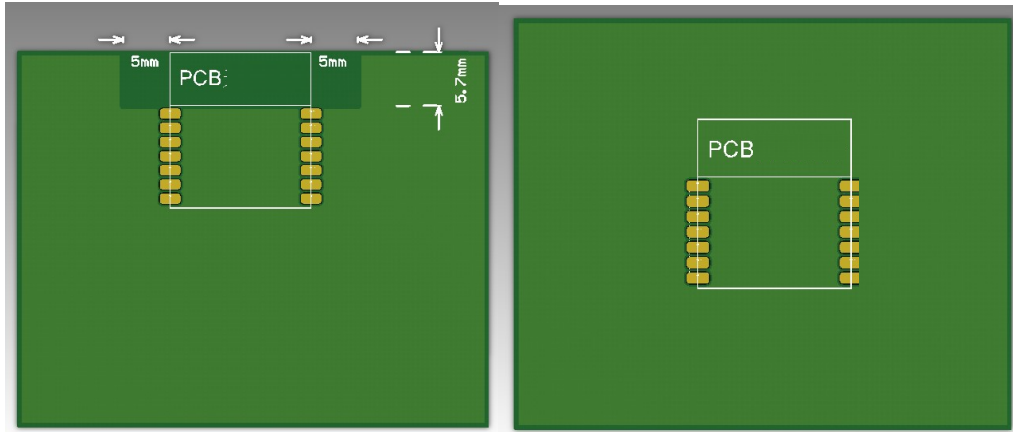
It's NOT recommended to use demonstration 4, the antenna lays inside the PCB frame, and there are copper and wire beneath it. RF performance will have significant attenuation.

Figure 3. layout demonstrations



Demonstration 1: Antenna lay outside the PCB frame

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



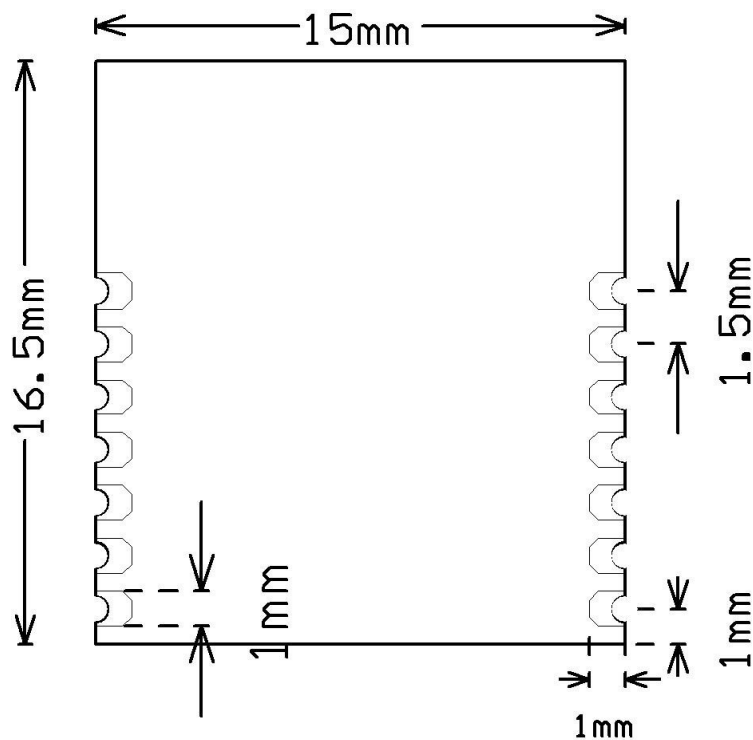
Demonstration 3: Antenna lay inside the PCB frame without copper or wire beneath it

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

6. Packaging information and production guide

6.1 Mechanical dimensions

Figure 4 Dimensions of the module



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 $< 30^{\circ}\text{C}$ and humidity $< 85\% \text{ RH}$.

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.

Regulatory Module Integration Instructions

This device complies with part 15.247 of the FCC Rules.

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The antenna is PCB Antenna and IPEX antenna ,maximum gain is 2.0dBi .

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

The host product with the module installed must be evaluated for simultaneous transmission requirements.

The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, use this module only with the included onboard antenna.

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

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: 2ANDLTYBT2",or "Contains

FCC ID: 2ANDLTYBT2", Any similar wording that expresses the same meaning may be used.