BT2S Module Datasheet

Device Development > Module > Bluetooth Module

Version: 20200420

Contents

1 Product Overview

BT2S is an embedded Bluetooth low energy (BLE) module that Tuya has developed. It consists of a highly integrated Bluetooth chip (TLSR8250F512ET32) and several peripheral components, with an embedded Bluetooth network protocol stack and robust library functions. BT2S also contains a low-power 32-bit multipoint control unit (MCU), BLE 5.0 component, 2.4 GHz radio component, 4 Mbits flash memory, 48 KB static random-access memory (SRAM).

1.1 Features

- Embedded low-power 32-bit MCU, which can also function as an application processor - Dominant frequency: 48 MHz
- Working voltage: 1.8 V to 3.6 V (Under 1.8 V to 2.7 V, the module can start but the RF performance is not guaranteed. Under 2.8 V to 3.6 V, the module performance is normal.)
- Peripherals: 5×GPIOs, 1×UART, 1×ADC
- BLE RF features

    - Compatible with BLE 5.0
    - Up to 2 Mbit/s RF data rate
    - TX power: +10 dBm
    - RX sensitivity: –94 dBm at BLE 1 Mbit/s
    - Embedded advanced encryption standard (AES) hardware encryption
    - Working temperature: –20°C to +85°C

1.2 Applications

- Smart LED lights
- Smart households
- Smart low-power sensors

2 Change History

Date	Change Description	Version After Change
2020/04,	This is the first release.	V1.0.0

3 Module Interfaces

3.1 Dimensions and Footprint

BT2S has two rows of pins with a 2 mm pin spacing. The BT2S dimensions are 15±0.35mm (W)×18±0.35mm (L) ×2.9±0.15mm(H),The PCB thickness is 0.8±0.1 mm. The BT2S pins show as below
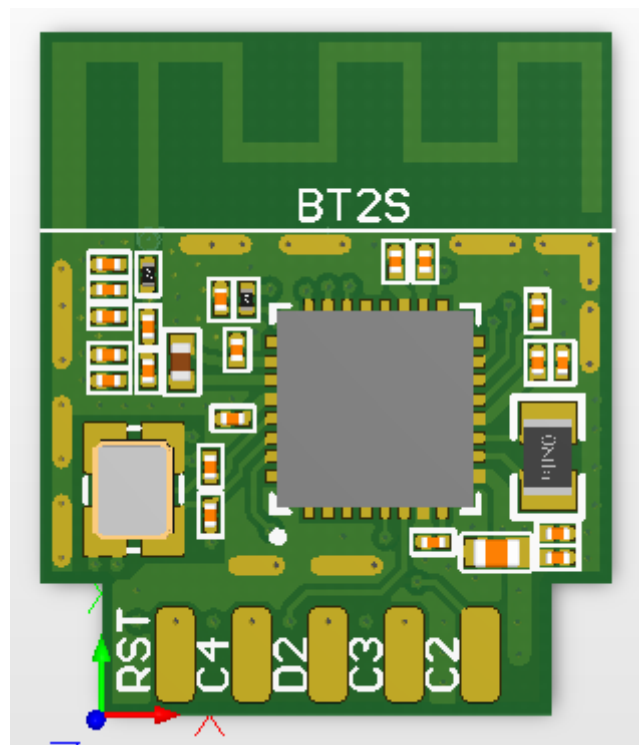
Figure 1: BT2S 正面图.png
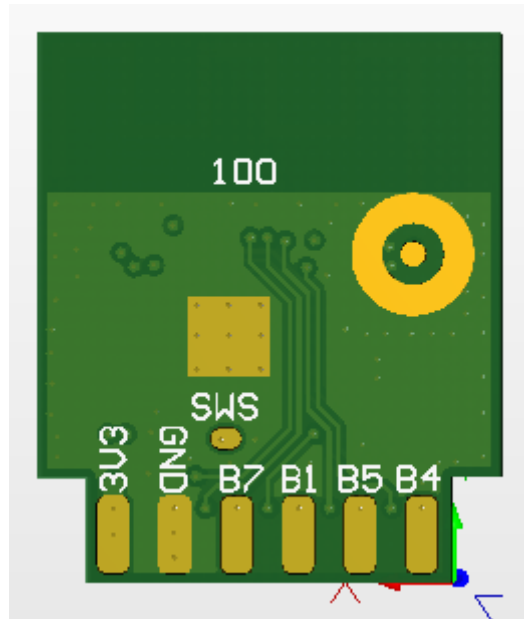
Figure 2: BT2S 反面图.png

3.2 Interface Pin Definition

Pin No.	Symbol	I/O Type	Function
1	3V3	P	Power supply pin
2	C2	I/O	Common I/O, which can be used as a PWM output of the LED drive and is connected to pin PC2 on the IC
3	GND	P	Power supply reference ground pin

Pin No.	Symbol	I/O Type	Function
4	C3	I/O	Common I/O, which can be used as a PWM output of the LED drive and is connected to pin PC3 on the IC
5	B7	I/O	UART_RX and is connected to pin PB7 on the IC
6	D2	I/O	Common I/O, which can be used as a PWM output of the LED drive and is connected to pin PD2 on the IC
7	B1	I/O	UART_TX and is connected to pin PB1 on the IC
8	C4	I/O	SAR ADC Input, and is connected to pin PC4 on the IC
9	B5	I/O	Common I/O, which can be used as a PWM output of the LED drive and is connected to pin PB5 on the IC
10	RST	1/O	Reset,and is connected to pin 25 on the IC

Pin No.	Symbol	I/O Type	Function
11	B4	I/O	Common I/O, which can be used as a PWM output of the LED drive and is connected to pin PB4 on the IC

Note: 1. P indicates power supply pins, I/O indicates input/output pins, and AI indicates analog input pins. 2. If you have special requirements for light colors controlled by PWM outputs, contact Tuya business personnel.

4 Electrical Parameters

4.1 Absolute Electrical Parameters

Parameter	Description	Minimum Value	Maximum Value	Unit
Ts	Storage temperature	-65	150	℃
VCC	Power supply voltage	-0.3	3.9	V
Static electricity voltage (human body model)	TAMB-25℃	-	2	KV
Static electricity voltage (machine model)	TAMB-25℃	-	0.5	KV

4.2 Electrical Conditions

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
Ta	Working temperature	-20	-	85	℃
VCC	Working voltage	1.8	3.3	3.6	V
VIL	I/O low-level input	VSS	-	VCC*0.3	V

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
VIH	I/O high-level input	VCC*0.7	-	VCC	V
VOL	I/O low-level output	VSS	-	VCC*0.1	V
VOH	I/O high-level output	VCC*0.9	-	VCC	V

4.3 Working Current

Symbol	Condition	Minimum Value(Typical)	Unit
Itx	Constant transmission, 10dBm output power	23.5	mA
Irx	Constant receiving	6.5	mA
IDC	Connected to a mesh network(Average)	6.59	mA
IDC	Connected to a mesh network(Peak)	24.9	mA
Ideepsleep1	Deep sleep mode 1 (16 KB RAM is reserved.)	1.2	uA

Symbol	Condition	Minimum Value(Typical)	Unit
Ideepsleep2	Deep sleep mode 2 (No RAM is reserved.)	0.4	uA

5 RF Features

5.1 Basic RF Features

Parameter	Description
Frequency band	2.4GHz ISM band
Wireless standard	BLE 4.2/5.0
Data transmission rate	1Mbps，2Mbps
Antenna type	Onboard PCB antenna

5.2 RF Output Power

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Average RF output power	-21	10	11.5	dBm
20 dB modulation signal bandwidth (1 Mbit/s)	-	2500	-	KHz
20 dB modulation signal bandwidth (2 Mbit/s)	-	1400	-	KHz

5.3 RF RX Sensitivity

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
RX sensitivity 1Mbps	-	-94	-	dBm
RX sensitivity 2Mbps	-	-91	-	dBm
Frequency offset 1Mbps	-250	-	+300	KHz
Frequency offset 2Mbps	-300	-	+200	KHz
Co-channel interference suppression	-	-10	-	dB

6 Antenna Information

6.1 Antenna Type

BT2S uses an onboard PCB antenna.

6.2 Antenna Interference Reduction

To ensure optimal RF performance, it is recommended that the antenna be at least 15 mm away from other metal parts. If metal materials are wrapped around the antenna, the wireless signals will be reduced greatly, deteriorating the RF performance. Because BT2S is inserted to the PCB, sufficient space needs to be reserved for the antenna.

7 Packaging Information and Production Instructions
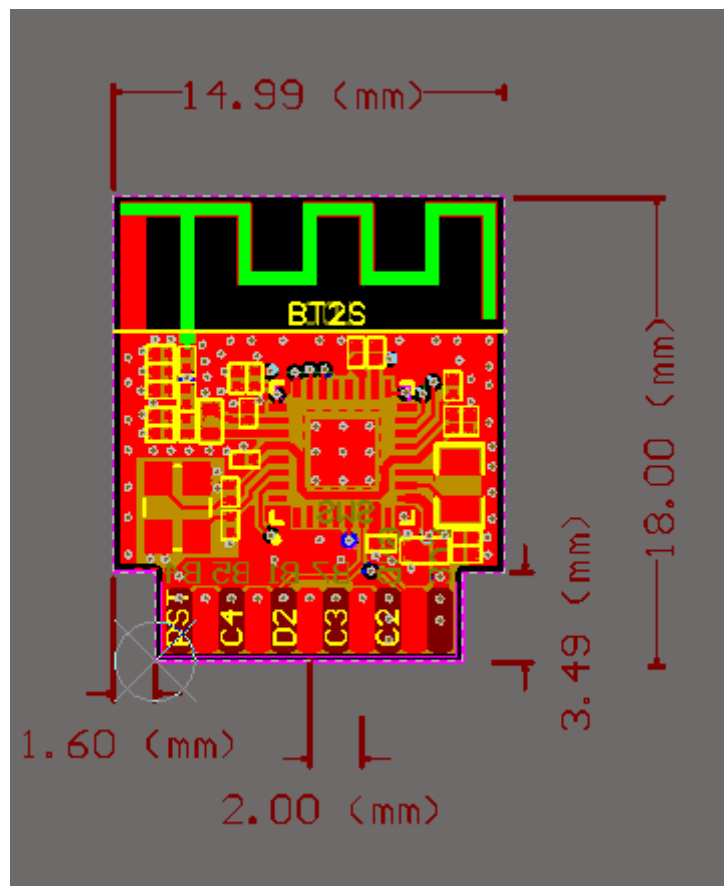
7.1 Mechanical Dimensions

Figure 3: BT2S 尺寸图.png

Note: The default dimensional tolerance is ±0.35 mm, and the tolerance for some measurements is ±0.1 mm. If a customer has other requirements, clearly specify them in the datasheet after communication.

7.2 Production Instructions

1. Use an SMT placement machine to mount components to the stamp hole module that Tuya produces within 24 hours after the module is unpacked and the

firmware is burned. If not, vacuum pack the module again. Bake the module before mounting components to the module.

A. SMT placement equipment

   a) Reflow soldering machine
   b) Automated optical inspection (AOI) equipment
   c) Nozzle with a 6 mm to 8 mm diameter
      B. Baking equipment
   d) Cabinet oven

   e) Anti-static heat-resistant trays
   f) Anti-static heat-resistant gloves

2. Storage conditions for a delivered module are as follows:

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1  A. The moisture-proof bag is placed in an environment where the
      temperature is below 30°C and the relative humidity is lower
      than 70%.
2  B. The shelf life of a dry-packaged product is six months from the
      date when the product is packaged and sealed.
3  C. The package contains a humidity indicator card (HIC).
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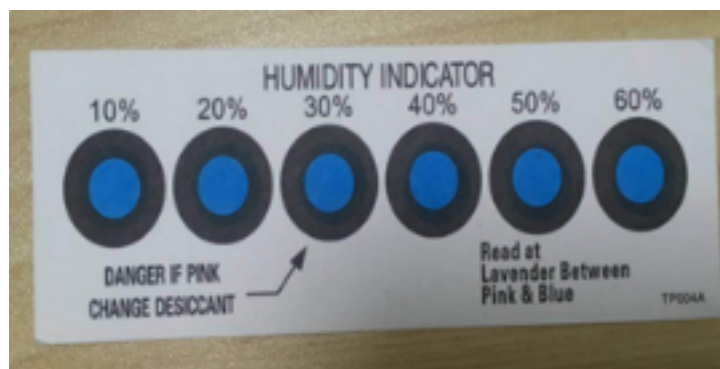

Figure 4: image.png

3. Bake a module based on HIC status as follows when you unpack the module package

A. If the 30%, 40%, and 50% circles are blue, bake the module for 2 consecutive hours.
B. If the 30% circle is pink, bake the module for 4 consecutive hours.
C. If the 30% and 40% circles are pink, bake the module for 6 consecutive

hours.

D. If the 30%, 40%, and 50% circles are pink, bake the module for 12 consecutive hours.

4. Baking settings:
   A. Baking temperature: 125±5°C
   B. Alarm temperature: 130°C
   C. SMT placement ready temperature after natural cooling: < 36°C
   D. Number of drying times: 1
   E. Rebaking condition: The module is not soldered within 12 hours after baking.

5. Do not use SMT to process modules that have unpacked for over three months. Electroless nickel immersion gold (ENIG) is used for the PCBs. If the solder pads are exposed to the air for over three months, they will be oxidized severely and dry joints or solder skips may occur. Tuya is not liable for such problems and consequences.

6. Before SMT placement, take electrostatic discharge (ESD) protective measures.

7. To reduce the reflow defect rate, draw 10% of the products for visual inspection and AOI before first SMT placement to determine a proper oven temperature and component placement method. Draw 5 to 10 modules every hour from subsequent batches for visual inspection and AOI.

7.3 Recommended Oven Temperature Curve

Please refer to the recommended temperature of wave soldering furnace for setting the furnace temperature. The peak temperature is 260℃±5℃. The curve of wave soldering temperature is shown in the following figure:
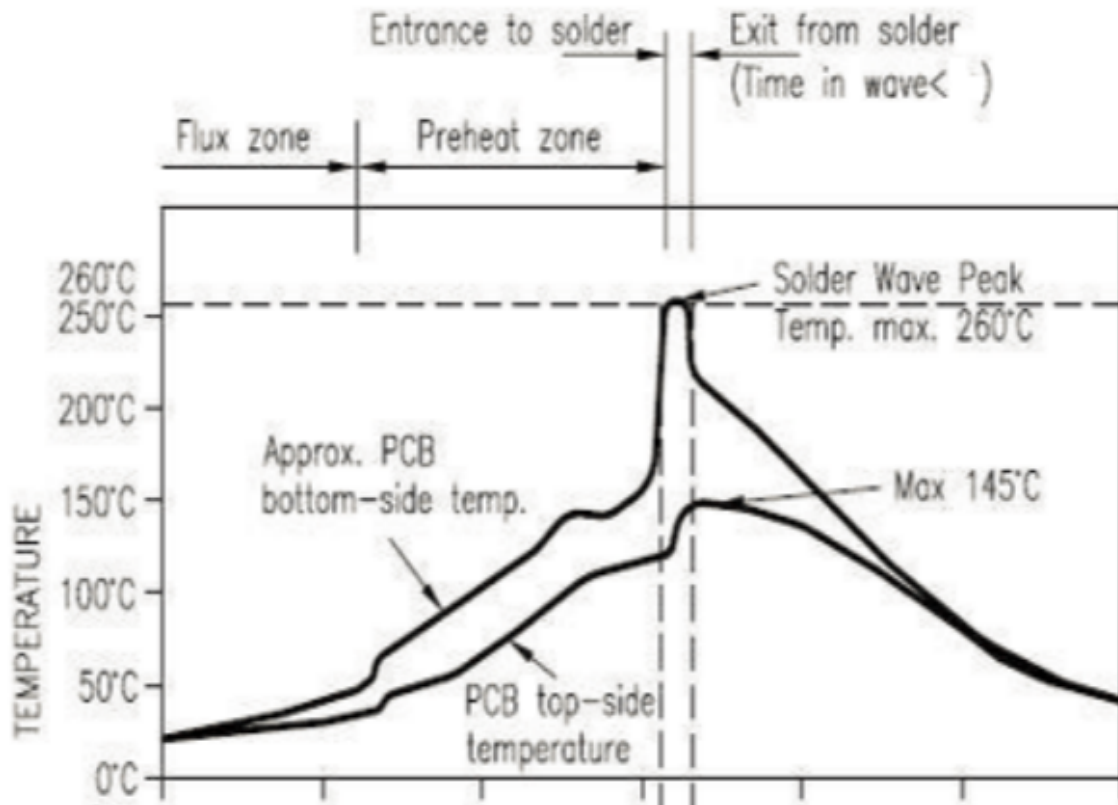
Figure 5: image.png

Recommended welding temperature:

波峰焊接炉温曲线建议		手工焊接温度建议	
预热温度	80-130℃	焊接温度	360℃±20℃
预热时间	75-100S	焊接时间	小于 3S/点
波峰接触时间	3-5S	NA	NA
锡缸温度	260±5℃	NA	NA
升温斜率	≤2℃/S	NA	NA
降温斜率	≤6℃/S	NA	NA

Figure 6: image.png

7.4 Storage Conditions

Figure 7: 储存条件.png

8 MOQ and Packing Information

Product Model	MOQ (pcs)	Packing Method	Number of Modules in Each Reel Pack	Number of Reel Packs in Each Box
BT2S	-	Carrier tape and reel packing	-	4

9 Appendix: Statement

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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. 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. Radiation Exposure Statement This equipment complies with FCC radiation exposure limits set forth for an uncontrolled rolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. Important Note This radio module must not installed to co-locate and operating simultaneously with other radios in host system except in accordance with FCC multi-transmitter product procedures. Additional testing and equipment authorization may be required to operating simultaneously with other radio. The availability of some specific channels and/or operational frequency bands are country dependent and are firmware programmed at the factory to match the intended destination. The firmware setting is not accessible by the end user. The host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. The end user manual shall include all required regulatory information/warning as shown in this manual, including: This product must be installed and operated with a minimum distance of 20 cm between the radiator and user body. This device have got a FCC ID: 2ANDL-BT2S.The final

end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: 2ANDL-BT2S" This device is intended only for OEM integrators under the following conditions: 1)The antenna must be installed such that 20cm is maintained between the antenna and users, and 2) The transmitter module may not be co-located with any other transmitter or antenna. As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed. Declaration of Conformity European notice

Figure 8: CE.png

Hereby, Hangzhou Tuya Information Technology Co., Ltd declares that this module product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EU,2011/65/EU.A copy of the Declaration of conformity can be found at https://www.tuya.com

Figure 9: 声明标识.png

This product must not be disposed of as normal household waste, in accordance with EU directive for waste electrical and electronic equipment (WEEE- 2012/19/EU). Instead，it should be disposed of by returning it to the point of sale, or to a municipal recycling collection point.

The device could be used with a separation distance of 20cm to the human body.