Product Manual

Tuya BTFM-G01 BLE Module

Version: 1.0.0   **Date: 2013-01-14**   **No.: 0000000001**

1 Product Overview

BTFM-G01 is a low-power embedded Bluetooth module developed by Tuya Smart that supports Apple's Find My function. It consists of a highly integrated radio frequency chip, a three-axis acceleration sensor chip and peripheral devices, and has a built-in Bluetooth network communication protocol stack and rich library functions.

BTFM-G01 includes low-power ARM Cortex CPU, Bluetooth 5.1 protocol stack, 512KB Flash, 128KB RAM and 10 I/O ports with specific functions.

1.1 Features

✧Built-in low-power ARM Cortex microprocessor, supporting floating-point operations

- Main frequency up to 64MHz

- Power Consumption 30uA/MHz

✧Working voltage: 2.2V-3.6V

✧Peripherals: 6×GPIOs, 1×Data UART, 1×Log UART and 1×ADC

✧BLE RF features

- Compatible with BLE 5.1

- Up to 2 Mbit/s RF data rate

- TX power: +7 dBm

- RX sensitivity: –97 dBm at BLE 1 Mbit/s

- TX transmit current: 3.05mA @0dBm,1Mbps

- RX receive current: 3.9mA @1Mbps

- Onboard PCB antenna with 1.61 dBi gain

- Working temperature: –20°C to +65°C

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1.2 Applications

✧Smart Outdoor Products

✧Consumer products requiring anti-lost functionalitySmart households

Change History

No.	Date	Change Description	Version After Change
1	2023-0114	This is the first release.	1.0.0

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2 Module Interfaces

2.1 Dimensions and Footprint

BTFM-G01 has two rows of pins with a 1.5mm pin spacing.

The BTFM-G01 dimensions are 15mm±0.35 (W)×21mm±0.35 (L)×2.85mm(H). Figure 2-1 shows the BTFM-G01 pins.
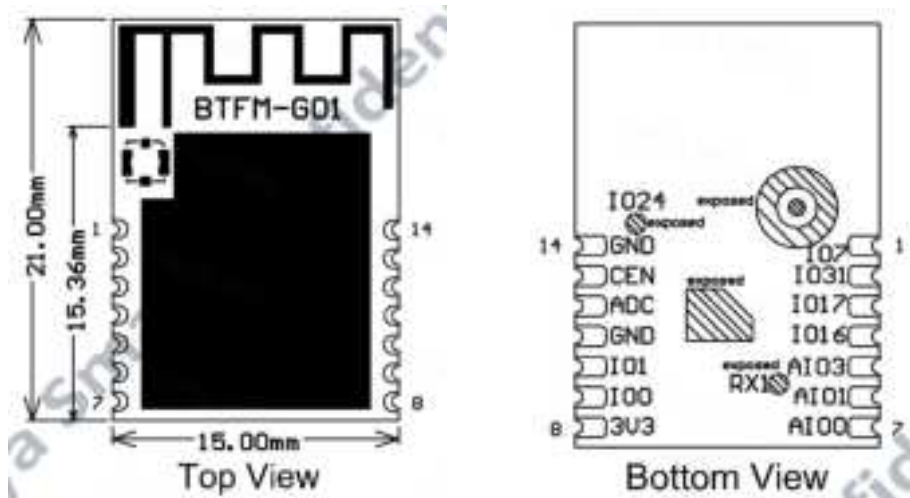
Figure 2-1 BTFM-G01 pins

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2.2 Interface Pin Definition

Table 2-1 BTFM-G01 interface pins

Pin No.	Symbol	I/O Type	Function
1	IO7	Output	Serial port UART1_TX, corresponding to P11 of IC, for log printout
2	IO31	Output	Audio square wave signal output, frequency is, corresponding to P34 of IC
3	IO17	Output	Control the EN2 pin of DC009S, corresponding to P33 of IC
4	IO16	Output	Control the EN1 pin of DC009S, corresponding to P32 of IC
5	AIO3	Output	Used to indicate the working status of the module, corresponding to P28 of the IC
6	AIO1	Output	Used to drive the LED indicator light of the status of the display module, corresponding to the IC P27
7	AIO0	Input	For key detection, corresponding to P26 of IC
8	3V3	P	Power supply pin (3.3 V)
9	IO0	Output	Serial port UART0_TX, corresponding to P4 of the IC, is used as the serial port for user docking
10	IO1	Input	Serial port UART0_RX, corresponding to P5 of the IC, is used as the user's docking serial port
11	GND	P	Power supply reference ground pin
12	ADC	Input	ADC port, 13 bits, used for battery voltage

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Pin No.	Symbol	I/O Type	Function
			detection, corresponding to P24 of IC
13	CEN	Input	Hardware reset pin (active low), corresponding to IC's CHIPEN
14	GND	P	Power supply reference ground pin

Note:

1. **P** indicates power supply pins, **I/O** indicates input/output pins.

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3 Electrical Parameters

3.1 Absolute Electrical Parameters

Table 3-1 Absolute electrical parameters

Parameter	Description	Minimum Value	Maximum Value	Unit
Ts	Storage temperature	−20	65	°C
VBAT	Power supply voltage	−0.3	3.6	V
Static electricity voltage (human body model)	Tamb - 25°C	N/A	2	kV
Static electricity voltage (machine model)	Tamb - 25°C	N/A	0.5	kV

3.2 Electrical Conditions

Table 3-2 Normal electrical conditions

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
Ta	Working temperature	−20	N/A	65	°C
VCC	Working voltage	2.2	3.3	3.6	V
V_{IL}	I/O low-level	VSS	N/A	0.3×VBAT	V

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Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
	input				
V_{IH}	I/O high-level input	0.7×VBAT	N/A	VBAT	V
V_{OL}	I/O low-level output	VSS	N/A	VSS+0.4	V
V_{OH}	I/O high-level output	VBAT-0.4	N/A	VBAT	V
Imax	IO drive current	N/A	N/A	2.5	mA

4 RF Features

4.1 Basic RF Features

Table 4-1 Basic RF features

Parameter	Description
Frequency band	2.4 GHz ISM band
Wireless standard	BLE 5.1
Data transmission rate	1 Mbps,2 Mbps,500 kbps,125 kbps
Antenna type	Onboard PCB antenna

4.2 RF Output Power

Table 4-2 Power during constant transmission

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Average RF output power	–20	0	7	dBm

4.3 RF RX Sensitivity

Table 4-3 RX sensitivity

Parameter		Minimum Value	Typical Value	Maximum Value	Unit
RX sensitivity	1 Mbit/s	N/A	–97	N/A	dBm

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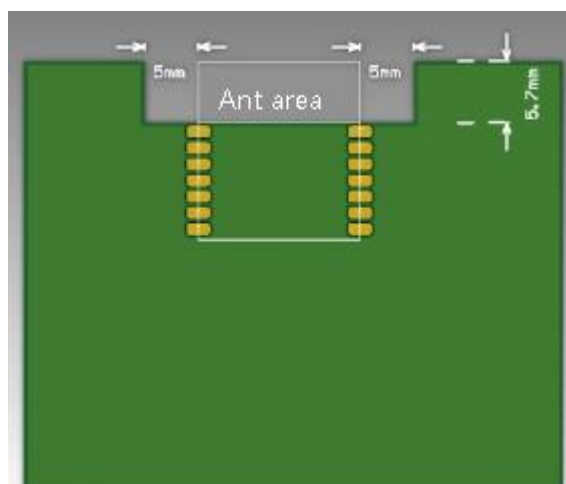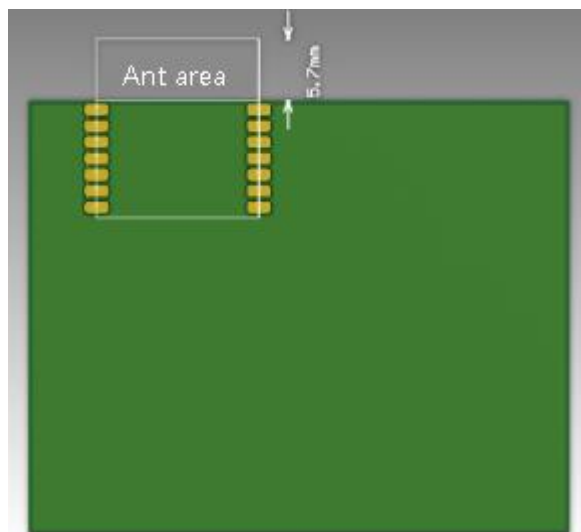| Parameter		Minimum Value	Typical Value	Maximum Value	Unit
	2 Mbit/s	N/A	–93	N/A	

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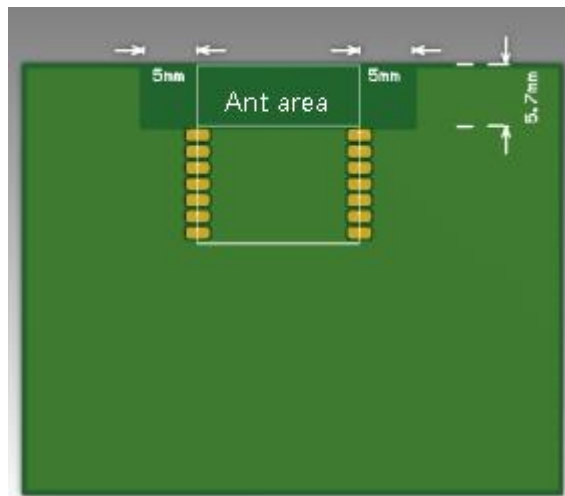# 5 Antenna Information

5.1 Antenna Type

BTFM-G01 uses an onboard PCB antenna.
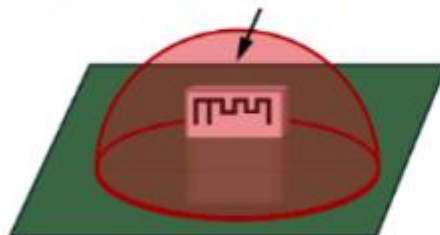
5.2 Antenna Interference Reduction

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 BTFM-G01 is inserted to the PCB, sufficient space needs to be reserved for the antenna.

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Please don't place the size of the metal arc in the red area over the antenna
（The recommend diameters is more than 3cm）

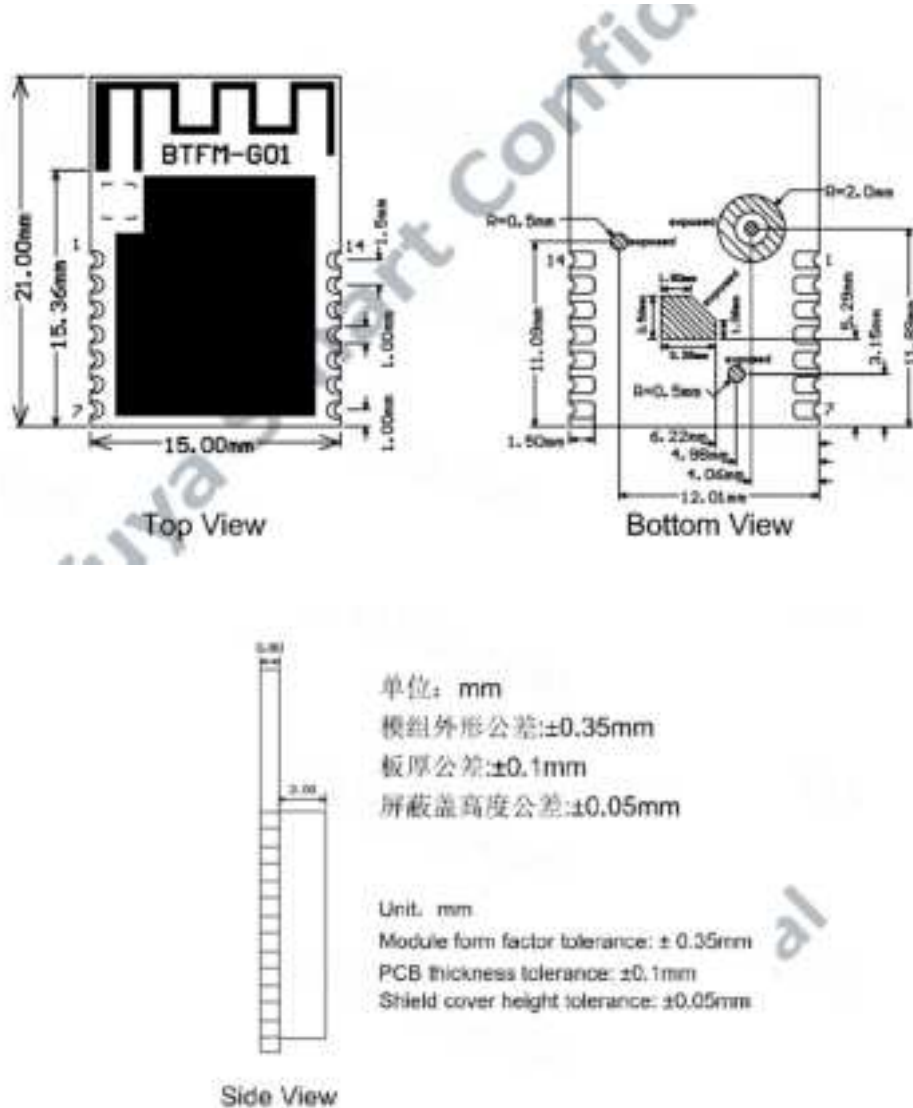# 6 Packaging Information and Production Instructions

6.1 Mechanical Dimensions

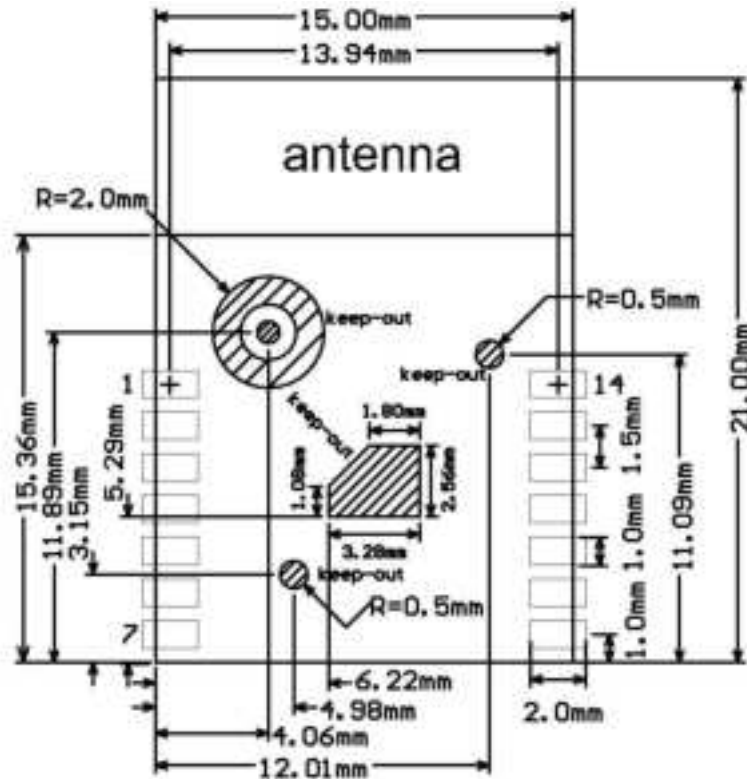

Figure 6-1 BTFM-G01 mechanical dimensions

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.

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Recommended footprint

6.2 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.

   (1) SMT placement equipment

      i. Reflow soldering machine

      ii. Automated optical inspection (AOI) equipment

      iii. Nozzle with a 6 mm to 8 mm diameter

   (2) Baking equipment

      i. Cabinet oven

      ii. Anti-static heat-resistant trays

      iii. Anti-static heat-resistant gloves

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

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    (1) 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) The shelf life of a dry-packaged product is six months from the date when the product is packaged and sealed.

    (3) The package contains a humidity indicator card (HIC).

Figure 6-2 HIC for BTFM-G01

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

    (1) If the 30%, 40%, and 50% circles are blue, bake the module for 2 consecutive hours.

    (2) If the 30% circle is pink, bake the module for 4 consecutive hours.

    (3) If the 30% and 40% circles are pink, bake the module for 6 consecutive hours.

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

4. Baking settings:

    (1) Baking temperature: 125±5°C

    (2) Alarm temperature: 130°C

    (3) SMT placement ready temperature after natural cooling: < 36°C

    (4) Number of drying times: 1

    (5) 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.

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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.

6.3 Recommended Oven Temperature Curve

Perform SMT placement based on the following reflow oven temperature curve. The highest temperature is 245°C.

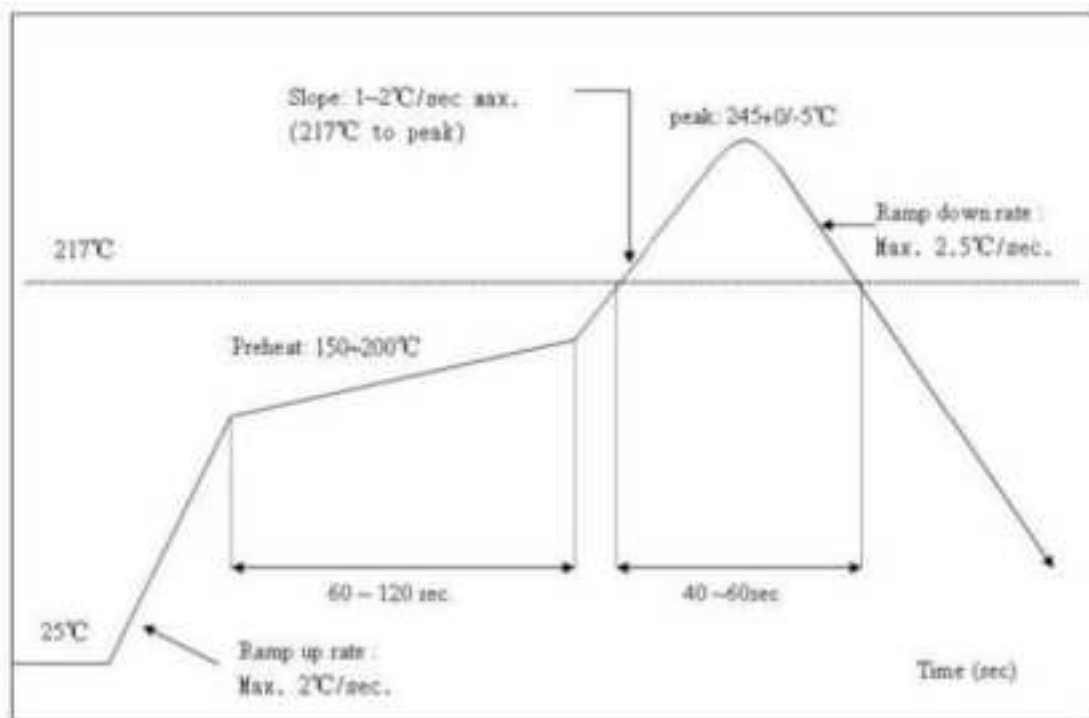Based on the IPC/JEDEC standard, perform reflow soldering on a module at most twice.

Figure 6-3 Oven temperature curve

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6.4 Storage Conditions

7 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 device. The module is limited to installation in mobile or fixed applications.

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 device has been tested and found to comply with the limits for a Class B digital device, according to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential instal- lation. This device generates, uses, and can radiate radio frequency energy and, if not installed and used following 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 device does cause harmful interference to radio or television reception, which can be determined by turning the device 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 device and receiver.

Connect the device to 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 device complies with FCC radiation exposure limits set forth for an uncontrolled rolled environment. This device should be installed and operated with a minimum distance of 20cm between the radiator and your body.

Important Note

This radio module must not be installed to co-locate and operate simultaneously with other radios in the host system except by following FCC multi-transmitter prod- uct procedures. Additional testing and device authorization may be required to operate simultaneously with other radios.

The availability of some specific channels and/or operational frequency bands are

country dependent and are firmware programmed at the factory to match the in- tended destination. The firmware setting is not accessible to the end-user.

The host product manufacturer is responsible for compliance with any other FCC rules that apply to the host not covered by the modular transmitter grant of certifi- cation. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed. The separate approval is required for all other op- erating configurations including portable configurations with respect to Part 2.1093 and different antenna configuration.

The end-user manual shall include all required regulatory information/warnings 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". The OEM integrator is responsible for ensuring that the end-user has no manual instructions to remove or install module.

This device has got an FCC ID: 2ANDL-BTFM-G. The end product must be labeled in a visible area with the following: "Contains Transmitter Module FCC ID: 2ANDL-BTFM-G".

This device is intended only for OEM integrators under the following conditions:

The antenna must be installed such that 20cm is maintained between the antenna and users, and the transmitter module may not be co-located with any other trans- mitter or antenna.

As long as the 2 conditions above are met, further transmitter tests 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

C E

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.

This product must not be disposed of as normal household waste, in accordance with the 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 from the human body.