



WBLC9 Module Datasheet

Device Development > Cloud Module > WiFi&BT Dual Mode Module

Version: 20200717

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1 Product Overview

WBLC9 is a low-power embedded Wi-Fi and BLE module that Tuya has developed. It consists of a highly integrated RF chip (BK7231T) and several peripheral components, with an embedded Wi-Fi network protocol stack and robust library functions. WBLC9 is embedded with a low-power 32-bit microcontroller unit (MCU), 2 MB flash memory, 256 KB static random-access memory (SRAM), and extensive peripherals. WBLC9 is an RTOS platform that integrates all function libraries of the Wi-Fi MAC and TCP/IP protocols. You can develop embedded Wi-Fi products as required.

1.1 Features

- Embedded low-power 32-bit CPU, which can also function as an application processor
- Dominant frequency: 120 MHz
- Working voltage: 3.0 V to 3.6 V
- Peripherals: 6 GPIOs
- Wi-Fi connectivity
 - 802.11 b/g/n
 - Channels 1 to 14 at 2.4 GHz
 - WPA and WPA2 security modes
 - Up to +17.5dBm output power in 802.11b mode
 - STA, AP, and STA+AP working modes
 - EZ and AP net pairing modes for Android and iOS devices
 - Onboard ceramics antenna with a gain of 0.5 dBi
 - Working temperature: -20°C to +105°C
- BLE connectivity
 - Support for BLE4.0
 - Maximum output power of +6 dBm

 - Onboard ceramics antenna

1.2 Applications

- Intelligent building

- Smart household and home appliances
- Smart socket and light
- Industrial wireless control
- Baby monitor
- Network camera
- Intelligent bus

1.3 Change History

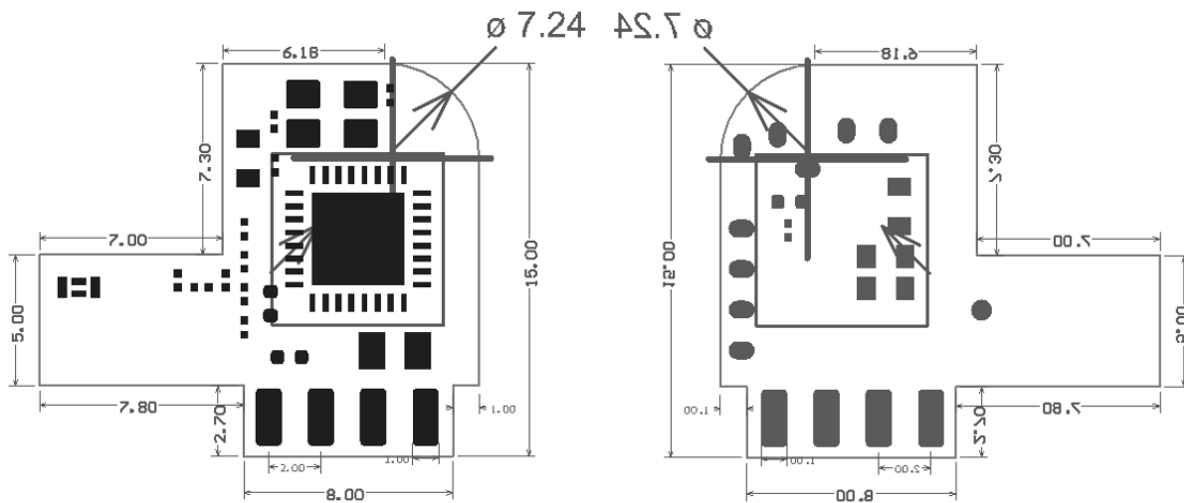
No.	Date	Change Description	Version After Change
1	2020-4-10	This is the first release.	V1.0.0

2 Module Interfaces

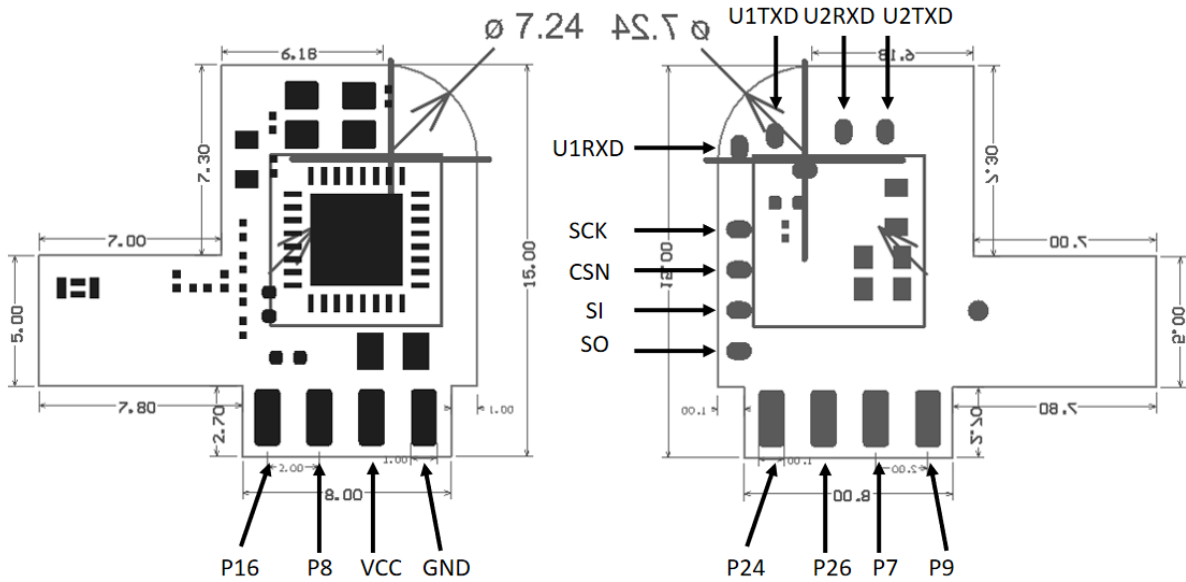
2.1 Dimensions and Footprint

WBLC9 has two rows of pins with a 2 ± 0.1 mm pin spacing.

The WBLC9 dimensions (H x W x L) are 3.6 ± 0.15 mm x 15 ± 0.35 mm x 16.8 ± 0.35 mm. Figure shows the WBLC9 front and rear views.



2.2 Interface Pin Definition



Pin No.	Symbol	I/O Type	Function
1	P9	I/O	Hardware PWM pin, which is connected to the P9
2	P16	I/O	Common I/O pin, which is connected to the P16
3	P7	I/O	Hardware PWM pin, which is connected to the P7
4	P8	I/O	Hardware PWM pin, which is connected to the P8

Pin No.	Symbol	I/O Type	Function
5	P26	I/O	Hardware PWM pin, which is connected to the P26
6	VCC	P	Power supply pin (3.3 V)
7	P24	I/O	Hardware PWM pin, which is connected to the P24
8	GND	P	Ground pin

2.3 Test Pin Definition

Pin No.	Symbol	I/O Type	Function
TP6	U2_TXD	I/O	UART2_TX, LOG TX
TP2	F_SCK	I/O	Clock pin when data is downloaded from the flash memory, which is connected to the P20 pin on the internal IC

Pin No.	Symbol	I/O Type	Function
TP3	F_CSN	I/O	Command enabling pin when data is downloaded from the flash memory, which is connected to the P21 pin on the internal IC
TP4	F_SI	I/O	Data input pin when data is downloaded from the flash memory, which is connected to the P22 pin on the internal IC
TP5	F_SO	I/O	Data output pin when data is downloaded from the flash memory, which is connected to the P23 pin on the internal IC
TP7	U2_RXD	I/O	UART2_RX, LOG RX
TP8	U1_TXD	I/O	UART1_TX, User serial port TX
TP9	U1_RXD	I/O	UART1_RX, User serial port RX

Pin No.	Symbol	I/O Type	Function
TP10	CEN	I	Reset pin, which is connected to 3.3 V for normal use

3 Electrical Parameters

3.1 Absolute Electrical Parameters

Parameter	Description	Minimum Value	Maximum Value	Unit
Ts	Storage temperature	-40	105	°C
VBAT	Power supply voltage	3.0	3.6	V
Static electricity voltage (human body model)	TAMB-25°C	-	2	KV
Static electricity voltage (machine model)	TAMB-25°C	-	0.5	KV

3.2 Working Conditions

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
Ta	Working temperature	-20	-	105	°C
VBAT	Power supply voltage	3.0	3.3	3.6	V

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
VIL	I/O low-level input	-0.3	-	VCC*0.25	V
VIH	I/O high-level input	VCC*0.75	-	VCC	V
VOL	I/O low-level output	-	-	VCC*0.1	V
VoH	I/O high-level output	VCC*0.8	-	VCC	V
I _{max}	I/O drive current	-	-	12	mA

3.3 Current consumption during constant transmission and receiving

Working Status	Mode	Rate	TX Power/ Receiving	Typical Value	Maximum Value	Unit
TX	11b	11Mbps	+17.5dBm	295	354	mA
TX	11g	54Mbps	+13.5dBm	266	300	mA
TX	11n	MCS7	+13dBm	260	290	mA
RX	11b	11Mbps	Constant receiving	98	100	mA
RX	11g	54Mbps	Constant receiving	98	100	mA
RX	11n	MCS7	Constant receiving	98	100	mA

3.4 Working Current

Working Mode	Working Status (Ta = 25°C)	Average Value	Maximum Value	Unit
BT	The module is in BT mode, and the Wi-Fi indicator blinks quickly.	96	13	mA
EZ	The module is in EZ mode, and the Wi-Fi indicator blinks quickly.	134	357	mA
AP	The module is in AP mode, and the Wi-Fi indicator blinks slowly.	178	264	mA
Connected	The module is connected to the network and work, and the Wi-Fi indicator is steady on.	134	357	mA
Connected	The module is connected to the network and idle, and the Wi-Fi indicator is steady on.	153	273	mA

4 RF Features

4.1 Basic RF Features

Parameter	Description
Frequency band	2.412~2.484GHz
Wi-Fi standard	IEEE 802.11b/g/n(channels1-14)
Data transmission rate	11b:1,2,5.5, 11 (Mbps); 11g:6,9,12,18,24,36,48,54(Mbps); 11n: HT20 MCS0~7
Antenna type	Onboard ceramics antenna with a gain of 0.5 dBi

4.2 TX Performance

Performance during constant transmission

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Average RF output power,802.11b CCK Mode 11M	-	17.5	-	dBm
Average RF output power,802.11g OFDM Mode 54M	-	14	-	dBm

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
Average RF output power, 802.11n OFDM Mode MCS7	-	12	-	dBm
Frequency error	-10	-	10	ppm

4.3 RX Performance

RX sensitivity

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
PER<8%, RX sensitivity, 802.11b DSSS Mode 11M	-	-85	-	dBm
PER<10%, RX sensitivity, 802.11g OFDM Mode 54M	-	-72	-	dBm
PER<10%, RX sensitivity, 802.11n OFDM Mode MCS7	-	-68	-	dBm

Parameter	Minimum Value	Typical Value	Maximum Value	Unit
PER<10%, RX sensitivity, BLE 1M MCS7	-	-95	-	dBm

5 Antenna Information

5.1 Antenna Type

WBLC9 uses an Onboard ceramics antenna .

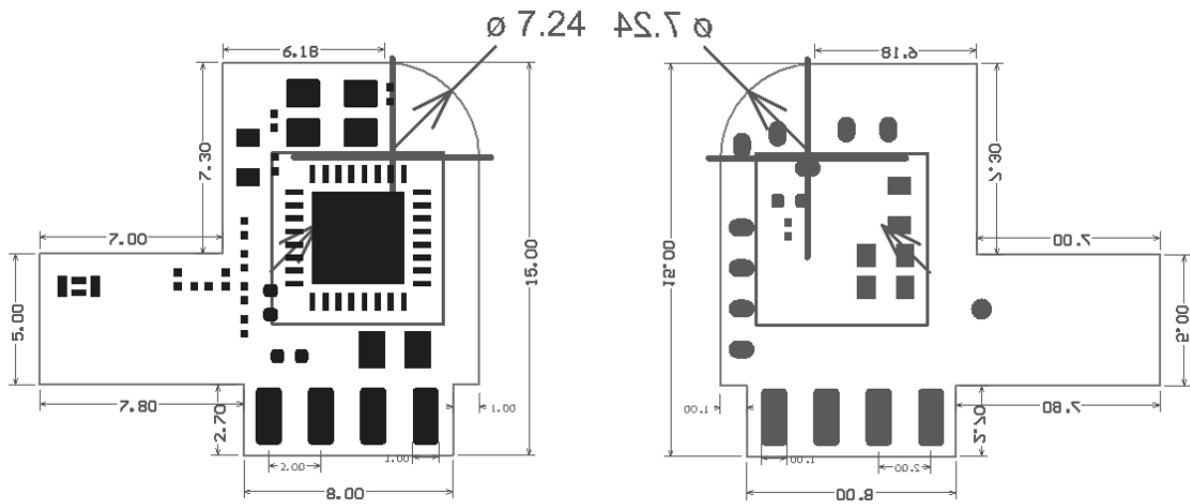
5.2 Antenna Interference Reduction

To ensure optimal Wi-Fi performance when the Wi-Fi module uses an onboard ceramics antenna.

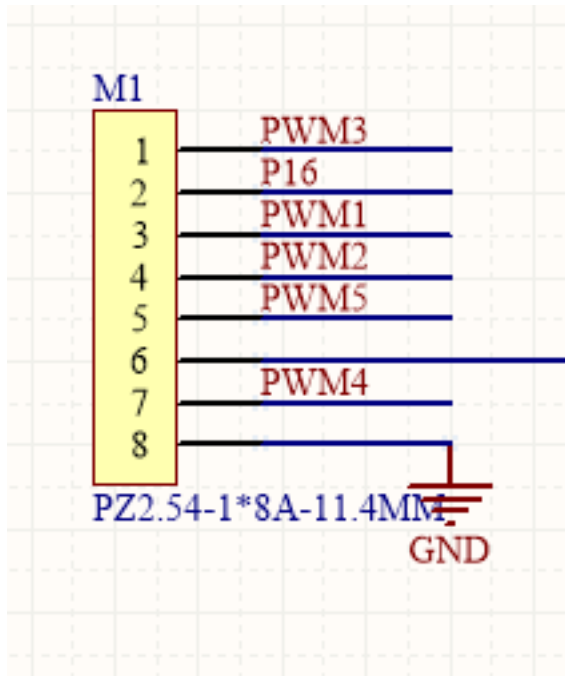
6 Packaging Information and Production Instructions

6.1 Mechanical Dimensions

The PCB dimensions (W x L x H) are $15\pm 0.35\text{mm}$ (W) \times $16.8\pm 0.35\text{mm}$ (L) \times $3.6\pm 0.15\text{mm}$ (H).



6.2 Recommended Schematic Encapsulation

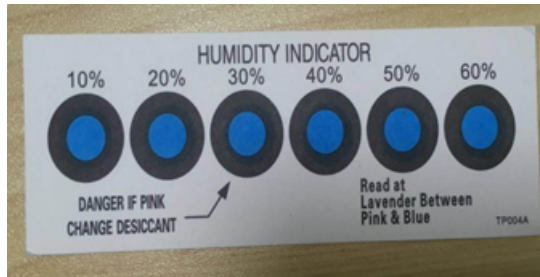


6.3 Recommended PCB Encapsulation-SMT

WBLC9 module is inserted and welded.

6.4 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: a)Cabinet oven; b)Anti-static heat-resistant trays; c)Anti-static heat-resistant gloves;
2. Storage conditions for a delivered module are as follows:: 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%. B.The shelf life of a dry-packaged product is six months from the date when the product is packaged and sealed. C.The package contains a humidity indicator card (HIC).

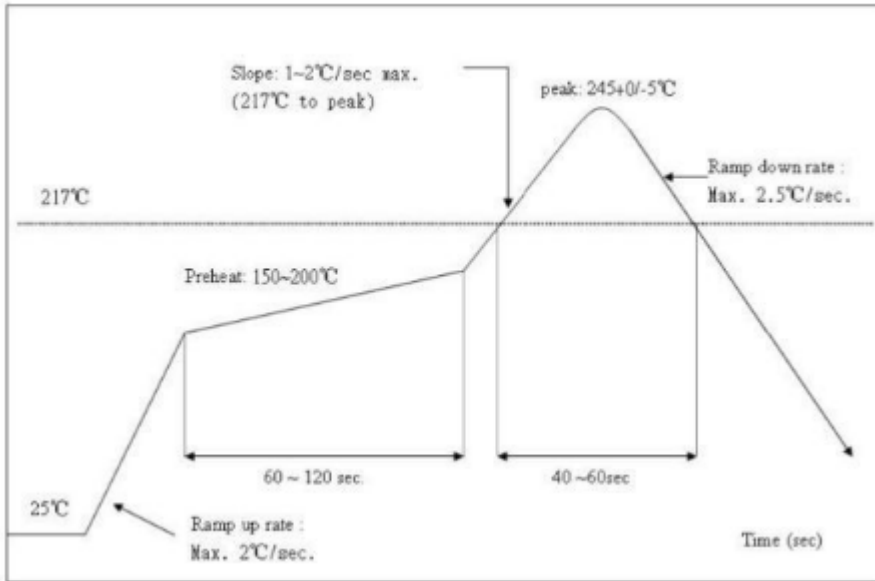


3. Bake a module based on HIC status as follows when you unpack the module package: A.If the 30%, 40%, and 50% circles are blue, bake the module for 2 consecutive hours. B. If the 30% circle is pink, bake the module for 4 consecutive hours. C.If the 30% and 40% circles are pink, bake the module for 6 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: $125 \pm 5^{\circ}\text{C}$; B.Alarm temperature: 130°C ; C.SMT placement ready temperature after natural cooling: $< 36^{\circ}\text{C}$; 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.
5. Before SMT placement, take electrostatic discharge (ESD) protective measures.
6. 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.

6.5 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.

Refer to IPC/JEDEC standard; Peak Temperature: <math><245^{\circ}\text{C}</math>; Number of Times: ≤ 2 times;



6.6 Storage Conditions



CAUTION
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL
3

If Blank, see adjacent bar code label

1. Calculated shelf life in sealed bag: 12 months at < 40°C and < 90% relative humidity (RH)
2. Peak package body temperature: 260 °C
If Blank, see adjacent bar code label
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must
 - a) Mounted within: 168 hrs. of factory conditions
If Blank, see adjacent bar code label
 ≤ 30°C/60%RH, OR
 - b) Stored at <10% RH
4. Devices require bake, before mounting, if:
 - a) Humidity Indicator Card is > 10% when read at 23 ± 5°C
 - b) 3a or 3b not met.
5. If baking is required, devices may be baked for 48 hrs. at 125 ± 5°C

Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: _____
If Blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

7 MOQ and Packing Information

Product Model	MOQ (pcs)	Packing Method	Number of Modules in Each Reel Pack	Number of Reel Packs in Each Box
WBLC9	4000	Carrier tape and reel packing	1000	4

8 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 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 be 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.

The RF module is considered as a limited modular transmitter according to FCC rules. Even though the RF module get a FCC ID, the host product manufacturer can not use the FCC ID on the final product directly. In these circumstances, the host product manufacturer integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining the FCC authorization by a Class II permissive change application or a new application.

Declaration of Conformity European notice



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 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.