WBR3S User manual

1 Product Overview

WBR3S is a low-power embedded WiFi+BT module that Tuya has developed. It consists of a highly integrated wireless RF chip (RTL8720CS), a few peripherals, an

embedded WiFi network protocol stack, the BT network protocol, and varied library

functions. WBR3S has an embedded low-power 32-bit CPU, 512 KB static randomaccess memory (SRAM), 4 MB flash memory, and rich peripherals. WBR3S is an

RTOS platform that integrates all function libraries of the WiFi MAC and TCP/IP protocols. You can develop embedded WiFi products as required.

1.1 Features

1. Embedded low-power 32-bit CPU, which can also function as an application

processor

2. The maxium clock rate: 200 MHz

3. Working voltage: 3.0 to 3.6 V

4. Peripherals: 8 GPIOs, 1 universal asynchronous receiver/transmitter (UART),

and 1 analog to digital converter (ADC)

5. WiFi connectivity

• 802.11b/g/n 1x1 2.4 G

• Channels 1 to 14 at 2.4 Ghz

• Support WPA and WPA2 security modes

• Up to +17.5 dBm output power in 802.11b mode

• Support STA/AP/STA+AP working modes

• Support SmartConfig and AP network configuration manners for Android

and iOS devices

• Onboard PCB antenna with a gain of 1.7 dBi at 2.4 G

• Working temperature: -20 to 85℃

6. BT/BLE connectivity

• Support BLE V5.0

• Up to the output power of +9 dbm The default output power is 7dB.

• PCB antenna with a gain of 1.7 dBi at 2.4 G shared with WiFi

• Working temperature: -20 to 85℃

1.2 Applications

• Intelligent building

• Smart household and home appliances

• Smart socket and light

• Industrial wireless control

• Baby monitor

• Network camera

• Intelligent bus

2. Electrical Parameters

2.1 Absolute Electrical Parameters

Parameter	Description	Minimum Value	Maximum Value	Unit
Ts	Storage temperature	-20	85	℃
VBAT	Power supply voltage	3.0	3.6	V
Static electricity voltage (human body model)	TAMB-25℃	-	2	KV
Static electricity voltage (machine model)	TAMB-25℃	-	0.5	KV

2.2 Normal Working Conditions

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
Ta	Working tempera-ture	-20	-	85	℃
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
Imax	I/O drive current	-	-	12	mA

4 RF Parameters

4.1 Basic RF Features

Parameter	Description
Frequency band	2.412~2.484GHz
Wi-Fi standard	IEEE 802.11b/g/n (Channels 1 to 14
Data transmission rate	802.11b: 1, 2, 5.5, or 11 (Mbit/s);802.11g: 6, 9, 12, 18, 24, 36, 48, or 54 (Mbit/s);802.11n: HT20 MCS0 to MCS7;802.11n: HT40 MCS0 to MCS7
Antenna type	PCB antenna with a gain of 1.7 dBi at 2.4 GHz

5 Antenna Information

5.1 Antenna Type

WBR3S uses only an onboard PCB antenna.

5.2 Antenna Interference Reduction

To ensure optimal WiFi performance when the WiFi module uses an onboard PCB antenna, it is recommended that the antenna be at least 15 mm away from other metal parts. To ensure the antenna performance, the PCB should not be routed or clad with copper in the antenna area. The main points of the layout: 1. Make sure that there is no substrate medium directly below or above the printed antenna. 2. Make sure that the area around the printed antenna is far away from the metal copper skin, so as to ensure the radiation effect of the antenna to the greatest extent

Parameter	Description
Working frequency	WiFi: 2.412 to 2.484 Ghz (channels 1 to 11 for US/CA and channels 1 to 13 for EU/CN); Bluetooth: 2402 to 2480 MHz
WiFi standard	IEEE 802.11 b/g/n
Data transmission rate	WiFi: 11b: 1, 2, 5.5, 11 (Mbps); 11g: 6, 9, 12, 18, 24, 36, 48, 54 (Mbps); 11n: HT2 0 MCS 0 to7; HT40 MCS 0 to 7; Bluetooth: 1M/2M
Antenna type	PCB antenna with a gain of 1.7 dBi at 2.4 GHz

6. Packaging Information and Production Instructions

6.1 Mechanical Dimensions

The WBR3S dimensions are 16mm (W)×24mm (L) ×3.0mm (H)

6.2 Production Instructions

1. Use an SMT placement machine to mount the stamp hole module that Tuya produces onto the PCB within 24 hours after the module is unpacked and the fifirmware is burned.If not, vacuum pack the module again. Bake the module before mounting it onto the PCB. A. SMT placement equipment

• a) Reflflow 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:

• The moisture-proof bag must be placed in an environment where the temperature is below 30°C and the relative humidity is lower than 70%.

• The shelf life of a dry-packaged product is 6 months from the date when the product is packaged and sealed.

• 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 blue, bake the module for 12 consecutive hours.

4. Baking settings:

• A. Baking temperature: 125±5°C

• B. Baking time: 130°C

• C. SMT placement ready temperature after natural cooling: < 36°C

• D. The 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 been unpacked for more than

3 months. Electroless nickel immersion gold (ENIG) is used for the PCBs. If the solder pads are exposed to the air for more than 3 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 reflflow defect rate, draw 10% of the products for visual inspection and AOI before the fifirst SMT placement to determine proper methods for con trolling the oven temperature and attaching and placing components. Draw 5 to 10 modules from subsequent batches each hour for visual inspection and AOI.

6.3 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 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 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 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 in

tended 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 Sub part 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-WBR3S. The final end product must be labeled in area with the following: “Contains Transmitter Module FCC ID: 2ANDL-WBR3S”

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 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

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.