



CB2S Module Datasheet

Hardware Product Development > Network Modules > Wi-Fi & BLE

Dual Mode Module > CB Series Module

Version: 20210408

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CB2S is a low-power embedded Wi-Fi - Bluetooth module that Tuya has developed. It consists of a highly integrated RF chip BK7231N and a few peripherals, and not only supports the AP and STA dual-network-connection manner but supports the BluetoothLE network connection manner.

1 Overview

CB2S is built-in with a 32-bit MCU with a running speed of up to 120 MHz, 2Mbyte flash, and 256-KB RAM, so as to support the Tuya IoT cloud connection. The MCU's specially extended instructions for processing signals can effectively implement audio encoding and decoding. Besides, it has rich peripherals, such as PWM, UART, and SPI. The six 32-bit PWM output makes the chip very suitable for high-quality LED control.

1.1 Features

- Embedded low-power 32-bit CPU, which can also function as an application processor
- The clock rate: 120 MHz
- Working voltage: 3.0V to 3.6V
- Peripherals: 5 pulse width modulations (PWM), 2 universal asynchronous receiver/transmitter (UART), and 1 serial peripheral interface (SPI)
- Wi-Fi connectivity
 - 802.11 b/g/n
 - Channels 1 to 14@2.4 GHz
 - Support WEP, WPA/WPA2, and WPA/WPA2 PSK (AES) security modes
 - Up to + 16 dBm output power in 802.11b mode
 - Support STA/AP/STA+AP working mode
 - Support SmartConfig and AP network configuration manners for Android and iOS devices
 - Onboard PCB antenna with a gain of 0 dBi
 - Working temperature: -40°C to 105°C
- Bluetooth LE connectivity
 - 6 dBm transmit power in Bluetooth mode
 - Complete Bluetooth coexistence interface
 - Onboard PCB antenna with a gain of 0 dBi

1.2 Applications

- Intelligent building

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

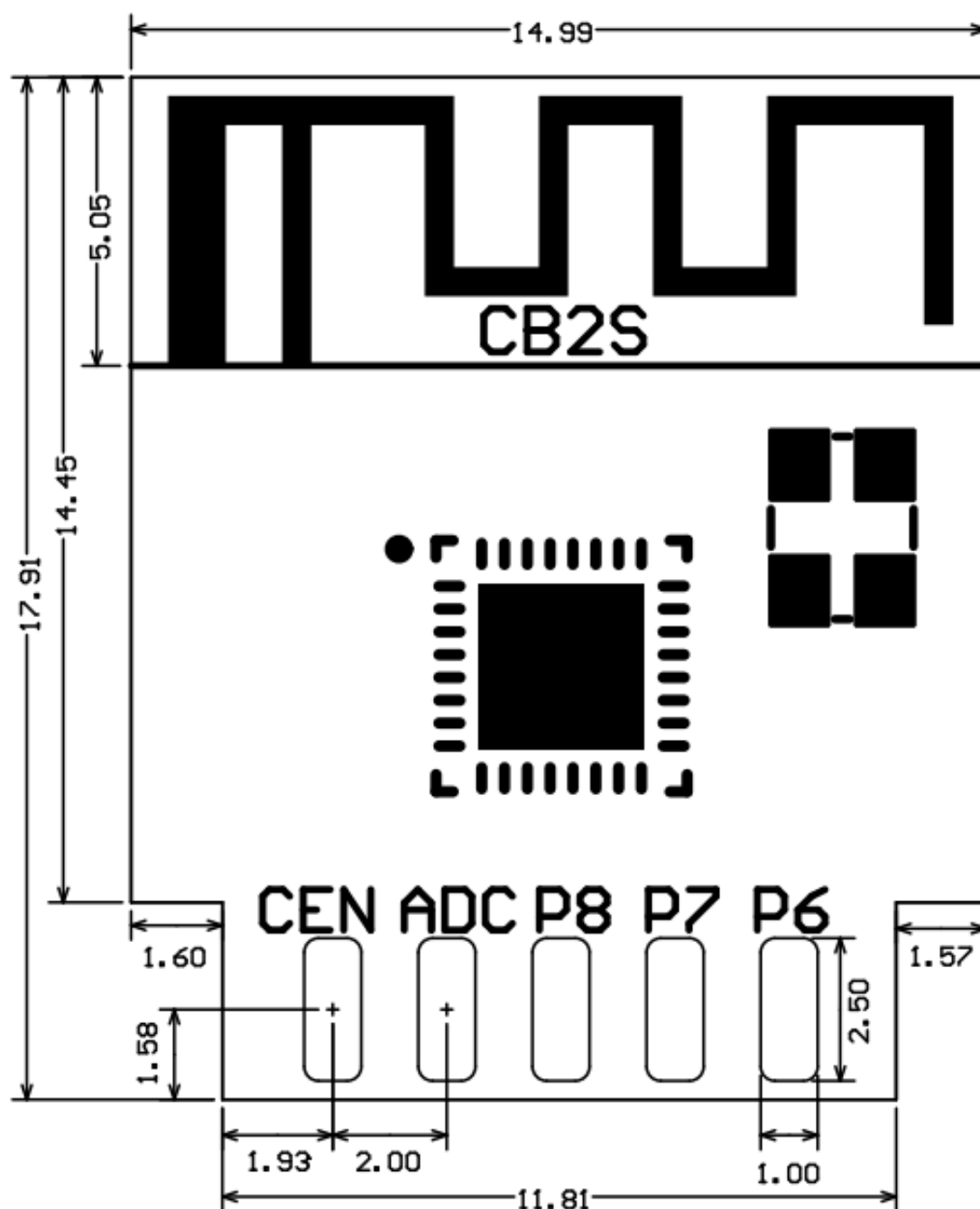
1.3 Change history

Update date	Updated content	Version after update
04/06/2021	This is the first release.	V1.0.0
04/06/2021	Updated test data	V1.0.1

2 Module interfaces

2.1 Dimensions and package

The CB2S dimensions are 17.9 ± 0.35 mm (L) \times 14.9 ± 0.35 mm (W) \times 2.8 ± 0.1 mm (H).
The dimensions of CB2S are as follows:



2.2 Pin definition

Pin number	Symbol	I/O type	Function
1	3V3	P	Power supply 3V3
2	P8	I/O	Support hardware PWM
3	GND	P	Power supply reference ground
4	P7	I/O	Support hardware PWM
5	RX1	I/O	UART_RX1, which is used for receiving user data and corresponds to P10 of the internal IC
6	P6	I/O	Support hardware PWM
7	TX1	I/O	UART_TX1, which is used for transmitting user data and corresponds to P11 of the internal IC
8	ADC	I/O	ADC, which corresponds to P23 on the internal IC
9	P24	I/O	Support hardware PWM
10	CEN	I/O	Reset pin

Pin number	Symbol	I/O type	Function
11	P26	I/O	Support hardware PWMC
Test point	RX2	I/O	UART_RX2, which corresponds to P1 on the internal IC, prohibition of use this pin
Test point	TX2	I/O	UART_TX2, which is used for outputting logs and corresponds to P0 of the internal IC
Test point	CSN	I/O	Mode selection pin. If connected to the ground before powered on, enter the firmware test mode. If not connected or connected to VCC before powered on, enter the firmware application mode Correspond to P21 on the internal IC.

Note: P indicates a power supply pin and I/O indicates an input/output pin.

3 Electrical parameters

3.1 Absolute electrical parameters

Parameter	Description	Minimum value	Maximum value	Unit
Ts	Storage temperature	-55	125	°C
VBAT	Power supply voltage	-0.3	3.9	V
Static electricity discharge voltage (human body model)	TAMB-25°C	-4	4	KV
Static electricity discharge voltage (machine model)	TAMB-25°C	-200	200	V

3.2 Normal working conditions

Parameter	Description	Minimum value	Typical value	Maximum value	Unit
Ta	Working temperature	-40		85	°C
VBAT	Power supply voltage	3.0	3.3	3.6	V

Parameter	Description	Minimum value	Typical value	Maximum value	Unit
VOL	I/O low level output	VSS	-	VSS+0.3	V
VOH	I/O high level output	VBAT-0.3	-	VBAT	V
I _{max}	I/O drive current	-	6	20	mA

3.3 RF power consumption

Working status	Mode	Rate	Transmit power/receive	Average value	Peak value (Typical value))	Unit
Transmit	11b	11Mbps	+16dBm	81	240	mA
Transmit	11g	54Mbps	+15dBm	82	238	mA
Transmit	11n	MCS7	+14dBm	85	234	mA
Receive	11b	11 Mbps	Constantly receive	73	82	mA
Receive	11g	54 Mbps	Constantly receive	75	82	mA
Receive	11n	MCS 7	Constantly receive	75	82	mA

3.4 Working current

Working mode	Working status, Ta = 25°C	Average value	Maximum value (Typical value)	Unit
Quick network connection state (Bluetooth)	The module is in the fast network connection state and the Wi-Fi indicator flashes fast	63	245	mA
Quick network connection state (AP)	The module is in the hotspot network connection state and the Wi-Fi indicator flashes slowly	80	270	mA
Quick network connection state (EZ)	The module is in the fast network connection state and the Wi-Fi indicator flashes fast	78	246	mA
Network connection state	The module is connected to the network and the Wi-Fi indicator is always on	25	342	mA

4 RF parameters

4.1 Basic RF features

Parameter	Description
Working frequency	2.412 to 2.480 GHz
Wi-Fi standard	IEEE 802.11 b/g/n (channels 1 to 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; 11n: HT40 MCS 0 to 7
Antenna type	PCB

4.2 Wi-Fi transmission performance

Parameter	Minimum value	Typical value	Maximum value	Unit
Average RF output power, 802.11b CCK Mode 11M	-	16	-	dBm
Average RF output power, 802.11g OFDM Mode 54M	-	15	-	dBm
Average RF output power, 802.11n OFDM Mode MCS7	-	14	-	dBm
Frequency error	-20	-	20	ppm

4.3 Wi-Fi receiving performance

Parameter	Minimum value	Typical value	Maximum value	Unit
PER<8%, RX sensitivity, 802.11b DSSS Mode 11M	-	-88	-	dBm
PER<10%, RX sensitivity, 802.11g OFDM Mode 54M	-	-74	-	dBm
PER<10%, RX sensitivity, 802.11n OFDM Mode MCS7	-	-73	-	dBm
PER<10%, RX sensitivity, Bluetooth LE 1M	-	-96	-	dBm

4.4 Bluetooth LE transmission performance

Parameter	Minimum value	Typical value	Maximum value	Unit
Working frequency	2402	-	2480	MHz
Air rate	-	1	-	Mbps
TX power	-20	6	20	dBm

Parameter	Minimum value	Typical value	Maximum value	Unit
Frequency error	-150	-	150	kHz

4.5 Bluetooth LE receiving performance

Parameter	Minimum value	Typical value	Maximum value	Unit
RX sensitivity	-	-96	-	dBm
Maximum RF signal input	-10	-	-	dBm
Inter-modulation	-	-	-23	dBm
Co-channel suppression ratio	-	10	-	dB

5 Antenna information

5.1 Antenna type

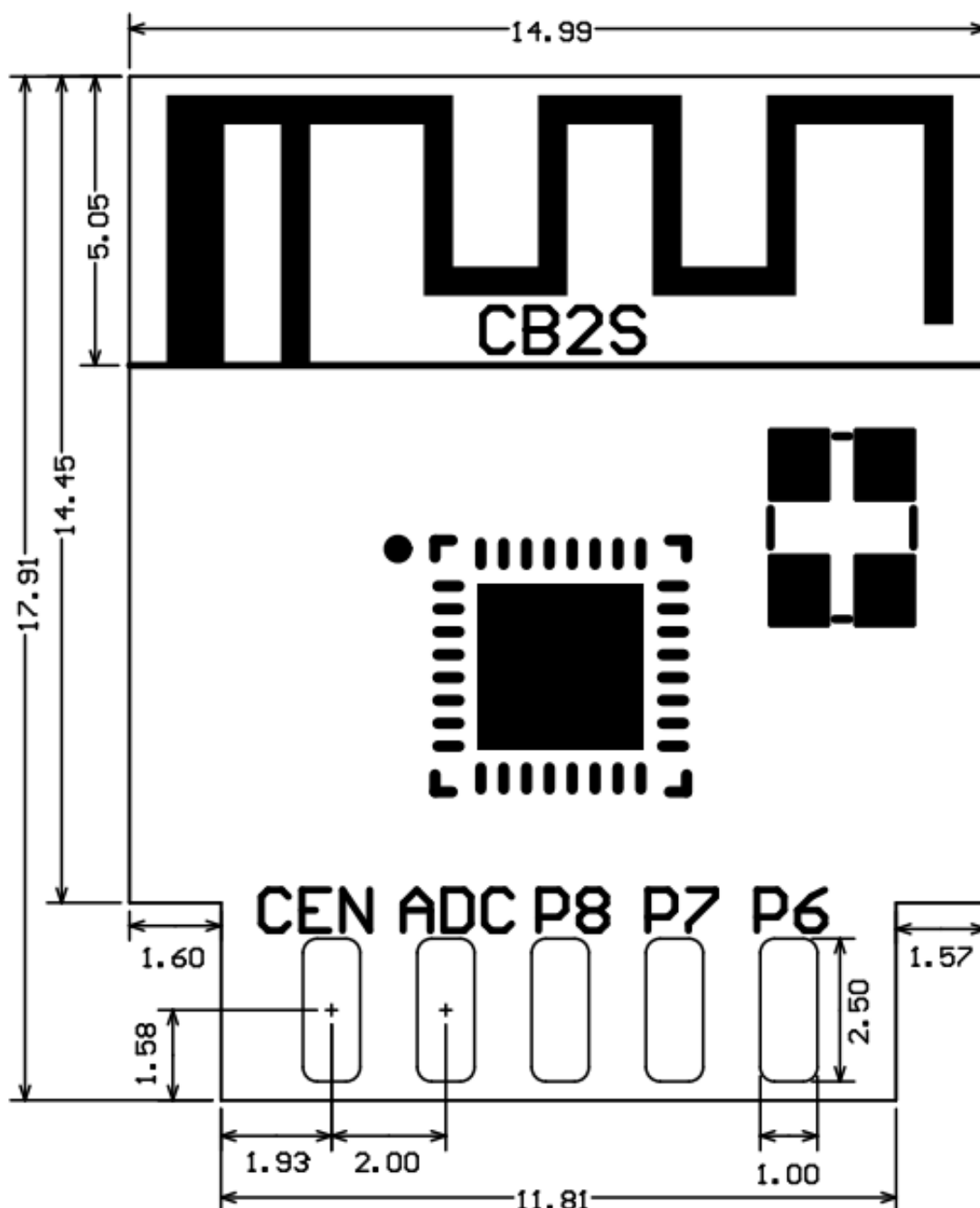
The CB2S select the PCB antenna.

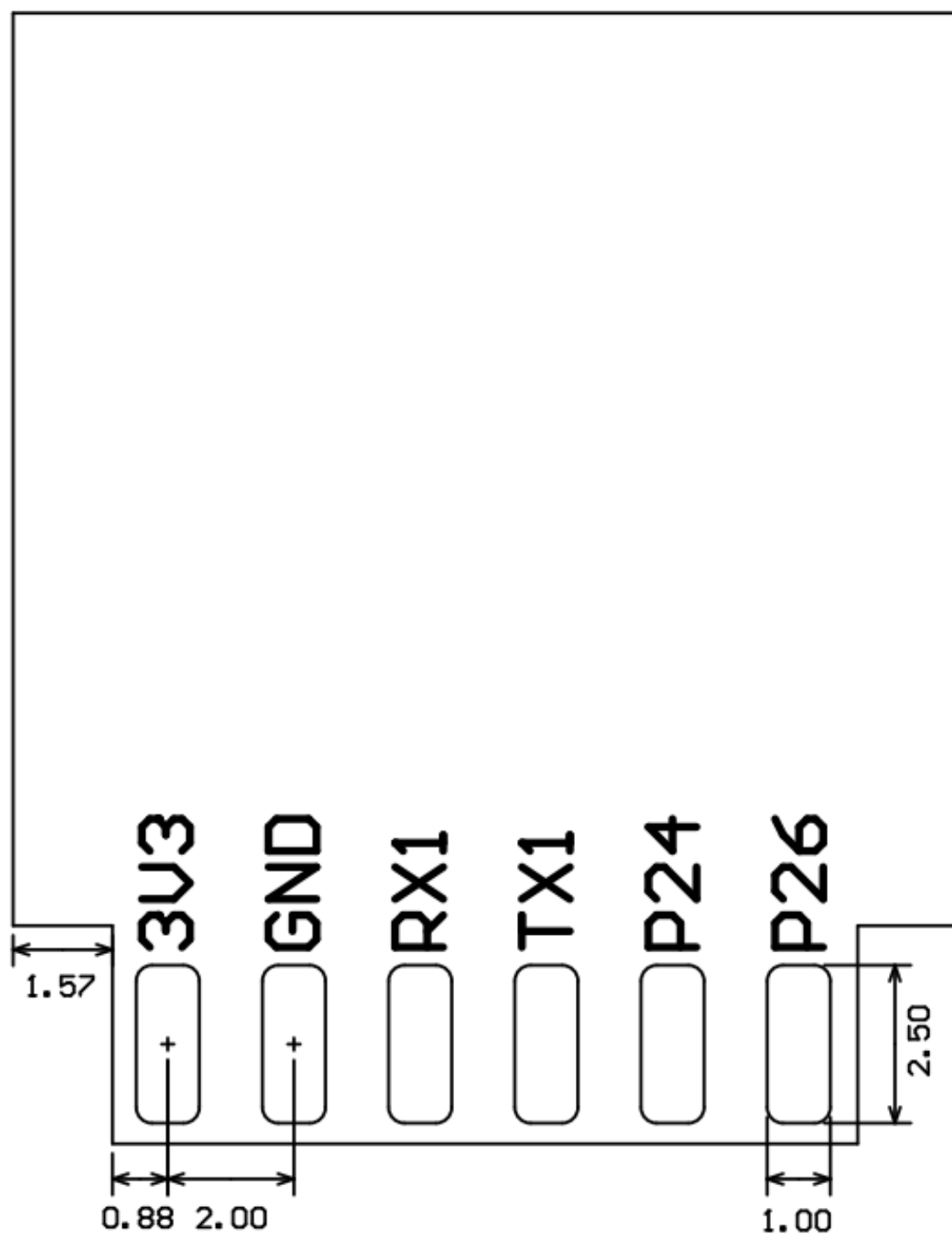
5.2 Antenna interference reduction

To ensure the optimal Wi-Fi performance when the Wi-Fi module uses an onboard PCB antenna, it is recommended that the antenna be at least 15 mm away from other metal parts. To prevent an adverse impact on the antenna radiation performance, avoid copper or traces within the antenna area on the PCB.

6 Packaging information and production instructions

6.1 Mechanical dimensions







Unit: mm

Module form factor tolerance: $\pm 0.3\text{mm}$

Plate thickness tolerance: $\pm 0.1\text{mm}$

Shield cover height tolerance: $\pm 0.05\text{mm}$

6.2 Production instructions

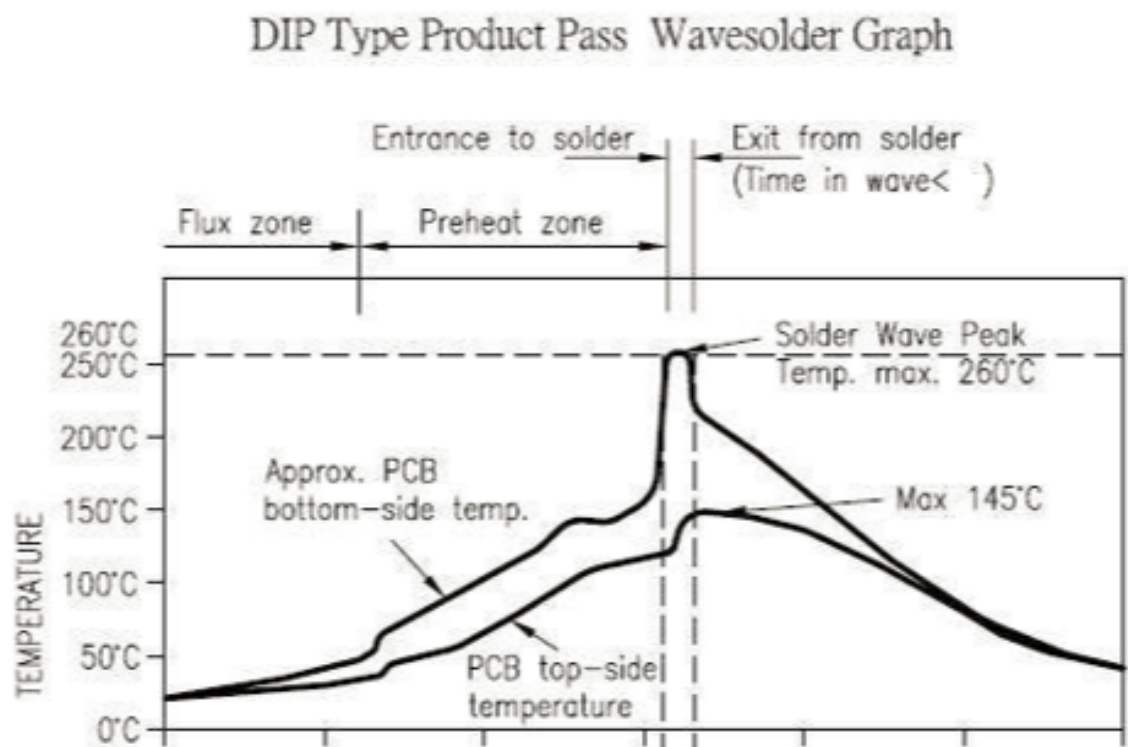
- For the in-line module developed by Tuya, the wave soldering equipment is most preferred and manual soldering is less preferred. After being unpacked, the module must be soldered within 24 hours. Otherwise, it must be put into the drying cupboard where the RH is not greater than 10%, or it needs to be packaged under vacuum again and record the exposure time (the total exposure time cannot exceed 168 hours).
- Soldering equipment and materials:
 - Wave soldering equipment
 - Wave soldering fixture
 - Constant-temperature soldering iron

- Tin bar, tin wire, and flux
 - Oven temperature tester
 - Baking equipment:
 - Cabinet oven
 - Anti-static heat-resistant pallets
 - Anti-static heat-resistant gloves
 - The module needs to be baked in the following cases:
 - The vacuum packing bag was found to be damaged before being unpacked.
 - There is no humidity indicator card (HIC) in the vacuum packing bag.
 - After being unpacked, 10% and above circles on the HIC become pink.
 - The total exposure time has been more than 168 hours since unpacking.
 - More than 12 months have passed since the sealing date of the bag.
 - Baking settings:
 - Temperature: 60°C and $\leq 5\%RH$ for reelizing and 125°C and $\leq 5\%RH$ for palletizing (please use heat-resistant pallet rather than plastic pallet)
 - Time: 48 hours for reelizing and 12 hours for palletizing
 - Alarm temperature: 65°C for reelizing and 135°C for palletizing
 - Production ready temperature after natural cooling: $< 36^{\circ}C$
 - The number of drying times: 1
 - Re-baking requirement: If a module remains unused for 168 hours after being unpacked, it must be baked again.
- Important:** If this batch of modules is not baked within 168 hours, do not use the wave soldering to solder them. Because the modules are 3-level moisture-sensitive components, they are very likely to get damp when exposed outside. In this case, if they are soldered at high temperatures, it may result in component failure or poor soldering.
- In the whole production process, take electrostatic discharge (ESD) protective measures.
 - To guarantee the quality of products, you must pay attention to the following items:

- The amount of soldering flux.
- The height of the wave peak.
- Whether the tin slag and copper content in the wave soldering tank exceed standards.
- Whether the window and thickness of the wave soldering fixture are appropriate.
- Whether the wave soldering oven temperature curve is reasonable.

6.3 Recommended oven temperature curve and temperature

For oven temperature setting, refer to oven temperatures for wave soldering. The peak temperature is $260^{\circ}\text{C} \pm 5^{\circ}\text{C}$. The wave soldering temperature curve is shown below:



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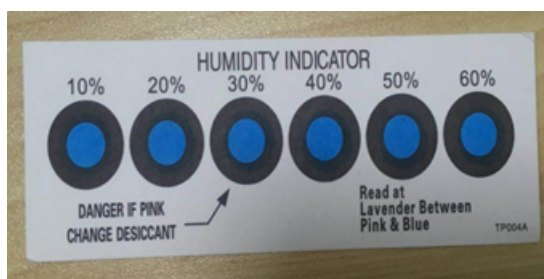
Recommended soldering temperature:

Recommended wave soldering oven temperature		Recommended manual soldering temperature	
Preheat temperature	80 to 130 °C	Soldering temperature	360±20°C
Preheat time	75 to 100s	Soldering time	< 3s/point
Peak contact time	3 to 5s	NA	NA
Temperature of tin cylinder	260±5°C	NA	NA
Ramp-up slope	≤2°C/s	NA	NA
Ramp-down slope	≤6°C/s	NA	NA

6.4 Storage conditions

Storage conditions for a delivered module are as follows:

- The moisture-proof bag is placed in an environment where the temperature is below 40°C and the relative humidity is lower than 90%.
- The shelf life of a dry-packaged product is 12 months from the date when the product is packaged and sealed.
- The package contains a humidity indicator card (HIC).



	<p>CAUTION This bag contains MOISTURE-SENSITIVE DEVICES</p>	<p>LEVEL 3</p> <p><small>If Blank, see adjacent bar code label</small></p>
<p>1. Calculated shelf life in sealed bag: 12 months at < 40°C and < 90% relative humidity (RH)</p>		
<p>2. Peak package body temperature: <u>260</u> °C <small>If Blank, see adjacent bar code label</small></p>		
<p>3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must</p>		
<p>a) Mounted within: <u>168</u> hrs. of factory conditions <small>If Blank, see adjacent bar code label</small></p>		
<p>≤ 30°C/60%RH, OR</p>		
<p>b) Stored at <10% RH</p>		
<p>4. Devices require bake, before mounting, if:</p>		
<p>a) Humidity Indicator Card is > 10% when read at 23 ± 5°C</p>		
<p>b) 3a or 3b not met.</p>		
<p>5. If baking is required, devices may be baked for 48 hrs. at 125 ± 5°C</p>		
<p>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</p>		
<p>Bag Seal Date: _____ <small>If Blank, see adjacent bar code label</small></p>		
<p>Note: Level and body temperature defined by IPC/JEDEC J-STD-020</p>		

7 MOQ and packaging information

Product number	MOQ (pcs)	Shipping packaging method	The number of modules per reel	The number of reels per carton
CB2S	3600	Tape reel	900	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 device.

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 installation. 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 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 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 operating simultaneously with other radios in the host system except following FCC multi-transmitter product 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 intended destination. The firmware setting is not accessible by 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 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/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”.

This device has got an FCC ID: 2ANDL-CB2S. The end product must be labeled in avisible area with the following: “Contains Transmitter Module FCC ID: 2ANDL-CB2S”.

This device is intended only for OEM integrators under the following conditions:The antenna must be installed such that 20cm is maintained between the antennaand users, and the transmitter module may not be co-located with any other transmitter 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

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 to the human body.