



CBLC5 Module Datasheet

Version: 20210602

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Contents

CBLC5 is a low-power embedded Wi-Fi module that Tuya has developed. It consists of a highly integrated RF chip (BK7231N), a few peripherals, an embedded Wi-Fi network protocol stack, and rich library functions.

1 Overview

CBLC5 not only supports the AP and STA dual-network-connection manner but supports the Bluetooth LE network connection manner.

CBLC5 has a 32-bit MCU with a running speed of up to 120 MHz, 2Mbyte flash, and 256-KB RAM, so as to support the multi-cloud connection. The three 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
- Peripheral: 3 pulse width modulation(PWM)
- 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
 - Working temperature: -40°C to 105°C
- Bluetooth LE connectivity
 - 6 dBm transmit power in bluetooth mode
 - Complete bluetooth coexistence interface

1.2 Applications

- Intelligent building
- Smart household and home appliances
- Smart socket and light
- Industrial wireless control

1.3 Change history

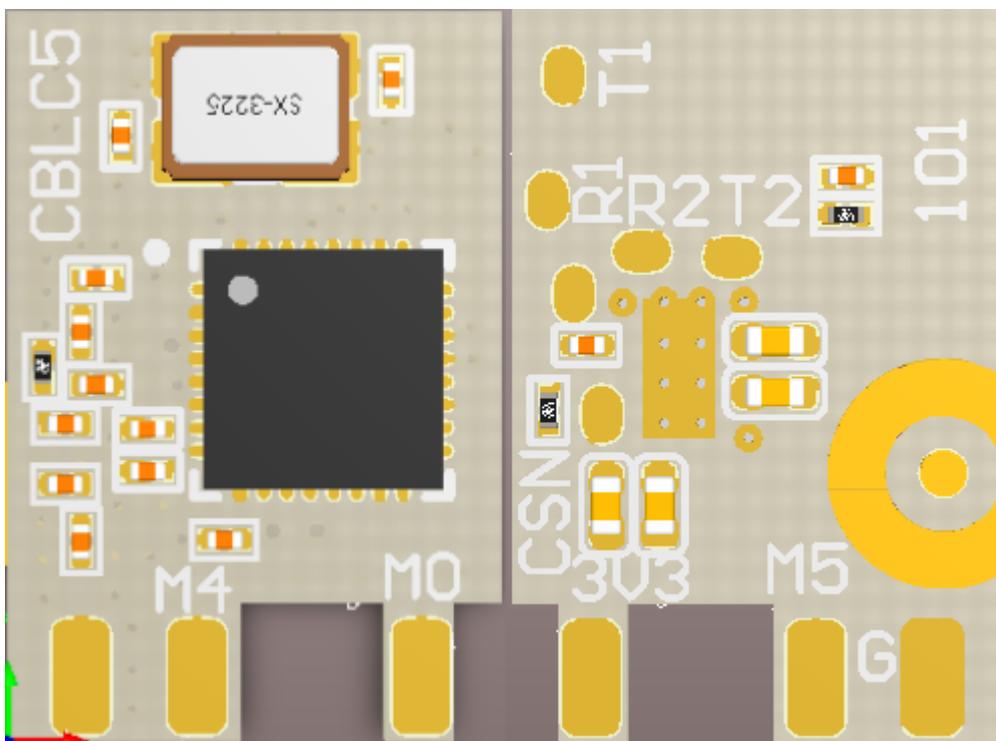
Update date	Updated content	Version after update
10/16/2020	This is the first release.	V1.0.0
11/24/2020	Updated test data	V1.0.1

2 Module interfaces

2.1 Dimensions and package

CBLC5 has two rows of pins with a 2 ± 0.1 mm pin spacing.

The CBLC5 dimensions are 8.5 ± 0.35 mm (W) \times 12.7 ± 0.35 mm (L) \times 2.4 ± 0.15 mm (H).



2.2 Pin definition

Symbol	I/O type	Function
ANT	O	Pad pin for the external antenna
GND	P	Ground pin
M4	I/O	Support hardware PWM and correspond to PA 24 on the internal IC
M5	I/O	Support hardware PWM and correspond to PA 26 on the internal IC
M0	I/O	Support hardware PWM and correspond to PA 6 on the internal IC
3V3	P	Power supply pin

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

2.3 Definitions on test points

Symbol	I/O type	Function
R2	I/O	UART2_RX, LOG RX, which corresponds to P1 on the internal IC
T2	I/O	UART2_TX, LOG TX, which corresponds to P0 on the internal IC

Symbol	I/O type	Function
R1	I/O	UART1_RX, user serial interface RX, which corresponds to P10 on the internal IC
T1	I/O	UART1_TX, user serial interface TX, which corresponds to P11 on the internal IC
CSN	I	If connected to the ground before powered on, enter the RF test mode. If not connected or connected to VCC before powered on, enter the firmware application mode.
None	I	RST pin, which corresponds to CEN on the internal IC

Note: Test pins are not recommended.

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	-	105	°C
VBAT	Power supply voltage	3	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	273	304	mA
Transmit	11g	54Mbps	+15dBm	265	280	mA
Transmit	11n	MCS7	+14dBm	250	273	mA
Receive	11b	11Mbps	Constantly receive	73	83	mA
Receive	11g	54Mbps	Constantly receive	75	84	mA
Receive	11n	MCS 7	Constantly receive	75	84	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	70	273	mA
Quick network connection state (AP)	The module is in the hotspot network connection state and the Wi-Fi indicator flashes slowly	80	300	mA
Quick network connection state (EZ)	The module is in the fast network connection state and the Wi-Fi indicator flashes fast	87	380	mA
Network connection state	The module is connected to the network and the Wi-Fi indicator is always on	40	350	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	External monopole subantenna

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 HT20 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	-	-75	-	dBm
PER<10%, RX sensitivity, 802.11n HT20 OFDM Mode MCS7	-	-72	-	dBm
PER<10%, RX sensitivity, Bluetooth LE 1M	-	-93	-	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	-	-93	-	dBm
Maximum RF signal input	-10	-	-	dBm
Inter-modulation	-	-	-23	dBm
Co-channel suppression ratio	-	10	-	dB

5 Antenna

5.1 Antenna type

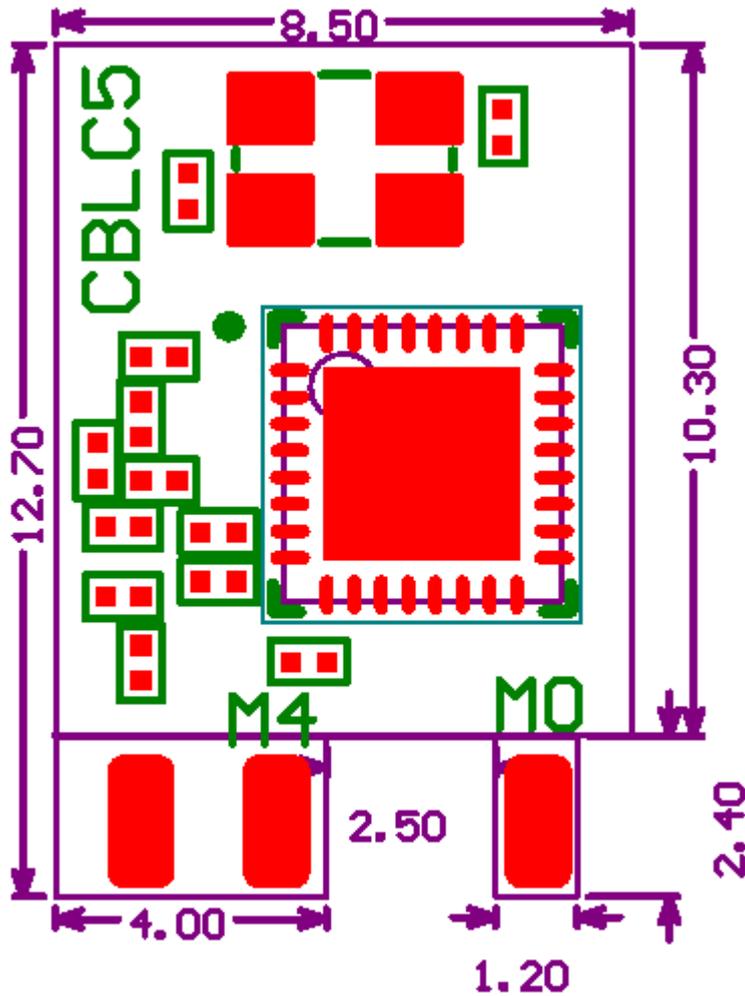
CBLC5 supports the external monopole subantenna.

5.2 Antenna interference reduction

To ensure optimal Wi-Fi performance, 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.

6 Packaging information and production instructions

6.1 Mechanical dimensions



Note: The default outline dimension tolerance is ± 0.35 mm, and the critical dimension tolerance is ± 0.1 mm. If you have specific requirements on dimensions, specify them clearly in the datasheet after communication.

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.

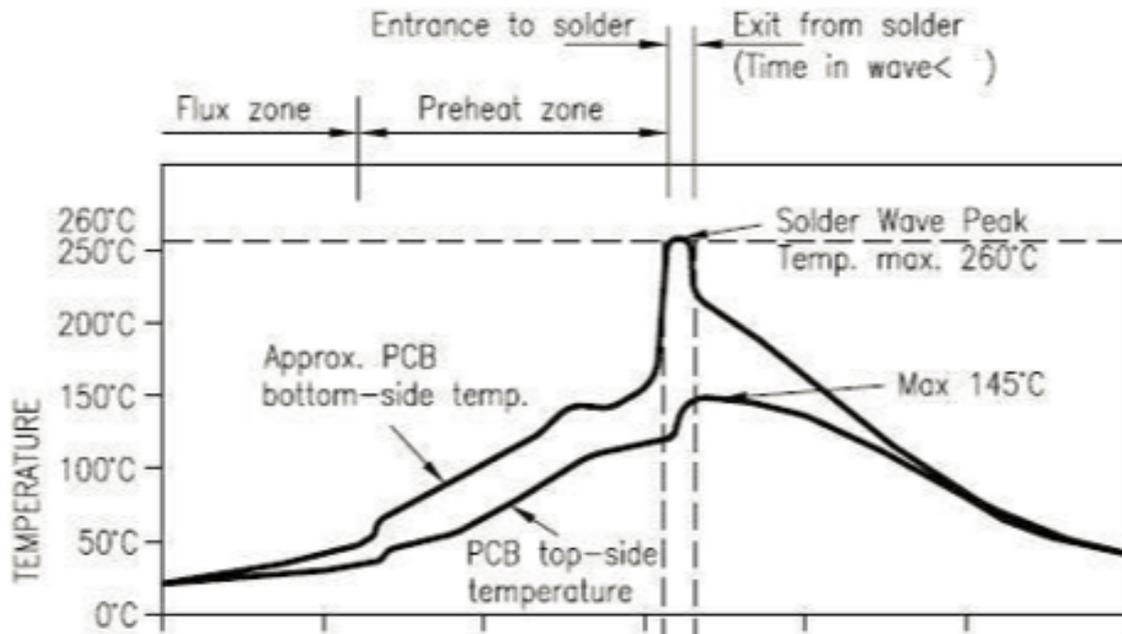
Important: If this batch of modules is not baked within 168 hours, do not use the wave soldering to solder them. Because the modules are 3-level moisture-sensitive components, they are very likely to get damp when exposed outside. In this case, if they are soldered at high temperatures, it may result 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:

DIP Type Product Pass Wavesolder Graph



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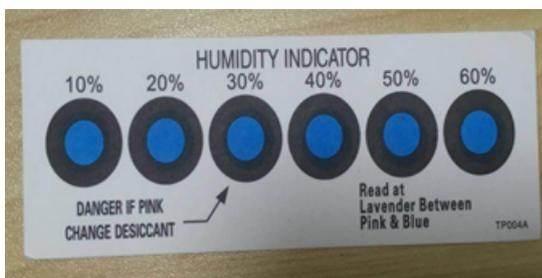
Recommended soldering temperature:

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).





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 packaging information

Product number	MOQ (pcs)	Shipping packaging method	The number of modules per reel	The number of reels per carton
CBLC5	7200	Tape reel	1800	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-CBLC5. The end product must be labeled in a visible area with the following: “Contains Transmitter Module FCC ID: 2ANDL-CBLC5”.

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 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.