CBLC9 Module Datasheet

Version: 20210602

Online Version

Contents

Developed by Tuya, CBLC9 is a single chip that integrates all peripheral devices. The chip integrates complete hardware and software resources required by Wi-Fi and Bluetooth LE applications. CBLC9 supports the AP and STA dual-role connection, and the Bluetooth LE connection. A 32-bit MCU with the running speed of up to 120 MHz and a built-in 256-KB RAM can enable the chip to support connection to the Tuya Cloud Platform, and the MCU’s specially extended instructions for processing signals can effectively implement audio encoding and decoding.

1 Overview

CBLC9 integrates crystals, RF matching circuits, and all peripheral devices, and has rich peripherals, such as PWM, I2C, UART, SPI, SDIO, USB, and IrDA. Up to six 32-bit PWM outputs, making 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 to 3.6V
- Peripheral: 6 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 + 16dBm 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℃ to 105℃
- Bluetooth LE connectivity
  - Up to 6 dBm transmit power in bluetooth mode
  - Bluetooth coexistence interface

1.2 Applications

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

1.3 Change history

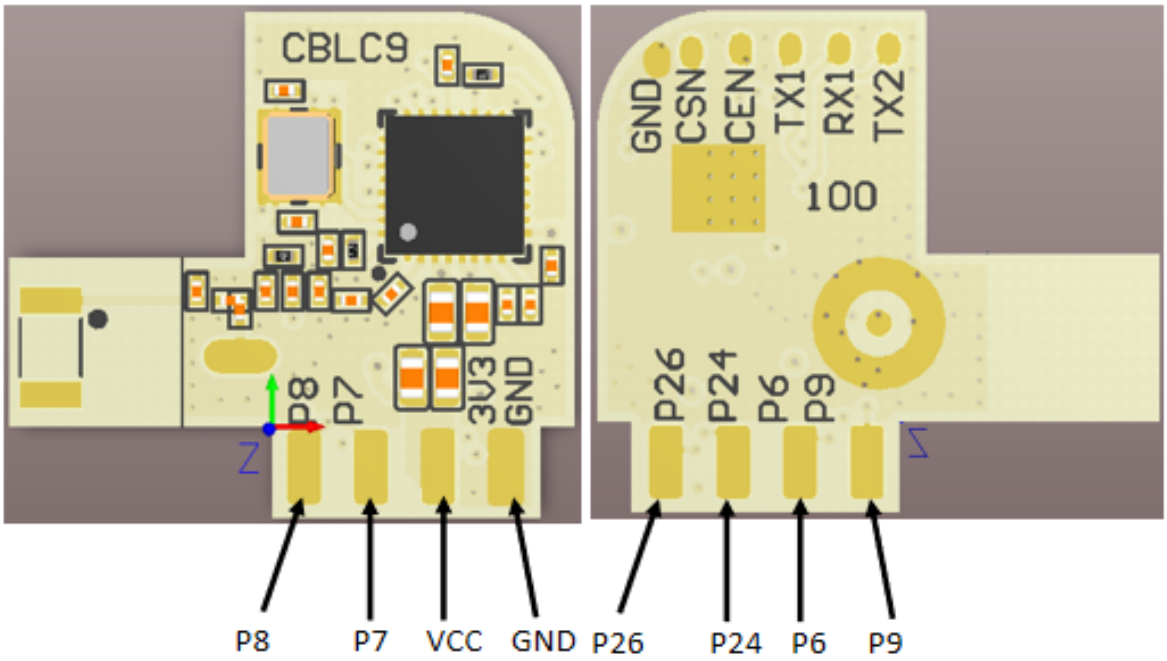
Update date	Updated content	Version after update
11/24/2020	This is the first release.	V1.0.0

2 Module interfaces

2.1 Dimensions and package

CBLC9 has two rows of pins with the spacing of 2±0.1 mm.

The CBLC9 dimensions are 15±0.35 mm (W)×16.8±0.35 mm (L) ×1.8±0.15 mm (H).



2.2 Pin definition

Pin number	Symbol	I/O type	Function
1	P9	I/O	Support hardware PWM and correspond to P9 on the internal IC
2	P8	I/O	Common I/O pin and correspond to P8 on the internal IC
3	P6	I/O	Support hardware PWM and correspond to P6 on the internal IC
4	P7	I/O	Support hardware PWM and correspond to P8 on the internal IC
5	P24	I/O	Support hardware PWM and correspond to P24 on the internal IC
6	VCC	P	Power supply pin (3.3V)
7	P26	I/O	Support hardware PWM and correspond to P26 on the internal IC
8	GND	P	Power supply reference ground

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

2.3 Definitions on test points

Pin number	Symbol	I/O type	Function
TP1	RF	I/O	RF test point
TP2	GND	P	Connection point
TP3	CEN	I	Reset pin, 3.3V, pull-up resistor
TP4	U1_TXD	I/O	UART1_TX, user serial interface TX
TP5	U1_RXD	I/O	UART1_RX, user serial interface RX
TP6	U2_TXD	I/O	UART2_TX, LOG TX
TP8	CSN	I	Pull down externally before power on and RF calibration

3 Electrical parameters

3.1 Absolute electrical parameters

Parameter	Description	Minimum value	Maximum value	Unit
Ts	Storage temperature	-55	125	℃
VBAT	Power supply voltage	-0.3	3.9	V
ESD voltage (human body model)	TAMB-25℃	-4	4	KV

Parameter	Description	Minimum value	Maximum value	Unit
ESD voltage (machine model)	TAMB-25℃	-200	200	V

3.2 Normal working conditions

Parameter	Description	Minimum value	Typical value	Maximum value	Unit
Ta	Working tempera-ture	-40	-	105	℃
VBAT	Power supply voltage	3	3.3	3.6	V
VOL	I/O low level output	VSS	-	VSS+0.3	V
VOH	I/O high level output	VBAT-0. 3	-	VBAT	V
Imax	I/O drive current	-	6	20	mA

3.3 RF power consumption

Working status	Mode	Rate	Transmit power/re-ceive	Average value	Peak value (Typical value)	Unit
Transmit	11b	11Mbps	+16dBm	279	315	mA

Working status	Mode	Rate	Transmit power/receive	Average value	Peak value (Typical value)	Unit
Transmit	11g	54Mbps	+14dBm	260	282	mA
Transmit	11n	MCS7	+13dBm	257	277	mA
Receive	11b	11 Mbps	Constantly receive	74	88	mA
Receive	11g	54 Mbps	Constantly receive	74	88	mA
Receive	11n	MCS 7	Constantly receive	74	88	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	79	263	mA
Quick network connection state (AP)	The module is in the hotspot network connection state and the Wi-Fi indicator flashes slowly	80	310	mA

Working mode	Working status, Ta = 25°C	Average value	Maximum value (Typical value)	Unit
Quick network connection state (EZ)	The module is in the fast network connection state and the Wi-Fi indicator flashes fast	97	316	mA
Connected state	The module is connected to the network and the Wi-Fi indicator is always on	47	308	mA
Weakly connected state	The module and hotspot are in the state of weak connection and the Wi-Fi indicator light is always on	205	350	mA
Disconnected state	The module is disconnected and the Wi-Fi indicator is always off	79	263	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 MCS 0 to 7
Antenna type	Ceramic patch antenna;Gain 1.2dbi

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	-	14	-	dBm
Average RF output power, 802.11n OFDM Mode MCS7	-	13	-	dBm
Frequency error	-10	-	10	ppm

4.3 Wi-Fi receiving performance

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
PER<10%, RX sensitivity, Bluetooth LE 1M	-	-94	-	dBm

4.4 Bluetooth LE transmission performance

Parameter	Minimum value	Typical value	Maximum value	Unit
Working frequency	2402	-	2480	MHz
Air rate	-	1	-	Mbps
Transmit power	-20	6	20	dBm
Frequency error	-150	-	150	kHz

4.5 BLE 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

CBLC9 uses the 3216 ceramic patch antenna.

5.2 Antenna interference reduction

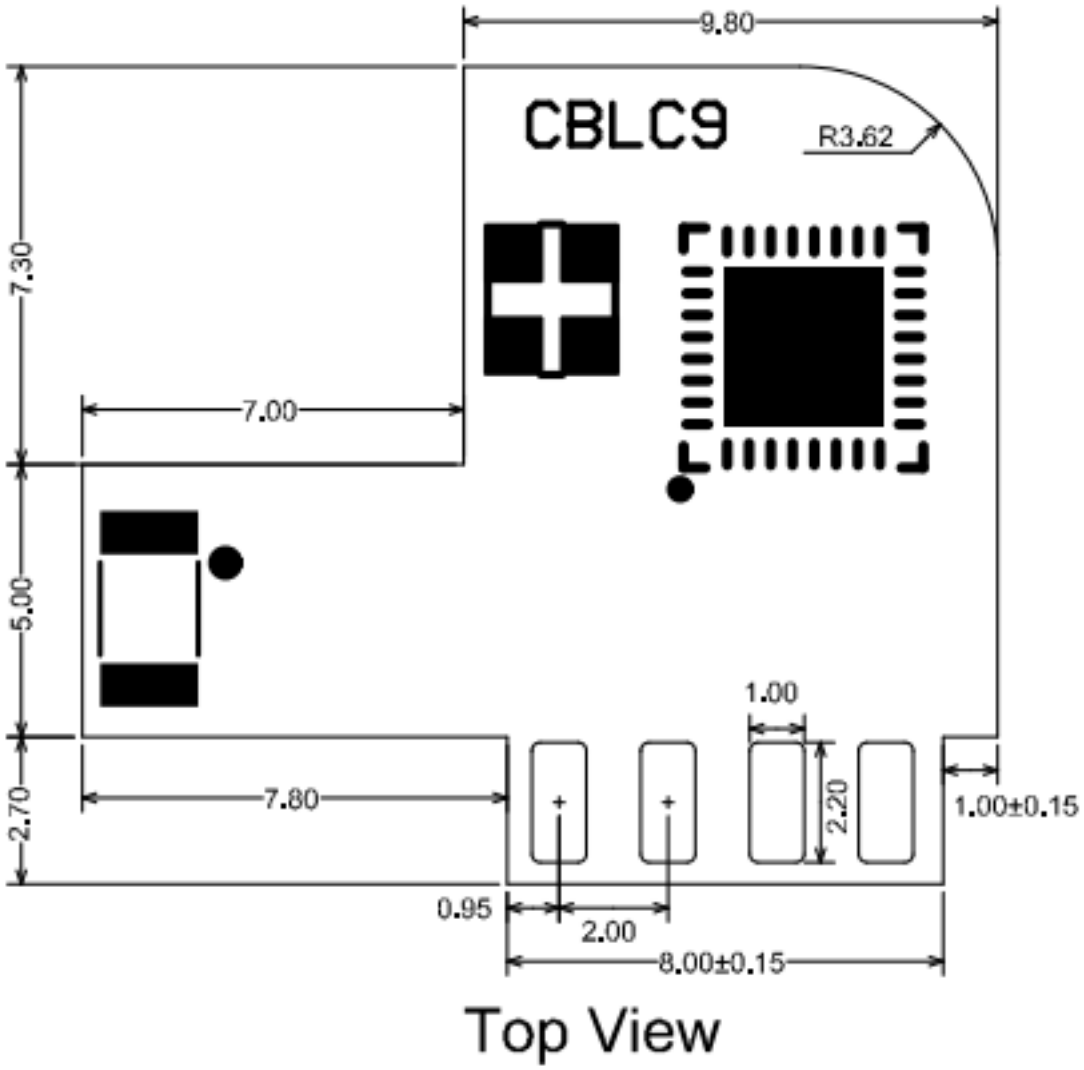
When the Wi-Fi module uses the ceramic patch antenna, to ensure the optimal Wi-Fi performance it is recommended that the antenna be at least 15 mm away from other metal parts.

To prevent an adverse impact on the antenna radiation performance, avoid copper or traces along the antenna area on the PCB.

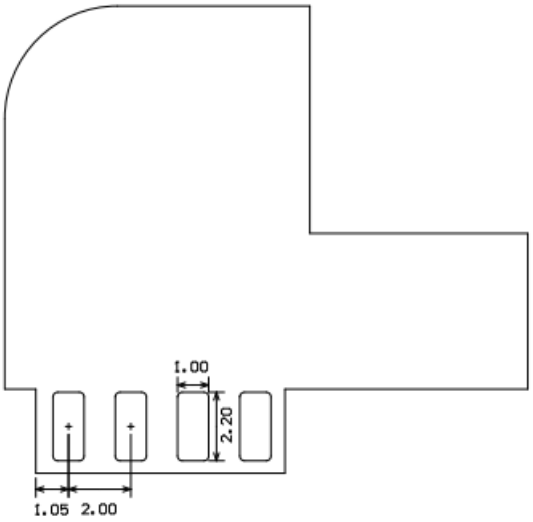
6 Footprint information and production instructions

6.1 Mechanical dimensions

The CBLC9 PCB dimensions are 15±0.35 mm (W)×16.8±0.35 mm (L) ×1±0.1 mm (H).



Top View



Bottom View

Unit： mm

Module form factor tolerance: ± 0.35mm

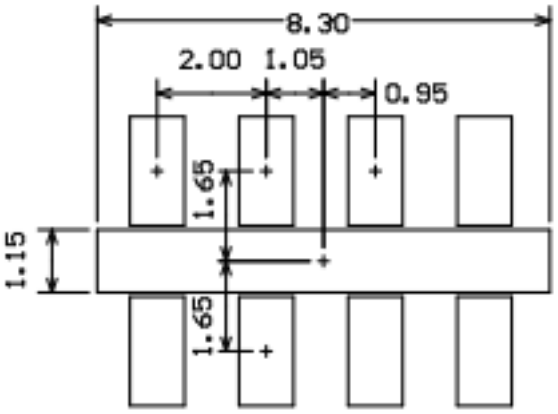
Plate thickness tolerance: ±0.1mm

The marked device heights are the max values

Side View

Note: The default outline dimension tolerance is ±0.35 mm, and the critical dimension tolerance is ±0.15 mm. If you have specific requirements on dimensions, specify them clearly in the datasheet after communication.

6.2 Recommended footprint



6.3 Production instructions

1. For the Tuya in-line module, wave soldering 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).
2. Wave soldering devices and materials:
   - Wave soldering equipment
   - Wave soldering fixture
   - Constant-temperature soldering iron
   - Tin bar, tin wire, and flux
   - Thermal profiler
3. Baking devices:
   - Cabinet oven

- Anti-electrostatic and heat-resistant trays
- Anti-electrostatic and heat-resistant gloves

4. The module needs to be baked in the following cases:

   - The packaging bag is damaged before unpacking.
   - There is no humidity indicator card (HIC) in the packaging bag.
   - After unpacking, circles of 10% and above on the HIC become pink.
   - The total exposure time has lasted for over 168 hours since unpacking.
   - More than 12 months have passed since the sealing of the bag.

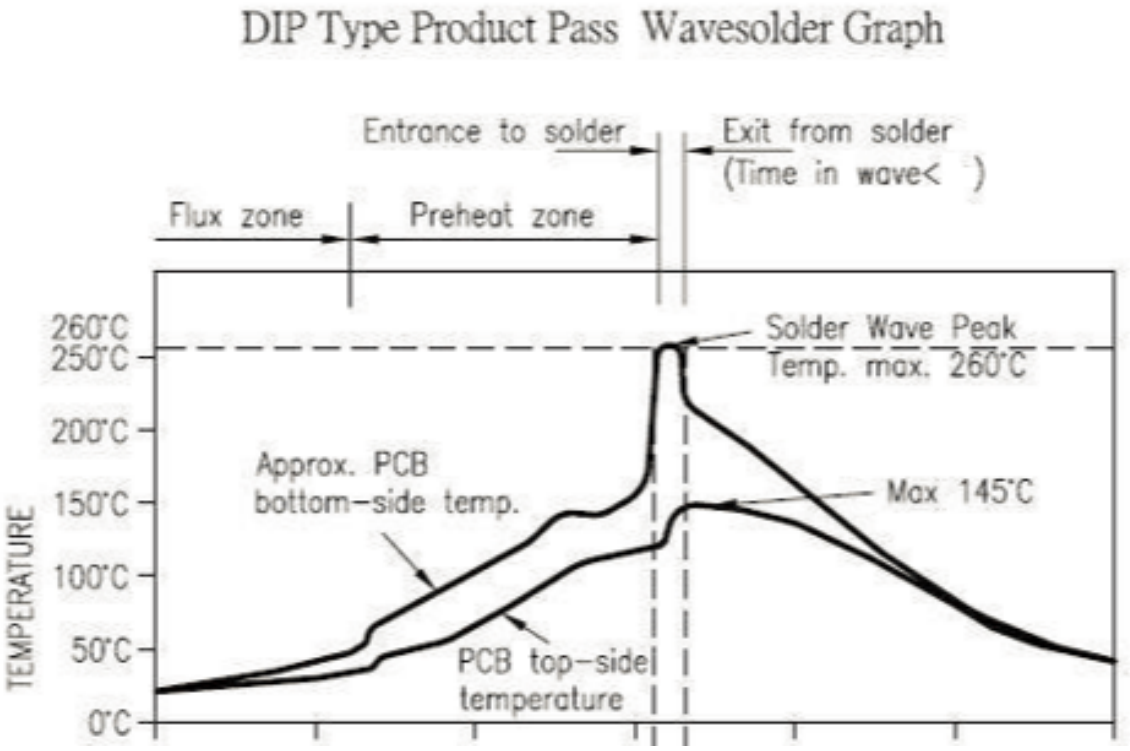
5. Baking settings:

   - Temperature: 60°C and ≤ 5% RH for reel package and 125°C and ≤5% RH for tray package (please use the heat-resistant tray rather than plastic container)
   - Time: 48 hours for reel package and 12 hours for tray package
   - Alarm temperature: 65°C for reel package and 135°C for tray package
   - Production-ready temperature after natural cooling: < 36°C
   - Re-baking situation: If a module remains unused for over 168 hours after being baked, it needs to be baked again.
   - If a batch of modules is not baked within 168 hours, do not use the wave soldering to solder them. Because these modules are Level-3 moisture-sensitive devices, they are very likely to get damp when exposed beyond the allowable time. In this case, if they are soldered at high temperatures, it may result in device failure or poor soldering.

6. In the whole production process, take electrostatic discharge (ESD) protective measures.
7. 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, and whether the wave soldering oven temperature curve is appropriate.

6.4 Recommended oven temperature curve and temperature

Set oven temperatures according to the following temperature curve of wave soldering. The peak temperature is 260°C±5°C.



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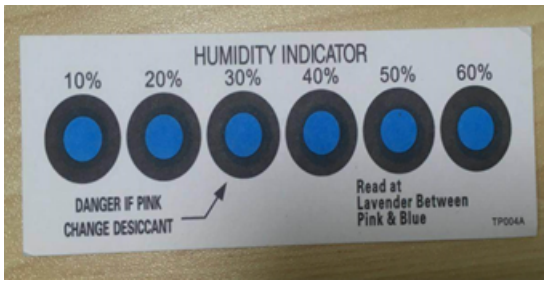
Recommended soldering temperature:

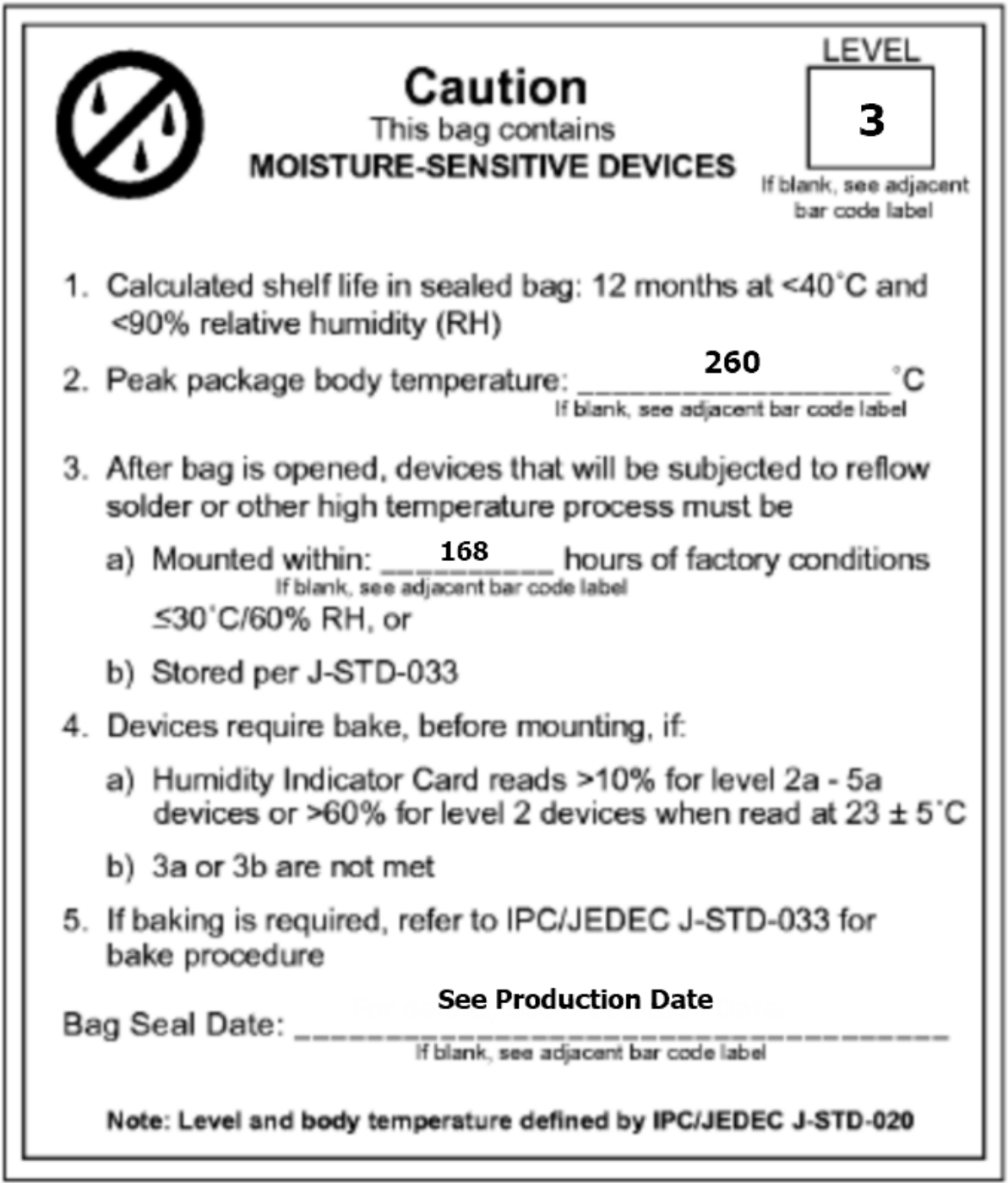
Suggestions on oven temperature curve of wave soldering		Suggestions on manual soldering temperature	
Preheat temperature	80 to 130 °C	Soldering temperature	360±20°C
Preheat time	75 to 100s	Soldering time	＜ 3s/point
Peak contact time	3 to 5s	NA	NA
Temperature of tin cylinder	260±5°C	NA	NA
Ramp-up slope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

6.5 Storage conditions

Storage conditions for a delivered module:

- 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.
- There is a humidity indicator card (HIC) in the packaging bag.





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 be
   a) Mounted within: **168** hours of factory conditions
   If blank, see adjacent bar code label
   ≤30˚C/60% RH, or
   b) Stored per J-STD-033
4. Devices require bake, before mounting, if:
   a) Humidity Indicator Card reads >10% for level 2a - 5a devices or >60% for level 2 devices when read at 23 ± 5˚C
   b) 3a or 3b are not met
5. If baking is required, refer to IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: **See Production 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
CBLC9	4400	Tape reel	1100	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”.

The RF module is considered as a limited modular transmitter according to FCC rules. Even though the RF module gets an 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 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.