AFI-VWBK1 Module Datasheet

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Product overview

VWBK1 is a single-chip online voice Wi-Fi module. It supports online voice interaction and AIoT. It can be usec
scenarios and Bluetooth voice transmission scenarios, to help customers access the IoT/smart speaker/smart g

Features

- Three kernels: BT MCU, Wi-Fi MCU, and CEVA DSP
- BT MCU with the maximum clock rate of 120 MHz
- Wi-Fi MCU with the maximum clock rate of 240 MHz
- DSP with the maximum clock rate of 320 MHz, responsible for voice interruption
- Operating voltage: 3.3 to 4.2V, 3.3V/1A recommended
- 12 GPIOs (reuse), 2 UARTs, 2 ADCs， 8 PWMs (reuse), and 1 I2C
- Antenna: Onboard antenna (IPEX antenna optional)
- Frequency of sample: 16K/16bit
- Voice input: Embedded with four ADCs, which can be externally connected to 4 analog microphones
- Voice output: Built-in 2 stereo outputs, which can be connected to an external high-power speaker driven
- Recommended wakeup distance: <=5m
- Recommended working background noise: <=60dBC

Applications

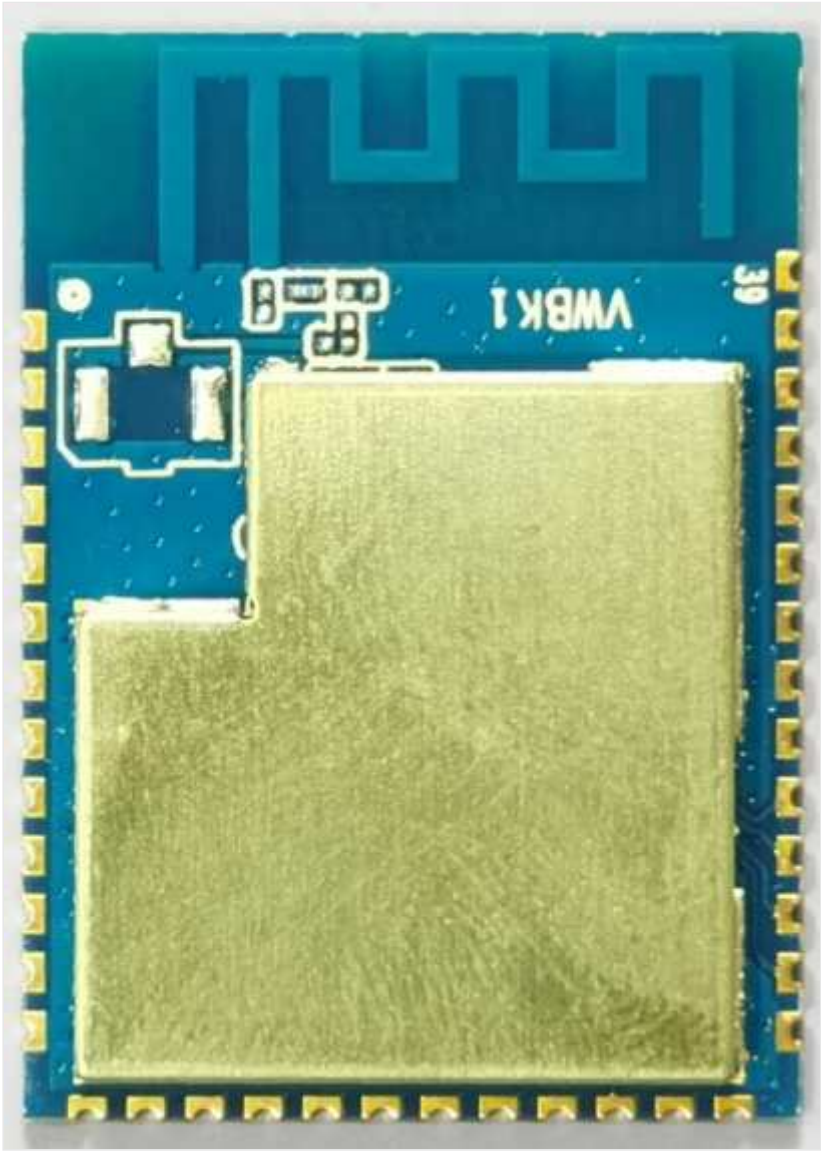
- Smart speaker and voice assistant
- Switch panel
- Lighting
- Major and small home appliances

- Toy

Module interfaces

Module and footprint

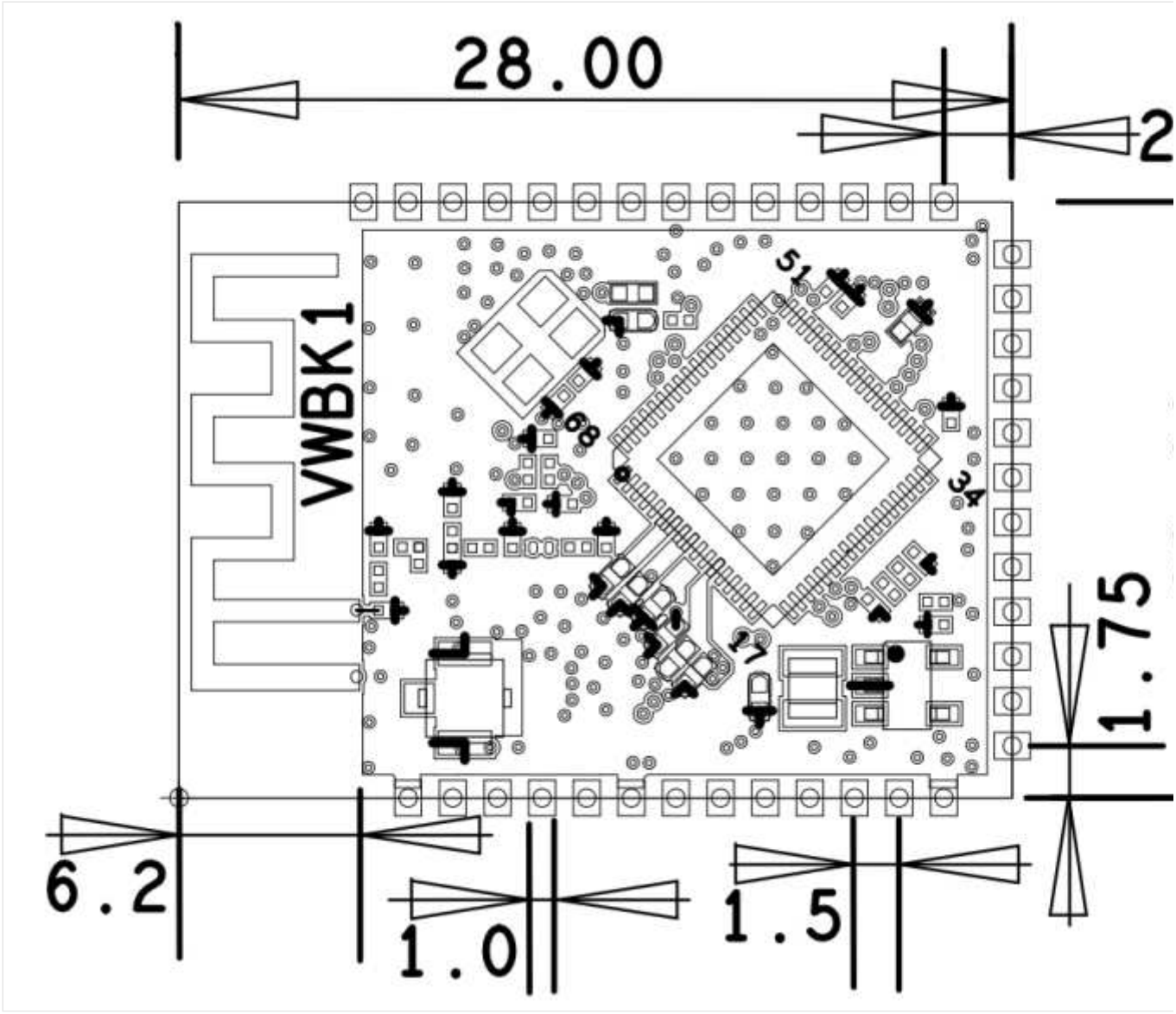
VWBK1 is a module with an onboard antenna. Its front side is sheild case. The physical module is shown below



Physical map of module (top)

Physical map of module (bottom)

There are pins on three sides of module VWBK1. The onboard antenna is on the fourth side. There are 39 pins between two pins is 1.5mm. The dimensions of VWBK1 are 20mm (W) *28mm (L) *3.6mm (H). The following fig diagram of the dimensions of VWBK1 (unit: mm)

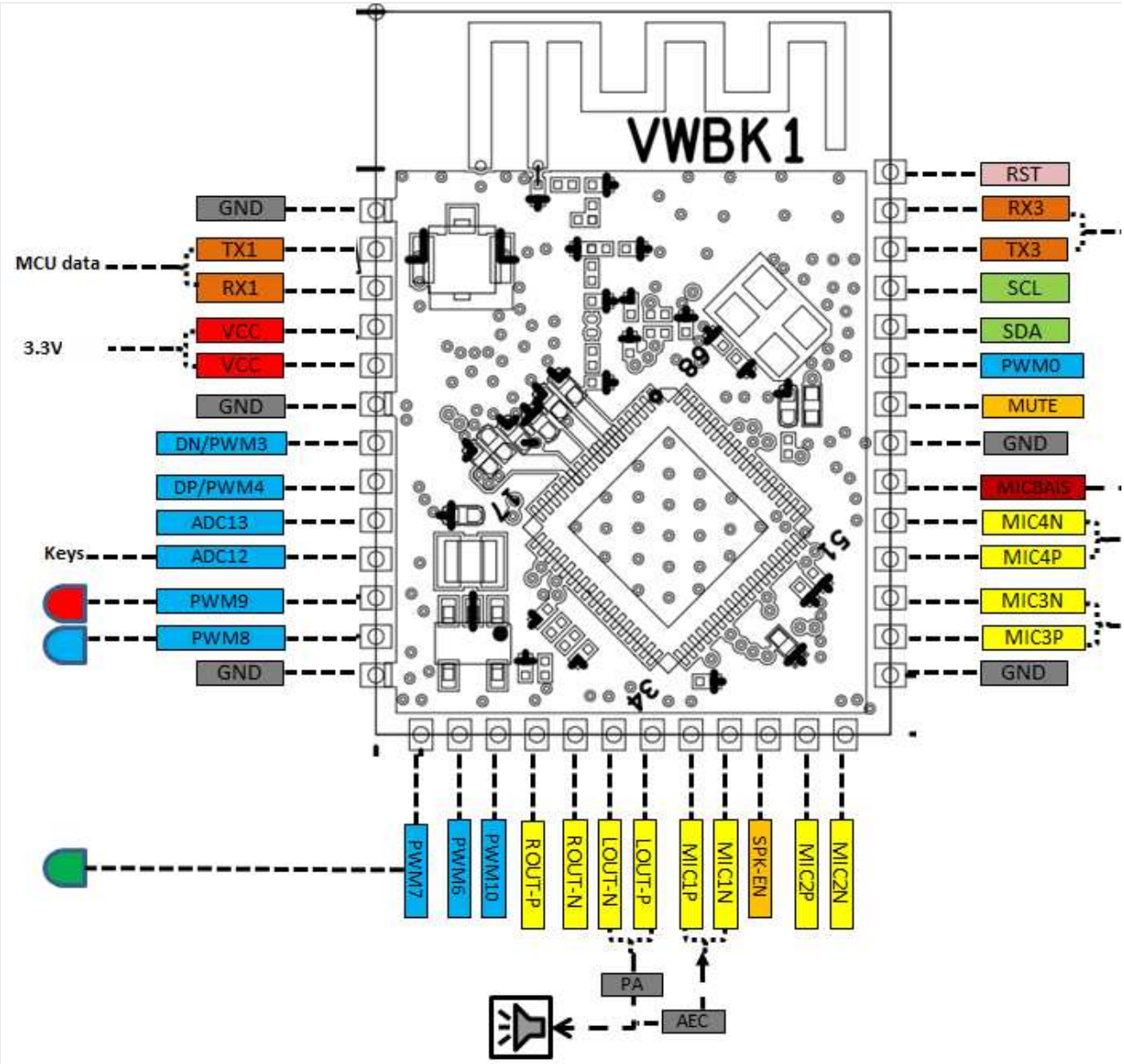


Pin definition

The voice interaction of VWBK1 needs an external microphone, amplifier, and speaker. VWBK1 is the voice solu
The logic of its keys and indicator light must meet specific requirements. Requirements on peripherals:

- Microphone (required): Currently, two microphones are needed. The distance between them is recommen specific requirements on the microphone, please consult Tuya technicians, or you can also refer to the Gu Microphone and Speaker of Voice Module.
- Power amplifier (required): The power amplifier must be selected based on the speaker. For specific requi amplifier, please consult the Tuya technicians, or you can also refer to the Guide to Selection of Microphо Module.

  -Speaker (required): The speaker must conform to its specifications. For specific specifications and structu please consult Tuya technicians, or you can also refer to the Guide to Selection of Microphone and Speak
- Indicator light (required): The Amazon voice system supports linear light, single light and ring light.
- Key (required): The Amazon voice system supports the microphone disable/wake up/volume up/volume d
- The interfaces of the module are shown below:



There are 39 pins in total. Their functions and definitions are shown below:

Pin number	Function	Type	Description
2	TX1	IO	TX1, used for communicating with MCU
3	RX1	IO	RX1, used for communicating with MCU
4,5	VCC	P	Power supply
1,6,13,26,32	GND	P	Ground
7	DN/PWM3	IO	DN of USB or PWM3 for the C light
8	DP/PWM4	IO	DP of USB or PWM4 for W light

9	ADC13	AI/IO	ADC13, reserve for peripherals. Also can be used as GPIO.
10	ADC12	AI/IO	ADC12, reserve for keys, for example, volume +/-/phone.
11	PWM9	IO	PWM9 dimming interface (by default, it is the indicator light of vc
12	PWM8	IO	PWM8 dimming interface (by default, it is the indicator light of vc
14	PWM7	IO	PWM7 dimming interface (by default, it is the indicator light of vc
15	PWM6	IO	Used to drive the green light, reserved to be used for infrared tra
16	PWM10	IO	Used to drive the red light, reserved to be used for infrared receiv
17	ROUT-P	AO	Right channel, output, positive, connected to the external power a speaker
18	ROUT-N	AO	Right channel, output, negative, connected to the external power speaker
19	LOUT-N	AO	Left channel, output, negative, connected to the external power a speaker
20	LOUT-P	AO	Left channel, output, positive, connected to the external power ar speaker
21	MIC1P	AI	MIC1 positive, used as the input interface of AEC
22	MIC1N	AI	MIC1 negative, used as the input interface of AEC
23	GPIO24	IO	Used to enable the power amplifier, SPK-EN
24	MIC2P	AI	MIC2 positive, used as the input interface of AEC
25	MIC2N	AI	MIC2 negative, used as the input interface of AEC
27	MIC3P	AI	MIC3 positive, connected to the external microphone
28	MIC3N	AI	MIC3 negative, connected to the external microphone
29	MIC4P	AI	MIC3 positive, connected to the external microphone

30	MIC4N	AI	MIC3 negative, connected to the external microphone
31	MICBIAS	P	Used to connect to the power supply of the microphone
33	GPIO2	IO	Input signals, used to detect the on/off of the microphone
34	PWM0	IO	PWM0, used to drive the blue light
35	SDA	IO	The data interface of the I2C (need to connect to the pull-up resis drive the ring light and other I2C sensory components
36	SCL	IO	The clock interface of the I2C (need to connect to the pull-up resi drive the ring light and other I2C sensory components
37	TX3	IO	Transmitting interface of UART3, debugging interface
38	RX3	IO	Receiving interface of UART3, debugging interface
39	RST	I	Reset pin

I/O is the common input/output pin, P is the power supply and ground pin, AI is the Analog input pin, and AO

Electrical parameters

Absolute electrical parameters

Parameter	Description	Minimum value	Maximum val
Ts	Storage temperature	-55	125
VCC	Power supply voltage	3.3V	4.2
ESD voltage (human body model)	TAMB-25℃	-	± 2000
ESD voltage (machine model)	TAMB-25℃	-	-
Supply voltage 3.3 to 4.2V, 3.3V preferred			

Working conditions

Parameter	Description	Minimum value	Typical value	Maximum value	Un
Ta	Operating temperature	-20	25	85	℃
VCC	Operating voltage	3.3	3.3	4.2	V
V_{IL}	Low voltage input	-0.3	-	1.32	V
V_{IH}	High voltage input	2.06	-	3.6	V
V_{OL}	Low voltage output	-0.3	-	0.4	V
V_{OH}	High voltage output	2.9	-	3.6	V
I_{max}	Drive current	-35	-	35	mA

Wi-Fi receiving and transmission power consumption

Operating status	Mode	Rate	Transmit power/receive	Average value	Peak value
Transmit	11b	11Mbps	+16dBm	279	313
Transmit	11g	54Mbps	+14dBm	280	309
Transmit	11n	MCS7	+13dBm	274	304
Receive	11b	11Mbps	Constantly receive	184	187
Receive	11g	54Mbps	Constantly receive	184	187
Receive	11n	MCS7	Constantly receive	184	187

Note: V_{BAT}=3.3V

Power consumption in operating mode

Working mode	Working status, Ta = 25℃, VCC=3.3V, not connected to PA power amplifier and lo

Fast connected	The module is fast connected to the network
Idle and connected	The module is connected to the network
Voice control	The module is connected to the network and waked up by voices

RF features

Basic RF features

Parameter	Description
Operating frequency	2.400 to 2.484 GHz
Wi-Fi standard	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: HT20MCS0~7
Antenna type	PCB antenna with a gain of 0.66 dBi

Transmission performance

TX performance

Parameter	Minimum value	Typical value	Maximum v
Average output power, 802.11b CCK Mode 11M	-	16	-
Average output power, 802.11g OFDM Mode 54M	-	14	-
Average output power, 802.11n OFDM Mode MCS7	-	13	-
EVM@802.11b CCK 11 Mbps Mode 16 dBm	-	-23	-
EVM@802.11g OFDM 54 Mbps Mode 13.5 dBm	-	-27	-
EVM@802.11n OFDM MCS7 Mode 12 dBm	-	-28	-

Frequency error	-10	-	10

RX performance

RX sensitivity

Parameter	Minimum value	Typical value	Maximum
PER<8%, RX sensitivity, 802.11b DSSS Mode 11M	-	-87	-
PER<10%, RX sensitivity, 802.11g OFDM Mode 54M	-	-71	-
PER<10%, RX sensitivity, 802.11n OFDM Mode MCS7	-	-68	-

Antenna information

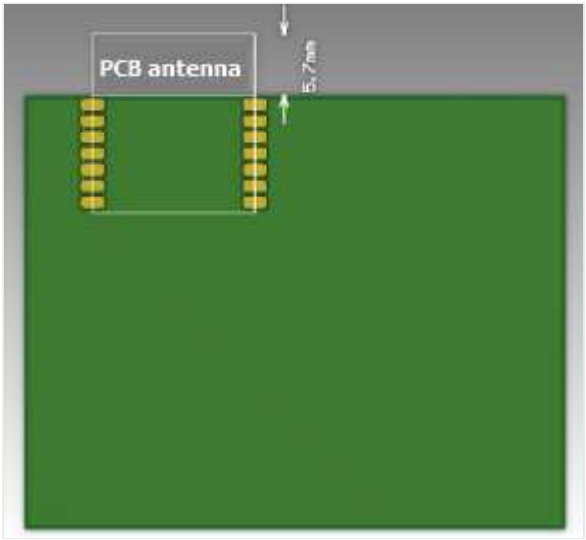
Antenna type

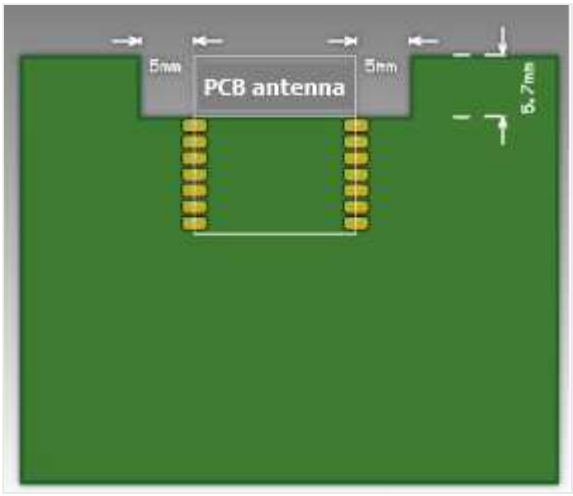
By default, VWBK1 uses an onboard MIFA PCB antenna whose frequency band is 2.4G.

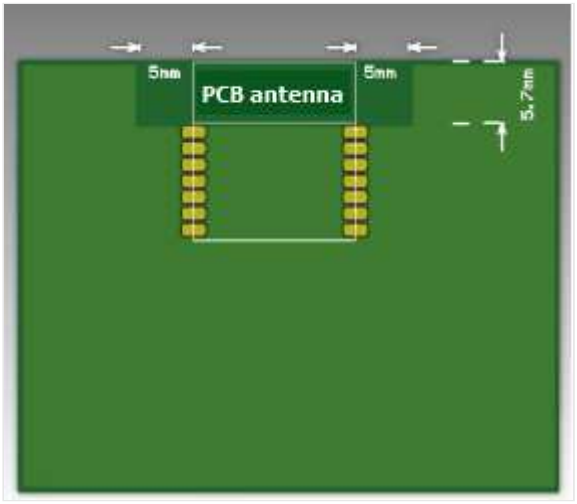
Antenna interference reduction

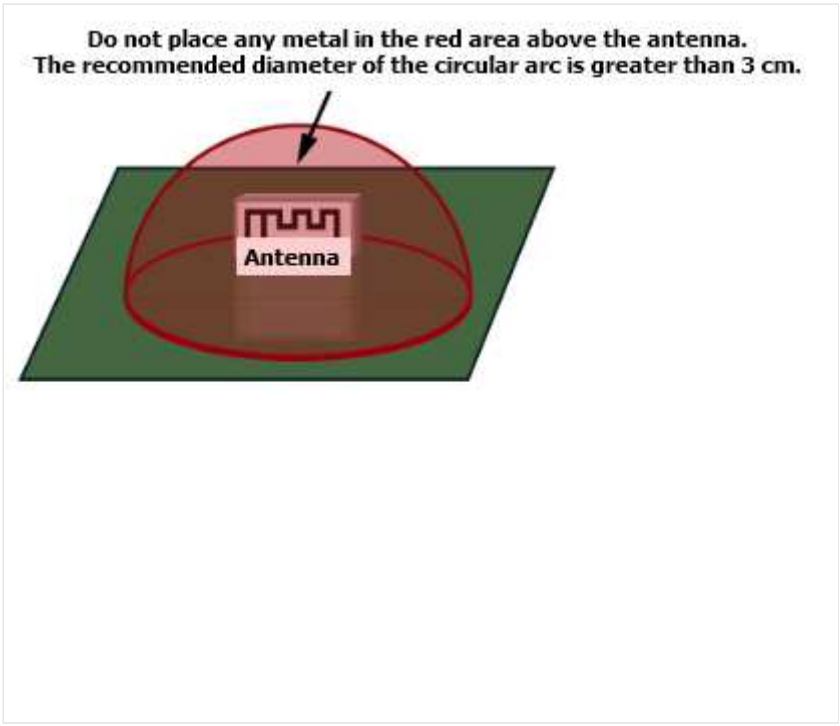
To ensure the optimal performance of Wi-Fi, it is recommended that the antenna should be 15mm away from

You should not wire or lay copper in the antenna area to avoid effects on the antenna performance.







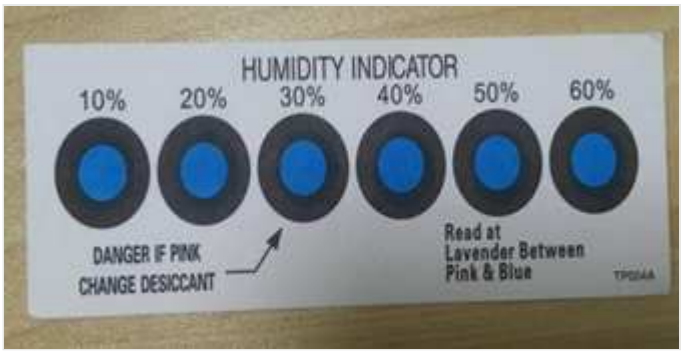


Production instructions

1. The Tuya SMT module should be mounted by the SMT device. After being unpacked, it should be soldere
   Otherwise, it should be put into the drying cupboard where the RH is not greater than 10%; or it needs tc
   vacuum again and the exposure time needs to be recorded (the total exposure time cannot exceed 168 h

- SMT devices:
  - Mounter
  - SPI
  - Reflow soldering machine
  - Thermal profiler
  - Automated optical inspection (AOI) equipment
- Baking devices:
  - Cabinet oven
  - Anti-electrostatic and heat-resistant trays
  - Anti-electrostatic and heat-resistant gloves

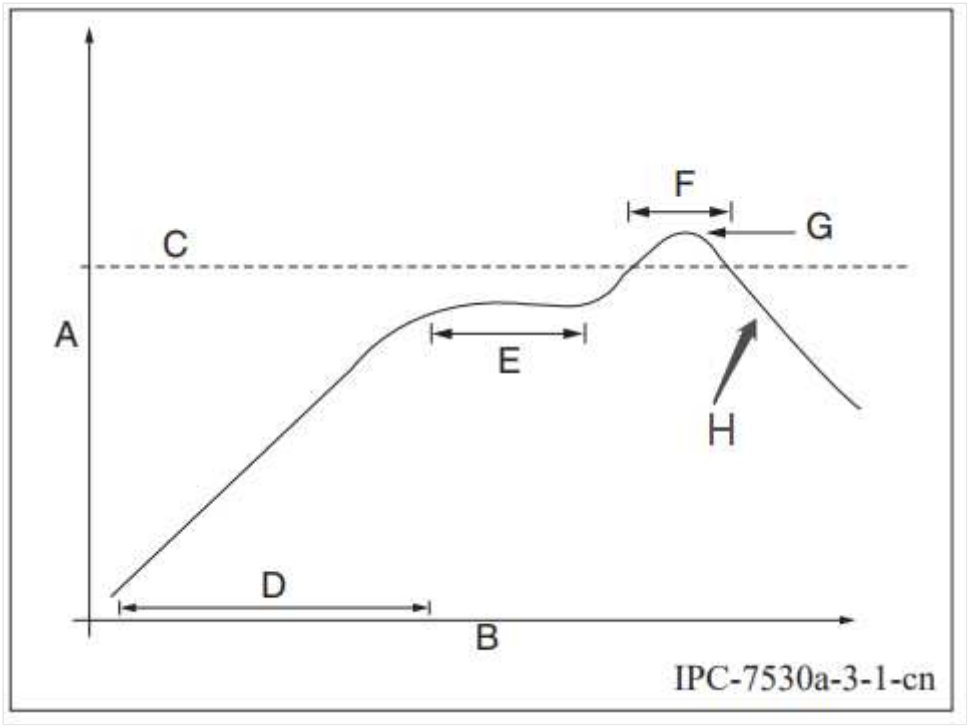
2. Storage conditions for a delivered module:
   - The moisture-proof bag must be placed in an environment where the temperature is below 40°C and t lower than 90%.
   - The shelf life of a dry-packaged product is 12 months from the date when the product is packaged an
   - There is a humidity indicator card (HIC) in the packaging bag.



3. The module needs to be baked in the following cases:
   - The packaging bag is damaged before unpacking.
   - There is no 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 has passed since the sealing of the bag.
4. Baking settings:
   - Temperature: 60°C and ≤ 5% RH for reel package and 125°C and ≤5% RH for tray package (please use 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 b
   - If a batch of modules is not baked within 168 hours, do not use the reflow soldering to solder them. B Level-3 moisture-sensitive devices, they are very likely to get damp when exposed beyond the allowab they are soldered at high temperatures, it may result in device failure or poor soldering.
5. In the whole production process, take electrostatic discharge (ESD) protective measures.
6. To guarantee the passing rate, it is recommended that you use the SPI and AOI to monitor the quality of mounting.

Recommended oven temperature curve

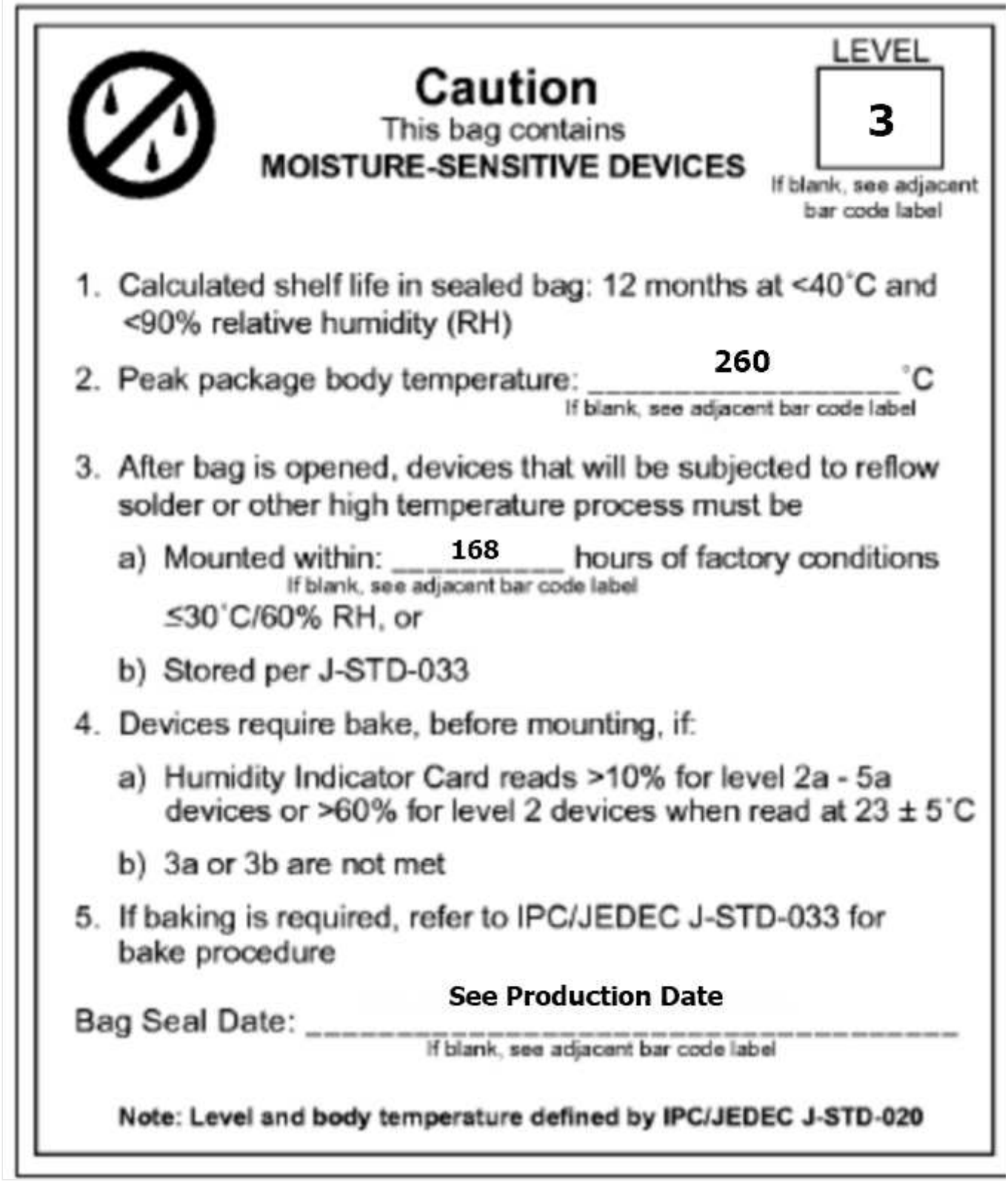
Set oven temperatures according to the following temperature curve of reflow soldering. The peak temperatu



- A: Temperature axis
- B: Time axis
- C: Liquidus temperature: 217 to 220°C
- D: Ramp-up slope: 1 to 3°C/s
- E: Duration of constant temperature: 60 to 120s; the range of constant temperature: 150 to 200°C
- F: Duration above the liquidus: 50 to 70s
- G: Peak temperature: 235 to 245°C
- H: Ramp-down slope: 1 to 4°C/s

> **Note**: The above curve is just an example of the solder paste SAC305. For more details about other sol
> refer to Recommended oven temperature curve in the solder paste specifications.

Storage conditions



Note: The unit is mm.

Revision	Update
V1.0.0	First release

V1.0.1	1. Updated some definitions on IO. 2. Added some descriptions. 3. Added the production instructions

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Yes No

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General Documentations for Lighting (/en/docs/iot/lighting-general-documentations?id=Kb4qjfrrwtp2s)

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