



WBR3-PRO Module Datasheet

Version: 20260331

Online Version

Contents

1. Overview	2
1.1. Features	2
1.2. Scope of applications	2
2. Module interfaces	4
2.1. Dimensions and footprint	4
2.2. Pinout	4
3. Electrical parameters	8
3.1. Absolute electrical parameters	8
3.2. Operating conditions	8
3.3. Radio frequency (RF) power	9
3.4. Power consumption in operating mode	10
4. RF parameters	13
4.1. Basic RF features	13
4.2. Transmitter (TX) performance	13
5. Antenna information	16
5.1. Antenna type	16
5.2. Antenna interference reduction	16
6. Power-on and power-off sequence	17
6.1. Power-on sequence	17
6.2. Power-off sequence	17
7. Footprint and production instructions	19
7.1. Mechanical dimensions	19
7.2. Recommended PCB footprint	19
7.3. Production instructions	22
7.4. Recommended oven temperature curve	23
7.5. Storage conditions	25
8. MOQ and packaging information	26
9. Appendix: Statement	27

WBR3-PRO is a Wi-Fi and Bluetooth low energy (LE) combo module developed by Tuya Smart. It consists of a highly integrated RF chip, RTL8720CF-VU2, with built-in Wi-Fi stacks and various library functions.

1. Overview

WBR3-PRO combines a low-power KM4 microcontroller unit (MCU), WLAN MAC, and 1T1R (1 transmitter/1 receiver) design. This module provides output frequency up to 100 MHz, 384 KB embedded SRAM, 4 MB flash memory, and configurable GPIOs that can function as digital peripherals for diverse applications.

WBR3-PRO is a real-time operating system (RTOS), integrated with all Wi-Fi MAC and TCP/IP libraries. All these resources can help you develop your own embedded Wi-Fi products.

1.1. Features

- Built-in low-power KM4 MCU that also acts as an application processor.
- Clock rate of 100 MHz.
- Operating voltage range: 3V to 3.6V.
- Peripherals: 9 × GPIOs, 1 × UART, and 1 × Log_Tx.
- Wi-Fi and Bluetooth connectivity
- IEEE 802.11b/g/n20.
- Channels 1-14@2.4 GHz (CH1-11 for US/CA, and CH1-13 for EU/CN).
- Support security protocols, including WPA2 and WPA2 PSK (AES).
- Support Bluetooth LE 5.4.
- The maximum output power is +20 dBm for IEEE 802.11b transmission.
- Support Wi-Fi Easy Connect (EZ mode) pairing mode on Android and iOS devices.
- Onboard PCB antenna.
- It has passed CE and FCC certifications.
- Operating temperature range: −20°C to +85°C.

1.2. Scope of applications

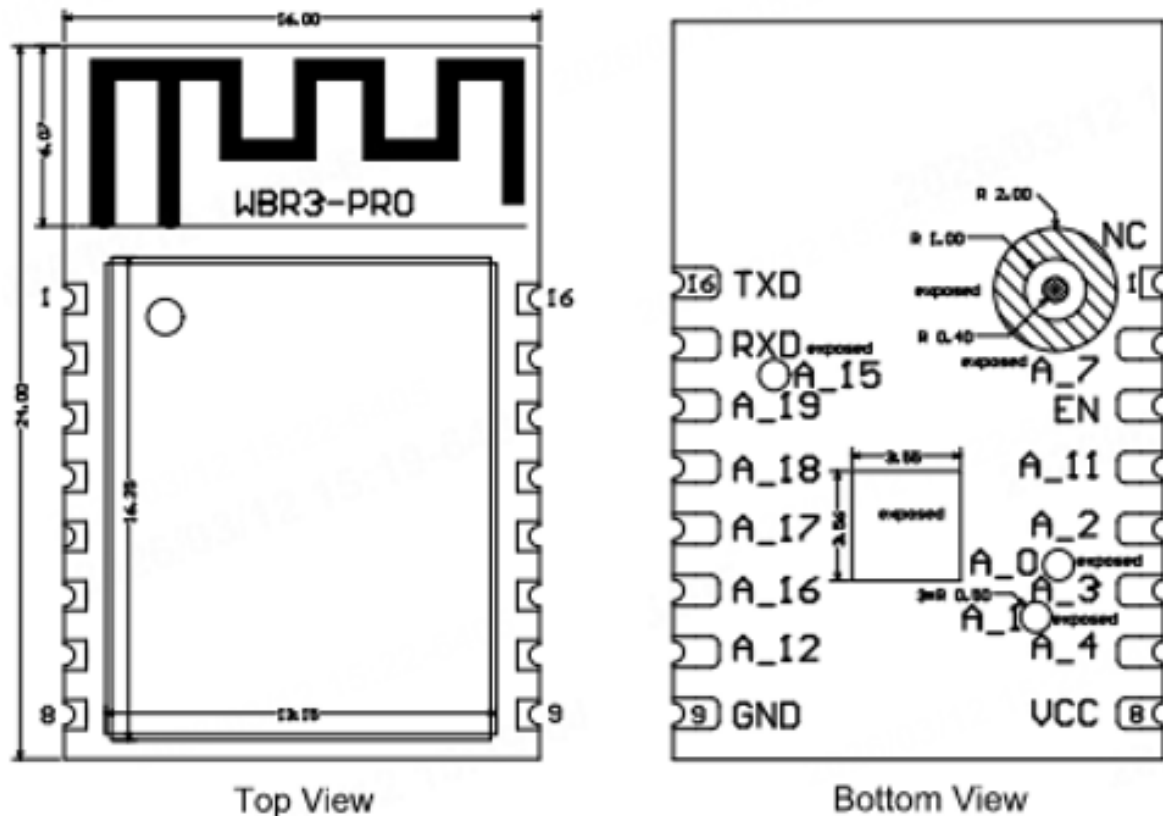
- Smart building
- Smart home
- Smart socket

- Smart lighting
- Smart bus
- Industrial wireless control
- Baby monitor
- IP camera

2. Module interfaces

2.1. Dimensions and footprint

- WBR3-PRO has two rows of pins (2×8) with a 2 mm pin spacing.
- WBR3-PRO dimensions: 16 ± 0.35 mm (W) × 24 ± 0.35 mm (L) × 2.9 ± 0.15 mm (H). The figure below shows the dimensions of the WBR3-PRO module.



2.2. Pinout

Pin	Symbol	I/O type	Feature
1	NC	/	Not connected, in order to be compatible with other modules.

Pin	Symbol	I/O type	Feature
2	A_7	I/O	GPIOA_7, which supports hardware PWM, corresponding to Pin 21 on the IC.
3	EN	I/O	The enable pin that is active high. The module has pulled up the high level, and users can control this pin externally.
4	A_11	I/O	GPIOA_11, which supports hardware PWM, corresponding to Pin 25 on the IC.
5	A_2	I/O	GPIOA_2, which supports hardware PWM, corresponding to Pin 18 on the IC.
6	A_3	I/O	GPIOA_3, which supports hardware PWM, corresponding to Pin 19 on the IC.
7	A_4	I/O	GPIOA_4, which supports hardware PWM, corresponding to Pin 20 on the IC.

Pin	Symbol	I/O type	Feature
8	VCC	P	Power supply pin (3.3V).
9	GND	P	Ground pin.
10	A_12	I/O	GPIOA_12, which supports hardware PWM, corresponding to Pin 26 on the IC.
11	A_16	I/O	GPIOA_16, which can be reused as the UART_Log_TXD pin for log printing.
12	A_17	I/O	GPIOA_17, which supports hardware PWM, corresponding to Pin 38 on the IC.
13	A_18	I/O	GPIOA_18, which supports hardware PWM, corresponding to Pin 39 on the IC.
14	A_19	I/O	GPIOA_19, which supports hardware PWM, corresponding to Pin 40 on the IC.

Pin	Symbol	I/O type	Feature
15	RXD	I/O	GPIOA_13, which can be reused as the UART0_RXD pin for serial communication.
16	TXD	I/O	GPIOA_14, which can be reused as the UART0_TXD pin for serial communication.

i

P indicates the power pin, and I/O indicates the input and output pin.

3. Electrical parameters

3.1. Absolute electrical parameters

Parameter	Description	Minimum value	Maximum value	Unit
T _s	Storage temperature	−40	105	°C
VDD	Supply voltage	−0.3	3.6	V
Electrostatic discharge voltage (human body model)	TAMB-25°C	-	2	kV
Electrostatic discharge voltage (machine model)	TAMB-25°C	-	0.5	kV

3.2. Operating conditions

Parameter	Description	Minimum value	Typical value	Maximum value	Unit
T _a	Operating temperature	−20	-	85	°C
VDD	Operating voltage	3.0	-	3.6	V
V _{IL}	I/O low-level input	-	-	0.8	V
V _{IH}	I/O high-level input	2.0	-	-	V

Parameter	Description	Minimum value	Typical value	Maximum value	Unit
VOL	I/O low-level output	-	-	0.4	V
VOH	I/O high-level output	2.4	-	-	V
I _{max}	I/O drive current	-	-	16	mA
C _{pad}	Input pin capacitor	-	2	-	pF

3.3. Radio frequency (RF) power

- Power consumption during continuous transmission (TX)

Symbol	Mode	Power	Average value	Peak (Typical) value	Unit
IRF	802.11b, 11 Mbit/s	17 dBm	217	268	mA
IRF	802.11b, 11 Mbit/s	18 dBm	231	283	mA
IRF	802.11g, 54 Mbit/s	15 dBm	159	188	mA
IRF	802.11g, 54 Mbit/s	17.5 dBm	177	213	mA
IRF	802.11n, BW20 MCS7	13 dBm	145	167	mA
IRF	802.11n, BW20 MCS7	16.5 dBm	165	193	mA

- Power consumption during continuous reception (RX)

Symbol	Mode	Average value	Peak (Typical) value	Unit
IRF	802.11b, 11 Mbit/s	63	65	mA
IRF	802.11g, 54 Mbit/s	65	67	mA
IRF	802.11n, HT20 MCS7	65	67	mA

3.4. Power consumption in operating mode

Operating mode	Status (Ta = 25°C)	Average value	Peak (Typical) value	Unit
Pairing over Bluetooth	The module is in Wi-Fi Easy Connect (EZ) mode. The Wi-Fi network status indicator blinks quickly.	61	272	mA
Pairing over AP	The module is in AP mode. The Wi-Fi network status indicator blinks slowly.	59	272	mA

Operating mode	Status (Ta = 25°C)	Average value	Peak (Typical) value	Unit
Pairing over EZ	The module is in Wi-Fi Easy Connect (EZ) mode. The Wi-Fi network status indicator blinks quickly.	62	280	mA
Connected and idle mode	The module is connected to the cloud. The network status indicator is steady on.	51	260	mA
Connected and operating mode	The module is connected to the cloud. The network status indicator is steady on.	59	268	mA

Operating mode	Status (Ta = 25°C)	Average value	Peak (Typical) value	Unit
Weakly connected	The connection between the module and the access point is intermittent. The network status indicator is steady on.	62	264	mA
Disconnected	The module is disconnected from the cloud. The network status indicator is steady off.	57	268	mA
Module disabled	The module's enable (EN) pin is pulled down.	1.5	1.6	mA

4. RF parameters

4.1. Basic RF features

Parameter	Description
Frequency range	2.400 to 2.4835 GHz
Wi-Fi standard	IEEE 802.11b/g/n (channels 1 to 14)
Bluetooth standard	Bluetooth LE 4.2
Data transmission rate	• IEEE 802.11b: 1, 2, 5.5, and 11 Mbit/s
	• IEEE 802.11g: 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s
	• IEEE 802.11n: HT20 MCS0-7
Antenna type	PCB antenna with a peak gain of 2.54 dBi

4.2. Transmitter (TX) performance

- Continuous TX performance:

Parameter	Minimum value	Typical value	Maximum value	Unit
RF average output power, 802.11b CCK mode, 1 Mbit/s	-	17.5	-	dBm
RF average output power, 802.11g OFDM mode, 54 Mbit/s	-	14.5	-	dBm

Parameter	Minimum value	Typical value	Maximum value	Unit
RF average output power, 802.11n OFDM mode, MCS7	-	13.5	-	dBm
RF average output power, Bluetooth LE 4.2, 1 Mbit/s	-	6.5	-	dBm
Frequency error	-20	-	20	ppm
EVM@802.11b CCK 11 Mbit/s mode, 17.5 dBm	-	-	-10	dB
EVM@802.11g OFDM 54 Mbit/s mode, 14.5 dBm	-	-	-29	dB
EVM@802.11n OFDM MCS7 mode, 13.5 dBm	-	-	-30	dB
• Receiver (RX) performance:				
Parameter	Minimum value	Typical value	Maximum value	Unit
PER < 8%, RX sensitivity, 802.11b CCK mode, 1 Mbit/s	-	-97	-	dBm

Parameter	Minimum value	Typical value	Maximum value	Unit
PER < 10%, RX sensitivity, 802.11g OFDM mode, 54 Mbit/s	-	-75	-	dBm
PER < 10%, RX sensitivity, 802.11n OFDM mode, MCS7	-	-72	-	dBm
PER < 10%, RX sensitivity, Bluetooth LE 4.2, 1 Mbit/s	-	-93	-	dBm

5. Antenna information

5.1. Antenna type

This module has an onboard PCB antenna with a peak gain of 2.54 dBi.

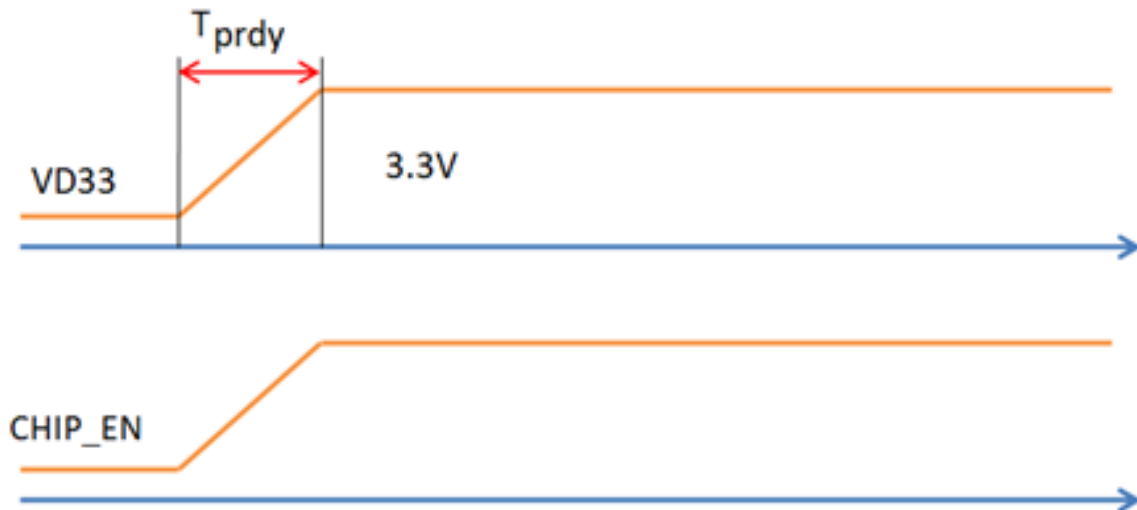
5.2. Antenna interference reduction

When a PCB antenna is used on a Wi-Fi module, we recommend that the module antenna is at least 15 mm away from other metal components. This can optimize the Wi-Fi performance.

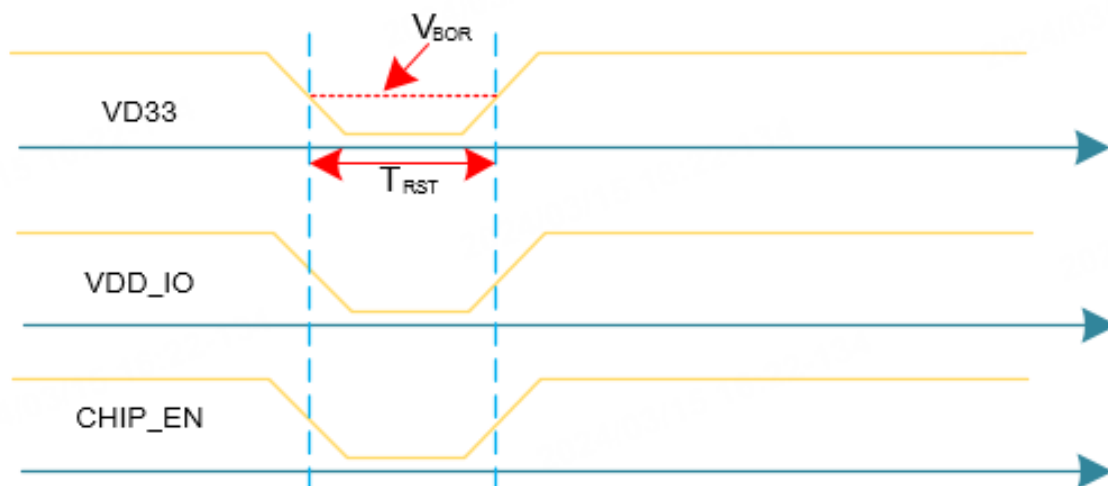
6. Power-on and power-off sequence

6.1. Power-on sequence

The RTL8720 chip has requirements for the power-on sequence. It is recommended that the time for the voltage to rise from 0V to 3.3V should be within 20ms.



6.2. Power-off sequence



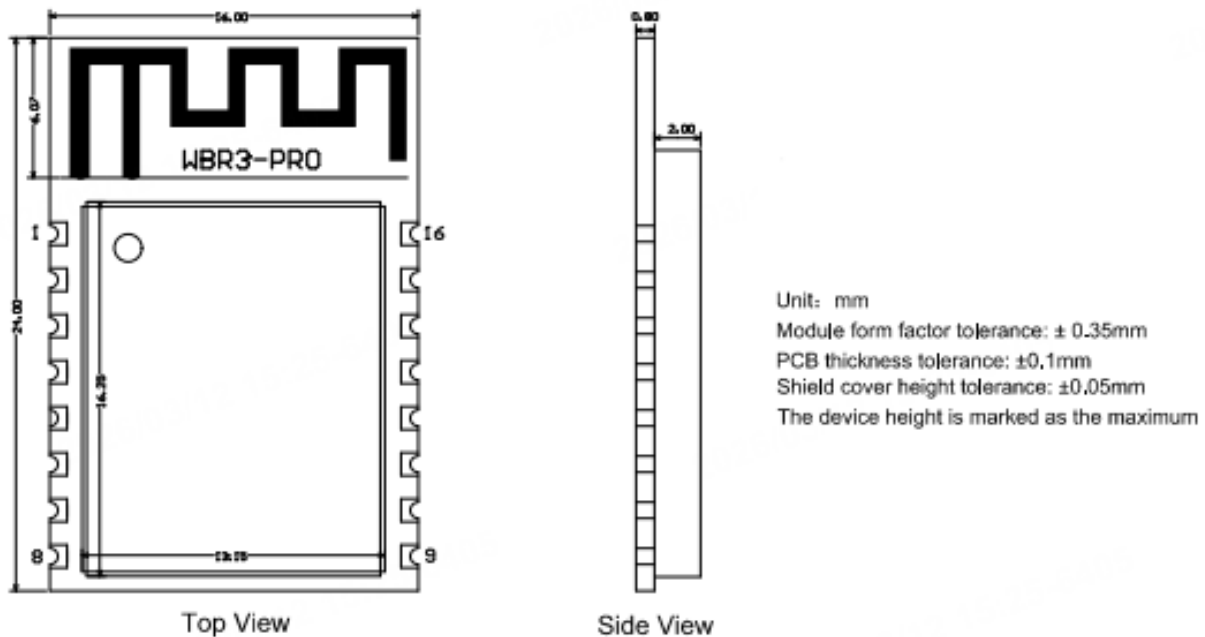
Symbol	Parameter	Minimum value	Typical value	Maximum value	Unit
--------	-----------	---------------	---------------	---------------	------

Symbol	Parameter	Minimum value	Typical value	Maximum value	Unit
TPRDY	3.3V ready time	0.6	-	20	ms
CHIP_EN	CHIP_EN ready time	0.6	-	20	ms
VBOR	BOR occurs after the 3.3V pin is lower than this voltage	2	-	-	V
TRST	The required time that 3.3V is lower than VBOR	1	-	-	ms

7. Footprint and production instructions

7.1. Mechanical dimensions

The WBR3-PRO module's PCB dimensions are 16 ± 0.35 mm (W) $\times$ 24 ± 0.35 mm (L) $\times$ 0.8 ± 0.1 mm (H). The figure below shows the mechanical dimensions of WBR3-PRO.

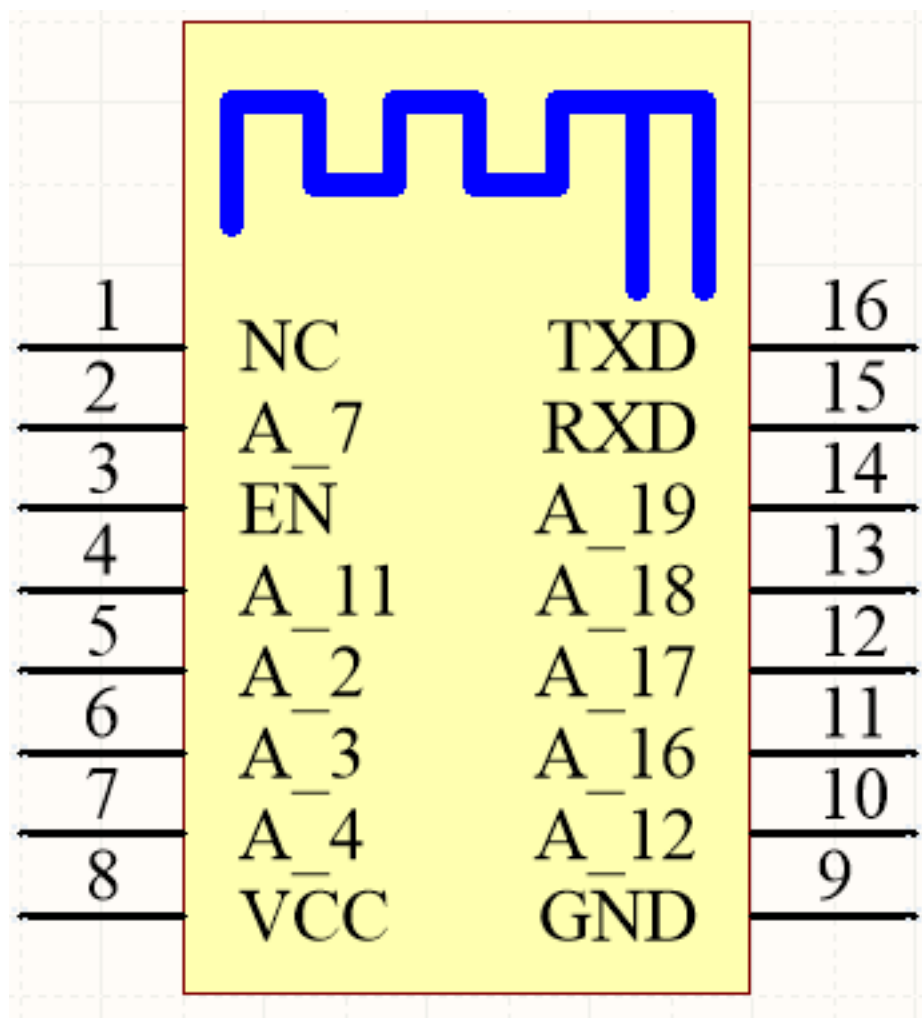


i

The default tolerance of the dimensions is ± 0.35 mm. If you have special requirements for key dimensions, specify them in the datasheet after consultations.

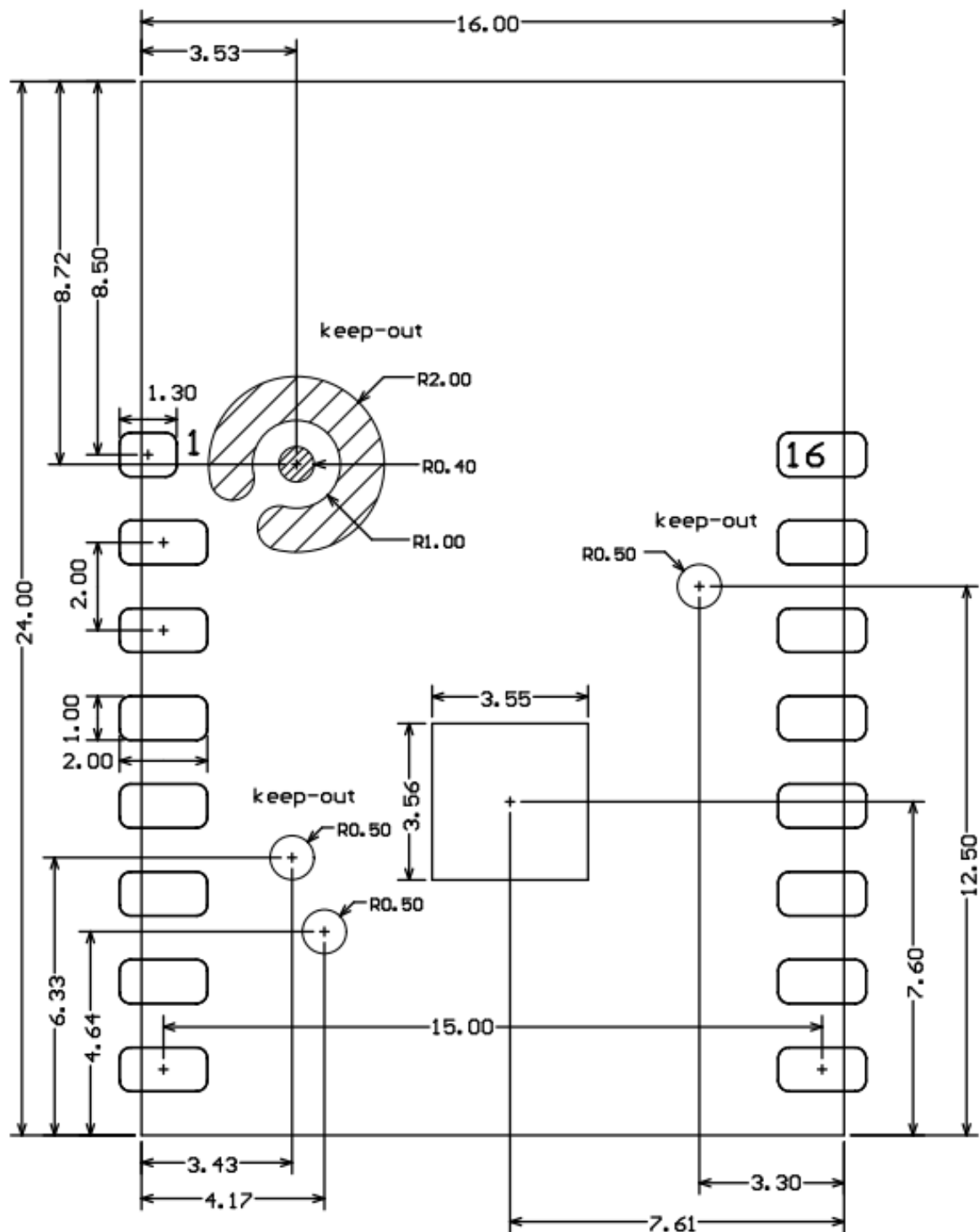
7.2. Recommended PCB footprint

WBR3-PRO pinout



WBR3-PRO PCB footprint

Recommended footprint

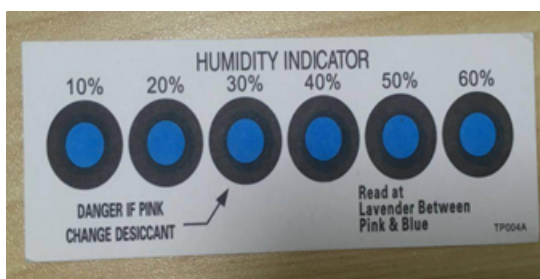


i

The area indicated as keep-out in the diagram above does not require tinning and should not have any traces routed through it.

7.3. Production instructions

1. Package the module with the SMT if Tuya's module is designed to be SMT-packaged. After being unpacked, the module must be soldered within 24 hours. Otherwise, it needs to be put into a drying cupboard with a relative humidity level no greater than 10%, or packaged in vacuum again. Then, record the packing time and duration of exposure. The total exposure time cannot exceed 168 hours.
 - Instruments or devices required for the SMT process:
 - Surface mount system
 - SPI
 - Reflow soldering machine
 - Thermal profiler
 - Automated optical inspection (AOI) device
 - Instruments or devices required for the baking process:
 - Cabinet oven
 - Electrostatic discharge (ESD) protection and heat-resistant trays
 - ESD protection and heat-resistant gloves
2. A delivered module must meet the following storage requirements:
 - The moisture-proof bag must be 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.
 - A humidity indication card (HIC) is put in the sealed package.

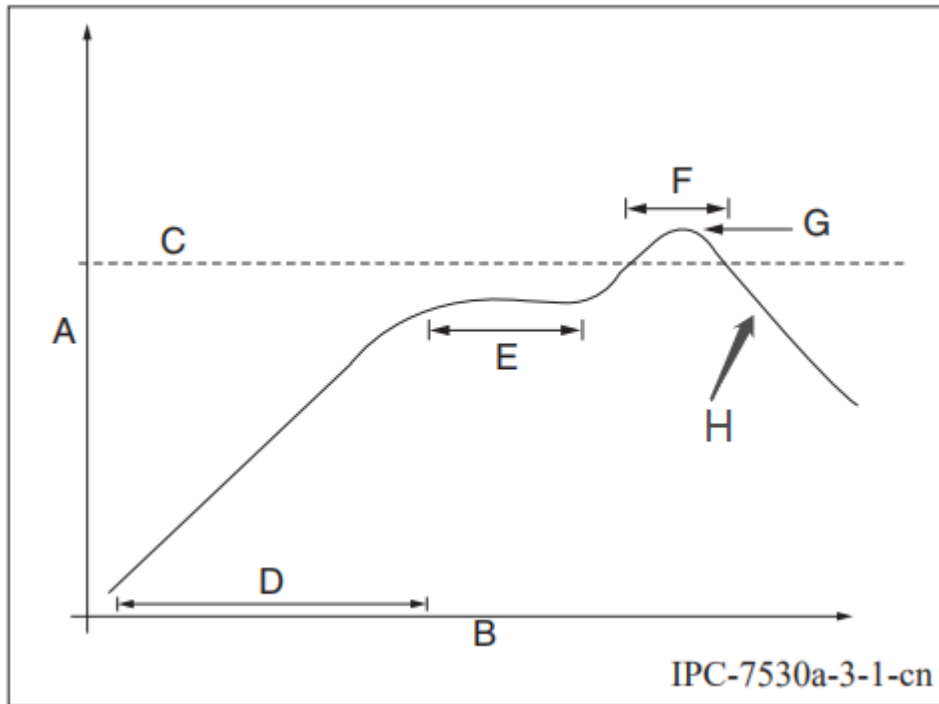


3. The module needs to be baked in the following cases:
 - The vacuum packaging bag is damaged before unpacking.
 - After unpacking, no HIC is found in the packaging bag.

- After unpacking, the HIC indicates a humidity level of 10% or higher. In this case, the circle turns pink on the HIC.
 - The total exposure time has lasted for over 168 hours since unpacking.
 - More than 12 months have passed since the first sealing of the bag.
4. The baking parameter settings are described below:
- Baking temperature: 40°C for reel packaging with relative humidity $\leq$ 5%. And 125°C for tray packaging with relative humidity $\leq$ 5% (use a heat-resistant tray, rather than a plastic container).
 - Baking time: 168 hours for reel packaging and 12 hours for tray packaging.
 - Temperature for triggering an alert: 50°C for reel packaging and 135°C for tray packaging.
 - Production can begin after a module has cooled down to below 36°C under natural conditions.
 - 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 after exposure for more than 168 hours, do not use 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, device failure or poor soldering performance might occur.
5. In the whole production process, take electrostatic discharge (ESD) protective measures.
6. To guarantee the pass rate, we recommend that you use the SPI and AOI to monitor the quality of solder paste printing and mounting.

7.4. Recommended oven temperature curve

Set the temperature according to the following temperature curve of reflow soldering. The peak temperature is 245°C.



- A: temperature axis
- B: time axis
- C: alloy liquidus temperature from 217°C to 220°C
- D: ramp-up slope from 1°C/s to 3°C/s
- E: keep a constant temperature from 150°C to 200°C for a time period from 60s to 120s
- F: keep a temperature above liquidus temperature for 50s to 70s
- G: peak temperature from 235°C to 245°C
- H: ramp-down slope from 1°C/s to 4°C/s

i

The curve above is based on solder paste SAC305. For more information about other solder pastes, see the recommended oven temperature curve in the specified solder paste specifications.

7.5. Storage conditions

	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: <u>260</u> °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: <u>168</u> 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: <u>See Production Date</u> If blank, see adjacent bar code label		
Note: Level and body temperature defined by IPC/JEDEC J-STD-020		

8. MOQ and packaging information

Model	MOQ (pcs)	Shipping packaging	Modules per reel	Reels per carton
WBR3-PRO	3,600	Tape and reel	900	4

9. 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 to 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 operate 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 to 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-WBR3PRO. The end product must be labeled in a visible area with the following: “Contains Transmitter Module FCC ID: 2ANDL-WBR3PRO”.

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 from the human body.