



MDWBRCU2D Smart Kit Datasheet

Version: 20260622

Online Version

Contents

1. Overview	2
1.1. Features	2
1.2. Scope of applications	3
2. Smart kit interfaces	4
2.1. Dimensions and footprint	4
3. Electrical parameters	5
3.1. Absolute electrical parameters	5
3.2. Normal operating conditions	5
3.3. Power consumption during continuous transmission and reception	6
3.4. Operating current	8
4. RF parameters	11
4.1. Basic RF features	11
4.2. Transmitter (TX) performance	11
4.3. Receiver (RX) performance	13
5. Antenna information	15
5.1. Antenna type	15
5.2. Antenna interference reduction	15
6. Packing and production instructions	17
6.1. Mechanical dimensions	17
6.2. Production instructions	21
6.3. Recommended oven temperature curve	23
6.4. Storage conditions	26
7. MOQ and packaging information	27
8. Appendix: Statement	28

MDWBRCU2D smart kit is a Wi-Fi and Bluetooth Low Energy (LE) combo smart kit developed by Tuya Smart. It consists of a highly integrated wireless RF chip RTL8711DAF and a few peripheral components, with built-in Wi-Fi and Bluetooth network protocol stacks and various library functions.

1. Overview

The smart kit is built around a 32-bit low power MCU with 512 KB SRAM, built-in 4 MB flash memory, and various peripheral resources.

MDWBRCU2D 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 32-bit CPU that also acts as an application processor.
- Clock rate of up to 345 MHz.
- Operating voltage range: 5.0 ± 0.5 V.
- Peripherals: 1 universal asynchronous receiver/transmitter (UART).
- Wi-Fi connectivity
- IEEE 802.11a/b/g/n 1x1, 2.4 GHz and 5 GHz.
- Channel 1 to 14 at 2.4 GHz, and 36-177 at 5 GHz.
- Support security protocols, including WPA2, WPA2 PSK (AES), and WPA3.
- The maximum output power is +18 dBm for IEEE 802.11b and 802.11a transmission.
- Support STA, AP, and STA + AP combo working modes. Except for UNII-2A/2C.
- Support two pairing modes, namely Wi-Fi Easy Connect (EZ mode) and access point (AP) mode. Both modes are suitable for pairing with Android and iOS devices.
- Onboard PCB antenna with a gain of 0.88 dBi at 2.4 GHz, and 1.53 dBi at 5 GHz.
- Operating temperature range: -40°C to 105°C .
- Bluetooth connectivity
- Support Bluetooth 5.0.
- Up to +8 dBm output power.
- Onboard PCB antenna with a gain of 0.88 dBi at 2.4 GHz, and sharing the same antenna with Wi-Fi.
- Operating temperature range: -40°C to 105°C .

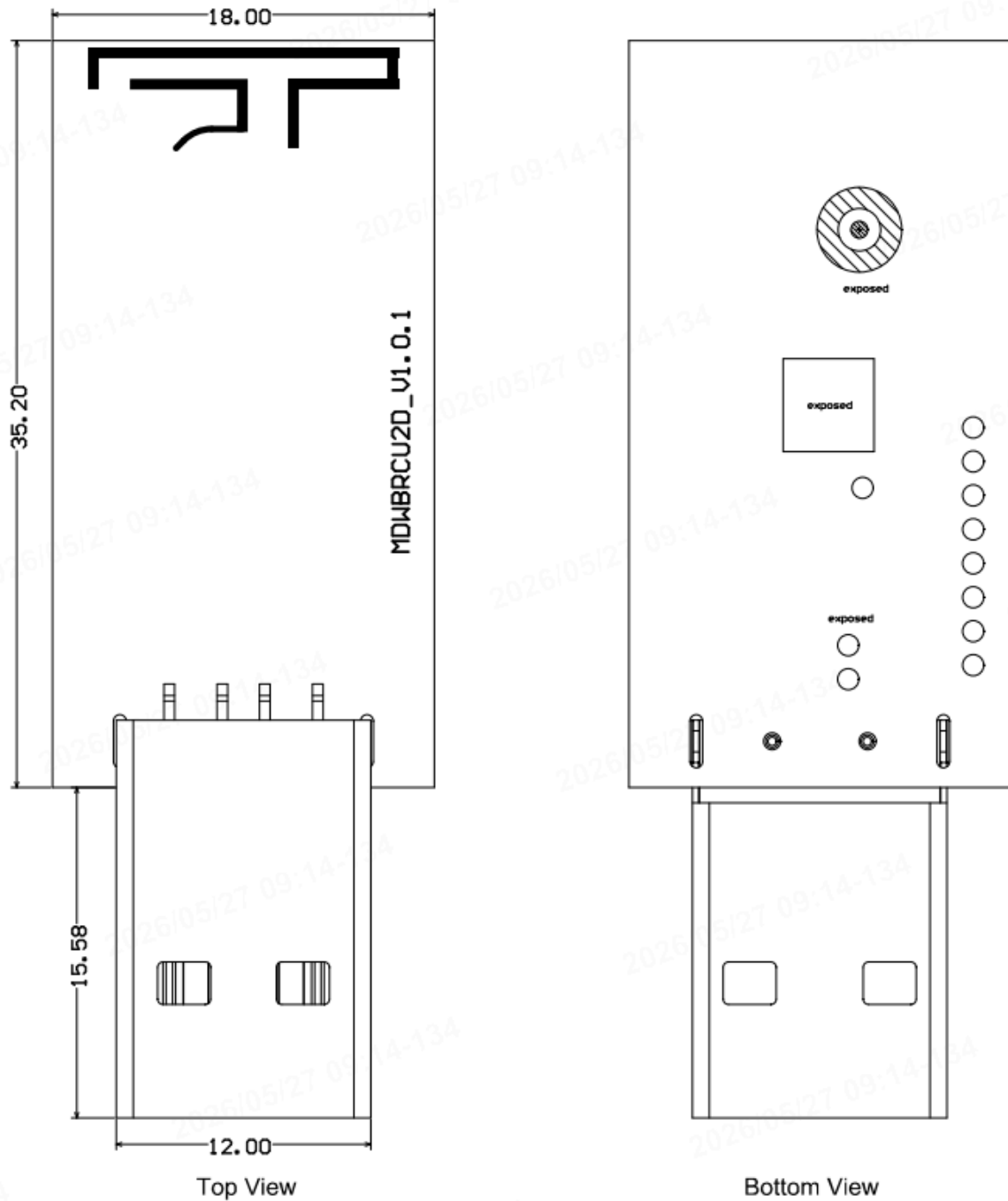
1.2. Scope of applications

- Smart home and electrical appliance

2. Smart kit Interface

2.1. Dimensions and footprint

The MDWBRCU2D dimensions are 50.78 ± 0.35 mm (W) $\times$ 18 ± 0.35 mm (L) $\times$ 4.52 ± 0.15 mm (H). The figure below shows the dimensions of the MDWBRCU2D



3. Electrical parameters

3.1. Absolute electrical parameters

Parameter	Description	Min value	Max value	Unit
T _s	Storage temperature	−40	125	°C
V _{BAT}	Supply voltage	3.6	6.0	V
Electrostatic discharge voltage (human body model)	T _{AMB} ≤ 25°C	-	2	kV
Electrostatic discharge voltage (machine model)	T _{AMB} ≤ 25°C	-	0.5	kV

3.2. Normal operating conditions

Parameter	Description	Min value	Typical value	Max value	Unit
T _a	Operating temperature	−40	-	105	°C
V _{BAT}	Supply voltage	4.5	5.0	5.5	V
V _{IL}	I/O low-level input	-	-	0.8	V
V _{IH}	I/O high-level input	2.0	-	-	V

Parameter	Description	Min value	Typical value	Max value	Unit
VOL	I/O low-level output	0	-	0.3	V
VOH	I/O high-level output	2.8	-	3.6	V
I _{max}	I/O drive current	-	-	12	mA

3.3. Power consumption during continuous transmission and reception

2.4 GHz transmission and reception

Operating status	Mode	Rate	Transmit/Receive power	Typical value	Unit
Transmit	802.11b	1 Mbit/s	+19 dBm	175	mA
Transmit	802.11b	11 Mbit/s	+19 dBm	180	mA
Transmit	802.11g	6 Mbit/s	+19 dBm	177	mA
Transmit	802.11g	54 Mbit/s	+18 dBm	161	mA
Transmit	802.11n-HT20	MCS0	+19 dBm	175	mA
Transmit	802.11n-HT20	MCS7	+17 dBm	151	mA
Transmit	802.11n-HT40	MCS0	+19 dBm	180	mA
Transmit	802.11n-HT40	MCS7	+17 dBm	161	mA
Receive	802.11b	1 Mbit/s	Continuous reception	29	mA
Receive	802.11b	11 Mbit/s	Continuous reception	29	mA

Operating status	Mode	Rate	Transmit/ Receive power	Typical value	Unit
Receive	802.11g	6 Mbit/s	Continuous reception	29	mA
Receive	802.11g	54 Mbit/s	Continuous reception	29	mA
Receive	802.11n- HT20	MCS0	Continuous reception	29	mA
Receive	802.11n- HT20	MCS7	Continuous reception	29	mA
Receive	802.11n- HT40	MCS0	Continuous reception	31	mA
Receive	802.11n- HT40	MCS7	Continuous reception	31	mA

5 GHz transmission and reception

Operating status	Mode	Rate	Transmit/ Receive power	Typical value	Unit
Transmit	802.11a	6 Mbit/s	+19 dBm	238	mA
Transmit	802.11a	54 Mbit/s	+17 dBm	216	mA
Transmit	802.11n- HT20	MCS0	+19 dBm	242	mA
Transmit	802.11n- HT20	MCS7	+16 dBm	208	mA
Transmit	802.11n- HT40	MCS0	+19 dBm	240	mA
Transmit	802.11n- HT40	MCS7	+16 dBm	206	mA
Receive	802.11a	6 Mbit/s	Continuous reception	32	mA
Receive	802.11a	54 Mbit/s	Continuous reception	32	mA

Operating status	Mode	Rate	Transmit/ Receive power	Typical value	Unit
Receive	802.11n- HT20	MCS0	Continuous reception	32	mA
Receive	802.11n- HT20	MCS7	Continuous reception	32	mA
Receive	802.11n- HT40	MCS0	Continuous reception	33	mA
Receive	802.11n- HT40	MCS7	Continuous reception	33	mA

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The above data is powered by a DC steady-state power supply at 5.0 V, utilizing a 100% duty cycle forced transmission mode. There are slight differences in data across different smart kit.

3.4. Operating current

Working mode	Working status, Ta = 25°C	Average value	Max value (Typical value)	Unit
Fast network configuration (AP)	The smart kit is in fast network configuration state and the Wi-Fi indicator flashes slowly.	34.1	319	mA

Working mode	Working status, Ta = 25°C	Average value	Max value (Typical value)	Unit
Fast network configuration (Bluetooth)	The smart kit is in Bluetooth pairing state and the Wi-Fi indicator flashes fast.	31.6	308	mA
No operation during network connection	The smart kit is in an idle networking working state and the Wi-Fi indicator is always on.	29.2	302	mA
Operations are being performed during network connection	The smart kit is in a networked operational state and the Wi-Fi indicator is always on.	30	308	mA
Weak network state	The smart kit is in a wireless signal weak network connection working state and the Wi-Fi indicator is off.	34.6	314	mA

Working mode	Working status, Ta = 25°C	Average value	Max value (Typical value)	Unit
Disconnected state	The smart kit is disconnected and the Wi-Fi indicator is off.	31.9	313	mA
The router is not powered	The smart kit is in a working state where the router is powered off and disconnected from the internet and the Wi-Fi indicator is off.	31.8	307	mA

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The above data is powered by a DC steady-state power supply of 5.0 V and is based on the Tuya universal firmware, with firmware version number v1.0.1. There are slight differences in test data for different smart kit with the same firmware.

4. RF parameters

4.1. Basic RF features

Parameter	Description
Operating frequency	2.412 GHz to 2.484 GHz (Ch1-11 for US/CA, Ch1-13 for EU/CN), 5.180-5.825 GHz
Wi-Fi standard	IEEE 802.11a/b/g/n (Ch1-11 for US/CA, Ch1-13 for EU/CN, and 36-177)
Bluetooth standard	Bluetooth LE 5.0
Data transmission rate	• 11b: 1, 2, 5.5, and 11 Mbit/s • 11a/g: 6, 9, 12, 18, 24, 36, 48, and 54 Mbit/s • 11n: HT20 MCS0-7, and HT40 MCS0-7 • Bluetooth 5.0: 1 Mbit/s /2 Mbit/s
Antenna type	Onboard PCB antenna with a gain of 0.88 dBi at 2.4 GHz, and 1.53 dBi at 5 GHz.

4.2. Transmitter (TX) performance

2.4 GHz continuous transmission performance

Parameter	Min value	Typical value	Max value	Unit
RF average output power, 802.11b CCK mode, 11 Mbit/s	-	18	-	dBm

Parameter	Min value	Typical value	Max value	Unit
RF average output power, 802.11g OFDM mode, 54 Mbit/s	-	17	-	dBm
RF average output power, 802.11n HT20 mode, MCS7	-	15	-	dBm
RF average output power, 802.11n HT40 mode, MCS7	-	15	-	dBm
RF average output power, Bluetooth 5.0, 1 Mbit/s/2 Mbit/s	-	8	-	dBm
Frequency error	-10	-	10	ppm

5 GHz continuous transmission performance

Parameter	Min value	Typical value	Max value	Unit
RF average output power, 802.11a OFDM mode, 54 Mbit/s	-	16	-	dBm
RF average output power, 802.11n HT20 mode, MCS7	-	15	-	dBm

Parameter	Min value	Typical value	Max value	Unit
RF average output power, 802.11n HT40 mode, MCS7	-	15	-	dBm
Frequency error	-10	-	10	ppm

4.3. Receiver (RX) performance

RX sensitivity

Parameter	Min value	Typical value	Max value	Unit
PER < 8%, RX sensitivity, 802.11b DSSS mode, 11 Mbit/s	-	-91	-	dBm
PER < 10%, RX sensitivity, 802.11a/g OFDM mode, 54 Mbit/s	-	-75	-	dBm
PER < 10%, RX sensitivity, 802.11n OFDM mode, HT20-MCS7	-	-72	-	dBm
PER < 30.8%, RX sensitivity, Bluetooth 5.0, 1 Mbit/s	-	-98	-	dBm

Parameter	Min value	Typical value	Max value	Unit
PER < 30.8%, RX sensitivity, Bluetooth 5.0, 2 Mbit/s	-	-94	-	dBm

5. Antenna information

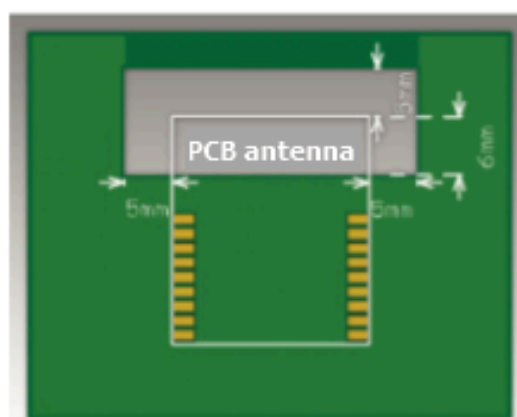
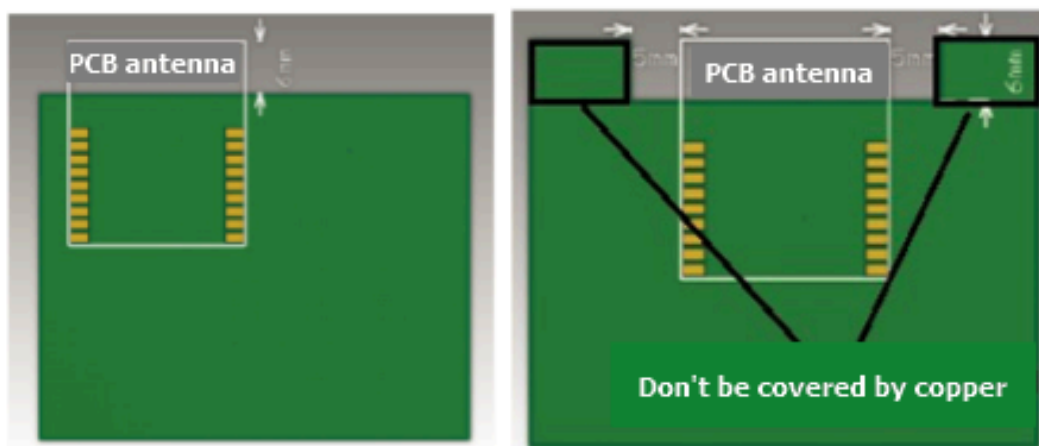
5.1. Antenna type

Only the PCB antenna applies.

5.2. Antenna interference reduction

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

Make sure that the enclosure surrounding the antenna is not traced or filled with copper. Otherwise, the RF performance might be degraded. Layout principles: No substrate medium exists directly below or above the PCB antenna. The PCB antenna is away from the copper sheet. This can maximize the radiation effect of the antenna.

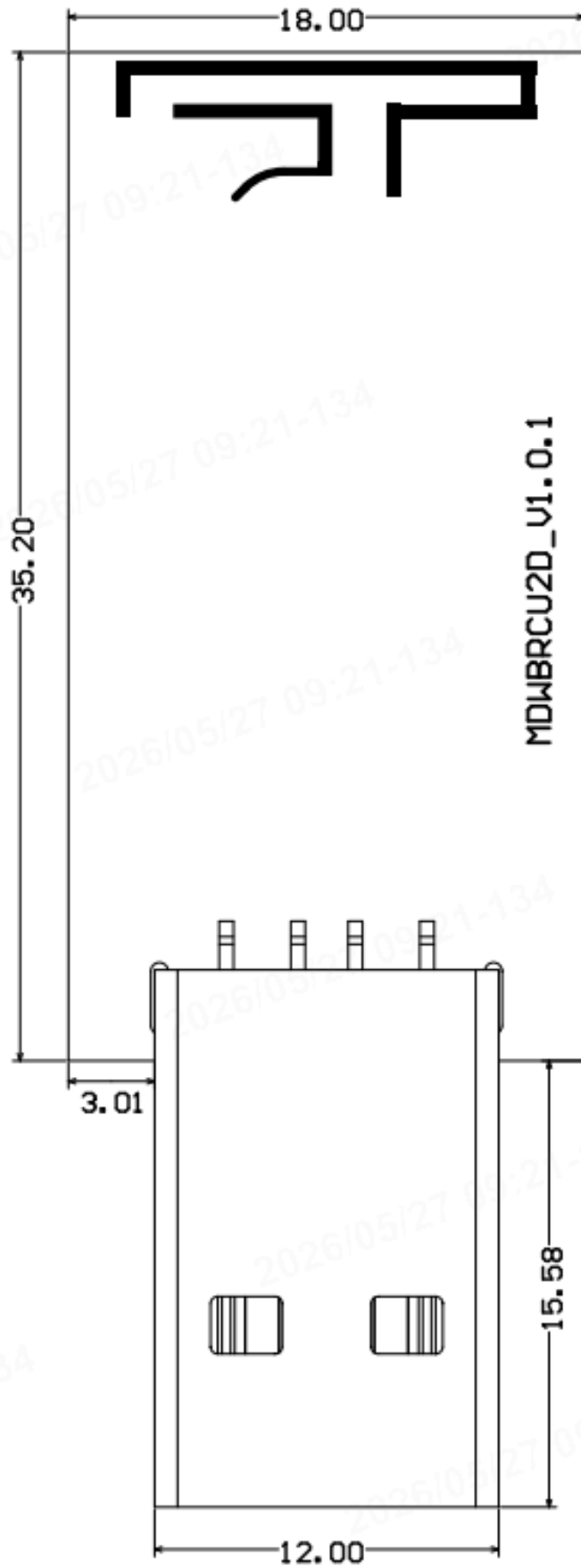


Refer to the **mechanical dimensions** below for the PCB onboard antenna area.

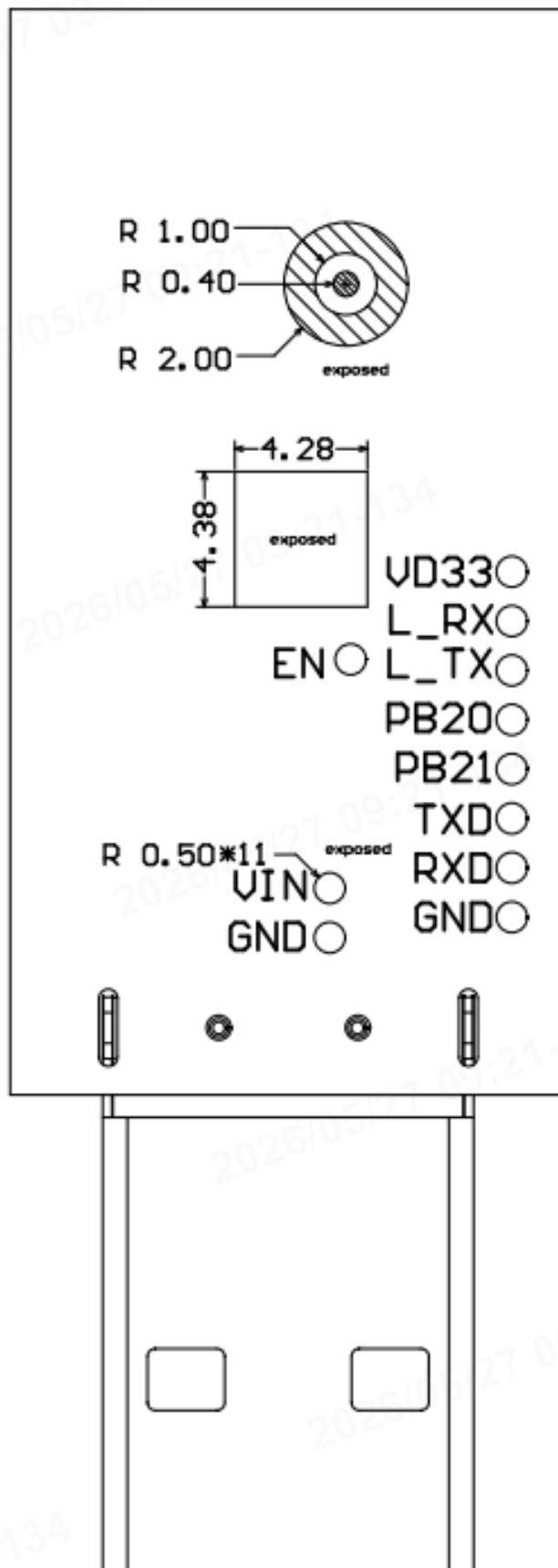
6. Packing and production instructions

6.1. Mechanical dimensions

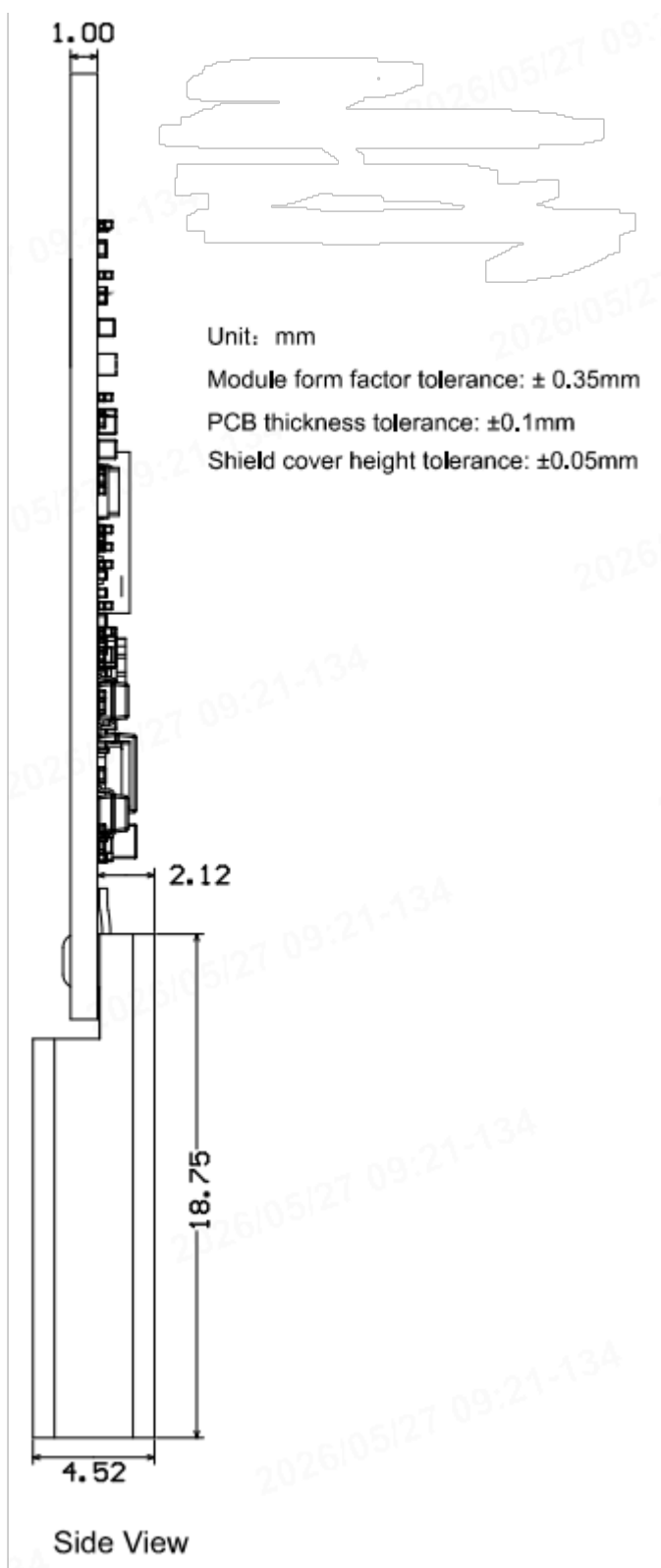
The MDWBRCU2D's PCB dimensions are 35.2 ± 0.35 mm (W) $\times$ 18 ± 0.35 mm (L) $\times$ 1.0 ± 0.1 mm (H). The figure below shows the mechanical dimensions of MDWBRCU2D.



Top View



Bottom View



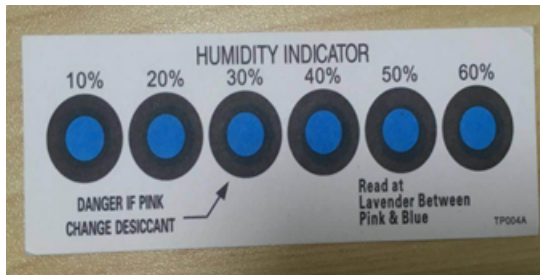


The default tolerance of the dimensions is ± 0.35 mm. If you have special requirements for key dimensions, specify them in the datasheet after consultations.

6.2. Production instructions

- For the smart kit that can be packaged with the surface-mount technology (SMT) or in in-line form, you can select either of them according to the PCB design solutions of customers. If a PCB is designed to be SMT-packaged, package the smart kit SMT. If a PCB is designed to use an in-line package, use wave soldering. Complete soldering within 24 hours after the smart kit is unpacked. Otherwise, we recommend that you place the smart kit drying cupboard with a relative humidity level below 10%, or pack the smart kit 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
 - Solder Paste Inspection (SPI)
 - Reflow soldering machine
 - Thermal profiler
 - Automated optical inspection (AOI) device
- Instruments or devices required for the wave soldering process:
 - Wave soldering device
 - Wave soldering fixture
 - Constant-temperature soldering iron
 - Tin bar, tin wire, and flux
 - Thermal profiler
- Instruments or devices required for the baking process:
 - Cabinet oven
 - Electrostatic discharge (ESD) protection and heat-resistant trays
 - ESD protection and heat-resistant gloves

- A delivered smart kit 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 indicator card (HIC) is put in the sealed package.



- The smart kit 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.
- 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 smart kit has cooled down to below 36°C under natural conditions.
- If a smart kit remains unused for over 168 hours after being baked, it needs to be baked again.
- If a batch of smart kit is not baked after exposure for more than 168 hours, do not use wave soldering to solder them. Because these smart kit 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.

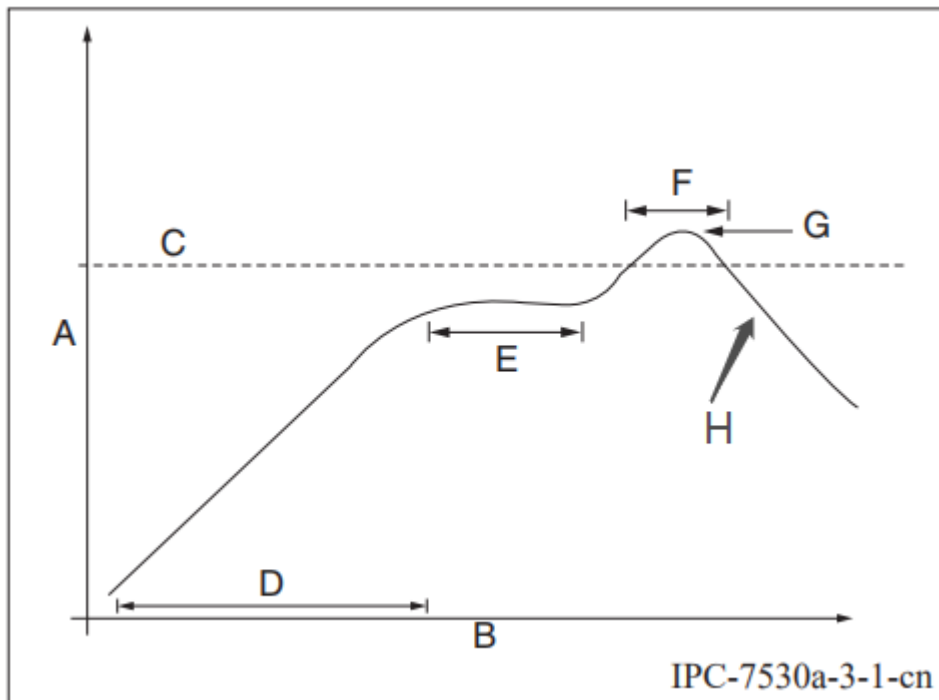
- In the whole production process, take electrostatic discharge (ESD) protective measures.
- To guarantee the pass rate, we recommend that you use the SPI and AOI to monitor the quality of solder paste printing and mounting.

6.3. Recommended oven temperature curve

Select a proper soldering technique according to the process. For more information, refer to the recommended oven temperature curve of either reflow soldering or wave soldering. The set temperatures might deviate from the actual temperature measurements. All temperatures shown in this smart kit datasheet are obtained through actual measurements.

Technique 1: SMT process (recommended oven temperature curve of reflow soldering)

Set the oven temperatures according to the following curve.



- A: temperature axis
- B: time axis
- C: alloy liquidus temperature from 217°C to 220°C

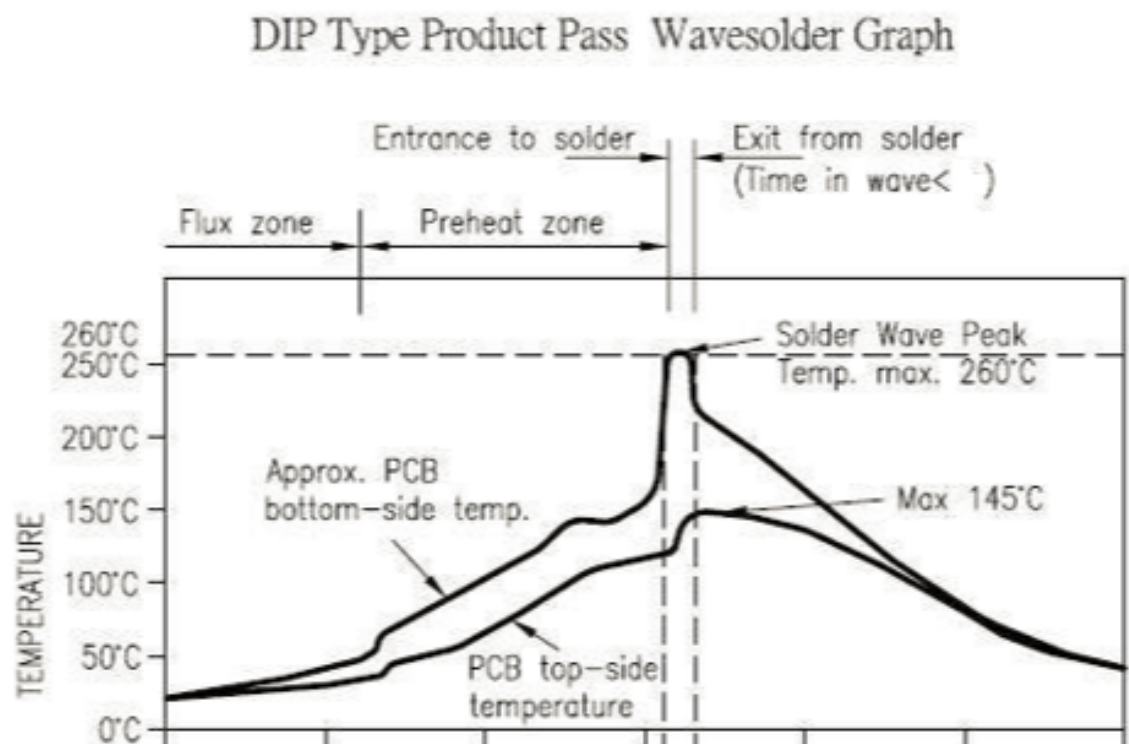
- D: ramp-up slope from 1°C/s to 3°C/s
- E: keep a constant temperature from 150°C to 200°C for a time period of 60 s to 120 s
- F: temperature above liquidus temperature for 50 s to 70 s
- G: peak temperature from 235°C to 245°C
- H: ramp-down slope from 1°C/s to 4°C/s

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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.

Technique 2: Wave soldering process (oven temperature curve of wave soldering)

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



**Suggestions on
wave soldering**

**Suggestions on
manual repair
soldering**

Suggestions on wave soldering		Suggestions on manual repair soldering	
Preheat temperature	80°C to 130°C	Soldering temperature	360°C ± 20°C
Preheat duration	75 s to 100 s	Soldering duration	Less than 3 s/ point
Contact duration at the peak	3 s to 5 s	N/A	N/A
Solder tank temperature	260°C ± 5°C	N/A	N/A
Ramp-up slope	≤ 2°C/s	N/A	N/A
Ramp-down slope	≤ 6°C/s	N/A	N/A

6.4. 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		

7. MOQ and packaging information

Product model	MOQ (pcs)	Shipping packaging	Smart kit per reel	Reels per carton
MDWBRCU2D	3600	Tape and reel	900	4

8. Appendix: Statement

Declaration of Conformity European Notice



Hereby, Hangzhou Tuya Information Technology Co., Ltd declares that this smart kit 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.

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 equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This

equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with 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 equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment 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 equipment and receiver.
- Connect the equipment 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.

Industry Canada Statement This device complies with Industry Canada's licence-exempt RSSs. Operation is subject to the following two conditions: (1) This device may not cause interference. (2) This device must accept any interference, including interference that may cause undesired operation of the device. Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage. (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Radiation Exposure Statement This equipment complies with IC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

Déclaration d'exposition aux radiations: Cet équipement est conforme aux limites d'exposition aux rayonnements ISED établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps. L'appareil peut interrompre automatiquement la transmission en cas d'absence d'informations à transmettre ou de panne opérationnelle. Notez que ceci n'est pas destiné à interdire la transmission d'informations de contrôle ou de signalisation ou l'utilisation de codes répétitifs lorsque cela est requis par la technologie.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes: (Pour utilisation de dispositif smart kit) (1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs. (2) Le smart kit émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur n'ont pas besoin d'être effectués. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requises pour ce smart kit installé.

IMPORTANT NOTE: In the event that these conditions can not be met (for example certain laptop configurations or colocation with another transmitter), then the Canada authorization is no longer considered valid and the IC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE: Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considérée comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling This transmitter smart kit is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users.

Plaque signalétique du produit final Ce smart kit émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs.



Operation in the band 5150-5250 MHz is only for indoor use to reduce the potential for harmful interference to co-channel mobile satellite systems.

Les dispositifs fonctionnant dans la bande 5150-5250 MHz sont réservés uniquement pour une utilisation à l'intérieur afin de réduire les risques de brouillage préjudiciable aux systèmes de satellites mobiles utilisant les mêmes canaux.

Operation in the band 5150-5250MHz and 5250-5350MHz are not permitted to be used on airplanes.

Les dispositifs certifiés en vertu de la présente section ne sont pas autorisés à être utilisés dans les avions.

(Gamme de fréquences:5150-5250MHz and 5250-5350MHZ)

The use of Wi-Fi 5GHz Band 1 is strictly limited to indoor environment.

CAN ICES (B) / NMB (B)