



## Tuya Smart Wi-Fi Module

### 1 Product Overview

WR6 is a low power-consuming built-in Wi-Fi module developed by Hangzhou Tuya Inc. It consists of a highly integrated RF microchip (W302 12E77H2) and an external flash chip, with a built-in Wi-Fi network protocol stack and robust library functions. WR6 also contains a low power-consuming ARM CM4F, a WLAN MAC, a 1T1R WLAN, and the maximum basic frequency of 125 MHz, and is embedded with a 256 KB SRAM, a 2 MB flash, and rich peripheral resources.

WR6 is an RTOS platform that integrates all the function libraries of the Wi-Fi MAC and TCP/IP protocols. You can develop built-in Wi-Fi products as required.

#### 1.1 Features

- ✧ Built-in low power-consuming 32-bit CPU functioning as an application processor
- ✧ Working voltage: 4.5 V to 5.5 V
- ✧ Peripherals: nine GPIOs, one UART, and one ADC
- ✧ Wi-Fi connectivity
  - 802.11b/g/n20/n40
  - Channels 1 to 11@ 2.4 GHz
  - WPA/WPA2 security mode
  - Smart network configuration function (for Android and iOS devices)
  - Onboard PCB antenna
  - Working temperature:  $-20^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$

## **1.2 Applications**

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

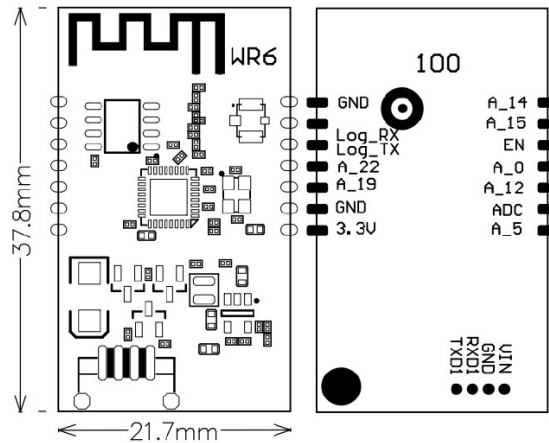
## 2 Module Interfaces

### 2.1 Dimensions and Footprint

WR6 has two rows of pins (2 x 7) with a 2 mm pin pitch.

Dimensions (H x W x D) of WR6 are as follows: 4.8 mm x 37.8 mm x 21.7 mm.

Figure 2-1 shows the dimensions of WR6.



### 2.2 Pin Definition

Table 2-1 describes common pins.

Table 2-1 WR6 interface pins

No.	Symbol	I/O Type	Function
1	A_14	I/O	GPIOA_14
2	A_15	I/O	GPIOA_15
3	EN	I/O	External enabled reset pin (active at low level)
No.	Symbol	I/O Type	Function
4	A_0	I/O	GPIOA_0, which cannot be pulled up during power-on and can be configured after power-on
5	A_12	I/O	GPIOA_12
6	ADC	AI	ADC port, with the maximum output power of 5 V
7	A_5	I/O	GPIOA_5
8	3.3 V	P	Module power supply pin (3.3 V)
9	GND	P	Power supply reference ground pin
10	A_19	I/O	GPIOA_19
11	A_22	I/O	GPIOA_22
12	Log_TX	I/O	UART_Log_TXD (used for printing the module internal information)
13	Log_RX	I/O	UART_Log_RXD (used for printing the module internal information)
14	GND	P	Power supply reference ground pin
15	VIN	P	External power input (5 V)
16	GND	P	Power supply reference ground pin
17	RXD1	I/O	UART0_RXD (user serial port)
18	TXD1	I/O	UART0_TXD (user serial port)

Note: **P** indicates power-supply pins, **I/O** indicates input/output pins, and **AI** indicates analog input pins.

## 3 Electrical Parameters

### 3.1 Absolute Electrical Parameters

Table 3-1 Absolute electrical parameters

Parameter	Description	Minimum Value	Maximum Value	Unit
T <sub>s</sub>	Storage temperature	−40	+125	°C
V <sub>IN</sub>	Power supply voltage	−0.3	+5.5	V
Static electricity voltage (human body model)	T <sub>AMB</sub> − 25°C	N/A	2	kV
Static electricity voltage (machine model)	T <sub>AMB</sub> − 25°C	N/A	0.5	kV

### 3.2 Electrical Conditions

Table 3-2 Normal electrical conditions

Parameter	Description	Minimum Value	Typical Value	Maximum Value	Unit
T <sub>a</sub>	Working temperature	−20	25	+85	°C
V <sub>IN</sub>	Working voltage	4.5	5.0	5.5	V
V <sub>IL</sub>	I/O low-level input	−0.3	N/A	+0.8	V
V <sub>IH</sub>	I/O high-level input	2.47	N/A	3.6	V
V <sub>OL</sub>	I/O low-level output	N/A	N/A	0.34	V
V <sub>OH</sub>	I/O high-level output	2.64	N/A	3.4	V
I <sub>max</sub>	I/O drive current	N/A	N/A	16	mA
C <sub>pad</sub>	Input pin capacitance	N/A	2	N/A	pF

### 3.3 Wi-Fi TX Power Consumption

**Table 3-3 TX power consumption during constant emission**

Symbol	Mode	Power	Typical Value	Unit
I <sub>RF</sub>	802.11b	20.15dBm	287	mA
I <sub>RF</sub>	802.11g	22.30dBm	255	mA
I <sub>RF</sub>	802.11n BW20	21.30dBm	244	mA
I <sub>RF</sub>	802.11n BW40	20.70dBm	220	mA

### 3.4 Wi-Fi RX Power Consumption

**Table 3-4 RX power consumption during constant receiving**

Symbol	Mode	Typical Value	Unit
I <sub>RF</sub>	CPU sleep	90	mA
I <sub>RF</sub>	CPU active	120	mA

### 3.5 Working Power Consumption

**Table 3-5 WR6 operating current**

Working Mode	Working Status (Ta = 25°C)	Typical Value	Peak Value*	Unit
EZ mode	The module is in EZ mode, and the Wi-Fi indicator quickly flashes.	115	125	mA
Idle	The module is connected to the network, and the Wi-Fi indicator is steady on.	60	209	mA
Connection mode	The module is connected to the network, and the Wi-Fi indicator is steady on.	118	198	mA
Disconnection mode	The module is disconnected from the network, and the Wi-Fi indicator is steady off.	34	192	mA

Note: The peak duration is about 5 μs. The preceding parameter values vary depending on the firmware functions.

## 4 RF Features

### 4.1 Basic RF Features

Table 4-1 Basic RF features

Parameter	Description
Frequency range	2.412 GHz to 2.462 GHz
Wi-Fi standard	IEEE 802.11b/g/n20/n40 (channels 1 to 11)
Data transmission rate	802.11b: 1, 2, 5.5, or 11 (Mbit/s) 802.11g: 6, 9, 12, 18, 24, 36, 48, or 54 (Mbit/s) 802.11n: HT20 MCS0 to MCS7 802.11n: HT40 MCS0 to MCS7
Antenna type	PCB antenna (default)

### 4.2 Wi-Fi RX Sensitivity

Table 4-2 RX sensitivity

Parameter		Minimum Value	Typical Value	Maximum Value	Unit
PER < 8%, 802.11b CCK mode	11 Mbit/s	N/A	-91	N/A	dBm
PER < 10%, 802.11g OFDM mode	54 Mbit/s	N/A	-75	N/A	dBm
PER < 10%, 802.11n OFDM mode	MCS7	N/A	-72	N/A	dBm

## 5 Antenna Information

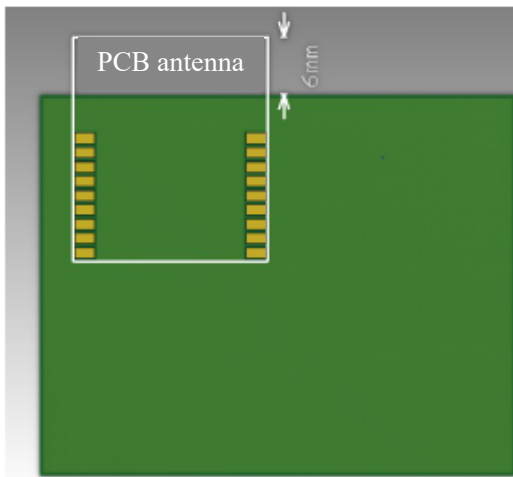
### 5.1 Antenna Types

onboard PCB antenna

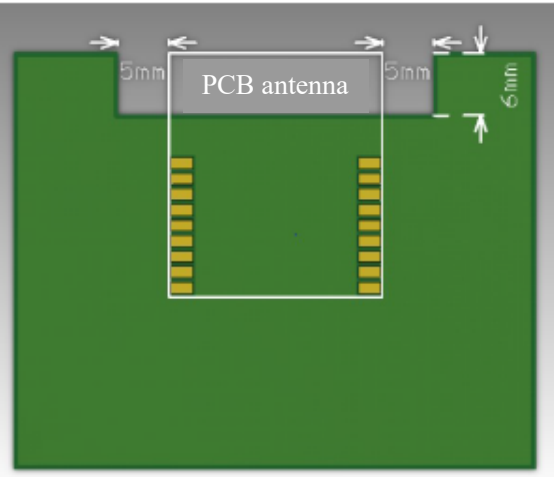
### 5.2 Antenna Interference Reduction

To ensure optimal Wi-Fi performance when the module uses an onboard PCB antenna, it is recommended that the antenna be at least 15 mm away from other metal parts.

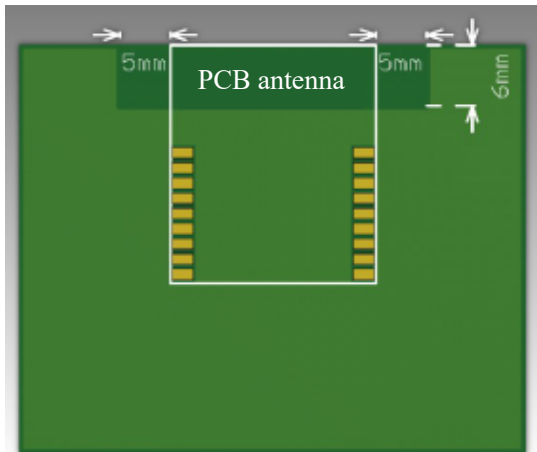
The following figures show five common antenna routing solutions. Solutions 1 and 2 have the best test performance, and the RF performance is the same as that of a single module. If the antenna must be routed on the PCB due to restrictions, solution 3 is recommended. However, the RF performance may be attenuated by 1 to 2 dBm. Solution 5 has the poorest RF performance and is not recommended. In solution 5, the antenna is routed in the PCB frame and RF signals cannot be transmitted or received properly.



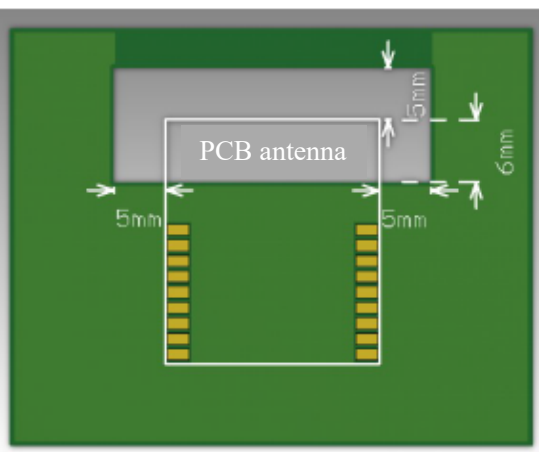
Solution 1: Antenna routed outside the PCB frame



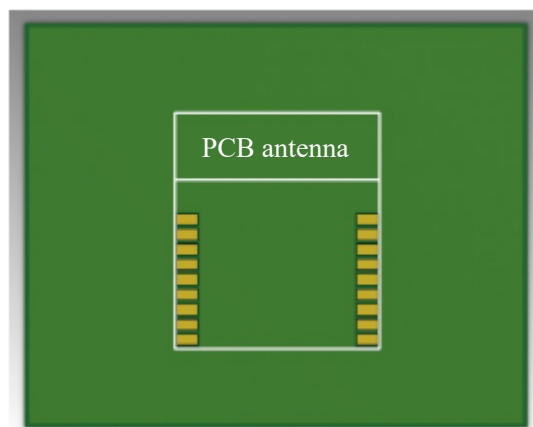
Solution 2: Antenna routed along the frame edge with carved area below



Solution 3: Antenna routed along the frame edge without copper below



Solution 4: Antenna routed in the frame with carved area below



Solution 5: Antenna routed in the frame with copper or wires below



## 6 Packaging Information and Production Instructions

### 6.1 Production Instructions

Storage conditions of a delivered module are as follows:

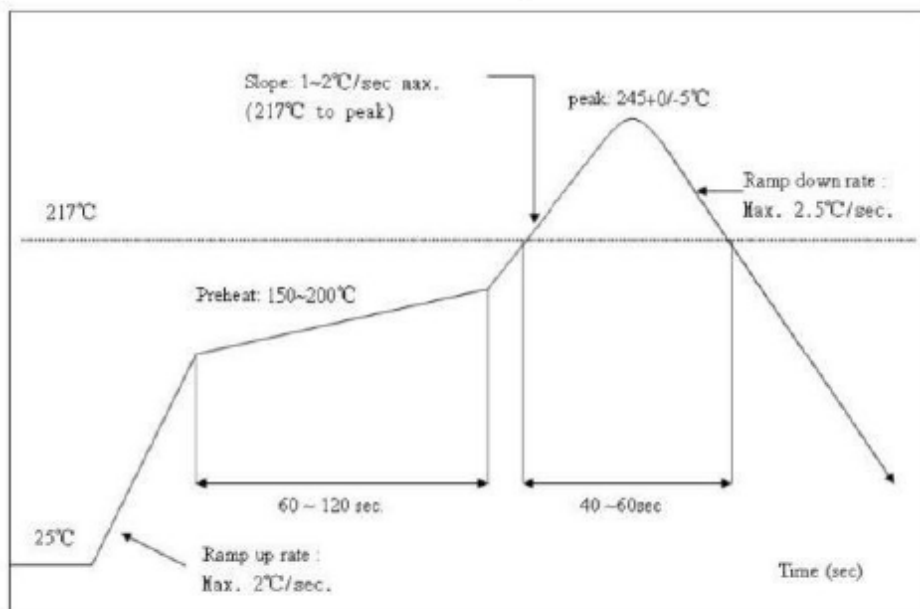
1. The anti-moisture bag must be placed in an environment where the temperature is below 30°C and the relative humidity is lower than 85%.
2. The shelf life of a dry-packaged product is six months from the date when the product is packaged and sealed.

Precautions:

1. Throughout the production process, each involved operator must wear an ESD wrist strap.
2. During the operation, strictly protect the module from water and strains.

### 6.2 Recommended Oven Temperature Curve

Refer to IPC/JEDEC standard ; Peak Temperature : <250°C ; Number of Times: ≤2 times ;



**Regulatory Module Integration Instructions**

This device complies with part 15.247 of the FCC Rules.

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The antenna is PCB Antenna and maximum gain is 2.5dBi .

This module has been granted modular approval for mobile applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, additional FCC approvals must be obtained.

The host product with the module installed must be evaluated for simultaneous transmission requirements.

The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, use this module only with the included onboard antenna.

The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

**FCC Statement**

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

**FCC Radiation Exposure Statement:**

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

**FCC Label Instructions:**

The outside of final products that contains this module device must display a label referring to the enclosed module. This exterior label can use wording such as: "Contains Transmitter Module FCC ID: 2ANDL-WR6",or "Contains FCC ID: 2ANDL-WR6 ", Any similar wording that expresses the same meaning may be used.