



Tuya Smart Wi-Fi Module

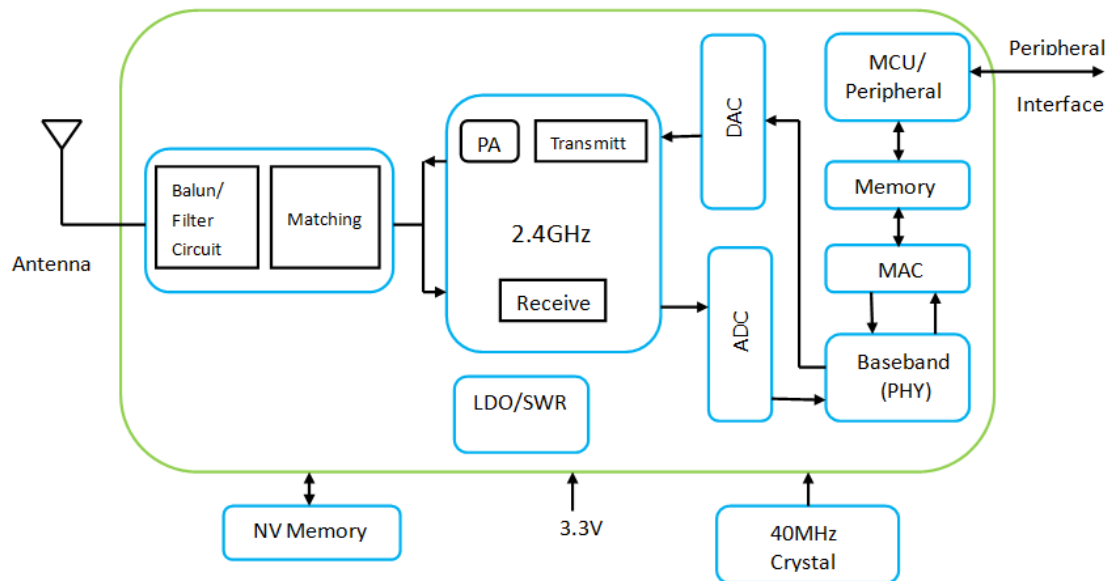
1. Product Overview

WR1 is a low power consumption module with built-in Wi-Fi connectivity solution designed by Hangzhou Tuya Information Technology Co., Ltd. The Wi-Fi Module consists of a highly integrated wireless radio chip W302 12E75M2 and some extra flash that has been programmed with Wi-Fi network protocol and plenty of software examples. WR1 include a ARM CM4F, WLAN MAC, 1T1R WLAN, maximum frequency reaches 125MHz, 256K SRAM, 1M byte flash and various peripheral resources.

WR1 is a RTOS platform, embedded with all the Wi-Fi MAC and TCP/IP protocol function examples, users can customize their Wi-Fi product by using these software examples.

Figure 1 shows the block diagram of the WR1.

Figure 1. The block diagram of the WR1



1.1 Features

- ✧ Integrated low power consumption 32-bit CPU, also known as application processor
- ✧ Basic frequency of the CPU can support 125 MHz
- ✧ Supply voltage range: 3V to 3.6V
- ✧ Peripherals: 6 GPIO channels, 2 UART, 1 ADC
- ✧ Wi-Fi connectivity:
 - 802.11 B/G/N20/N40
 - Channel 1 to 11 @ 2.4GHz
 - Support WPA/WPA2
 - +21.10dBm output power in 802.11b mode

- Support SmartConfig function for both Android and IOS devices
- On-board PCB antenna
- Operating temperature range: -20°C to 105°C

1.2 Main Application Fields

- ✧ Intelligent Building
- ✧ Intelligent home, Intelligent household applications
- ✧ Healthy devices
- ✧ Industrial wireless control
- ✧ Baby monitor
- ✧ Webcam
- ✧ Intelligent bus

2. Dimensions and Footprint

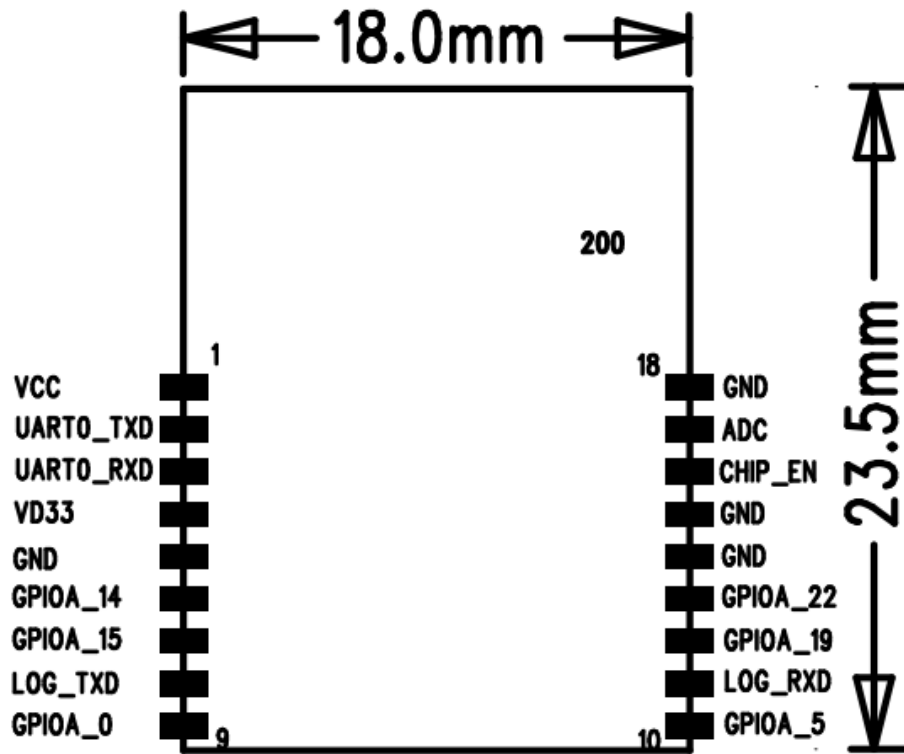
2.1 Dimensions

WR1 has 2 columns of Pins (2*9). The distance between each Pin is 1.5 mm.

Size of WR1: 18mm(W)*23.5mm(L)*3.1mm(H)

Figure 2 shows the dimensions of WR1.

Figure 2. The dimensions of WR1



2.2 Pin Definition

Table 1 shows the general pin attributes of WR1

Table 1. The typical pin definition of WR1

| PIN NO. | NAME | TYPE | DISCREPTION |
|---------|-----------|------|-----------------------|
| 1 | VCC | P | Supply voltage (3.3V) |
| 2 | UART0_TXD | I/O | UART0_TXD |
| 3 | UART0_RXD | I/O | UART0_RXD |
| 4 | VD33 | P | Supply voltage (3.3V) |
| 5 | GND | P | Ground |
| 6 | GPIOA_14 | I/O | GPIOA_14 |
| 7 | GPIOA_15 | I/O | GPIOA_15 |

| | | | |
|----|----------|-----|---|
| 8 | LOG_TXD | I/O | UART_Log_TXD(used to print module's internal information) |
| 9 | GPIOA_0 | I/O | GPIOA_0, can not be pull-up while booting, can be used as GPIO while in normal working mode |
| 10 | GPIOA_5 | I/O | GPIOA_5 |
| 11 | LOG_RXD | I/O | UART_Log_RXD (used to print module's internal information) |
| 12 | GPIOA_19 | I/O | GPIOA_19 |
| 13 | GPIOA_22 | I/O | GPIOA_22 |
| 14 | GND | P | Ground |
| 15 | GND | P | Ground |
| 16 | CHIP_EN | I/O | External reset singal(low level effects) |
| 17 | ADC | AI | ADC terminal(input 5V maximally) |
| 18 | GND | P | Ground |

Note: S: Power supply pins; I/O: Digital input or output pins; AI: Analog input.

3. Electrical Characteristics

3.1 Absolute Maximum Ratings

Table 3.1. Absolute Maximum Ratings

| PARAMETERS | DESCRIPTION | MIN | MAX | UNIT |
|---|---------------------|------|-----|------|
| Ts | Storage temperature | -20 | 105 | °C |
| VCC | Supply voltage | -0.3 | 3.6 | V |
| Static electricity voltage (human model) | TAMB-25°C | - | 2 | KV |
| Static electricity voltage (machine model) | TAMB-25°C | - | 0.5 | KV |

3.2 Electrical Conditions

Table 3.2. Electrical Conditions

| PARAMETERS | DESCRIPTION | MIN | TYPICAL | MAX | UNIT |
|------------------|----------------------|----------|---------|----------|------|
| Ta | Working temperature | -20 | - | 105 | °C |
| VCC | Working voltage | 3 | - | 3.6 | V |
| VIL | IO low level input | -0.3 | - | VCC*0.25 | V |
| VIH | IO high level input | VCC*0.75 | - | VCC | V |
| VOL | IO low level output | - | - | VCC*0.1 | V |
| VoH | IO high level output | VCC*0.8 | - | VCC | V |
| I _{max} | IO drive current | - | - | 16 | mA |
| C _{pad} | Input capacitor | - | 2 | - | pF |

3.3 Wi-Fi Transmitting Current Consumptions

Table 3.3. Wi-Fi TX current consumption

| PARAMETERS | MODE | RATE | Transmitting power | TYPICAL | UNIT |
|------------|----------|-------|--------------------|---------|------|
| IRF | 11b | 1Mbps | +21.10dBm | 287 | mA |
| IRF | 11g | 6Mbps | +19.97dBm | 255 | mA |
| IRF | 11n-HT20 | MCS0 | +20.09dBm | 244 | mA |
| IRF | 11n-HT40 | MCS0 | +20.19dBm | 220 | mA |

3.4 Wi-Fi Receiving Current Consumptions

Table 3.4. Wi-Fi RX currentconsumption

| PARAMETERS | MODE | TYPICAL | UNIT |
|------------|------------|---------|------|
| IRF | CPU sleep | 90 | mA |
| IRF | CPU active | 120 | mA |

3.5 Working Mode Current Consumptions

Table 3.5. The module working currentcon sumption

| WORK MODE | AT TA=25℃ | TYPICAL | MAX* | UNIT |
|--------------------|--|---------|------|------|
| EZ Mode | WR1 is under EZ paring mode, Wi-Fi indicator light flashes quickly | 121.8 | 141 | mA |
| Standby Mode | WR1 is connected, Wi-Fi indicator light is on | 52 | 125 | mA |
| Operation Mode | WR1 is connected, Wi-Fi indicator light is on | 180 | 312 | mA |
| Disconnection Mode | WR1 is disconnected, Wi-Fi indicator light is off | 46 | 120 | mA |

Note: peak continuous time is about 5us.

The parameter shown above will vary dependigon different firmware functions.

4. WLAN Radio Specification

4.1 Basic Radio Frequency Characteristics

Table 41.Basic Radio frequency characteristics

| PARAMETERS | DESCRIPTION |
|------------------------|--|
| Frequency band | 2412MHz-2462MHz |
| Wi-Fi standard | IEEE 802.11n20/n40/g/b (Terminal 1-11) |
| Data transmitting rate | 11b:1,2,5.5,11(Mbps) |
| | 11g:6,9,12,18,24,36,48,54(Mbps) |
| | 11n:HT20,MCS0~7 |
| | 11n:HT40,MCS0~7 |
| Antenna type | On-board PCB Antenna |

4.2Wi-Fi Transmitting Power

Table 4.2. Wi-Fi transmitting power

| PARAMETERS | | MIN | TYPICAL | MAX | UNIT |
|--|------|-----|---------|-----|------|
| RF average output power, 802.11b CCK Mode | 1M | - | 21.10 | - | dBm |
| RF average output power, 802.11g OFDM Mode | 6M | - | 19.97 | - | dBm |
| RF average output power, 802.11n20 OFDM Mode | MCS0 | - | 20.09 | - | dBm |
| RF average output power, 802.11n40 OFDM Mode | MCS0 | - | 20.19 | - | dBm |
| The Frequency error | | -10 | - | 10 | ppm |

4.3 Wi-Fi Receiving Sensitivity

Table 4.3. Wi-Fi Receiving sensitivity

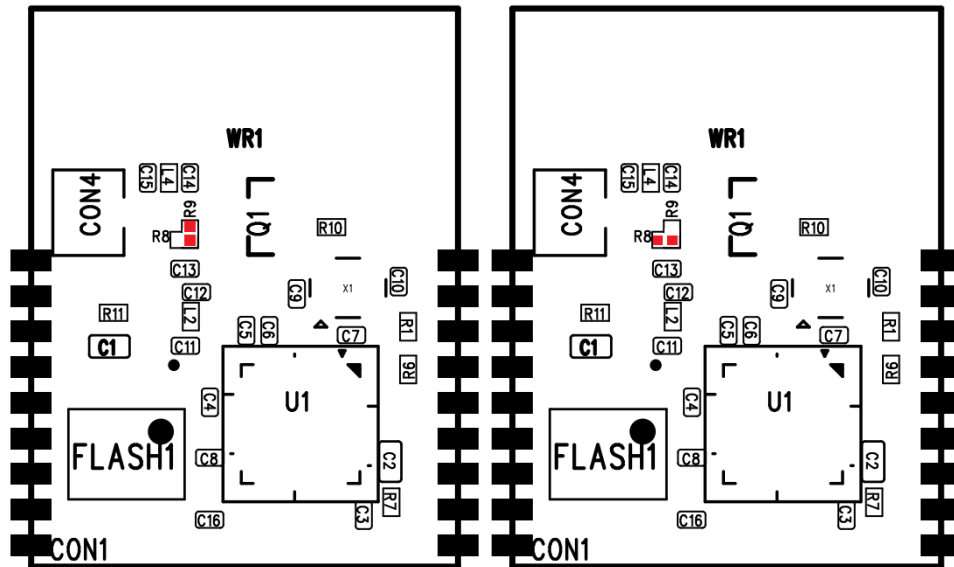
| PARAMETERS | | MIN | TYPICAL | MAX | UNIT |
|---|------|-----|---------|-----|------|
| PER<8%, Receiving sensitivity, 802.11b CCK Mode | 1M | - | -91 | - | dBm |
| PER<10%, Receiving sensitivity, 802.11g OFDM Mode | 6M | - | -75 | - | dBm |
| PER<10%, Receiving sensitivity, 802.11n OFDM Mode | MCS0 | - | -72 | - | dBm |

5. Antenna Information

5.1 Antenna Type

Antenna can be connected using On-board PCB antenna

Figure 5.1. Resistor definition for on-board PCB antenna Figure 5.2. Resistor definition for external antenna



5.2 Antenna Interference

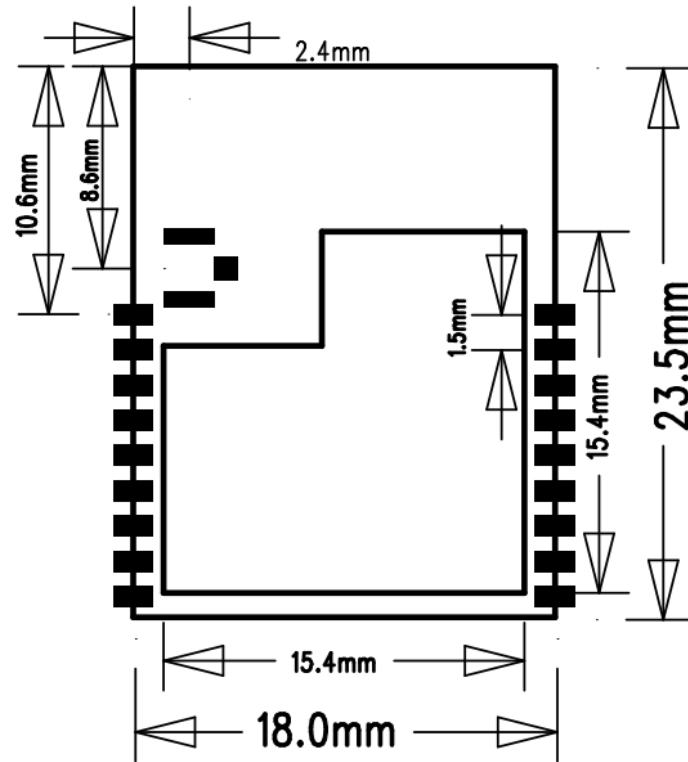
While using the On-board PCB antenna, in order to have the best Wi-Fi performance, it's recommended to keep a minimum 15mm distance between the antenna part and the other metal pieces.

User's own PCBA design is recommended NOT to pass any wire, NOT do copper pour under the region of the module's antenna, to avoid interferences.

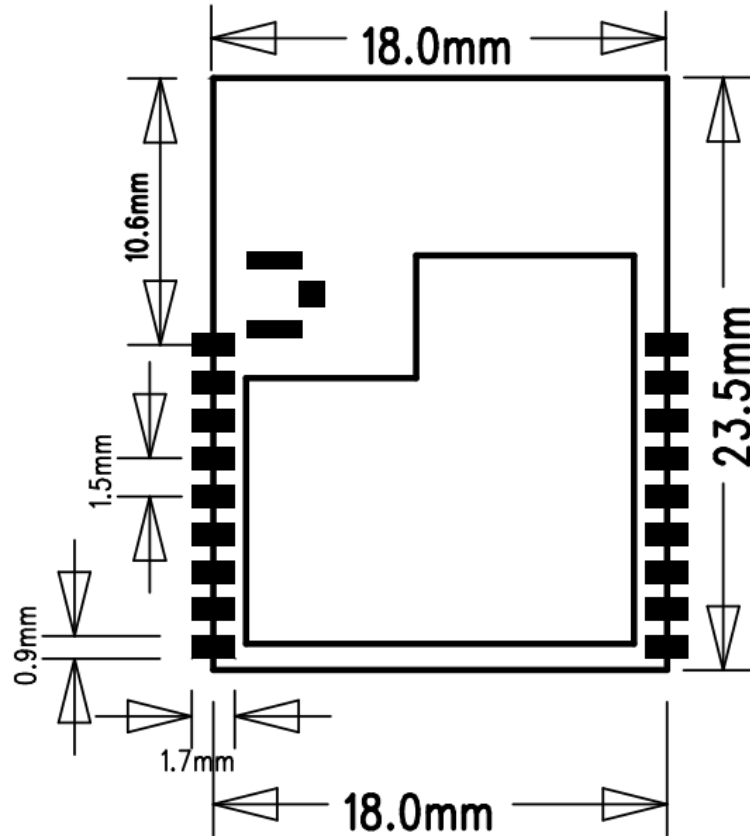
6. Packaging Information And Production Guide

6.1 Mechanical Dimensions

Figure 6.1. Top view of the module



6.2 PCB Recommended Package



6.3 Production Guide

- ✧ The storage for the delivered module should meet the following condition:
 1. The anti-moisture bag should be kept in the environment with temperature $< 30^{\circ}\text{C}$ and humidity $< 85\% \text{ RH}$.
 2. The expiration date is 6 months since the dry packaging products was sealed.
- ✧ Cautions:
 1. All the operators should wear electrostatic ring in the whole process of production.
 2. While operating, water and dirt should not have any contact with the modules.

6.4 Recommended furnace temperature curve

Figure 6.4. PCB Package Drawing Recommended furnace temperature curve

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

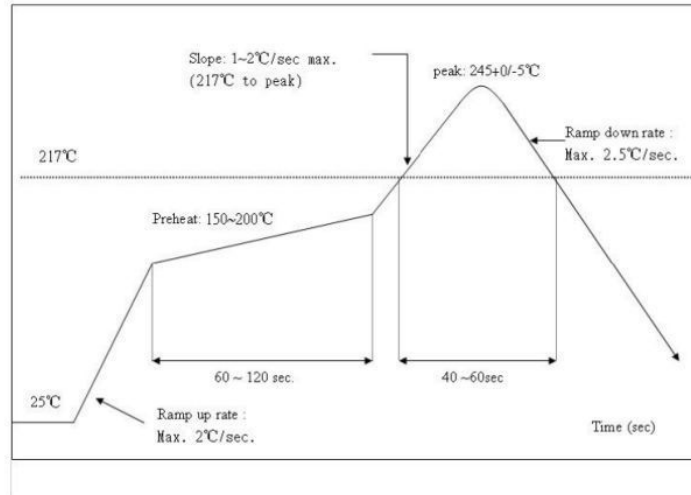
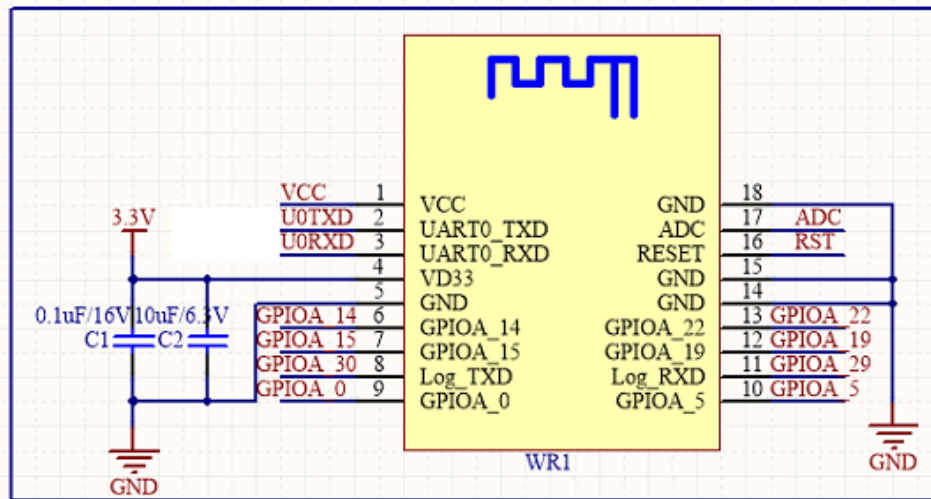


Figure A.1. The application schematic design of the module



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-WR1",or "Contains FCC ID:2ANDL-WR1", Any similar wording that expresses the same meaning may be used.