



TuyaSmartWi-Fi Module

1. Product Overview

WR2E 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 HB140P1 and some extra flash that has been programmed with Wi-Fi network protocol and plenty of software examples.WR2E include a ARM CM4F, WLAN MAC, 1T1R WLAN, maximum frequency reaches 125MHz, 256K SRAM, 1M byte flash and various peripheral resources.

WR2E 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.

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: 7 GPIO channels, 2 UART, 1 ADC
- ✧ Wi-Fi connectivity:
 - 802.11 B/G/N20/N40
 - Channel 1 to 11 @ 2.4GHz
 - Support WPA/WPA2
 - Support SmartConfig function for both Android and IOS devices
 - On-board PCB antenna
 - Pass CE, FCC, SRRC certifications
 - Operating temperature range: -20°C to 85°C

Main ApplicationFields

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

2. Dimensions and Footprint

2.1 Dimensions

WR2E has 2 columns of Pins (2*9).The distance between each Pin is 2 mm.

Size of WR2E: 15 mm (W)×18 mm (L) ×3.3 mm (H)

2.2 Pin Definition

Table 1 shows the general pin attributes of WR2E

Table 1. The typical pin definition of WR2E

| PIN NO. | NAME | TYP E | DISCREPTION |
|---------|--------------|-------|---|
| 1 | VD33 | P | 3.3V |
| 2 | GPIOA_1 2 | I/O | GPIOA_12, general GPIO, hardware PWM |
| 3 | GND | P | Power supply |
| 4 | GPIOA_1 9 | I/O | GPIOA_19, general GPIO |
| 5 | GPIOA_1 8 | I/O | UART0_RXD |
| 6 | GPIOA_5 | I/O | GPIOA_5, general GPIO, hardware PWM |
| 7 | GPIOA_2 3 | I/O | UART0_TXD |
| 8 | ADC | AI | ADC port, Max5V |
| 9 | GPIOA_1 4 | I/O | GPIOA_14 , General GPIO, hardware PWM |
| 10 | CHIP_EN | I/O | External can make reset pin (effective) low level |
| 11 | GPIOA_1 5 | I/O | GPIOA_15, General GPIO, hardware PWM |

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

3. Electrical Characteristics

Absolute Maximum Ratings

Table 3.1. Absolute Maximum Ratings

| PARAMETERS | DESCRIPTION | MIN | MAX | UNIT |
|---|---------------------|------|-----|------|
| Ts | Storage temperature | -40 | 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 |

Electrical Conditions

Table 3.2. Electrical Conditions

| PARAMETERS | DESCRIPTION | MIN | TYPICAL | MAX | UNIT |
|------------------|----------------------|----------|---------|----------|------|
| Ta | Working temperature | -20 | - | 85 | °C |
| VCC | Working voltage | 3 | - | 3.6 | V |
| VIL | IO low level input | -0.3 | - | VDD*0.25 | V |
| VIH | IO high level input | VDD*0.75 | - | VDD | V |
| VOL | IO low level output | - | - | VDD*0.1 | V |
| VoH | IO high level output | VDD*0.8 | - | V | V |
| I _{max} | IO drive current | - | - | 16 | mA |
| C _{pad} | Input capacitor | - | 2 | - | pF |

Wi-Fi Receiving CurrentConsumptions

Table 3.3. Wi-Fi RX currentconsumption

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

Working Mode CurrentConsumptions

Table 3.4. The module working currentconsumption

| WORK MODE | AT TA=25℃ | TYPICAL | MAX* | UNIT |
|--------------------|---|---------|------|------|
| EZ Mode | WR2E is under EZ paring mode, Wi-Fi indicator light flashes quickly | 115 | 125 | mA |
| Standby Mode | WR2E is connected, Wi-Fi indicator light is on | 60 | 209 | mA |
| Operation Mode | WR2E is connected, Wi-Fi indicator light is on | 118 | 198 | mA |
| Disconnection Mode | WR2E is disconnected, Wi-Fi indicator light is off | 34 | 192 | mA |

Note: peak continuous time is about 5us.

The parameter shown above will vary depending on different firmware functions.

4. WLAN Radio Specification

Basic Radio Frequency Characteristics

Table 4.1. Basic Radio frequency characteristics

| PARAMETERS | DESCRIPTION |
|------------------------|---|
| Frequency band | 2412MHz-2462MHz(802.11b/g/n20);2422MHz-2452MHz(802.11n40) |
| Wi-Fi standard | IEEE 802.11n/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 |

Wi-Fi Transmitting Power

Table 4.2. Wi-Fi transmitting power

| |
|--|
| RF output power |
| 802.11b:20.19dBm 802.11g:23.85dBm 802.11n20:24.04dBm 802.11n40:23.98dBm |

Wi-Fi Receiving Sensitivity

Table 4.3. Wi-Fi Receiving sensitivity

| PARAMETERS | | MIN | TYPICAL | MAX | UNIT |
|---|------|-----|---------|-----|------|
| PER<8%, Receiving sensitivity, 802.11b CCK Mode | 11M | - | -91 | - | dBm |
| PER<10%, Receiving sensitivity, 802.11g OFDM Mode | 54M | - | -75 | - | dBm |
| PER<10%, Receiving sensitivity, 802.11n OFDM Mode | MCS7 | - | -72 | - | dBm |

5. Antenna Information

Antenna Type

On-board PCB antenna.

Reduce 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.

6. Packaging Information And Production Guide

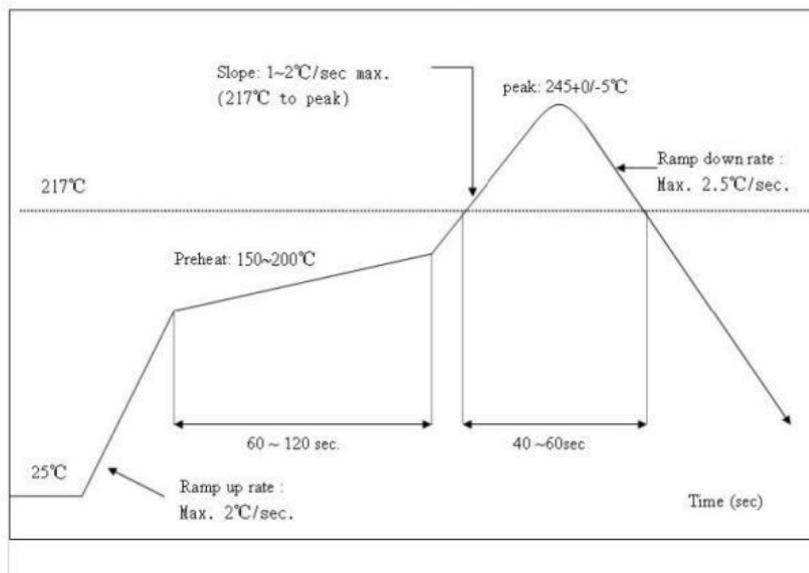
Production Guide

- ◇ The storage for the delivered module should meet the following condition:
 1. The anti-moisture bag should be kept in the environment with temperature <math>< 30^{\circ}\text{C}</math> and humidity <math>< 85\% \text{ RH}</math>.
 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.

Recommended furnace temperature curve

Figure 6.2. PCB Package Drawing Recommended furnace temperature curve

Refer to IPC/JEDEC standard ; Peak Temperature : <math>< 250^{\circ}\text{C}</math> ; Number of Times: ≤ 2 times ;



Regulatory Module Integration Instructions

2.2 List of applicable FCC rules

This device complies with part 15.247 of the FCC Rules.

2.3 Summarize the specific operational use conditions

This module can be used in household electrical appliances as well as lighting equipments.

The input voltage to the module should be nominally 3.0 to 3.6V_{DC}, typical value

3.3V_{DC} and the ambient temperature of the module should not exceed 85°C.

This module using only one kind of antennas with maximum gain is 2.5 dBi .Other antenna arrangement is not covered by this certification.

The antenna is not field replaceable. If the antenna needs to be changed, the certification should be re-applied.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

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. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by§ 2.1093.

2.7 Antennas

Module only contains one PCB antenna. No additional external connectors.

2.8 Label and compliance information

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-WR2E ”,or “Contains FCC ID: 2ANDL-WR2E ”, Any similar wording that expresses the same meaning may be used.

2.9 Information on test modes and additional testing requirements

a) The modular transmitter has been fully tested by the module grantee on the required number of channels, modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter, perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

b) The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not

have any responsibility for final product compliance.

c) If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference has been corrected

Below are steps for TX verification :

```
wpriv mp_start //enter MP mode
```

```
iwpriv mp_channel 1 //set channel to 1 . 2, 3, 4~11 etc.
```

```
iwpriv mp_bandwidth 40M=0,shortGI=0 //40M=0 set 20M mode and long GI ,
```

```
40M=1 set 40M mode
```

```
iwpriv mp_ant_tx a //select antenna A for operation
```

```
iwpriv mp_txpower patha=44,pathb=44 //set path A and path B Tx power level
```

```
iwpriv mp_rate 108 //set OFDM data rate to 54Mbps,ex:
```

```
CCK 1M = 2, CCK 5.5M = 11, KK, OFDM54M = 108 N Mode: MCS0 = 128, MCS1  
= 129.....etc.
```

```
iwpriv mp_ctx background,pkt //start packet continuous Tx
```

```
iwpriv mp_ctx stop //stop continuous Tx
```

2.10 Additional testing, Part 15 subpart B disclaimer

The final host / module combination 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.

The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369.

Frequency spectrum to be investigated

For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation.

Operating the host product

When testing the host product, all the transmitters must be operating. The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory devices or drivers are not available.

When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further

general testing details.

The product under test is set into a link/association with a partnering WLAN device, as per the normal intended use of the product. To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content.

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