

# TUYA WiFi Module

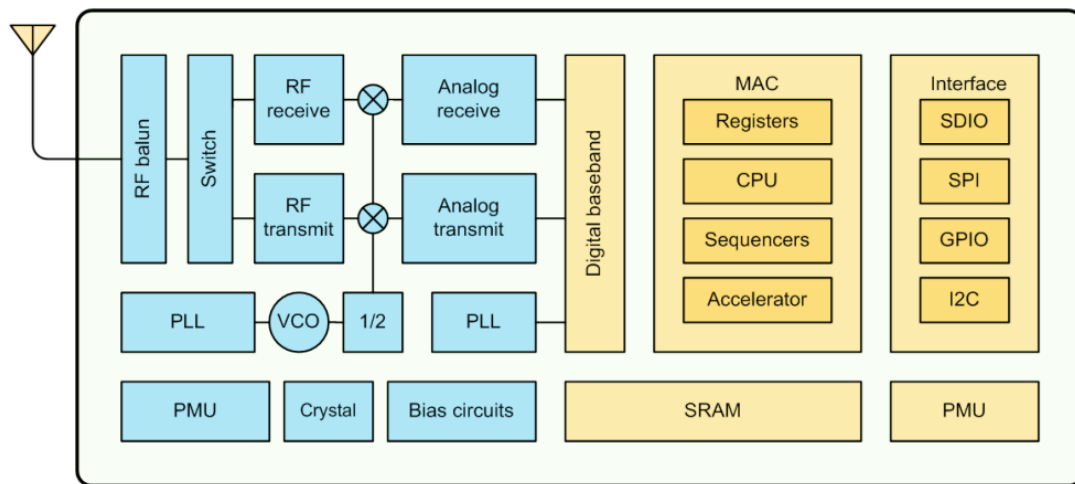
## 1. Product Overview

TYWE3S is a low power consumption module with built-in Wi-Fi connectivity solution designed by HangZhou Tuya Technology Corporation. The Wi-Fi Module consists of a highly integrated wireless radio chip ESP8266 and some extra component that has been programmed with Wi-Fi network protocol and plenty of software examples. TYWE3S include a 32-bit CPU, 1M byte flash, 50k SRAM and various peripheral resources.

TYWE3S 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 TYWE3S.

Figure 1. The block diagram of the TYWE3S



### 1.1 Features

- ✧ Integrated low power consumption 32-bit CPU, also known as application processor
- ✧ Basic frequency of the CPU can support both 80MHz and 160MHz
- ✧ Supply voltage range: 3V to 3.6V
- ✧ Peripherals: 9 GPIO channels, 1 UART, 1 ADC
- ✧ Wi-Fi connectivity:
  - 802.11 b/g/n
  - channel 1 to 11@2.4G for FCC,channel 1 to 13 @2.4G for EU
  - Support WPA/WPA2
  - +20dBm output power in 802.11b mode
  - Support STA/AP/STA+AP operation mode
  - Support SmartConfig function for both Android and IOS devices
  - On-board PCB antenna
  - Operating temperature range: -20°C to 85°C

## **1.2 Main Application Fields**

- ✧ Intelligent Building
- ✧ Intelligent home, Intelligent household applications
- ✧ Health care
- ✧ Industrial wireless control
- ✧ Baby monitor
- ✧ Webcam
- ✧ Intelligent bus

## 2. Dimensions and Footprint

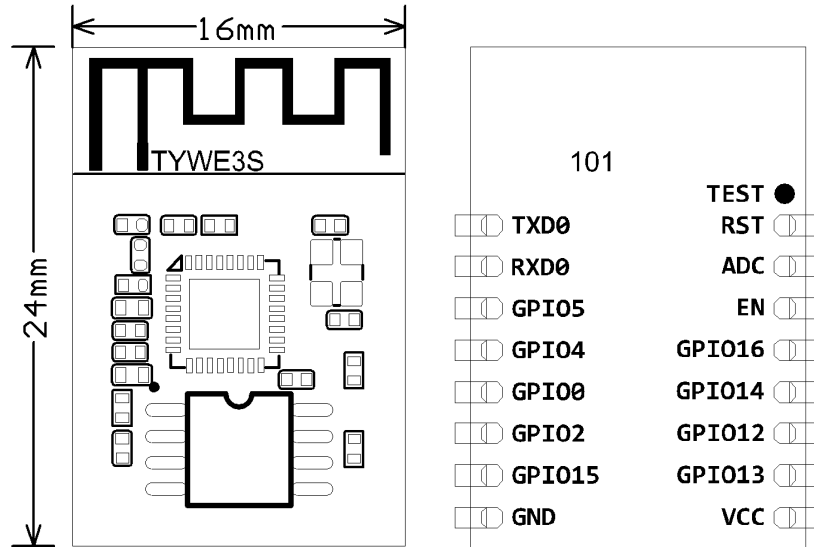
### 2.1 Dimensions

TYWE3S has 2 columns of Pins. The distance between each Pin is 2mm.

Size of TYWE3S: 16mm(W)\*24mm(L)\*3.5mm(H)

Figure 2 shows the dimensions of TYWE3S.

Figure 2. The dimensions of TYWE3S



### 2.2 Pin Definition

Table 1 shows the general pin attributes of TYWE3S

Table 1. The typical pin definition of TYWE3S

PIN NO.	NAME	TYP E	DISCREPTION
1	TXD0	O	UART0_TXD <sup>(2)</sup>
2	RXD0	I/O	UART0_RXD <sup>(2)</sup>
3	GPIO5	I/O	GPIO_05
4	GPIO4	I/O	GPIO_04
5	GPIO0	I/O	GPIO_0(processing during initials, caution when used)
6	GPIO2	O	UART0_TXD(used to print module's internal information)
7	GPIO15	O	GPIO_15(processing during initials, caution when used)
8	GND	P	Ground
9	VCC	P	Supply voltage (3.3V)
10	GPIO13	I/O	GPIO_13
11	GPIO12	I/O	GPIO_12
12	GPIO14	I/O	GPIO_14
13	GPIO16	I/O	GPIO_16 ( 10k pull-up resistor needed)
14	EN	I	Enable pin for module, high level effects

15	ADC	AI	ADC terminal(10-bits SAR ADC) <sup>(1)</sup>
16	RST	I/O	External reset (low level effects, there's already had pull-up resistor)

Note: S: Power supply pins; I/O: Digital input or output pins; AI: Analog input. RST pin is the module hardware reset pin; it cannot eliminate module-pairing information.

(\*1) This pin can only be used as ADC input, cannot use it as normal I/O. when not using, just connect nothing. When used as ADC input, the input voltage range is 0~1.0V.

(\*2) UART0 is serial port, during power on progress; this serial port will output something, which can be ignored.

### 2.3 Test Pin Definition

Table 2 shows the general test pin definition of TYWE3S

Table 2. The general test pin definition of TYWE3S

PIN NO.	NAME	TYPE	DESCRIPTION
-	TEST	I	Used for module's production test

Note: This test pin is not recommended to use.

### 3. Electrical Characteristics

#### 3.1 Absolute Maximum Ratings

Table 3. Absolute Maximum Ratings

PARAMETERS	DESCRIPTION	MIN	MAX	UNIT
Ts	Storage temperature	-20	85	°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 4. Electrical Conditions

PARAMETERS	DESCRIPTION	MIN	TYPICAL	MAX	UNIT
Ta	Working temperature	-20	-	85	°C
VCC	Working voltage	3	3.3	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 <sub>max</sub>	IO drive current	-	-	12	mA

#### 3.3 Wi-Fi Transmitting Current Consumptions

Table 5. Wi-Fi TX current consumption

PARAMETERS	MODE	RATE	transmitting power	TYPICAL	UNIT
IRF	11b	11Mbps	+17dBm	220	mA
IRF	11g	54Mbps	+15dBm	110	mA
IRF	11n	MCS7	+13dBm	100	mA

#### 3.4 Wi-Fi Receiving Current Consumptions

Table 6. Wi-Fi RX current consumption

PARAMETERS	MODE	RATE	TYPICAL	UNIT
IRF	11b	11Mbps	76	mA
IRF	11g	54Mbps	76	mA
IRF	11n	MCS7	76	mA

### 3.5 Working Mode Current Consumptions

Table 7. The module working current consumption

WORK MODE	AT TA=25℃	TYPICAL	MAX*	UNIT
EZ Mode	TYWE3S is under EZ paring mode, Wi-Fi indicator light flashes quickly	80	151	mA
AP Mode	TYWE3S is under AP paring mode, Wi-Fi indicator light flashes slowly	90	451	mA
Operation Mode	TYWE3S is connected, Wi-Fi indicator light is on	58.5	411	mA
Disconnection Mode	TYWE3S is disconnected, Wi-Fi indicator light is off	80	430	mA

## 4. WLAN Radio Specification

### 4.1 Basic Radio Frequency Characteristics

Table 8. Basic Radio frequency characteristics

PARAMETERS	DESCRIPTION
Frequency band	2.4GHz to 2.5GHz
Wi-Fi standard	IEEE 802.11n/g/b (Terminal 1-14)
Data transmitting rate	11b:1,2,5,11(Mbps)
	11g:6,9,12,18,24,36,48,54(Mbps)
	11n:HT20, MCS0~7
Antenna type	On-board PCB Antenna

### 4.2 Wi-Fi Transmitting Power

Table 9. Wi-Fi transmitting power

PARAMETERS		MIN	TYPICAL	MAX	UNIT
RF average output power, 802.11b CCK Mode	11M	-	20	-	dBm
RF average output power, 802.11g OFDM Mode	54M	-	17	-	dBm
RF average output power, 802.11n OFDM Mode	MCS7	-	14	-	dBm
The Frequency error		-10	-	10	ppm

### 4.3 Wi-Fi Receiving Sensitivity

Table 9. Wi-Fi Receiving sensitivity

PARAMETERS	MIN	TYPICAL	MAX	UNI

TYWE3S DATASHEET

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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**

### **5.1 Antenna Type**

Antenna can be connected only using On-board PCB antenna.

### **5.2 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.

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 3. Top view of the module

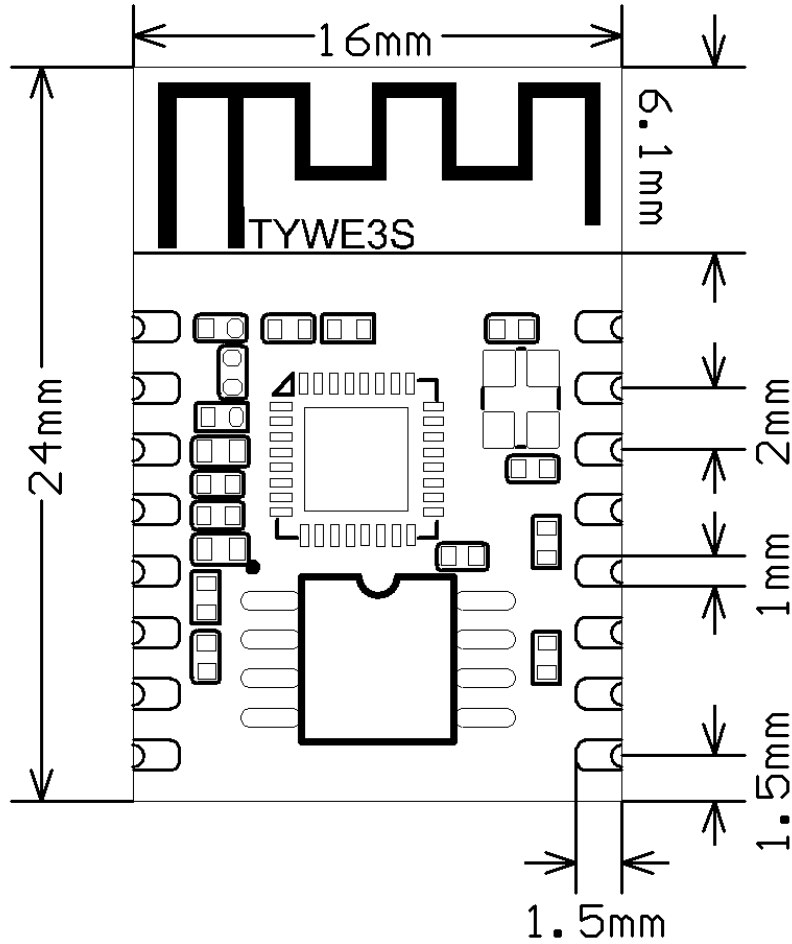
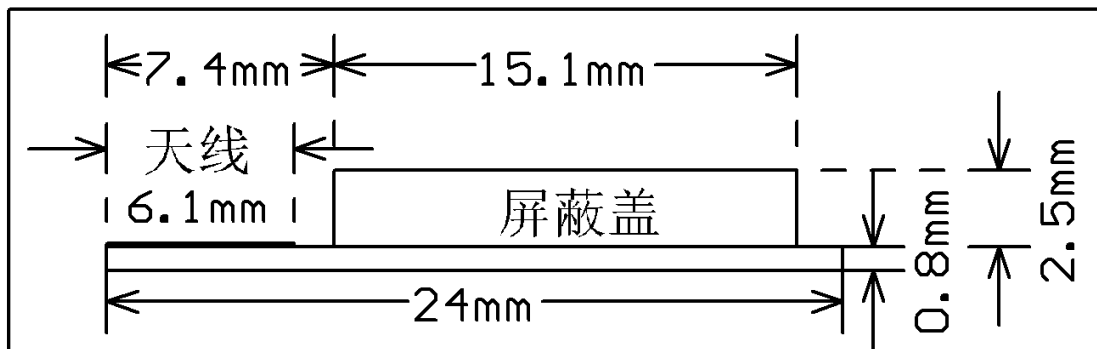


Figure 4. The module's mechanical view



## 6.2 PCB Recommended Package

Figure 5. PCB schematic Drawing

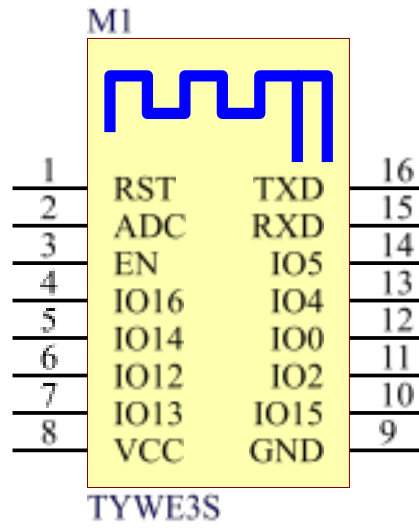
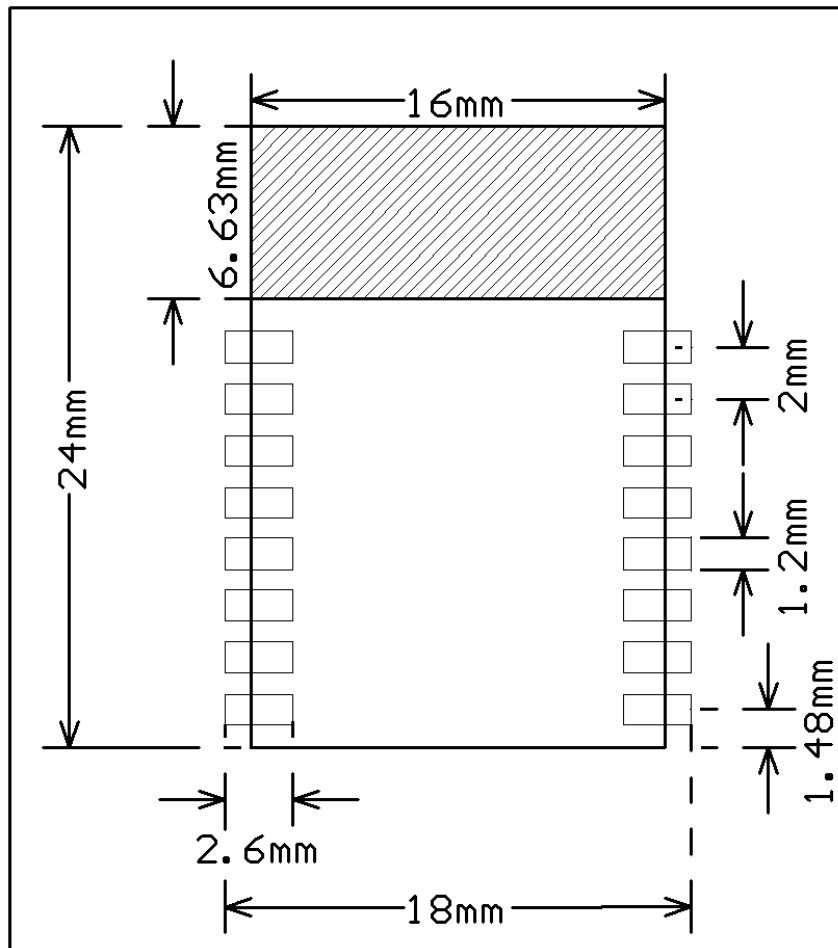


Figure 6. PCB Package Drawing



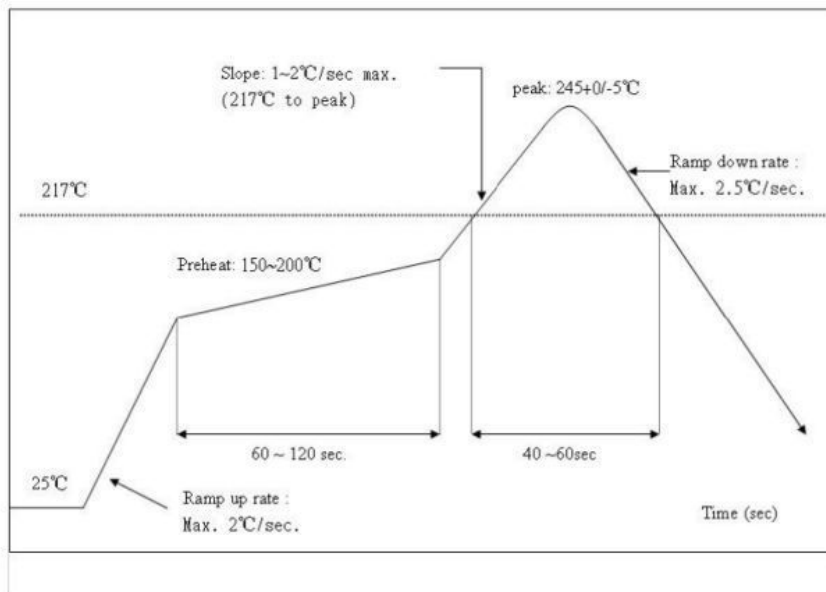
## 6.3 Production Guide

- ◇ 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  $< 85\%$  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 7. PCB Package Drawing Recommended furnace temperature curve

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



## 7. Declaration

### 7.1 Federal Communications Commission (FCC) Declaration of Conformity

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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. This device and its antenna(s) must not be co-located or operating in conjunction with any other antenna or transmitter.

15.105 Information to the user.

(b) For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

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.

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 and your body.

Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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 by the end user.

The final end product must be labelled in a visible area with the following:  
"Contains Transmitter Module 2AFNL-TYWE3S"

This radio module must not installed to co-locate and operating simultaneously with other radios in host system, additional testing and equipment authorization may be required to operating simultaneously with other radio.

This LMA does not have RF shielding and is tested and approved as standalone configuration, additional evaluation may be required for any system integrated this radio module.

This transmitter module 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. The final end product must be labeled in a visible area with the following: "Contains FCC ID: 2AFNL-TYWE3S".

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 end user manual shall include all required regulatory information /warning as shown in this manual

## **TUYA WiFi Module**

P/N: TYWE3S

S/N:

CMIIT ID:

FCC ID: 2AFNL-TYWE3S

**CE RoHS**

Hangzhou

AiXiangJi

Technology Co., Ltd



### **7.2 Declaration of Conformity European notice**



Hereby, Hangzhou AiXiangji Technology Co., Ltd declares that this Wifi module product is in compliance with essential requirements and other relevant provisions of Directive 2014/53/EC. A copy of the Declaration of conformity can be found at <http://www.tuya.com>.

EN 300 328 V2.1.1

EN 301 489-1 V2.1.1; EN 301 489-17 V3.1.1

EN 62311:2008

EN 60950-1:2006+A11:2009+A1:2010+A12:2011+A2:2013