



# EBYTE E103-W11 WiFi 6+BLE 5.1 Serial to WiFi Module User Manual

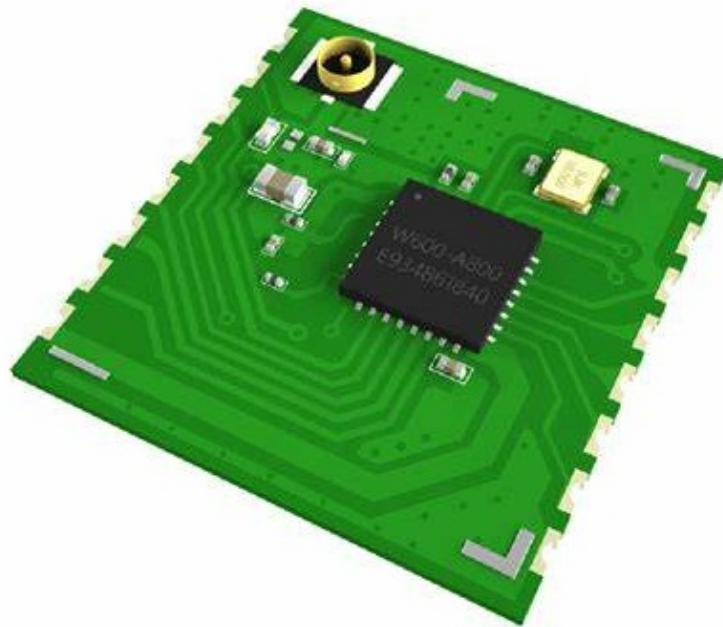
[Home](#) » [ebyte](#) » EBYTE E103-W11 WiFi 6+BLE 5.1 Serial to WiFi Module User Manual

## Contents [ [hide](#) ]

- [1 EBYTE E103-W11 WiFi 6+BLE 5.1 Serial to WiFi Module](#)
- [2 Disclaimer](#)
- [3 Introduction](#)
- [4 Features](#)
- [5 Specification and parameter](#)
- [6 Packaging Requirements](#)
- [7 Quick Start](#)
- [8 Instruction for network configuration](#)
- [9 Hardware design](#)
- [10 Frequently Asked Questions](#)
- [11 Welding Operation Guidance](#)
- [12 Batch product packaging](#)
- [13 Documents / Resources](#)
  - [13.1 References](#)
- [14 Related Posts](#)



**EBYTE E103-W11 WiFi 6+BLE 5.1 Serial to WiFi Module**



## E103-W11 User Manual

### WiFi 6+BLE 5.1 Serial to WiFi Module

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#### Introduction

##### Brief Introduction



E103-W11 is a cost-effective serial to Wi-Fi module, small size package, working in the 2.4~2.4835GHz

frequency band. The module can use the serial port to send and receive data, which reduces the threshold for wireless applications. E103-W11 is a Bluetooth low energy BLE5.1 and Wi-Fi 802.11b/g/n/ax module. The main chip of the module integrates the hardware and software resources required for complete Wi-Fi and Bluetooth applications, and can support dual-role connections of AP and STA, as well as BLE low-power Bluetooth connections. An MCU running at speeds up to 240 MHz and built-in 512KB RAM enables the chip to support cloud connectivity.

## **Features**

- Support WiFi 6 and Bluetooth Low Energy BLE 5.1
- Available for global license-free ISM 2.4GHz frequency band
- Support high-speed data transparent transmission
- Support cloud server (MQTT);
- Support STA/AP mode, at least 8 devices' access is supported in AP mode
- Support network protocols: IPv4, TCP/ UDP
- Support three Socket roles: TCP Server, TCP Client and UDP
- Serial communication supported
- AT commands supported
- OTA upgrade supported
- Support for Bluetooth distribution network
- With superior MIMO technology

## **Application**

- Home security alarm and remote keyless entry
- Smart home appliances
- Wireless alarm security system
- Building automation solutions
- Industrial control
- Healthcare products
- Advanced Meter Reading Architecture (AMI)
- Environmental monitoring

## **Specification and parameter**

### **RF Parameters**

RF parameters	Value	Remark
Working frequency	2400MHz 2480MHz	Support ISM band
transmit power	19.5dBm 20.5dBm	The software is adjustable, available for user self-development and configuration
Receive sensitivity	-87dBm	Air rate 500kbps
Wi-Fi version	IEEE 802.11 b/g/n/ax	Modulation technology
Air rate	150Mbps	\
Blocking power	10dBm	The probability of burning at close range is small
Reference distance	300m	Sunny and open, antenna gain 0dBi, on-board PCB antenna.

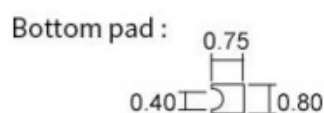
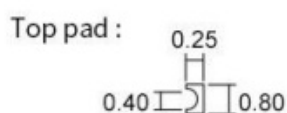
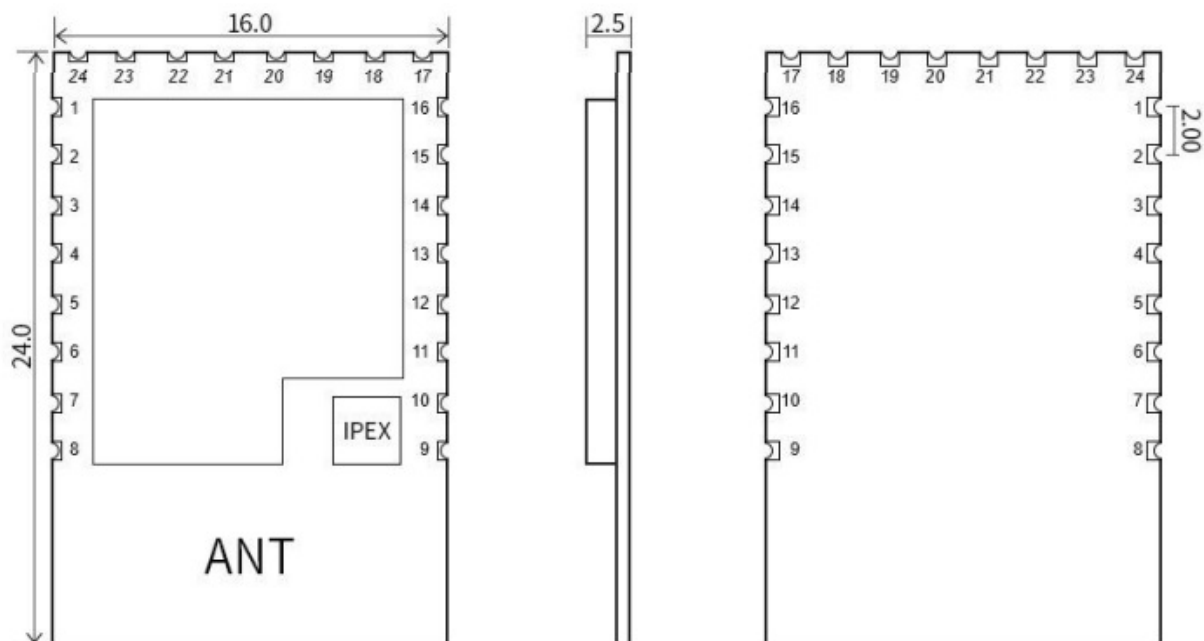
### Electrical parameters

Main parameters	Performance			Remark
	Min	Typical value	Max	
Working voltage (V)	3	3.3	3.6	≥5V guarantees output power, higher than 5.5V will permanently burn modules
I/O voltage	-0.3	—	3.6	Voltage over 3.6V will cause permanent damage to module I/O
Communication level (V)	-0.3	3.3	3.6	5V TTL will permanently burn the module
Working temperature (°C)	-40	—	+85	Industrial design

### Hardware parameters

Hardware parameters	Value	Remark
Packaging method	SMD	—
Interface	Stamp hole	Spacing 2.0mm
Communication interface	UART serial port	TTL level
Dimension	16*24mm	—
Net weight	1.3g	±0.1g
RF interface	IPEX/stamp hole	Equivalent impedance is about 50Ω

### Size and Pin Definition

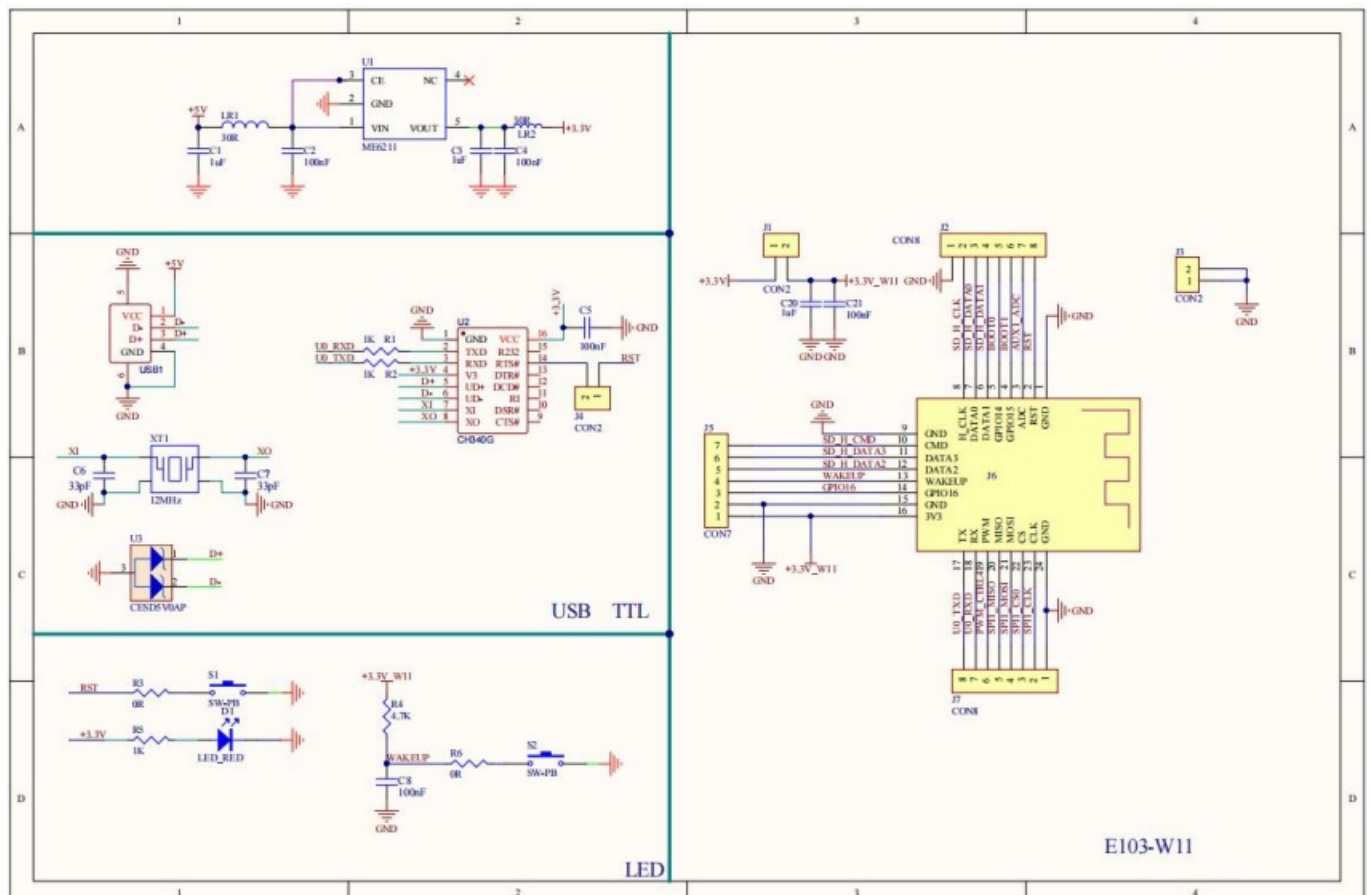


Unit : mm  
 pad quantity : 24  
 Tolerance value : X.X±0.1mm  
 X.XX±0.05mm

Item	Pin name	I/O	Application
1	U0_TXD	O	AT serial port, TX of the module, connecting to RX of external TTL
2	U0_RXD	I	AT serial port, RX of the module, connecting to TX of external TTL
3	PWM	I/O	GPIO_NUM_4, it can be used as general GPIO by SYIO series instructions
4	MISO	I/O	GPIO_NUM_3, it can be used as general GPIO by SYIO series instructions
5	MOSI	O	Modulation serial port of E103-W11, LOG_TX, connecting to RX of external TTL
6	CS	I	Modulation serial port of E103-W11, LOG_RX, connecting to TX of external TTL
7	CLK	I/O	GPIO_NUM_0, it can be used as general GPIO by SYIO series instructions
8	GND		Ground wire, connected to the power reference ground
9	GND		Ground wire, connected to the power reference ground
10	RST	I	Chip reset input pin, low level reset
11	ADC	I/O	GPIO_NUM_20, it can be used as general GPIO by SYIO series instructions
12	IO1	I/O	GPIO_NUM_1, it can be used as general GPIO by SYIO series instructions

13	IO2	I/O	GPIO_NUM_2, it can be used as general GPIO by SYIO series instructions
14	DATA1	I/O	GPIO_NUM_23, it can be used as general GPIO by SYIO series instructions
15	DATA0	I/O	GPIO_NUM_22, it can be used as general GPIO by SYIO series instructions
16	H_CLK	I/O	GPIO_NUM_13, it can be used as general GPIO by SYIO series instructions
17	GND		Ground wire, connected to the power reference ground
18	CMD	I/O	GPIO_NUM_21, it can be used as general GPIO by SYIO series instructions
19	DATA3	I/O	GPIO_NUM_25, it can be used as general GPIO by SYIO series instructions
20	DATA2	I/O	GPIO_NUM_24, it can be used as general GPIO by SYIO series instructions
21	WAKE	I	Chip reset input pin, low level reset. When using, RC reset pull-up is needed
22	IO3	I/O	GPIO_NUM_16, it can be used as general GPIO by SYIO series instructions
23	GND		Ground wire, connected to the power reference ground
24	VCC		Power input

## Recommended wire diagram



**Note:** The power supply must be within 3.0~3.6V. In order to ensure the stable operation of the module, it is recommended to select an external LDO with a current greater than 500mA.

## Packaging Requirements

**Note:** Please use the product package provided on Ebyte official website for secondary development and design.

## Quick Start

- E103-W11 is featured with easy usability. In order that users can quickly familiarize, this section will guide users to configure and communicate with this module in various modes through simple setting.
- All AT commands are used in the test process. To facilitate users' quick connection, we have developed quick configuration software for users.
- In this section, tests will use configuration software and the module will echo the currently-sent commands, so that users can quickly know how to use AT command, thereby writing their own AT serial commands (Note: A newline is required after each AT command).

Hardware used in this section:	
1	E103-W11 Wi-Fi module: 1pcs
2	E103-W11 Wi-Fi test board 1 pcs
3	Computer with Wi-Fi function 1 set
4	Router (replaceable by a mobile phone Wi-Fi hotspot) 1 set
Software that will be used in this section (All can be downloaded on Ebyte official website)	
1	E103-W11 network debugging assistant
2	BLE configuration APP
3	Serial Port Assistant Xcom

## Communication with server as TCP client

The following preparations are needed before doing the preliminary work

- Ensure that modules and server can exchange data via ping commands
- Module can operate normally
- E103-W11 network debugging assistant is needed

## Access to network

AT+CWMODE=1,"s.y" //Switch the module mode to STA and save it to FLASH

AT+CWLAP="Test11","12345678","s.y" //Connect the module to the WiFi with SSID "Test11" and password "12345678"

## Switch to communication mode and connect to TCP Server

AT+CIPSTART="TCP","192.168.1.100",1001 //Establish a TCP connection with the tcp sever of 192.168.1.100. If transparent transmission once start is needed,

use the AT+SAVELINK command

AT+CIPMODE=1 //Switch to transparent transmission

AT+CIPSEND // Send data //After the module sends the '>' symbol, transparent transmission is enabled

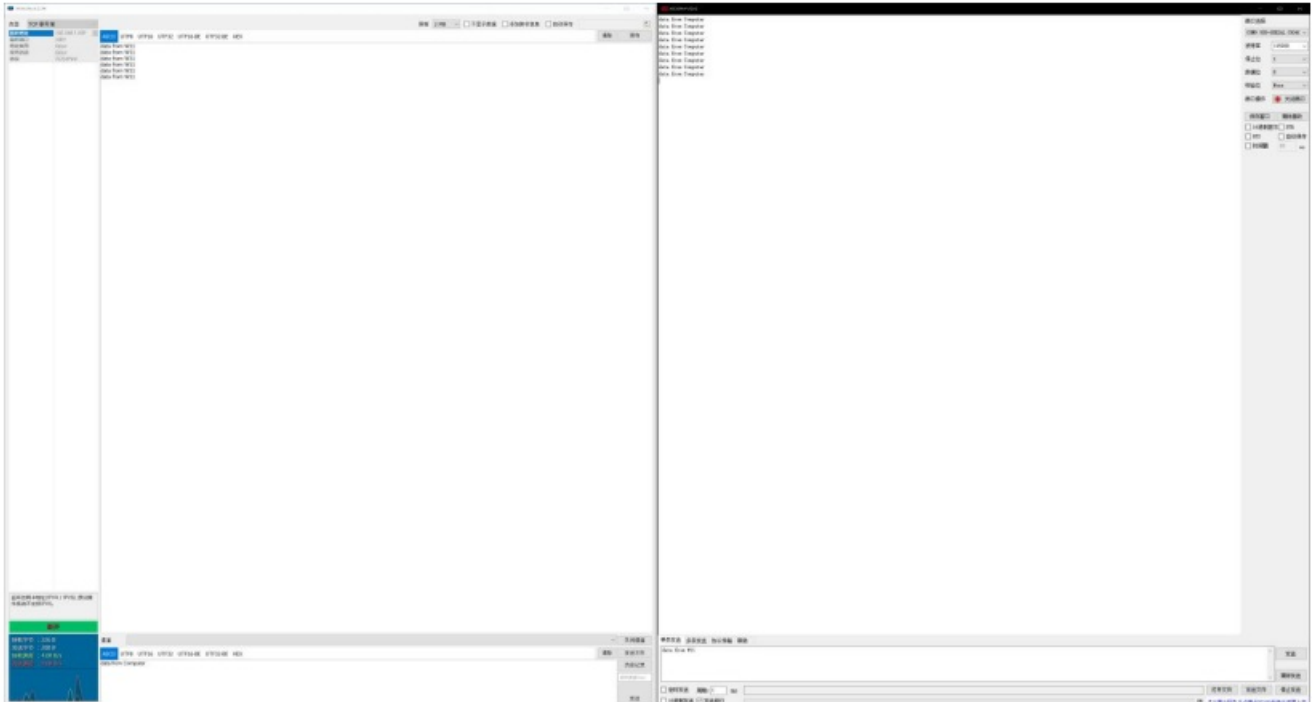


Fig.1 Schematic of module communication mode

### Use BLE for network configuration

#### Below preparations are needed

- Ensure the module is in STA mode
- Serial Port Assistant Xcom and BLE configuration APP are needed
- The following diagram 1 and diagram 2 are operation schematic

### Switch working mode

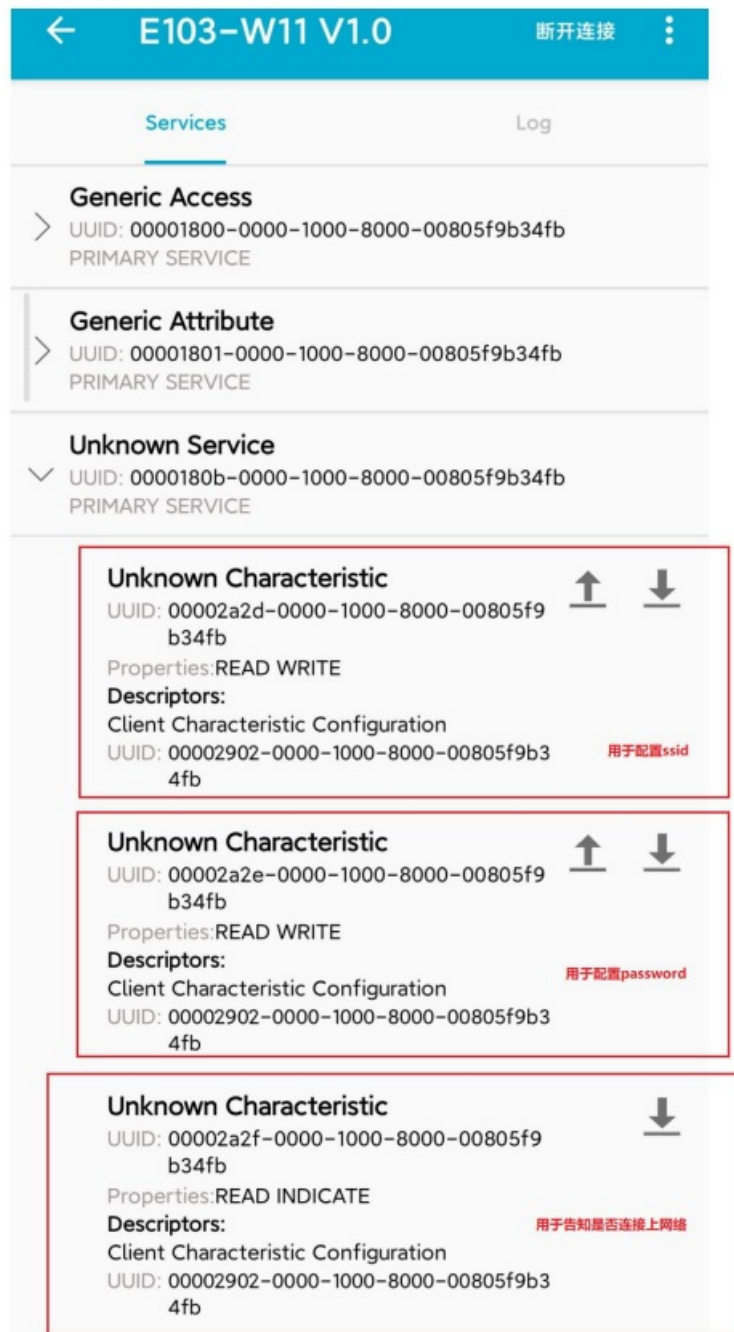
AT+CWMODE=1,"s.y" //Switch the module mode to STA and save it to FLASH

### Enable BLE broadcast

AT+BLEADVSTART







## Instruction for network configuration

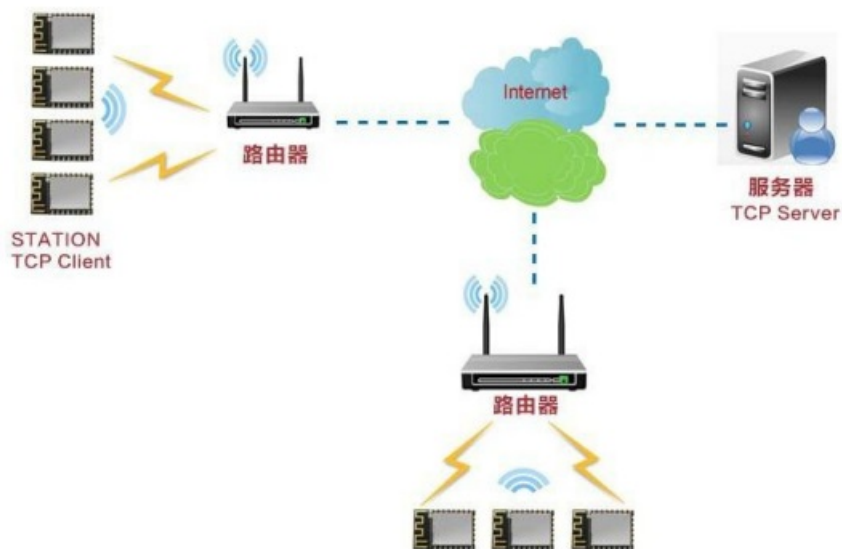
### Network configuration role

Serial No.	Remark
1	E103-W11 supports AP mode as a physical connection role (equivalent to a router). In STAT ION mode (it is equivalent to a Wi-Fidevice), access of up to 8 Wi-Fi devices in APmode is s upported.
2	E103-W11 includes TCPServer, TCPClientand UDPas Socketrole. In TCPServer modeas So cketrole. Connection to 5 Socketsissupported. In caseof TCP-basedconnectionmechanism, if connected for a longtime is needed, pleaseuse TCP heartbeat packets.

### Network configuration model

**The module realize connection and communication between a TCP Client and a remote server in STATION mode (typical application)**

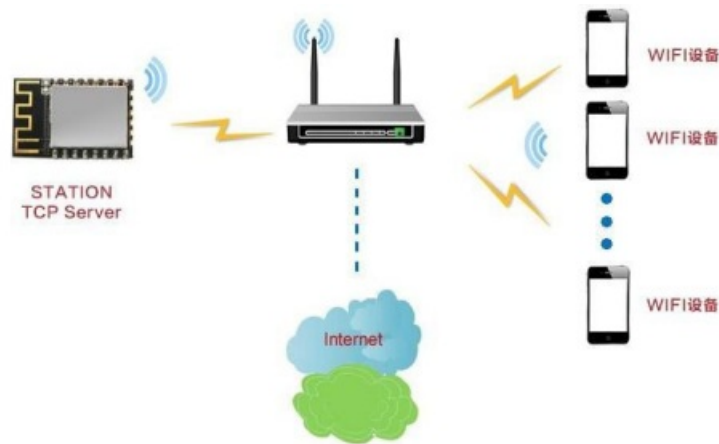
The model can meet the application requirements of home Internet of things, intelligent meter reading, real-time monitoring, etc. The module is available for real-time exchange data with the network server. User can perform various operations on the module in real time by interacting with the network server.



**The module enables a connection between the TCP Server and the Wi-Fi device in STATION mode**

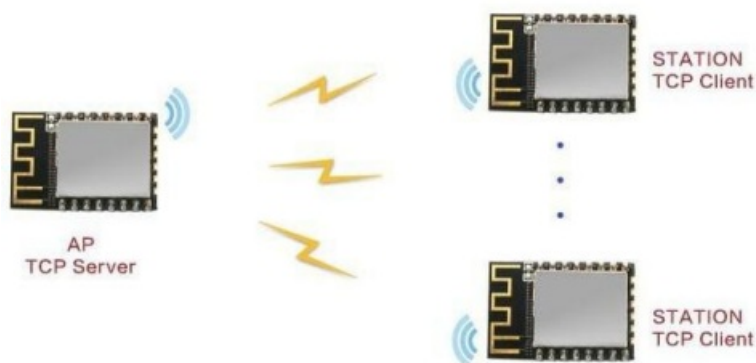
This networking model is similar to the first one. The difference is that the module enables a TCP Server instead of a TCP Client in STATION mode.

Under the condition of networking, this mode can support up to 5 remote device connections.



**One module enables TCP Server in AP mode, and other modules enables TCP Client to communicate with each other in STATION mode**

This networking model can be referred to as intra-module networking. A module in AP mode can be connected to a maximum of 8 STATIONS, that is, there are up to 9 module devices in the network. Under the condition that the internal networking is completed, the TCP Server can be established on any module, and the remaining 8 modules can use the TCP Client to communicate with it (but the number of clients that can access the TCP server at the same time cannot exceed 5).



## Hardware design

- It is recommended to use a DC regulated power supply to supply power to the module, the power supply ripple

coefficient should be as small as possible, and the module should be grounded reliably

- Please pay attention to the correct connection of the positive and negative poles of the power supply, such as reverse connection may cause permanent damage to the module
- Please check the power supply to ensure that it is between the recommended power supply voltages. If it exceeds the maximum value, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage should not fluctuate greatly and frequently;
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, so that the whole machine can work stably for a long time;
- The module should be kept as far away as possible from the power supply, transformer, high-frequency wiring and other parts with large electromagnetic interference;
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the underside of the module. If it is absolutely necessary to pass under the module, assuming that the module is soldered on the Top Layer, ground copper is placed on the Top Layer of the contact part of the module (all layers).
- Copper and well grounded), must be close to the digital part of the module and routed on the Bottom Layer;
- Assuming that the module is soldered or placed on the Top Layer, it is also wrong to arbitrarily route wires on the Bottom Layer or other layers, which will affect the stray and receiving sensitivity of the module to varying degrees;
- Assuming that there are devices with large electromagnetic interference around the module, it will also greatly affect the performance of the module. It is recommended to stay away from the module according to the intensity of the interference. If the situation allows, appropriate isolation and shielding can be done;
- Assuming that there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power traces), the performance of the module will also be greatly affected. It is recommended to stay away from the module according to the intensity of the interference. Proper isolation and shielding;
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, there is still a risk of damage); Try to stay away from some TTL protocols whose physical layer is also 2.4GHz, for example: USB3.0;
- The antenna installation structure has a great influence on the performance of the module. Make sure that the antenna is exposed, preferably vertically upward.
- When the module is installed inside the case, a high-quality antenna extension cable can be used to extend the antenna to the outside of the case
- The antenna is not allowed to be installed inside the metal shell, which will greatly reduce the transmission distance.

## Frequently Asked Questions

### The transmission distance is not ideal

- When there is a straight line communication obstacle, the communication distance will be attenuated accordingly;
- Temperature, humidity, and co-frequency interference will increase the communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test effect is poor near the ground;
- Sea water has a strong ability to absorb radio waves, so the seaside test effect is poor;
- If there are metal objects near the antenna or placed in a metal shell, the signal attenuation will be very serious;

- The power register is set incorrectly, and the air rate is set too high (the higher the air rate, the closer the distance);
- The low voltage of the power supply at room temperature is lower than the recommended value, the lower the voltage, the lower the power output;
- The poor matching degree of the antenna and the module or the quality of the antenna itself.

### **Module is easy to damage**

- Please check the power supply to ensure that it is within the recommended power supply voltage. If it exceeds the maximum value, it will cause permanent damage to the module;
- Please check the stability of the power supply, and the voltage cannot fluctuate significantly and frequently;
- Please ensure that the installation and use process is anti-static, and high-frequency components are electrostatically sensitive; Please ensure that the humidity should not be too high during installation and use, and some components are humidity sensitive devices;
- If there is no special requirement, it is not recommended to use at too high or too low temperature.

### **Bit error rate is too high**

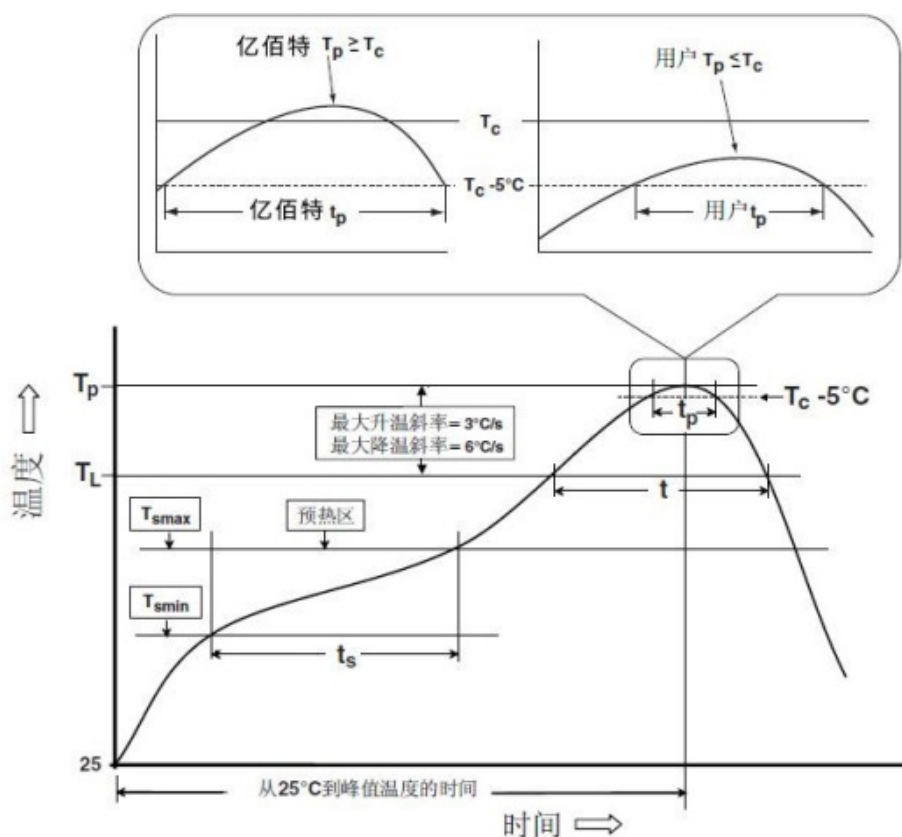
- There is co-frequency signal interference nearby, stay away from the interference source or modify the frequency and channel to avoid interference;
- If the power supply is not ideal, it may also cause garbled characters. Be sure to ensure the reliability of the power supply; Poor quality or too long extension lines and feeders will also cause high bit error rates.

## **Welding Operation Guidance**

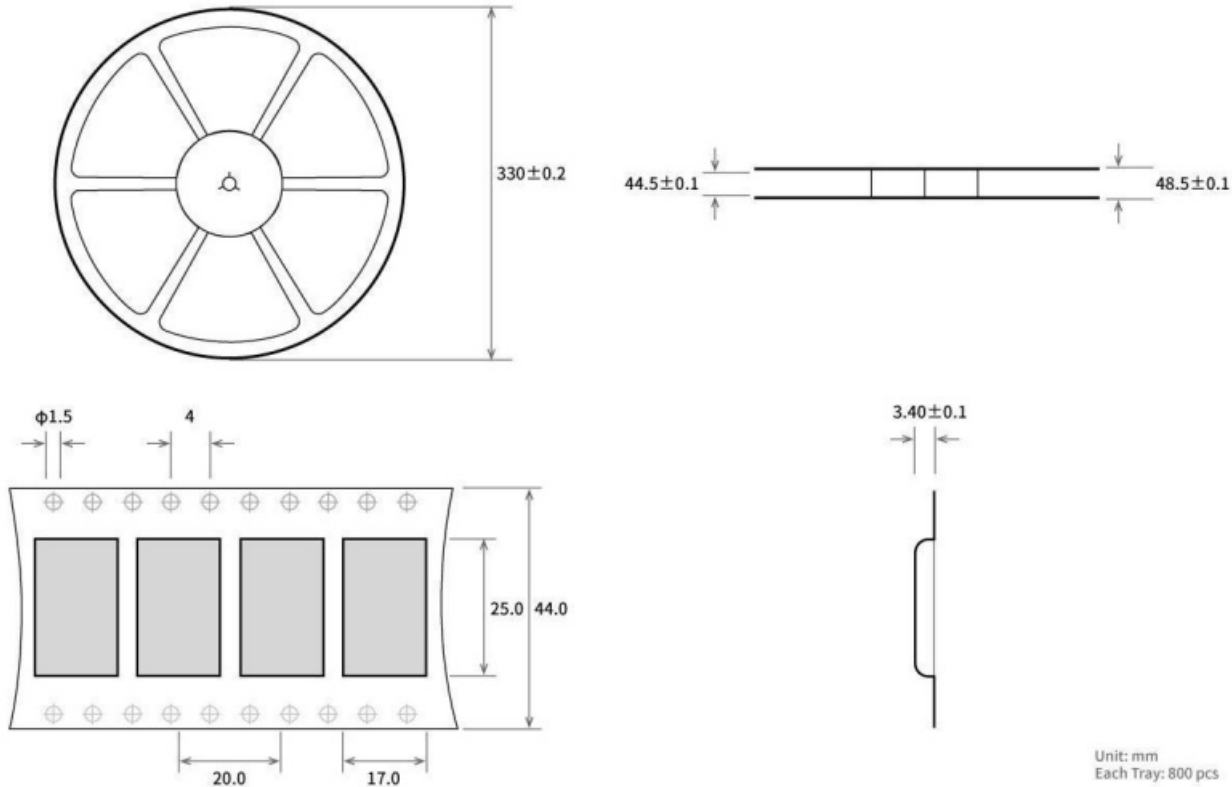
### **Reflow temperature**

Profile Feature		Sn-Pb Assembly	Pb-Free Assembly
Preheat/ heat preservation	Min preheating temp. ( $T_{smin}$ )	100°C	150°C
	Max preheating temp. ( $T_{smax}$ )	150°C	200°C
	Preheating time ( $T_{smin} \sim T_{smax}$ )	60-120 sec	60-120 sec
Average ramp-up rate ( $T_L \sim T_p$ )		3°C/second max	3°C/second max
Liquidous Temperature ( $T_L$ )		183°C	217°C
Time Maintained Above $T_L$		60~90 sec	60~90 sec
Peak temperature $T_p$		Do not exceed the temperature stated on the “damp sensitivity” label.	Do not exceed the temperature stated on the “damp sensitivity” label.
See the figure below for time ( $T_p$ ) within 5°C of the specified grading temperature ( $T_c$ )		20 sec	30 sec
Average ramp-down rate ( $T_p \sim T_L$ )		6°C/second max	6°C/second max
Time 25°C to peak temperature		6 minutes max	8 minutes max
※The peak temperature ( $T_p$ ) tolerance definition of the temperature profile is the upper limit			

## Reflow profile



Batch product packaging



Revision history

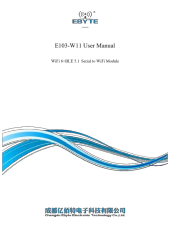
Version	Date	Description	Issued by
V1.0	2022-10-18	Initial version	Hao

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Documents / Resources

	<p><b><a href="#">EBYTE E103-W11 WiFi 6+BLE 5.1 Serial to WiFi Module</a></b> [pdf] User Manual E103-W11, E103-W11 WiFi 6 BLE 5.1 Serial to WiFi Module, WiFi 6 BLE 5.1 Serial to WiFi Module, 5.1 Serial to WiFi Module, WiFi Module</p>
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## References

- [LoRa/ZigBee/WiFi/ - - - - -](#)
- [Китайские производители беспроводных модемов Lora, поставщики промышленных терминалов IoT](#)