EBYTE

Chengdu Ebyte Electronic Technology Co.,Ltd

Wireless Modem

User Manual

E103-W12 Product User Manual

DA16200 Ultra-low power WiFi serial port module

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1. Overview

1.1 Brief introduction

E103-W12 series is a support IEEE 802.11b/g/n ultra-low power WiFi module developed by Chengdu Yibaite Electronics Co., Ltd. based on Dialog DA16200 SoC chip, built-in high-performance ARM Cortex-M4 processor, working in the 2.4~2.4835GHz frequency band, wireless maximum transmission power up to 20dBm.

In terms of function, the module supports IEEE802.11 b/g/n standard, the module supports AP and STA modes, supports TCP/UDP/HTTP/MQTT multiple network transmission protocols, and can maintain WIFI connection in low-power mode.





E103-W12X E103-W12C

1.2 Features:

- Support IEEE802.11 /b/g/n standard, working in the 2.4GHz frequency band;
- Three low-power modes are available, with a minimum current of 0.2uA.
- Support AP, STA, AP+STA 3 working modes;
- Support WEP/WPA/WPA2/WPA3 multiple WIFI security authentication methods;
- Support TCP/UDP/HTTP/MQTT network communication protocols;
- Support up to 7 socket connections;
- AP access point supports 6-channel STA device connection;
- Support SNTP network time acquisition (under the premise of Internet access);
- MQTT and MQTTS network protocols (Alibaba Cloud, Baidu Cloud, OneNet, Amazon Cloud)
- 支持 HTTP Client;
- TCP SERVER/TCP CLIENT, UDP COMMUNICATION MODE;
- Support AT command configuration;
- Support static IP address allocation and DHCP dynamic allocation;
- Supports scanning of nearby AP information;
- Support WIFI fast connection;
- Support low-power mode to maintain WIFI connection;

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- Support PWM output, ADC acquisition, GPIO control;

1.3 Application scenarios

- Medical and health care
  Multi-parameter patient monitor
  Electrocardiogram (ECG)
  Hospital electronic bed and bed control system
  Telemedicine system
- Construction & Home Automation:
  HVAC systems and thermostats
  Video surveillance, video doorbell, and low-power cameras
  Building security systems and low-power electronic locks
- Smart appliances
- Smart wearables
- Asset tracking
- Factory automation
- Grid infrastructure

2. Specifications

2.1 RF parameters

RF parameters	unit	Model		remark
		E103-W12X	E103-W12C	
WiFi protocol	-	IEEE 802.11b/g/n		
Antenna form	-	IPEX	Ceramic antennas	The characteristic impedance is about 50 ohms
Reference distance	M	500	300	The antenna gain is 5dBi, and the module communicates with the device
Band	GHz	2.4		Supports the global license-free ISM 2.4GHz band

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2.2 Electrical parameters

RF parameters			unit	Model		remark
				E103-W12X	E103-W12C	
Operating voltage			V	2.1-3.6V		Permanently burns out the module over 3.5V
Communication level			V	3.3		There is a risk of burnout with 5V TTL
power consumption	Transmit power		dBm	20		
	Emission current		but	200		
	Receive current		but	46		
	Sleep current	Sleep1	U	0.2		Shut off completely
		Sleep2	U	3		It can be timed to wake up or pin to wake up, Wake up can be connected to WiFi within 200ms.
		Sleep3	U	100-200		WIFI keeps connected, TCP/UDP/MQTT can keep connected, can receive data, send data needs to pass through the wake-up module, power consumption is related to the router and network quality.
temperature	Operating temperature		℃	-40～+85		Industrial grade
	Storage temperature			-40～+125		

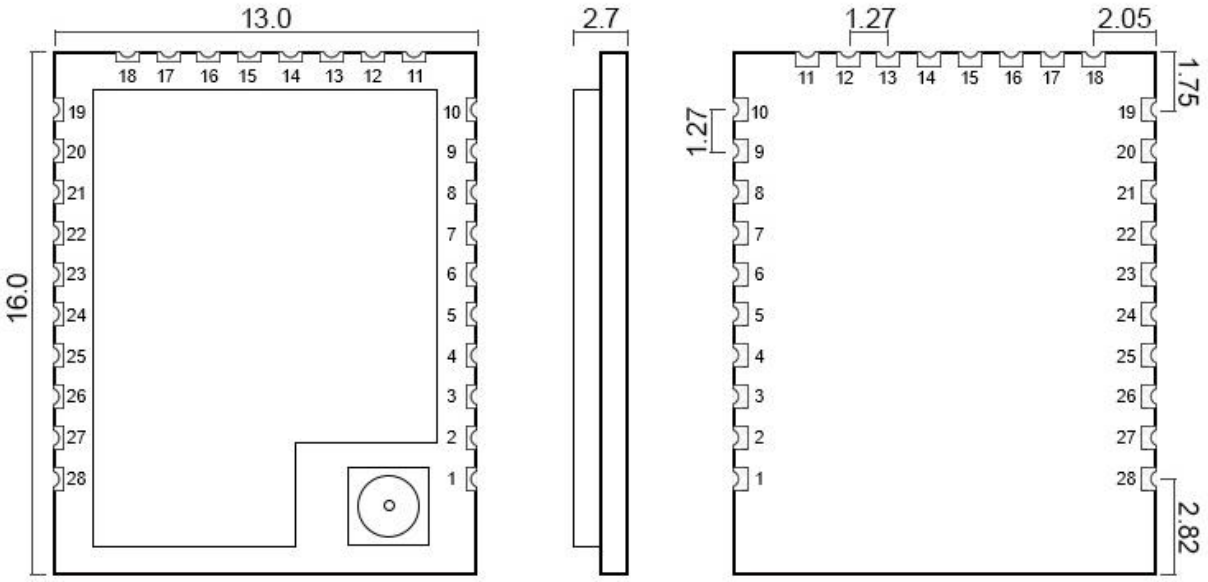
2.3 Hardware parameters

Hardware parameters	Model		remark
	E103-W12X	E103-W12C	
chip	DA16200		
Flash	4MB		Customizable 16MB/8MB
Encapsulation	Patches		
size	16*13*2.7mm		The error size is ±0.1mm
weight	3.5g	3.4g	The error is ±0.1g

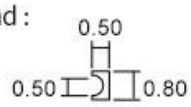
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3. Mechanical dimensions and pin definitions

3.1 E103-W12X pin diagram



Top pad :



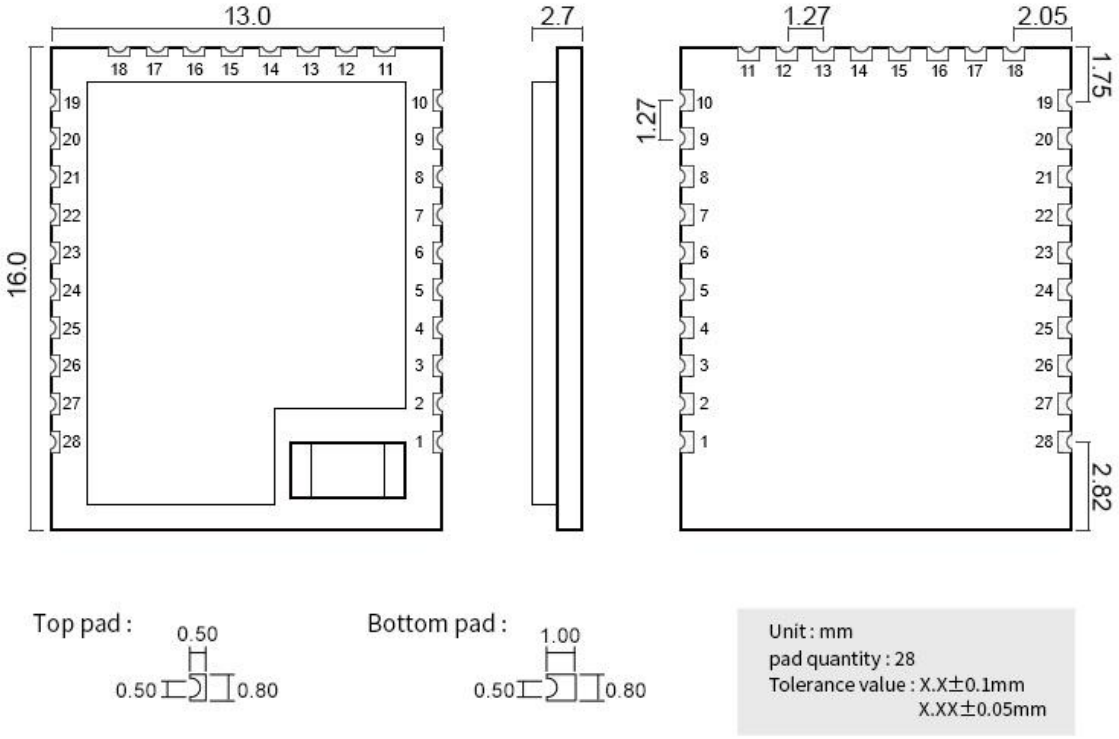
Bottom pad :



Unit : mm
pad quantity : 28
Tolerance value : X.X±0.1mm
X.XX±0.05mm

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3.2 Pin diagram of E103-W12C



E103-W12C&E103-W12X Pin Definitions:

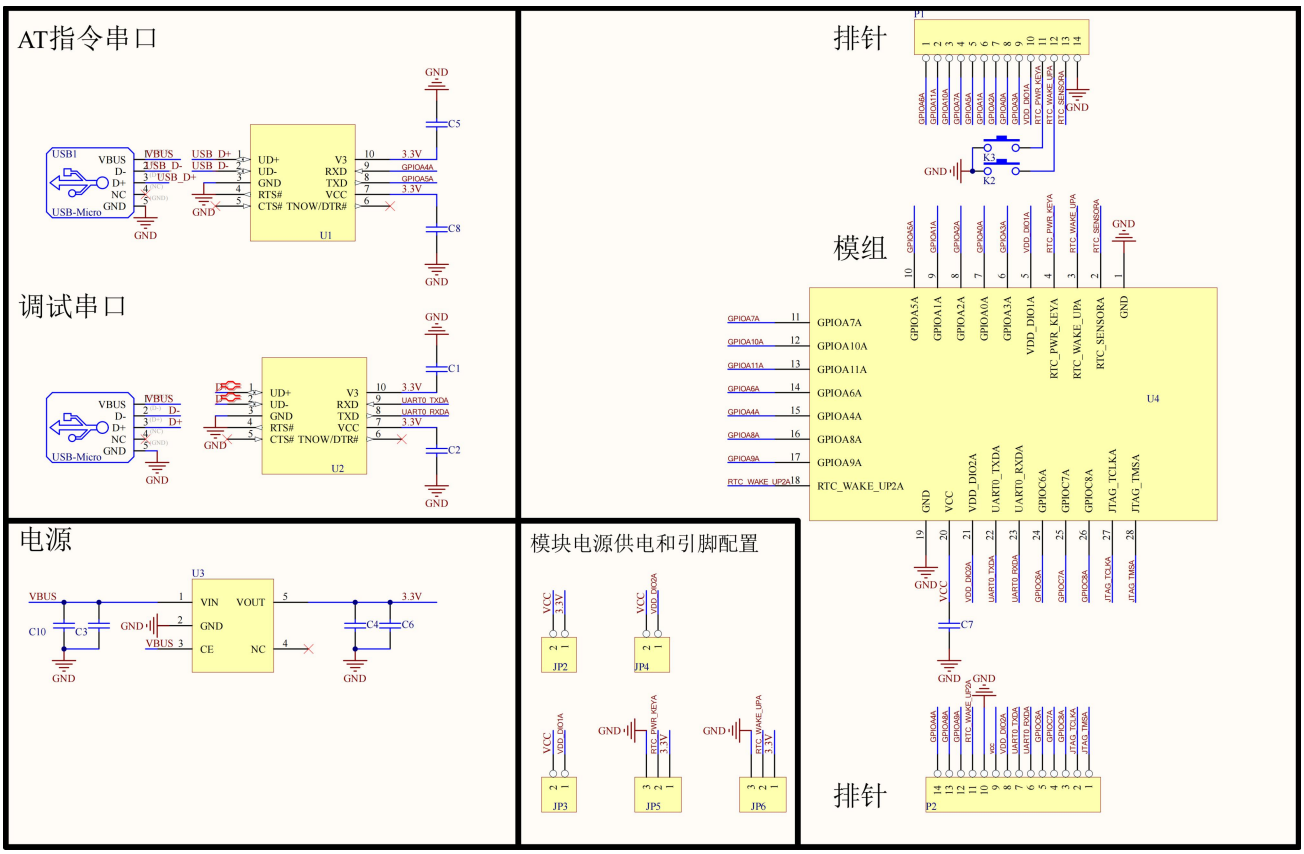
Pin sequence number	Pin name	Pin type	Pin Usage
1	GND	-	Ground, connected to the power reference ground
2	NC	-	-
3	WAKE_UP	-	sleep2/sleep3 external wake up feet
4	PWR_KEY	-	The power supply enable pin, high level enabled, low level shutdown is in sleep1 mode
5	VDD_DIO1	I/O	GPIOA1-GPIOA11 power supply 1.8v-3.3V, GPIO output voltage is the same
6	GPIO3	I/O	General-purpose IO port, ADC channel3 can be reused
7	GPIOA0	I/O	General-purpose IO port, ADC channel0 can be reused
8	GPIOA2	I/O	General-purpose IO port, ADC channel2 can be reused
9	GPIOA1	I/O	General-purpose IO port, ADC channel1 can be reused
10	GPIOA5	I/O	AT command serial port UART_RX

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11	GPIO7	I/O	General-purpose I/O port
12	GPIOA10	I/O	Universal I/O port, multiplexable PWM output
13	GPIOA11	I/O	General-purpose I/O port, receive data notification pin in sleep3 mode
14	GPIOA6	I/O	General-purpose I/O port
15	GPIOA4	I/O	AT command serial port UART1_TX
16	GPIO8	I/O	General-purpose I/O port
17	GPIOA9	I/O	General-purpose I/O port
18	RTC_WAKE_UP2	I/O	Pull-down grounding
19	GND	I/O	Ground, connected to the power reference ground
20	VDC	I/O	Module powered, 3.3V
21	VDD_DIO2	I/O	GPIOC6-GPIOC8 power supply 1.8v-3.3V, GPIO output voltage is the same
22	UART0_TXD	I/O	Debugging the serial port TX, users don't need to care
23	UART0_RXD	I/O	Debugging the serial port RX, users don't have to care
24	GPIOC6	I/O	General-purpose I/O port
25	GPIOC7	I/O	General-purpose I/O port
26	GPIOC8	I/O	General-purpose I/O port
27	JTAG_TCLK	-	JTAG emulation burning pin
28	JTAG_TMS	-	JTAG emulation burning pin

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4. Wiring diagrams are recommended



Note:

1、 The power supply must be guaranteed to be 2.1V~3.6V, in order to ensure the stable operation of the module, it is recommended to choose an LDO power supply with a power supply capacity greater than 500mA.

5. Feature description

This module can be divided into Access Point, which is commonly referred to as AP access point, and Station, which is commonly referred to as a site, can be divided into TCP Server, TCP Client, UDP, MQTT, HTPP client from the transmission module and service category.

5.1 Job Roles

Job roles are defined based on the perspective of the WiFi physical layer.

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5.2 Access Point(AP mode)

Access Point is referred to as AP mode, which is similar to a router, allowing wireless devices to connect and establish TCP/IP-based server, client, and UDP communication. In this mode, 6 stations can be connected, and a maximum of 7 TCP socket transmissions are supported. command AT+CWMODE=1 to configure the module to work in the AP role.

5.3 Station(STA mode)

Station mode is referred to as STA, the module does not provide connection under this role, can only be connected to the Access Point or router, this module supports TCP server, TCP client, UDP under the Station role, and supports up to 8 sockets. MQTT and HTTP clinet are also supported. Command AT+CWMODE=0, S is set in STA mode.

。

5.4 Network Capabilities

This module supports TCP server, TCP cliet, UDP, MQTT, HTTP client and other functions. All network functions can be used at the same time, such as TCP server can be enabled and TCP client can be used to connect to other servers at the same time.

5.4.1 TCP server

Let the module work as a TCP server. Use the command: AT+CIPSERVER to set the TCP server with the corresponding ip and port. Up to 8 servers can be opened, and each server can connect to 7 clients. After 8 servers are enabled, TCP client and UDP functions cannot be used.

5.4.2 TCP client

Let the module work as a TCP client. Use the AT+CIPSTART command to start the TCP client and connect to the corresponding server. A maximum of 8 clients can be enabled to connect to the server, and the TCP server and UDP functions cannot be used after the 8 clients are enabled.

5.4.3 UDP

The module uses UDP to communicate, and uses the AT+CIPUDP=<local_port> command to enable the local UDP port number. You can create up to 8 local udp port numbers, and you cannot use TCP client or TCP server after the maximum number is reached.

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5.4.4 MQTT

The module supports IoT platforms such as Alibaba Cloud, Baidu Cloud, and OneNet in MQTT mode. The service parameters created by the platform can be added to the module for communication.

5.4.4.1 Alibaba Cloud

For network communication based on the Alibaba Cloud platform, you need to log in to Alibaba Cloud to obtain relevant parameters, including product key, device name, client ID, and other information.

5.4.4.2 Baidu Cloud

For network communication based on Baidu Cloud platform, you need to log in to Baidu Cloud to obtain relevant parameters, mainly including device name, user name, password and other confidence, see Chapter 7 Baidu Cloud Configuration Tutorial for details.

5.4.4.3 Onenet

For network communication based on the OneNet cloud platform, you need to log in to OneNet to obtain relevant parameters, including device ID, product ID, and authentication information, as detailed in Chapter 7 of the OneNet Configuration Tutorial.

5.4.4.4 Amazon Cloud

For Amazon Cloud-based network communication, you need to log in to Amazon Cloud to obtain relevant parameters, which mainly contain AmazonRootCA1.pem, xxxxxx-certificate.pem.crt, and xxxxxx-private.pem.key. For details, see Chapter 7 of the Amazon Cloud Configuration Tutorial.

5.4.5 HTTP Client

When using this function, you only need to configure the corresponding server resource URL and start a trigger request to obtain the resources that the server responds to, without worrying about the complex HTTP protocol layer, as detailed in Chapter 7 HTTP Client Configuration Tutorial.

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5.5 Low power consumption

This module has three low-power modes: sleep1, sleep2, sleep3 mode. The Sleep1 mode supplies power to the shutdown module, and the current is about 0.2ua. The Sleep2 mode RTC is working, and it can be woken up at a timed or pinned out, with a current of about 3ua. Sleep3 mode wifi is keep-alive can receive TCP, UDP, MQTT data, send data needs to wake up the module through pins and commands to send data, after sending instructions into sleep.

5.6 Scans for nearby APs

When this module works in STA mode, you can use the AT command to scan nearby AP information, and if so, print out the AP information through the serial port in the following format:

Fixed head	MAC(BSSID)	frequency	RSSI	flag	ssid
+CWSCAN:	70:5d:cc:32:15:32	2422	-30	[WPA2-PSKCCMP] [WPS] [ESS]	TEST

1、 Scanning nearby APs can only be in STA mode.

2、 Each parameter is separated by a comma '\t' and ends with <LF>. MAC addresses (BSSID) are separated by a semicolon ':'.

6. Use the tutorial

This module has a variety of functions, and you need to configure the relevant parameters before using it before it can work properly.

In the following tutorial, add * is the operation that must be performed, and please set it according to your own needs when using other modes.

6.1 Basic TCP/UDP data transfer

6.1.1 Communication with the PC side

6.1.1.1 The module does STA communicate with the TCP server of the PC

To communicate with the PC under the STA role, the module and the module block need to be on the same LAN. Here we do the STA to communicate with the PC's TCP server, and the next module is to communicate with the PC's TCP client.

1. Set the module to STA mode, and then restart to take effect: AT+CWMODE=0, restart: AT+RST.
2. Connect to the router in the network segment where the computer is located: AT+CWJAPA=TST-2.4G,

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TST12345678, after the connection is successful, the wifi name and the assigned IP address will be printed.

3. Open the network debugging assistant and open a TCP server. The local IP address of the Network Debugging Assistant must be on the same network segment as the IP address of the module.



4. The module is connected to the TCP server: AT+CIPSTART=192.168.2.25,8080, and return: +CIPSTART:1 OK.

5、Use the command to send data to the TCP server: AT+CIPSEND=1,10,192.168.2.25,8080,123456789.

6、Looking at the Network Debugging Assistant and seeing that the data was received:

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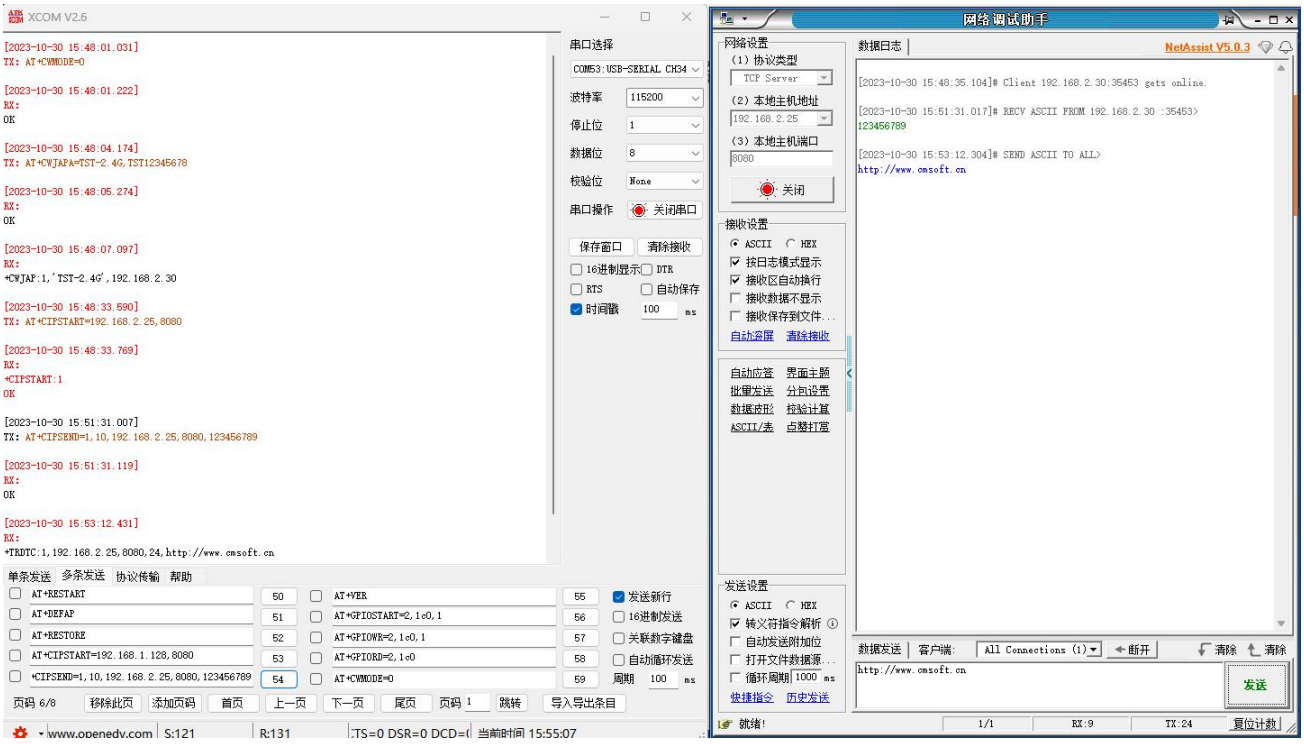


7、The network debugging assistant sends data to the module, and the module receives the data and prints it:



8. The whole operation steps.

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6.1.1.2 The module communicates with the TCP client of the PC by the AP

1、Set the module to AP mode: AT+CWMODE=1.

2、Reset module: AT+RST.

3、Set the IP address of the AP: AT+CIPIP=1,192.168.10.1,255.255.255.0,192.168.10.1.

4、Set the DHCP server: AT+CWDHCPS=1,192.168.10.2,192.168.10.10,1800.

5、Set the soft AP to AT+CWSAP=MY_SSID,3,1,1,12345678,1,CN.

6、AP created by the PC connection module:

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After the connection is successful, the module prints the MAC address of the computer:

```
[2023-10-30 16:54:40.488]
RX:
+CWCST:f0:d4:15:92:3a:0b
```

7、Create a TCP server in the module: AT+CIPSERVER=8080.

8、The network debugging assistant connects the TCP client to the module, and the module prints the IP address and port number of the PC after the connection is successful.

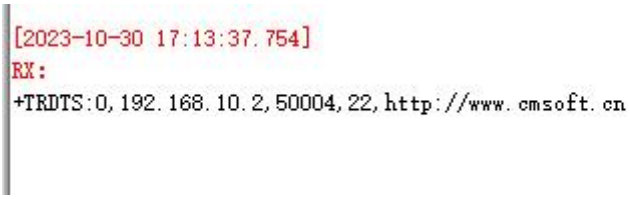
```
[2023-10-30 17:02:40.693]
RX:
+TRCTS:0,192.168.10.2,50004
```

9、The module sends data to the network debugging assistant: AT+CIPSEND=0,10,192.168.10.2,50004,1234567890.

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10. The network debugging assistant receives the data, and the network debugging assistant sends:





6.1.1.3 UDP transmission

The above has introduced the use of the module as an AP or STA to connect to TCP, here we will only communicate in STA mode.

1、Set the setting mode to STA mode: AT+CWMODE=0.

2、Reset: AT+RST.

3、Connect to the router (the IP of the module needs to be in the same network segment as the computer): AT+CWJAPA=TST-2.4G, TST12345678.

4、OPEN A LOCAL UDP PORT: AT+CIPUDP=8081.

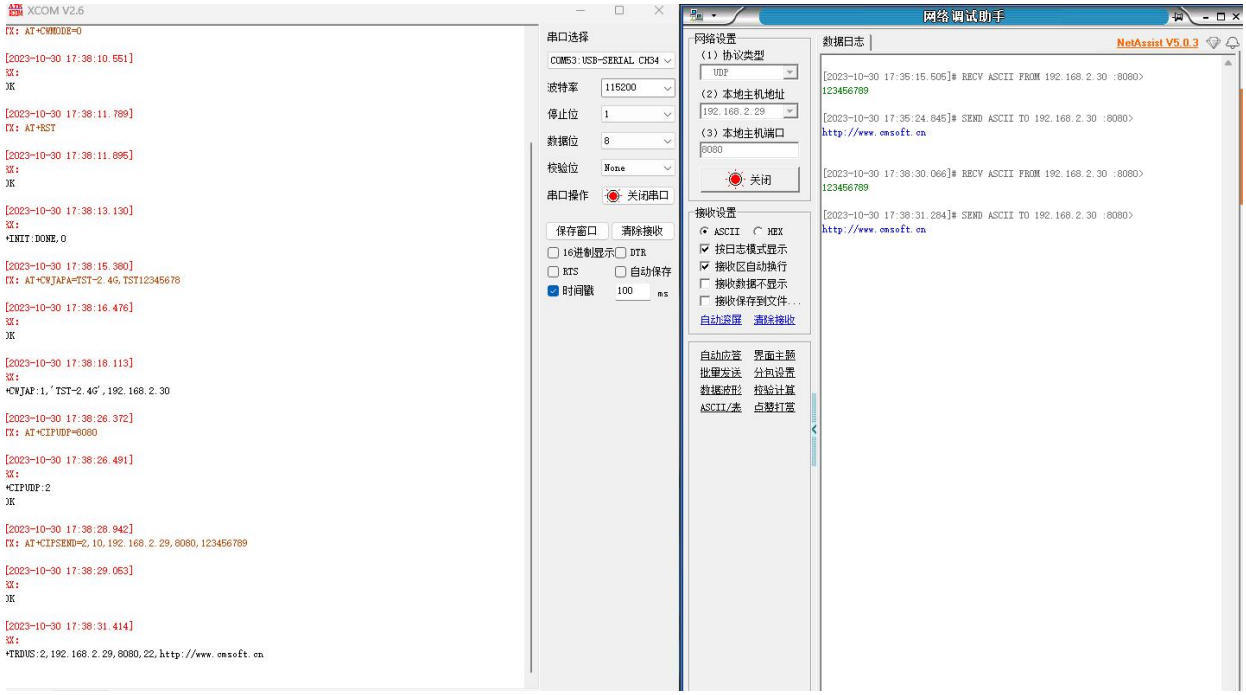
5、The Network Debugging Assistant creates a UDP session.

6、The module sends data to the Network Debugging Assistant, and the Network Debugging Assistant sends data to the module.

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7、All operations are shown in the figure below



6.1.1.4Transparent transmission mode

Currently, the transparent transmission mode can only be used in non-low-power mode, and supports TCP client and udp modes, and the sending of data needs to end in a line break. In transparent transmission mode, only one socket connection can be established, and multiple connections cannot be made.

1. Connect to the router AP (the ip of the module needs to be in the same network segment as the computer): AT+CWJAPA=TST-2.4G, TST12345678.

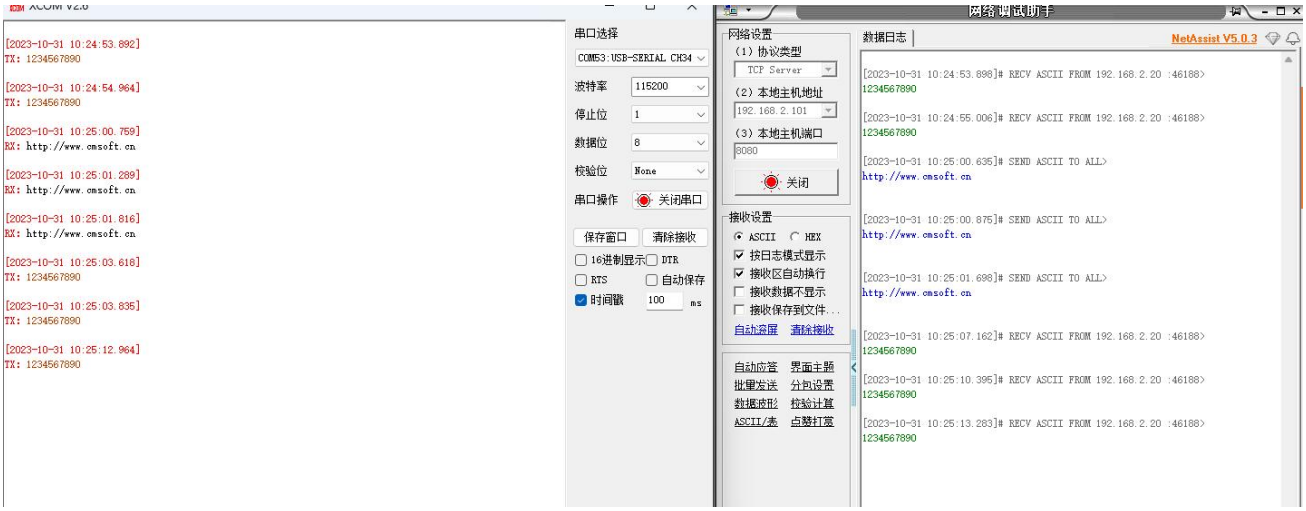
2. Open the network debugging assistant and open a TCP server, and the local address of the network debugging assistant needs to be in the same network segment as the IP address of the module.

3、 The module is connected to the TCP server: AT+CIPSTART=192.168.2.101,8080.

4、 Enter the transparent transmission: AT+CIPTRANSLINK=0 //0 is tcp, and 1 is udp.

5、 Send data to each other without any problem, such as: 123456789.

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10. Send +++ and exit the transparent transmission mode // This should also be newlined.

6.1.1.5High-speed transmission of instructions

In high baud rates, packets may be lost when using AT commands or transparent transmission when sending quickly. We can send a command to enter data mode first, and then send the data. < the value of the ESC > is 0x1b, and the instructions are described in the AT Command Manual.

发送格式：<ESC>H<cid>,<length>,<remote_ip >,<remote_port >

Data: < data>

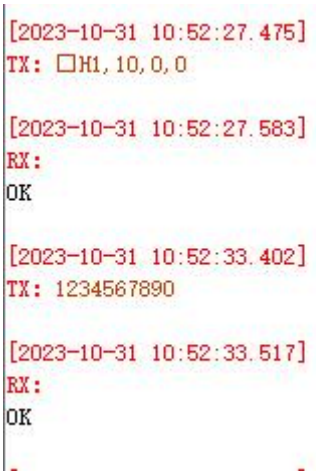
1. Connect to the router AP (the ip of the module needs to be in the same network segment as the computer): AT+CWJAPA=TST-2.4G, TST12345678.

2. Open the network debugging assistant and open a TCP server, and the local address of the network debugging assistant needs to be in the same network segment as the IP address of the module.

3. The module is connected to the TCP server: AT+CIPSTART=192.168.2.101,8080.

4. Enter data mode: < ESC>H1,10,0,0.

6、 If the data specified above is sent, it will wait until the length is insufficient, for example, 1234567890.



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6.1.2 MQTT

MQTT supports v3.1 and v3.1.1, as long as the MQTT cloud platform supports these two versions, it can be connected. In this summary, Alibaba Cloud, Baidu Cloud, ONNET, and Amazon Cloud will be used as instances to connect and launch data. This section only explains the basic operations on the module side, and the registration and operation of the cloud platform are described in another document.

6.1.3 Alibaba Cloud

1、 The module connects the STA to a router that can access the external network.

2、 Go to Alibaba Cloud > IoT Platform > Device Management > Device Information > MQTT Connection Parameters to obtain the required connection parameters.



3、 Set the MQTT Client ID:

AT+MQTTCID=’*********.device1|securemode=2,signmethod=hmacsha256,timestamp=1698667627806|’

Since there are commas in the Alibaba Cloud client ID, you need to use single or double quotation marks to expand the entire client ID.

4、 Set the MQTT broker address and port number:

AT+MQTTBR=a1***.iot-as-mqtt.cn-shanghai.aliyuncs.com，1883。

5、 If you subscribe to a topic, you can find the topic format in Alibaba Cloud -> IoT Platform ->

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Device Management - > Products - > Topic List - > Custom Topic List.



AT+MQTTTS=1,/a*********/${deviceName}/user/update

6、 Post Topics:

AT+MQTTTP=/a*********/${deviceName}/user/update

7、 Set the device name and login password:

AT+MQTTLI=username,password

8、 Start connecting to MQTT:

AT+MQTTCL=1

```
[2023-10-30 20:47:11.654]
TX: AT+MQTTCL=1

[2023-10-30 20:47:11.763]
RX:
OK

[2023-10-30 20:47:12.318]
RX:
+MQTTCL:1
```

Response+MQTTCL:1The connection is successful, if it fails, the topic may be set incorrectly.

9、 Post MQTT message:

AT+MQTTMSG=hello,/a*********/${deviceName}/user/update

Since we have the same subject as a publisher and subscriber, we receive the message sent.

```
[2023-10-30 20:53:05.799]
TX: AT+MQTTMSG=hello,/k[illegible]C3UkL/device1/user/update

[2023-10-30 20:53:06.017]
RX:
OK

+MQTTMSGSND:1

[2023-10-30 20:53:06.224]
RX:
+MQTTMSG:hello,/[illegible]C3UkL/device1/user/update,5
```

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6.1.3.1Baidu Cloud

The module connects the STA to a router that can access the external network.

1、 After Baidu Cloud registers the device, the connection parameters are IoTCoreId, DeviceKey, and DeviceSecret.



It is inconsistent with the actual MQTT connection parameters, we want to use this provided by Baidu CloudOnline toolsCalculate our actual connection parameters:



The input information here is the connection parameter we obtained above, and we can generate our actual connection parameters by clicking on the calculation. Note that this timestamp is only 10 minutes. The timestamp must be set to 0 or much greater than the current time.

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2. The rest of the operations are the same as those of Alibaba Cloud.

6.1.3.2 OneNet

Onenet is similar to Alibaba Cloud and Baidu Cloud in that it uses the parameters and calculation tools of the cloud platform to generate the final connection parameters: broker address, username, password, and clientID. It should be noted that the current MQTT version of OneNet is V3.1.1, and the version setting is incorrect, and the connection cannot be successful.

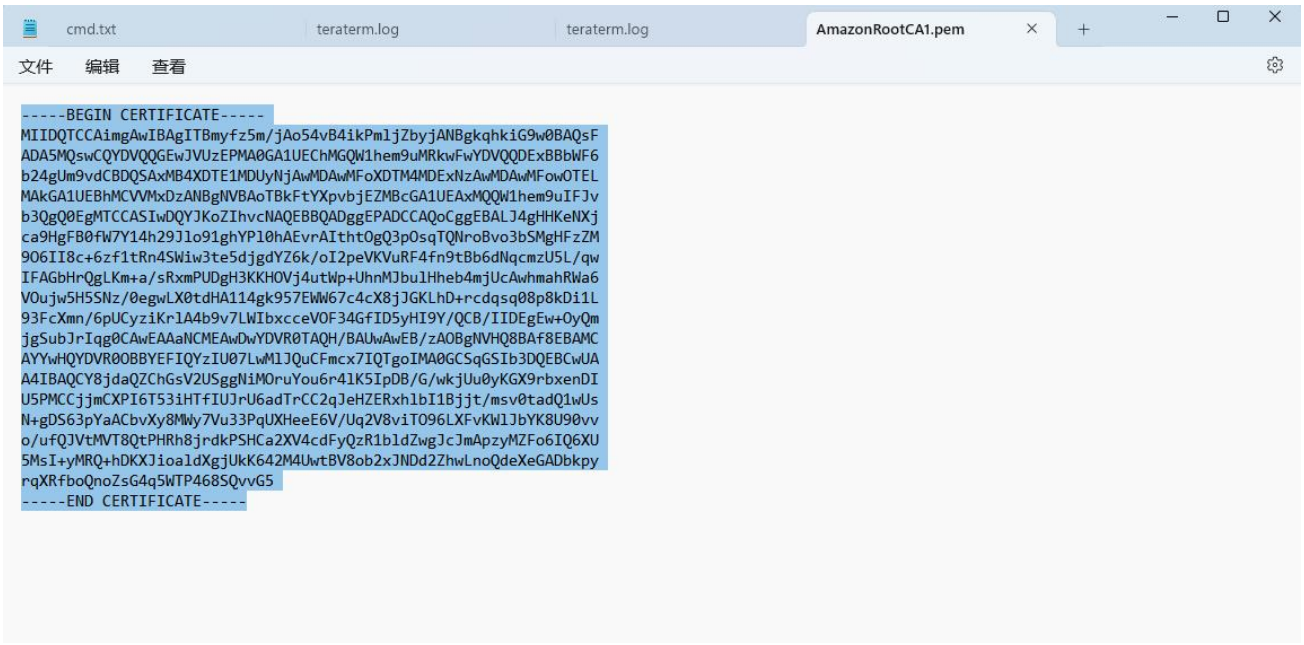
6.1.3.3 Amazon Cloud

Amazon Cloud connects in the form of certificates, and we get several certificates after signing up for Amazon Cloud's MQTT service. The certificates we need are the suffixes in the figure below.



1、To flash the certificate to the module, we need to burn the root certificate, the client certificate and the private key, open our certificate above in a notepad way, and then copy it.

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Example:

AT+MQTTCA=0,’ -----BEGIN CERTIFICATE-----

MIIDQTCCAimgAwIBAgITBmyfz5m/jAo54vB4ikPmljZbyjANBgkqhkiG9w0BAQsF

ADA5MQswCQYDVQQGEwJVUzEPMA0GA1UEChMGQW1hem9uMRkwFwYDVQQDExBBbWF6

b24gUm9vdCBDQSAxMB4XDTE1MDUyNjAwMDAwMFoXDTM4MDExNzAwMDAwMFowOTEL

MAkGA1UEBhMCVVMxDzANBgNVBAoTBkFtYXpvbjEZMBcGA1UEAxMQQW1hem9uIFJv

b3QgQ0EgMTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBALJ4gHHKeNXj

ca9HgFB0fW7Y14h29Jlo91ghYPl0hAEvrAIthtOgQ3pOsqTQNroBvo3bSMgHFzZM

9O6II8c+6zf1tRn4SWiw3te5djgdYZ6k/oI2peVKVuRF4fn9tBb6dNqcmzU5L/qw

IFAGbHrQgLKm+a/sRxmPUDgH3KKHOVj4utWp+UhnMJbulHheb4mjUcAwhmahRWa6

VOujw5H5SNz/0egwLX0tdHA114gk957EWW67c4cX8jJGKLhD+rcdqsq08p8kDi1L

93FcXmn/6pUCyziKrlA4b9v7LWIbxcceVOF34GfID5yHI9Y/QCB/IIDEgEw+OyQm

jgSubJrIqg0CAwEAAaNCMEAwDwYDVR0TAQH/BAUwAwEB/zAOBgNVHQ8BAf8EBAMC

AYYwHQYDVR0OBBYEFIQYzIU07LwMlJQuCFmcx7IQTgoIMA0GCSqGSIb3DQEBCwUA

A4IBAQCY8jdaQZChGsV2USggNiMOruYou6r4lK5IpDB/G/wkjUu0yKGX9rbxenDI

U5PMCCjjmCXPI6T53iHTfIUJrU6adTrCC2qJeHZERxhlbI1Bjjt/msv0tadQ1wUs

N+gDS63pYaACbvXy8MWy7Vu33PqUXHeeE6V/Uq2V8viTO96LXFvKWlJbYK8U90vv

o/ufQJVtMVT8QtPHRh8jrdkPSHCa2XV4cdFyQzR1bldZwgJcJmApzyMZFo6IQ6XU

5MsI+yMRQ+hDKXJioaldXgjUkK642M4UwtBV8ob2xJNDd2ZhwLnoQdeXeGADbkpy

rqXRfboQnoZsG4q5WTP468SQvvG5

-----END CERTIFICATE-----’

The content of the certificate must be enclosed in single or double quotation marks.

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```
[2023-10-31 11:14:58.746]
TX: AT+MQTTCA=0,'-----BEGIN CERTIFICATE-----

[2023-10-31 11:14:58.898]
RX:
OK

[2023-10-31 11:15:31.901]
TX: AT+MQTTCA=0,'-----BEGIN CERTIFICATE-----
MIIDQTCCAimgAwIBAgITBmyfz5m/jAo54vB4ikPmljZbyjANBgkqhkiG9w0BAQsF
ADA5MQswCQYDVQQGEwJVUzEPMA0GA1UEChMGQW1hem9uMRkwFwYDVQQDExBBbWF6
b24gUm9vdCBDQSAxMB4XDTE1MDUyNjAwMDAwMFoXDTM4MDExNzAwMDAwMFowOTEL
MAkGA1UEBhMCVVMxDzANBgNVBAoTBkFtYXpvbjEZMBcGA1UEAxMQQW1hem9uIFJv
b3QgQ0EgMTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBALJ4gHHKeNXj
ca9HgFB0fW7Y14h29Jlo91ghYPl0hAEvrAIthtOgQ3pOsqTQNroBvo3bSMgHFzZM
9O6II8c+6zf1tRn4SWiw3te5djgdYZ6k/oI2peVKVuRF4fn9tBb6dNqcmzU5L/qw
IFAGbHrQgLKm+a/sRxmPUDgH3KKHOVj4utWp+UhnMJbulHheb4mjUcAwhmahRWa6
VOujw5H5SNz/0egwLX0tdHA114gk957EWW67c4cX8jJGKLhD+rcdqsq08p8kDi1L
93FcXmn/6pUCyziKrlA4b9v7LWIbxcceVOF34GfID5yHI9Y/QCB/IIDEgEw+OyQm
jgSubJrIqgOCAwEAAaNCMEAwDwYDVR0TAQH/BAUwAwEB/zAOBgNVHQ8BAf8EBAMC
AYYwHQYDVR0OBBYEFIQYzIU07LwMlJQuCFmcx7IQTgoIMA0GCSqGSIb3DQEBCwUA
A4IBAQCY8jdaQZChGsV2USggNiMOruYou6r4lK5IpDB/G/wkjUu0yKGX9rbxenDI
U5PMCCjjmCXPI6T53iHTfIUJrU6adTrCC2qJeHZERxhlbI1Bjjt/msv0tadQ1wUs
N+gDS63pYaACbvXy8MWy7Vu33PqUXHeeE6V/Uq2V8viTO96LXFvKWlJbYK8U90vv
o/ufQJVtMVT8QtPHRh8jrdkPSHCa2XV4cdFyQzR1bldZwgJcJmApzyMZFo6IQ6XU
5MsI+yMRQ+hDKXJioaldXgjUkK642M4UwtBV8ob2xJNDd2ZhwLnoQdeXeGADbkpy
rqXRfboQnoZsG4q5WTP468SQvvG5
-----END CERTIFICATE-----'

[2023-10-31 11:15:32.095]
RX:
OK
```

2、Next, follow this method to burn the client certificate and private key.

3、Since Amazon Cloud wants to verify the current time, we need to enable the SNTP network to obtain the time: AT+CIPSNTP=1, pool.ntp.org, 86400.

4、Set the time zone, the default is UTC time and China time difference of 8 hours: AT+TZONE=28800.

5、Restart and look at the query time: AT+TZONE=28800,AT+RST,AT+TIME.

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```
[2023-10-31 11:27:35.353]
TX: AT+TZONE=28800

[2023-10-31 11:27:35.539]
RX:
OK

[2023-10-31 11:27:41.284]
TX: AT+RST

[2023-10-31 11:27:41.393]
RX:
OK

[2023-10-31 11:27:42.632]
RX:
+INIT:DONE,0

[2023-10-31 11:27:44.177]
RX:
+CWJAP:1,'TP-LINK_6C35',192.168.1.115

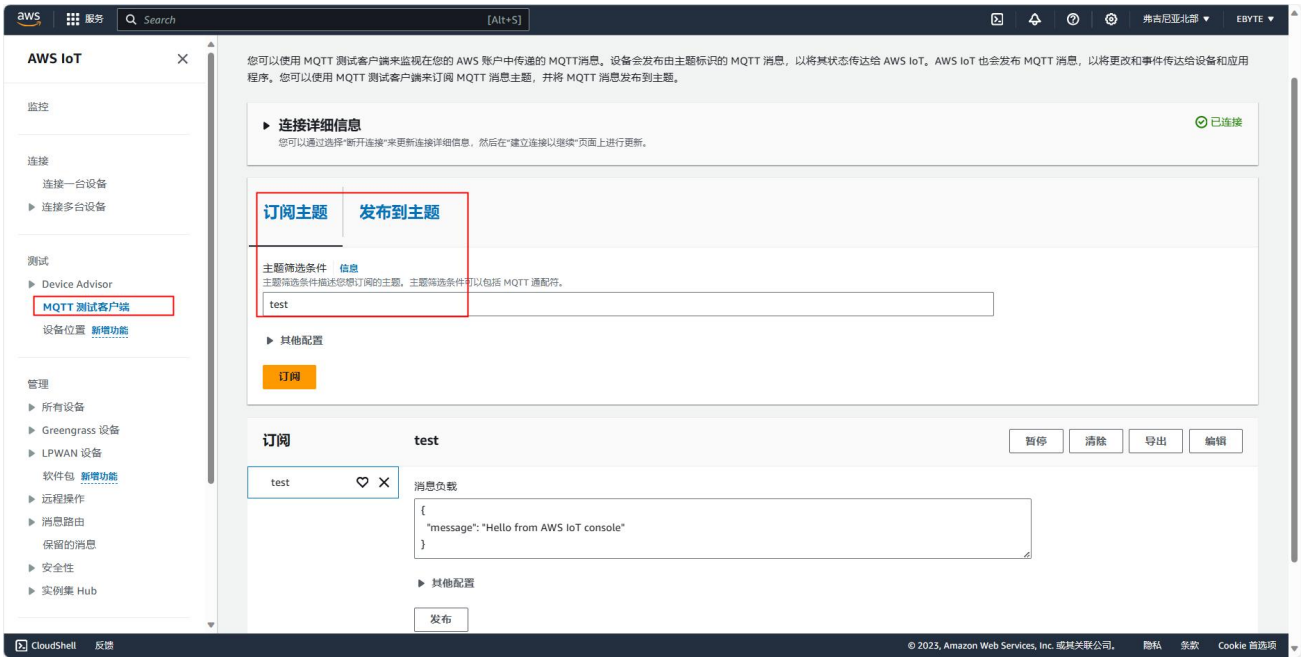
[2023-10-31 11:27:47.309]
TX: AT+TIME

[2023-10-31 11:27:47.427]
RX:
+TIME:2023-10-31,11:27:49
OK
```

10、Set the MQTT broker address and port number: AT+MQTTBR=a-ats.iot.us-east-1.amazonaws.com,8883.

11、Enable TLS: AT+MQTTTLS=1.

12、When Amazon Cloud tests MQTT, the topic can be customized, and here we define the topic name as test.



13、Module subscription topic, module publishing topic: AT+MQTTTS=1,test;AT+MQTTTP=test1.

14. Start the connection MQTT: AT+MQTTCL=1.



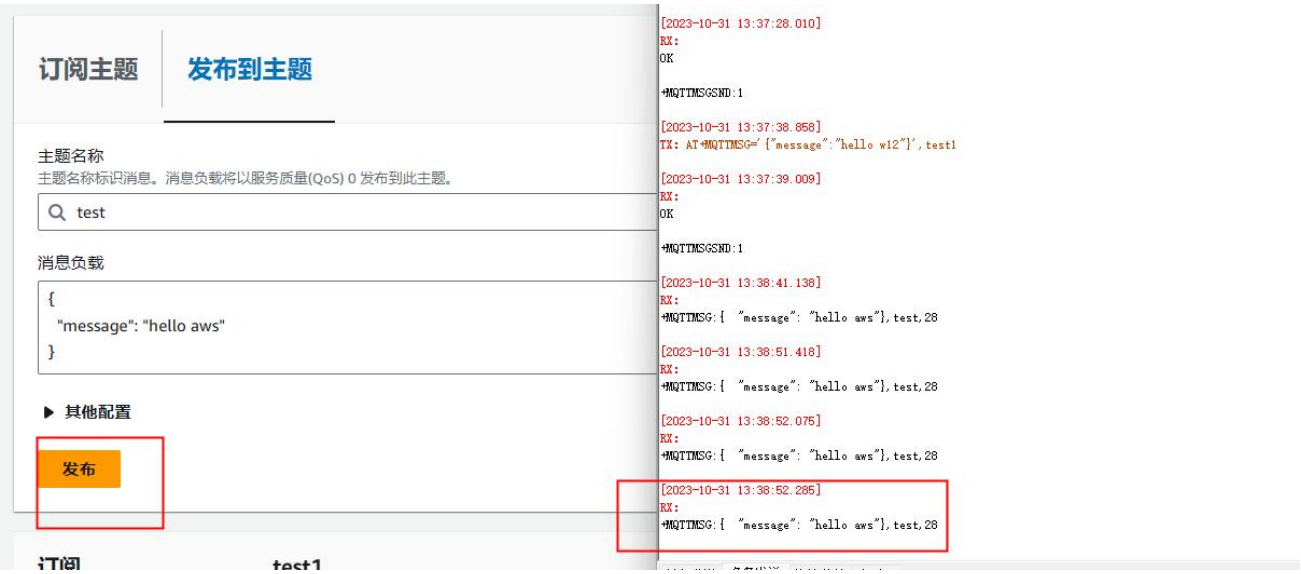
The connection is successful.

14、Modules send messages to AWS, and messages with line breaks or commas need to be enclosed in double quotation marks or single boots:

AT+MQTTMSG='{ "message": "hello"}',test



15、Amazon MQTT is issued



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6.1.4 HTTP Client

Use AT+HTTPC to get the corresponding http information, here is an example of httpbin.org: AT+HTTPC=https://httpbin.org/get,get。

```
[2023-10-31 10:56:48.074]
TX: AT+HTTPC=https://httpbin.org/get,get

[2023-10-31 10:56:48.194]
RX:
OK

[2023-10-31 10:56:49.580]
RX: HTTP/1.1 200 OK
Date: Tue, 31 Oct 2023 02:56:50 GMT
Content-Type: application/json
Content-Length: 297
Connection: close
Server: gunicorn/19.9.0
Access-Control-Allow-Origin: *
Access-Control-Allow-Credentials: true

{  "args": {},   "headers": {    "Accept": "*/*",      "Host": "httpbin.org",      "User-Agent":
"lwIP/2.1.2 (http://savannah.nongnu.org/projects/lwip)",      "X-Amzn-Trace-Id": "Root=1-65406cf2-
653c5eb5453c413e410e19d8"  },   "origin": "112.54.89.224",   "url": "https://httpbin.org/get"}
+HTTPCSTATUS:0
```

6.2 Low power usage

6.2.1 sleep1 mode

Sleep1 is the shutdown mode, which enters sleep1 mode when the PWR_KEY is pulled down, and exits when it is pulled up.

6.2.2 sleep2 mode

The RTC in Sleep2 mode is working, and the wake-up mode is when the time is up or WAKE_UP the falling edge wake-up;

AT+SETDPMSLPEXT=10,0 // Enter sleep2 mode, automatically wake up when the time is up in 10s, and you can also wake up by WAKE_UP feet.

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6.2.3 sleep3 mode

Keep wifi connection in sleep3 mode, sleep3 mode can only be in sta mode, and need to be connected to AP, after failing to connect successfully and failing for many times, it will enter abnormal low-power mode and need to be re-powered on (can be achieved through PWR_KEY), and cannot send data to the serial port when it is not awakened. Here we take the low-power mode as an example as a TCP client.

1、Connect to AP:

AT+CWJAPA=TST-2.4G,TST12345678

2、The IP of the computer is in the same network segment as the module, open the network debugging assistant to open a TCP server.



3、The module is connected to the TCP server on the PC side:

AT+CIPSTART=192.168.2.101.8080

4、Save the current state and prepare for low power:

AT+CIPSAVE

5、Enter Low Power Consumption:

AT+DPM=1

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```
[2023-10-31 09:44:54.155]
TX: AT+CIPSTART=192.168.2.101,8080

[2023-10-31 09:44:54.330]
RX:
+CIPSTART:1
OK

[2023-10-31 09:47:22.939]
TX: AT+CIPSAVE

[2023-10-31 09:47:23.126]
RX:
OK

[2023-10-31 09:47:57.048]
TX: AT+DPM=1

[2023-10-31 09:47:57.415]
RX:
OK

[2023-10-31 09:47:58.693]
RX:
+INIT:DONE,0

[2023-10-31 09:48:00.741]
RX:
+CWJAP:1,'TST-2.4G',192.168.2.24

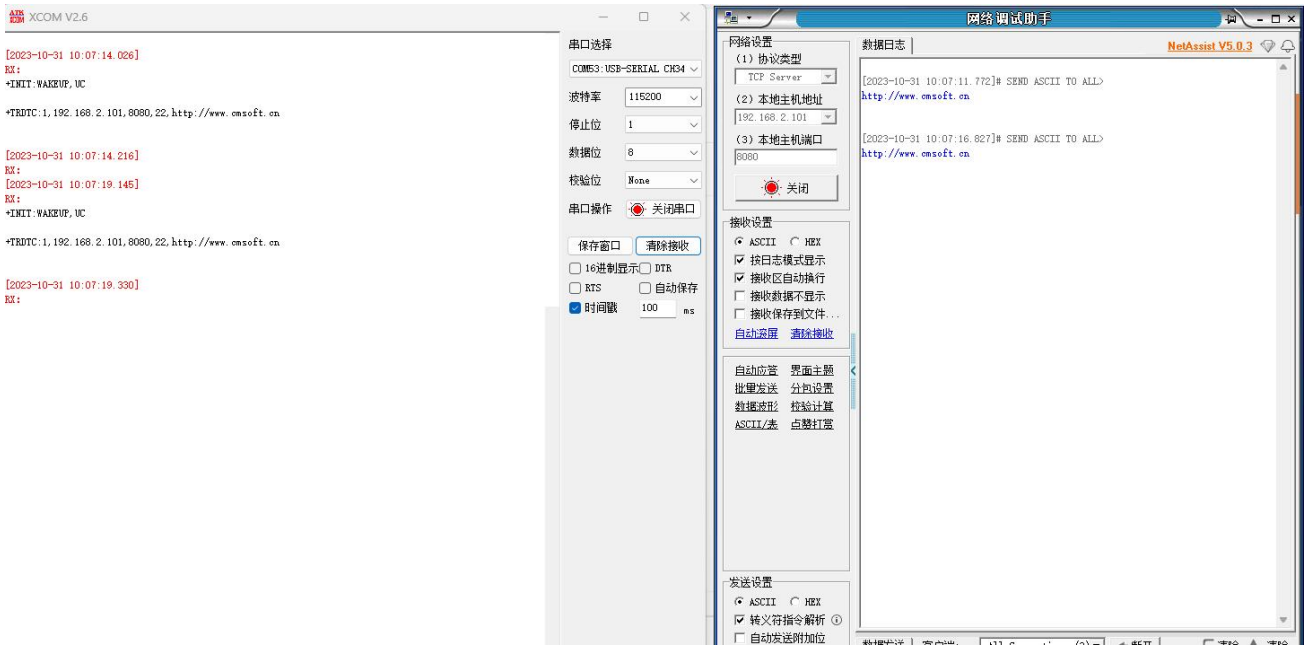
[2023-10-31 09:48:01.928]
RX:
+CIPINFOALL:1,TCP,192.168.2.101,8080,32493
```

6、When entering sleep3 mode, the module will periodically wake up to receive data and report it once in a period of time. Under normal circumstances, the average power consumption is about 150UA, but the WiFi frame of some routers will make the module answer and cause the power consumption to be very large, about 1MA, and the average power consumption will also increase when the AP network quality is not good. Here we are using a router with TP-LINK, with an average power consumption of about 150ua, and you can also use your mobile phone to open a hotspot for verification.



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7、In low-power mode, the data sent by our network debugging assistant to the module can be received, as shown in the following figure:



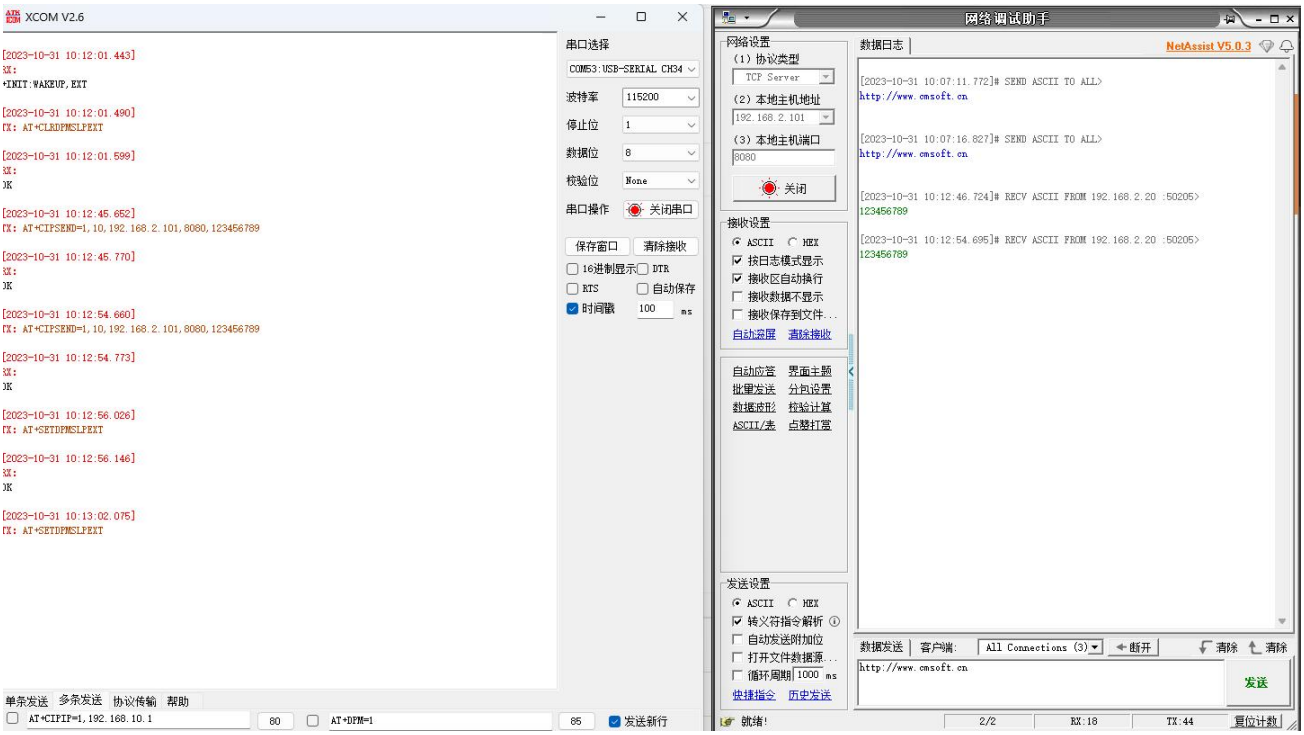
8、The module needs to wake up when sending data, WAKE_UP the falling edge of the foot needs to wake up, and it needs to send AT+CLRDPMSLPEXT command within 1s to show the exit of low power consumption, otherwise it will enter a low power consumption state, and the serial port is unusable.

9、After the module wakes up, it sends data to the tcp server on the PC, and after the sending is completed, it enters the low power consumption through AT+SETDPMSLPEXT, for example:

AT+CIPSEND=1,10,192.168.2.101,8080,123456789

AT+SETDPMSLPEXT

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7. Welding work instructions

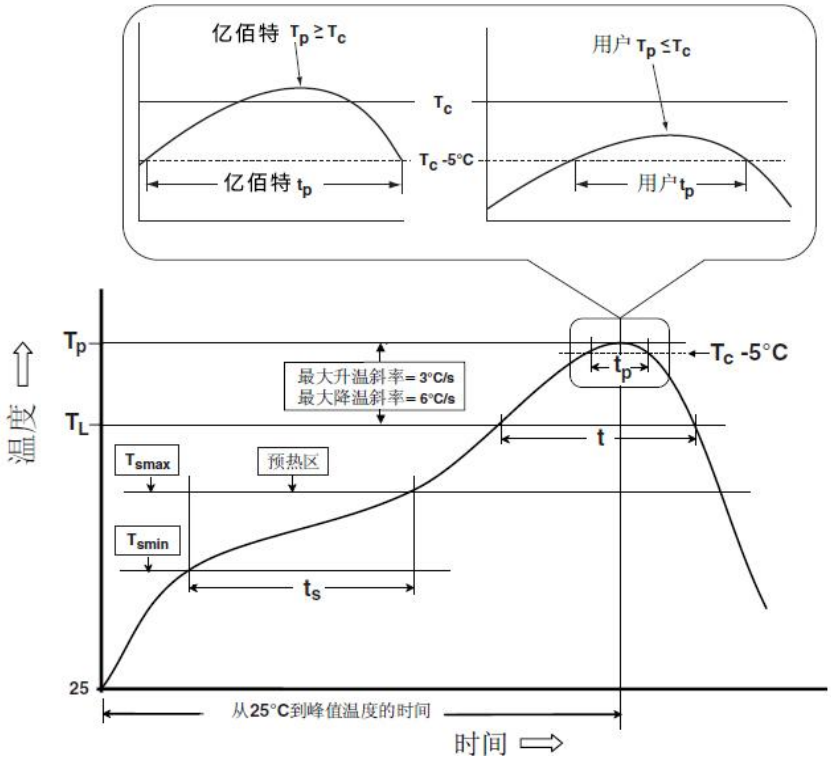
7.1 Reflow soldering temperature

Reflow soldering curve characteristics		Assembled with lead process	Lead-free process assembly
Preheating/keeping warm	Minimum temperature (Tsmin).	100℃	150℃
	Maximum temperature (Tsmax).	150℃	200℃
	Time (Tsmin~Tsmin).	60-120 seconds	60-120 seconds
Slope of heating (T_L~T_P).		3 ° C/sec, maximum	3 ° C/sec, maximum
Liquid phase temperature (TL)		183℃	217℃
TL above the holding time		60~90 seconds	60~90 seconds
Peak temperature of the package T_P		The user must not exceed the temperature indicated on the product's "Moisture Sensitivity" label.	The user must not exceed the temperature indicated on the product's "Moisture Sensitivity" label.

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The time (Tp) within 5° C of the specified grading temperature (Tc) is shown in the figure below	20 seconds	30 seconds
Cooling slope (Tp~TL).	6° C/sec, max	6° C/sec, max
The time from room temperature to peak temperature	6 minutes, the longest	8 minutes, the longest
※The peak temperature (Tp) tolerance of the temperature curve is defined as the upper limit of the user		

7.2 Reflow soldering curve



8. Revision History

version	Date of revision	Revision Notes	Maintainers
1.0	2023-10-31	Initial release	Create
1.1	2024-5-7	Replace the recommended schematic diagram	Hao

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