EWM22A-400/900BWL22S Series User Manual

2.4GHz 400/900MHz 20/22dBm BLE/WIFI/LoRa All-in-One Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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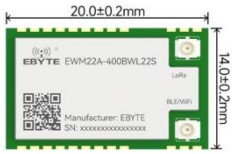
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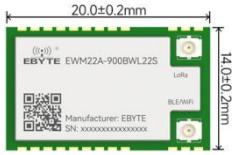
1 Introduction

1.1 Brief Introduction

EWM22A-400/900BWL22S is a BLE, WIFI, LoRa all-in-one wireless data transmission module developed by Chengdu Yibert, this series of modules support BLE, WIFI, LoRa communication, of which the LoRa function is compatible with the E22-T series of modules, SMD-type, the maximum transmit power of 20dBm for BLE/WIFI and 22dBm for LoRa. Transmit power, pin spacing 1.27mm, factory self-firmware, powerful, mainly for data transmission application scenarios.



EWM22A-400BWL22S



EWM22A-900BWL22S

1.2 Features

Product Functional Features:

- Supports LoRa, WIFI (IEEE 802.11b/g/n), and BLE5.0 all-in-one communication technology, which makes the applicable scenes more diversified;
- Supports BLE over-the-air firmware encryption upgrade, which is convenient for later maintenance;
- Supports AT command, which is more convenient to use;
- Supports deep hibernation, and the whole power consumption in this mode is about 6.7uA;
- Parameters are saved when power down, and the module will work according to the set parameters after power up again;
- High-efficiency watchdog design, once an abnormality occurs, the module will restart automatically, and can continue to work according to the previous parameter settings;
- 4 MB embedded FLASH;
- Flexible deployment: a single module supports multiple protocols, reducing hardware redundancy and lowering IoT system integration costs.

LoRa Functional Features:

- Supports AT command and HEX command settings;.
- Adopts the new generation LoRa spread spectrum modulation technology, which brings longer communication distance and stronger anti-interference ability;
- Supports automatic relay networking, and multi-level relay is suitable for ultra-long-distance communication, and the same area runs multiple networks at the same time;
- Supports users to set their own communication key and cannot be read, which greatly improves the confidentiality of user data;
- Supports LBT function to listen to the channel environmental noise before sending, which can greatly improve the

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success rate of communication of the module in harsh environments;

- Supports RSSI signal strength indication function, which is used to evaluate signal quality, improve communication network, and range measurement;
- Supports wireless parameter configuration, sending command packets wirelessly to remotely configure or read wireless module parameters;
- Supports Wake-on-Air, i.e., ultra-low power consumption function for battery-powered application solutions;
- Supports fixed-point transmission, broadcast transmission, and channel listening;
- Communication distance up to 5km under ideal conditions;
- Supports data transmission rates from 2.4K to 62.5Kbps;
- Industrial-grade standard design, support -40 ~ +85 ℃ under long time use;
- Module power can be up to 160mW (22dBm), the transmission is more far and stable.

BLE Functional Features:

- Supports the slave role;
- Supports the Bluetooth BLE 5.0 protocol;
- Supports Bluetooth parameter over-the-air configuration function;
- Supports transmit power modification with a maximum transmit power of 20dBm;
- Maximum communication maximum distance up to 500m;
- MTU max 517 bytes;

WIFI functionality features:

- Supports STA working mode;
- Supports disconnected automatic reconnection;
- Supports WPA2 WIFI security authentication method;
- Supports TCP CLIENT communication mode;
- Transmit power is 20dBm;
- The maximum communication distance of is up to 500m;

1.3 Application

- Smart home as well as industrial sensors, etc;
- Security systems, positioning systems;
- Wireless remote control, drones;
- Healthcare products;
- Automotive industry applications

2 Specification

2.1 Limit parameters

	Performances	

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Main Parameters	Mini	Max	Remark
Power supply voltage (V)	0	3.6	Permanent module burnout above 3.6V
Blocking power (dBm)	-	10	Low probability of burnout in close proximity
Operating temperature (℃)	-40	+85	Industrial Grade

2.2 Operating parameters

Main Parameters		Performances			Remark
		Mini	typical	Max	
Operating Voltage (V)		3.0	3.3	3.6	≥3.3V can guarantee output power
Communication level (V)			3.3		Risk of burn-in with 5V TTL
Operating temperature (℃)		-40	-	+85	Industrial grade design
BLE/WIFI operating band (GHz)		2.400	-	2.480	Supports ISM bands
EWM22A-400BWL22S LoRa Operating Frequency Band (MHz)		410.125	433.125	493.125	
EWM22A-900BWL22S LoRa Operating frequency band (MHz)		850.125	868.125	930.125	
LoRa air rate（Kbps）		2.4	62.5	62.5	
power consumption	Transmit Current (mA)		185		Mode 1, BLE listening off, instantaneous power consumption
	Receive Current (mA)		23		Mode 1, BLE listening off, average power consumption
	Deep sleep current (μA)		6.7		
BLE transmit power (dBm)		-9	20	20	Configurable
WIFI transmit power (dBm)		-	20	-	Fixed, not configurable
LoRa transmit power (dBm)		10	22	22	Configurable

Main Parameters	Description	Remark
BLE communication distance	500m	Clear and open environment, antenna gain 5.0dBi, height 2 meters.
WIFI communication distance	500m	Clear and open environment, antenna gain 5.0dBi, height 2 meters.

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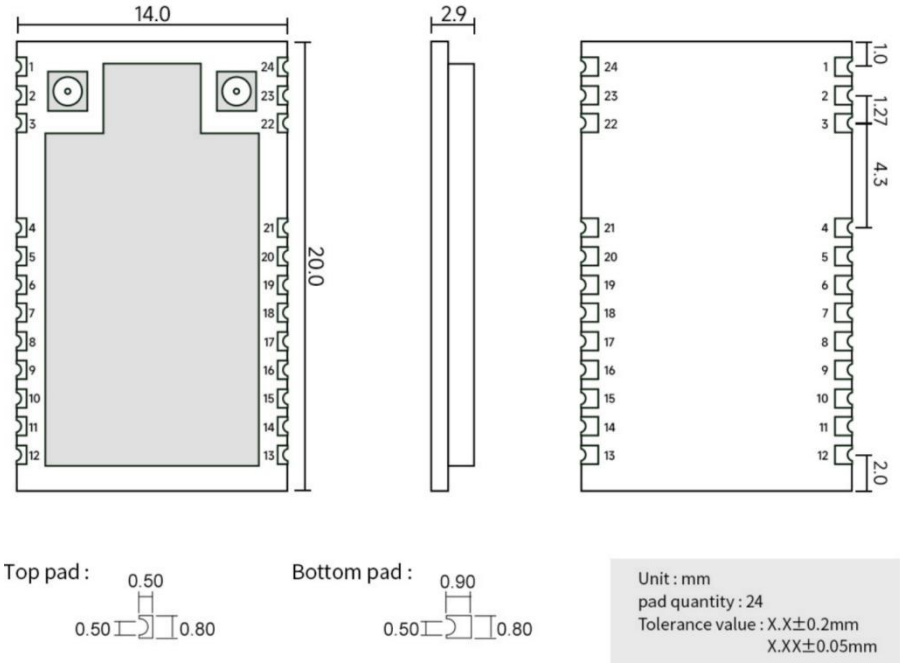
LoRa communication distance	5Km	Clear and open environment, antenna gain 3.5dBi, height 2 meters, air rate 2.4kbps.
Protocols	BLE/WIFI/LoRa	BLE5.0、Wi-Fi(IEEE 802.11b/g/n)
Communication Interface	UART	TTL level
Packaging	SMD	
LoRa packet length	240 Btyes	Command-set packetized 32/64/128/240 byte sends
BLE MTU	517 Btyes	
UART RX BUFFER	1024 Btyes	
UART TX BUFFER	1024 Btyes	
LORA_TX_BUF_SIZE	2028 Btyes	
BLE_TX_BUF_SIZE	1024 Btyes	
TCP_TX_BUF_SIZE	2048 Btyes	
Interface	1.27mm	Stamp Hole
Dimension	14*20mm	±0.2mm
LoRa Antenna Interface	IPEX/Stamp Hole	Equivalent impedance about 50Ω
BLE/WIFI Antenna Interface	IPEX	
Weight	1.2g	±0.1g

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3 Mechanical Dimensions and Pin Definitions

3.1 Dimensions and Pin Definitions



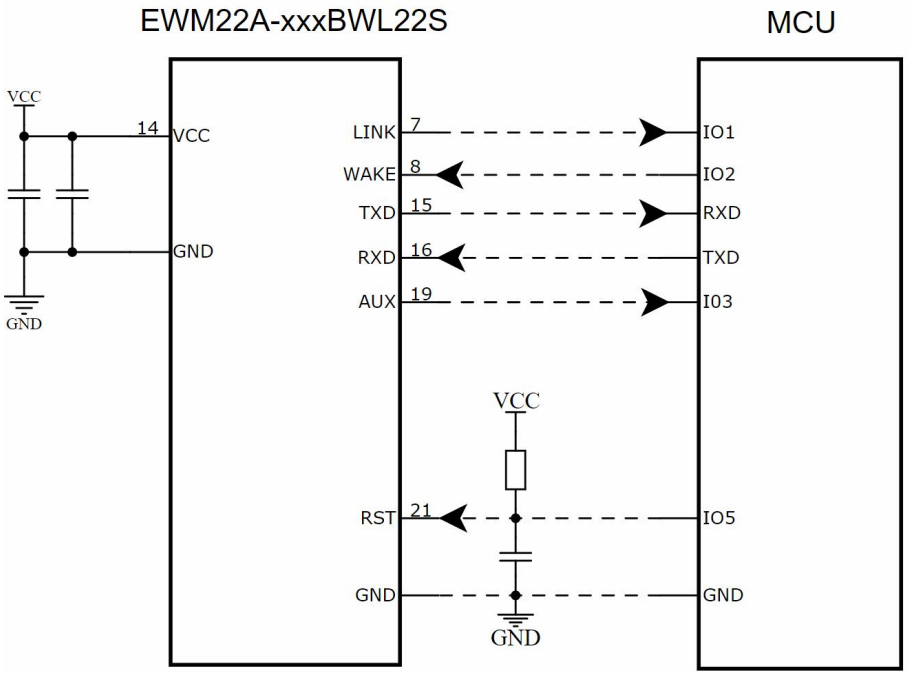
Pin No.	Pin Name	Pin Direction	Pin Purpose
1	GND	-	Power Ground
2	ANT	-	LoRa antenna interface, 50 ohm characteristic impedance
3	GND	-	Power Ground
4	GND	-	Power Ground
5	TX_EN	-	Reserved Pins
6	RX_EN	-	Reserved Pins
7	LINK	Output	Bluetooth/WIFI connection status indication pin: BLE:Default high,BLE connected is low; WIFI: default high, WIFI connected, TCP not connected outputs 1Hz high and low level change, TCP connected outputs low level.
8	WAKE	Input	Deep Hibernation Wake-Up Pin, Wake-Up Low.
9	NC	Input/Output	Reserved Pins
10	NC	Input/Output	Reserved Pins
11	NC	Input/Output	Reserved Pins
12	NC	Input/Output	Reserved Pins
13	GND	-	Power Ground
14	VCC	Input	Power input: 3.0~3.6V
15	TXD	Output	TTL serial output connected to external RXD input pin;
16	RXD	Input	TTL serial input to external TXD output pin;
17	NC	-	Reserved pins

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18	NC	-	Reserved pins
19	AUX	Output	Used to indicate LoRa operating status; user wakes up external MCU and outputs low during power-on self-test initialization; (can be left dangling)
20	NC	-	Reserved pins
21	RST	Input	Reset pin, low level reset
22	GND	-	Power ground
23	NC	-	Reserved pin
24	GND	-	Power Ground

3.2 Recommended Wiring Diagram



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4 Function Introduction

4.1 Working mode

The module supports four communication modes: BLE, WIFI, LoRa and URAT, and implements 8 modes together. Each mode includes UART function (for mode switching, data sending and receiving and monitoring), and BLE and WIFI cannot coexist. The 8 working modes are as follows:

Working mode	Description
0 --- Configuration Mode	Enable UART, BLE function 1、You can use AT instruction to configure the module through BLE and UART.
1 --- UART/LORA pass-through, BLE listening	Enable UART, BLE, LORA function 1、BLE listens to the data flow direction and outputs the corresponding data; 2、Can use AT commands to configure the module via BLE; 3、Can receive remote LoRa configuration commands;
2 --- UART/BLE passthrough, LORA listening	Enable UART, BLE, LORA function 1.LoRa listens to the data flow direction and outputs the corresponding data; 2. can use AT commands to configure the module via BLE; 3. Can receive remote LoRa configuration commands;
3 --- LORA/BLE passthrough, UART listening	Enable UART, BLE, LORA function 1、UART listens to the data flow direction and outputs the corresponding data; 2、Can use AT command to configure the module via BLE; 3、Can receive remote LoRa configuration commands;
4 --- UART/LORA pass-through, WIFI listening	Enable UART, WIFI, LORA function 1、After WIFI connection, the tcp server listens to the data flow direction and outputs the corresponding data; 2、You can use AT command to configure the module via TCP; 3、Can receive remote LoRa configuration commands;
5 --- LORA/WIFI pass-through, UART listening	Enable UART, WIFI, LoRa function 1、UART listens to the data flow direction and outputs the corresponding data; 2、Can use AT command to configure the module via TCP;

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	3、Can receive remote LoRa configuration commands;
6 --- UART/WIFI pass-through, LORA listening	Enable UART, WIFI, LoRa function 1、LoRa listens to the data flow direction and outputs the corresponding data; 2、Can use AT commands to configure the module via TCP; 3、Can receive remote LoRa configuration commands;
7 --- LORA/UART pass-through, WOR mode	Open UART, LoRa function 1, WOR slave timed wake-up scanning to determine whether there is a host to send data, there is data to receive data and wake up the module and receive data, there is no data to enter hibernation again;

4.2 BLE Functions in Detail

UUID	Description	Remark
FFF1	Transmission Receiving	NOTIFY
FFF2	Transmit-Transmit	WRITE, WRITE_NO_RESPONSE
FFF3	AT Configuration	NOTIFY, WRITE_NO_RESPONSE

Basic functions:

1.BLE only supports slave, you can configure the module and send/receive serial data through APP;

2. module firmware upgrade through BLE OTA.APK;

3. Only support AT command to configure BLE related configuration;

Default parameters:

1. device name: EWM22A-400BWL22S/EWM22A-900BWL22S (module model);

2. broadcast interval: 100ms;

3. Connection interval 20ms~40ms.

4. Broadcast type is connectable and scannable broadcast;

5. Connection timeout 2.5 seconds;

UUID is 16 bits by default;

4.3 WIFI/TCP Functions in Detail

Basic functions:

1.WIFI is only supported as station;

2.TCP only supports Ipv4;

3. Only AT commands are supported for configuring WIFI-related configurations;

4.4 LoRa Features in Detail

Basic function: Support AT instruction and HEX instruction setting

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4.4.1 LoRa HEX command format

The list of supported commands in the configuration mode (Mode 0) is as follows (serial port parameters are only supported in 9600, 8N1 format if setup with the E22 host computer):

No.	command format	Explanation
1	Setup Register	Instruction: C0 + start address + length + parameters Response: C1 + start address + length + parameters Example 1: Configure the channel as 0x09 Command Start address Length Parameters Send: C0 05 01 09 Return: C1 05 01 09 Example 2: Configure module address (0x1234), network address (0x00), serial port (9600 8N1) and airspeed (2.4K) at the same time Send: C0 00 04 12 34 00 62 Return: C1 00 04 12 34 00 62
2	Read register	Command: C1 + start address + length Response: C1 + start address + length + parameters Example 1: Read channel Command Start address Length Parameters Send: C1 05 01 Return: C1 05 01 09 Example 2: Read module address, network address, serial port, airspeed at the same time Send: C1 00 04 Return: C1 00 04 12 34 00 61
3	Setting Temporary Register	Command: C2 + start address + length + parameters Response: C1 + start address + length + parameters Example 1: Configure channel as 0x09 Command Start address Length Parameters Send: C2 05 01 09 Return: C1 05 01 09 Example 2: Configure module address (0x1234), network address (0x00), serial port (9600 8N1), and airspeed (2.4K) simultaneously Send: C2 00 04 12 34 00 62 Return: C1 00 04 12 34 00 62
4	Wireless Configuration	Command: CF CF + regular command Response: CF CF + regular response Example 1: Wireless configuration channel is 0x09 Wireless Command Header Command Start Address Length Parameters Send: CF CF C0 05 01 09 Return: CF CF C1 05 01 09 Example 2: Wireless configure module address (0x1234), network address (0x00), serial port (9600 8N1), airspeed (2.4K) simultaneously Send: CF CF C0 00 04 12 34 00 62 Return: CF CF C1 00 04 12 34 00 62
5	Formatting error	Format Error Response FF FF FF FF

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4.4.2 LoRa register description

No	Read Write	Name	Description				Remark
00H	Read /Write	ADDH	ADDH（default 0）				Module address high byte and low byte; Note: When the module address is equal to FFFF, it can be used as the broadcast and listen address, i.e.: at this point the module will not perform address filtering
01H	Read /Write	ADDL	ADDL（default 0）				
02H	Read /Write	NETID	NETID（default 0）				Network address for distinguishing networks; When communicating with each other, they should be set to the same.
03H	Read /Write	EG0	7	6	5	UART serial port rate (bps)	Two modules communicating with each other can have different serial port baud rates and different checksums; When transmitting larger data packets continuously, the user needs to consider the data blocking brought by the same baud rate, and may even be lost; It is generally recommended that the baud rates of the two communicating parties are the same.
			0	0	0	Serial port baud rate of 1200	
			0	0	1	Serial port baud rate of 2400	
			0	1	0	Serial port baud rate of 4800	
			0	1	1	Serial port baud rate of 9600	
			1	0	0	Serial port baud rate of 19200	
			1	0	1	Serial Baud Rate of 38400	
			1	1	0	Serial baud rate is 57600	
			1	1	1	Serial baud rate is 115200 (default)	
			4	3	Serial port parity bit		The serial port modes can be different on both sides of the communication;
			0	0	8N1 (default)		
			0	1	8O1		
			1	0	8E1		
			1	1	8N1 (00 equivalent)		
			2	1	0	Wireless Air Rate (bps)	The air rate must be the same on both sides of the communication; The higher the air rate, the lower the delay and the shorter the transmission distance.
			0	0	0	Air Rate 2.4k	
			0	0	1	Air Rate 2.4k	
			0	1	0	Air Rate 2.4k (default)	
			0	1	1	Air Rate 4.8k	
			1	0	0	Air Rate 9.6k	
			1	0	1	Air Rate 19.2k	
			1	1	0	Air Rate 38.4k	
			1	1	1	Airspeed 62.5k	
04H	Read /Write	REG1	7	6	Packetization Settings		If the data sent by the user is less than the packet length, the output of the serial port at the receiving end is presented as uninterrupted continuous output;
			0	0	240 bytes (default)		
			0	1	128 bytes		
			1	0	64 bytes		

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			1	1	32 bytes	If the data sent by the user is larger than the packet length, the serial port at the receiving end will output in packets.
			5	RSSI Ambient Noise Enable		When enabled, instruction C0 C1 C2 C3 can be sent in UART-loRa mode or WOR transmit mode Instruction Read Register; Register 0x00 : Current ambient noise RSSI; Register 0X01 : RSSI of the last received data. (The current channel noise is: dBm = -(256 - RSSI)); Instruction format: C0 C1 C2 C3 + start address + read length; return: C1 + address + read length + read the effective value; for example: send C0 C1 C2 C3 00 01 Return C1 00 01 RSSI (address can only start from 00) Translated with www.DeepL.com/Translator (free version)
			0	Disable (default)		
			1	Enable		
			4	3	reservation	reservation
			2	(E22 is software switching, EWM22 removes this feature) Retained		
			1	0	Transmit power	Power and current are non-linearly related, and the power supply is most efficient at maximum power; Current does not decrease in the same proportion as power decreases.
			0	0	22dBm (default)	
			0	1	17dBm	
			1	0	13dBm	
			1	1	10dBm	
05H	Read /Write	REG2	Channel Control (CH) 0-83 represent a total of 84 channels (for 400 band) respectively 0-80 represent a total of 81 channels respectively (for 900 band)			Actual frequency = 410.125 + CH * 1M Actual frequency = 850.125 + CH * 1M
06H	Read /Write	REG3	7	Enable RSSI bytes		When enabled, the module receives wireless data, which will follow an RSSI strength byte when output through the serial port TXD.
			0	Disable (default)		
			1	Enable		
			6	Transmission Method		For fixed-point transmission, the module will recognize the first three bytes of the serial data as: address high + address low + channel, and will use it as the wireless transmit target.
			0	Transparent transmission (default)		
			1	Fixed transmission		
			5	Relay Function		When the relay function is enabled, the module will initiate a forwarding if the destination address is not the module itself; In order to prevent data backhauling, it is recommended to be used in conjunction with fixed-point mode; i.e., the destination
			0	Disable relay function (default)		
			1	Enable relay function		

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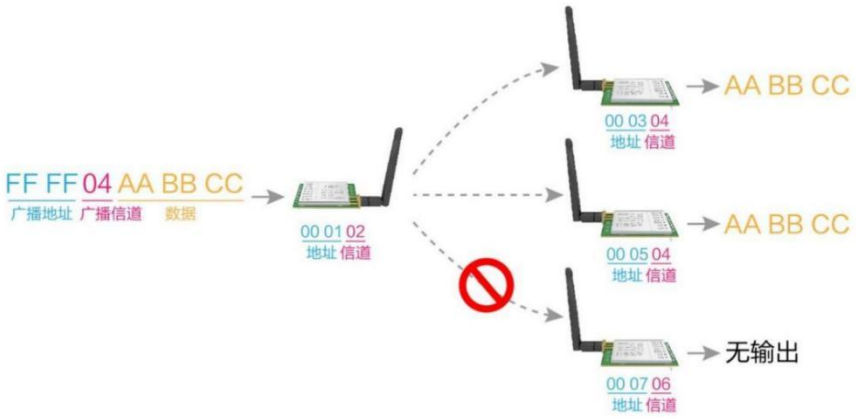
							address is different from the source address.
			4	LBT Enable			When enabled, wireless data will be listened to before transmitting, which can avoid interference to some extent, but may bring data delay; The maximum dwell time of LBT is 2 seconds, and it will be forced to send out when it reaches two seconds.
			0	Disable (default)			
			1	Enable			
			3	WOR mode transceiver control			Valid only for mode 7;
			0	WOR receiver (default) Works in WOR listening mode, see below for listening period (WOR period), which saves a lot of power consumption.			
			1	WOR transmitter The module transmits and receives open and adds a wake-up code for a certain period of time when transmitting data.			
			2	1	0	WOR cycle	Valid only for mode 1; Cycle time T= (1+WOR)*500ms, the maximum is 4000ms and the minimum is 500ms; The longer the period time between WOR listening intervals, the lower the average power consumption, but the higher the data delay; Both sender and receiver must agree (very important)
			0	0	0	500ms	
			0	0	1	1000ms	
			0	1	0	1500ms	
			0	1	1	2000ms	
			1	0	0	2500ms	
			1	0	1	3000ms	
			1	1	0	3500ms	
			1	1	1	4000ms	
07H	Write	CRYPT_H	Key high byte (default 0)				Write only, read returns 0; Used for encryption to avoid interception of over-the-air wireless data by similar modules; The module will internally use these two bytes as a calculation factor to transform and encrypt the over-the-air wireless signal.
08H	Write	CRYPT_L	Key low byte (default 0)				
80H～86H	Read	PID	Product information 7 bytes				7 bytes of product information

4.4.3 LoRa factory default parameters

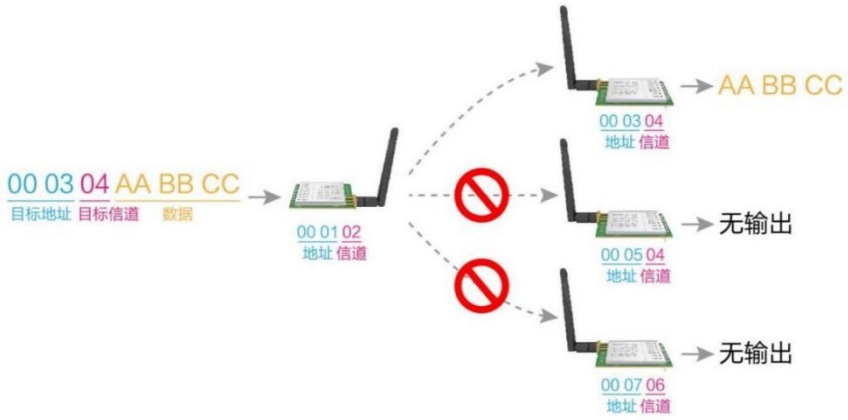
Model number	**EWM22A-400BWL22S factory default parameter values: C0 00 09 00 00 00 62 00 17 03 00 00 00 EWM22A-900BWL22S factory default parameter values: C0 00 09 00 00 00 62 00 12 03 00 00**						
Model number	Frequency	Address	Channel	Air speed	Baud	Serial Format	Transmission power

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EWM22A-400BWL22S	433.125MHz	0x0000	0x17	2.4kbps	115200	8N1	22dbm
EWM22A-900BWL22S	868.125MHz	0x0000	0x12	2.4kbps	115200	8N1	22dbm



4.4.4 LoRa Transmit, Receive Instructions

1.fixed point transmitter

2. Broadcast transmitter

3. Broadcast Address

Example: set module A address to 0xFFFF and channel to 0x04.

When module A acts as a transmitter (same mode, transparent transmission method), all receiving modules under channel 0x04 can receive the data for the purpose of broadcastin

4. Listening address

Example: Set module A address to 0xFFFF and channel to 0x04.

When module A is used as a receiver, it can receive all the data under channel 0x04 to achieve the purpose of listening.

5. AUX detailed explanation

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AUX is used for LoRa transceiver buffer indication and self-test indication.

It indicates whether the module has data that has not yet been emitted through LoRa, or whether the wireless data that has been received has not yet been sent out all through the serial port, or whether the module is in the process of initializing self-test.

5 AT command

5.1 Command format

Command format	Description	Example
AT+XXX	Run command	AT+RESET
AT+XXX=?	Query command	AT+HELP=?
AT+XXX=YYYY	Setting command	AT+BLENAME=ABC

- Module supports parameter reading and writing, the default baud rate supported by the module serial port is 115200bps, 8N1 format.
- UART, BLE, and TCP commands do not bring back carriage returns;
- The return result of UART configuration mode ends with (\r) and (\n), BLE configuration return value does not end with (\r) and (\n);
- Serial port baud rate defaults to 115200, 8bit data bit, 1 stop bit, no parity;
- Instruction parameters are in ASCII format;
- Instructions are case-sensitive.
- Some instructions do not support UART configuration, such as AT+AUTH, AT+AUTHEXIT;
- All AT instructions cannot contain invisible characters such as spaces and tabs.

5.2 Return Value Description

AT instruction return value	Explanation
AT_OK	Correct
AT_PARAM_ERROR	Setting parameter error
AT_NVS_ERROR	NVS error
AT_AUTH_ERR	Permission error, need to use AT+AUTH to configure authentication
AT_ERROR	Other errors

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5.3 Status output

Status output	Description
BLE CONNECT	BLE connection successful
BLE DISCONNECT	BLE disconnected
WIFI START CONNECT:ssid,password	WIFI start to connect
CONNECTED AP GOT IP: 192.168.x.x	WIFI connection successful
RECONNECT:ssid,password	WIFI reconnect
TCP CLIENT START	TCP client started to connect
UNABLE TO CONNECT:192.168.xx.xx:3333	TCP client cannot connect to server
TCP CONNECTED	TCP client connects to server
TCP DISCONNECTED	TCP client disconnects

The above states can be turned on or off by the AT command “AT+ LOGMSG”, see the AT command section for details.

5.4 AT command table

Categories	Command	Description
Basic Command	AT	AT Link Check
	AT+FWCODE	Query Firmware Version
	AT+UID	Query MAC
	AT+DEVTYPE	Query Product Model
	AT+RESET	Reset
	AT+DEFAULT	Restore Factory Settings
	AT+UART	Setting/Querying Baud Rate
	AT+HELP	Query all commands
	AT+HMODE	Query/set operating mode
	AT+SMODE	Query/set listening function
	AT+AUTHKEY	Query/Set BLE/WIFI pairing key
	AT+AUTH	BLE/WIFI authentication pairing key
	AT+AUTHEXIT	Exit key verification
	AT+LIGHTSLEEP	Enter shallow sleep
	AT+DEEPSLEEP	Enter deep sleep
	AT+SLEEPKEEP	Deep Hibernation Hold Function
	AT+COMSW	BLE/WIFI/LORA forced switching
	ATE0	Turn off display back
	ATE1	Open display
	AT+LOGMSG	Status Print

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WIFI/TCP Command	AT+STA	Setting/querying connected WIFI settings
	AT+CIPSTATE	Setting/querying TCP connection IP and port
2.4G Command	AT+NOWADDR	Setting/querying the 2.4G transmit destination
	AT+NOWPER	Set/Query 2.4G Prefix Switch
BLE Command	AT+BLENAME	Set/Query BLE Name
	AT+BLEADV	Set/query BLE broadcast interval
	AT+BLEOTA	Set/Query BLE upgrade function
	AT+BLEPOWER	Set/Query BLE transmit power
	AT+RATE	Set/Query Air Rate
	AT+PACKET	Set/Query Packet Length
	AT+WOR	Set/Query WOR Role
	AT+WTIME	Set/Query WOR period
	AT+POWER	Set/Query Transmit Power
	AT+TRANS	Set/Query Transmit Mode
	AT+ROUTER	Set/query relay mode
	AT+LBT	Query Listen Before Talk switch
	AT+ERSSI	Query ambient noise RSSI switch
	AT+DRSSI	Query RSSI output
	AT+ADDR	Query module address
	AT+CHANNEL	Query module working channel
	AT+NETID	Set Network ID
	AT+KEY	Setting the module key

5.5 Description of the AT command

5.5.1 AT link check

Command	Responsive	Example
AT	AT_OK	Send: AT Return：AT_OK //command successfully responded

5.5.2 Check Firmware Version

Command	Responsive	Example
AT+FWCODE=?	<version number>	Send: AT+FWCODE=?

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	AT_OK	Return: FWCODE=75XX-0-10 AT_OK

5.5.3 Check UID

Command	Responsive	Example
AT+UID=?	< BASE MAC> AT_OK	Send: AT+UID=? Return: d0:ef:76:9b:3e:34 AT_OK //command successfully responded
< base MAC >	The returned BASE MAC address is in hexadecimal characters.	
Description: <BASE MAC> chip base MAC, <BLE MAC> adds 2 to this base. e.g. a module with a <BASE MAC> of d0:ef:76:9b:3e:34 has a <BLE MAC> of d0:ef:76:9b:3e:36.		

5.5.4 Module Model

Command	Responsive	Example
AT+DEVTYPE=?	<Module Model> AT_OK	Send: AT+DEVTYPE=? Return: DEVTYPE=EWM22A-900BWL22S AT_OK //command successfully responded
<Module Model>	Return Module Model:EWM22A-900BWL22S, EWM22A-400BWL22S;	

5.5.5 Reset Chips

Command	Responsive	Example
AT+RESET	AT_OK	Send: AT+RESET Return: AT_OK

5.5.6 Restore Factory Setting

Command	Responsive	Example
AT+DEFAULT	AT_OK	Send: AT+DEFAULT Return: AT_OK //command successfully responded
Description: Will restart automatically.		

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5.5.7 Serial port setting

Command	Responsive	Example
AT+UART=?	AT_OK	Send: AT+UART=? Return: 7,0 AT_OK //command successfully responded
AT+UART=<Baud rate>,<Check digit>.	AT_OK	Send: AT+UART=3,0 Return: 3,0 AT_OK //command successfully responded
<Baud rate>	0 --- 1200 1 --- 2400 2 --- 4800 3 --- 9600 4 --- 19200 5 --- 38400 6 --- 57600 7 --- 115200	
<check digit>	0 --- disable 1 --- odd 2 --- even 3 --- disable	
Description: Reboot to take effect, power down to save; Two modules communicating with each other can have different serial port baud rates and different checksums; When transmitting larger data packets continuously, users need to consider the data blocking brought by the same baud rate, and may even be lost; It is generally recommended that the baud rates of the two communicating parties are the same.		

5.5.8 AT Instruction Query

Command	Responsive	Example
AT+HELP=?	<command list AT_OK	Send: AT+HELP=? Return: AT_OK //command successfully responded

5.5.9 AT Disable display back

Command	Responsive	Example
ATE0	AT_OK	Send: ATE0 Return： AT_OK //command successfully responded

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5.5.10 AT Enable display back

Command	Responsive	Example
ATE1	AT_OK	Send: ATE1 Return： AT_OK //command successfully responded

5.5.11 Status Printing

Command	Responsive	Example
AT+LOGMSG=?	<Status Print Switch> AT_OK	Send: AT+LOGMSG=? Return: 11 AT_OK //command successfully responded
AT+LOGMSG=<output switch>	<output switch> AT_OK	Send: AT+LOGMSG=1 Return: 1 AT_OK //command successfully responded
<Status Print Switch>	0 --- off 1 --- On (default)	
Description: Effective immediately, power down to save;		

5.5.12 BLE/WIFI/LORA Forced switch

Command	Responsive	Example
AT+COMSW=?	L: <Switch>,W: <Switch>,B: <Switch> AT_OK	Send: AT+COMSW=? Return: L:1,W:1,B:1 AT_OK //command successfully responded
AT+COMSW=<switch>,<switch>,<switch>,<switch>	<Switch AT_OK	Send: AT+COMSW=1,1,1 Return: 1 AT_OK //command successfully responded
<Switch>	0 --- off 1 --- On (default)	
Description: Reboot to take effect, power down to save; Force off BLE/WIFI/LORA, use this command with caution, it may conflict with the function of various modes.		

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5.5.13 BLE/WIFI key pairing

Command	Responsive	Example
AT+AUTHKEY=?	<AUTHKEY> AT_OK	Send: AT+AUTHKEY=? 123456 Return: AT_OK //command successfully responded
AT+ AUTHKEY=XXXXXX	<AUTHKEY> AT_OK	Send: AT+AUTHKEY=123456 123456 Return: AT_OK //command successfully responded
<AUTHKEY>	BLE, TCP into the configuration mode need to verify the key, the length of 6-15 characters, the default 123456.	
Description: Effective immediately, power down to save;		

5.5.14 BLE/WIFI Configuring Authentication

Command	Responsive	Example
AT+AUTH=XXXXXX	AT_OK	Send: AT+AUTH=123456 Return: AT_OK //command successfully responded
Description: Valid for single connection, need to authenticate again after reconnecting ; After BLE, TCP and the module are connected, you can send this command through the configuration channel, and after the return success, you can use all AT commands through the configuration channel; If there is no authorization to send commands directly, the module returns “AT_AUTH_ERR”. This command is only used for BLE configuration, UART can not use this command, to modify the key use AT+AUTHKEY command.		

5.5.15 Exit Configuration Authentication

Command	Responsive	Example
AT+AUTHEXIT	AT_OK	Send: AT+AUTHEXIT Return: AT_OK //command successfully responded
Description: BLE, TCP and module connection, through the AT + AUTH = XXXXXXXX into the configuration of the successful authentication before using this configuration; This command is only used for BLE and TCP configuration, UART cannot use this command.		

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5.5.16 Shallow sleep

Command	Responsive	Example
AT+LIGHTSLEEP	AT_OK	Send: AT+LIGHTSLEEP Return: AT_OK
Description: Turn off WIFI, BLE, LoRa to significantly reduce power consumption; Can use serial port to wake up, power consumption is higher than deep hibernation;		

5.5.17 Deep sleep

Command	Responsive	Example
AT+DEEPSLEEP	AT_OK	Send: AT+DEEPSLEEP Return: AT_OK //command successfully responded
Description: Turning off WIFI, BLE, LoRa significantly reduces power consumption; Wake-up via wake pin low consumes less power than shallow hibernation.		

5.5.18 Working mode

Command	Responsive	Example
AT+HMODE=?	<working mode> AT_OK	Send: AT+HMODE=? Return: 0 AT_OK //command successfully responded
AT+HMODE=<working mode>	AT_OK	Send: AT+HMODE=3 Return: 3 AT_OK //command successfully responded
<working mode>	0 --- Configuration mode 1 --- UART/LORA pass-through, BLE listening 2 --- UART/BLE passthrough, LORA listening 3 --- LORA/BLE passthrough, UART listening 4 --- UART/LORA passthrough, WIFI listening 5 --- LORA/WIFI passthrough, UART listening 6 --- UART/WIFI passthrough, LORA listening 7 --- LORA/UART passthrough, WOR mode, WIFI/BLE both off	
Description: After switching the module, the module restarts automatically;		

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5.5.19 Deep sleep hold function

Command	Responsive	Example
AT+SLEEPKEEP=?	<Hold switch> AT_OK	Send: AT+SLEEPKEEP=? Return: 1 AT_OK //command successfully responded
AT+SLEEPKEEP=<Hold switch>	AT_OK	Send: AT+SLEEPKEEP=1 Return: 1 AT_OK //command successfully responded
<Hold switch>	0 --- off (default) 1 --- On	
Description: Effective immediately, power down save; If this function is turned on, the module still enters deep hibernation after power down and restart, and can be woken up by wake pin low.		

5.5.20 Listening Settings

Command	Responsive	Example
AT+SMODE=?	<monitor switch>,<listener prefix> AT_OK	Send: AT+SMODE=? Return: 1,1 AT_OK //command successfully responded
AT+SMODE=1,1	AT_OK	Send: AT+SMODE=1.1 Return: 1,1 AT_OK //command successfully responded
<Listening switch>	0 --- off 1 --- On (default)	
<listener prefix>	0 --- off 1 --- On (default)	
Description: Effective immediately, power-down save; Controls whether the listening end listens for data and whether it prints the data flow and length prefix.		

5.5.21 WIFI STA

Command	Responsive	Example
AT+STA=?	<SSID>,<PASSWORD> AT_OK	Send: AT+STA=? Return: KingOfSoftware,123456789 AT_OK //command successfully responded
AT+STA=wifissid,wifipswd	<SSID>,<PASSWORD>	Send: AT+STA=wifissid,wifipswd

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	AT_OK	Return: wifissid,wifipswd AT_OK //command successfully responded
<SSID>	SSID of the target AP. length 1-32 characters.	
<PASSWORD>	Password of the target AP. Length is 8-32 characters.	
Description: Reboot to take effect, power down to save; Can only connect to 2.4G AP, and only support WPA2 WIFI security authentication method.		

5.5.22 Connection target TCP server IP/PORT

Command	Responsive	Example
AT+CIPSTATE=?	<TCP server IP>,<PORT> AT_OK	Send: AT+CIPSTATE=? Return: 192.168.31.102,3333 AT_OK //command successfully responded
AT+CIPSTATE=192.168.31.102,3333	<TCP server IP>,<PORT> AT_OK	Send: AT+CIPSTATE=192.168.31.102,3333 Return: 192.168.31.102,3333 AT_OK //command successfully responded
Description: Reboot to take effect, power down to save. Only IPV4 IP addresses are supported.		

5.5.23 BLE broadcast name

Command	Responsive	Example
AT+BLENAME=?	<BLE broadcast name> AT_OK	Send: AT+BLENAME=? Return: EWM22A-900BWL22S AT_OK //command successfully responded
AT+BLENAME=<BLE broadcast name>	<BLE broadcast name> AT_OK	Send: AT+BLENAME=ABC Return: ABC AT_OK //command successfully responded
<BLE broadcast name>	Broadcast name length no greater than 16 bytes; factory default broadcast name is module model (EWM22A-900BWL22S, EWM22A-400BWL22S)	
Description: Reboot to take effect, power down to save;		

5.5.24 BLE Broadcast Intervals

Command	Responsive	Example
AT+BLEADV=?	<broadcast interval>	Send: AT+BLEADV=?

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	AT_OK	Return: 100 AT_OK //command successfully responded
AT+BLEADV=<broadcast interval>	<broadcast interval> AT_OK	Send: AT+BLEADV=100 Return: 100 AT_OK //command successfully responded
<broadcast interval>	Broadcast interval, parameter value range 32-16384, default 1600, 1600*0.625ms=1000ms	
Description: Reboot to take effect, power down to save The larger the broadcast interval, the longer the update time and the lower the power consumption;		

5.5.25 BLE power setting

Command	Responsive	Example
AT+BLEPOWER=?	<BLE power level> AT_OK	Send: AT+BLEOTA=? Return: 1 AT_OK //command successfully responded
AT+BLEOTA =<BLE power level>	<BLE power level> AT_OK	Send: AT+BLEOTA=1 Return: 1 AT_OK //command successfully responded
<BLE power level>	0 --- +20dbm 1 --- +15dbm 2 --- +9dbm 3 --- +3dbm 4 --- 0dbm(default) 5 --- -3dbm 6 --- -9dbm	
Description: Power and current are non-linearly related, and the power supply is most efficient at maximum power; Current does not decrease in the same proportion as power decreases.		

5.5.26 BLE Upgrade settings

Command	Responsive	Example
AT+BLEOTA=?	<BLE Upgrade Switch> AT_OK	Send: AT+BLEOTA =? Return: 1 AT_OK //command successfully responded
AT+BLEOTA =<BLE Upgrade Switch>	<BLE Upgrade Switch> AT_OK	Send: AT+BLEOTA =1 Return: 1 AT_OK //command successfully responded
<BLE Upgrade Switch>	0 --- off (default)	

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	1 --- On
Description Immediately effective, power down to save. BLE OTA will occupy a lot of stack, enable this function will only run BLE function to avoid upgrade failure. The module will restart automatically after successful upgrade, firmware upgrade may add settings, it is recommended to manually restore factory settings and reconfigure the module after upgrade;	

5.5.27 LoRa airspeed

Command	Responsive	Example
AT+RATE =?	<airspeed> AT_OK	**Send: AT+RATE=?** **Return: 2** **AT_OK //command successfully responded**
AT+RATE =<airspeed>	<airspeed> AT_OK	**Send: AT+RATE=1** **Return: 1** **AT_OK //command successfully responded**
<airspeed>	0 --- 2.4K 1 --- 2.4K 2 --- 2.4K 3 --- 4.8K 4 --- 9.6K 5 --- 19.2K 6 --- 38.4K 7 --- 62.5K	
Description: The air rate must be the same for both sides of the LoRa communication; The higher the air rate, the lower the delay and the shorter the transmission distance.		

5.5.28 LoRa Packet length

Command	Responsive	Example
AT+PACKET=?	<Packet length> AT_OK	Send: AT+PACKET=? Return: 1 AT_OK //command successfully responded
AT+PACKET =<Packet length>	<Packet length> AT_OK	Send: AT+PACKET=1 Return: 1 AT_OK //command successfully responded
<Packet length>	0 --- 240 (default)	

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	1 --- 128 2 --- 64 3 --- 32
Description: The user sends data less than the packet length, the serial port output at the receiving end is presented as uninterrupted continuous output; If the data sent by the user is larger than the packet length, the serial port at the receiving end will output in packets.	

5.5.29 LoRa WOR role

Command	Responsive	Example
AT+WOR=?	<WOR role > AT_OK	Send: AT+PACKET=? Return: 1 AT_OK //command successfully responded
AT+WOR =< WOR role>	< WOR role > AT_OK	Send: AT+PACKET=1 Return: 1 AT_OK //command successfully responded
<WOR role>	0 --- WOR receiver (default) Working in WOR listening mode with the listening period described below (WOR period) saves a lot of power consumption. 1 --- WOR transmitter Module transmits and receives on and adds a wake-up code for a certain period of time when transmitting data.	
Description: Valid only for mode 7;		

5.5.30 LoRa WOR cycle

Command	Responsive	Example
AT+WTIME=?	<time index> AT_OK	Send: AT+WTIME=? Return: 1 AT_OK //command successfully responded
AT+WTIME=<time index>	<time index> AT_OK	Send: AT+WTIME=1 Return: 1 AT_OK //command successfully responded
<time index>	0 --- 500ms 1 --- 1000ms 2 --- 1500ms 3 --- 2000ms 4 --- 2500ms	

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	5 --- 3000ms 6 --- 3500ms 7 --- 4000ms (default)
Description: Valid only for mode 7; Cycle time T= (1+WOR)*500ms, the maximum is 4000ms and the minimum is 500ms; The longer the period time between WOR listening intervals, the lower the average power consumption, but the higher the data delay; Both sender and receiver must agree (very important)	

5.5.31 LoRa firing power

Command	Responsive	Example
AT+POWER=?	<Power Index> AT_OK	Send: AT+WTIME=? Return: 1 AT_OK //command successfully responded
AT+POWER=<Power Index>	<Power Index> AT_OK	Send: AT+WTIME=1 Return: 1 AT_OK //command successfully responded
<Power Index>	0 --- 22dBm 1 --- 22dBm 2 --- 22dBm 3 --- 22dBm	
Power and current are non-linearly related, and the power supply is most efficient at maximum power; Current does not decrease in the same proportion as power decreases.		

5.5.32 LoRa transfer mode

Command	Responsive	Example
AT+TRANS=?	<LoRa transfer mode> AT_OK	Send: AT+TRANS=? Return: 1 AT_OK //command successfully responded
AT+TRANS=<LoRa transfer mode>	<LoRa transfer mode> AT_OK	Send: AT+TRANS=1 Return: 1 AT_OK //command successfully responded
<LoRa transfer mode>	0 --- transparent (default) 1 --- fixed point	
For fixed-point transmission, the module recognizes the first three bytes of the serial data as: address high + address low + channel, and uses them as the wireless transmit target.		

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5.5.33 LoRa relay mode

Command	Responsive	Example
AT+ROUTER=?	<LoRa relay switch> AT_OK	**Send: AT+ROUTER=?** **Return: 1** **AT_OK //command successfully responded**
AT+ROUTER=<LoRa relay switch>	<LoRa relay switch> AT_OK	**Send: AT+ROUTER=1** **Return: 1** **AT_OK //command successfully responded**
<LoRa relay switch>	0 --- off (default) 1 --- On	
When the relay function is enabled, the module will initiate a forwarding if the destination address is not the module itself; In order to prevent data backhauling, it is recommended to be used in conjunction with fixed-point mode; i.e., the destination address is different from the source address.		

5.5.34 LoRa Listen Before Talk

Command	Responsive	Example
T+LBT=?	<LBT switch> AT_OK	Send: T+LBT=? Return: 1 AT_OK //command successfully responded
T+LBT=<LBT switch>	<LBT switch> AT_OK	Send: T+LBT=1 Return: 1 AT_OK //command successfully responded
<LBT switch>	0 --- off (default) 1 --- On	
When enabled, wireless data will be listened to before transmitting, which can avoid interference to some extent, but may bring data delay; The maximum dwell time of LBT is 2 seconds, and it will be forced to send out when it reaches two seconds.		

5.5.35 LoRa Environmental RSSI (erssi)

Command	Responsive	Example
AT+ERSSI=?	< ERSSI switch> AT_OK	Send: AT+ERSSI=? Return: 1 AT_OK //command successfully responded
T+LBT=< ERSSI switch>	< ERSSI switch> AT_OK	Send: AT+ERSSI=1 Return: 1

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		AT_OK //command successfully responded
< ERSSI switch>	0 --- off (default) 1 --- On	
Description: Reboot to take effect, power down to save; When enabled, you can send instruction C0 C1 C2 C3 instruction to read registers in UART-loRa mode or WOR transmit mode; Register 0x00 : current ambient noise RSSI; Register 0X01 : RSSI of the last received data. (The current channel noise is: dBm = -(256 - RSSI)); Instruction format: C0 C1 C2 C3 + start address + read length; return: C1 + address + read length + read the effective value; for example: send C0 C1 C2 C3 00 01 Return C1 00 01 RSSI (address can only start from 00)		

5.5.36 LoRa Data RSSI (data_rssi)

Command	Responsive	Example
AT+DRSSI=?	< DRSSI switch AT_OK	Send: AT+DRSSI=? Return: 1 AT_OK //command successfully responded
AT+DRSSI=< DRSSI switch>	< DRSSI switch AT_OK	Send: T+DRSSI=1 Return: 1 AT_OK //command successfully responded
< DRSSI switch>	0 --- off (default) 1 --- On	
Description: When enabled, the module receives wireless data, which will follow an RSSI intensity byte when output through the serial port TXD.		

5.5.37 LoRa module address

Command	Responsive	Example
AT+ADDR=?	<module address> AT_OK	Send: AT+ADDR=? Return: 1 AT_OK //command successfully responded
AT+ADDR=<module address>	<module address> AT_OK	Send: AT+ADDR=1 Return: 1 AT_OK //command successfully responded
<module address>	Module address 0~65535 (decimal), default 0	
Description: Module address high byte and low byte;		

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Note: When the module address is equal to FFFF, it can be used as the broadcast and listening address, i.e.: at this point the module will not be address filtered

5.5.38 LoRa module channel

Command	Responsive	Example
AT+CHANNEL=?	< CH > AT_OK	Send: AT+CHANNEL=? Return: 18 AT_OK //command successfully responded
AT+CHANNEL=< CH >	<module channel> AT_OK	Send: AT+ CHANNEL=18 Return: 18 AT_OK //command successfully responded
< CH >	Channel Control (CH) 0-83 represent a total of 84 channels (for 400 band) respectively 0-80 represent a total of 81 channels respectively (for 900 band)	
Description: Actual frequency = 410.125 + CH * 1M Actual frequency = 410.125 + CH * 1M Actual frequency = 850.125 + CH * 1M		

5.5.39 LoRa Network ID

Command	Responsive	Example
AT+NETID=?	<Network ID > AT_OK	Send: AT+NETID=? Return: 0 AT_OK //command successfully responded
AT+NETID=<Network ID >	<Network ID > AT_OK	Send: AT+NETID=0 Return: 0 AT_OK //command successfully responded
<Network ID >	Module network 0~255 (decimal), default 0	
Description: Network address for distinguishing networks; When communicating with each other, they should be set to the same.		

5.5.40 LoRa Key（key）

Command	Responsive	Example
AT+KEY=?	<KEY> AT_OK	Send: AT+KEY=? Return: 0 AT_OK //command successfully responded

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AT+KEY=<KEY>	<KEY> AT_OK	Send: AT+KEY=1 Return: 0 AT_OK //command successfully responded
<KEY>	Module key 0~65535 (decimal),default 0	
Description: Write only, read returns 0; Used for encryption to avoid interception of over-the-air wireless data by similar modules; The module will internally use these two bytes as a calculation factor to transform and encrypt the over-the-air wireless signal.		

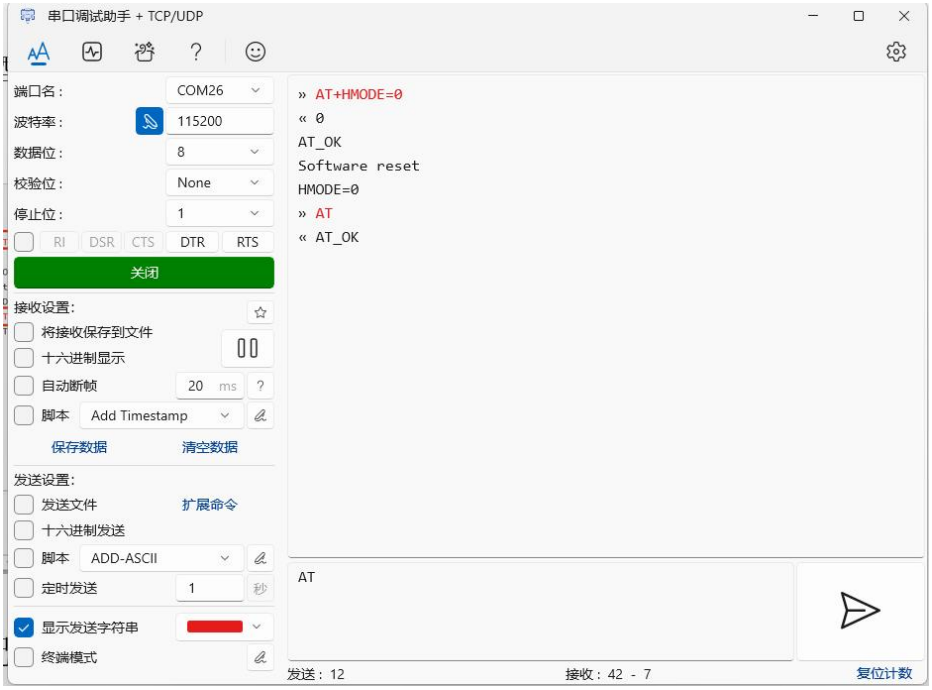
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6 Quick Start

1. UART AT command configuration module

AT+HMODE=0 //Enter the configuration module



2. BLE AT command configuration module

1、 Preparation of cell phone APP (Android phone)

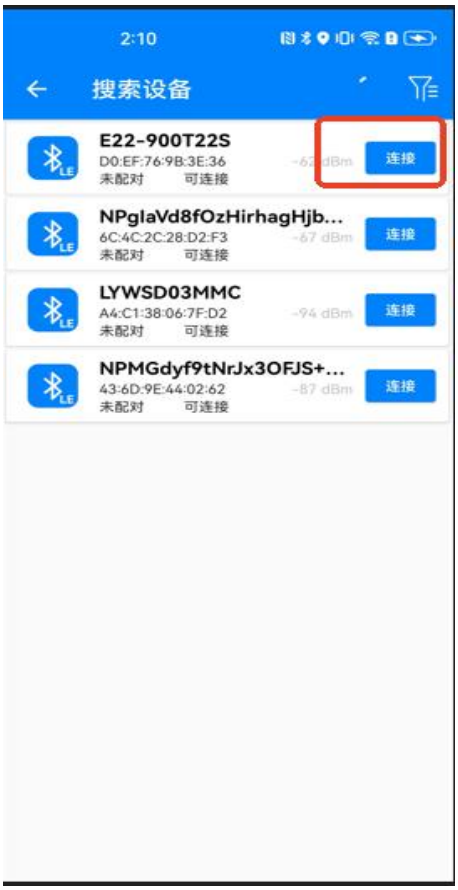


2、 Connect to the module Bluetooth, send AT+AUTH=123456

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3. TCP AT command configuration module

1、 Preparation

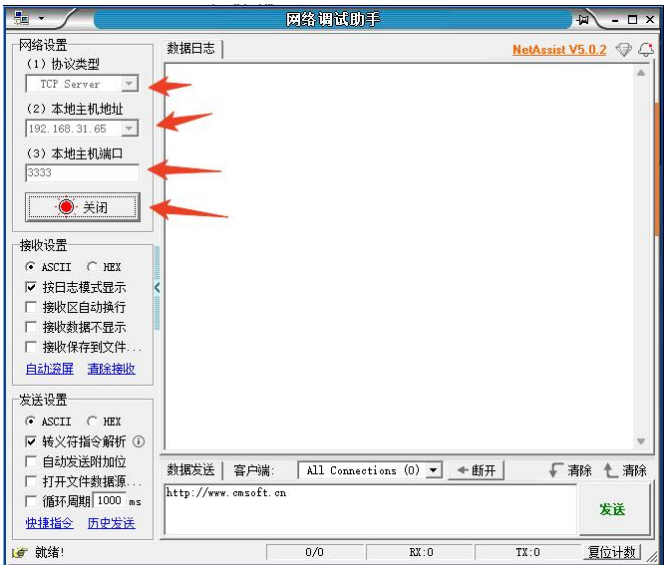
① NetAssist.exe



② A computer, and ensure that the module and the computer can be connected to the same wifi hotspot (2.4g hotspot) at the same time.

③ Can use the serial port or BLE configuration module, and the module 2.4g must be connected to the antenna

2、 Start NetAssist.exe and open a tcp server:



3、 AT command configuration to connect to TCP Server

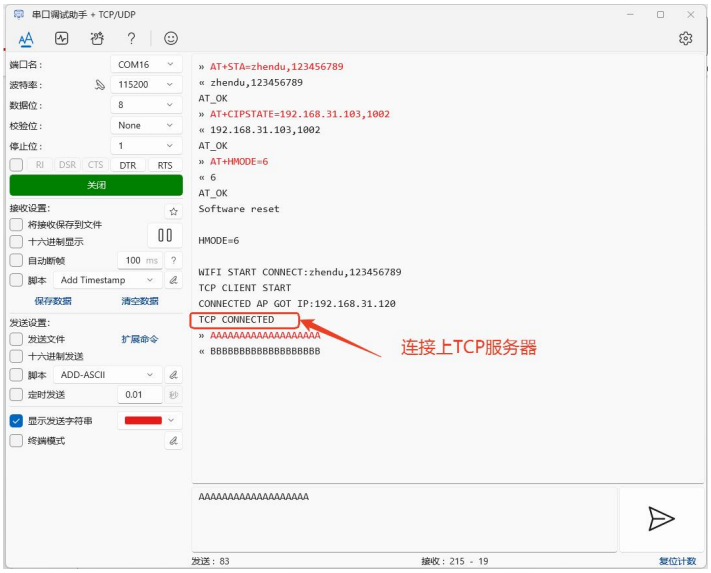
AT+STA=zhendu,123456789 // set wifi account/password

AT+CIPSTATE=192.168.31.103,1002 // Set the IP/port of the TCP server to connect to.

AT+HMODE=6 // Enter mode 6, UART-TCP passthrough.

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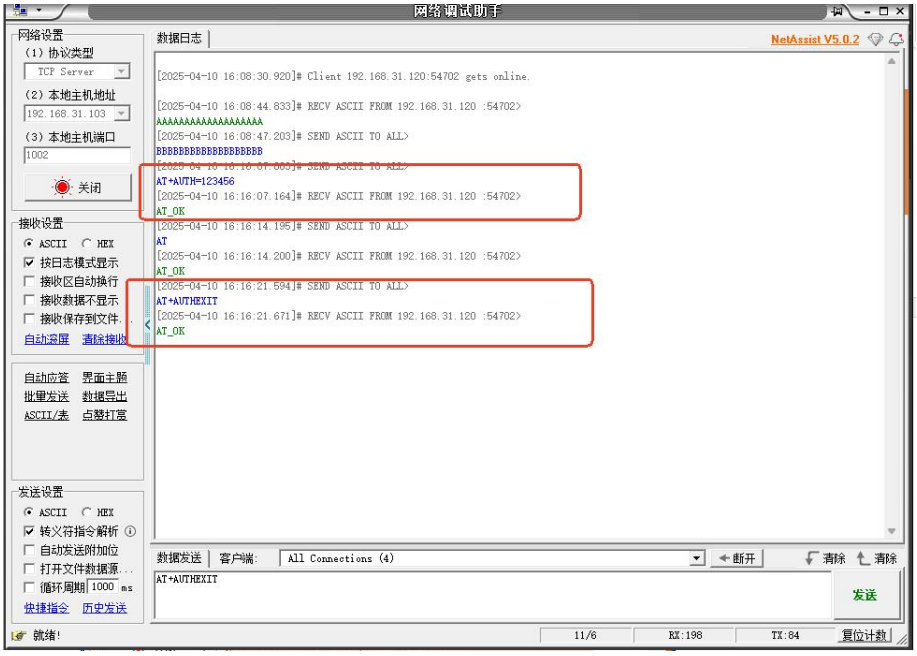


4、 Configured by NetAssist.exe using AT commands

AT+AUTH=123456 // Perform permission verification to enter AT command mode.

AT // Verify entry into AT command mode

AT+AUTHEXIT // exit AT command configuration



4. LoRa fired at a fixed point

AT+HMODE=0 // Enter configuration

AT+TRANS=1 // Fixed-point transmission

AT+ADDR=1 // Set module address to 00 01

AT+CHANNEL=1 // set channel to 1

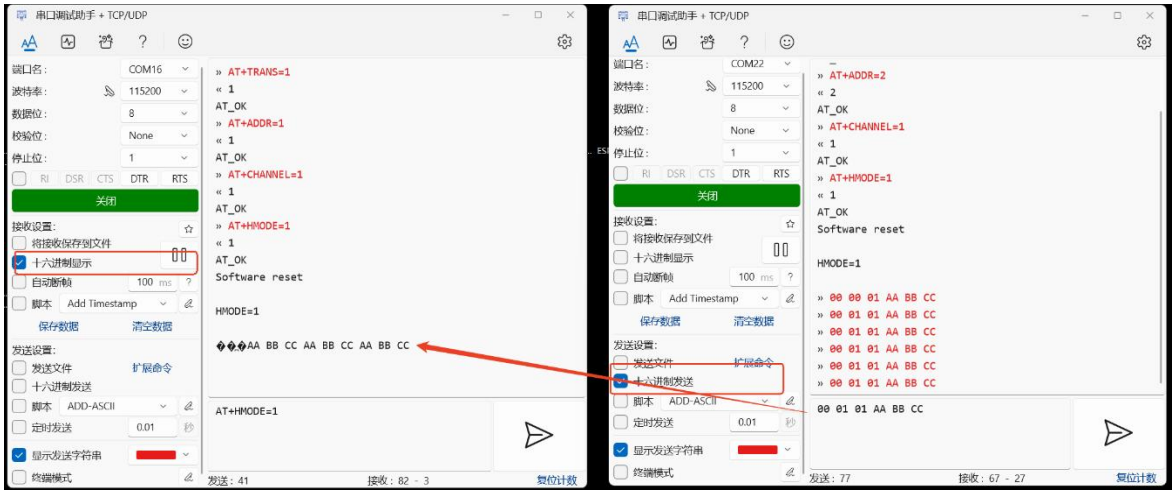
AT+HMODE=1 // Set mode UART-LoRa pass-through, BLE listening

Transmit/receive data in hexadecimal

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00 01 01 AA BB CC // Target address is 00 01, channel is 01, data is AA BB CC



5. UART-LoRa Transmission, BLE Listening

Topology:

Two through LoRa to achieve serial port pass-through, the use of cell phones / or other Bluetooth host module (eg: E104-BT53) connected to one of the modules, to achieve the module to listen to the serial port and LoRa data, this example uses a cell phone to listen to the data

1, both modules serial port AT + HMODE = 1 command.

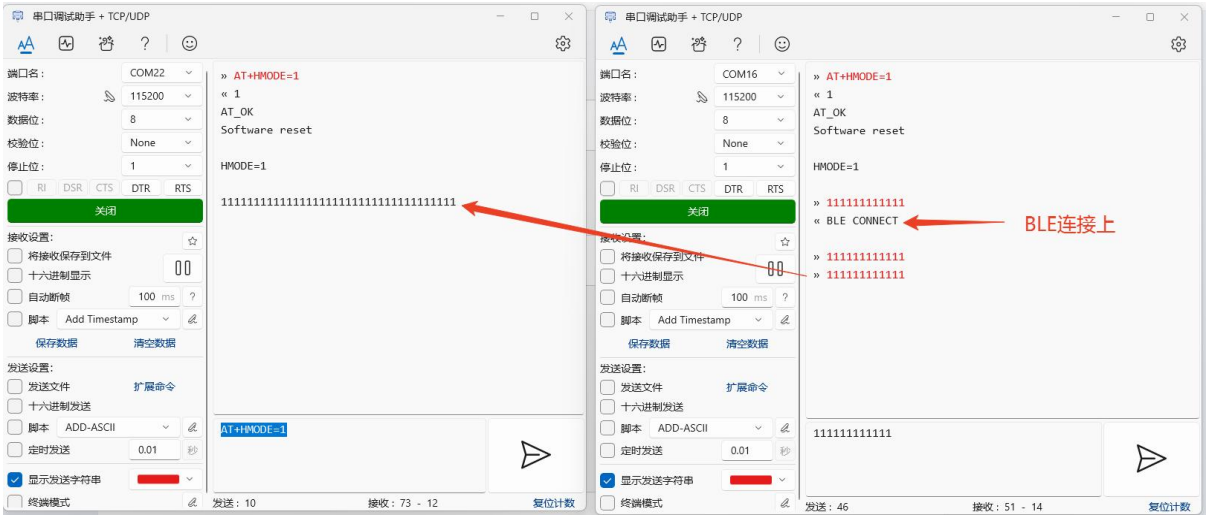
2、Use【BLE debugging treasure】to connect to one of the module bluetooth, modify the MTU, through the FFF2 channel to send AT+AUTH=123456





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6. UART-WIFI pass-through, LoRa listening

Topology:

A module is connected to TCP to realize data passthrough between serial port and TCP, and the data flow will be sent out through LoRa, using another LoRa module can receive the data and print out through serial port.

Module I:

AT command to configure connection to TCP Server

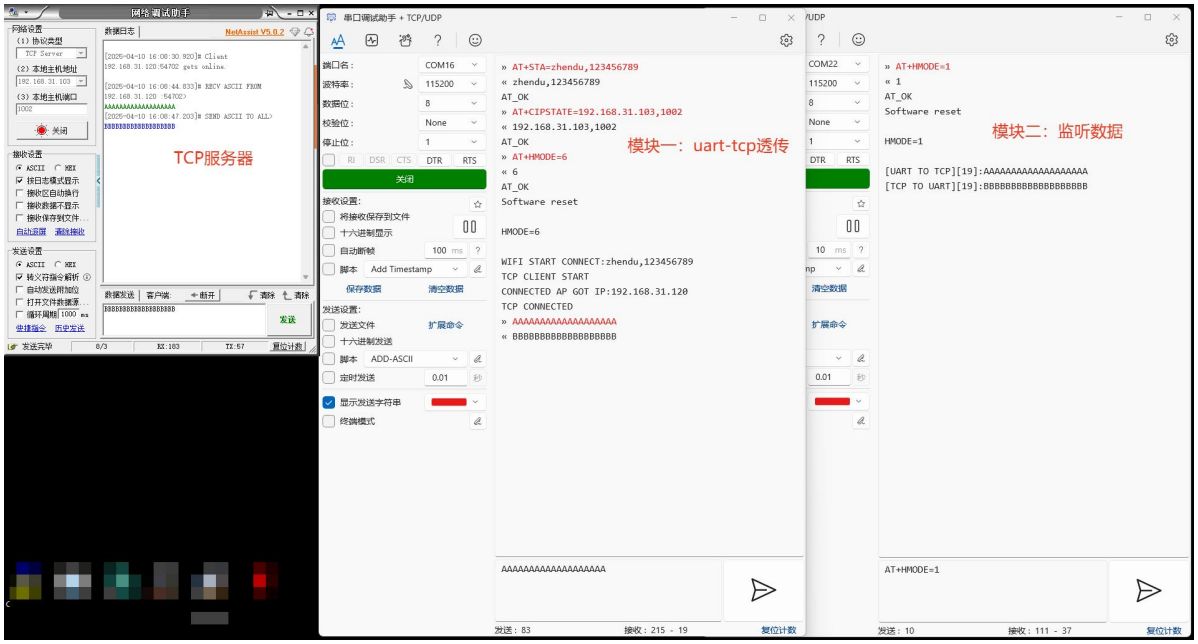
AT+STA=zhendu,123456789 // set wifi account/password

AT+CIPSTATE=192.168.31.103,1002 // Set the IP/port of the TCP server to connect to.

AT+HMODE=6 // Enter mode 6, UART-TCP passthrough.

Module 2:

AT+HMODE=1 // enter mode 1,UART-LoRa pass-through, BLE listening (mainly using LoRa)

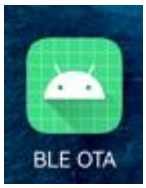


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7. BLE Upgrade module firmware

1. Preparation of cell phone APP (Android phone)



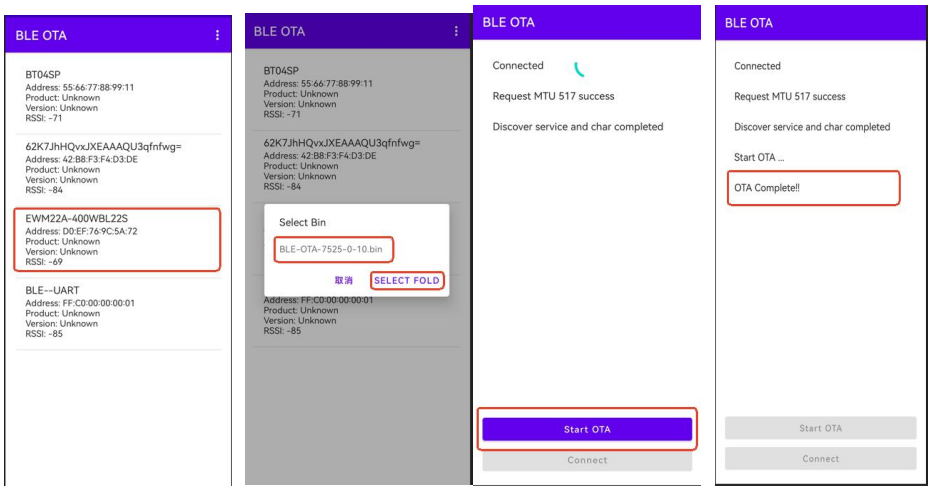
2. 2Prepare the upgrade file: BLE-OTA-7525-0-10.bin

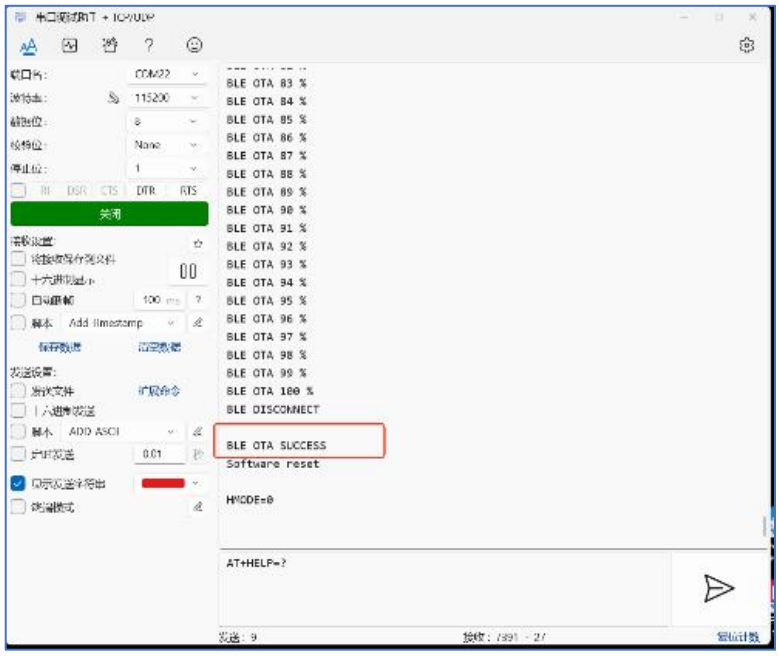
3. Configure the AT command to enter BLE upgrade mode.

AT+BLEOTA=1 // Enter BLE upgrade mode.

4、Use the BLE OTA.apk upgrade program.

5、Connect the module's BLE, upgrade to select the firmware for upgrading.





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7 Hardware design

- It is recommended to use a DC regulated power supply to power this module, the power supply ripple factor should be as small as possible, and the module should be reliably grounded;
- Please pay attention to the correct connection of the positive and negative terminals 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 supply voltages, if it exceeds the maximum value it may cause permanent damage to the module;
- Please check the power supply stability, the voltage should not fluctuate significantly and frequently;
- When designing the power supply circuit for the module, it is often recommended to keep more than 30% of the residual amount, and there is the whole machine is conducive to long-term stable work;
- Module should be as far away as possible from the power supply, transformers, high-frequency alignments and other electromagnetic interference parts;
- High-frequency digital alignment, high-frequency analog alignment, power supply alignment must be avoided below the module, if you really need to go through the module below, assuming that the module is welded in the Top Layer, in the module contact part of the Top Layer paved copper (all paved copper and a good ground), it must be close to the digital part of the module and the alignment in the Bottom Layer;
- Assuming that the module is soldered or placed in the Top Layer, it is also wrong to route the module in the Bottom Layer or any other layer, as this will affect the spuriousness of the module as well as the reception sensitivity to varying degrees;
- Assuming that the module is surrounded by large electromagnetic interference devices will also greatly affect the performance of the module, according to the intensity of the interference is recommended to stay away from the module, if the situation permits you can do appropriate isolation and shielding;
- Assume that there is a large electromagnetic interference around the module alignment (high-frequency digital, high-frequency analog, power supply alignment) will also greatly affect the performance of the module, according to the intensity of the interference is recommended to be appropriate away from the module, if the situation permits you can do appropriate isolation and shielding;
- Communication line if you use 5V level, must be connected in series with 1k-5.1k resistor (not recommended, there is still a risk of damage);
- Try to stay away from some TTL protocols whose physical layer is also 2.4GHz, e.g. USB3.0;
- Antenna mounting structure has a big impact on the module performance, make sure the antenna is exposed and preferably vertically upward; when the module is mounted inside the chassis, use a good quality antenna extension cable to extend the antenna to the outside of the chassis;
- Antenna must not be installed inside the metal housing, which will result in a great weakening of the transmission distance.

8 Common problems

8.1 Unsatisfactory transmission distance

- When there are linear communication barriers, the communication distance will decay accordingly;
- Temperature, humidity, and co-channel interference, which will lead to higher communication packet loss rate;

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- The ground absorbs and reflects radio waves, and the test results are poorer near the ground;
- Seawater has a strong ability to absorb radio waves, so the effect of the seaside test is poor;
- Metal objects near the antenna, or placed in a metal shell, the signal attenuation will be very serious;
- Wrong power register setting, air rate setting is too high (the higher the air rate, the closer the distance);
- Low voltage of power supply at room temperature is lower than the recommended value, the lower the voltage the lower the hair power;
- The use of antenna and module matching degree is poor or the antenna itself quality problems.

8.2 Modules are fragile

- Please check the power supply to ensure that it is between the recommended supply voltages, if it exceeds the maximum value it will cause permanent damage to the module;
- Please check the power supply stability, the voltage can not be substantial frequent fluctuations;
- Please ensure that the installation and use process anti-static operation, high-frequency device electrostatic sensitivity;
- Please ensure that the installation and use of the process of humidity should not be too high, part of the components for humidity-sensitive devices;
- If there is no special demand is not recommended to be used at too high or too low a temperature.

8.3 BER is too high

- Near the same frequency signal interference, away from the source of interference or modify the frequency and channel to avoid interference;
- Poor power supply may also cause garbled code, be sure to ensure the reliability of the power supply;
- Extension cords, feeder cords of poor quality or too long, can also cause high BER.

9 Welding instructions

9.1 Reflow temperature

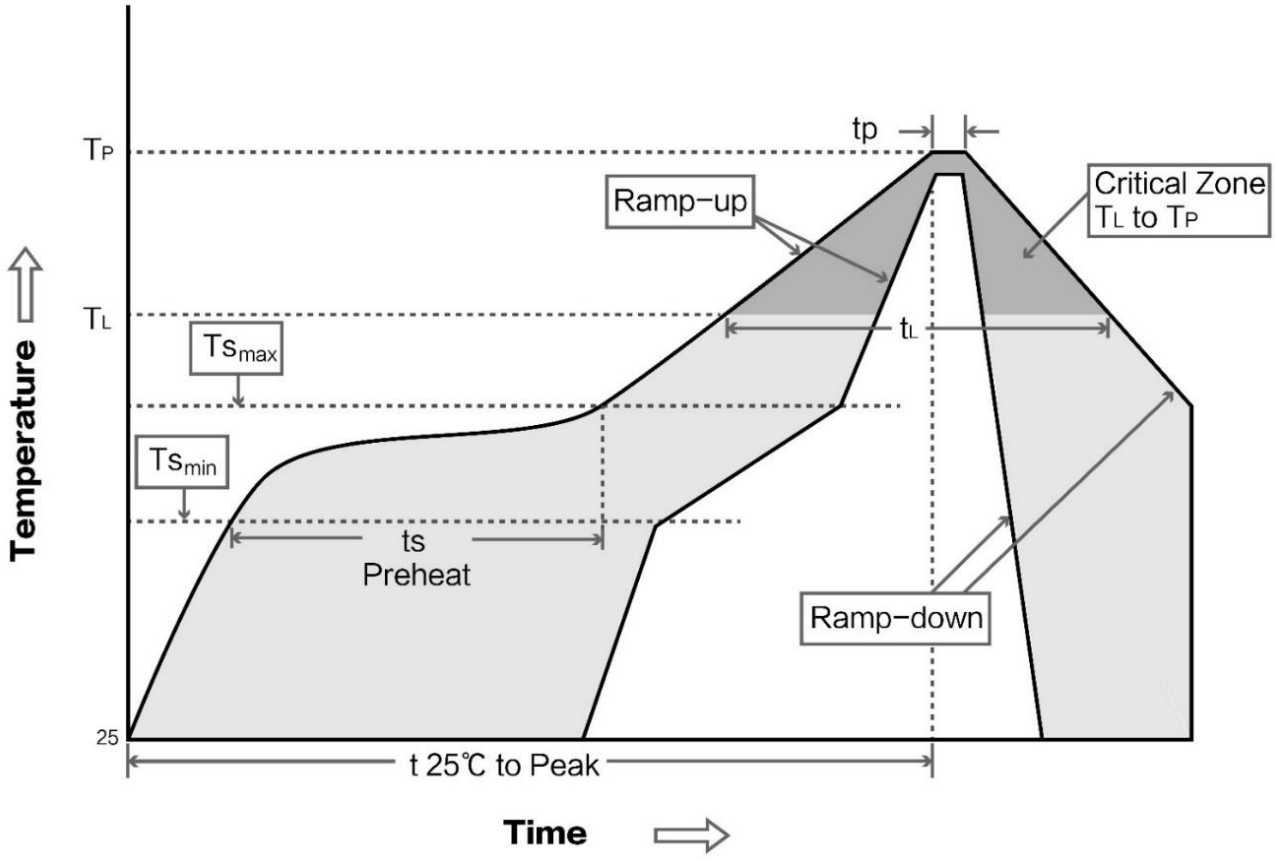
Profile Feature	Curve Characteristics	**Sn-Pb Assembly**	**Pb-Free Assembly**
Solder Paste	Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	Minimum Preheat Temperature	100℃	150℃
Preheat temperature max (Tsmax)	Maximum Preheat Temperature	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	Preheat Time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average Rise Rate	3℃/second max	3℃/second max

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Liquidous Temperature (TL)	Liquid phase temperature	183℃	217℃
Time（tL）Maintained Above（TL）	Time above liquid phase line	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average rate of descent	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time from 25°C to peak temperature	6 minutes max	8 minutes max

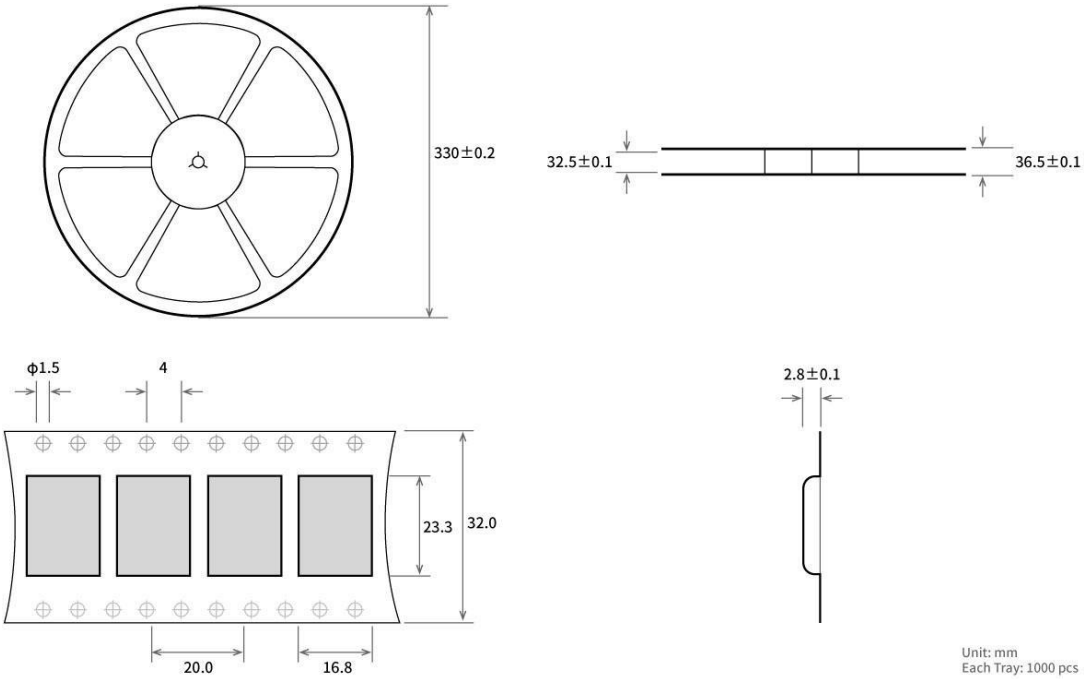
9.2 Reflow temperature



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10 Product Packaging



Revision history

Version	Date	Description	Issued by
1.0	2025-5-13	Initial version	Bin
1.1	2026-5-15	Content revision	Bin

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