EWM220M-xxxT22S User Manual

433/470MH z 22dBm new generation small size LoRa wireless module



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Table of contents

CHAPTER 1 PRODUCT OVERVIEW 3
1.1 PRODUCT INTRODUCTION 3
1.2 FEATURES 3
1.3 APPLICATION SCENARIO 3
CHAPTER 2 SPECIFICATIONS 5
2.1 LIMIT PARAMETERS 5
2.2 WORKING PARAMETERS 5
CHAPTER 3 MECHANICAL DIMENSIONS AND PIN DEFINITION 6
CHAPTER 4 RECOMMENDED CONNECTION DIAGRAM 8
CHAPTER 5 FUNCTION DETAILED EXPLANATION 9
5.1 FIXED-POINT LAUNCH 9
5.2 BROADCAST TRANSMISSION 9
5.3 BROADCAST ADDRESS 10
5.4 LISTENING ADDRESS 10
5.5 MODULE RESET 10
5.6 AUX DETAILED EXPLANATION 10
CHAPTER 6 WORKING MODE 12
6.1 MODE SWITCHING 12
6.2 NORMAL MODE (MODE 0) 13
6.3 WOR SENDING MODE (MODE 1) 13
6.4 WOR RECEIVING MODE (MODE 2) 14
6.5 SLEEP MODE (MODE 3) 14
CHAPTER 7 REGISTER READ AND WRITE CONTROL 14
7.1 COMMAND FORMAT 14
7.2 REGISTER DESCRIPTION 15
7.3 FACTORY DEFAULT PARAMETERS 17
CHAPTER 8 PC CONFIGURATION SOFTWAREINSTRUCTIONS 18
CHAPTER 9 HARDWARE DESIGN 19
CHAPTER 10 FAQ 20
10.1 TRANSMISSION DISTANCE IS NOT IDEAL 20
10.2 MODULES ARE VULNERABLE TO DAMAGE 20
10.3 BIT ERROR RATE TOO HIGH 20
CHAPTER 11 WELDING OPERATION INSTRUCTIONS 21
11.1 REFLOW TEMPERATURE 21
CHAPTER 12 RELATED MODELS 21
CHAPTER 13 ANTENNA GUIDE 22
13.1 ANTENNA RECOMMENDATIONS 22
CHAPTER 14 BULK PACKAGING METHODS 23
REVISION HISTORY 24
ABOUT US 24

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Chapter 1 Product Overview

1.1 Product Introduction

EWM220M-400T22S /EWM220M-900T22S is a new generation of LoRa wireless serial port module (UART) . It has multiple transmission modes, works in the 410.125 ~ 493.125MHz frequency band (default 433.125MHz) and 850.125 ~ 930.125MHz frequency band (default 873.125MHz) , LoRa spread spectrum technology, TTL level output, compatible with 3.3V and 5V IO port voltage.

EWM220M -400T22S /EWM220M-900T22S, featured with long transmission distance, high speed, low power consumption, small size and high cost performance, supports functions such as air wake-up, carrier monitoring, communication key, etc., supports packet length setting, and can provide customized development services.

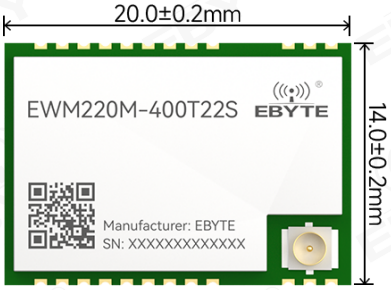


Figure 1: EWM220M -400T22S

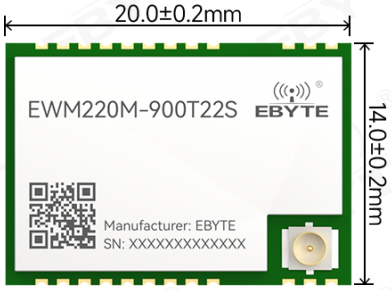


Figure 2: EWM220M - 900T22S

- It has the significant advantages of low power consumption, high speed, long distance, small size and high cost performance ;
- Under ideal conditions, the communication distance can reach 5 km;
- Maximum transmit power 22dBm, software adjustable in multiple levels;
- Supports users to set communication keys by themselves, which cannot be read, greatly improving the confidentiality of user data;
- Support RSSI signal strength indication function , which is used to evaluate signal quality, improve communication network, and measure distance;
- Supports wake-up on the air, an ultra-low power consumption feature suitable for battery-powered applications;
- Supports fixed-point transmission, broadcast transmission, and channel monitoring;
- The parameters are saved when power is off , and the module will work according to the set parameters after power is turned on again ;
- Efficient watchdog design, once an abnormality occurs, the module will automatically restart and continue to work according to the previous parameter settings ;
- Supports data transmission rates of 2.4k ~ 62.5 kbps;
- Supports 2.7~ 5.5V power supply, and the best performance can be guaranteed when the power supply is greater than 3.3V ;
- Industrial standard design, supports long-term use at -40 ~ + 85 ℃ ;
- Dual antennas are optional (IPEX/ stamp hole) , which is convenient for users to carry out secondary development and facilitates integration.

1.3 Application Scenario

- Home security alarm and remote keyless entry;
- Smart home and industrial sensors, etc.

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- Wireless alarm security system ;
- Building automation solutions;
- Wireless industrial remote control;
- Healthcare products;
- Advanced Metering Infrastructure (AMI);
- Automotive industry applications.

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Chapter 2 Specifications

2.1 Limit parameters

Main parameters	Performance		Remark
	Minimum	Maximum	
Supply voltage (V)	2.7	5.5	Exceeding 5.5V may permanently burn the module
Blocking power (dBm)	-	10	Low probability of burning when used at close range
Operating temperature (℃)	-40	+ 85	Industrial Grade

2.2 Working Parameters

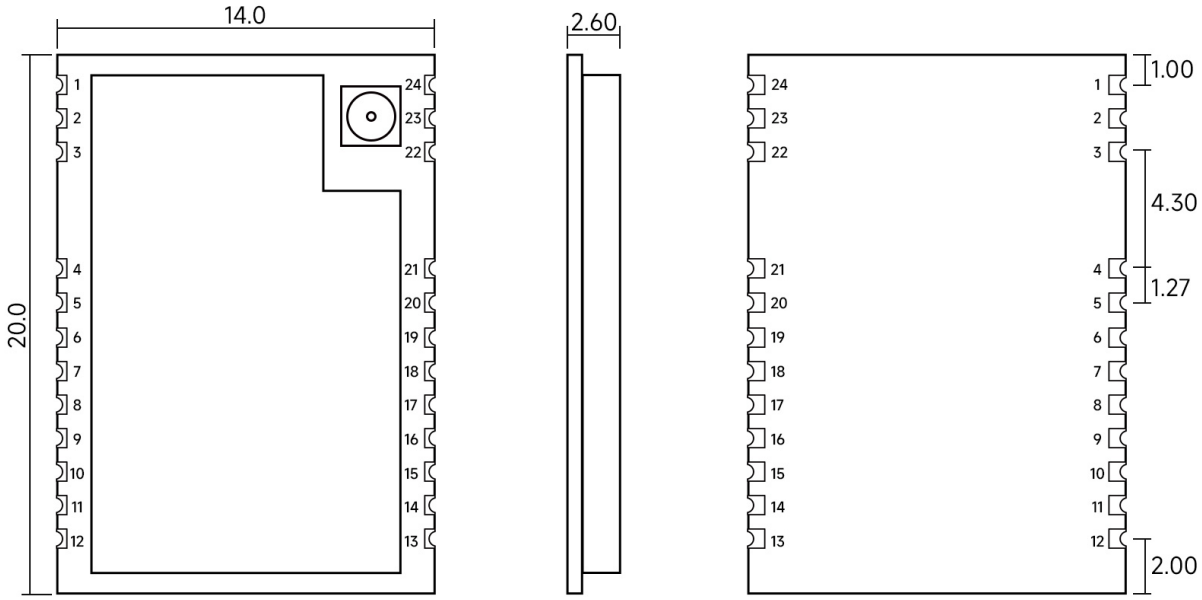
Main parameters		Model		Remark
		EWM220M-400T22S	EWM220M-900T22S	
Operating voltage (V)		2.7～5.5		≥ 3.3 V to ensure output power , typical value 5V
Communication level (V)		3. 3		Using 5V level may cause burnout
Operating temperature (℃)		-40 ～ 85		Industrial-grade design
Working frequency band (MHz)		410.125～493.125	850.125~930.125	Support ISM band
Power consumption	Emission current (mA)	110	120	Instantaneous power consumption @22dBm
	Receive current (mA)	8	8	-
	Sleep current (uA)	3	3	Software shutdown
Maximum transmit power (dBm)		22.0	22. 0	Error range: ±1dBm
Receiving sensitivity (dBm)		-129	-129	-124 dBm,BW _L=125kHz,SF = 7,LORA ™; -129 dBm,BW _L=125kHz,SF = 9,LORA ™; -121 dBm,BW _L=250kHz,SF = 7,LORA ™; -129 dBm,BW _L=250kHz,SF = 10,LORA ™; -117 dBm,BW _L=500kHz,SF = 7,LORA ™; -127 dBm,BW _L=500kHz,SF = 11,LORA ™;
Air speed (bps)		2.4k ~ 62.5k		User programmable control
Reference distance		5 km		Clear and open air, antenna gain 5dBi, antenna height 2.5 meters, air speed 2.4kbps
Launch length		200 Bytes		The command can be set to send packets of 32/64/128/200 bytes
Cache capacity		400 Bytes		-

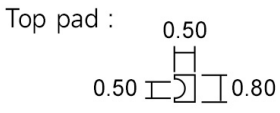
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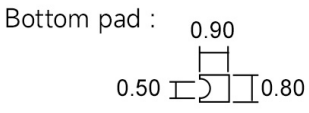
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Modulation	LoRa	New generation Lo Ra modulation technology
Communication interface	UART Serial Port	TTL level
Packaging	SMD	-
Interface	1.27mm	Stamp holes, spacing 1.27mm
Dimensions	14 * 20 mm	-
RF Interface	IPEX-1/Stamp Hole	Equivalent impedance is about 50 Ω

Chapter 3 Mechanical Dimensions and Pin Definition







Unit : mm
Pad quantity : 24
Tolerance value : X.X±0.2mm
X.XX±0.05mm

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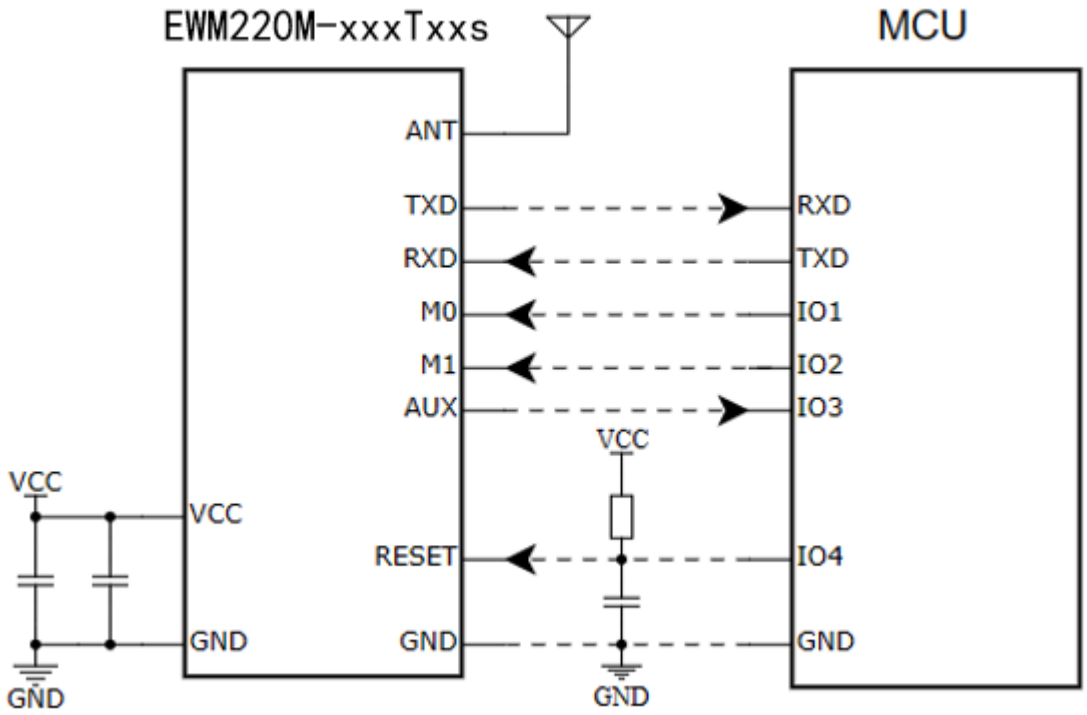
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Pin number	Pin Name	Pin Direction	Pin Purpose
1	GND	-	Module ground wire
2	NC	-	Empty foot (not open for use, users do not need to care)
3	GND	-	Module ground wire
4	GND	-	Module ground wire
5	TX_EN	Output	Used with RX_EN to control external PA; left unconnected if not used
6	RX_EN	Output	Used with TX_EN to control external PA; left unconnected if not used
7	CLK	Input/Output	SWCLK Clock pin when program is loaded (suspended, user does not need to connect)
8	DIO	Input/Output	SWDIO data pin when program is loaded (suspended, user does not need to connect)
9	NC	-	Empty foot (not open for use, users do not need to care)
10	NC	-	Empty foot (not open for use, users do not need to care)
11	NC	-	Empty foot (not open for use, users do not need to care)
12	NC	-	Empty foot (not open for use, users do not need to care)
13	GND	-	Module ground wire
14	VCC	-	Module power positive reference, voltage range: 2.7～5.5V DC
15	TXD	Output	TTL serial port output, connected to the external RXD output pin;
16	RxD	Input	TTL serial port input, connected to external TXD output pin;
17	M1	Input	Cooperate with M0 to determine the 4 working modes of the module (cannot be left floating , can be grounded if not used)
18	M0	Input	Cooperate with M1 to determine the 4 working modes of the module (cannot be left floating , can be grounded if not used)
19	AUX	Output	Used to indicate the working status of the module; the user wakes up the external MCU, and outputs a low level during the power-on self-test initialization period; (can be left floating)
20	NC	-	Empty foot (not open for use, users do not need to care)
21	RESET	Input	Module reset pin, low level reset.
22	GND	-	Module ground wire
23	ANT	-	Antenna interface (high frequency signal output, 50 ohm characteristic impedance)
24	GND	-	Module ground wire

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Chapter 4 Recommended Connection Diagram



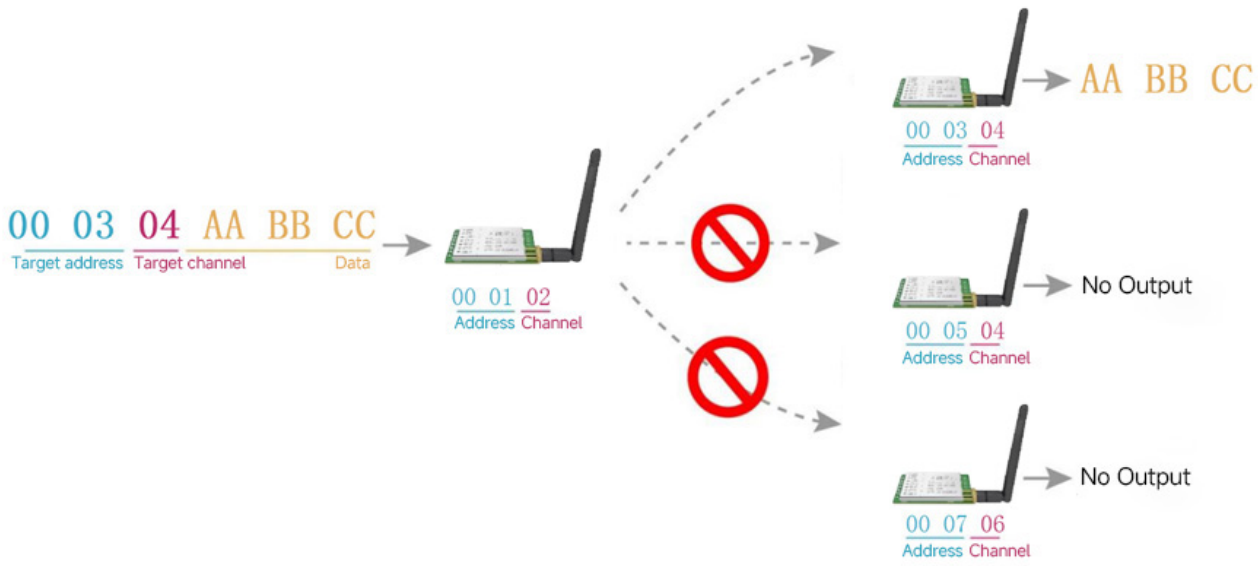
Serial number	Brief connection instructions between the module and the MCU (the above figure takes the STM8L MCU as an example)
1	The wireless serial port module is TTL level, please connect it to the TTL level MCU.
2	~ 10K pull-up resistors to the TXD and AUX pins of the module .
3	It is recommended to reserve a 1MΩ pull-up resistor at the M0/M1 interface

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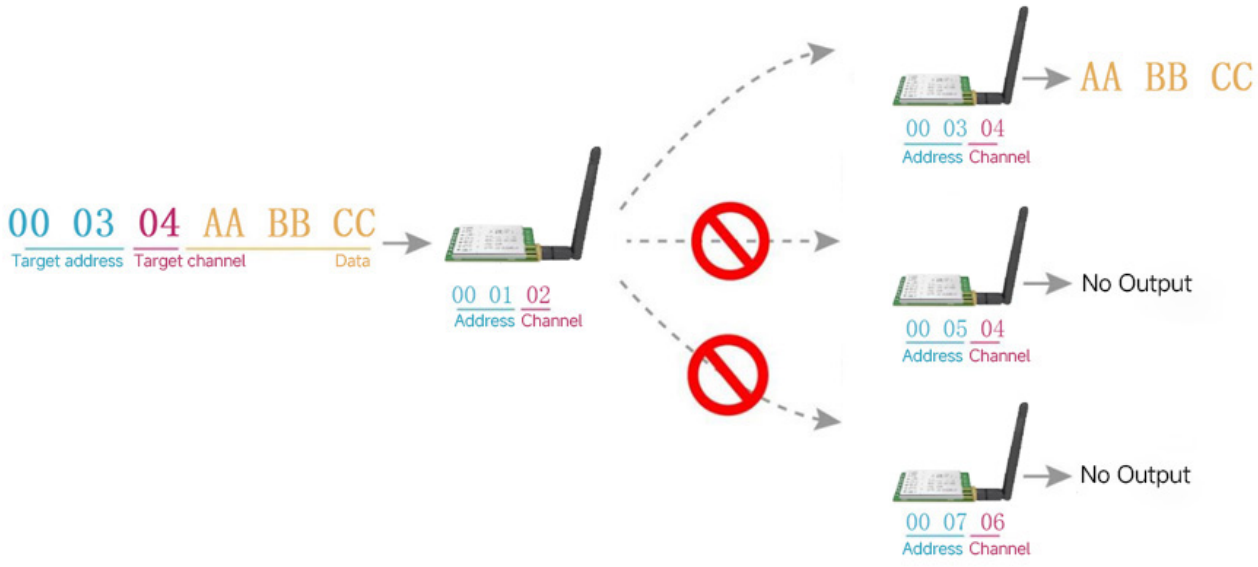
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Chapter 5 Functional Details

5.1 Fixed-point Transmission



5.2 Broadcast Transmission



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5.3 Broadcast Address

- For example: Set the module A address to 0xFFFF and the channel to 0x04.
- When module A is used as a transmitter (same mode, transparent transmission), all receiving modules under channel 0x04 can receive data, thus achieving the purpose of broadcasting.

5.4 Listening Address

- For example: Set the module A address to 0xFFFF and the 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 monitoring.

5.5Module Reset

- After the module is powered on, AUX will immediately output a low level , perform a hardware self-check, and set the working mode according to user parameters;

  During this process, AUX maintains a low level. After completion, AUX outputs a high level and starts working normally according to the working mode composed of M1 and M0.

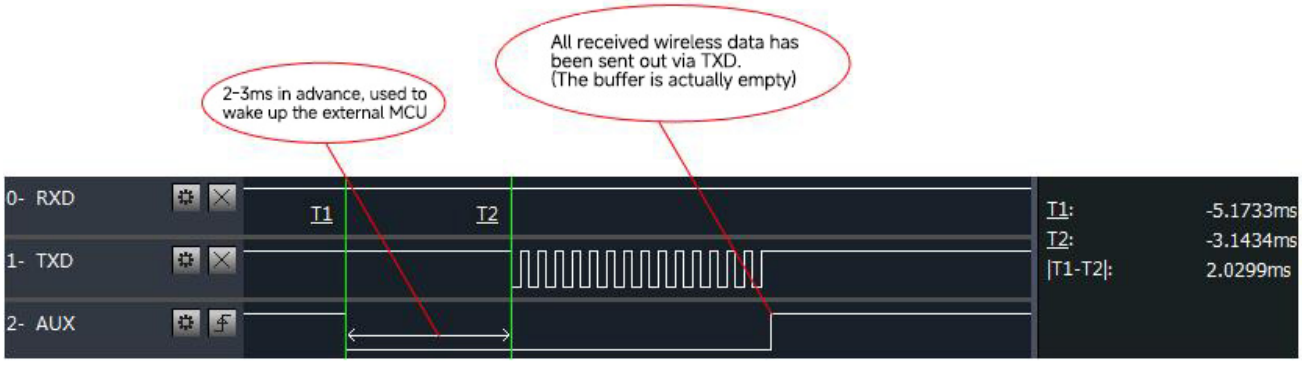
  Therefore, the user needs to wait for the AUX rising edge as the starting point for the module to work normally.

5.6 AUX Detailed Explanation

- AUX is used for wireless transceiver buffer indication and self-test indication.
- It indicates whether the module has data that has not been transmitted wirelessly, or whether the received wireless data has not been sent out through the serial port, or the module is in the process of initializing self-test.

5.6.1Serial port data output indication

- Used to wake up the external MCU in sleep mode;



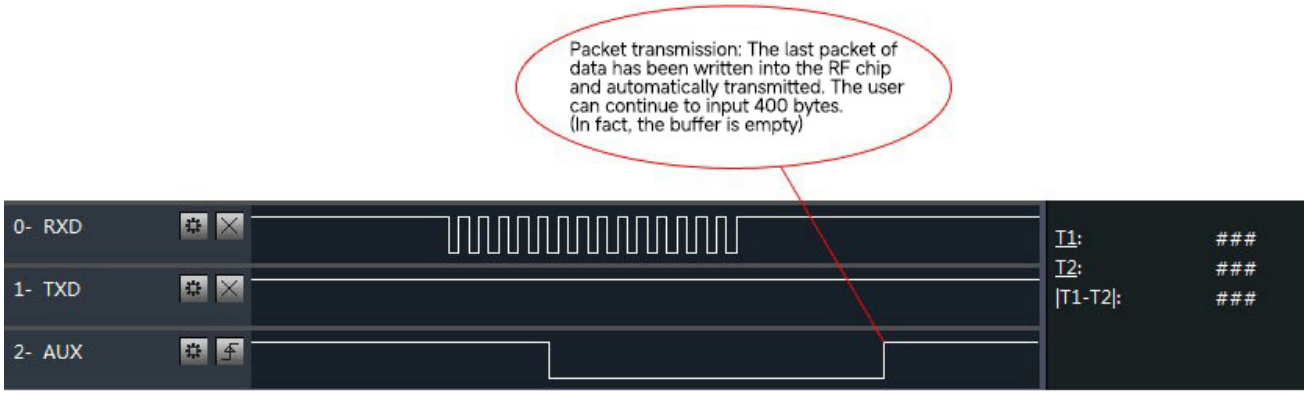
AUX pin timing diagram when the module serial port sends data

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5.6.2 Wireless transmission instruction

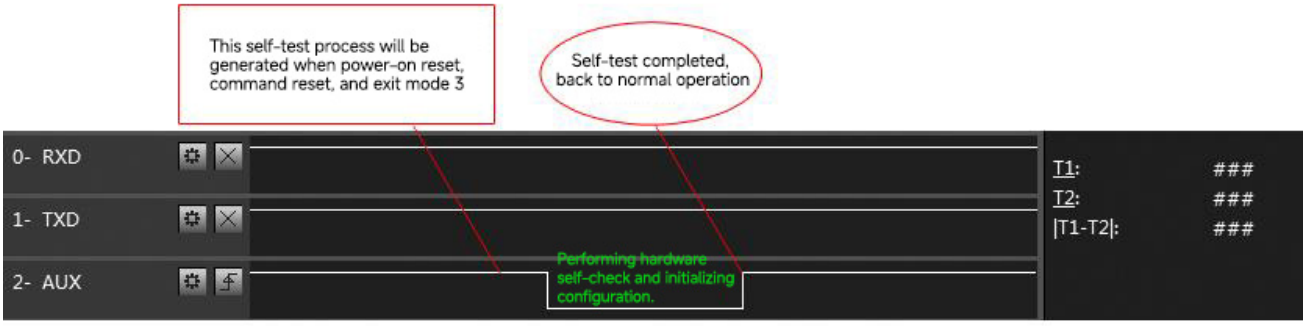
- Buffer empty: data in the internal 400-byte buffer are all written to the wireless chip (automatically divided into packets) ;
  When AUX=1, the user can continuously send data less than 400 bytes without overflow ;
  When AUX=0, the buffer is not empty: the data in the internal 400- byte buffer has not been fully written to the wireless chip and the transmission has not yet started. At this time, the module may have timed out waiting for the end of user data, or is transmitting wireless packets .
  【Note】: When AUX=1, it does not mean that all serial port data of the module has been transmitted wirelessly. It is also possible that the last packet of data is being transmitted.



AUX pin timing diagram when the module receives serial port data

5.6.3 The module is being configured

- Only when resetting and exiting sleep mode;



AUX pin timing diagram during self-test

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5.6.4 Notes

Serial number	AUX Notes
1	For the above functions 1 and 2, the output low level is given priority, that is, if any output low level condition is met, AUX will output low level ; When all low-level conditions are not met, AUX outputs a high level.
2	When AUX outputs a low level , it means the module is busy and no working mode detection will be performed at this time; When the module AUX outputs a high level within 1ms, the mode switching will be completed.
3	After the user switches to a new working mode, the module will not actually enter this mode until at least 2ms after the AUX rising edge. If AUX is always at a high level, the mode switch will take effect immediately.
4	When the user enters other modes from mode 3 (sleep mode) or during the reset process, the module will reset the user parameters, during which AUX outputs a low level .
5	Due to the characteristics of LoRa modulation, the information transmission delay is much longer than FSK. For example, at an airspeed of 2.4kbps, the transmission delay of 100 bytes is about 1.5 seconds. Customers are advised not to transmit large amounts of data at low airspeeds to avoid data loss due to data accumulation and cause communication abnormalities.

Chapter 6 Working Mode

The module has four working modes, which are set by pins M1 and M0; the details are shown in the following table:

Mode (0-3)	M1	M0	Mode Introduction	Remark
0 Transmission Mode	0	0	UART and wireless channel are open, transparent transmission is on	—
1 WOR sent model	0	1	Can be set as WOR Transmitter or WOR Receiver	Support wake up over the ai
2 WOR Receive model	1	0	WOR Transmitter function off, WOR receive data	—
3 Sleep mode	1	1	Available for parameter configuration	—

6.1 Mode Switching

Serial number	Remark
1	● The user can combine M1 and M0 with high and low levels to determine the module working mode. The 2 GPIOs of the MCU can be used to control the mode switching; ● After changing M1 and M0: if the module is idle, it can start working in the new mode after 1ms; ● If the module has serial port data that has not been transmitted wirelessly, it can enter a new working mode only after the transmission is completed; ● If the module receives wireless data and sends data out through the serial port, it needs to finish sending before entering the new working mode; ● Therefore, mode switching is only effective when AUX output is 1, otherwise the switching will be delayed.

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2	● For example, if a user continuously inputs a large amount of data and switches modes at the same time, the mode switching operation is invalid. The module will only detect a new mode after processing all user data. ● Therefore, the general recommendation is: detect the output status of the AUX pin and wait for 2ms after the output is high before switching.
3	● When the module is switched from other modes to sleep mode, if there is data that has not been processed; ● The module will enter sleep mode only after processing these data (including receiving and sending). This feature can be used for fast sleep, thus saving power consumption; for example: the transmitting module works in mode 0, the user initiates the serial port data "12345", and then there is no need to wait for the AUX pin to be idle (high level), it can directly switch to sleep mode and put the user's main MCU to sleep immediately. The module will automatically send all the user data wirelessly and automatically enter sleep within 1ms; ● This saves MCU working time and reduces power consumption.
4	● Similarly, any mode switching can use this feature. After the module processes the current mode event, it will automatically enter the new mode within 1ms, thus eliminating the need for users to query AUX and achieving the purpose of fast switching. ● For example, switching from transmit mode to receive mode; the user MCU can also enter sleep mode in advance before the mode switch, and use the external interrupt function to obtain AUX changes to switch the mode.
5	● This operation mode is very flexible and efficient, designed entirely according to the operational convenience of the user's MCU, and can reduce the workload of the entire system as much as possible, improve system efficiency, and reduce power consumption.

6.2 Normal mode (mode 0)

Type	When M0 = 0, M1 = 0, the module works in mode 0
Transmitting	The user can input data through the serial port, and the module will start wireless transmission.
Receiving	The module's wireless receiving function is turned on, and after receiving wireless data, it will be output through the serial port TXD pin.

6.3 WOR mode (mode 1)

Type	When M0 = 1, M1 = 0, the module works in mode 1
Transmitting	Wireless data transmission function is on.
Receiving	Wireless data receiving function is on.

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6.4 WOR receiving mode (mode 2)

Type	When M0 = 0, M1 = 1, the module works in mode 2
Transmitting	Wireless data transmission function is off.
Receiving	Wireless data receiving function is on.

6.5 Sleep mode (mode 3)

Type	When M0 = 1, M1 = 1, the module works in mode 3
Transmitting	Unable to transmit wireless data.
Receiving	Unable to receive wireless data.
Configuration	Users can access registers to configure the module operating status.
Notice	When entering other modes from sleep mode, the module will reconfigure parameters. During the configuration process, AUX remains at a low level. After completion, it outputs a high level, so it is recommended that the user detect the rising edge of T_BUSY .

Chapter 7 Register Read and Write Control

7.1 Command format

In configuration mode (mode 2: M1=1, M0= 1), the supported command list is as follows (**when setting, only 9600, 8N1 format is supported**):

Serial number	Command Format	Detailed description
1	Setting Registers	Command: C0+starting address+length+parameter Response: C1+starting address+length+parameters Example 1: Configure the channel to 0x09 Command start address length parameter Send: C0 04 01 09 Return: C1 04 01 09 Example 2: Configure the module address (0x1234), serial port (9600 8N1), and airspeed (2.4 K) at the same time Send: C0 00 03 12 34 61 Return: C1 00 03 12 34 61

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2	Read Register	Instruction: C1+starting address+length Response: C1+starting address+length+parameters Example 1: Reading a channel Command start address length parameter Send: C1 04 01 Return: C1 04 01 09 Example 2: Read module address, serial port, and airspeed simultaneously Send: C1 00 03 Return: C1 00 03 12 34 61
3	Setting up temporary registers	Command : C2 + starting address + length + parameter Response: C1 + start address + length + parameter Example 1: Configure the channel to 0x09 Command start address length parameter Send: C2 04 01 09 Return: C1 04 01 09 Example 2: Configure the module address (0x1234), serial port (9600 8N1), and airspeed (2.4 K) at the same time Send: C2 00 0 3 12 34 61 Return: C1 00 0 3 12 34 61
4	Format Error	Format Error Response FF FF FF

7.2 Register Description

<table>
<tr><th>Serial number</th><th>Read and Write</th><th>Name</th><th colspan="5">Description</th><th>Remark</th></tr>
<tr><td>00H</td><td>Read/ Write</td><td>ADDH</td><td colspan="5">ADDH (default 0)</td><td rowspan="2">Module address high byte and low byte ;
Note: When the module address is equal to FFFF, it can be used as a broadcast and monitoring address, that is, the module will not perform address filtering at this time</td></tr>
<tr><td>01H</td><td>Read/ Write</td><td>ADDL</td><td colspan="5">ADDL (default 0)</td></tr>
<tr><td rowspan="11">02 H</td><td rowspan="11">Read/ Write</td><td rowspan="11">REG0</td><td>7</td><td>6</td><td>5</td><td>UART serial port rate (bps)</td><td rowspan="11">The two modules that communicate with each other can have different serial port baud rates and verification methods ;
When transmitting large data packets continuously, users need to consider data blocking or even data loss caused by the same baud rate ;
It is generally recommended that both parties in communication have the same baud rate.</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>The serial port baud rate is 1200</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>The serial port baud rate is 2400</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>The serial port baud rate is 4800</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>The serial port baud rate is 9600 (default)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>The serial port baud rate is 19200</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>The serial port baud rate is 38400</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>The serial port baud rate is 57600</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>The serial port baud rate is 115200</td></tr>
<tr><td>4</td><td>3</td><td colspan="2">Serial port check digit</td><td>The communication parties can have different</td></tr>
</table>

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			0	0	8 N1 (default)		serial parity bit ;
			0	1	8 O1		
			1	0	8 E1		
			1	1	8 N1 (equivalent to 0 0)		
			2	1	0	Wireless air speed (bps)	The air speed of both communicating parties must be the same ; The higher the air data rate is, the smaller the delay in response, and the shorter the transmission distance is.
			0	0	0	Air speed 2.4k (default)	
			0	0	1	Air speed 2.4k (default)	
			0	1	0	Air speed 2.4k (default)	
			0	1	1	Air speed 4.8k	
			1	0	0	Air speed 9.6k	
			1	0	1	Air speed 1 9.2k	
			1	1	0	Air speed 38.4 k	
			1	1	1	Air speed 62.5 k	
03 H	Read/ Write	REG1	7	6	Sub packet settings		When the data sent is smaller than the sub packet length, the serial output of the receiving end is an uninterrupted continuous output ; When the data sent is larger than the sub packet length, the serial port in receiving end will sub packet the data and then output them
			0	0	200 bytes (default)		
			0	1	128 bytes		
			1	0	64 bytes		
			1	1	32 bytes		
			5	RSSI Ambient Noise Enable			RSSI enable command (Sub packet setting, transmission power as default parameters, configuration mode): C0 03 01 20; After enabling, you can send command C0 C1 C2 C3 in transfer mode or WOR send mode to read registers ; Register 0x00: Current ambient noise RSSI ; Register 0X01: RSSI when receiving data last time (Current channel noise is: dBm = -(256 - RSSI)) ; command format: C0 C1 C2 C3 + starting address + read length ; Return: C1 + address + read length + read valid value; such as: send C0 C1 C2 C3 00 01 Return C1 00 01 RSSI **(address can only start from 0 0)**
			0	Disabled (default)			
			1	Enable			
			4	3	2	Reserve	
			1	0	Transmit power		The relationship between power and current is nonlinear. When the power is at maximum, the power efficiency is the highest . The current does not decrease in the same proportion as the power decreases.
			0	0	22 dB m (default)		
			0	1	17dBm		
			1	0	13dBm		
			1	1	10dBm		
04H	Read/ Write	REG2	Channel control (CH) 0-83 represent a total of 8 4 channels				Actual frequency = 410.125 + CH *1M
05H	Read/ Write	REG3	7	Enable RSSI Byte			After enabling, the module receives wireless data and outputs it through the serial port TXD, followed by an RSSI strength byte.
			0	Disabled (default)			
			1	Enable			
			6	Transmission method			During fixed-point transmission, the module will recognize the first three bytes of the serial port data as: address high + address low + channel, and
			0	Transparent transmission (default)			

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			1	Fixed-point transmission			use it as the wireless transmission target.
			5	reserve			-
			4	L BT Enable			When enabled, wireless data will be monitored before transmission, which can avoid interference to a certain extent, but may cause data delays ; The maximum stay time of LBT is 2 seconds, and it will be forcibly issued after 2 seconds.
			0	Disabled (default)			
			1	Enable			
			3	Reserve			
			2	1	0	WOR Cycle	Only valid for mode 1; Period T = (1+WOR) *500ms , maximum 4000ms , minimum 500ms ; The longer the WOR monitoring interval is, the lower the average power consumption is , but the greater the data delay is; The sender and receiver must be consistent (very important)
			0	0	0	500 ms	
			0	0	1	1000 ms	
			0	1	0	1500 ms	
			0	1	1	2000 ms	
			1	0	0	2500 ms	
			1	0	1	3000 ms	
			1	1	0	3500 ms	
			1	1	1	4000 ms	
06H	Write	CRYPT_H	Key high byte (default 0)				Write only, read returns 0 ; Used for encryption to prevent wireless data from being intercepted by similar modules ; The module will use these two bytes as calculation factors to transform and encrypt the wireless signal in the air.
07H	Write	CRYPT_L	Key low byte (default 0)				
08H	Read	Version	Version number information 1 byte				Version number information 1 byte

7.3 Factory default parameters

Model	**EWM220M-400Txxx Factory default parameter value: C0 00 09 00 00 62 00 17 03 00 00** **EWM220M-900Txxx Factory default parameter value: C0 00 09 00 00 62 00 12 03 00 00**						
Module Model	Frequency	Address	Channel	Air speed	Baud rate	Serial port format	Transmit power
EWM220M-400T22S	433.125MHz	0x0000	0x17	2.4kbps	9600	8N1	22dbm
EWM220M - 900T22S	873.125 MHz	0x0000	0x12	2.4kbps	9600	8N1	22dbm

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Chapter 8 PC Configuration Software Instructions

- The figure below shows the configuration interface of EWM220M- xxx T22S configuration software. Users can switch to command mode through M0 and M1 to quickly configure and read parameters.



- In the configuration software, the module address, frequency channel, network ID, and key are all displayed in decimal mode; the value range of each parameter is:

  Network address: 0-65535

  Frequency channel: 0～83

  Key: 0-65535

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Chapter 9 Hardware Design

- It is recommended to use a DC regulated power supply to power the module. The power supply ripple coefficient 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 poles of the power supply. Reverse connection may cause permanent damage to the module.
- Please check the power supply to ensure that it is within the recommended power supply voltage. 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 or frequently.
- When designing the power supply circuit for the module, it is often recommended to retain more than 30% margin, which is conducive to long-term stable operation of the whole machine;
- The module should be kept as far away as possible from power supplies, transformers, high-frequency wiring and other parts with large electromagnetic interference;
- High-frequency digital routing, high-frequency analog routing, and power routing must avoid the bottom of the module. If it is necessary to pass under the module, assuming that the module is soldered on the Top Layer, ground copper should be laid on the Top Layer of the module contact part (all copper should be laid and well grounded), and it must be close to the digital part of the module and routed on the Bottom Layer ;
- Assuming the module is soldered or placed on the Top Layer, it is also wrong to randomly route the wires on the Bottom Layer or other layers, which will affect the module's spurious signal and receiving sensitivity to varying degrees ;
- If there are devices with large electromagnetic interference around the module, it will also greatly affect the performance of the module. It is recommended to keep them away from the module according to the intensity of the interference. If possible, appropriate isolation and shielding can be performed.
- If there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power traces), it will also greatly affect the performance of the module. It is recommended to keep them away from the module according to the intensity of the interference. If possible, appropriate isolation and shielding can be performed.
- If the communication line uses 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, such as USB3.0;
- The antenna installation structure has a great impact on the module performance. Make sure the antenna is exposed and preferably vertically upward;
- When the module is installed inside the case, you can use a high-quality antenna extension cable to extend the antenna to the outside of the case;
- The antenna must not be installed inside a metal shell, as this will greatly reduce the transmission distance.

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Chapter 10 Frequently Asked Questions

10.1 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-channel interference can increase the communication packet loss rate ;
- The ground absorbs and reflects radio waves, so the test results are poor when close to the ground ;
- Seawater has a strong ability to absorb radio waves, so the test effect at the seaside is poor ;
- If there are metal objects near the antenna, or the antenna is placed in a metal shell, the signal attenuation will be very serious ;
- The power register is set incorrectly, or the air speed is set too high (the higher the air speed, the closer the distance) ;
- The power supply voltage is lower than the recommended value at room temperature. The lower the voltage, the lower the power output .
- The antenna used does not match the module well or the antenna itself has quality issues.

10.2 Module is easily damaged

- Please check the power supply to ensure that it is within the recommended power supply voltage. 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 or frequently .
- Please ensure anti-static operation during installation and use, as high-frequency components are sensitive to static electricity ;
- Please ensure that the humidity is not too high during installation and use, as some components are humidity sensitive devices ;
- If there is no special requirement, it is not recommended to use it at too high or too low temperature.

10.3 The bit error rate is too high

- There is interference from the same frequency signal nearby. Stay away from the interference source or change the frequency or channel to avoid interference.
- An unsatisfactory power supply may also cause garbled characters, so the reliability of the power supply must be ensured;
- Extension cables or feeder cables that are of poor quality or are too long can also cause a high bit error rate.

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Chapter 11 Welding Operation Instructions

11.1 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 preheating temperature	100 ℃	150 ℃
Preheat temperature max (Tsmax)	Maximum preheating temperature	150 ℃	200 ℃
Preheat Time (Tsmin to Tsmax)(ts)	Warm-up time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average ascent rate	3 ℃ /second max	3 ℃ /second max
Liquid Temperature (TL)	Liquidus temperature	183 ℃	217 ℃
Time(tL)Maintained Above(TL)	Time above liquidus	60-90 sec	30-90 sec
Peak temperature (Tp)	Peak temperature	220-235 ℃	230-250 ℃
Aveage ramp-down rate (Tp to Tsmax)	Average descent rate	6 ℃ /second max	6 ℃ /second max
Time 25 ℃ to peak temperature	Time from 25 ℃ to peak temperature	6 minutes max	8 minutes max

Chapter 12 Related Models

Product Model	Chip Solution	Carrier frequency Hz	Transmit power dBm	Test distance km	Package	Communication interface
E220-400T22S	LLCC68	433/470 M	twenty two	5	Patches	TTL
E220-400T30S	LLCC68	433/470 M	30	10	Patches	TTL

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Chapter 13 Antenna Guide

1 3.1 Antenna Recommendation

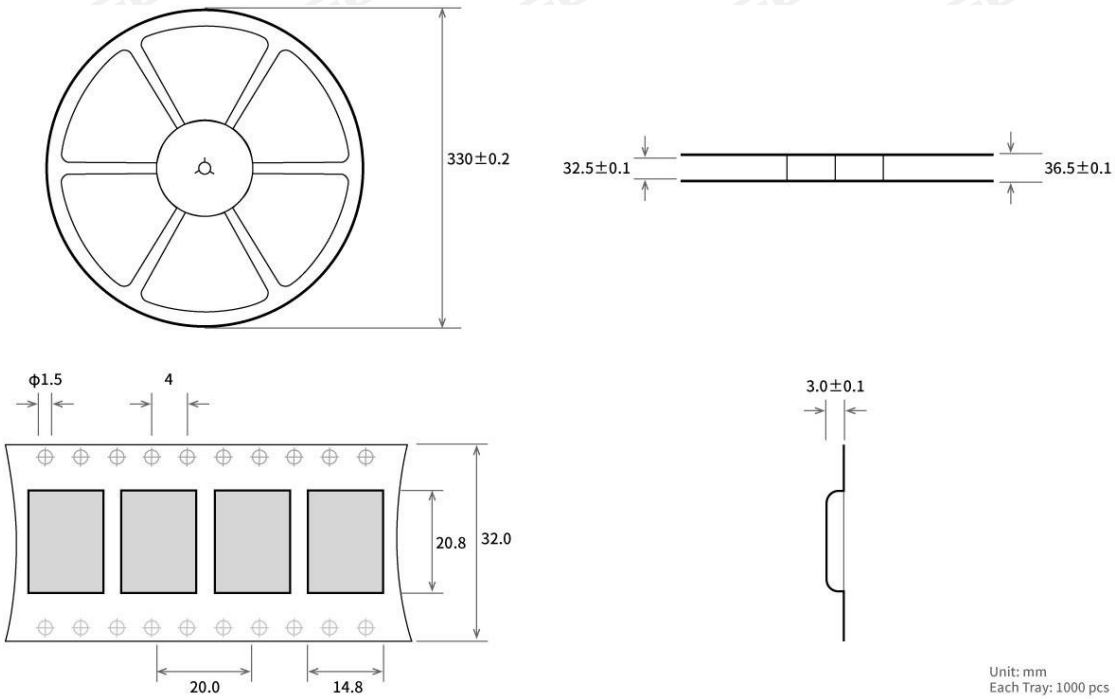
Antennas play an important role in the communication process. Often, poor-quality antennas will have a great impact on the communication system. Therefore, our company recommends some antennas as matching antennas for our wireless modules with excellent performance and reasonable prices.

Product Model	type	Frequency band Hz	interface	Gain dBi	high m m	Feeder c m	Features
TX433-JZ-5	Glue stick antenna	433M	SMA-J	2.0	52	-	Ultra-short straight, omnidirectional antenna
TX433-JZG-6	Glue stick antenna	433M	SMA-J	2.5	6 2	-	Ultra-short straight, omnidirectional antenna
TX433-JW-5	Glue stick antenna	433M	SMA-J	2.0	50	-	Bend the glue stick, omnidirectional antenna
TX433-JWG-7	Glue stick antenna	433M	SMA-J	2.5	75	-	Bend the glue stick, omnidirectional antenna
TX433-JK-11	Glue stick antenna	433M	SMA-J	2.5	110	-	Bendable glue stick, omnidirectional antenna
TX433-XP L -100	Suction cup antenna	433M	SMA-J	3.5	18 5	100	Small suction cup antenna, cost-effective
TX433-XP-200	Suction cup antenna	433M	SMA-J	4.0	19 0	200	Neutral suction cup antenna, low loss
TX433-XPH-300	Suction cup antenna	433M	SMA-J	6.0	96 5	300	Large suction cup antenna, high gain
TX490-JZ-5	Glue stick antenna	4 7 0 /490 M	SMA-J	2.0	50	-	Ultra-short straight, omnidirectional antenna
TX490-XP L -100	Suction cup antenna	4 7 0 /490 M	SMA-J	3.5	12 0	100	Small suction cup antenna, cost-effective

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Chapter 14 Bulk Packaging Methods



Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-01-10	Initial release	Lei
1.1	2025-02-26	Modify factory default parameter description	Lei

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