E22-400T33D Product Specification

SX1262 433/470MHz 2W LoRa Wireless Module

Chengdu Ebyte Electronic Technology Co.,Ltd.

Content

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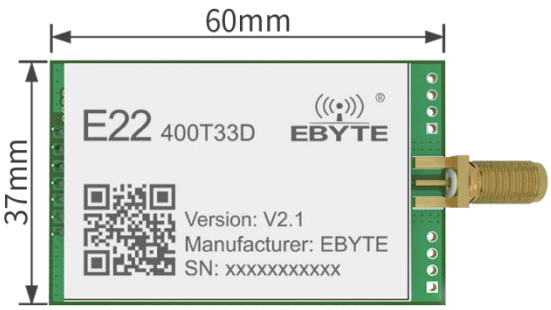
Chapter 1 Product Overview

1.1 Product introduction



E22-400T33D is a new generation of LoRa wireless module. It is a wireless serial port module (UART) based on SX1262 radio frequency chip. It has a variety of transmission methods. Level output, support 3.3V - 5.5V supply voltage.

A new generation of LoRa spread spectrum technology, compared with the traditional SX1278 solution, the SX1262 is farther, faster, lower power consumption, and smaller in size; supports functions such as wake-up in the air, wireless configuration, carrier monitoring, automatic relay, communication key, etc. , support subcontracting length setting, can provide customized development services.

1.2 Features

- Based on SX1262, the new LoRa spread spectrum modulation technology is developed, which brings longer communication distance and stronger anti-interference ability;
- Support automatic relay networking, multi-level relay is suitable for ultra-long-distance communication, and multiple networks run in the same area at the same time;
- Support users to set the communication key by themselves, and it cannot be read, which greatly improves the confidentiality of user data;
- Support LBT function, monitor the channel environmental noise before sending, which can greatly improve the communication success rate of the module in harsh environments;
- Support RSSI signal strength indicator function for evaluating signal quality, improving communication network, and ranging;
- Support wireless parameter configuration, send command data packets wirelessly, configure or read wireless module parameters remotely;
- Support air wake-up, that is, ultra-low power consumption, suitable for battery-powered applications;
- Support fixed-point transmission, broadcast transmission, channel monitoring;
- Support deep sleep, the power consumption of the whole machine in this mode is about 2uA;
- Support global license-free ISM 433MHz frequency band, support 470MHz meter reading frequency band;
- The module has built-in PA+LNA, and the communication distance can reach 16km under ideal conditions;
- The parameters are saved after power-off, and the module will work according to the set parameters after power-on 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;
- Support data transmission rate of 2.4K～62.5kbps;
- Support 3.3 ~ 5.5V power supply, more than 4.7V power supply can ensure the best performance;
- Industrial-grade standard design, support long-term use at -40 ~ +85 ℃;
- The maximum power of the module can reach 2W (33dBm), and the transmission is farther and more stable。

1.3 Application scenarios

- Home security alarm and remote keyless entry;
- Smart home and industrial sensors, etc.;
- Wireless alarm security system;
- Building automation solutions;
- Wireless industrial-grade remote control;
- Healthcare products;
- Advanced Meter Reading Architecture (AMI);
- Automotive industry applications。

Chapter 2 Specifications

2.1 Limit parameters

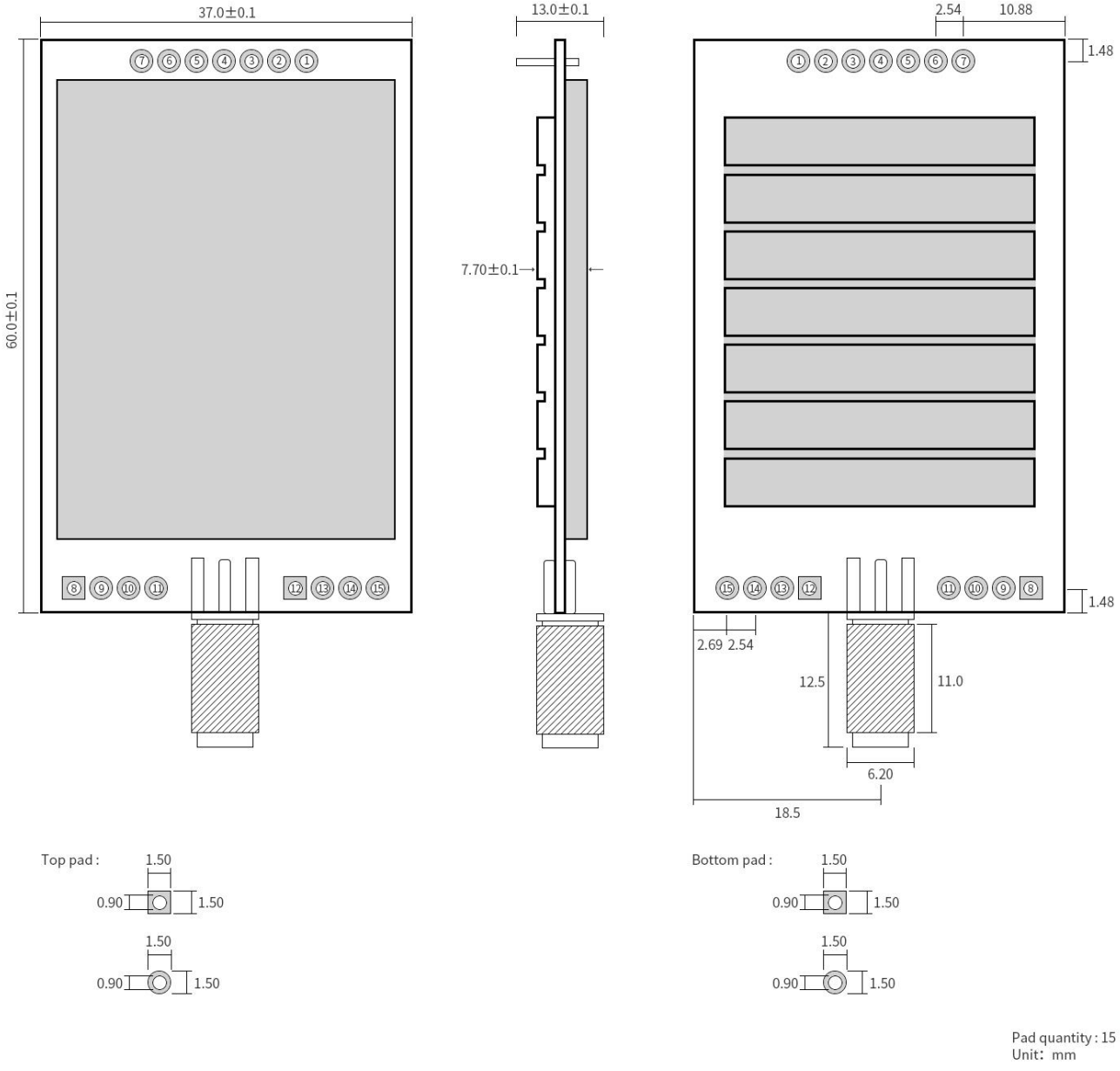
The main parameters	performance		Remark
	minimum	maximum value	
voltage (V)	3.3	5.5	Exceeding 5.5V may permanently burn the module
blocking power (dBm)	-	10	The probability of burning at close range is small
Operating temperature (℃)	-40	+85	Industrial grade

2.2 Working parameters

The main parameters		performance			Remark
		minimum	Typical value	maximum value	
Operating Voltage (V)		3.3	5.0	5.5	≥4.7V Guaranteed output power
communication level (V)		-	3.3	-	There is a risk of burnout when using the 5V level
Operating temperature(℃)		-40	-	85	Industrial grade design
Working frequency (MHz)		410.125	-	493.125	Support ISM band
Power consumption	Emission current (mA)	850	1000	1200	Instantaneous power consumption@33dBm
	receive current (mA)	11	13	15	-
	sleep current (uA)	-	2	-	software shutdown
Maximum transmit power (dBm)		32	33	34	-
Receive sensitivity (dBm)		-126	-128	-130	Air rate 2.4 kbps

air rate (bps)	2.4k	2.4k	62.5k	User programming control
reference distance	16km			Clear and open, antenna gain 5dBi, antenna height 2.5 meters
launch length	240 Byte			It can be sent in packets of 32/64/128/240 bytes by setting the instruction
Cache capacity	1000 Byte			-
Modulation	LoRa			A new generation of LoRa modulation technology
Communication Interface	UART serial port			TTL level
Packaging method	plugin			-
interface	Plug-in pin header			Spacing 2.54mm
Dimensions	37*60*7.6mm			Tolerance ±0.1mm (excluding pin header height)
RF interface	SMA			Equivalent impedance is about 50Ω

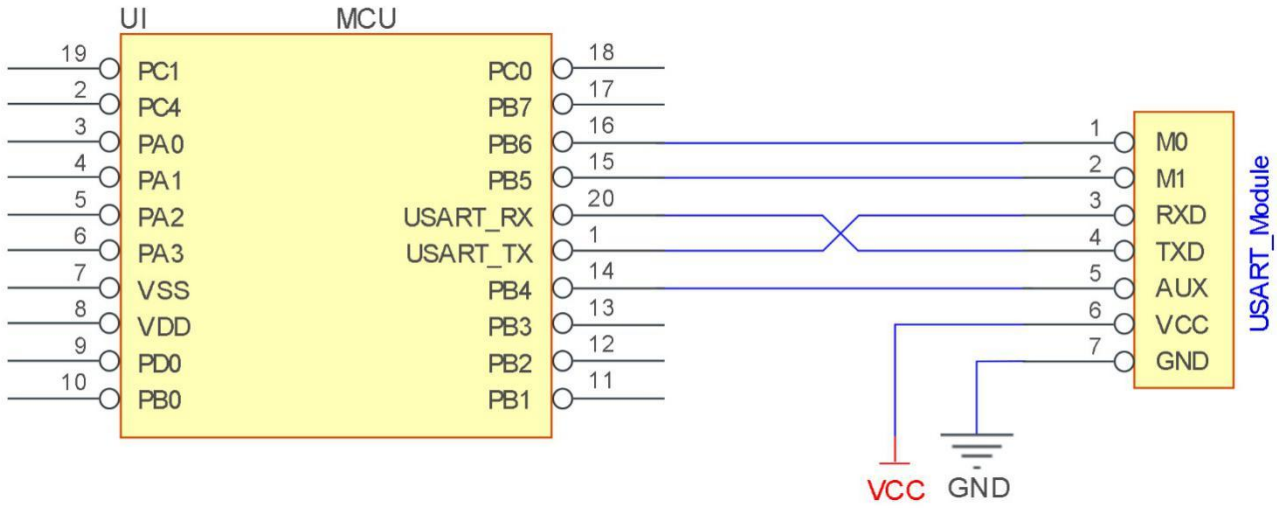
Chapter 3 Mechanical Dimensions and Pin Definition



pin number	pin name	Pin Orientation	pin usage
1	M0	Input (very weak pull-up)	Cooperate with M1 to determine the 4 working modes of the module (can not be suspended, if not used, it can be grounded)
2	M1	Input (very weak pull-up)	Cooperate with M0 to determine the 4 working modes of the module (can not be suspended, if not used, it can be grounded)
3	RXD	Input	TTL serial port input, connected to the external TXD output pin;
4	TXD	Output	TTL serial output, connected to external RXD input pin;
5	AUX	Output	Used to indicate the working state of the module; the user wakes

			up the external MCU, and outputs a low level during the power-on self-test initialization; (can be left floating)
6	VCC	Input	Connect to the internal reference ground of the module
7	GND	Input	Connect to the internal reference ground of the module
8	fixing hole	Input	Connect to the internal reference ground of the module
9	fixing hole	Input	Connect to the internal reference ground of the module
10	fixing hole	Input	Connect to the internal reference ground of the module
11	fixing hole	Input	Connect to the internal reference ground of the module
12	fixing hole	Input	Connect to the internal reference ground of the module
13	fixing hole	Input	Connect to the internal reference ground of the module
14	fixing hole	Input	Connect to the internal reference ground of the module
15	fixing hole	Input	Connect to the internal reference ground of the module

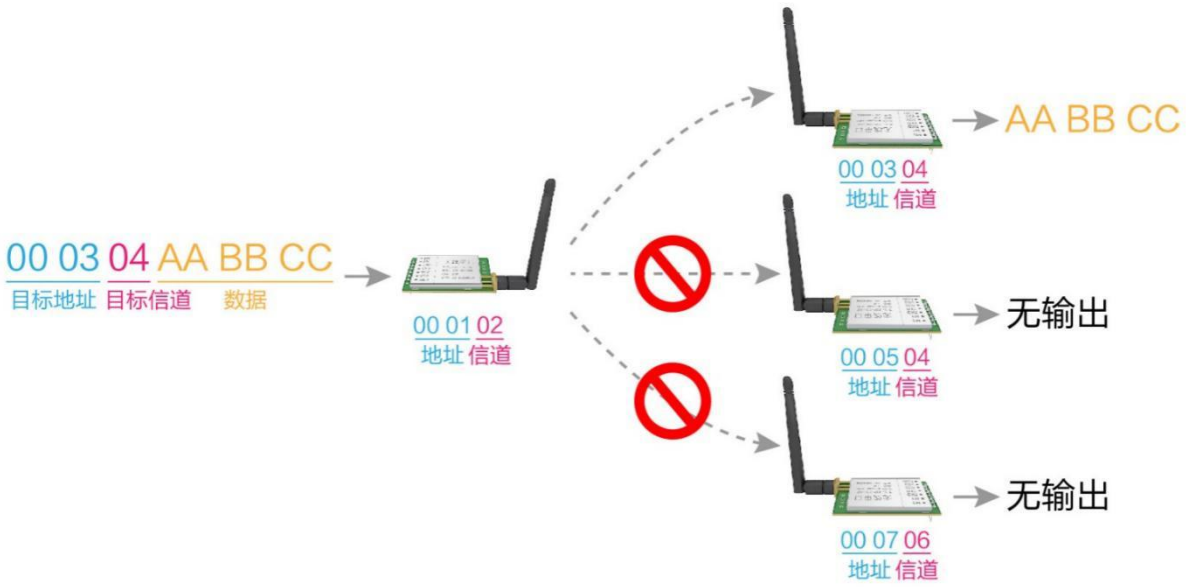
Chapter 4 Recommended Wiring Diagram



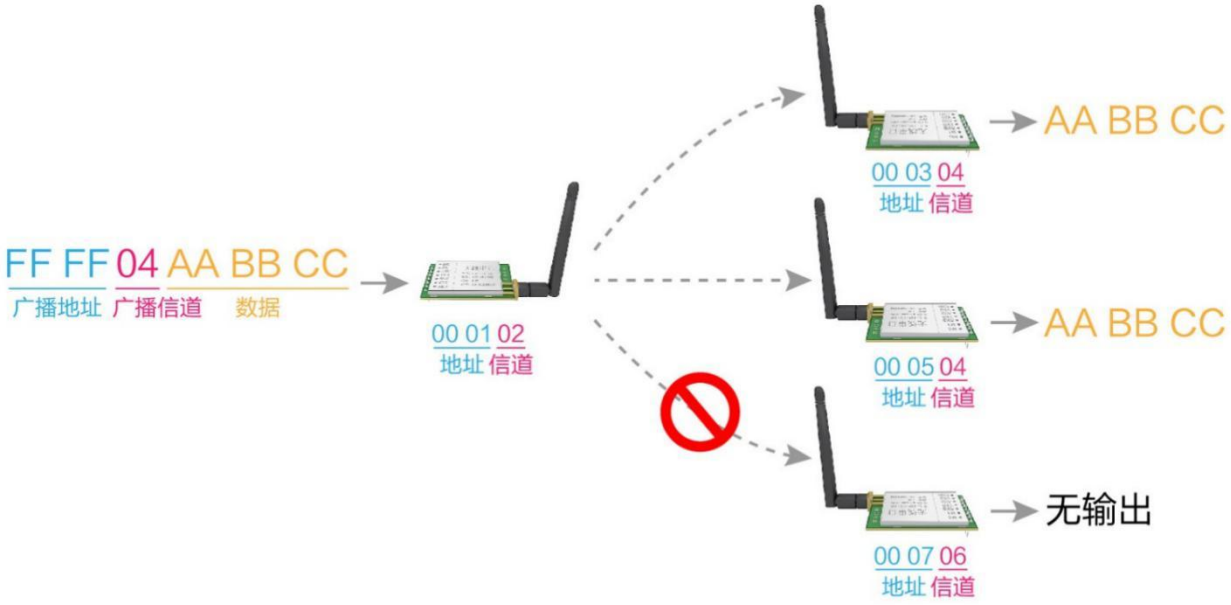
Number	A brief description of the connection between the module and the microcontroller (the above picture takes the STM8L microcontroller as an example)
1	The wireless serial port module is TTL level, please connect with TTL level MCU.
2	When using a 5V microcontroller, please perform level conversion.

Chapter 5 Function Details

5.1 fixed point launch



5.2 broadcast transmission



5.3 broadcast address

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

5.4 listen address

- Example: Set the address of module A to 0xFFFF and the channel to 0x04.
- When module A is used as a receiver, it can receive all data under the 0x04 channel to achieve the purpose of monitoring.

5.5 Module reset

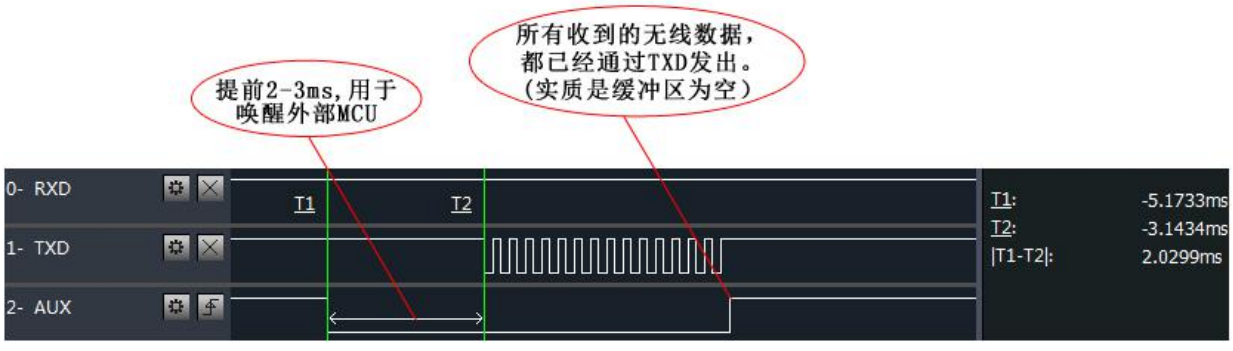
- After the module is powered on, AUX will output a low level immediately, perform hardware self-check, and set the working mode according to user parameters;During this process, the AUX keeps the low level, and after the completion, the AUX outputs the high level, and starts to work normally according to the working mode composed of M1 and M0;Therefore, the user needs to wait for the rising edge of AUX as the starting point for the normal operation of the module.

5.6 Detailed AUX

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

5.6.1 Serial data output indication

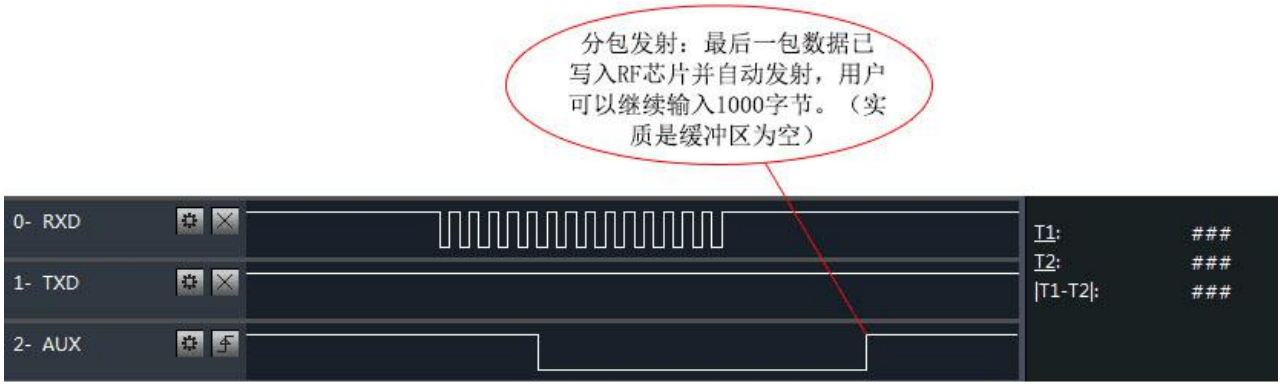
- Used to wake up an external MCU from sleep;



模块串口外发数据时，AUX引脚时序图

5.6.2 wireless transmission indication

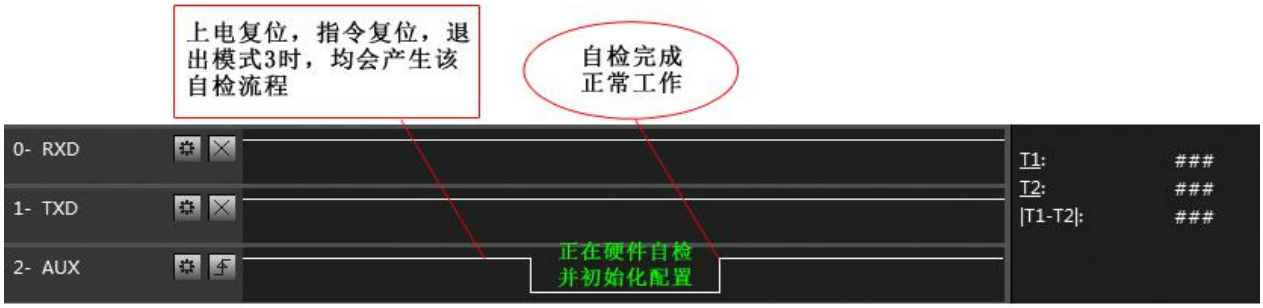
- The buffer is empty: the data in the internal 1000-byte buffer is written to the wireless chip (automatically subdivided);When AUX=1, the user continuously initiates data less than 1000 bytes without overflow;When AUX=0, the buffer is not empty: the data in the internal 1000-byte buffer has not been written to the wireless chip and the transmission is started. At this time, the module may be waiting for the end of the user data to time out, or the wireless packet transmission is in progress. [Note]: When AUX=1, it does not mean that all serial port data of the module has been transmitted wirelessly, or the last packet of data may be being transmitted.



模块接收串口数据时，AUX引脚时序图

5.6.3 Module is being configured

- Only at reset and when exiting sleep mode;



自检期间，AUX引脚时序图

5.6.4 Precautions

serial number	AUX Notes
1	For the above functions 1 and 2, the output low level is given priority, that is, if any one of the output low level conditions is met, the AUX outputs the low level;When all low level conditions are not met, AUX outputs high level.
2	When AUX outputs a low level, it means that the module is busy, and the working mode detection will not 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 the new working mode, at least 2ms after the rising edge of AUX, the module will actually enter this mode; If AUX is always high, then 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 the LoRa modulation method, the information transmission delay is much longer than that of FSK. It is recommended that customers do not transmit large amounts of data at low airspeeds, so as to avoid data loss caused by 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:

model (0-3)	M1	M0	模式介绍	备注
0 transfer mode	0	0	Serial port open, wireless open, transparent transmission	Support special command over-the-air configuration
1 WORmodel	0	1	Can be defined as WOR sender and WOR receiver	Support air wake-up
2 configuration mode	1	0	Users can access the registers through the serial port to control the working status of the module	
3 deep sleep	1	1	Module goes to sleep	

6.1 Mode switch

number	Remark
1	● Users can combine M1 and M0 with high and low levels to determine the working mode of the module. The 2 GPIOs of the MCU can be used to control the mode switching; ● After changing M1 and M0: If the module is idle, after 1ms, it can start to work according to the new mode; ● If the module has serial port data that has not been transmitted wirelessly, the new working mode can only be entered after the transmission is completed; ● If the module receives wireless data and sends out data through the serial port, it needs to be sent to the new working mode; ● Therefore, the mode switching can only be effective when the AUX output is 1, otherwise the switching will be delayed.
2	● For example: if the user continuously inputs a large amount of data and switches modes at the same time, the mode switching operation is invalid at this time; the module will process all user data before performing the new mode detection;So the general suggestion is: Detect the output state of the AUX pin, wait for 2ms after the output is high, and then switch.
3	● When the module is switched from other modes to sleep mode, if there is data that has not been processed; ● The module can enter the sleep mode only after processing these data (including receiving and sending). This feature can be used for fast sleep to save power consumption; for example: the transmitter module works in mode 0, the user initiates serial port data "12345", and then does not need to wait for the AUX pin to be idle (high level), and can directly switch to sleep mode, Put the user's main MCU to sleep immediately, the module will automatically send all user data wirelessly, and automatically enter sleep within 1ms; ● Thus, the working time of the MCU is saved and the power consumption is reduced.

4	● In the same way, this feature can be used for any mode switching. After the module processes the current mode event, it will automatically enter the new mode within 1ms; thus saving the user's work of querying AUX, and achieving the purpose of fast switching ; ● For example, switching from the transmit mode to the receive mode; the user MCU can also go to sleep in advance before the mode switch, and use the external interrupt function to obtain the AUX change, so as to switch the mode.
5	● This operation mode is very flexible and efficient, and is completely designed according to the user's MCU operation convenience, 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)

Types	When M0 = 0, M1 = 0, the module works in mode 0
emission	Users can input data through the serial port, and the module will start wireless transmission.
take over	The wireless receiving function of the module is turned on, and the wireless data will be output through the serial port TXD pin after receiving the wireless data.

6.3 WOR Mode (Mode 1)

Type	When M0 = 1, M1 = 0, the module works in mode 1
emission	When defined as a transmitter, a wake-up code for a certain period of time will be automatically added before transmission
take over	Data can be received normally, and the receiving function is equivalent to mode 0

6.4 Configuration Mode (Mode 2)

Type	当 M0 = 0，M1 = 1 时，模块工作在模式 2
emission	wireless transmission off
take over	Wireless reception is off
configure	User can access registers to configure module operating status

6.5 Deep Sleep Mode (Mode 3)

Type	When M0 = 1, M1 = 1, the module works in mode 3
Emission	Unable to transmit wireless data.
Take over	Unable to receive wireless data.
Notice	When entering other modes from sleep mode, the module will reconfigure parameters. During the configuration process, AUX remains low; After completion, it outputs a high level, so it is recommended that the user detect the rising edge of AUX.

Chapter 7 Register Read and Write Control

7.1 Instruction format

In configuration mode (mode 2: M1=1, M0=0), the list of supported commands is as follows (when setting, only 9600 and 8N1 formats are supported):

Number	Instruction format	Detailed description
1	set register	Command: C0+start address+length+parameter Response: C1+start address+length+parameter Example 1: Configure the channel as 0x09 Command Start Address Length Parameter Send: C0 05 01 09 Return: C1 05 01 09 Example 2: Configure the 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 61 Return: C1 00 04 12 34 00 61
2	read register	Instruction: C1+start address+length Response: C1+start address+length+parameter Example 1: Reading a channel Command Start Address Length Parameter 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	set temporary register	Command: C2 + start address + length + parameter Response: C1 + start address + length + parameter Example 1: Configure the channel as 0x09 Command Start Address Length Parameter Send: C2 05 01 09

		Return: C1 05 01 09 Example 2: Configure the module address (0x1234), network address (0x00), serial port (9600 8N1), and airspeed (2.4K) at the same time Send: C2 00 04 12 34 00 61 Return: C1 00 04 12 34 00 61
5	Wireless configuration	Instructions: CF CF + regular instructions Response: CF CF + regular response Example 1: Wireless configuration channel is 0x09 Wireless Command Header Command Start Address Length Parameter Send: CF CF C0 05 01 09 Return: CF CF C1 05 01 09 Example 2: Wirelessly configure the module address (0x1234), network address (0x00), serial port (9600 8N1), and airspeed (2.4K) at the same time Send: CF CF C0 00 04 12 34 00 61 Return: CF CF C1 00 04 12 34 00 61
6	wrong format	malformed response FF FF FF

7.2 register description

<table>
<tr><th>Number</th><th>Read/ write</th><th>Name</th><th colspan="4">Description</th><th>Remark</th></tr>
<tr><td>00H</td><td>read/write</td><td>ADDH</td><td colspan="4">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 listening 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="4">ADDL (default 0)</td></tr>
<tr><td>02H</td><td>read/write</td><td>NETID</td><td colspan="4">NETID (default 0)</td><td>Network address, used to distinguish the network;
When communicating with each other, they should be set to the same.</td></tr>
<tr><td rowspan="7">03H</td><td rowspan="7">Read/write</td><td rowspan="7">REG0</td><td>7</td><td>6</td><td>5</td><td>UART serial rate (bps)</td><td rowspan="7">For the two modules that communicate with each other, the serial port baud rate can be different, and the verification method can also be different;

When continuously transmitting large data packets, users need to consider the data blocking caused by the same baud rate, and may even be lost;

It is generally recommended that both sides of the communication have the same baud rate.</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>Serial port baud rate is 1200</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>Serial port baud rate is 2400</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>Serial port baud rate is 4800</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>Serial port baud rate is 9600 (default)</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>Serial port baud rate is 19200</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>Serial port baud rate is 38400</td></tr>
</table>

			1	1	0	Serial port baud rate is 57600	
			1	1	1	Serial port baud rate is 115200	
			4	3	Serial check digit		The serial port modes of both sides of the communication can be different;
			0	0	8N1 (default)		
			0	1	8O1		
			1	0	8E1		
			1	1	8N1 (equivalent 00)		
			2	1	0	Wireless air rate (bps)	The air speed of both parties must be the same; 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	Air rate 62.5k	
04H	Read/write	REG1	7	6	Subcontracting settings		When the data sent by the user is less than the packet length, the serial output of 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 of the receiving end will be output in packets.
			0	0	240 bytes (default)		
			0	1	128 bytes		
			1	0	64 bytes		
			1	1	32 bytes		
			5	RSSI Ambient Noise Enable			Enable command (packet setting, transmit power as default parameters, configuration mode): C0 04 01 20; After it is enabled, the C0 C1 C2 C3 instruction can be sent in the transmission mode or the WOR transmission mode to read the register; Register 0x00: Current ambient noise RSSI; Register 0X01: RSSI when data was last received (Current channel noise is: dBm = -(256 - RSSI)); Instruction format: C0 C1 C2 C3+start 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 00)
			0	disabled (default)			
			1	enable			
			4	3	2	Reserve	
			1	0	transmit power		Power and current have a non-linear relationship, and the power supply efficiency is the highest at the maximum
			0	0	30dBm (default)		
			0	1	27dBm		

<table>
<tr><td></td><td></td><td></td><td>1</td><td>0</td><td>24dBm</td><td>power;

The current does not decrease proportionally as the power decreases.</td></tr>
<tr><td></td><td></td><td></td><td>1</td><td>1</td><td>21dBm</td><td></td></tr>
<tr><td>05H</td><td>read/write</td><td>REG2</td><td colspan="3">Channel Control (CH)
0-83 respectively represent a total of 84 channels</td><td>Actual frequency = 410.125 + CH *1M</td></tr>
<tr><td rowspan="15">06H</td><td rowspan="15">Read/write</td><td rowspan="15">REG3</td><td>7</td><td colspan="3">Enable RSSI bytes</td><td rowspan="3">When enabled, the module receives wireless data and outputs it through the serial port TXD, followed by an RSSI strength byte.</td></tr>
<tr><td>0</td><td colspan="3">disabled (default)</td></tr>
<tr><td>1</td><td colspan="3">enable</td></tr>
<tr><td>6</td><td colspan="3">transfer method</td><td rowspan="3">During fixed-point transmission, the module will recognize the three bytes of serial port data as: address high + address low + channel, and use it as the wireless transmission target.</td></tr>
<tr><td>0</td><td colspan="3">transparent transmission (default)</td></tr>
<tr><td>1</td><td colspan="3">fixed point transmission</td></tr>
<tr><td>5</td><td colspan="3">Relay function</td><td rowspan="3">After the relay function is enabled, if the target address is not the module itself, the module will start a forwarding;
In order to prevent data return, it is recommended to use in conjunction with fixed-point mode; that is, the destination address and the source address are different.</td></tr>
<tr><td>0</td><td colspan="3">Disable relay function (default)</td></tr>
<tr><td>1</td><td colspan="3">Enable relay function</td></tr>
<tr><td>4</td><td colspan="3">LBT enable</td><td rowspan="3">After enabling, the wireless data will be monitored before transmission, which can avoid interference to a certain extent, but may cause data delay;

The maximum stay time of LBT is 2 seconds. When it reaches two seconds, it will be issued forcibly.</td></tr>
<tr><td>0</td><td colspan="3">disabled (default)</td></tr>
<tr><td>1</td><td colspan="3">enable</td></tr>
<tr><td>3</td><td colspan="3">WOR Mode Transceiver Control</td><td rowspan="3">Only valid for mode 1;
1. In the receiving mode of wor, the module can modify the delay time after wake-up, the default time is 0;
2. The receiver needs to send the command C0 09 02 03 E8 in the configuration mode (C0 is the write command, 09 is the register starter address, 02 is the length, 03 E8 is the set delay, the maximum FFFF is 65535ms, set to 0 disables wakeup delay.)
3. Data can be sent within the delay</td></tr>
<tr><td>0</td><td colspan="3">WOR receiver (default)
Working in WOR monitor mode, the monitor cycle is shown below (WOR cycle), which can save a lot of power consumption.</td></tr>
<tr><td>1</td><td colspan="3">WOR transmitter
The transceiver is turned on, and a wake-up code for a certain period of time is added when transmitting data.</td></tr>
<tr><td>2</td><td>1</td><td>0</td><td>WOR cycle</td><td rowspan="9">Only valid for mode 1;

Period T= (1+WOR)*500ms, the maximum is 4000ms, and the minimum is 500ms;

The longer the WOR monitoring interval period, the lower the average power consumption, but the greater the data delay;

The sender and receiver must agree (very important)</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>500ms</td></tr>
<tr><td>0</td><td>0</td><td>1</td><td>1000ms</td></tr>
<tr><td>0</td><td>1</td><td>0</td><td>1500ms</td></tr>
<tr><td>0</td><td>1</td><td>1</td><td>2000ms</td></tr>
<tr><td>1</td><td>0</td><td>0</td><td>2500ms</td></tr>
<tr><td>1</td><td>0</td><td>1</td><td>3000ms</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>3500ms</td></tr>
<tr><td>1</td><td>1</td><td>1</td><td>4000ms</td></tr>
</table>

07H	Write	CRYPT_H	Key high byte (default 0)	write only, read returns 0; It is used for encryption to avoid the interception of wireless data in the air by similar modules; The module will use these two bytes as a calculation factor to transform and encrypt the air wireless signal.
08H	Write	CRYPT_L	key low byte (default 0)	
80H～86H	Read	PID	Product information 7 bytes	Product information 7 bytes

7.3 Factory default parameters

model	Factory default parameter value: C0 00 00 62 00 17						
Module model	Frequency	Address	channel	air rate	baud rate	Serial format	transmit power
E22-400T33D	433.125MHz	0x0000	0x17	2.4kbps	9600	8N1	33dbm

Chapter 8 Use of Relay Network Mode

序号	Relay Mode Description
1	After setting the relay mode through the configuration mode, switch to the general mode, and the relay starts to work.
2	In relay mode, ADDH and ADDL are no longer used as module addresses, but correspond to NETID forwarding pairing respectively. If one network is received, it will be forwarded to the other network; The network ID of the repeater itself is invalid.
3	In relay mode, the relay module cannot send and receive data, and cannot perform low-power operation.
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.

Relay networking rules description:

1. Forwarding rules, the relay can forward data between two NETIDs in both directions.

2. In relay mode, ADDH\ADDL is no longer used as module address, but as NETID forwarding pairing.

As shown in the figure:

①First-level relay

"Node 1" NETID is 08.

"Node 2" NETID is 33.

The ADDH\ADDL of relay 1 are 08 and 33 respectively.

So the signal sent by node 1 (08) can be forwarded to node 2 (33)

At the same time, the addresses of node 1 and node 2 are the same, so the data sent by node 1 can be received by node 2.

②Secondary relay

The ADDH\ADDL of relay 2 are 33 and 05 respectively.

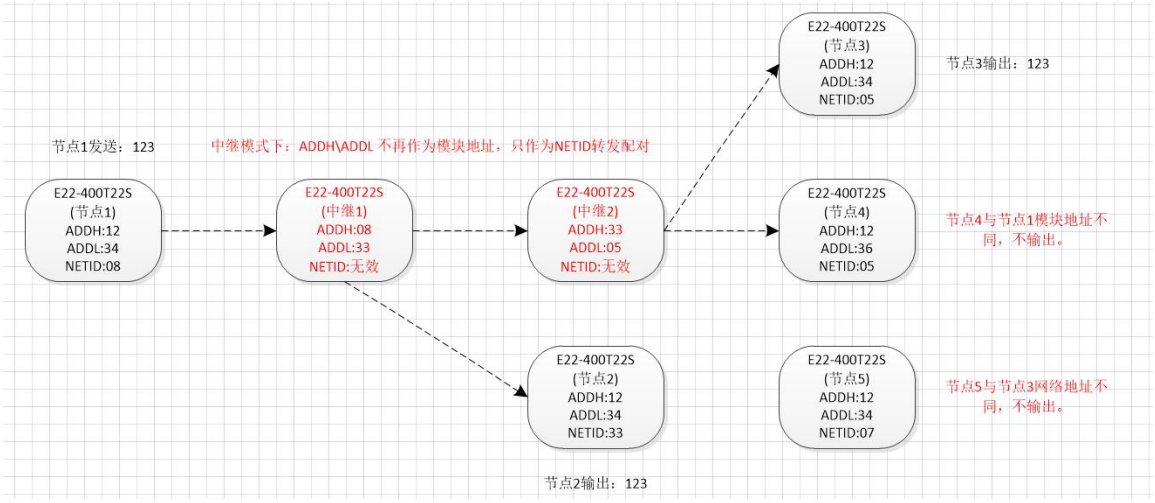
So relay 2 can forward relay 1's data to network NETID: 05.

Therefore, node 3 and node 4 can receive the data of node 1. Node 4 outputs data normally, and node 3 and node 1 have different addresses, so no data is output.

③Two-way relay

As shown in the configuration: the data sent by node 1 can be received by nodes 2 and 4, and the data sent by nodes 2 and 4 can also be received by node

1.



Chapter 9 PC Configuration Instructions

- The following picture shows the E22-400T33D configuration host computer display interface, the user can switch to command mode through M0 and M1, and quickly configure and read parameters on the host computer.

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

  Network address: 0～65535

  Frequency channel: 0～83

  Network ID: 0～255

  Key: 0～65535

  When using the host computer to configure the relay mode, users need to pay special attention, because in the host computer, each parameter is displayed in decimal mode, so the module address and network ID need to be converted into decimal when filling in;

  If the network ID input by transmitter A is 02, and the network ID input by receiver B is 10, then when relay terminal R sets the module address, convert the hexadecimal value 0X020A to decimal value 522 and fill in as relay terminal R the module address;

  That is, the module address value that needs to be filled in by the relay terminal R at this time is 522.

Chapter 10 Hardware Design

- It is recommended to use a DC regulated power supply to supply power to the module, the power supply ripple coefficient should be as small as possible, and the module should be grounded reliably;
- Please pay attention to the correct connection of the positive and negative poles of the power supply. If the reverse connection will directly cause permanent damage to the module, it is recommended to design and add an anti-reverse connection circuit.
- Please check the power supply to ensure that it is between the recommended power supply voltages. If it exceeds the maximum value, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage should not fluctuate greatly and frequently;

- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, so that the whole machine can work stably for a long time;
- The module should be kept as far away as possible from the power supply, transformer, high-frequency wiring and other parts with large electromagnetic interference;
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the underside of the module. If it is necessary to pass under the module, assuming that the module is soldered on the Top Layer, ground copper (all copper) is placed on the Top Layer of the contact part of the module. And well grounded), it must be close to the digital part of the module and routed on the Bottom Layer;
- Assuming that the module is soldered or placed on the Top Layer, it is also wrong to arbitrarily route wires on the Bottom Layer or other layers, which will affect the stray and receiving sensitivity of the module to varying degrees;
- Assuming that there are devices with large electromagnetic interference around the module, it will greatly affect the performance of the module. It is recommended to stay away from the module according to the intensity of the interference. If the situation allows, appropriate isolation and shielding can be done.;
- Assuming that there are traces with large electromagnetic interference around the module (high-frequency digital, high-frequency analog, power traces), the performance of the module will also be greatly affected. It is recommended to stay away from the module according to the intensity of the interference. Proper isolation and shielding;
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, there is still a risk of damage);
- The antenna installation structure has a great influence on the performance of the module, and it is necessary to ensure that the antenna is exposed and preferably vertically upward;
- When the module is installed inside the case, a high-quality antenna extension cable can be used to extend the antenna to the outside of the case;
- The antenna must not be installed inside the metal shell, which will greatly reduce the transmission distance.

Chapter 11 Frequently Asked Questions

11.1 The transmission distance is not ideal

- When there is a straight line communication obstacle, the communication distance will be correspondingly attenuated;
- Temperature, humidity, and co-channel interference will increase the communication packet loss rate;地面吸收、反射
- Seawater has a strong ability to absorb radio waves, so the seaside test effect is poor;
- There are metal objects near the antenna, or placed in a metal case, the signal attenuation will be very serious;
- The power register is set incorrectly, and the air rate is set too high (the higher the air rate, the closer the distance);
- At room temperature, the low voltage of the power supply is lower than the recommended value. The lower the voltage, the lower the output power.;
- The antenna used is poorly matched with the module or the quality of the antenna itself is faulty.

11.2 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 and frequently;
- Please ensure anti-static operation during installation and use, the electrostatic sensitivity of high-frequency components;
- Please ensure that the humidity during installation and use should not be too high. Some components are humidity-sensitive components.;
- If there is no special requirement, it is not recommended to use it at too high or too low temperature.

11.3 Bit error rate too high

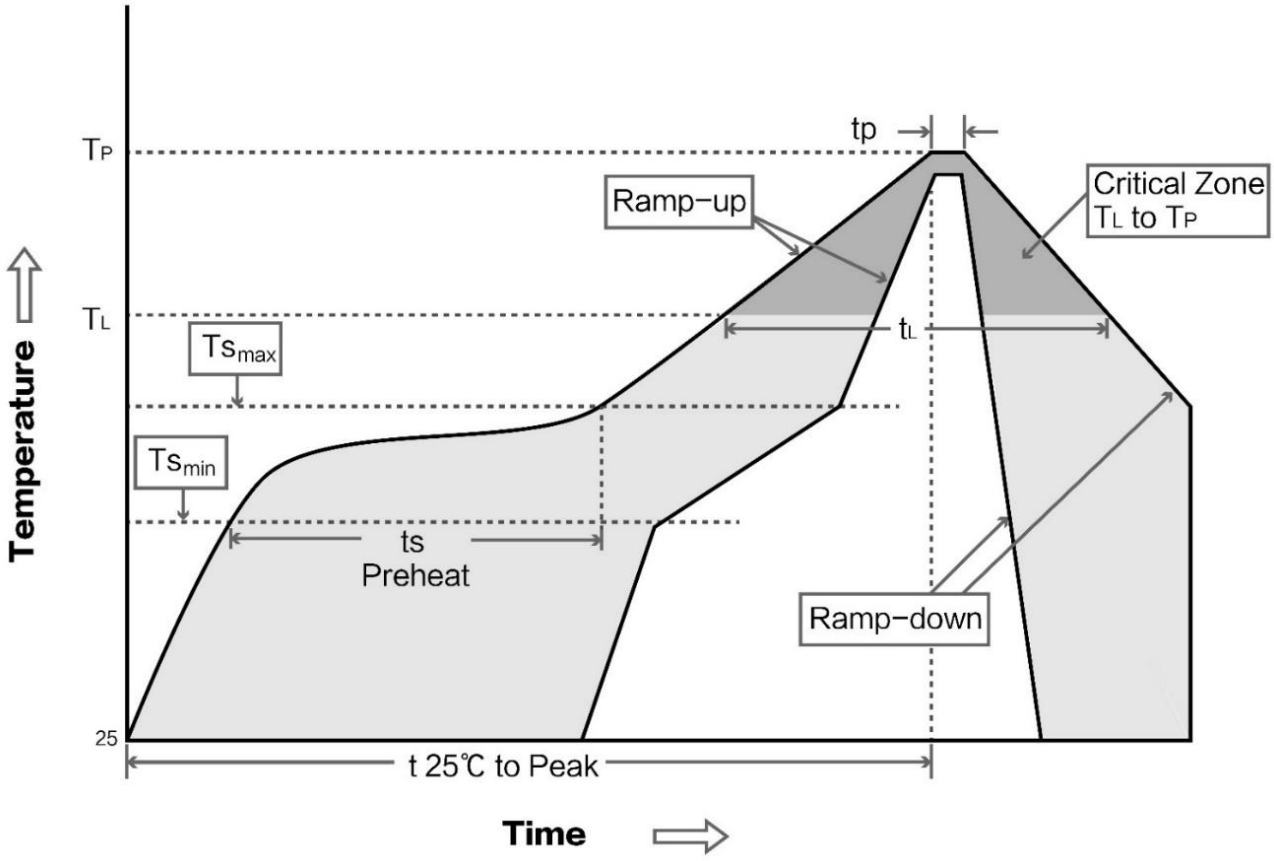
- There is co-frequency signal interference nearby, stay away from the interference source or modify the frequency and channel to avoid interference;
- If the power supply is not ideal, it may also cause garbled characters. Be sure to ensure the reliability of the power supply.;
- Poor quality or too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

Chapter 12 Welding Operation Instructions

12.1 reflow temperature

Profile Feature	Curve feature	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 rate of ascent	3℃/second max	3℃/second max
Liquidous 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 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

12.2 Reflow Soldering Curve



Chapter 13 Related Models

Product number	Chip solution	carrier frequency Hz	Power dBm	Testing Distance km	Package form	Product size mm	Communication interface
E22-400T22S	SX1262	433/470M	22	5	SMD	16*26	UART
E22-400T22D	SX1262	433/470M	22	5	DIP	21*36	UART
E22-400T30S	SX1262	433/470M	30	10	SMD	20*40.5	UART
E22-400T30D	SX1262	433/470M	30	10	DIP	24*43	UART
E22-900T22S	SX1262	868/915M	22	5	SMD	16*26	UART
E22-900T22D	SX1262	868/915M	22	5	DIP	21*36	UART
E22-900T30S	SX1262	868/915M	30	10	SMD	20*40.5	UART
E22-900T30D	SX1262	868/915M	30	10	DIP	24*43	UART
E22-400T33D	SX1262	433/470M	33	12	DIP	37*60	UART

Chapter 14 Antenna Guidelines

14.1 Antenna recommendation

Antennas play an important role in the communication process, and often inferior antennas will have a great impact on the communication system. Therefore, our company recommends some antennas as antennas with excellent performance and reasonable price for our wireless modules.

Product number	Type	Frequency Hz	Interface	Gain dBi	Height mm	Feeder cm	Features
TX433-NP-4310	flexible antenna	433M	welding	2.0	43.8*9.5	-	Built-in flexible, FPC soft antenna
TX433-JZ-5	Rubber antenna	433M	SMA-J	2.0	52	-	Ultra-short straight, omnidirectional antenna
TX433-JZG-6	Rubber antenna	433M	SMA-J	2.5	62	-	Ultra-short straight, omnidirectional antenna
TX433-JW-5	Rubber antenna	433M	SMA-J	2.0	50	-	Bend glue stick, omnidirectional antenna
TX433-JWG-7	Rubber antenna	433M	SMA-J	2.5	75	-	Bend glue stick, omnidirectional antenna
TX433-JK-11	Rubber antenna	433M	SMA-J	2.5	110	-	Bendable glue stick, omnidirectional antenna
TX433-JK-20	Rubber antenna	433M	SMA-J	3.0	210	-	Bendable glue stick, omnidirectional antenna
TX433-XPL-100	Suker antenna	433M	SMA-J	3.5	185	100	Small suction cup antenna, cost-effective
TX433-XP-200	Suker antenna	433M	SMA-J	4.0	190	200	Neutral suction cup antenna, low loss
TX433-XPH-300	Suker antenna	433M	SMA-J	6.0	965	300	Large suction cup antenna, high gain
TX490-JZ-5	Rubber antenna	470/490M	SMA-J	2.0	50	-	Ultra-short straight, omnidirectional antenna
TX490-XPL-100	Suker antenna	470/490M	SMA-J	3.5	120	100	Small suction cup antenna, cost-effective

Revise history

Version	revision date	Revision Notes	Maintenance man
1.0	2022-1-26	initial version	Linson

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