



E22-400MM22S product specifications

**SX1268 433/470MHz ultra-small size
Lora SMD module**



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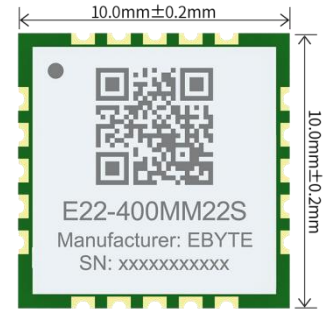
Chapter 1 Overview

1.1 Introduce

E22-400MM22S is an ultra-small size and suitable for 433MHz and 470MHz SMD LoRaTM wireless module based on the new generation of LoRaTM RF chip SX1268 produced by Semtech in the United States as its core.

As the original imported SX1268 is used as the core of the module, the anti-interference performance and communication distance are further improved compared with the previous generation LoRaTM transceiver. Due to its new LoRaTM modulation technology, its anti-jamming performance and communication distance are far better than those of the current FSK and GFSK modulation methods. The module is mainly aimed at smart home, wireless meter reading, scientific research and medical treatment as well as medium and long distance wireless communication devices. Due to the RF performance and component selection are in accordance with the industrial standard, the product can cover 410 ~ 493MHz ultra-wide applicable frequency range and backward compatible with SX1278, SX1276. using industrial grade high-precision 32MHz crystal.

As the module is pure RF transceiver module, it needs to be driven by MCU or use special SPI debugging tool.



1.2 Features

- The measured communication distance can reach 7km.
- Maximum transmit power 160mW, multi-stage tunable software;
- supports global license-free ISM 433/470MHz band;
- LoRaTM supports data transfer rates ranging from 0.018 to 62.5kbps.
- FSK mode supports up to 300kbps data transfer rate.
- Backwards compatible with SX1278/SX1276 series RF transceivers;
- The FIFO has a large capacity and supports 256Byte data caching.
- A new SF5 spreading factor that supports dense networks.
- supports 1.8V to 3.7V power supply, and any power supply greater than 3.3V ensures the best performance.
- Industrial-grade standard design, supporting long-term use at -40 ~ 85° C;
- IPEX interface, stamp hole optional, easy to user secondary development, easy to integrate.

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;
- Advanced Meter Reading Architecture (AMI);

- Applications in the automotive industry.

Chapter 2 Specifications

2.1 Limit parameters

mainly parameters	Performance		Notes
	Min	Max	
Power Supply Voltage (V)	0	3.7	Permanently burn module over 3.7V
Blocking power (dBm)	-	10	At close range, the burn probability is low
Operating temperature (°C)	-40	85	
Product net weight	0.5g±0.02g		Product net weight

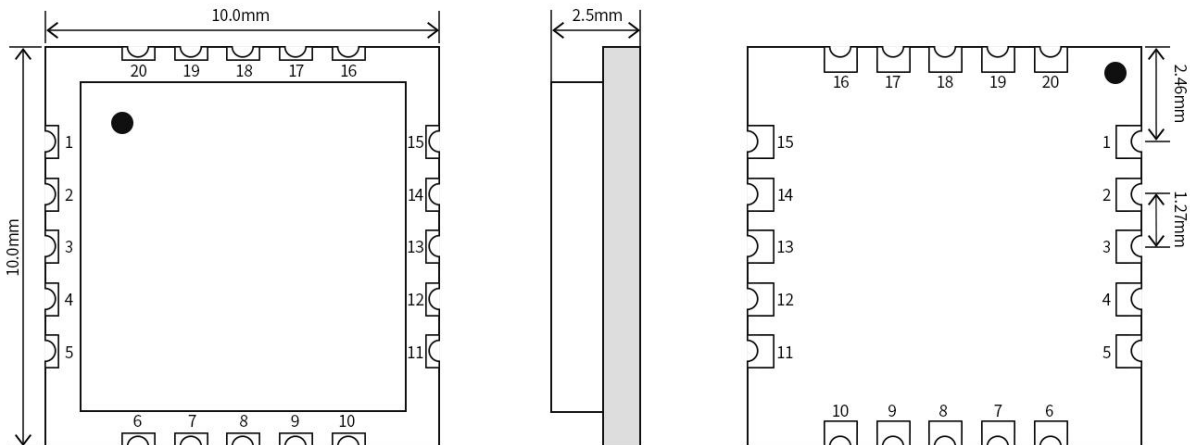
2.2 Working Frequency

mainly parameters		Performance			Notes
		Min	Typical values	Max	
Power Supply Voltage (V)		1.8	3.3	3.7	≥3.3V Can ensure the output power
communication level (V)			3.3		Using 5V TTL may burn out
Working temperature (°C)		-40	-	85	Industrial grade design
Working frequency band (MHz)		410	433/470/490	493	Support ISM Frequecy
Power consumption	Emission current (mA)		100		instantaneous power consumption
	Receives the current (mA)		10		
	Sleep current (nA)		180		software shut off
Maximum transmitted power (dBm)		21.4	21.5	22.3	
Sensitivity of reception (dBm)		-144	-146	-147	air rate is 0.3kbps
air rate (bps)		0.6k	-	300k	User programming control
		0.018k		62.5k	User programming control

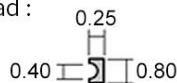
mainly parameters	Description	Notes
Distance	6000m	Clear and open environment, antenna gain 5dBi, antenna height 2.5m, air speed 0.3kbps.
FIFO	256 Byte	Maximum sending length
Crystal frequency	32 MHz	Passive crystal oscillator

Modulation method	LoRa (recommend)	
Encapsulation way	SMD	
Interface	1.27mm	Stamp hole
Communication interface	SPI	0-10Mbps
Overall dimensions	10* 10*2.5 mm	
Antenna interface	Stamp hole/IPEX	The equivalent impedance is about 50 ohms

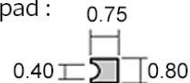
Chapter 3 machine dimensions and pin definition



Top pad :



Bottom pad :



Unit: mm
pad quantity: 20
Tolerance value: X.X±0.2mm
X.XX±0.05mm

Pin number	Pin name	Pin direction	Pin purposes
1	VCC		Power supply, range 1.8V~3.7V (external ceramic filter capacitor is recommended)
2	GND		Ground wire, connected to the power reference ground
3	NRST	input	Chip reset triggers input pin, active low level
4	NC		
5	NC		
6	ANT		Radio frequency interface, stamp hole
7	GND		Ground wire, connected to the power reference ground
8	NC		
9	TXEN	input	Rf switch transmitting control pin, connected to external microcontroller IO or DI02, high level effective
10	RXEN	input	Rf switch receiving control pin, connected to external microcontroller IO, high level effective
11	BUSY	output	Used for status indication
12	MISO	output	SPI data output pin

13	MOSI	input	SPI data input pin
14	NSS	input	The module chip selection pin is used to start an SPI communication
15	SCK	input	SPI clock input pin
16	GND		Ground wire, connected to the power reference ground
17	NC		
18	DI03	Input/output	Configurable universal I/O port
19	DI02	Input/output	Configurable universal I/O port
20	DI01	Input/output	Configurable universal I/O port

Chapter 4 Basic operations

4.1 Hardware design

- It is recommended to use DC regulated power supply to power the module, the ripple coefficient of the power supply is as small as possible, and the module must be reliably grounded.
- 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;
- Check the power supply, making sure it's between recommended supply voltages, as exceeding the maximum value can permanently damage the module.
- Check the stability of the power supply, the voltage cannot fluctuate dramatically and frequently;
- When designing a power supply circuit for a module, it is often recommended to retain more than 30% margin, which is conducive to long-term and stable work of the whole machine.
- The module should be kept away from parts with high electromagnetic interference, such as power supplies, transformers, and high-frequency cables.
- High-frequency digital cable routing, high-frequency analog cable routing, and power cable routing must avoid under the module. If necessary, pass under the module, assuming that the module is welded at the Top Layer, copper is laid on the Top Layer of the contact part of the module (all copper is laid and well grounded), and it must be near the digital part of the module and wired at the Bottom Layer.
- Assuming the module is welded or placed at the Top Layer, arbitrarily wiring at the Bottom Layer or other layers is also wrong, affecting the module's stray and receiving sensitivity to varying degrees.
- Assuming that there are large electromagnetic interference devices around the module will greatly affect the performance of the module, and according to the strength of the interference suggest to stay away from the module, if the circumstances allow for appropriate isolation and shielding;
- Assuming that there are wires around the module with large electromagnetic interference (high-frequency digital, high-frequency analog, power cable) will also greatly affect the performance of the module, it is recommended to stay away from the module according to the strength of the interference, and do appropriate isolation and shielding if circumstances permit.
- Communication lines using 5V level must be connected in series with 1k-5.1k resistors (not recommended, there is still a risk of damage);
- Try to stay away from TTL protocols at the 2.4GHz physical layer, such as USB3.0.
- Antenna installation structure has a great impact on module performance, so make sure the antenna is exposed, preferably vertically up. When the module is installed inside the enclosure, the antenna extension cable

can be used to extend the antenna outside the enclosure.

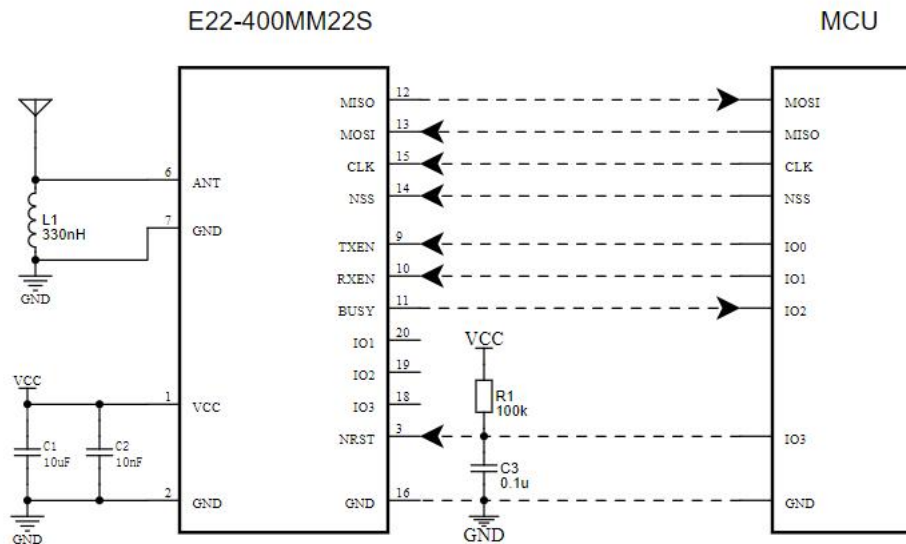
- The antenna must not be mounted inside a metal shell, which weakens the transmission range.
- It is recommended to add a 200R protection resistor to the RXD/TXD of the external MCU.

4.2 Software programming

- This module has a built-in SX1268/SX1262, and its driving mode is exactly the same as SX1268/SX1262, users can operate in accordance with the SX1268/SX1262 chip volume.
- DIO1, DIO2 are generic I/O ports that can be configured for many functions. DIO2 can be connected with TXEN, not with the I/O port of MCU, and used to control the RF switch emission. See SX1262 manual for details. If not used, it can be suspended.
- The module uses a 32 MHz passive crystal oscillator.

Chapter 5 basic application

5.1 Basic circuit



Chapter 6 FAQ

6.1 Transmission distance is not ideal

- When there is a straight-line communication obstacle, the communication distance will decay accordingly.
- Temperature, humidity, and co-frequency interference increase the communication packet loss rate.
- The ground absorbs and reflects radio waves, which is poor near the ground.
- Sea water is extremely capable of absorbing radio waves, making seaside tests less effective.
- Antenna near a metal object, or placed in a metal shell, the signal attenuation can be severe;
- The power register is incorrectly set, or the air rate is set too high (the higher the air rate, the closer the distance);
- The low voltage of the power supply is lower than the recommended value at room temperature, and the lower the voltage, the lower the power generation.
- The matching degree between the antenna and the module is poor or the quality of the antenna itself is faulty.

6.2 Modules are easily damaged

- Check the power supply to make sure it's between recommended supply voltages, as exceeding the maximum value can permanently damage the module.
- Check the stability of the power supply, the voltage shouldn't fluctuate wildly or frequently.
- Ensure that high-frequency devices are electrostatic sensitive during installation and use using anti-static operations.
- Ensure that the humidity is not too high during installation and use, as some components are humidity sensitive.
- Do not use the device at too high or too low temperature if there are no special requirements.

6.3 Bit error rate is too high

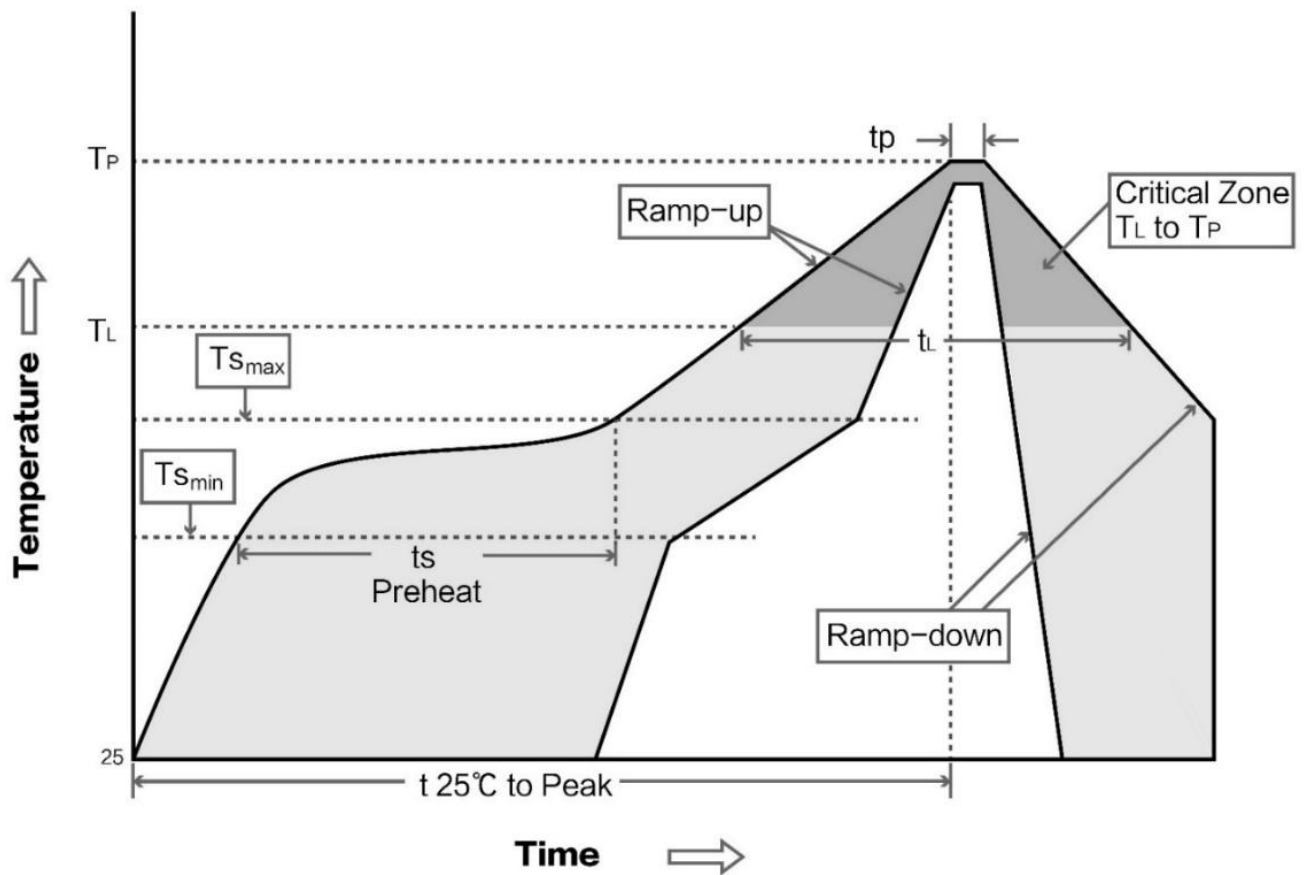
- Stay away from the interference source, or change the frequency and channel to avoid interference.
- The clock waveform on the SPI is non-standard. Check whether there is interference on the SPI line, and the SPI bus should not be too long.
- A poor power supply can cause garbled , so ensure the reliability of the power supply.
- Poor quality or too long extension wires or feeders will also cause high BER.

Chapter 7 Welding operation guidance

7.1 Reflow soldering 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 (T _{min})	Minimum preheating temperature	100°C	150°C
Preheat temperature max (T _{max})	Maximum preheating temperature	150°C	200°C
Preheat Time (T _{min} to T _{max})(t _s)	Warm up time	60-120 sec	60-120 sec
Average ramp-up rate(T _{max} to T _p)	Average rate of rise	3°C/second max	3°C/second max
Liquidous Temperature (T _L)	Temperature of the liquid phase	183°C	217°C
Time (t _L) Maintained Above (T _L)	Time above the liquidus	60-90 sec	30-90 sec
Peak temperature (T _p)	Peak temperature	220-235°C	230-250°C
Average ramp-down rate (T _p to T _{max})	Average rate of decline	6°C/second max	6°C/second max
Time 25°C to peak temperature	Time from 25 ° C to peak temperature	6 minutes max	8 minutes max

7.2 Diagram of reflow welding



Chapter 8 Related models

Model	IC	Frequency Hz	Power dBm	Disatance km	Package	Size mm	Antenna interface
E22-400T22S	SX1268	430M 470M	22	4	SMD	16*26	Stamp hole/IPEX
E22-400M30S	SX1268	433M 470M	30	12	SMD	24*38.5	Stamp hole/IPEX
E22-900M30S	SX1262	868M 915M	30	12	SMD	24*38.5	Stamp hole/IPEX
E22-900M22S	SX1262	868M 915M	22	6.5	SMD	14*20	Stamp hole/IPEX
E22-400M22S	SX1268	433M 470M	22	6.5	SMD	14*20	Stamp hole/IPEX

Chapter 9 Antenna Guide

9.1 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 supporting our wireless module with excellent performance and reasonable price.

Model	Type	Frequency Hz	Interface	Gain dBi	Height	Feeder	Features
TX433-NP-4310	Soft PCB Antenna	433M	SMA-J	2	43.8*9.5mm	-	Built-in flexible, FPC soft antenna
TX433-JW-5	Rubber antenna	433M	SMA-J	2	50mm	-	Bendable adhesive rod, omnidirectional antenna
TX433-JWG-7	Rubber antenna	433M	SMA-J	2.5	75mm	-	Bendable adhesive rod, omnidirectional antenna
TX433-JK-20	Rubber antenna	433M	SMA-J	3	210mm	-	Bendable adhesive rod, omnidirectional antenna
TX433-JK-11	Rubber antenna	433M	SMA-J	2.5	110mm	-	Bendable adhesive rod, omnidirectional antenna
TX433-XP-200	Sucker antenna	433M	SMA-J	4	19cm	200cm	Suction cup antenna, high gain
TX433-XP-100	Sucker antenna	433M	SMA-J	3.5	18.5cm	100cm	Suction cup antenna, high gain
TX433-XP-300	Sucker antenna	433M	SMA-J	6	96.5cm	300cm	On-board suction cup antenna, ultra high gain
TX433-JZG-6	Rubber antenna	433M	SMA-J	2.5	52mm	-	Ultra short straight, omnidirectional antenna
TX433-JZ-5	Rubber antenna	433M	SMA-J	2	52mm	-	Ultra short straight, omnidirectional antenna
TX490-XP-100	Sucker antenna	490M	SMA-J	50	12cm	100cm	Suction cup antenna, high gain
TX490-JZ-5	Rubber antenna	490M	SMA-J	50	50mm	-	Ultra short straight, omnidirectional antenna

Revise history

Version	Revise date	Revise notes	maintainer
1.0	2022-10-21	Original version	Yan
1.1	2023-02-07	Bug fixes	Yan
1.2	2023-11-08	Modify the crystal description	Ning

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