



E22P-xxxMxxS Product Specification Sheet

SX1262 /SX1268 SPI SMD LoRa Module



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1. Overview

1.1 Introduction

The E22P- xxxM30S series module is a surface-mount LoRa[™] wireless module independently developed based on the Semtech high-performance RF chip SX126 X ① . It has a maximum power of 30dBm and is suitable for the 433/868/915 MHz frequency band . It uses an industrial - grade high-precision active temperature-compensated crystal oscillator internally .

Using the original imported SX126 X ① as the core module, an additional RF front-end module (RF FEM) is added to the original design. This module includes a power amplifier (PA), a low-noise amplifier (LNA), and an RF switch, enabling a maximum transmit power of 30dBm while further improving receive sensitivity. Overall communication stability is significantly improved compared to products without power and LNA amplifiers. Compared to the previous generation LoRa[™] transceivers, interference immunity and communication range are enhanced, further widening the gap with products using FSK and GFSK modulation methods.

Since this module is a pure RF transceiver module, it requires the use of an MCU driver or a dedicated SPI debugging tool . For a detailed product [selection comparison table, please see section 2.1 of this article](#) .

1.2 Features and Functions

- To the SX127X series modules, the SX126X module has significant advantages in terms of lower power consumption, faster speed, and longer range;
- Under ideal conditions, the communication distance can reach 12 km ;
- Built-in PA+LNA +SWA significantly improves communication distance and communication stability;
- ESD protection design ensures efficient module operation;
- The module is equipped with an RF front-end module, resulting in high overall communication performance;
- 32MHz industrial-grade high-precision active temperature-compensated crystal oscillator ;
- Maximum transmit power 30dBm , adjustable in multiple software levels;
- Supports 433/868/915 MHz frequency bands (frequency band customization supported) ;
- Supports multiple modulation modes, LoRa[™] / GFSK;
- LoRa[™] mode, it supports data transmission rates from 0.3 kbps to 62.5 kbps;
- G FSK mode, it supports a data transfer rate of up to 300kbps;
- Backward compatible with SX1278/SX1276 series RF transceivers;
- The FIFO has a large capacity and supports 25.5 - byte data buffering.
- The new SF5 spreading factor was introduced to support dense networks;
- It supports power supply from 3.3 to 5.25 V , and can guarantee optimal performance with power supply greater than 5 V;
- Industrial-grade standard design, supporting long-term use at temperatures ranging from -40° C to +85° C;
- Dual antennas are optional (IPEX/stamp hole), which facilitates secondary development and integration for users;
- It has relevant certifications such as FCC, CE, and RoHS.

Note: SX126 X ① generally refers to the two chip models SX1262 and SX1268.

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.

2. Specifications

2.1 Comparison of E22P-M Series Products

category	Product Model	Chip solution s	Carrier frequency ① Hz	Transmit power ② dBm	Test distance ③ km	Product dimensions (mm)	Antenna type ④
433 MHz Frequency band module	E22P-433M30S	SX1268	429 ~ 440M	30	1 2	38.5 * 24	IPEX -1/ Stamp Hole
868 MHz Frequency band module	E22P-868M30S	SX1268	863.3 ~ 873.3 M	30	1 2	38.5 * 24	IPEX -1/ Stamp Hole
915MHz Frequency band module	E22P-915M30S	SX1262	902 ~ 928 M	30	1 2	38.5 * 24	IPEX -1/ Stamp Hole

Note:

Carrier frequency ① : Frequency band range can be customized by the user;

Transmit power ② : 30dBm=1000mW, error range ± 1 dBm, power is adjustable in multiple levels, please see [Chapter 4 of this article for details of power levels](#);

Test distance ③ : Clear and open, airspeed 2.4kbps, antenna height 2 meters (for reference only, actual measurement is recommended);

Antenna type ④ : Equivalent impedance approximately 50Ω ;

Modules operating on the same frequency band can communicate with each other.

2.2 Basic Parameters

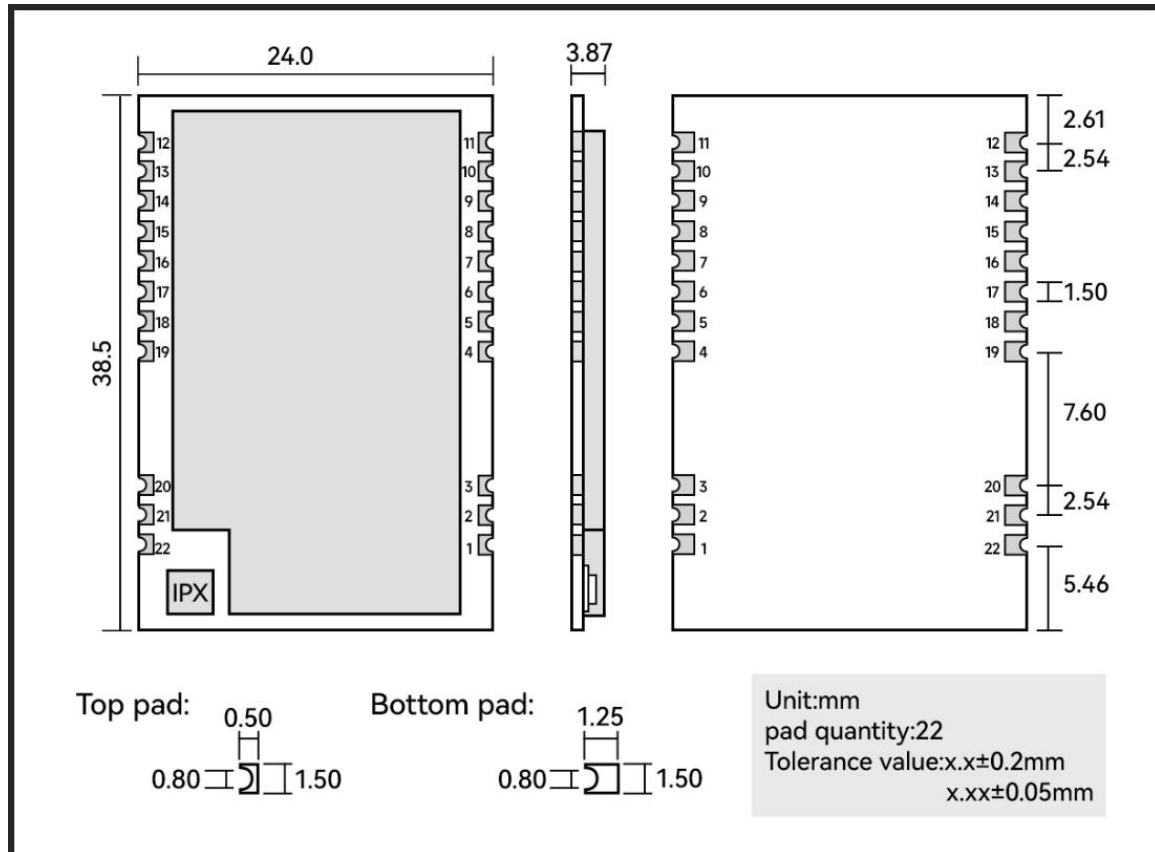
Conditions: Tc=25°C, VCC=5.0V, 433MHz / 868MHz / 915MHz

parameter	describe
Modulation method	Next-generation LoRa™ modulation technology
Interface method	1.27mm stamp perforation
Communication interface	SPI, 0 – 10 Mbps
Crystal oscillator frequency	32MHz high-precision active temperature-compensated crystal oscillator
FIFO	2 55 Btye , maximum length sent in a single batch
Packaging method	surface mount
Product net weight	5.1 , tolerance $\pm 0.02g$
Work environment	
Operating temperature	-40°C~+85°C, industrial grade standard
Operating humidity	10-90%RH
Storage	-40°C~+125°C

parameter	describe
temperature	
RF parameters	
Transmit power	30dBm = 1000mW, power adjustable in multiple levels . For details on power levels, please see Chapter 4 of this document.
Operating frequency band	429 MHz~ 440 MHz , supports frequency band customization, suitable for E22 P - 433 M 30 S
	873.3MHz , supports frequency band customization, suitable for E22P - 868M30S
	928MHz , supports frequency band customization, suitable for E22P - 915M30S
air speed	0.018~62.5kbps, supports user-programmable control
Blocking power	10dBm
Electrical parameters	
Power supply voltage	is 3.3 to 5.25V . When the operating voltage is $\geq 5V$, the output power requirement can be met. However, there is a risk of burnout when the operating voltage exceeds 5.5V .
Communication level	3.3 V
Emission current	600 - 670 mA, instantaneous power consumption @ 30 dBm
Received current	≈ 18 mA
Dormant current	≈ 2 uA

3. Mechanical dimensions and pin definitions

3.1 E22P-433M30S Dimension Drawing

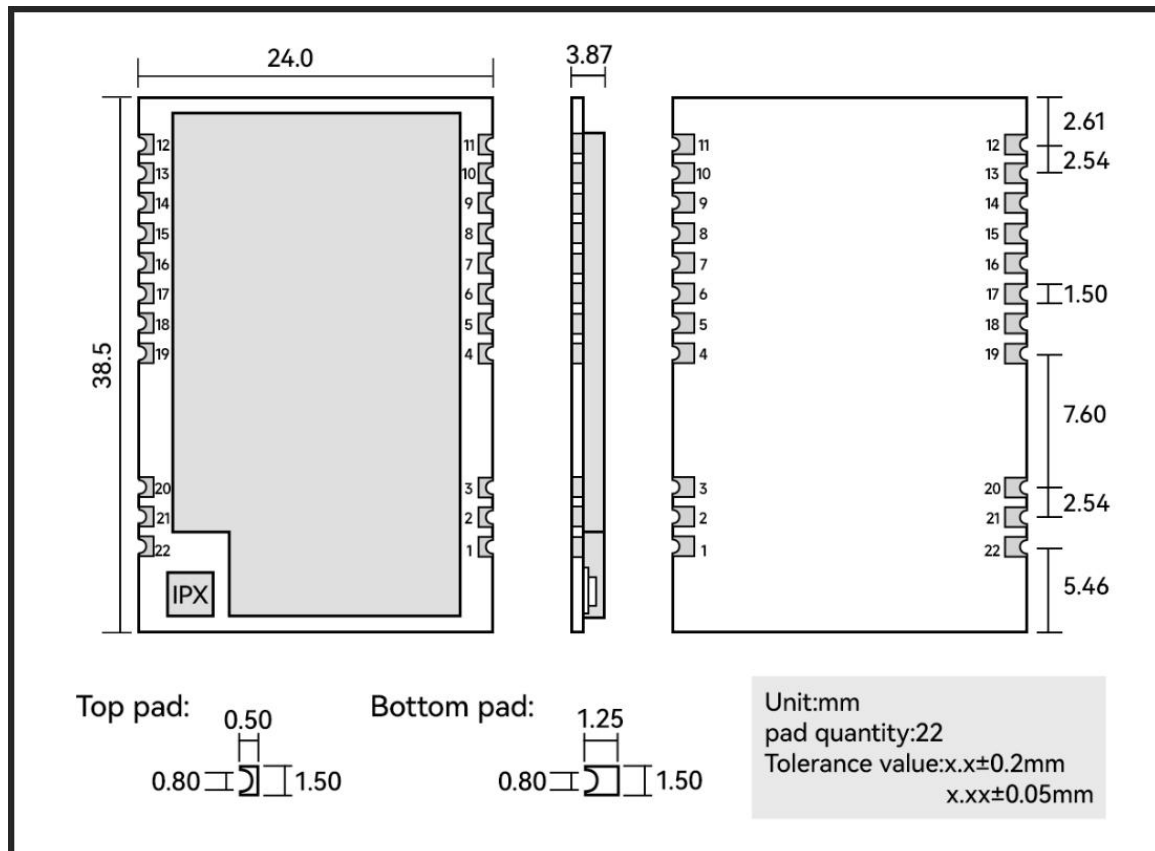


Pin number	Pin Name	Pin direction	Pin Applications
1	GND	-	Ground wire, connected to power reference ground
2	GND	-	Ground wire, connected to power reference ground
3	GND	-	Ground wire, connected to power reference ground
4	GND	-	Ground wire, connected to power reference ground
5	GND	-	Ground wire, connected to power reference ground
6	TXEN	Input	The RF switch receives the control pin, which connects to an external microcontroller I/O pin . For logic control, please refer to section 4.2 .
7	RXEN	Input	The RF switch transmit control pin connects to an external microcontroller IO or DIO2 (see SX126 8 manual for details) . For logic control, please refer to section 4.2 .
8	DIO2	Input/Output	Configurable general-purpose I/O ports (see SX126 8 manual for details)
9	VCC	-	Power supply range: 3.3 V to 5.25 V (external ceramic filter capacitor recommended).
10	VCC	-	Power supply range: 3.3 V to 5.25 V (external ceramic filter capacitor

Pin number	Pin Name	Pin direction	Pin Applications
			recommended).
11	GND	-	Ground wire, connected to power reference ground
12	GND	-	Ground wire, connected to power reference ground
13	DIO1	Input/Output	Configurable general-purpose I/O ports (see SX126 8 manual for details)
14	BUSY	Output	Used for status indication (see SX126 8 manual for details).
15	NRST	Input	Chip reset trigger input pin, active low.
16	MISO	Output	SPI data output pin
17	MOSI	Input	SPI data input pin
18	SCK	Input	SPI clock input pin
19	NSS	Input	The module's chip select pin is used to initiate an SPI communication.
20	GND	-	Ground wire, connected to power reference ground
twenty one	ANT	-	Antenna interface, stamp hole (50 Ω characteristic impedance)
twenty two	GND	-	Ground wire, connected to power reference ground

Note ①: If the DIO and TXEN pins are shorted, the DIO2 switch control function needs to be enabled in the software.

3.2 Dimensional Drawings of E22P-868M30S & E22P-915M30S



Pin number	Pin Name	Pin direction	Pin Applications
1	GND	-	Ground wire, connected to power reference ground
2	GND	-	Ground wire, connected to power reference ground
3	GND	-	Ground wire, connected to power reference ground
4	GND	-	Ground wire, connected to power reference ground
5	GND	-	Ground wire, connected to power reference ground
6	EN	Input	The RF enable control pin connects to an external microcontroller I/O pin. It is active high. For logic control, please refer to section 4.2.
7	T/R CTRL	Input	These are RF transmit and receive control pins. A high level indicates transmit, and a low level indicates receive. They connect to an external microcontroller's I/O or DIO2 pins . For logic control, please refer to section 4.2.
8	DIO2	Input/Output	Configurable general-purpose I/O ports (see SX126 2 manual for details)
9	VCC	-	Power supply range: 3.3 V to 5.25 V (external ceramic filter capacitor recommended).
10	VCC	-	Power supply range: 3.3 V to 5.25 V (external ceramic filter capacitor recommended).
11	GND	-	Ground wire, connected to power reference ground
12	GND	-	Ground wire, connected to power reference ground
13	DIO1	Input/Output	Configurable general-purpose I/O ports (see SX126 2 manual for details)
14	BUSY	Output	Used for status indication (see SX126 2 manual for details).
15	NRST	Input	Chip reset trigger input pin, active low.
16	MISO	Output	SPI data output pin
17	MOSI	Input	SPI data input pin
18	SCK	Input	SPI clock input pin
19	NSS	Input	The module's chip select pin is used to initiate an SPI communication.
20	GND		Ground wire, connected to power reference ground
twenty one	ANT		Antenna interface, stamp hole (50 Ω characteristic impedance)
twenty two	GND		Ground wire, connected to power reference ground

4.Basic Operations

4.1 Hardware Design

- It is recommended to use a DC regulated power supply to power this module, with the power supply ripple coefficient as small as possible, and the module must be reliably grounded;
- Please ensure the correct connection of the power supply positive and negative terminals. Reversing the connection may cause permanent damage to the module.

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- When designing power supply circuits for modules, it is often recommended to retain a margin of more than 30% to ensure long-term stable operation of the entire unit.
- The module should be kept as far away as possible from power supplies, transformers, high-frequency traces, and other parts with high electromagnetic interference.
- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the area under the module. If it is absolutely necessary to run under the module, assuming the module is soldered on the Top Layer, lay ground copper on the Top Layer of the module contact area (all copper and well grounded), and run the traces close to the digital part of the module on the Bottom Layer.
- Assuming the module is soldered or placed in the Top Layer, it is also wrong to arbitrarily route traces in the Bottom Layer or other layers, as this will affect the module's stray emissions and receiver sensitivity to varying degrees.
- If there are devices around the module that cause significant electromagnetic interference, it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If there are traces around the module that cause significant electromagnetic interference (high-frequency digital, high-frequency analog, power supply traces), it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, as there is still a risk of damage).
- The antenna mounting structure has a significant impact on module performance; therefore, it is essential to ensure that the antenna is exposed, ideally vertically upwards. When the module is installed inside the housing, a high-quality antenna extension cable can be used to extend the antenna to the outside of the housing.
- Antennas should never be installed inside a metal casing, as this will greatly reduce the transmission distance.
- It is recommended to add a 200 Ω protection resistor to the RXD/TXD of the external MCU.

4.2 Software writing

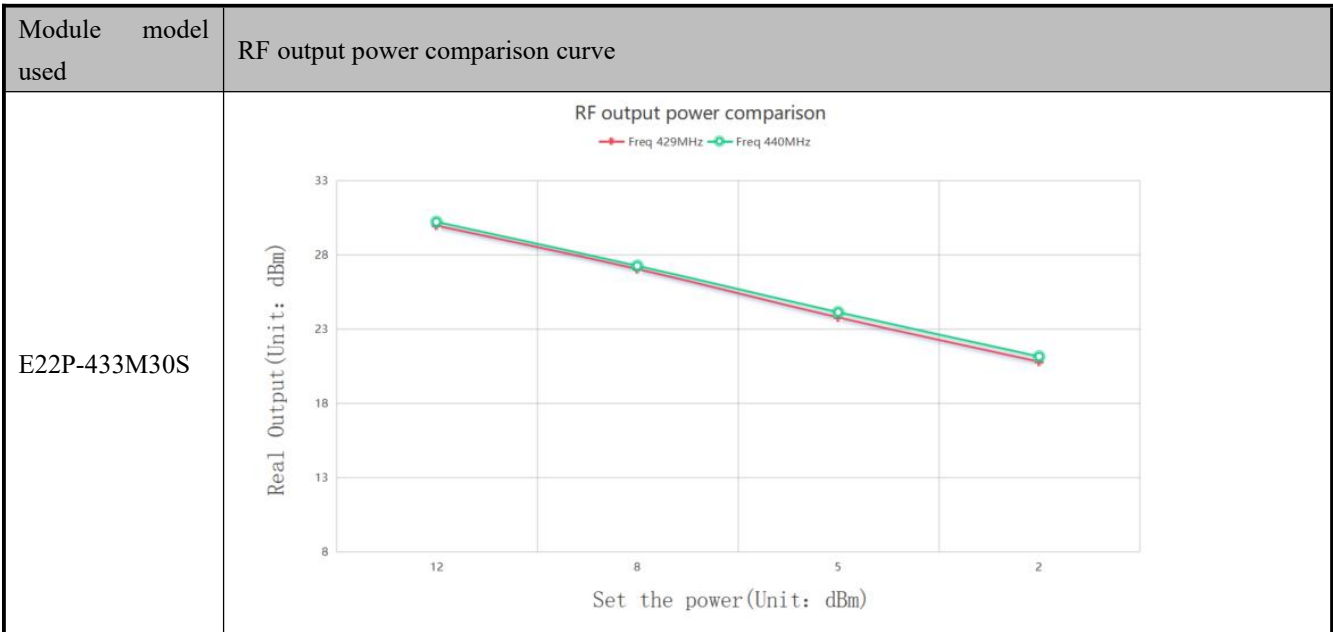
- The three modules are SX126 X + PA + LNA , and their driving methods are completely equivalent to SX126 X. Users can operate them in accordance with the SX126 X chipset manual.
- Please note: For E22P - 868M30S and E22P - 915M30S , PA_EN and RF_switch T/R CTRL are connected together, and LNA_EN and RF_switch EN are connected together. Therefore , users only need to control the T/R CTRL when transmitting and use it when receiving. However, for E22P-433M30S, RF_switch is controlled by TX_EN and RX_EN.
- / O ports that can be configured for various functions. Among them, DIO2 of E22P -868M30S and E22P-915M30S can be connected to T / R CTRL and not connected to the MCU 's I / O port. It is used to control the RF switch transmission. See the SX1262 manual for details . If not used , it can be left floating.
- Internally, a DIO3 is used to power a 32MHz TCXO crystal oscillator (the DIO3 is configured to output 1.8V) .
- Chengdu Ebyte Electronic Technology Co., Ltd. also provides sample code for users' reference: <https://www.ebyte.com/pdf-down/3485.html>
- E22P - 433M30S RF switch control logic truth table :

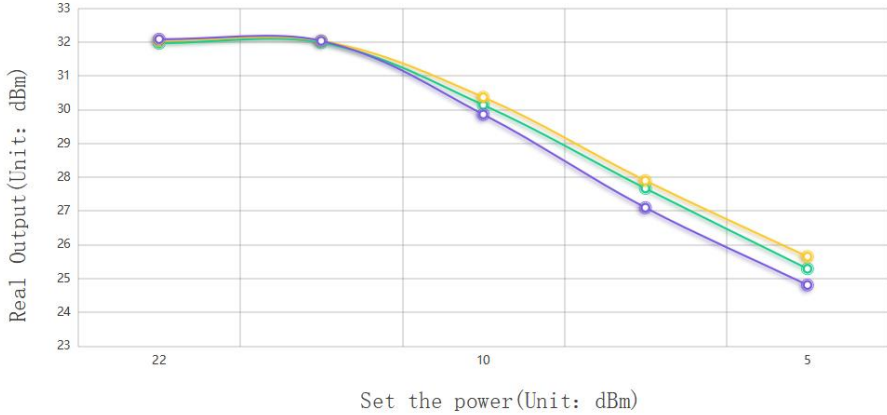
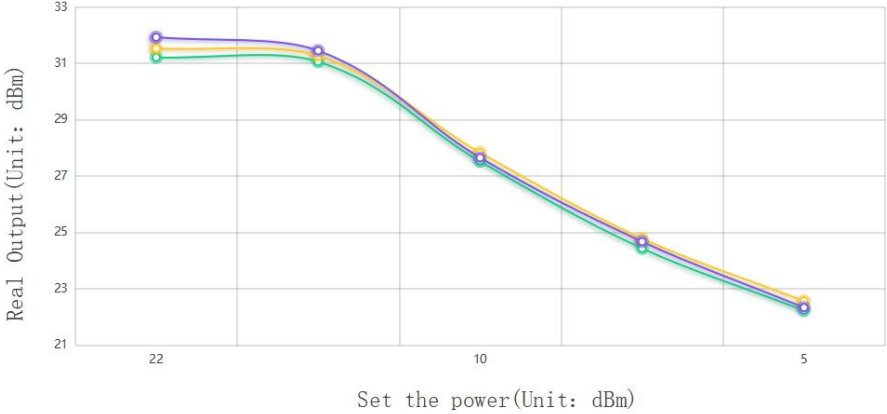
TX EN	RXEN	MODE
1	0	TX
0	1	RX
0	0	CLOSE

- Truth table for E22P - 868M30S and E22P - 915M30S RF switch control logic :

● EN	● T/R CTRL	● MODE
● 1	● 1	● TX
● 1	● 0	● RX
● 0	● X	● CLOSE

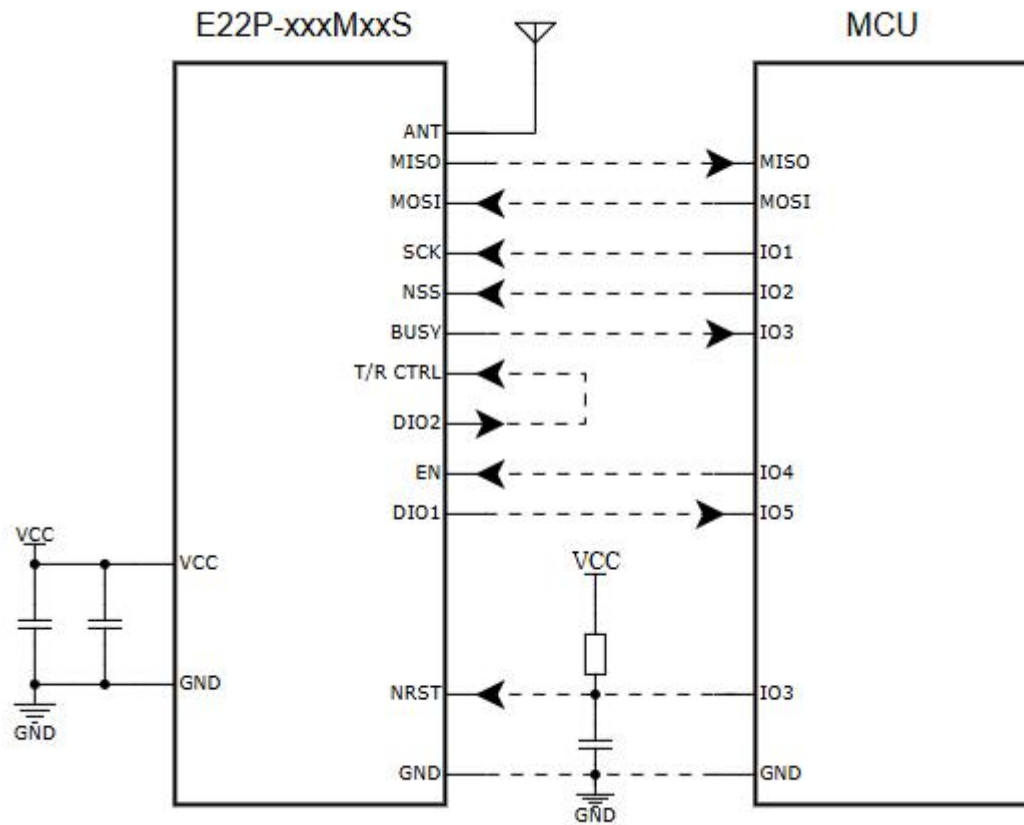
- Power rating chart (for 5V power supply) :
- Conditions: Tc = 25°C, VCC = 5.0V



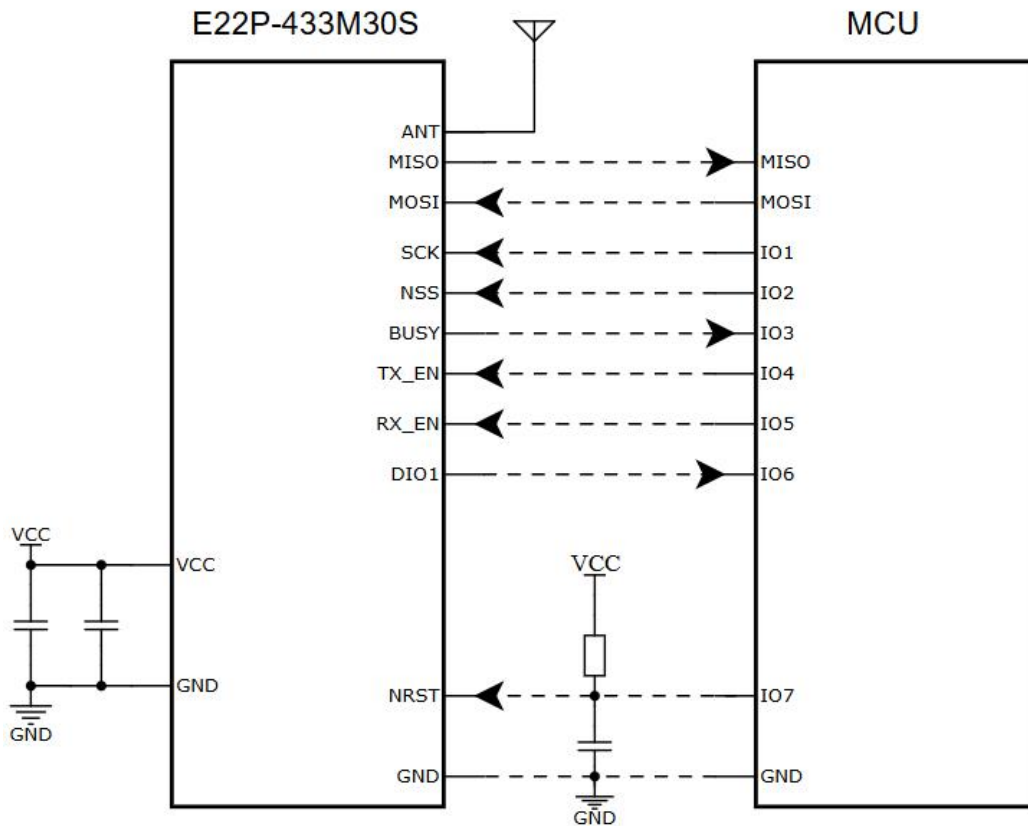
Module used	model	RF output power comparison curve																
E22P-868M30S		<div>RF output power comparison</div> <div><div>Freq 873MHz</div><div>Freq 868MHz</div><div>Freq 863MHz</div></div>  <table><caption>Data for E22P-868M30S RF output power comparison</caption><thead><tr><th>Set the power (Unit: dBm)</th><th>Freq 873MHz (dBm)</th><th>Freq 868MHz (dBm)</th><th>Freq 863MHz (dBm)</th></tr></thead><tbody><tr><td>22</td><td>32.0</td><td>32.0</td><td>32.0</td></tr><tr><td>10</td><td>30.0</td><td>30.5</td><td>29.8</td></tr><tr><td>5</td><td>25.2</td><td>25.8</td><td>24.8</td></tr></tbody></table>	Set the power (Unit: dBm)	Freq 873MHz (dBm)	Freq 868MHz (dBm)	Freq 863MHz (dBm)	22	32.0	32.0	32.0	10	30.0	30.5	29.8	5	25.2	25.8	24.8
Set the power (Unit: dBm)	Freq 873MHz (dBm)	Freq 868MHz (dBm)	Freq 863MHz (dBm)															
22	32.0	32.0	32.0															
10	30.0	30.5	29.8															
5	25.2	25.8	24.8															
E22P-915M30S		<div>RF output power comparison</div> <div><div>Freq 928MHz</div><div>Freq 915MHz</div><div>Freq 902MHz</div></div>  <table><caption>Data for E22P-915M30S RF output power comparison</caption><thead><tr><th>Set the power (Unit: dBm)</th><th>Freq 928MHz (dBm)</th><th>Freq 915MHz (dBm)</th><th>Freq 902MHz (dBm)</th></tr></thead><tbody><tr><td>22</td><td>31.2</td><td>31.5</td><td>31.8</td></tr><tr><td>10</td><td>27.5</td><td>27.8</td><td>27.8</td></tr><tr><td>5</td><td>21.8</td><td>22.2</td><td>22.0</td></tr></tbody></table>	Set the power (Unit: dBm)	Freq 928MHz (dBm)	Freq 915MHz (dBm)	Freq 902MHz (dBm)	22	31.2	31.5	31.8	10	27.5	27.8	27.8	5	21.8	22.2	22.0
Set the power (Unit: dBm)	Freq 928MHz (dBm)	Freq 915MHz (dBm)	Freq 902MHz (dBm)															
22	31.2	31.5	31.8															
10	27.5	27.8	27.8															
5	21.8	22.2	22.0															

5. Basic Applications

5.1 Recommended Circuits for E22P-868M30S & E22P-915M30S



5.2 Recommended Circuit for E22P-433M30S



6.Frequently Asked Questions

6.1 Transmission distance is not ideal

- When there are obstacles in line-of-sight communication, the communication distance will be reduced accordingly;
- Temperature, humidity, and co-channel interference can all lead to increased packet loss rates in communications.
- The ground absorbs and reflects radio waves, and the test results are poor when the ground is close to the ground.
- Seawater has a strong ability to absorb radio waves, so testing results are poor at the seaside.
- If there are metal objects near the antenna, or if it is placed inside a metal casing, the signal attenuation will be very severe.
- Power register settings are incorrect; air speed is set too high (the higher the air speed, the shorter the distance).
- At room temperature, the power supply voltage is lower than the recommended value; the lower the voltage, the lower the power output.
- The antenna may be poorly matched with the module or have quality issues.

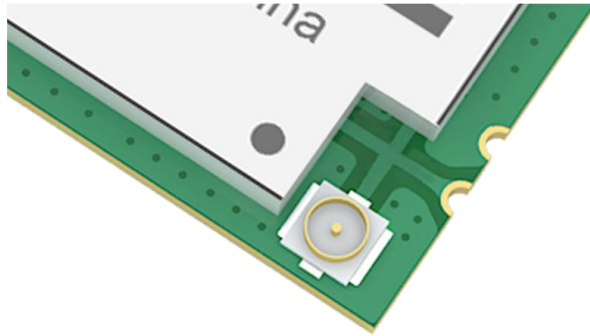
6.2 The module is easily damaged.

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- Please ensure anti-static operation during installation and use, as high-frequency devices are sensitive to electrostatic discharge.
- Please ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive.
- Unless there are special requirements, it is not recommended to use it at excessively high or low temperatures.

6.3 The error rate is too high.

- If there is interference from a co-channel signal nearby, move away from the source of interference or change the frequency or channel to avoid the interference.
- If the clock waveform on the SPI is not standard, check for interference on the SPI line and ensure that the SPI bus traces are not too long.
- An inadequate power supply can also cause garbled characters, so it is essential to ensure the reliability of the power supply.
- Poor quality or excessive length of extension lines or feeders can also lead to a high bit error rate.

6.4 Antenna Selection



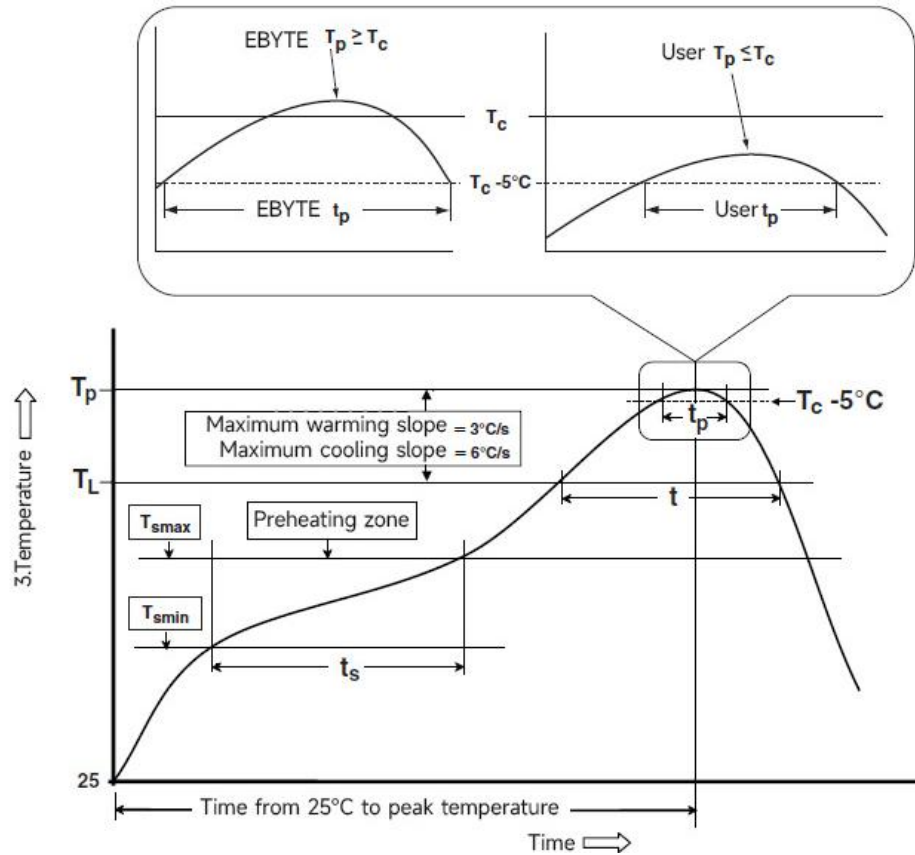
Both the IPEX interface and the stamp hole interface are enabled simultaneously; either the IPEX interface or the stamp hole interface can be selected arbitrarily.

7. Welding Operation Instructions

7.1 Reflow soldering temperature

Reflow soldering profile characteristics		Lead-based assembly	Lead-free assembly
Preheating/Insulation	Minimum temperature (T_{smin})	100℃	150℃
	Maximum temperature (T_{smax})	150℃	200℃
	Time ($T_{smin} \sim T_{smax}$)	60-120 seconds	60-120 seconds
Temperature rise slope ($T_L \sim T_p$)		3 ℃ /second, maximum value	3 ℃ /second, maximum value
Liquid phase temperature (T_L)		183℃	217℃
T L above the holding time		60~ 90 seconds	60~ 90 seconds
Package peak temperature T_p		Users must not exceed the temperature specified on the product's "humidity sensitivity" label.	Users must not exceed the temperature specified on the product's "humidity sensitivity" label.
T_p) within 5 ° C of the specified grading temperature (T_c) is shown in the figure below.		20 seconds	30 seconds
Cooling slope ($T_p \sim T_L$)		6 ℃ /second, maximum value	6 ℃ /second, maximum value
Time from room temperature to peak temperature		6 minutes, the longest	8 minutes, the longest
* The peak temperature (T_p) tolerance of the temperature profile is defined as the user's upper limit.			

7.2 Reflow Soldering Profile



8.Related Models

Product Model	Chip solutions	carrier frequency Hz	Transmit power dBm	Test distance (km)	Packagin g	Product dimensions (mm)	Communicatio n interface
E22-400M22 S	SX1262	433/470M	22	7	SMD	14*20	SPI
E22-900M22 S	SX1262	868/915M	22	7	SMD	14*20	SPI
E22-900M33 S	SX1262	433/470M	33	1 6	SMD	24*38.5	SPI
E22-900M30 S	SX1262	868/915M	30	12	SMD	24*38.5	SPI
E22-230T22 S	SX1262	230M	22	5	SMD	16*26	TTL
E22-400T22 S	SX1262	433/470M	22	5	SMD	16*26	TTL

Product Model	Chip solutions	carrier frequency Hz	Transmit power dBm	Test distance (km)	Packaging	Product dimensions (mm)	Communication interface
E22-900T22S	SX1262	868/915M	22	5	SMD	16*26	TTL
E22-230T30S	SX1262	230M	30	10	SMD	25*40.5	TTL
E22-400T30S	SX1262	433/470M	30	10	SMD	25*40.5	TTL
E22-900T30S	SX1262	868/915M	30	10	SMD	25*40.5	TTL

9. Antenna Guide

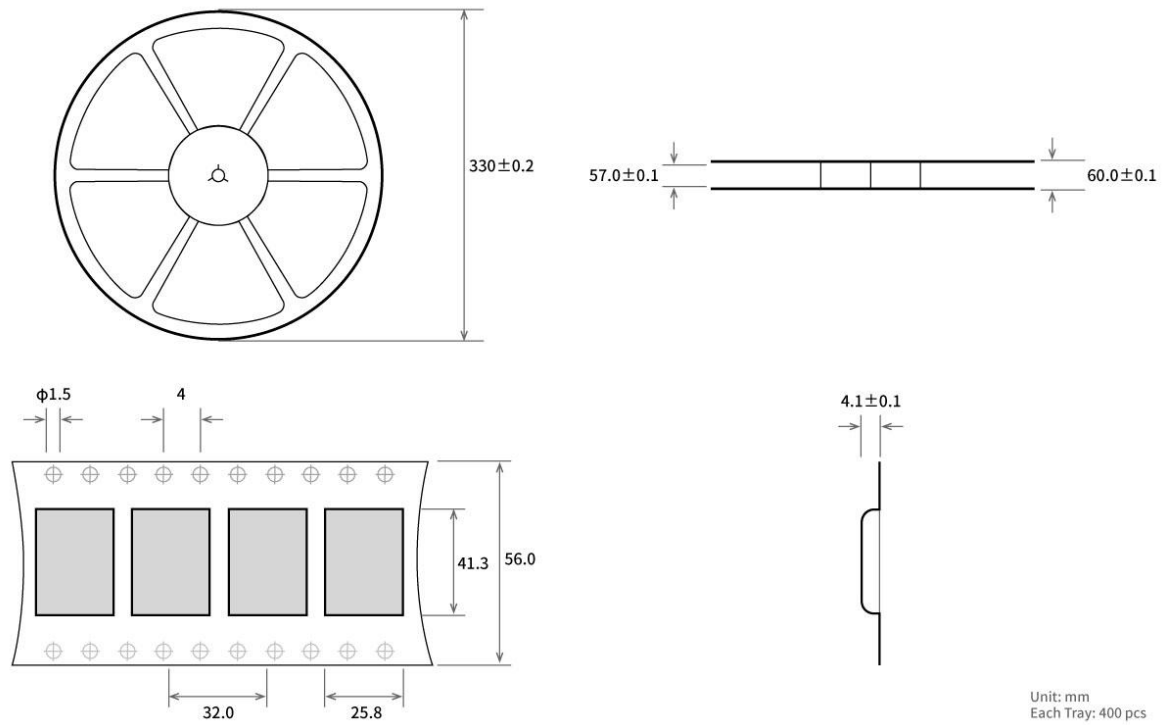
9.1 Antenna Recommendation

Antennas play a crucial role in communication, and inferior antennas can often have a significant impact on communication systems. Therefore, our company recommends certain antennas that are high-performing and reasonably priced and compatible with our wireless modules.

Product Model	type	frequency band Hz	interface	Gain dBi	Height (mm)	feeder cm	Features
TX170-XP-200	Suction Cup Antenna	170 M	SMA-J	4.0	5 00	200	Miniature suction cup antenna, omnidirectional antenna
TX170-JKD-20	Glue rod antenna	170 M	SMA-J	3.0	200	-	Bending a rubber rod, omnidirectional antenna
TX170-JK-11	Glue rod antenna	170 M	SMA-J	2.5	110	-	Bending a rubber rod, omnidirectional antenna
TX433-NP-4310	Flexible antenna	433M	welding	2.0	43.8*9.5	-	Built-in flexible FPC soft antenna
TX433-JZ-5	Glue rod antenna	433M	SMA-J	2.0	52	-	Ultra-short straight omnidirectional antenna
TX433-JZG-6	Glue rod antenna	433M	SMA-J	2.5	62	-	Ultra-short straight omnidirectional antenna
TX433-JW-5	Glue rod antenna	433M	SMA-J	2.0	50	-	Bending a rubber rod, omnidirectional antenna
TX433-JWG-7	Glue rod antenna	433M	SMA-J	2.5	75	-	Bending a rubber rod, omnidirectional antenna
TX433-JK-11	Glue rod antenna	433M	SMA-J	2.5	110	-	Bendable rubber rod, omnidirectional antenna
TX433-JK-20	Glue rod	433M	SMA-J	3.0	210	-	Bendable rubber rod,

Product Model	type	frequency band Hz	interface	Gain dBi	Height (mm)	feeder cm	Features
	antenna						omnidirectional antenna
TX433-XPL-100	Suction Cup Antenna	433M	SMA-J	3.5	185	100	Miniature suction cup antenna, cost-effective
TX433-XP-200	Suction Cup Antenna	433M	SMA-J	4.0	190	200	Neutral suction cup antenna, low loss
TX433-XPB-300	Suction Cup Antenna	433M	SMA-J	6.0	965	300	Large suction cup antenna, high gain
TX490-JZ-5	Glue rod antenna	470/490M	SMA-J	2.0	50	-	Ultra-short straight omnidirectional antenna
TX490-XPL-100	Suction Cup Antenna	470/490M	SMA-J	3.5	120	100	Miniature suction cup antenna, cost-effective
TX868-JKS-IPX20	Glue rod antenna	868M	IPEX-1	3.0	197	200	Bendable rubber rod, omnidirectional antenna
TX868-JZLW-15	Glue rod antenna	868M	IPEX-1	3.0	165	150	Bendable rubber rod, omnidirectional antenna
TX868-XPL-100	Suction Cup Antenna	868M	SMA-J	3.5	290	100	Miniature suction cup antenna, cost-effective
TX868-JKD-20	Glue rod antenna	868M	SMA-J	3.0	170	-	Bendable rubber rod, omnidirectional antenna
TX915-JKS-IPX20	Glue rod antenna	915M	IPEX-1	3.0	197	200	Bendable rubber rod, omnidirectional antenna
TX915-JZLW-15	Glue rod antenna	915M	IPEX-1	3.0	155	150	Bendable rubber rod, omnidirectional antenna
TX915-JKD-20	Glue rod antenna	915M	SMA-J	3.5	200	-	Bendable rubber rod, omnidirectional antenna
TX915-XPL-100	Suction Cup Antenna	915M	SMA-J	3.5	260	100	Miniature suction cup antenna, cost-effective

10.Bulk Packaging Methods



Revision History

Version	Revision Date	Revision Notes	maintainer
1.0	2025-7-16	Manual Release	Hao
1.1	2025-11-17	Content correction	Hao
1.2	2025-12-8	New Models	Hao

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