



E22P-915M30S User Manual

SX1262 915MHz 1W SPI SMD LoRa module



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1 Overview

1.1 Introduction

The E22 P - xxx M3 0 S series module is a SMD LoRa[™] wireless module independently developed based on Semtech's high-performance RF chip SX1262 . It has a maximum power of 30dBm and is suitable for the 868 / 915 MHz

frequency band . It uses an industrial-grade high-precision active temperature -compensated crystal oscillator.

Since the imported SX1262 is used as the core of the module, a radio frequency front-end module (RF FEM) is added on the original basis. The module includes a power amplifier (PA), a low noise amplifier (LNA) and a radio frequency switch, so that the maximum transmission power reaches 30dBm and the receiving sensitivity is further improved. The overall communication stability is greatly improved compared with products without power amplifiers and low noise amplifiers. Compared with the previous generation of LoRaTM transceivers, the anti-interference performance and communication distance have been improved, further widening the gap with products with FSK and GFSK modulation methods.

Since this module is a pure RF transceiver module, it needs to be driven by an MCU or a dedicated SPI debugging tool.

1.2 Features

- Compared with the SX1278 module, the SX1262 module has the significant advantages of lower power consumption, faster speed and longer distance;
- Under ideal conditions, the communication distance can reach 1-2 km ;
- Built-in PA+LNA greatly improves communication distance and communication stability;
- 32MHz industrial grade high precision active temperature compensated crystal oscillator
- Maximum transmission power 30dBm , software adjustable in multiple levels;
- Supports 868/915 MHz frequency bands ;
- Support multiple modulation modes, LoRaTM/GFSK;
- LoRaTM mode supports data transmission rates of 0.3 k to 62.5 kbps;
- G FSK mode supports data transmission rate up to 300kbps;
- Backward compatible with SX1278/SX1276 series RF transceivers;
- FIFO has large capacity and supports 255Byte data cache;
- New SF5 spreading factor to support dense networks;
- Supports 3.3 ~ 5.5V power supply, and the best performance can be guaranteed when the power supply is greater than 5V;
- Industrial-grade standard design, supports long-term use at -40~+85°C;
- Dual antennas are optional (IPEX/stamp hole), which is convenient for users to carry out secondary development and facilitate integration;
- With FCC, CE, ROHS and other related certifications.

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 remote control;

- Advanced Metering Infrastructure (AMI);
- Automotive industry applications.

2 Specifications

2.1 RF parameters

RF parameters	unit	model	Remark
		E22P-915M30S	
Transmit power	dBm	26	Support software multi-level adjustable
Reference distance	m	12000	Clear and open air, antenna gain 5dBi, antenna height 2.5 meters, air rate 2.4 kbps
Working frequency band	MHz	902-928	Support ISM band
Air speed	bps	0.3 k~62.5 k	LoRa modulation mode, user programming control

2.2 Electrical parameters

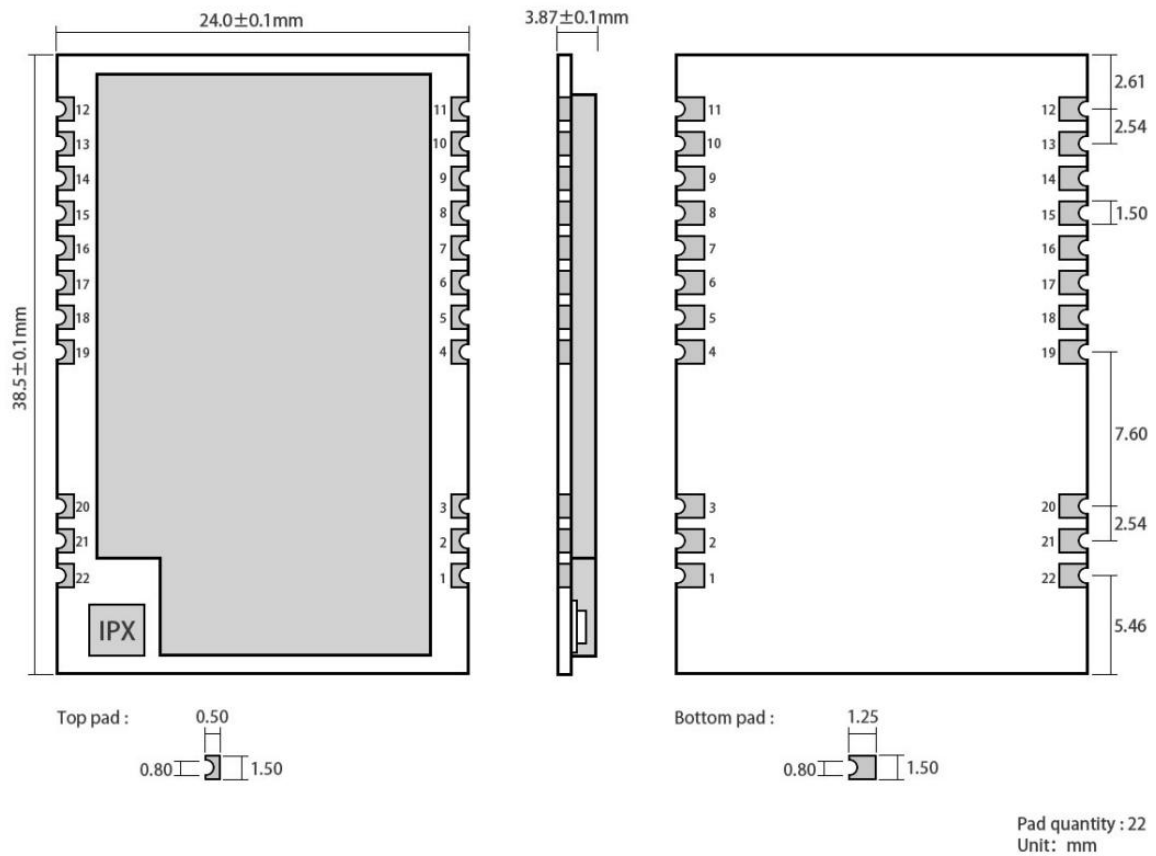
Electrical parameters		unit	model	Remark
			E22P-915M30S	
Operating voltage		V	3.3~5.5	When the operating voltage is $\geq 5V$, the output power requirement can be met. When the operating voltage exceeds 5.5V, there is a risk of burning.
Communication level		V	3.3	Using 5V TTL may burn out
Power consumption	Emission current	mA	640	Instantaneous power consumption @5V
	Receiving current	mA	twenty three	
	Sleep current	μA	3	Software shutdown
temperature	Operating temperature	$^{\circ}C$	-40 ~ + 85	Industrial Grade
	Storage temperature		-40 ~ +125	

2.3 Hardware Parameters

Hardware Parameters	model	Remark
	E22P-915M30S	
chip	SX1262	-
FIFO	255Byte	Maximum length of a single transmission
Crystal frequency	32MHz	High-precision active temperature compensated crystal oscillator

Modulation	LoRa(recommended)	Next-generation LoRa™ modulation technology
Interface	Stamp Holes	Pitch 2.54 mm
Communication interface	SPI	0~10Mbps
Product Net Weight	5.1	Tolerance ±0.02g
Packaging	SMD	-
Antenna interface	Stamp hole/IPEX -1	Characteristic impedance is about 50 ohms
size	38.5*24mm	Error value ±0.2mm

3 Mechanical Dimensions and Pin Definition



Pin number	Pin Name	Pin Direction	Pin Purpose
1	GND		Ground wire, connected to the power reference ground
2	GND		Ground wire, connected to the power reference ground
3	GND		Ground wire, connected to the power reference ground
4	GND		Ground wire, connected to the power reference ground
5	GND		Ground wire, connected to the power reference ground

6	EN	enter	RF enable control pin, connected to external MCU IO, high level is effective
7	T/R CTRL	Input /Output	RF transmission and reception control pin, high level for transmission, low level for reception, connected to external microcontroller IO or DIO2
8	DIO2	Input/Output	Configurable general IO port (see SX1262 manual for details)
9	VCC		Power supply, range 3.3 ~ 5.5V (it is recommended to add external ceramic filter capacitor)
10	VCC		Power supply, range 3.3 ~ 5.5V (it is recommended to add external ceramic filter capacitor)
11	GND		Ground wire, connected to the power reference ground
12	GND		Ground wire, connected to the power reference ground
13	DIO1	Input/Output	Configurable general IO port (see SX1262 manual for details)
14	BUSY	Output	Used for status indication (see SX1262 manual for details)
15	NRST	enter	Chip reset trigger input pin, low level is effective
16	MISO	Output	SPI data output pin
17	MOSI	enter	SPI data input pin
18	SCK	enter	SPI clock input pin
19	NSS	enter	Module chip select pin, used to start an SPI communication
20	GND		Ground wire, connected to the power reference ground
twenty one	ANT		Antenna interface, stamp hole (50Ω characteristic impedance)
twenty two	GND		Ground wire, connected to the power reference ground

4 Basic Operations

4.1 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 parts with large electromagnetic interference, such as power supplies, transformers, and high-frequency wiring;
- 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 is laid on the Top Layer of the module contact part (all copper is laid and well grounded), and it must be

close to the digital part of the module and routed on the Bottom Layer;

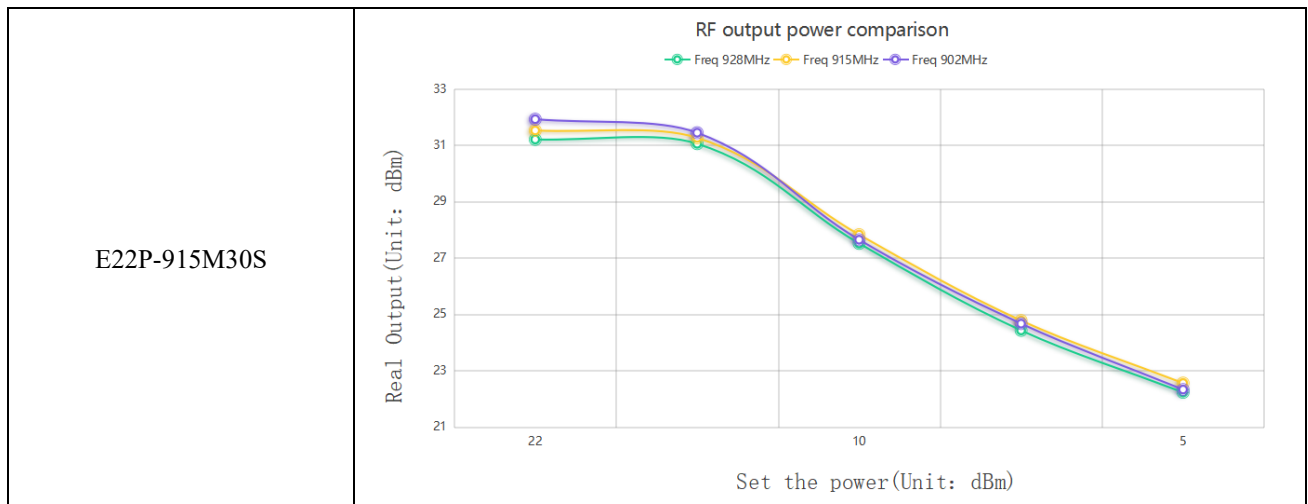
- Assuming the module is soldered or placed on the Top Layer, it is also wrong to randomly route the wires on the Bottom Layer or other layers, which will affect the module's spurious signal and receiving sensitivity to varying degrees;
- If there are devices with large electromagnetic interference around 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 performance of the module. Make sure the antenna is exposed and preferably vertically upward. When the module is installed inside the housing, use a high-quality antenna extension cable to extend the antenna to the outside of the housing;
- The antenna must not be installed inside a metal shell, as this will greatly reduce the transmission distance.
- It is recommended to add a 200R protection resistor to the RXD/TXD of the external MCU.

4.2 Software Writing

- This module is SX1268/SX1262+PA+LNA , and its driving mode is completely the same as SX1268/SX1262 . Users can operate it completely according to the SX1268/SX1262 chip manual; it should be noted that PA_EN and T/R CTRL of RF_switch are connected together, and LNA_EN and EN of RF_switch are connected together, so users only need to control T/R CTRL when sending, and use T/R CTRL when receiving.
- DIO1 and DIO2 are general IO ports that can be configured with multiple functions. DIO2 can be connected to T/R CTRL and not to the MCU's IO port. It is used to control the RF switch transmission. For details, see the SX1262 manual. If not used, it can be left floating. T/R CTRL and EN cannot be high at the same time, and the level states should be opposite.
- DIO3 is used internally to power a 32MHz TCXO crystal oscillator (DIO3 is configured to output 1.8V) .
- Chengdu Ebyte Electronic Technology Co., Ltd. also provides sample code for users to refer to:
<https://www.ebyte.com/pdf-down/3485.html>
- RF switch control logic truth table:

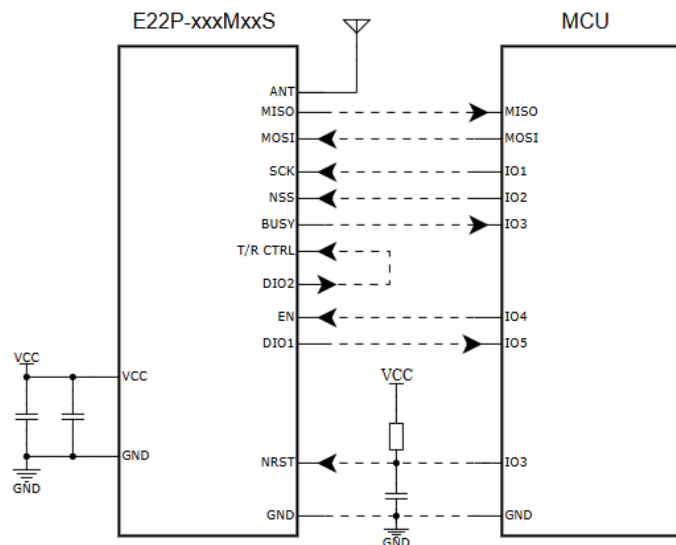
EN	T/R CTRL	MODE
1	1	TX
1	0	RX
0	X	CLOSE

- Power classification comparison chart:



5 Basic Applications

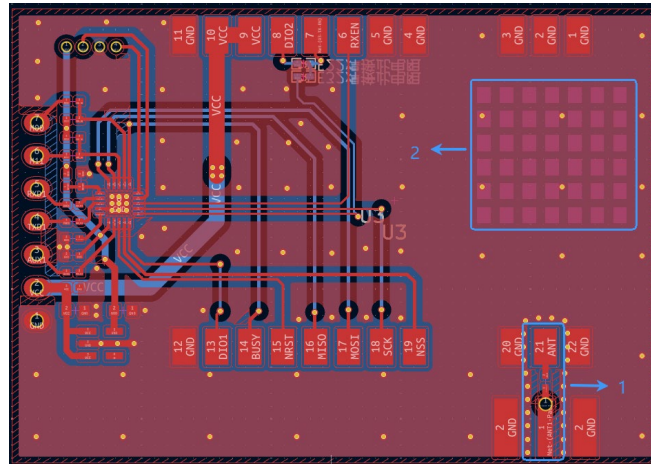
5.1 Recommended Circuit



6 Board Layout Guidelines

- 1、 It is recommended to use 50 ohm impedance control for RF traces, and keep the RF traces as short as possible. The RF traces length of EVB is less than 10mm. It is also suggested to reserve a π -type matching network near the module for trace lengths exceeding 50 mm.
- 2、 Since heat dissipation pads are reserved on the back of the module, it is also recommended to reserve heat

dissipation pads on the back of the PCB to optimize module performance.



7 Frequently Asked Questions

7.1 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 rate is set too high (the higher the air rate, the closer the distance);
- The power supply voltage at room temperature is lower than the recommended value. 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.

7.2 Modules are vulnerable to damage

- 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.

7.3 Bit Error Rate is Too High

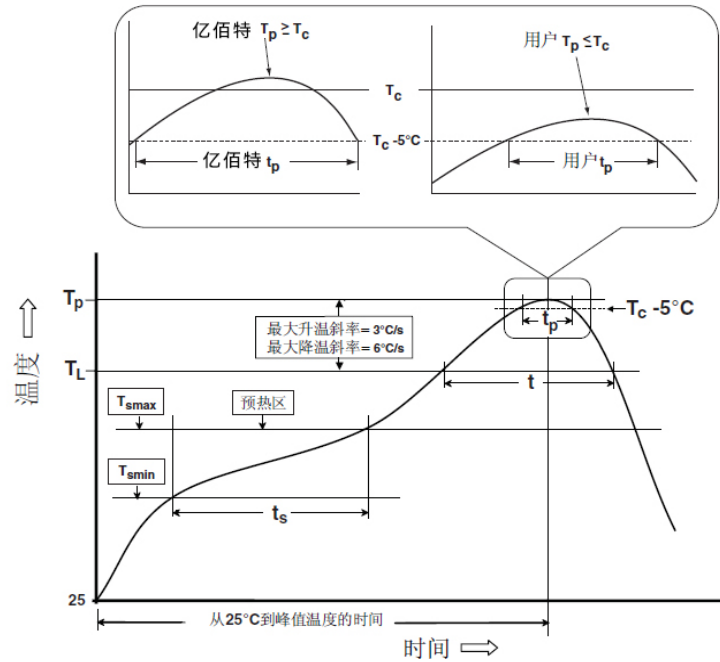
- There is interference from the same frequency signal nearby. Stay away from the interference source or change the frequency or channel to avoid interference.
- The clock waveform on SPI is not standard. Check whether there is interference on the SPI line. The SPI bus line should not be too long.
- 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.

8 Welding Operation Instructions

8.1 Reflow Temperature

Reflow profile characteristics		Leaded process assembly	Lead-free assembly
Preheating/keepin g	Minimum temperature (T _{min})	100°C	150°C
	Maximum temperature (T _{max})	150°C	200°C
	Time (T _{min} ~T _{min})	60-120 seconds	60-120 seconds
Heating slope (TL~Tp)		3°C/sec, max.	3°C/sec, max.
Liquidus temperature (TL)		183°C	217°C
Keep time above TL		60~ 90 seconds	60~ 90 seconds
Package peak temperature Tp		Users must not exceed the temperature stated on the product's "Moisture Sensitivity" label.	Users must not exceed the temperature stated on the product's "Moisture Sensitivity" label.
The time (Tp) within 5°C of the specified classification temperature (Tc) is shown in the figure below.		20 seconds	30 seconds
Cooling slope (Tp~TL)		6°C/sec, max.	6°C/sec, max.
Time from room temperature to peak temperature		6 minutes, longest	8 minutes, longest
※ The peak temperature (Tp) tolerance of the temperature curve is defined as the upper limit of the user			

8.2 Reflow Oven Curve



9 Related Models

Product Model	Chip Solution	Carrier frequency Hz	Transmit power dBm	Test distance km	Package	Product size mm	Communication interface
E22-400M22S	SX1262	433/470M	twenty two	7	Patches	14*20	SPI
E22-900M22S	SX1262	868/915M	twenty two	7	Patches	14*20	SPI
E22-900M33S	SX1262	433/470M	33	16	Patches	24*38.5	SPI
E22-900M30S	SX1262	868/915M	30	12	Patches	24*38.5	SPI
E22-230T22S	SX1262	230M	twenty two	5	Patches	16*26	TTL
E22-400T22S	SX1262	433/470M	twenty two	5	Patches	16*26	TTL
E22-900T22S	SX1262	868/915M	twenty two	5	Patches	16*26	TTL
E22-230T30S	SX1262	230M	30	10	Patches	25*40.5	TTL
E22-400T30S	SX1262	433/470M	30	10	Patches	25*40.5	TTL
E22-900T30S	SX1262	868/915M	30	10	Patches	25*40.5	TTL

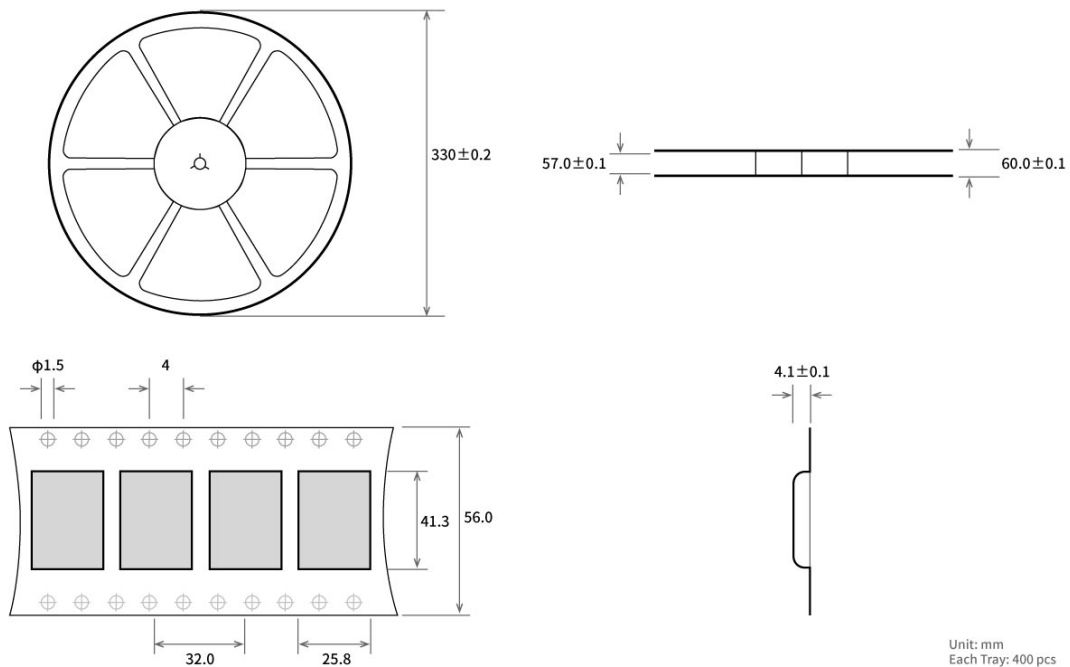
10 Antenna Guide

10.1 Antenna Recommendations

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 supporting antennas for our wireless modules with excellent performance and reasonable prices.

Product Model	type	Frequency band Hz	interface	Gain dBi	high mm	Feeder cm	Features
TX915-JKD-20RP	Rod antenna	915M	SMA-K	3.5	200	-	Bendable glue stick, omnidirectional antenna
TX915-JKD-20	Rod antenna	915M	SMA-J	3.5	200	-	Bendable glue stick, omnidirectional antenna

11 Bulk Packaging Methods



Revision History

Version	Revision Date	Revision Notes	Maintainer
1.0	2025-7-16	Manual Release	Hao

About Us

Technical support: support@cdebyte.com

Documents and RF Setting download link: <https://www.cdebyte.com>

Thank you for using Ebyte products! Please contact us with any questions or suggestions: info@cdebyte.com

Web: <https://www.cdebyte.com>

Address: B5 Mould Industrial Park, 199# Xiqu Ave, High tech Zone, Chengdu, Sichuan, China



Chengdu Ebyte Electronic Technology Co.,Ltd.

FCC Statements:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

- (1) This device may not cause harmful interference, and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Warning: Changes or modifications to this unit not expressly approved by the part responsible for compliance could void the user's authority to operate the equipment.

RF Exposure

This equipment complied with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body. when installed in certain specific OEM configurations.

2.6 RF EXPOSURE CONSIDERATIONS:

The module has been evaluated and shown compliant with the FCC RF Exposure limits under mobile exposure conditions. OEM integrator shall equipped the antenna to compliance with antenna requirement part 15.203& 15.204 and must not be co-located or operating in conjunction with any other antenna or transmitters, otherwise, a Class II Permissive Change (C2PC) must be filed with the FCC and/or a new FCC authorization must be applied.

2.7 ANTENNAS:

The antenna of the module was designed as rod antenna and the best gain is 3.5dBi. Modification the antenna design may need additional testing and evaluation.

2.8 LABELING AND USER INFORMATION REQUIREMENTS OF THE END PRODUCT:

The final end product must be labelled in a visible area with the following "Contains TX FCC ID: 2A8C3-E22P900M30S or "Contains Transmitter Module FCC ID: 2A8C3-E22P900M30S. If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users' manual: This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

A user's manual for the finished product should include one of the following statements:

-For a Class A digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

- For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The User's Manual for The finished product should include the following statements:

Any changes or modifications to this equipment not expressly approved by the OEM/Integrator may cause harmful interference and void the user's authority to operate this equipment.

2.9 INFORMATION ON TEST MODES AND ADDITIONAL TESTING REQUIREMENTS:

Data transfer module demo board can control the EUT work in RF test mode at specified conditions. This radio module must not be installed to co-locate and operating simultaneously with other radios in the host system except in accordance with FCC multi-transmitter product procedures. Additional testing and equipment authorization may be required operate simultaneously with other radio.

2.10 ADDITIONAL TESTING, PART 15 SUBPART B DISCLAIMER:

The host product manufacturer is responsible for compliance with any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

General Statements

The module is limited to OEM installation only.

The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.

The OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

OEM integrator shall not modify and change the fixed designed PCB print antenna, and must not be co-located or operating in conjunction with any other antenna or transmitters, otherwise, a Class II Permissive Change (C2PC) must be filed with the FCC and/or a new FCC authorization must be applied.

2.11 Note EMI Considerations

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

For standalone mode, reference the guidance in D04 Module Integration Guide and for simultaneous mode7; see D02 Module Q&A Question 12, which permits the host manufacturer to confirm compliance.

2.12 How to make changes

Since. only Grantees are permitted to make permissive changes, it is recommended that module manufactures provide contact information and some guidance to host providers in the integration instructions if they expect their module will be used differently than granted.