

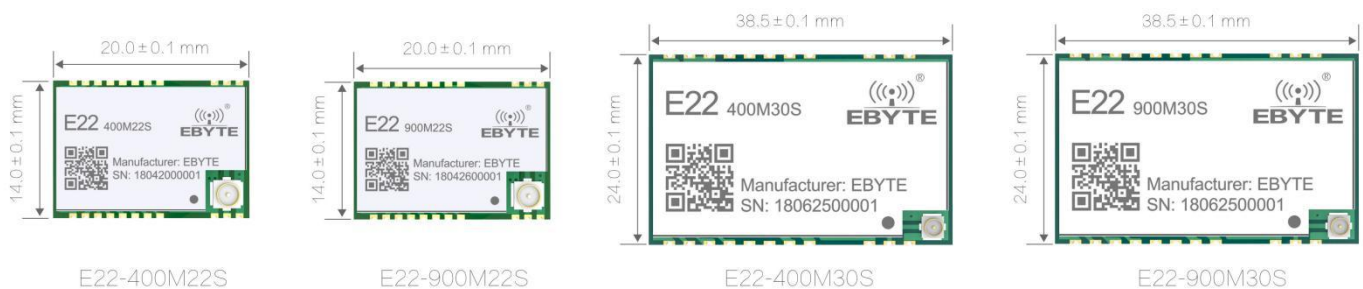
SX1262/SX1268 Wireless Module

E22 Series

User Manual

Version	Date	Description	Issued by
1.00	2018/04/27	Initial version	huaa
1.10	2018/08/06	Modified version 01	Huaa

Brief Introduction



With multiple frequency band and wide frequency range , E22 series are small size (pin spacing :1.27mm) SMD wireless transceiver module designed by Chengdu Ebyte. It features long range transmission and super low power consumption.

The E22 series is the first wireless module in China to adopt Semtech's SX1262, SX1268 RF chip. This chip provides a variety of modulation methods, such as LoRa™ and traditional GFSK. Its special LoRa™ modulation method increases the communication distance. At the same time, SX126x owns two distribution methods, low-dropout regulator (LDO) and high-efficiency step-down DC-DC converter, under the premise of the choice of DC-DC mode, the receiving current is extremely low to achieve Low power consumption. Compared with SX127x series, SX126x can achieve up to 62.5kbps air data rate in Lora mode. In GFSK mode, air data rate can support up to 300kbps; according to the application of choice of power management, in the DC/DC mode, when in the maximum power output of 22dBm The SX126x's power consumption is only 118mA, and the efficiency is improved significantly. The SX126x RF receiver power consumption is 4.8mA, which is less than half of the SX127x series' 10mA receiving current.

E22 series strictly stick to the design rules home and abroad of FCC, CE, CCC and meet the related RF certifications and export standards. As hardware platform, users need to carry out secondary development.

Model	Frequency	Transmitting power	Distance	Packing	Antenna
E22-400M22S	410-493MHz	22dBm	6500m	SMD	Stamp hole/IPEX
E22-900M22S	850-930MHz	22dBm	6500m	SMD	Stamp hole/IPEX
E22-400M30S	410-493MHz	30dBm	12000m	SMD	Stamp hole/IPEX
E22-900M30S	850-930MHz	30dBm	12000m	SMD	Stamp hole/IPEX

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1. Technical Parameter

Model	Core IC	Size	Net Weight	Operating Temperature	Operating Humidity	Storage Temperature
E22-400M22S	SX1268	20* 14*2.8 mm	1.35±0.1 g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C
E22-900M22S	SX1262	20* 14*2.8 mm	1.35±0.1 g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C
E22-400M30S	SX1268	38.5* 24*3.6 mm	4.8±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C
E22-900M30S	SX1262	38.5* 24*3.6 mm	4.64±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C

1.1. E22-400M22S

Parameter	Min	Typ	Max	Unit
Tx current (LoRa@2.4kbps)	95	100	105	mA
Rx current (LoRa@2.4kbps)	4.6	4.8	5.7	mA
Turn-off current	150	180	200	nA
Tx power	21.4	21.5	22.3	dBm
Rx sensitivity	-144	-146	-147	dBm
TCXO	32	32	32	MHz
TCXO voltage setting	1.8	1.8	3.3	V
Operating frequency	410	433/470/490	493	MHz
Voltage supply	1.8	3.3	3.7	V
Communication level	1.8	3.3	3.7	V

1.2. E22-900M20S

Parameter	Min	Typ	Max	Unit
Tx current (LoRa@2.4kbps)	114	119	124	mA
Rx current (LoRa@2.4kbps)	4.8	5.0	5.9	mA
Turn-off current	150	185	200	nA
Tx power	21.4	21.5	22.3	dBm
Rx sensitivity	-144	-146	-147	dBm
TCXO	32	32	32	MHz
TCXO voltage setting	1.8	1.8	3.3	V
Operating frequency	850	868/915	930	MHz
Voltage supply	1.8	3.3	3.7	V
Communication level	1.8	3.3	3.7	V

1.3. E22-400M30S/ E22-900M30S

Parameter	Min	Typ	Max	Unit
Tx current (LoRa@2.4kbps)	600	650	700	mA
Rx current (LoRa@2.4kbps)	12	14	16	mA
Turn-off current	1	3	5	nA
Tx power	29.5	30.0	31	dBm
Rx sensitivity	-149	-150	-151	dBm
TCXO	32	32	32	MHz
TCXO voltage setting	1.8	1.8	1.8	V
Operating frequency	410	433/470/490	493	MHz
Voltage supply	2.5	5	5.5	V
Communication level	1.8	3.3	3.7	V

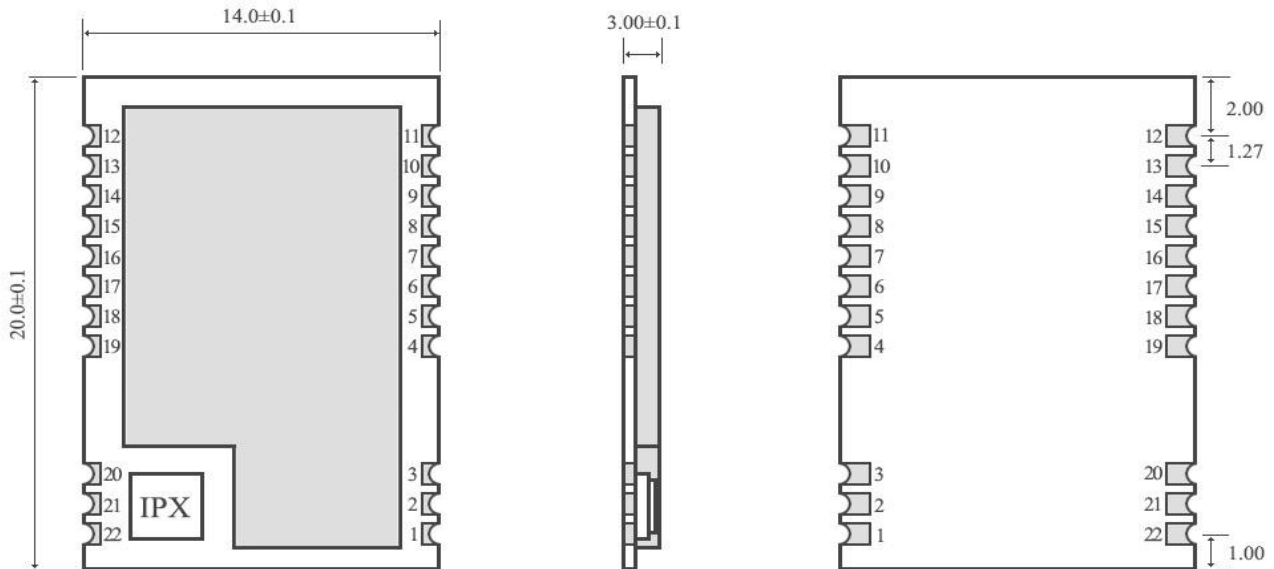
1.4. Parameter descriptions

- When designing the power supply circuit for the module, it is recommended to reserve more than 30% margin, and the whole machine is conducive to long-term and stable operation.
- The current required to launch at the moment is large but often because of the very short launch time, the total energy consumed may be smaller;
- When users use an external antenna, the impedance matching between the antenna and the module at different frequency points will affect the emission current to a different extent.
- The current consumed when the radio frequency chip is in the pure receiving state is called the receiving current. Some radio frequency chips with communication protocols or developers have loaded some of the self-developed protocols on the entire unit. This may cause the received current to be large. ;
- The currents in pure receiving state are often of the mA level, and for μA -level "receiving current", developer need to process the software.
- Shutdown current is often much less than the current consumed by the entire power supply when it is in no-load condition, and it is not excessively demanding;
- Because the material itself has a certain error, a single LRC component has an error of $\pm 0.1\%$, but due to the use of multiple LRC components in the entire RF loop, there will be an accumulation of errors, resulting in different emission current and receiving current of different modules. ;
- Lowering the transmit power can reduce the power consumption to some extent, but reducing the transmit power emission due to many reasons will reduce the efficiency of the internal PA.

2. Mechanical characteristic

2.1 E22-400M22S/E22-900M22S

2.1.1 Dimensions



2.1.2. Pin definition

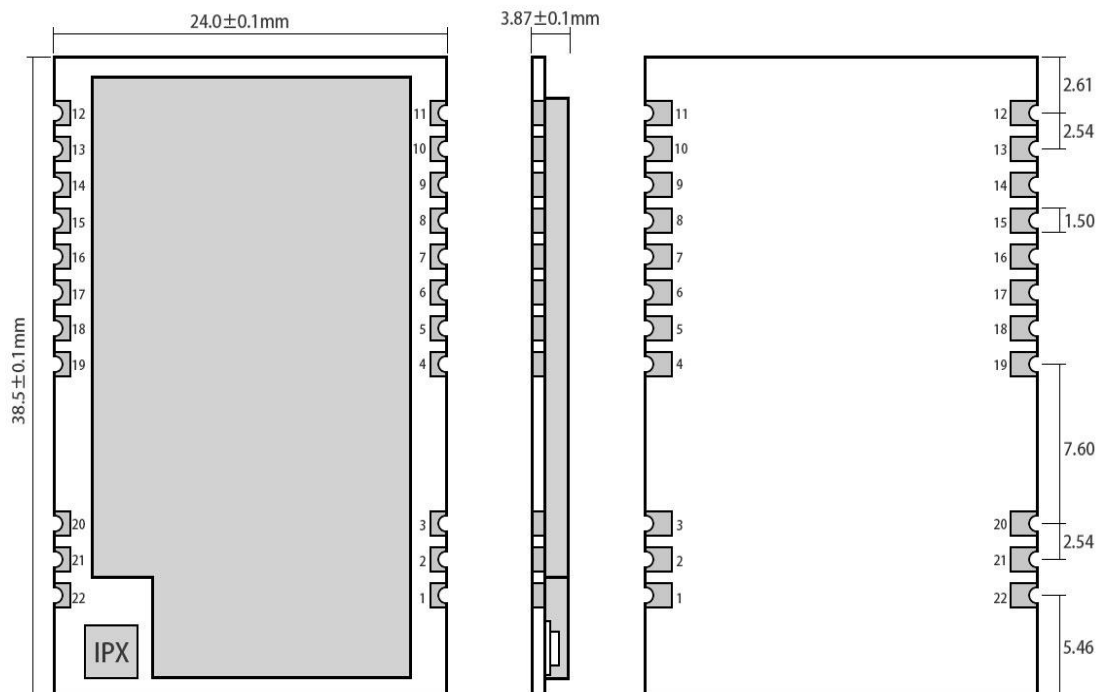
Pin No.	Pin item	Pin direction	Pin application
1	GND		Ground
2	GND		Ground
3	GND		Ground
4	GND		Ground
5	GND		Ground
6	RXEN	Input	RF switch RX control, connecting external MCU IO, valid in high level
7	TXEN	Input	RF switch TX control, connecting external MCU IO or DIO2, valid in high level
8	DIO2	Input /output	Configurable IO port (see more in SX126x datasheet)
9	VCC		Power supply, 1.8V~3.7V (external ceramic filter capacitor is recommended)
10	GND		Ground
11	GND		Ground

12	GND		Ground
13	DIO1	Input /output	Configurable IO port (see more in SX126x datasheet)
14	BUSY	output	State indicator (see more in SX126x datasheet)
15	NRST	Input	Chip reset initiation, valid in low level
16	MISO	output	SPI master input slave output
17	MOSI	Input	SPI master output slave input
18	SCK	Input	SPI clock
19	NSS	Input	Chip select, for starting a SPI communication
20	GND		Ground
21	ANT		Stamp hole (50 ohm impedance)
22	GND		Ground

★ Find more details on 《SX126x Datasheet》 from Semtech ★

2.2 E22-400M30S/E22-900M30S

2.2.1 Dimensions



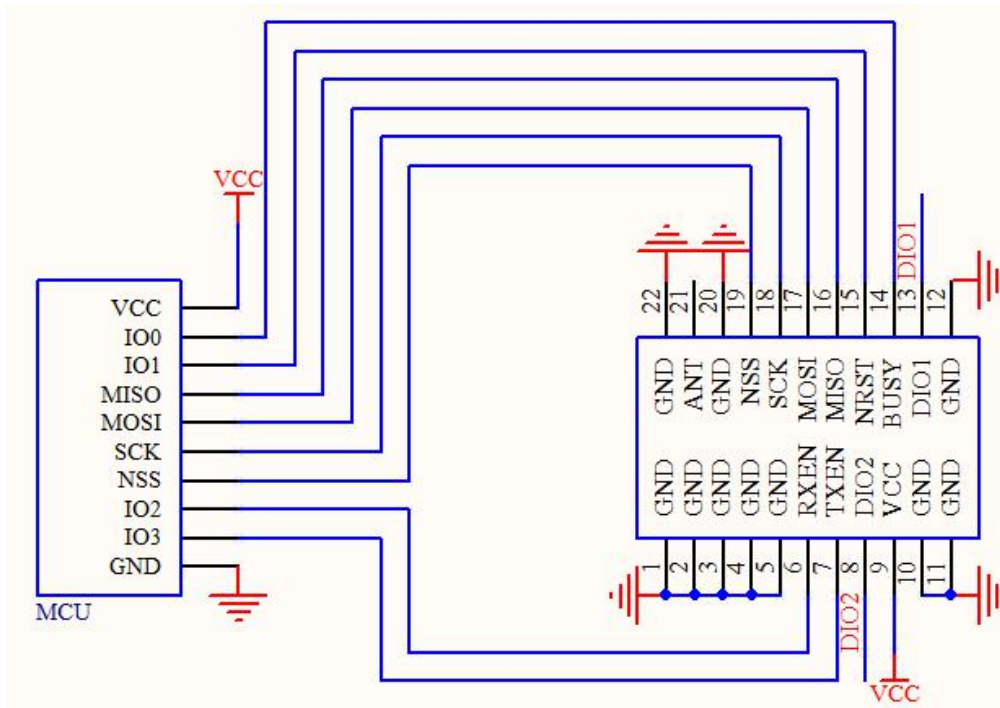
2.2.2 Pin definition

Pin No.	Pin item	Pin direction	Pin application
1	GND		Ground
2	GND		Ground
3	GND		Ground
4	GND		Ground
5	GND		Ground
6	RXEN	Input	RF switch RX control, connecting external MCU IO, valid in high level
7	TXEN	Input	RF switch TX control, connecting external MCU IO or DIO2, valid in high level
8	DIO2	Input /Output	Configurable IO port (see more in SX126x datasheet)
9	VCC		Power supply, 2.5V~5.5V (external ceramic filter capacitor is recommended)
10	VCC		Power supply, 2.5V~5.5V (external ceramic filter capacitor is recommended)
11	GND		Ground
12	GND		Ground
13	DIO1	Input /Output	Configurable IO port (see more in SX126x datasheet)
14	BUSY	Output	State indicator (see more in SX126x datasheet)
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18	SCK	Input	SPI clock
19	NSS	Input	Chip select, for starting a SPI communication
20	GND		Ground
21	ANT		Stamp hole (50 ohm impedance)
22	GND		Ground

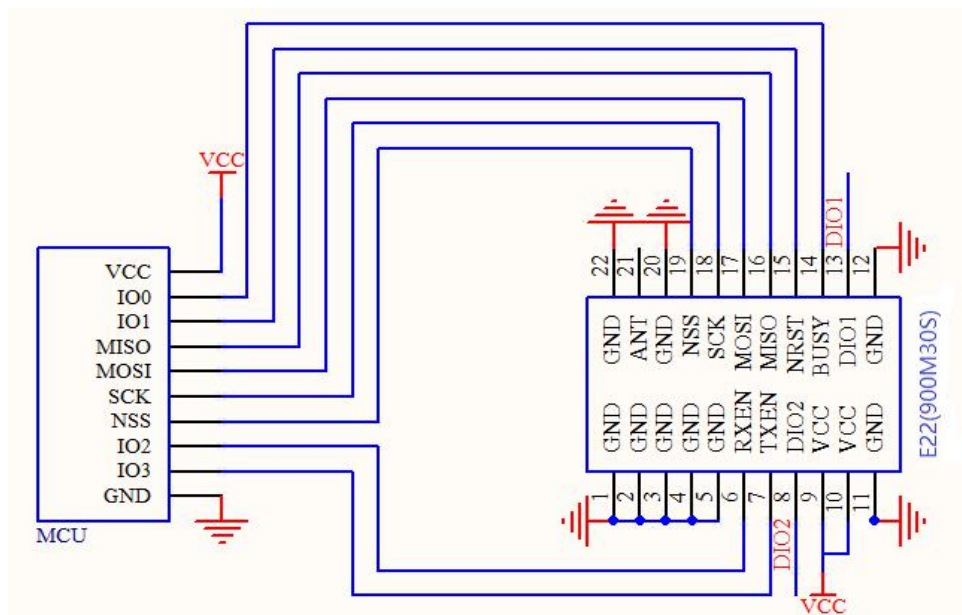
★ Find more details on 《SX126x Datasheet》 from Semtech ★

3. Recommended Circuit Diagram

3.1. E22-433M22S/E22-900M22S



3.2. E22-400M30S/E22-900M30S



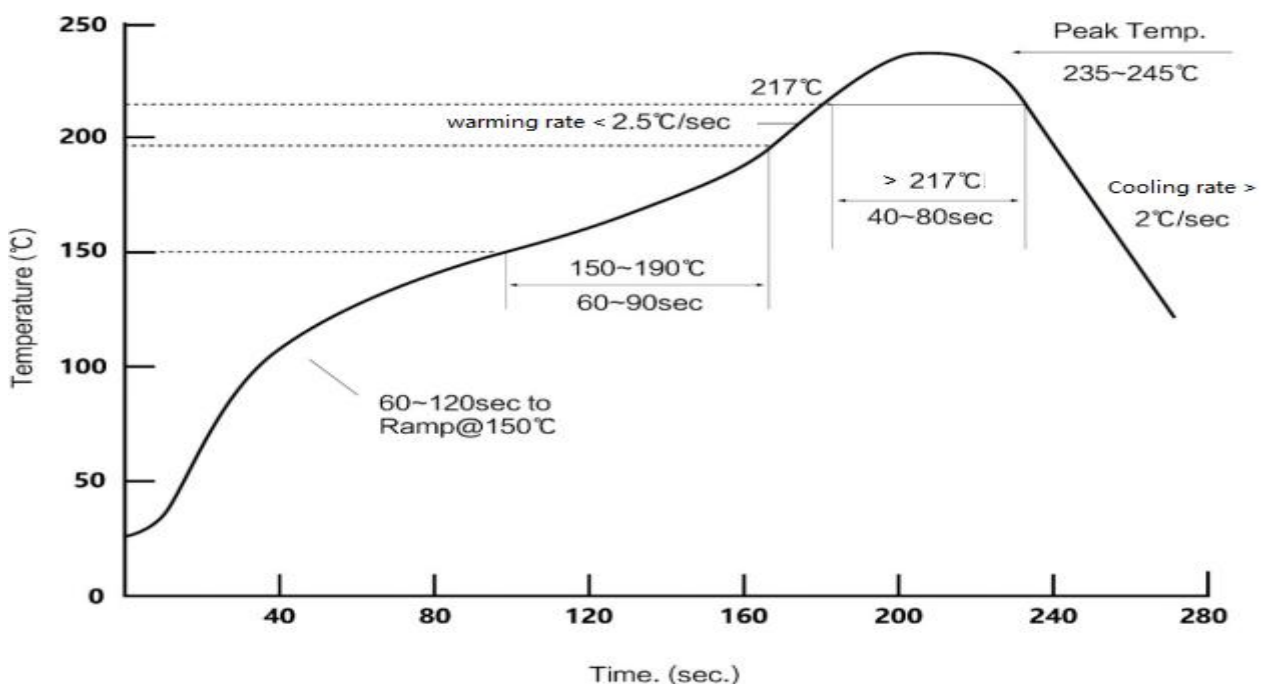
NO.	Instruction for connection between module and MCU
1	IO0, IO1, IO2, IO3 means IO ports of MCU.
2	DIO1、DIO2 are GPIO, configurable for multiple functions; DIO2 can connect to TXEN, without connecting to IO of MCU, for controlling RF switch TX , Please see more in SX126x datasheet, can be floated when free.
3	E22(433M22S) uses DIO3 internally to power 32MHz TCXO.
4	Well grounded with large area for grounding, small power ripple, filter capacitor should be installed and near to VCC and GND.
5	E22(400M30S): It is recommended to add a 200R protection resistor to the RXD/TXD of the external MCU.

4. Production Guidance

4.1. Reflow Soldering Temperature

Profile Feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min (T _{smin})	100°C	150°C
Preheat temperature max (T _{smax})	150°C	200°C
Preheat Time (T _{smin} to T _{smax})(ts)	60-120 sec	60-120 sec
Average ramp-up rate(T _{smax} to T _p)	3°C/second max	3°C/second max
Liquidous Temperature (TL)	183°C	217°C
Time (tL) Maintained Above (TL)	60-90 sec	30-90 sec
Peak temperature (T _p)	220-235°C	230-250°C
Average ramp-down rate (T _p to T _{smax})	6°C/second max	6°C/second max
Time 25°C to peak temperature	6 minutes max	8 minutes max

4.2. Reflow Curving Diagram



5. FAQ

5.1. Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Seawater has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- The power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power.
- Due to antenna quality or poor matching between antenna and module.

5.2. Module is easy to damage

- Please check the power supply source, ensure it is within the recommended value, voltage higher than that will damage the module.
- Please check the stability of power source, the voltage cannot fluctuate too much.
- Please make sure antistatic measure are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range, some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

6. Important Notes

- All rights to interpret and modify this manual belong to Ebyte.
- This manual will be updated based on the upgrade of firmware and hardware, please refer to the latest version.
- Please refer to our website for new product information

7. About Us

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