



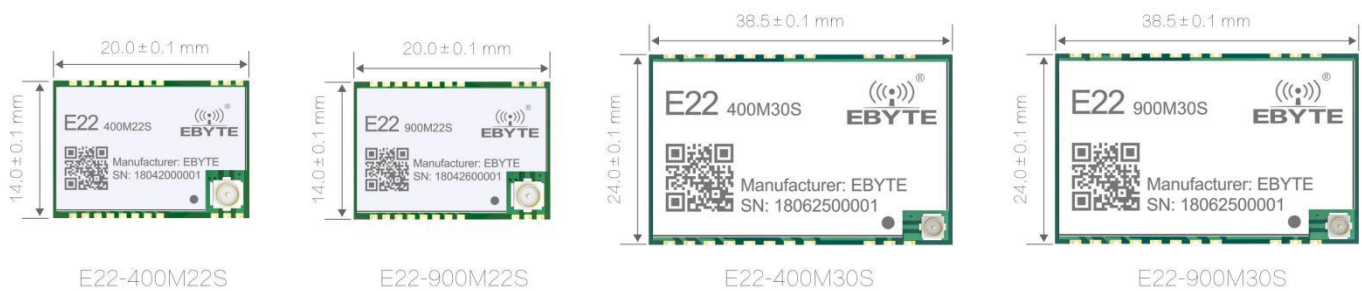
**SX1262/SX1268 Wireless Module**

**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℃             | 10% ~ 90%          | -40 ~ 125℃          |
| E22-900M22S | SX1262  | 20* 14*2.8 mm   | 1.35±0.1 g | -40 ~ 85℃             | 10% ~ 90%          | -40 ~ 125℃          |
| E22-400M30S | SX1268  | 38.5* 24*3.6 mm | 4.8±0.1g   | -40 ~ 85℃             | 10% ~ 90%          | -40 ~ 125℃          |
| E22-900M30S | SX1262  | 38.5* 24*3.6 mm | 4.64±0.1g  | -40 ~ 85℃             | 10% ~ 90%          | -40 ~ 125℃          |

## 1.1. E22-400M22S

| Parameter                    | Min  | Typ         | Max  | Unit |
|------------------------------|------|-------------|------|------|
| Tx current<br>(LoRa@2.4kbps) | 95   | 100         | 105  | mA   |
| Rx current<br>(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<br>(LoRa@2.4kbps) | 114  | 119     | 124  | mA   |
| Rx current<br>(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<br>(LoRa@2.4kbps) | 600  | 650         | 700  | mA   |
| Rx current<br>(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    |

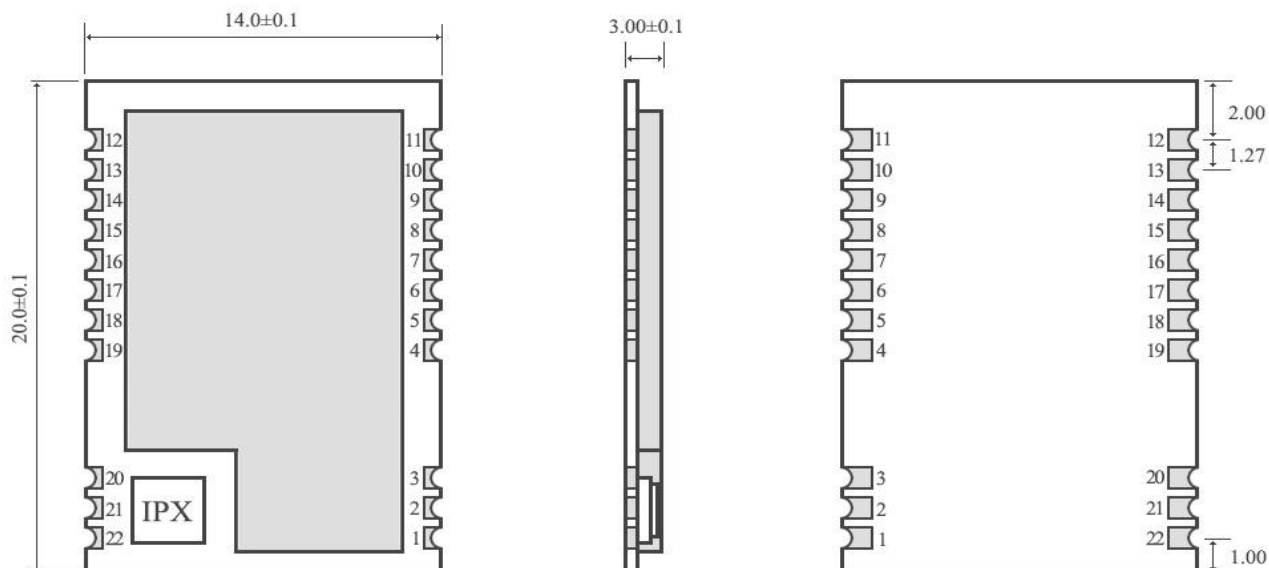
### 1.4. Parameter descriptions

- 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  $\mu\text{A}$ -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

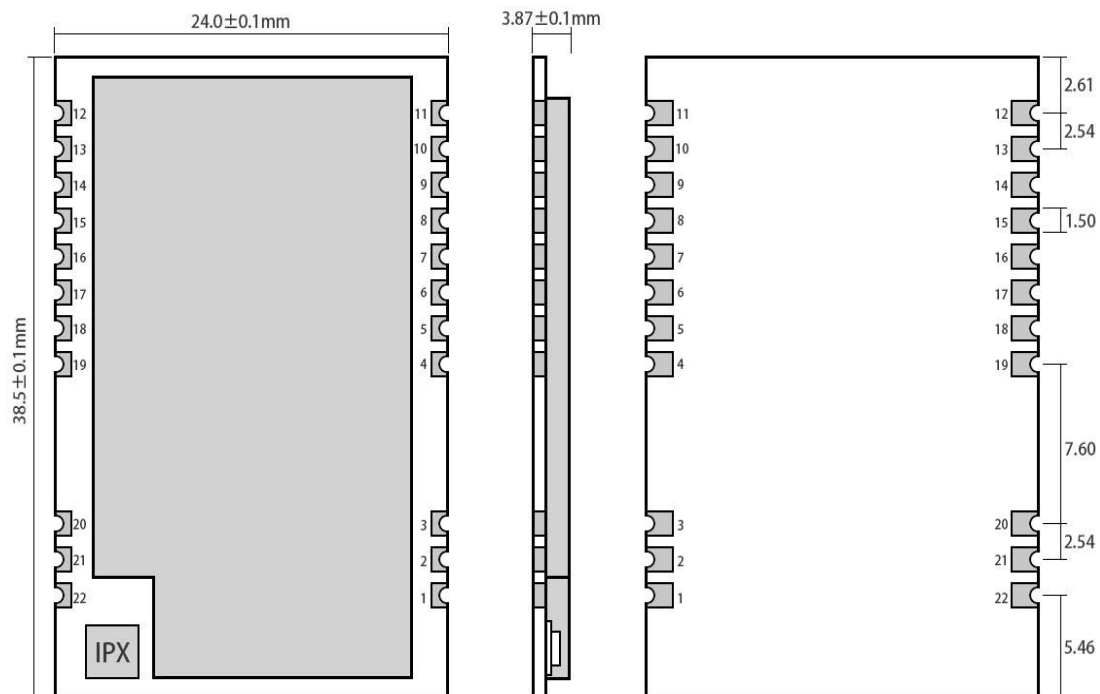
| Pin No. | Pin item | Pin direction | Pin application                                                               |
|---------|----------|---------------|-------------------------------------------------------------------------------|
| 1       | GND      |               | Ground                                                                        |
| 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



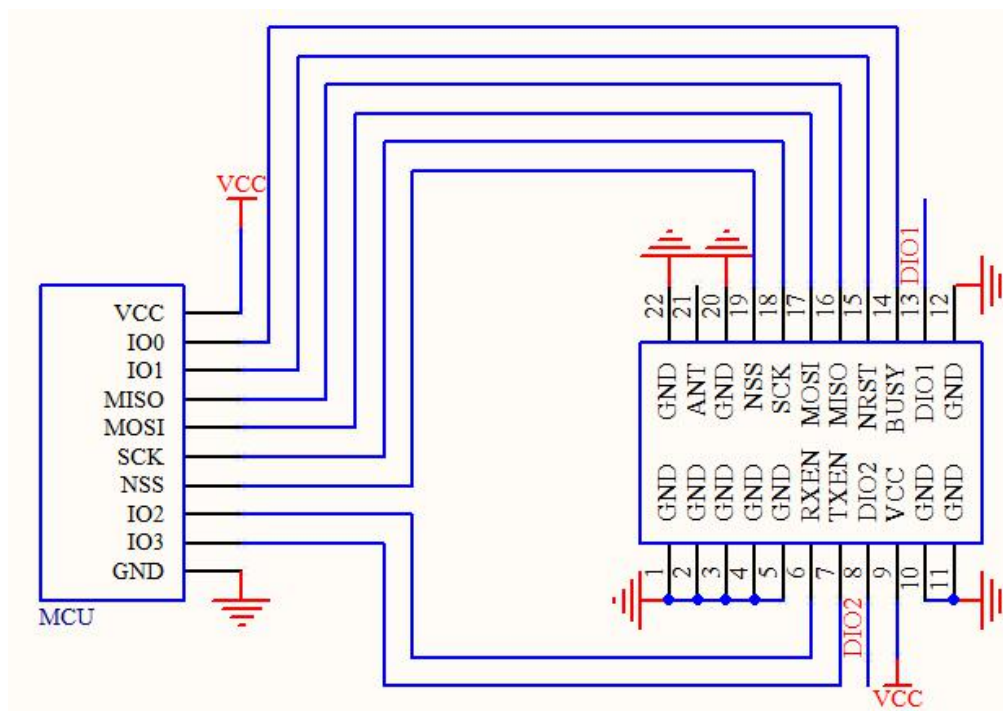
## 2.2.2 Pin definition

| 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)                                |
| 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 ★ |          |               |                                                                               |

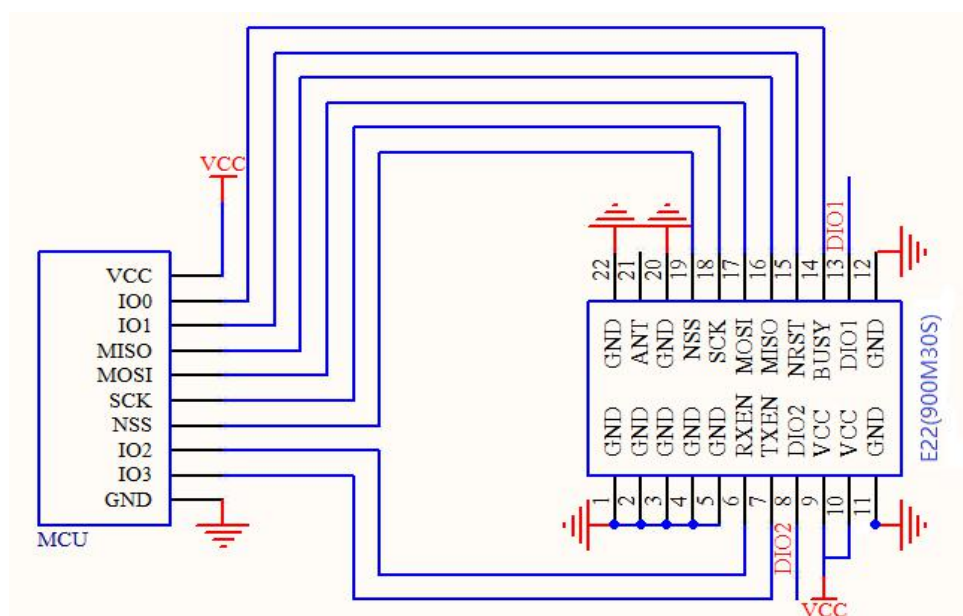


### 3. Recommended Circuit Diagram

#### 3.1. E22-433M22S/E22-900M22S



#### 3.2. E22-400M30S/E22-900M30S



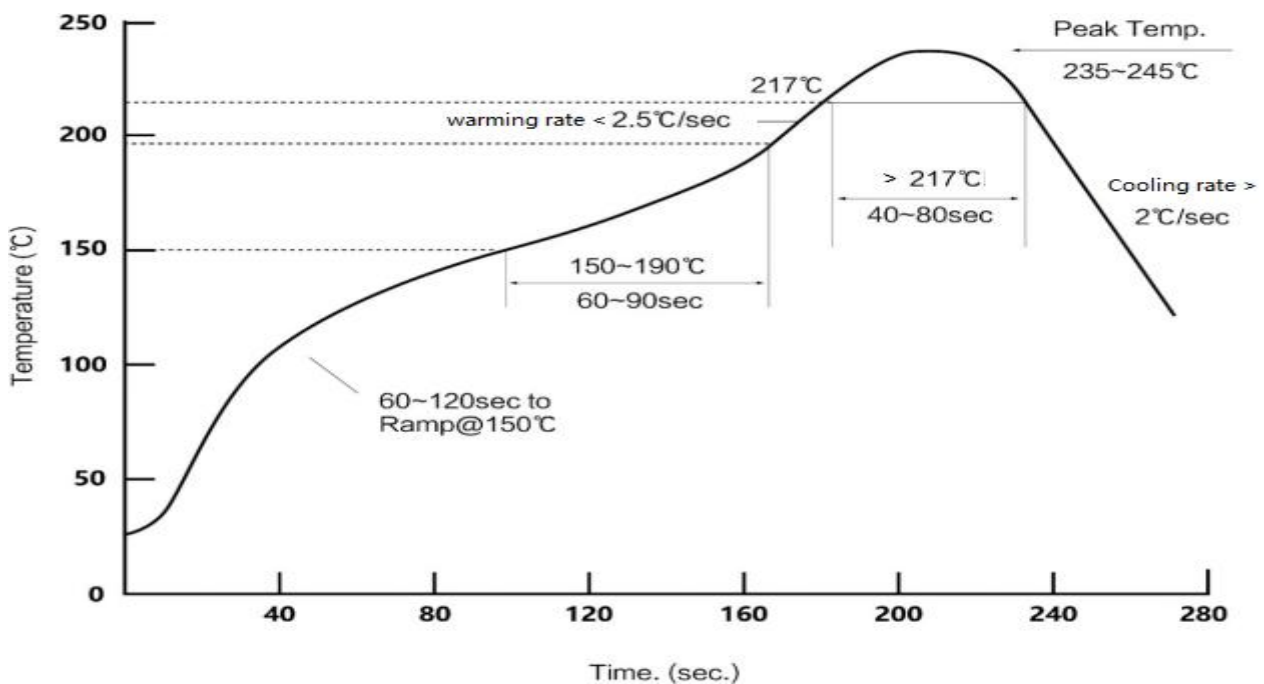
| NO. | Instruction for connection between module and MCU                                                                                                                                                                        |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | IO0, IO1, IO2, IO3 means IO ports of MCU.                                                                                                                                                                                |
| 2   | DIO1、DIO2 are GPIO, configurable for multiple functions; <b>DIO2 can connect to TXEN, without connecting to IO of MCU, for controlling RF switch TX</b> , 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 <sub>smin</sub> )                  | 100°C          | 150°C            |
| Preheat temperature max (T <sub>smax</sub> )                  | 150°C          | 200°C            |
| Preheat Time (T <sub>smin</sub> to T <sub>smax</sub> )(ts)    | 60-120 sec     | 60-120 sec       |
| Average ramp-up rate(T <sub>smax</sub> to T <sub>p</sub> )    | 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 <sub>p</sub> )                            | 220-235°C      | 230-250°C        |
| Average ramp-down rate (T <sub>p</sub> to T <sub>smax</sub> ) | 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

Technical support: [support@cdebyte.com](mailto:support@cdebyte.com)

Documents and RF Setting download link: [www.cdebyte.com/en/](http://www.cdebyte.com/en/)



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