E160-RxMD2 Datasheet

OOK/ASK 315/433.92MHz Superheterodyne receiver module



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Chapter 1 Product Overview

1.1 Product Introduction

E160-RxMD2 is an extremely low-cost OOK/ASK modulated 315MHz/433.92MHz wireless receiving module developed by EBYTE. Using high-performance RF chip, built-in image suppression, good anti-interference performance, to ensure the accuracy of signal small signal recognition; It has the characteristics of small size, low power consumption, high sensitivity, wide voltage and high protection.It can pass FCC and CE certification, and is suitable for remote control of small home appliances, door access system remote control, electric curtain and electric clothes rack and other application scenarios.

**Since this module is a pure hardware RF module, the user needs to decode its output signal before it can be used directly.*



E160-TxMD2

1.2 Features

- Small size: 22.0×8.5×2.5mm(L×W×H);
- High speed: up to 40kbps transmission rate;
- High sensitivity: -109dBm(315MHz/433.92MHz);
- High ESD protection: ±4KV HBM;
- Start time: 5ms;
- Built-in image suppression, good anti-interference performance;
- Communication distance: 210m;

1.3 Application Scenarios

- Remote control of small household appliances (fan, lighting)
- Toy remote control
- Access control system remote control
- Tire pressure detection
- Wireless data transmission

Chapter 2 Specifications

2.1 RF Parameters

RF parameters	Parameter value	remark

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Operating Frequency (MHz)	315	E160-R3MD2
	433.92	E160-R4MD2
Modulation	ASK/OOK	Amplitude keying/on-off keying
Blocking Power (dBm)	10	-
Receiver Sensitivity (dBm)	-109	@315MHz/433.92MHz
Receive Bandwidth (dBc)	±200	-
Maximum Transmission Rate (KHz)	40	-
Frequency Offset (MHz)	±0.05	-
Antenna Impedance (Ω)	50	-
Reference communication distance (m)	210	When used with the E160-TxMS1, the antenna gain is 1.5dBi and the height is 2m

2.2 Electrical Parameters

Electrical parameters	Minimum	Typical	Maximum	Remark
Operating Voltage(V)	2.0	3.3	3.6	≥3.3V can guarantee the output power, and there is a risk of burning out if it exceeds 3.6V
Communication Level (V)	2.0	3.3	3.6	Depending on the supply voltage, there is a risk of burning beyond 3.6V
Transmit Current (mA)	-	-	-	The receiver module has no transmit current
Received Current (mA)	-	4.5	-	@3.3V，315/433.92MHz
Sleep Current (μA)	-	4.5	-	No sleep mode, using external IO to control the VDD switch, reduce the average power consumption
ESD Protection (KV)	-8		+8	HBM
Operating Temperature (°C)	-40	-	+85	Industrial-grade design
Operating Humidity (%RH)	10	-	90	-
Storage Temperature (°C)	-65	-	+150	-

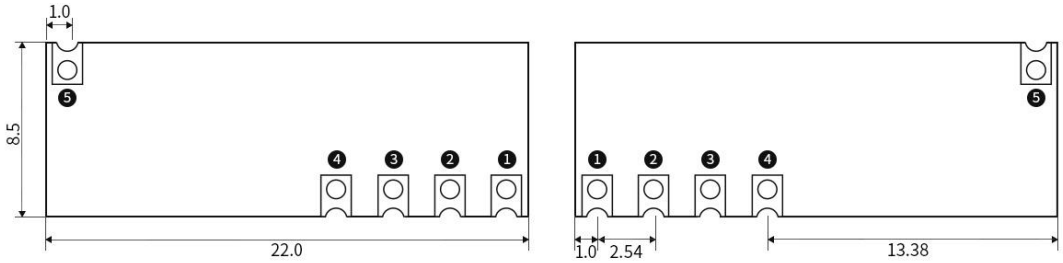
2.3 Hardware Parameters

Hardware parameters	Parameter value	Remarks
Crystal oscillator frequency(MHz)	26.2774	E160-R3MD2(315MHz)
	27.1412	E160-R4MD2(433.92MHz)
Module size (mm)	22.0*8.5*2.5	Length*width*height
Antenna form	Stamp holes	-
Communication interfaces	GPIO	The communication level is 2.0~5.5V, and 3.3V is recommended to ensure data reliability
Encapsulation	SMD/Stamp holes	The pin pitch is 2.54mm, see Chapter 3 for detailed dimensions
Weight (g)	1.85	-

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Chapter 3 Mechanical Dimensions and Pin Definitions





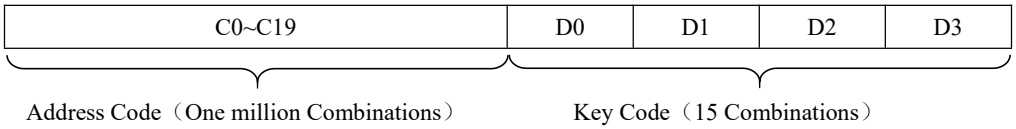
Unit : mm
pad quantity : 5
Tolerance value : X.X±0.2mm
X.XX±0.05mm

Pin Number	Pin Name	Pin Direction	Pin Usage
1	GND	power supply	-
2	DATA	output	Data output pins
3	DATA	output	Data output pins
4	VCC	power supply	DC 2.0~3.6V
5	ANT	Input	Antenna pins (receiving module, only receiving, no transmitting)

Chapter 4 Software development use

In terms of the coding type of wireless remote control, it can be divided into two categories: one is a fixed code, that is, the address of the coding chip is unchanged, and the chip model is represented by HS1527, EV1527, RT1527, FP1527 and PT2262; The other type is the rolling code, the address code of the chip is changing, and the chip model is represented by HS300 and HS301.

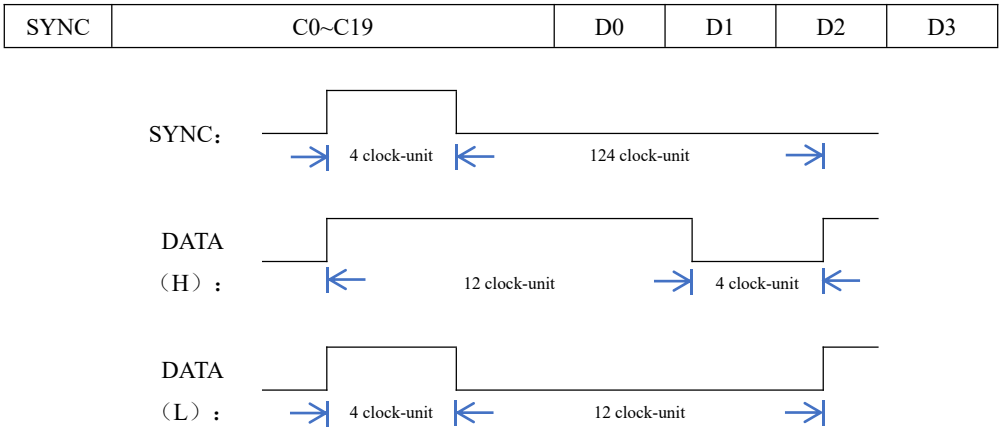
We take the common 1527 encoding as an example to briefly introduce the data frame structure characteristics of wireless remote control. 1527 Each frame of data consists of 24 data bits, the first 20 bits are address codes, and the last 4 bits are key codes. Usually the 1527 encoding IC will pre-flash the 20-bit address code, a total of 1048576 address code combinations, and the 4-bit key code is determined by the K0~K3 input pins on the corresponding IC, and there are up to 15 key code combinations.



Before the data bits, there is also a sync pulse, i.e. each frame of data starts with a sync pulse. The "1" and "0" of the data bits are determined by the ratio of the high and low level widths (pulse widths). If the high width is 3 times the low width, it means the logic "1", and conversely, if the low level is 3 times the high width, it means the logic "0", and the ratio of the sync pulse high to low is fixed at 4:124.

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From here, we can conclude that the pulse signal can be input to the module through the DATA pin of the E160-TxMS1, and the module will convert it into a wireless RF signal for transmission. On the contrary, the receiver is converted into a pulse signal by the E160-RxMD2 module and output outward by the DATA pin. The minimum pulse period that can be communicated is determined by the "transmission rate" of the module, for example, the maximum "transmission rate" of the transmitter module is 40kbps, and the maximum "transmission rate" of the receiver module is 4kbps, then the maximum "transmission rate" between the two is determined by the receiver module, that is, 4kbps.

Above we have briefly introduced a public encoding rule, which can also be considered a communication protocol, from which we can also make a private encoding rule by changing the frame structure (packet length/number of bytes), pulse width, pulse period, and 0/1 data judgment logic.

Regarding those public coding rules, codec instructions and sample codes can be easily found on the Internet, and Xiaoyi will not give examples one by one.

Chapter 5 Hardware Design

- It is recommended to use a DC regulated power supply to supply power to the module, the ripple coefficient of the power supply should be as small as possible, and the module should be reliably grounded;
- Please note that the correct connection of the positive and negative poles of the power supply, such as reverse connection may cause permanent damage to the module;
- Please check the power supply to ensure that it is between the recommended supply voltage, if the maximum value is exceeded, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage should not fluctuate greatly and frequently;
- When designing the power supply circuit for the module, it is often recommended to keep more than 30% of the margin, which is conducive to long-term stable operation.
- The module should be kept away from the power supply, transformer, high-frequency wiring and other parts with large electromagnetic interference as much as possible;
- If you really have to pass under the module, assuming that the module is welded to the top layer, the top layer of the contact part of the module (all copper is poured and well grounded) must be close to the digital part of the module and the wire must be routed in the bottom layer;
- Assuming that the module is soldered or placed in the top layer, it is also wrong to route the cables at random in the bottom layer or other layers, which will affect the spurious and receiving sensitivity of the module to varying degrees.
- Assuming that there are devices with large electromagnetic interference around the module, it is recommended to stay away from

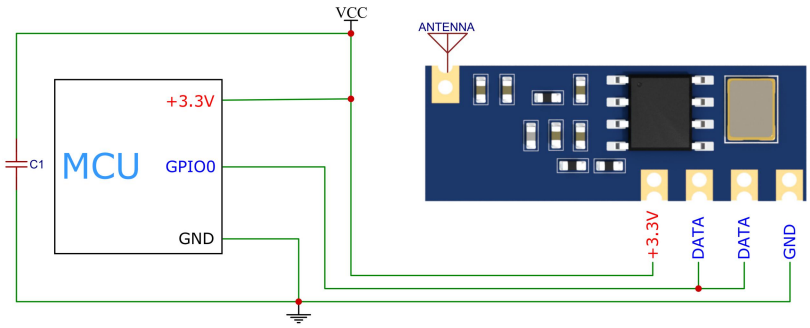
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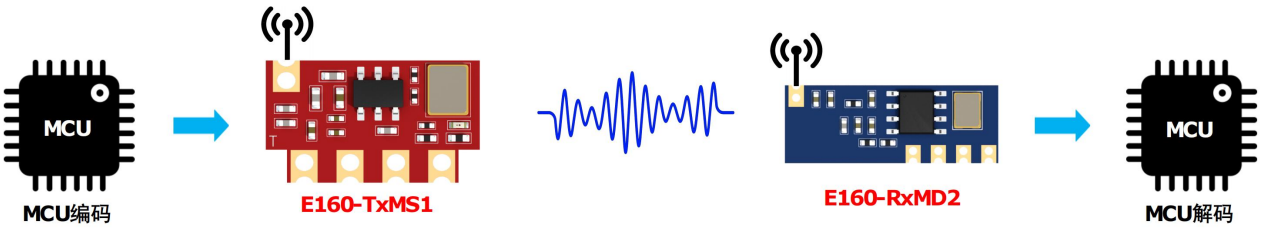
the module appropriately according to the intensity of the interference, and if the situation allows, appropriate isolation and shielding can be done;

- Assuming that there are traces (high-frequency digital, high-frequency analog, power cables) around the module that have large electromagnetic interference, it will also greatly affect the performance of the module, and it is recommended to stay away from the module appropriately according to the intensity of interference, and if the situation allows, appropriate isolation and shielding can be done;
- Try to stay away from some TTL protocols that also have a physical layer of 2.4GHz, such as USB3.0;
- The antenna mounting structure has a great impact on the performance of the module, so it is important to ensure that the antenna is exposed and preferably vertically upward. When the module is installed inside the chassis, a high-quality antenna extension cable can be used to extend the antenna to the outside of the chassis;
- The antenna must not be installed inside a metal case, as the transmission distance will be greatly reduced.

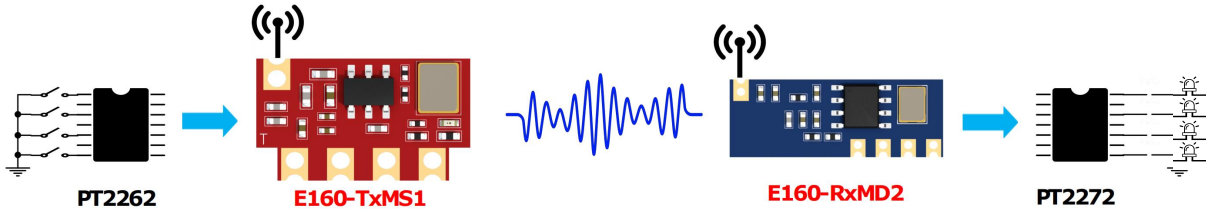
Chapter 6 Reference Circuit and Application Diagram



※ Schematic diagram of E160-RxMD2 and MCU application ※



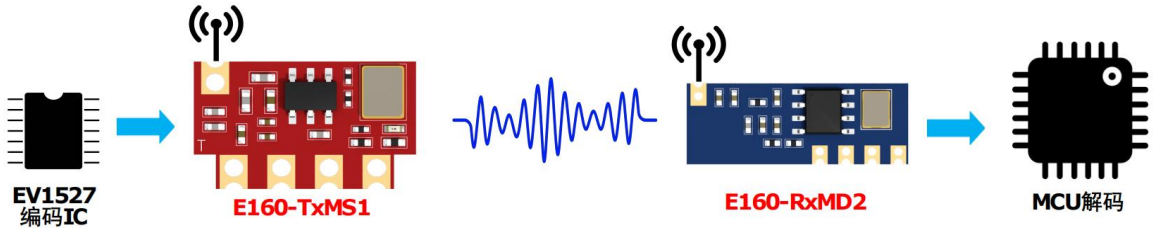
※ Schematic diagram of E160-TxMS1/E160-RxMD2 connection with MCU application ※



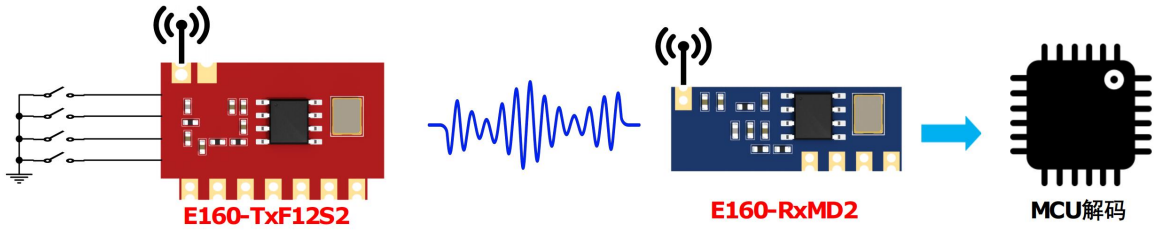
※ Schematic diagram of E160-TxMS1/E160-RxMS1 and PT2262/PT2272 ※

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※ Schematic diagram of connection between E160-TxMS1/E160-RxMD2 and EV1527 encoded IC applications ※



※ Application connection diagram of E160-TxF12S2/E160-RxMD2 ※

Chapter 7 Frequently Asked Questions

7.1 The transmission distance is not ideal

- When there is a straight-line communication barrier, the communication distance will be attenuated accordingly;
- Temperature, humidity, and co-channel interference will lead to an increase in the communication packet loss rate.
- The ground absorbs and reflects radio waves, and the test effect near the ground is poor;
- Seawater has a strong ability to absorb radio waves, so the seaside test effect is poor;
- If there is a metal object near the antenna, or if it is placed in a metal shell, the signal attenuation will be very serious;
- The power register is set incorrectly, the air rate is set too high (the higher the air rate, the closer the distance);
- At room temperature, the low voltage of the power supply is lower than the recommended value, and the lower the voltage, the smaller the generating power;
- The antenna is poorly matched with the module or the antenna itself is of poor quality.

7.2 Modules are vulnerable

- Please check the power supply to ensure that it is between the recommended supply voltage, if the maximum value is exceeded, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage should not fluctuate greatly and frequently;
- Please ensure that the installation and use process is anti-static operation, and the electrostatic sensitivity of high-frequency devices;
- Please ensure that the humidity should not be too high during installation and use, and some components are humidity-sensitive devices;
- If there are no special needs, it is not recommended to use it at too high or too low temperatures.

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7.3 The bit error rate is too high

- If there is co-channel signal interference nearby, stay away from the interference source or modify the frequency and channel to avoid interference;
- Unsatisfactory power supply may also cause garbled codes, so it is important to ensure the reliability of the power supply;
- Poor or too long extension wires and feeders can also cause high bit error rates.

Chapter VIII Welding Operation Instructions

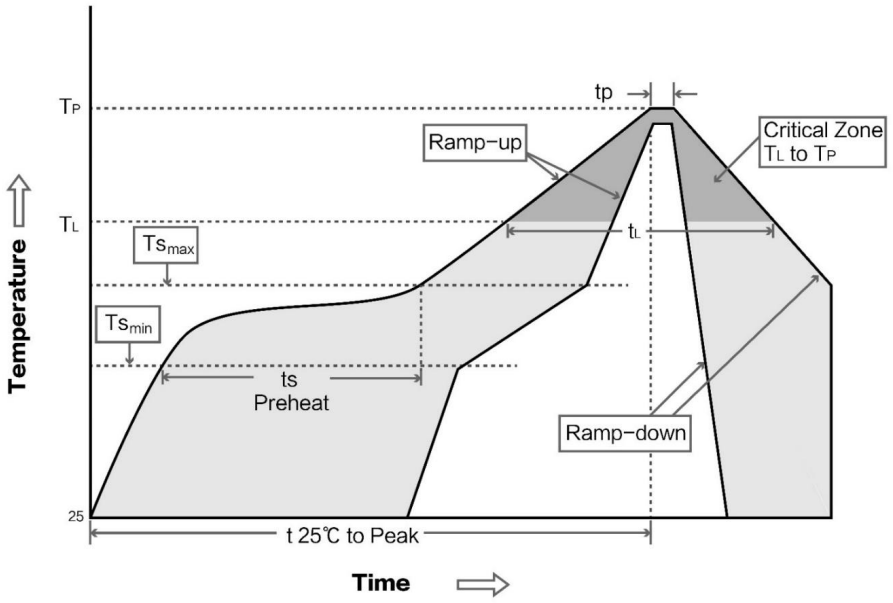
8.1 Reflow temperature

Profile Feature	Curve features	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	Minimum warm-up temperature	100℃	150℃
Preheat temperature max (Tsmax)	Maximum warm-up temperature	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	Warm-up time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average ascent rate	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquid phase temperature	183℃	217℃
Time（tL）Maintained Above（TL）	Time above liquidphase	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temperature	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average rate of decline	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time from 25°C to peak temperature	6 minutes max	8 minutes max

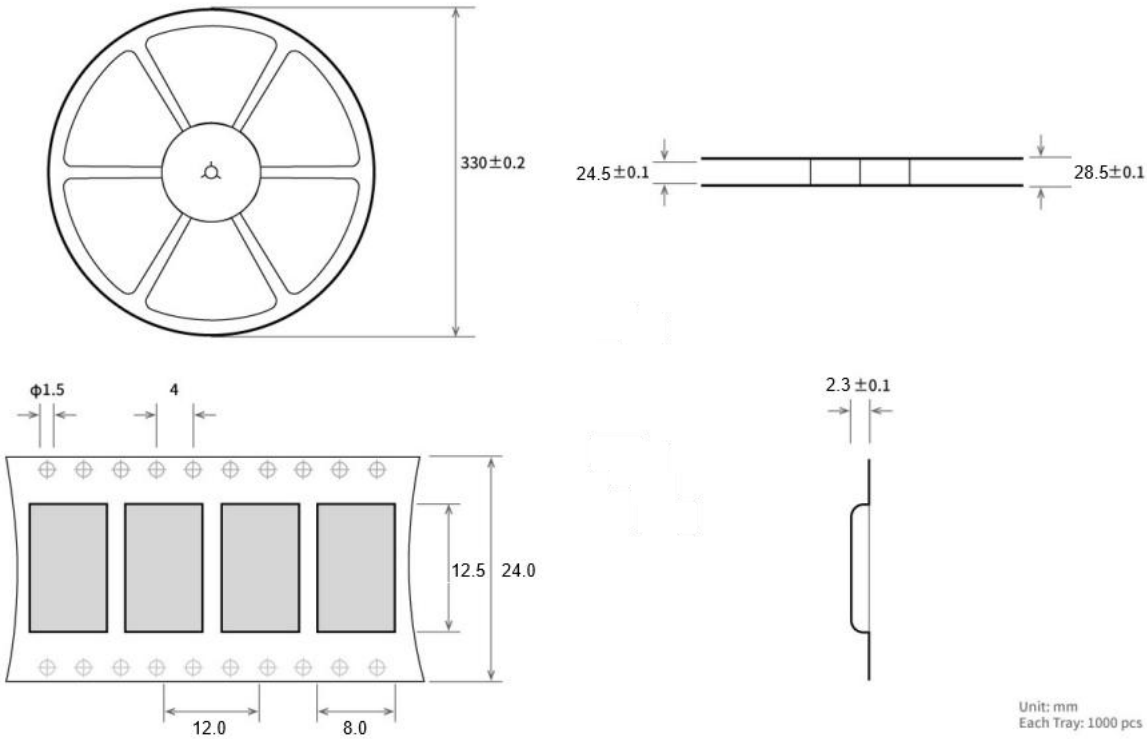
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8.2 Reflow soldering curve



Chapter 9 Batch Packaging Methods



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Revision History

version	Date of revision	Revision Notes	Maintainers
1.0	2025-7-11	first edition	Ning

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