E200-470A17S User Manual

470MHz Wireless audio module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1. General Introduction

1.1 Brief Introduction



E200-470A17S is a new wireless audio transmission module, which integrates transceiver. It has the characteristics of small size and convenient use. It works in the frequency band (470.033 ～ 512.273MHz) (default 512.273MHz), uses hardware I/O to select channels, supports MIC input and speaker output, and is compatible with 3.3V and 5V power supply voltages.

The E200-470A17S integrates a microphone (Microphone) and a speaker (Speaker) PA amplifier. Direct connection to the microphone does not require an external amplifier. The audio output can directly drive a 250mW/8ohm speaker. The radio frequency part provides a sensitivity of -98dBm, which greatly improves the wireless distance.

1.2 Features

- Support one-to-many broadcast transmission;
- Under ideal conditions, the communication distance can reach 300m;
- Control the working channel through the channel pin (restart effective), easy to use;
- The master-slave mode can be switched in real time, which is more flexible;
- Support 3.0～5.5V power supply, power supply greater than 3.3V can guarantee the best performance;
- Industrial standard design, supporting long-term use at -40～+85℃;
- Dual antennas are optional (IPEX/stamp hole), which is convenient for users to develop and integrate.

1.3 Application

- Smart home;
- Wireless alarm security system;
- Wireless audio transmission;
- Intelligent voice system;

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2. Specification and Parameter

2.1 limit parameter

Main parameter	Performance		Remark
	Min	Max	
voltage（V）	0	5.5	Voltage over 5.5V will cause permanent damage to module
I/O Voltage	-0.3	3.6	Voltage over 3.6V will cause permanent damage to module I/O
Blocking power（dBm）	-	15	It is less likely to burn when used at close range
Operating temperature（℃）	-40	+85	Industrial grade

2.2 Operating parameter

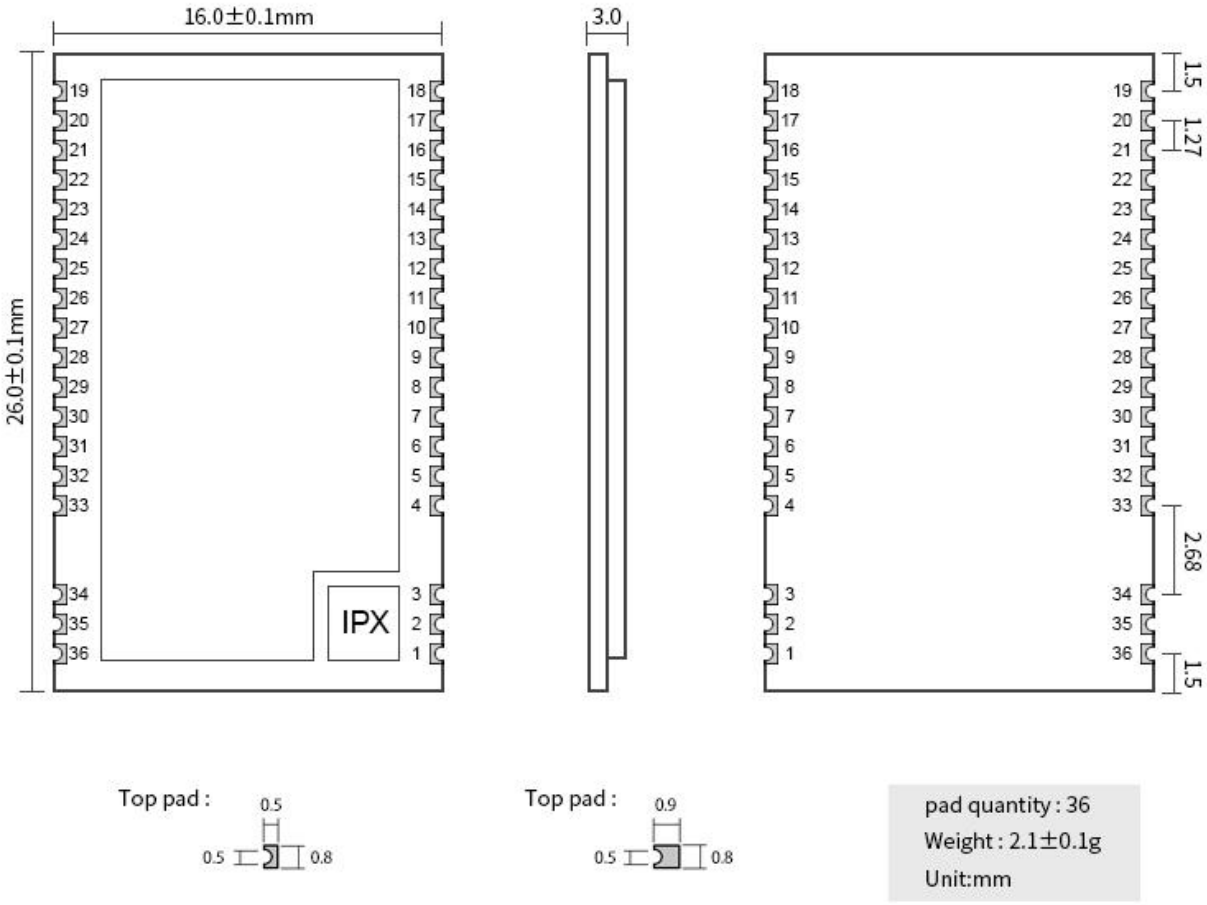
Main parameter		Performance			Remark
		Min	Type	Max	
Operating voltage（V）		2.3	3.3	5.5	≥5.0 V ensures output power
Communication level （V）		-0.3	3.3	3.6	For 5V TTL, it may be at risk of burning down
Operating temperature （℃）		-40	-	85	Industrial grade
Operating frequency（MHz）		470.033	-	512.273	Support ISM band
Power Consum-ption	TX current（mA）	98	100	102	Instantaneous power consumption, average current: 35mA
	RX current（mA）	44	45	46	The output is connected to 8ohm, 250mW speaker, the maximum volume is 185mA
Max TX power（dBm）		16.5	17	17.5	--
Receiving sensitivity（dBm）		-	-98	-	Air data rate 500kbps
Bit depth (bit)		-	8	-	default 8-bit
Audio sampling rate (kHZ)		8	8	32	default 8-kHz

Main parameter	Description	Remark
Reference distance	300m	Test condition：clear and open area, antenna gain: 5dBi， antenna height: 2.5 m，air data rate: 500 kbps
Modulation	FSK	Modulation technology
Communication Interface	UART serial	TTL level (reserved unused)
Audio Interface	DAC	Analog Signal Output
Package	SMD	--
Interface	1.27mm	--
size	16*26 mm	--
RF Interface	IPEX/Stamp hole	50 ohm impedance

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3. Size and Pin Definition



Pin No.	Item	Direction	Description
2	ANT	-	Antenna
6	REST	Input	Module reset pin, low level effective;
11	TXD	Output	TTL serial port output, currently only supports reading the module version, and does not use floating processing;
12	RXD	Input	TTL serial port input, currently only supports reading the module version, and does not use floating processing;
16	TTCLK	-	Debug clock pin, do not use floating processing;
17	TTDIO	-	Debug data pins, do not use floating processing;
20	VCC	power supply	Module power supply is positive reference, voltage range: 2.3～5.5V DC, recommended 3.3V or 5V;
23	Mode	Input	The module's transceiver mode control pin, low-level transmission mode, high-level reception mode, cannot be left floating;
25	Debug_EN	-	Debug control pin, enter the program burning mode for the low-level module, do not use floating processing;

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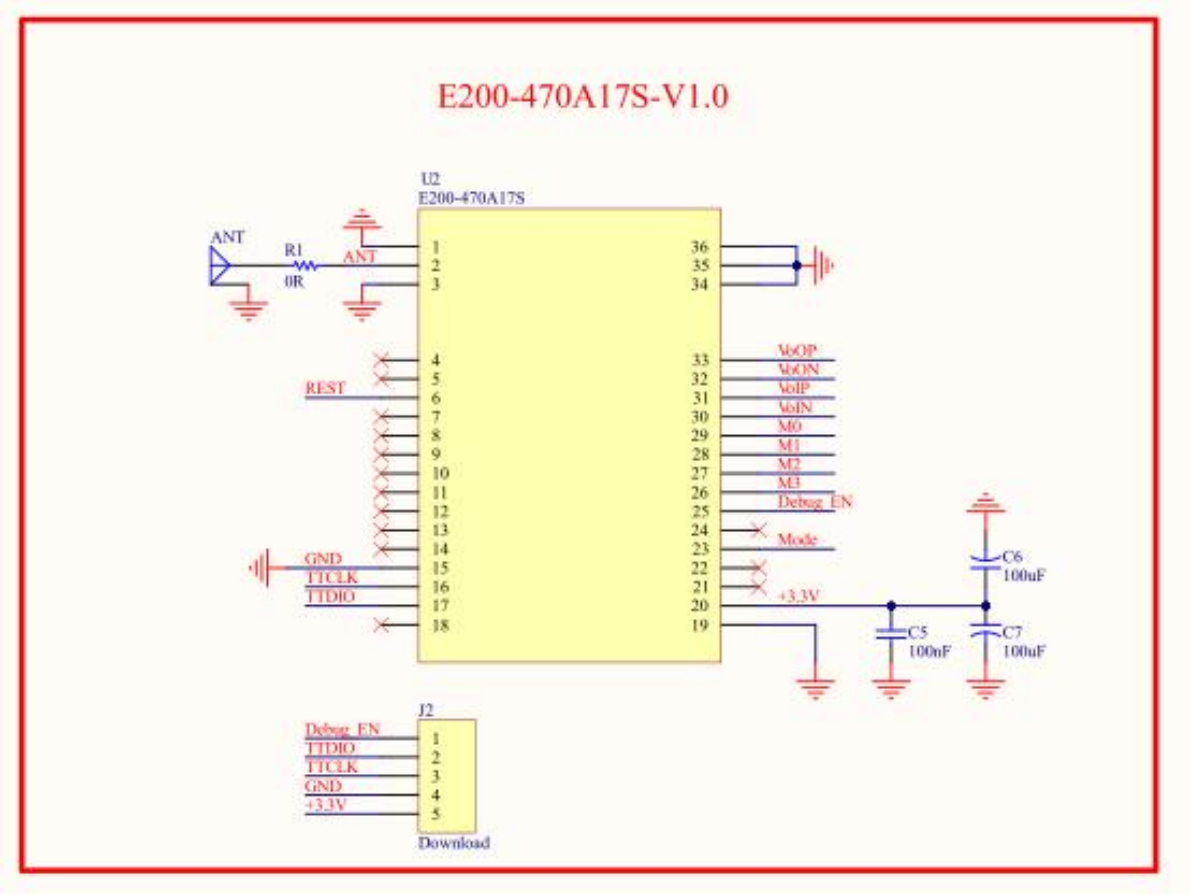
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26	CH3	Input	Channel selection 3, combined with CH0, CH1, CH2 to select 16 channels that can work, see the channel table for details;
27	CH2	Input	Channel selection 2, combined with CH0, CH1, CH3 to select 16 channels that can work, see the channel table for details;
28	CH1	Input	Channel selection 1, combined with CH0, CH2, and CH3 to select 16 channels that can work, see the channel table for details;
29	CH0	Input	Channel selection 0, combined with CH1, CH2, CH3 to select 16 channels that can work, see the channel table for details;
30	VOIN	Input	Audio input is negative, please refer to the recommended circuit for hardware design;
31	VOIP	Input	The audio input is positive, the hardware design is detailed in the recommended circuit;
32	VOON	Output	Audio output is negative, please refer to the recommended circuit for hardware design;
33	VOOP	Output	The audio output is positive, the hardware design is detailed in the recommended circuit;
1、3、15、19、34、35、36	GND	power supply	Module ground
4、5、7、8、9、10、13、14、18、21、22、24	NC	-	Keep it unused and suspend it for disposal;

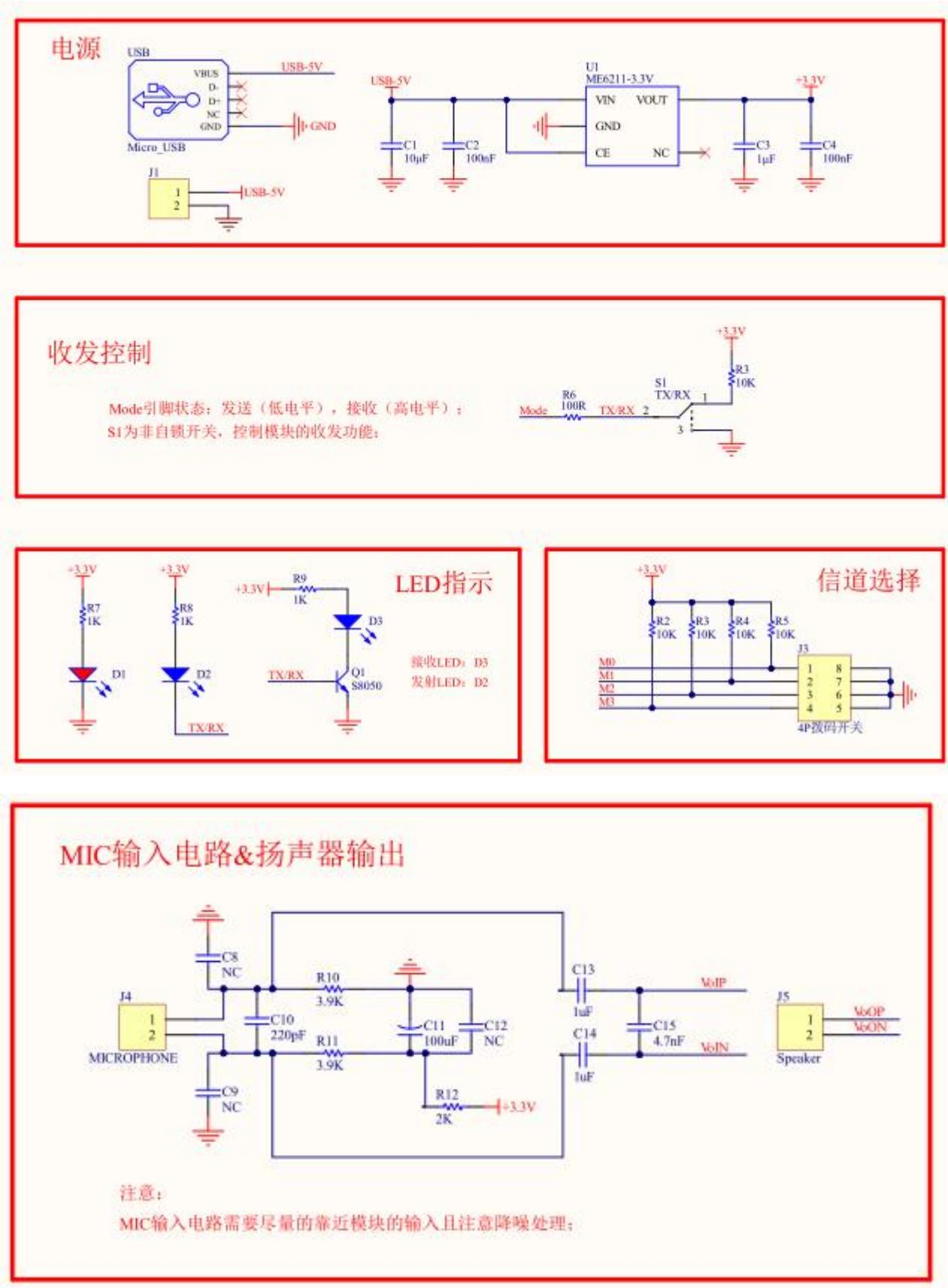
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4. Recommended connection diagram



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For hardware design considerations, see Chapter 8;

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5. Channel Code Value Table

E200-470A17S switches channels through different combinations of high and low levels of the four pins CH0~CH3. Low level is represented by "0", and high level is represented by "1". The frequency correspondence table is as follows:

CH3	CH2	CH1	CH0	channel	Frequency（MHZ）	**Remark**
0	0	0	0	channel0	470.033	-
0	0	0	1	channel1	472.849	-
0	0	1	0	channel2	475.665	-
0	0	1	1	channel3	478.481	-
0	1	0	0	channel4	481.297	-
0	1	0	1	channel5	484.113	-
0	1	1	0	channel6	486.929	-
0	1	1	1	channel7	489.745	-
1	0	0	0	channel8	492.561	-
1	0	0	1	channel9	495.377	-
1	0	1	0	channel10	498.193	-
1	0	1	1	channel11	501.009	-
1	1	0	0	channel12	503.825	-
1	1	0	1	channel13	506.641	-
1	1	1	0	channel14	509.457	-
1	1	1	1	channel15	512.273	-

Note: After switching channels, you need to restart to take effect.

6. Operating mode

The module has two working modes, which are set by pin Mode; the details are shown in the following table:

Mode (send/receive)	**Mode**	**Mode introduction**	**Remark**
Send mode	0	The module is in the transmitting state, and the signal input by the audio input interface is sent out wirelessly;	Transceiver function can be switched in real time
Receive mode	1	The module is in the receiving state, and the signal received wirelessly is output through the audio output interface;	Transceiver function can be switched in real time

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7. Instructions and factory parameters

7.1 Instruction format

The module supports software version reading, and it can be read through the serial port in the transceiver mode (when reading, only 9600, 8N1 format is supported):

No.	Instruction format	Detailed description
1	Read software version	instruction：C3 C3 C3 response：E200-470A17S(Vx.x) example 1: Send: C3 C3 C3 (hexadecimal format) Return: E200-470A17S(V1.0)

7.2 Factory default parameters

model	Factory default information：E200-470A17S				
Module model	Frequency	Air data rate	Baud rate	Serial port format	Transmitting power
E200-470A17S	512.273MHz	500kbps	9600bps	8N1	17.5dbm

8. Hardware design

- It is recommended to use a DC stabilized power supply. The power supply ripple factor is as small as possible and the module needs to 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 between the recommended supply voltage, if exceeding the maximum, the module will be permanently damaged;
- Please check the stability of the power supply. Voltage can not fluctuate greatly and frequently;
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, so the whole machine is beneficial for long-term stable operation;
- The module should be as far away as possible from the power supply, transformers, high-frequency wiring and other parts with large electromagnetic interference;
- Bottom Layer High-frequency digital routing, high-frequency analog routing, and power routing must be avoided under the module. If it is necessary to pass through the module, assume that the module is soldered to the Top Layer, and the copper is spread on the Top Layer of the module contact part(well grounded), it must be close to the digital part of the module and routed in the Bottom Layer;
- Assuming the module is soldered or placed over the Top Layer, it is wrong to randomly route over the Bottom Layer or other layers, which will affect the module's spurs and receiving sensitivity to varying degrees;
- It is assumed that there are devices with large electromagnetic interference around the module that will greatly

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affect the performance. It is recommended to keep them away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done;

- Assume that there are traces with large electromagnetic interference (high-frequency digital, high-frequency analog, power traces) around the module that will greatly affect the performance of the module. It is recommended to stay away from the module according to the strength of the interference.If necessary, appropriate isolation and shielding can be done;
- 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);
- The antenna installation structure has a great influence on the performance of the module. Make sure that the antenna is exposed and it is best to be vertically upward;
- The mounting structure of antenna has a great influence on the performance of the module. It is necessary to ensure that the antenna is exposed, preferably vertically upward. When the module is mounted inside the case, use a good antenna extension cable to extend the antenna to the outside.
- The antenna must not be installed inside the metal case, which will cause the transmission distance to be greatly weakened.

9. FAQ

9.1 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;
- Sea water 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 recommended value, the lower the voltage, the lower the transmitting power;
- Due to antenna quality or poor matching between antenna and module.

9.2 Module is easy to damage

- Please check the power supply source, ensure it is between the recommended supply voltage, voltage higher than the maximum 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.

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9.3 Sound quality is too bad

- The power supply ripple is too large, so be sure to reduce the power supply ripple, increase the decoupling capacitor, and increase the EMC filter circuit;
- The audio input wiring is unreasonable, and it needs to be differentially designed and as close as possible to the module pins;
- The audio input wiring is unreasonable, and it needs to be differentially designed and as close as possible to the module pins;
- There may be co-channel signal interference nearby, modify the module channel usage;

10. Welding operation guidance

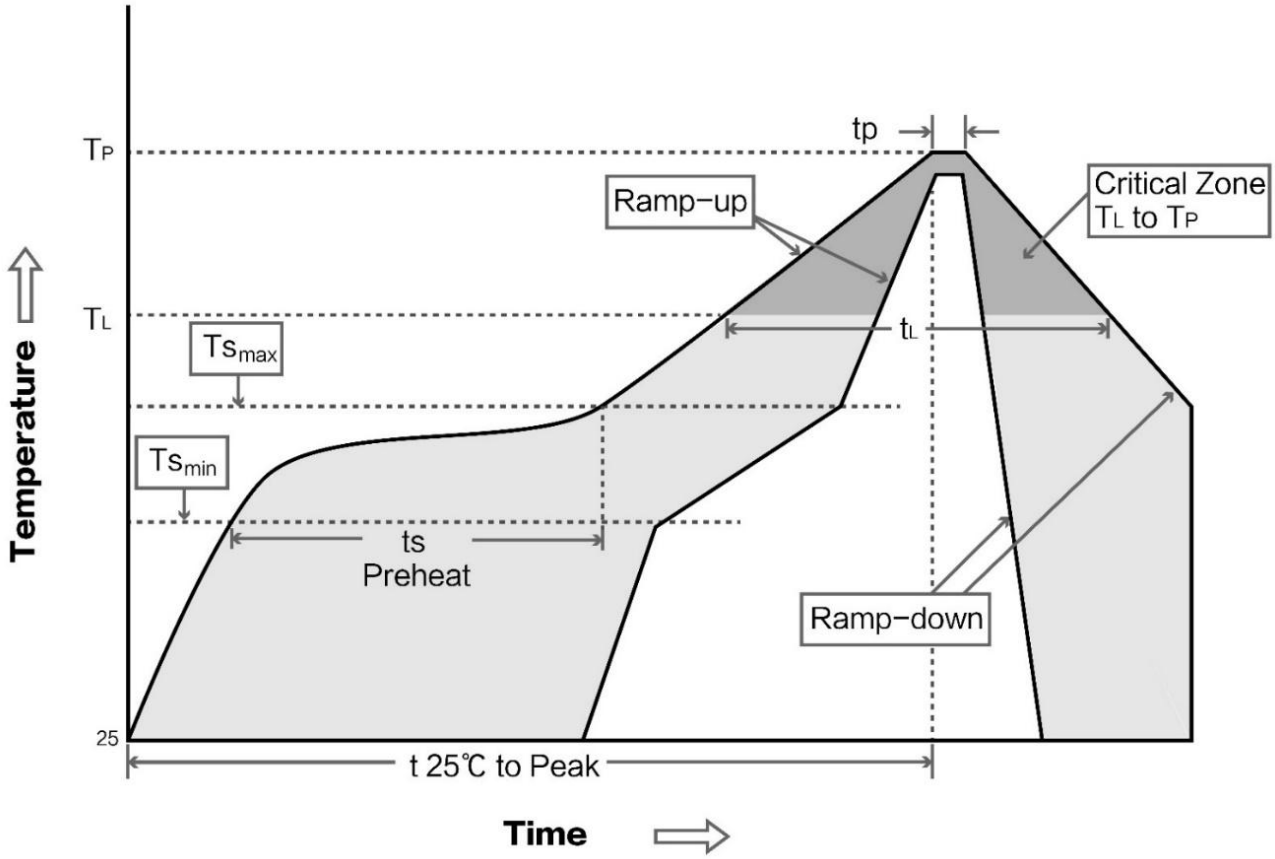
10.1 Reflow soldering temperature

Profile Feature	Curve characteristics	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	Min preheating temp.	100℃	150℃
Preheat temperature max (Tsmax)	Max preheating temp.	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	Preheating time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average ramp-up rate	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquid phase temp	183℃	217℃
Time（tL）Maintained Above（TL）	Time below liquid phase line	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temp	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Average ramp-down rate	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time to peak temperature for 25℃	6 minutes max	8 minutes max

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10.2 Reflow soldering curve



11. Related models

Product No.	Frequency Hz	Transmit power dBm	Test distance km	Package	Size mm	Communication Interface
E200-470A17S	470M-512M	17.5	0.3	SMD	16*26	Analog/TTL

12. Antenna guide

12.1 Antenna recommendation

Antenna is an important role in the communication process. Inferior antennas often have a great impact on the communication system. Therefore, we recommend some antennas as antennas that support our wireless modules and have excellent performance and reasonable price.

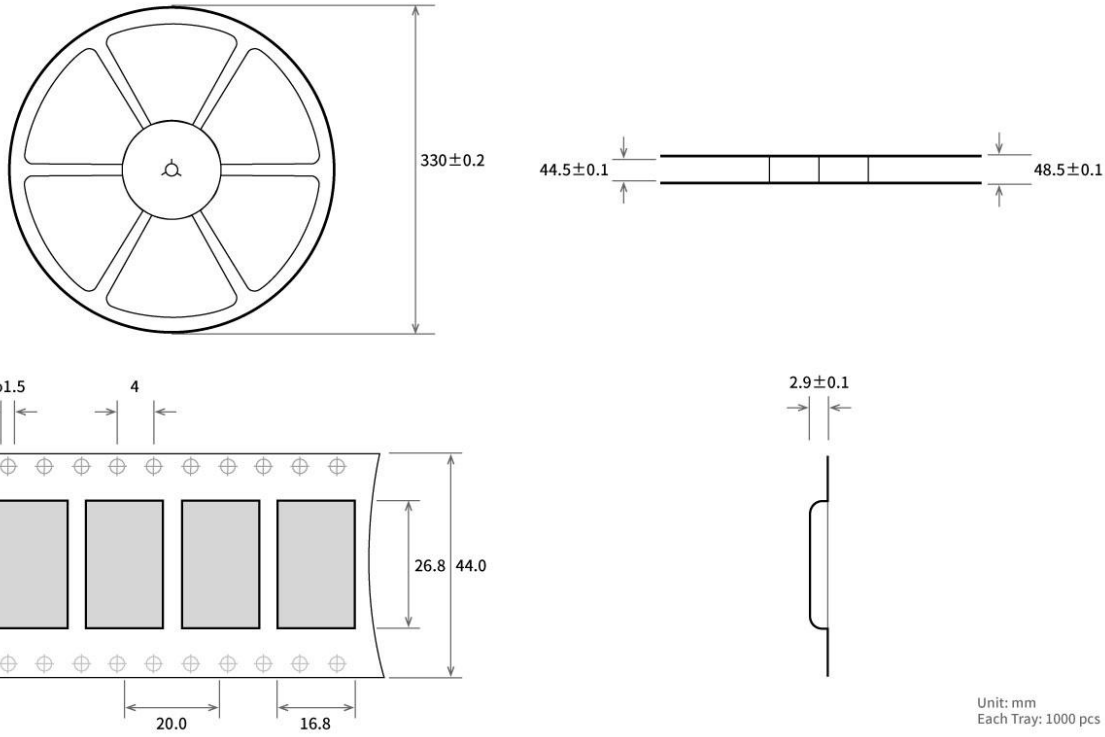
Product	Type	Frequency	Interference	Gain	Height	Feeder	Features

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		Hz		dBi			
TX490-JZ-5	Rubber antenna	470/490M	SMA-J	2.0	50	-	Ultrashort Straight and Omnidirectional Antenna
TX490-XPL-100	Sucker antenna	470/490M	SMA-J	3.5	120	100	Small Sucker antenna,cost-effective

13. Batch packaging



Revision history

Version	Date	Description	Issued by
1.0	2020-06-16	Original version	
1.1	2020-07-21	Format revision	Ren
1.2	2026-07-01	Revise sampling rate description;	Lei

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