# E200-2G4A20S

# User Manual

2.4GHz 20dBm Wireless Audio Module

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Content

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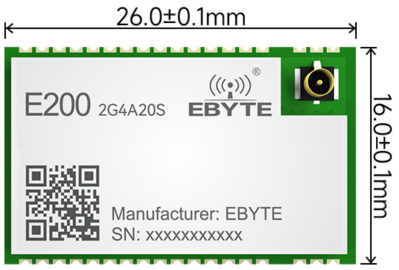
# 1. Overview

## 1.1 Introduction




E200-2G4A20S is a new wireless audio transmission module launched by Chengdu EBYTE, transceiver all-in-one. It is characterized by small size, easy to use, etc. It works in 2.4G frequency band, adopts hardware I/O to select channel by default, and can also be set to software select channel by command, supports MIC input and speaker output, and is compatible with 3.3V power supply voltage.

The E200-2G4A20S integrates Microphone and Speaker PA amplifiers internally, connecting directly to the microphone without the need for an external amplifier, and the audio output can directly drive a 250mW/8ohm speaker with a maximum barrier-free transmission distance of around 300m.

The E200-2G4A20S adopts a frequency hopping mechanism, which can automatically switch among 3 channels, and can effectively avoid being interfered by neighboring signals such as Wi-Fi or Bluetooth. In addition, the module also adopts a low power consumption design, usually the standby current is only 12uA, which greatly extends the service life of battery-powered devices.

## 1.2 Features

- Supports one-to-one audio transfer;
- Supports AT commands;
- Communication distance up to 300m under ideal conditions;
- Controls the working channel through the channel pin by default, and can also control the working channel using software commands after setup, which is easy to use;
- Can switch master-slave mode in real time, more flexible;
- Supports 2.2~3.6V power supply, and any power supply greater than 3.3V can ensure the best performance;
- Low power consumption design, standby current is only 12uA;
- Industrial-grade standard design, support -40 ~ +85 ℃ under long time use;
- Dual antennas are optional (IPEX/stamp hole), which is convenient for users' secondary development and facilitates integration.

## 1.3 Application Scenarios

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

- Security alarm systems

# 2. Specification

## 2.1 RF parameters

| RF parameters | Parameter value | Note |
|---|---|---|
| Frequency band | 2405~2478MHz | Supports ISM bands |
| Transmit power | 12dBm～20dBm | Software adjustable |
| Receiving Sensitivity | -88dBm | Air Rate 2Mbps |
| Modulation mode | GFSK | Modulation technology |
| Blocking Power | 15dBm | Less probability of burn-in in close proximity |
| Audio Sample Rate | 8KHz | 12-bit ADC inside the chip |
| Reference Distance | 300m | Clear and open, antenna gain 5dBi, antenna height 2.5 meters, air rate 500kbps |

## 2.2 Electrical parameters

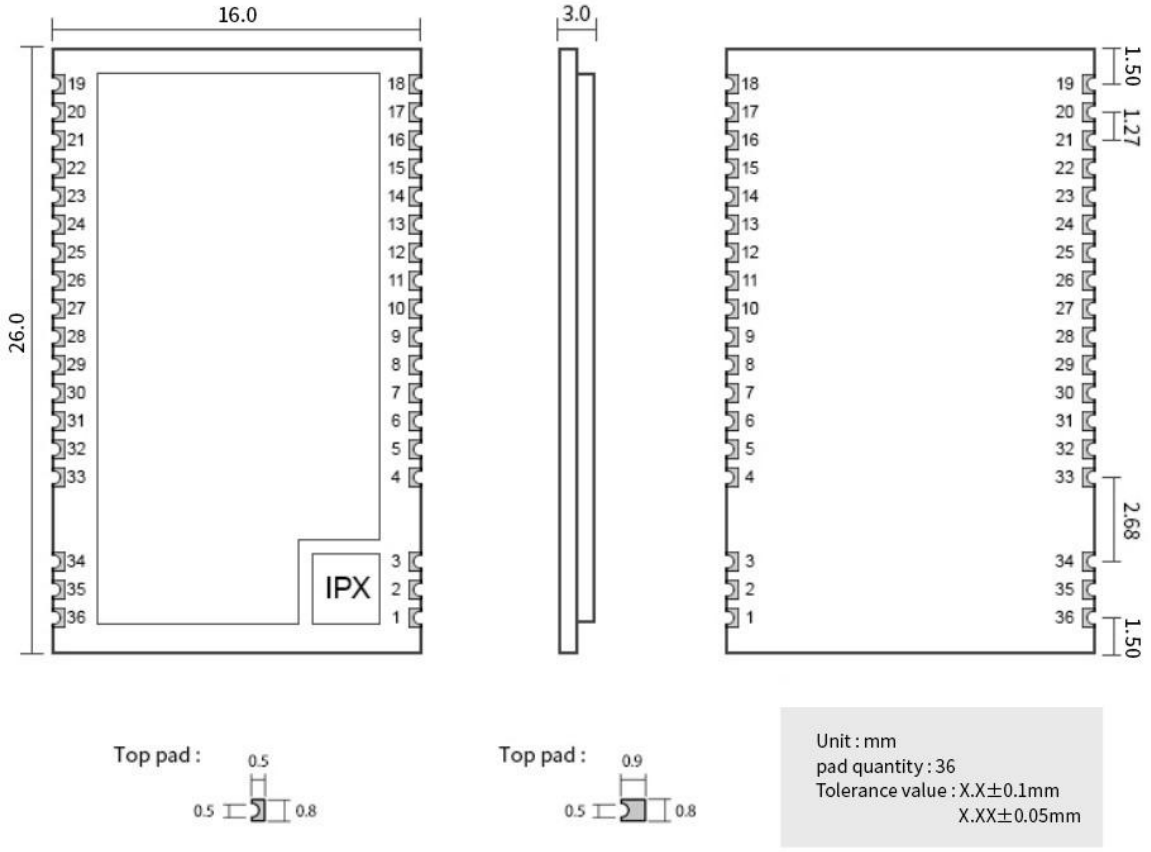
| Main parameters | | Performances | | | Note |
|---|---|---|---|---|---|
| | | Min | typical value | Max | |
| Operating Voltage (V) | | 2.2 | 3.3 | 3.6 | ≥3.3V guarantees output power, over 3.6V permanently burns module |
| I/O Voltage | | -0.3 | - | 3.6 | Over 3.6V may permanently damage module I/Os |
| Communication level (V) | | -0.3 | 3.3 | 3.6 | Risk of burn-in using 5V levels |
| Operating temperature (℃) | | -40 | - | +85 | Industrial grade design |
| power wastage | Transmit Current (mA) | 180 | 190 | Instantaneous power consumption, average current at transmit: 80mA | Instantaneous power consumption, average current at transmit: 80mA |
| | Receive Current (mA) | - | 1 | Receive Mode, Average Power Consumption in Single Cycle | Receive Mode, Average Power Consumption in Single Cycle |
| | Sleep current (uA) | - | 12 | Receive Mode, Average Power Consumption at Sleep | Receive Mode, Average Power Consumption at Sleep |

## 2.3 Hardware parameters

| Hardware parameters | Parameter value | Note |
|---|---|---|

| | | |
|---|---|---|
| Packaging method | SMD | - |
| Interface | Stamp Hole | Pitch 1.27mm |
| Communication Interface | UART Serial Port | TTL Level |
| Overall Dimension | 16*26 mm | - |
| Net Weight | 2.2g | ±0.1g |
| RF Interface | IPEX/Stamp Hole | Equivalent impedance approx. 50Ω |

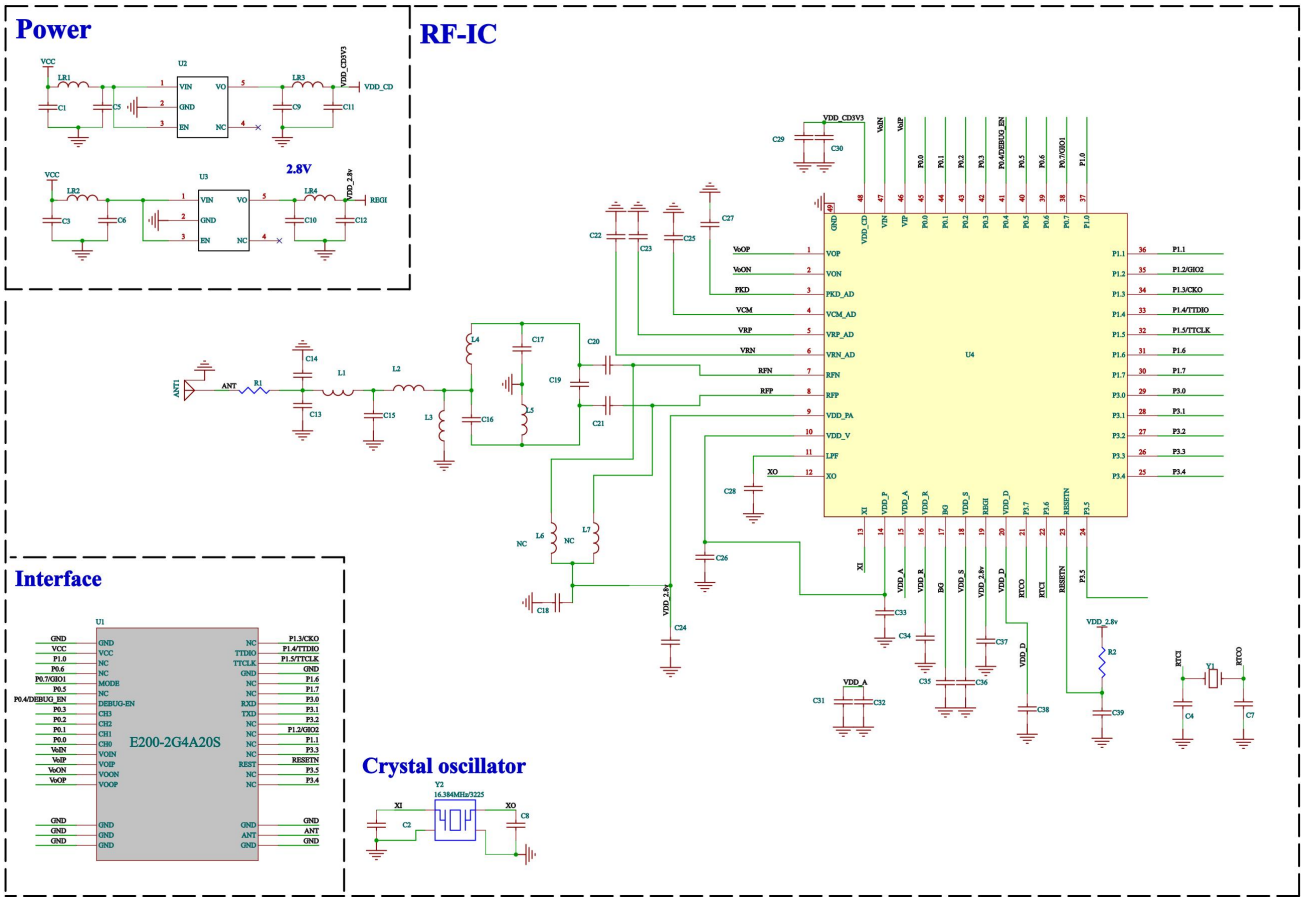
# 3. Mechanical Dimensions and Pin Definitions




| No | Name | Pin orientation | Pin Usage |
|---|---|---|---|
| 2 | ANT | - | Antenna Interface |
| 6 | REST | Inputs | Module reset pin, active low; |
| 11 | TXD | Outputs | TTL serial port output; |
| 12 | RXD | Inputs | TTL serial port input; |
| 16 | TTCLK | - | Debug clock pins without dangling processing; |
| 17 | TTDIO | - | Debug data pins without dangling processing; |
| 20 | VCC | POWER SUPPLY | Positive reference for module power supply, voltage range: 2.2 to 3.6V DC, 3.3V recommended; |

| | | | |
|---|---|---|---|
| 22 | WAKE_UP | Inputs | Wake-up pin, used for AT command configuration parameters, low level wake-up; |
| 23 | MODE | Input | Transmit/receive mode control pin of the module, low level transmit mode, high level receive mode, cannot be suspended; |
| 25 | Debug_en | -Inputs | Debugging control pin, for low level module into the program burning mode, do not use the suspension processing; |
| 26 | CH3 | Input | Channel selection 3, and CH0,CH1,CH2 combination of 16 channels can work, see the channel table; |
| 27 | CH2 | Input | Channel selection 2, combining with CH0,CH1,CH3 to select the 16 channels that can work, see the channel table for details; |
| 28 | CH1 | Input | Channel selection 1, combining with CH0,CH2,CH3 to select the 16 channels that can work, see the channel table for details; |
| 29 | CH0 | Input | Channel selection 0, with CH1,CH2,CH3 combination to select the 16 channels that can work, see the channel table for details; |
| 30 | VOIN | Input | Audio input negative, see recommended circuitry for hardware design details; |
| 31 | VOIP | Input | Audio input positive, see recommended circuits for hardware design details; |
| 32 | VOON | Outputs | Negative audio output, see recommended circuitry for hardware design; |
| 33 | VOOP | Outputs | Audio output positive, see recommended circuits for hardware design details; |
| 1、3、15、19、34、35、36 | GND | POWER SUPPLY | Module ground |
| 4、5、7、8、9、10、13、14、18、21、24 | NC | - | Retained unused, suspended for disposal; |

# 4. Recommended Connectivity Charts




# 5. Channel code value table

The E200-2G4A20S switches channels through different combinations of high and low levels on the four pins CH0~CH3, with the low level indicated by "0" and the high level indicated by "1", and the frequency correspondence table is shown below:

| CH3 | CH2 | CH1 | CH0 | channel | 频率（MHZ） | 备注 |
|---|---|---|---|---|---|---|
| 0 | 0 | 0 | 0 | channel0 | 2405、2430、2455 | - |
| 0 | 0 | 0 | 1 | channel1 | 2407、2432、2457 | - |
| 0 | 0 | 1 | 0 | channel2 | 2409、2434、2459 | - |
| 0 | 0 | 1 | 1 | channel3 | 2411、2436、2461 | - |
| 0 | 1 | 0 | 0 | channel4 | 2413、2438、2463 | - |
| 0 | 1 | 0 | 1 | channel5 | 2415、2440、2465 | - |
| 0 | 1 | 1 | 0 | channel6 | 2417、2442、2467 | - |
| 0 | 1 | 1 | 1 | channel7 | 2419、2444、2469 | - |
| 1 | 0 | 0 | 0 | channel8 | 2421、2446、2471 | - |
| 1 | 0 | 0 | 1 | channel9 | 2423、2448、2473 | - |
| 1 | 0 | 1 | 0 | channel10 | 2425、2450、2475 | - |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 | 0 | 1 | 1 | channel11 | 2427、2452、2477 | - |
| 1 | 1 | 0 | 0 | channel12 | 2427、2452、2477 | Same channel11 |
| 1 | 1 | 0 | 1 | channel13 | 2427、2452、2477 | Same channel11 |
| 1 | 1 | 1 | 0 | channel14 | 2427、2452、2477 | Same channel11 |
| 1 | 1 | 1 | 1 | channel15 | 2427、2452、2477 | Same channel11 |

Note: Switching the sending mode takes effect after switching the channel.

# 6. Operating mode

The module has two modes of operation, set by pin Mode; details are shown in the table below:

| Mode (send/receive) | Mode | Introduction to the model | Note |
|---|---|---|---|
| Send Mode | 0 | The module is in the transmitting state and sends out the signals input through the audio input connector wirelessly; | Real-time switching of send/receive functions |
| Receive Mode | 1 | The module is in the receiving state and will output the signal received wirelessly through the audio output interface; | Real-time switching of send/receive functions |

# 7. Command and factory parameters

## 7.1 Command format

The module supports parameter reading and writing, and can be read through the serial port in receive mode (when reading, only 9600, 8N1 format is supported):

| Setup command | description |
|---|---|
| AT+MIC=<mic> | Setting the Microphone Gain Level |
| AT+POWER=<pwr> | Setting the Transmit Power Level |
| AT+CHANNEL=<channel> | Setting the software channel |
| AT+ENCHANNEL=<en_channel> | Enable software channel function |
| AT+DEFAULT | Restore Default Settings |

| Read comman | description |
|---|---|
| AT+DEVTYPE=? | Read device model number |
| AT+FWCODE=? | Read firmware code |
| AT+MIC=? | Read the microphone gain size |
| AT+POWER=? | Read Transmit Power |
| AT+CHANNEL=? | Read software channel |
| AT+ENCHANNEL=? | Reads whether the software control channel function is enabled or not |

## 7.2 Command format

| Parameters | Range of values | Meaning of a parameter |
|---|---|---|
| <mic> | [0~31] | Microphone gain, the higher the value the higher |

| | | |
|---|---|---|
| | | the gain |
| <pwr> | [0~3] | Transmit power<br>[0:12dBm 1:15dBm 2:17dBm 3:20dBm] |
| <channel> | [0~15] | Software channel, need to enable software control channel function first. |
| <en_channel> | [0~1] | Whether to enable the software control channel function or not |

## 7.3 Factory Default Parameters

| Model | Air Speed | Baud | Serial Port Format | transmission power | Microphone Gain | software-controlled channel | software channel |
|---|---|---|---|---|---|---|---|
| E200-2G4A20S | 500kbps | 9600bps | 8N1 | 20dbm | 16 | 关 | Channel0 |

## 7.4 Cautionary note

- A connection needs to be established between the 200-2G4A20S to start communication, and when the communication ends, it will re-enter the low-power mode after 5 seconds;
- E200-2G4A20S adopts WOR low power wake-up technology with a wake-up period of 600ms;
- E200-2G4A20S communication process has ACK answer, so one-to-many usage scenario cannot be realized;
- Wake pin is low will always wake up the module, at this time you can use the AT instruction to configure (recommended);
- Serial port pin received data can also wake up the module, you need to send a packet of arbitrary data to wake up the module after a delay of 30ms and then send the AT instruction (not recommended);
- AT instruction will automatically save to Flash after setting parameters, no need to configure again.

# 8. Hardware Design

- It is recommended to use a DC regulated power supply to power this module, 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 terminals 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 voltages, if it exceeds the maximum value it may cause permanent damage to the module;
- please check the power supply stability, the voltage should not fluctuate significantly and frequently;
- In the design of power supply circuit for the module, it is often recommended to retain more than 30% of the margin, there is the whole machine is conducive to long-term stable work;
- module should be as far away as possible from the power supply, transformers, high-frequency alignments and

other electromagnetic interference in the larger part;

- high-frequency digital alignment, high-frequency analog alignment, power supply alignment must be avoided below the module, if you really need to go through the module below, assuming that the module is welded in the Top Layer, the Top Layer in the contact part of the module to lay the ground copper (all paved with copper and a good ground), it must be close to the digital part of the module and alignment in the Bottom Layer;
- Assuming that the module is soldered or placed in the Top Layer, it is also wrong to randomly route the module in the Bottom Layer or any other layer, which will affect the spuriousness of the module as well as the reception sensitivity to varying degrees;
- Assuming that there is a large electromagnetic interference around the module device will also greatly affect the performance of the module, according to the intensity of the interference is recommended to stay away from the module, if the situation permits you can do appropriate isolation and shielding;
- assume that there is a large electromagnetic interference around the module alignment (high-frequency digital, high-frequency analog, power supply alignment) will also greatly affect the performance of the module, according to the intensity of the interference is recommended to be appropriate away from the module, if the situation permits you can do appropriate isolation and shielding;
- communication line if you use 5V level, must be connected in series with 1k-5.1k resistor (not recommended, there is still a risk of damage);
- antenna mounting structure has a large impact on the module performance, be sure to ensure that the antenna is exposed and preferably vertically upward;
- When the module is mounted inside the chassis, a good quality antenna extension cable can be used to extend the antenna to the outside of the chassis;
- The antenna must not be installed inside the metal shell, which will lead to a great weakening of the transmission distance.

# 9. Common problems

## 9.1 Undesirable transmission distance

- When there are linear communication barriers, the communication distance will decay accordingly;
- temperature, humidity, and co-channel interference, which will lead to higher communication packet loss rate;
- The ground absorbs and reflects radio waves, and the test results are poorer near the ground;
- seawater has a strong ability to absorb radio waves, so the effect of the seaside test is poor;
- metal objects near the antenna, or placed in a metal shell, the signal attenuation will be very serious;
- wrong power register setting, air rate setting is too high (the higher the air rate, the closer the distance);
- The low voltage of power supply at room temperature is lower than the recommended value, the lower the voltage, the lower the hair power;
- Poor matching between the antenna and the module or the quality of the antenna itself.

## 9.2 Modules are fragile

- Please check the power supply to ensure that it is between the recommended supply voltages, if it exceeds the maximum value it will cause permanent damage to the module;
- please check the power supply stability, the voltage can not be substantial frequent fluctuations;
- please ensure that the installation and use process anti-static operation, high-frequency device electrostatic sensitivity;
- Please ensure that the installation and use of the process of humidity should not be too high, part of the components for humidity-sensitive devices;
- If there is no special demand is not recommended to be used at too high or too low a temperature.

## 9.3 The sound quality is terrible.

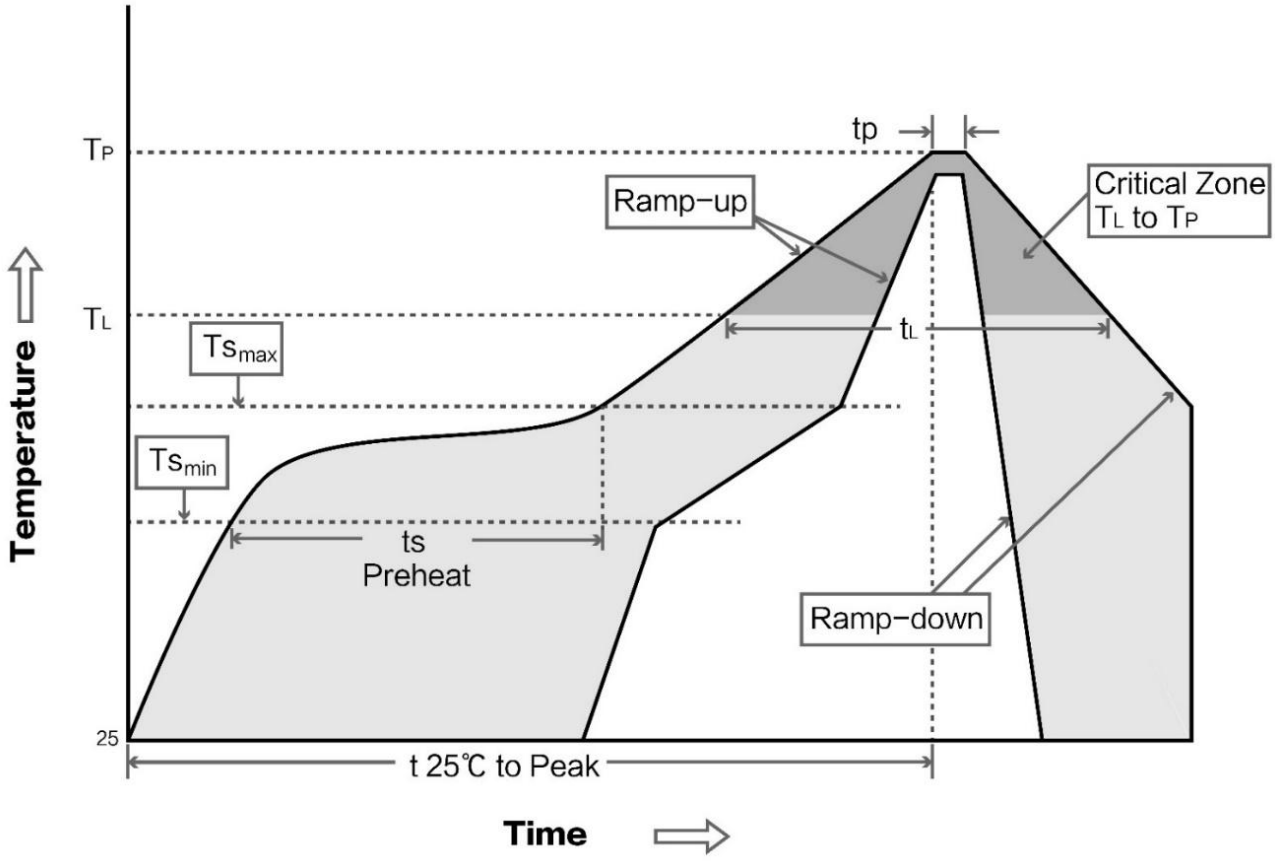
- power supply ripple is too large, be sure to reduce the power supply ripple increase decoupling capacitors, increase EMC filter circuit;
- audio input alignment is not reasonable, the need for differential design and as close as possible to the module pins;
- near the same frequency signal interference may exist, modify the module channel to use.

# 10. Welding instructions

## 10.1 Reflow temperature

| Profile Feature | curvilinear feature | Sn-Pb Assembly | Pb-Free Assembly |
|---|---|---|---|
| Solder Paste | Solder Paste | Sn63/Pb37 | Sn96.5/Ag3/Cu0.5 |
| Preheat Temperature min （Tsmin） | Minimum Preheat Temperature | 100℃ | 150℃ |
| Preheat temperature max (Tsmax) | Maximum Preheat Temperature | 150℃ | 200℃ |
| Preheat Time (Tsmin to Tsmax)(ts) | Preheat Time | 60-120 sec | 60-120 sec |
| Average ramp-up rate(Tsmax to Tp) | Average Rise Rate | 3℃/second max | 3℃/second max |
| Liquidous Temperature (TL) | Liquid phase temperature | 183℃ | 217℃ |
| Time（tL）Maintained Above（TL） | Time above liquid phase line | 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 descent | 6℃/second max | 6℃/second max |
| Time 25℃ to peak temperature | Time from 25℃ to peak temperature | 6 minutes max | 8 minutes max |

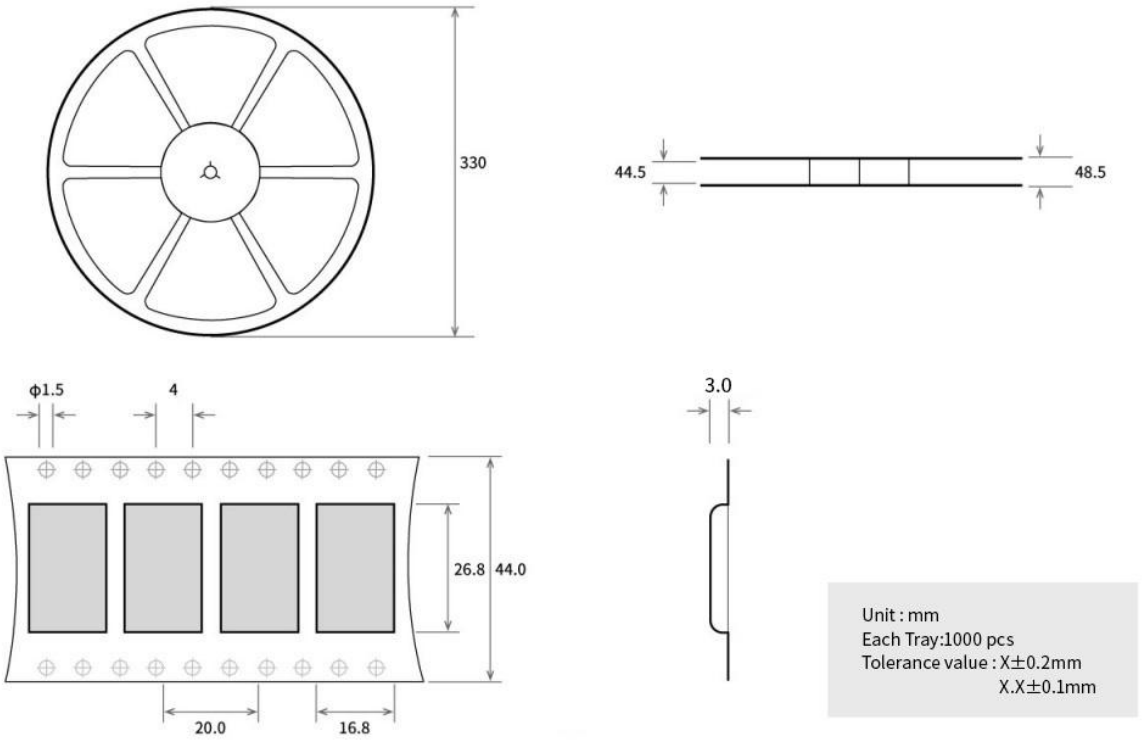
## 10.2 Reflow Profile




# 11. Related Models

| Model | carrier frequency Hz | firing power dBm | Test Distance km | Package form | Product Size mm | communications interface |
|---|---|---|---|---|---|---|
| E200-470A17S | 470.033M-512.273M | 17.5 | 0.3 | 贴片 | 16*26 | Analog/TTL |

# 12. Batch packing method




# Revision history

| Version | revision date | revised description | maintainer |
|---|---|---|---|
| 1.0 | 2024-03-22 | initial version | Bin |
| | | | |
| | | | |

# About us

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