# EWM104-BT60SP2&SP3 User Manual

## AT Command Bluetooth Audio + Serial Data Transmission Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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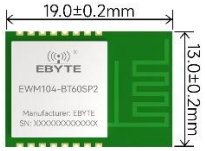

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# 1 Introduction

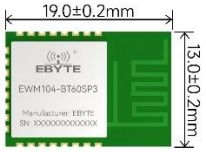
## 1.1 Brief Introduction

EWM104-BT60SP2/EWM104-BT60SP3 are new China produced, low-cost dual-mode Bluetooth slave modules for audio and data transmission launched by Chengdu EBYTE. Utilizing a domestic SOC integrated chip and adhering to Bluetooth 5.2 protocol specifications, they meet customers' low-cost Bluetooth audio requirements.

The EWM104-BT60SP2/EWM104-BT60SP3 supports the Bluetooth protocol stack including audio, voice, and SPP profiles. It provides a UART serial port, supports BLE/BR and EDR, and supports AT commands. Users can flexibly modify parameters such as serial port baud rate and device name as needed. The module can be customized for specific development requirements.




EWM104-BT60SP2




EWM104-BT60SP3

## 1.2 Features

- Bluetooth 5.2 protocol;
- Supports BLE and BR/EDR;
- Supports simultaneous Bluetooth audio playback and BLE data transmission;
- Maximum single-packet data transmission size of 63 bytes under BLE;
- Supports true Bluetooth wireless stereo;
- Supports AAC and SBC audio codecs;
- Supported Bluetooth profiles: A2DP, AVRCP, HFP, GATT, and SPP;
- Provides UART serial port with AT command support;
- Supports audio button control and microphone input;
- Connection range: 200m; communication range: up to 300m (in clear, open environments at maximum transmit power);
- EWM104-BT60SP2/EWM104-BT60SP3 module dimensions: 13×19mm;

## 1.3 Application

- Smart speakers
- Smart toys
- Massage chairs
- Smart home devices, etc.

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# 2 Operating Parameters

## 2.1 Specifications

| Parameter Name | EWM104-BT60SP2 | EWM104-BT60SP3 | Note |
|---|---|---|---|
| Operating Frequency Band | 2.4GHz | | - |
| Communication Interface | UART Serial port | | Supports AT commands |
| Serial Port Configuration | 115200bps 8N1 | | - |
| Transmit Power | 8dBm @MAX | | Support Configuration |
| Receive Sensitivity | -95dBm | | - |
| Connection Range | 200m | | - |
| Transmission Range | 300m | | - |
| Operating Voltage (V) | 3.0~4.3 | | Typical value: 3.3V. Risk of burnout if exceeded. |
| Operating Temperature (°C) | -40~+85 | | Industrial-grade design |
| Operating Humidity (%) | 10~90 | | Clear, open environment at maximum transmit power |
| Dimensions | 13 * 19 mm | | Clear, open environment at maximum transmit power |
| Antenna Interface | Postage Stamp Hole/PCB Antenna | | Pinhole requires jumper resistor modification/equivalent impedance approx. 50Ω |
| Package Type | Surface Mount | | - |
| Interface Type | Postage Stamp Hole | | Pitch: 1.27mm |

| Average power consumption | EWM104-BT60SP2 | EWM104-BT60SP3 |
|---|---|---|
| Standby | 1.8 | 1.8 |
| BLE Connection (mA) | 1.5 | 1.6 |
| SPP Connection (mA) | 2.6 | 2.5 |
| BR/EDR Connection (mA) | 2.6 | 2.5 |
| BR/EDR Music Playback (mA) | 4.1 | 4.3 |
| BLE Data Pass-Through (mA) | 1.5 | 1.8 |
| SPP Data Pass-Through (mA) | 2.8 | 2.8 |
| BLE Data Pass-Through + BR/EDR Music Playback (mA) | 4.1 | 4.4 |

Note: ① The EWM104-BT60SP2 adopts a 16-pin package, does not provide a button GPIO, and does not support OTA updates.

②The EWM104-BT60SP3 adopts a 24-pin package, provides a button GPIO, and supports OTA updates.

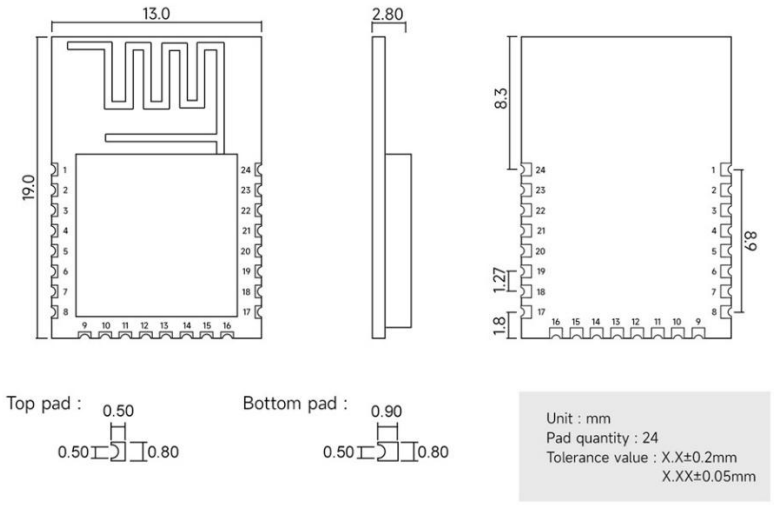
③When playing music, data can be transmitted simultaneously via BLE connection. If using SPP for data transmission, disconnect the music connection first.

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# 3 Mechanical Dimensions and Pin Definitions

## 3.1 EWM104-BT60SP3 Mechanical Dimensions and Pin Definitions



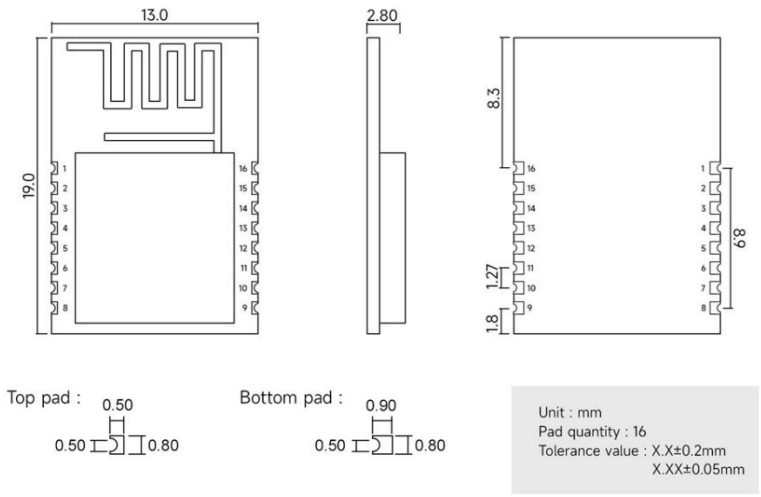

| No | Name | Pin Function |
|---|---|---|
| 1 | AUDL_R | Audio Left Channel Positive Output |
| 2 | AUDL_N | Audio Left Channel Negative Output |
| 3 | GND | Ground |
| 4 | AUDR_N | Audio Right Channel Negative Output |
| 5 | AUDR_P | Audio Right Channel Positive Output |
| 6 | K1 | Button GPIO: Active low. Single click: Play/Pause. Double click: Reject call. Long press: Disconnect Bluetooth. |
| 7 | MICBAIS | Microphone bias input. Leave floating when not in use. |
| 8 | MIC_P | Microphone channel positive input. Leave floating when not in use. |
| 9 | MIC_N | Microphone channel negative input. Leave floating when not in use. |
| 10 | GND | Ground |
| 11 | K2 | Button GPIO2: Active low. Single click decreases volume; double click skips to previous track. |
| 12 | GND | Ground |
| 13 | MUTE | Power amplifier control pin. Outputs low level. |
| 14 | NC | Reserved pin. User does not need to concern themselves with this pin. Leave floating when not in use. |
| 15 | NC | Reserved pin. User does not need to concern themselves with this pin. Leave floating when not in use. |
| 16 | K3 | Button GPIO3: Active low. Single click increases volume; double click skips to next track. |
| 17 | VBAT | Power Input Pin (Must be connected during operation, 3.0~4.3V) |
| 18 | VUSB | USB Charging Input (5V) |
| 19 | LED_A | Audio connection status pin, active high |

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| | | |
|---|---|---|
| 20 | LED_L | BLE connection status pin, active high |
| 21 | RXD | Serial data RX input |
| 22 | TXD | Serial data TX output |
| 23 | GND | Ground |
| 24 | ANT | Stamp pad antenna (requires internal jumper resistor adjustment when in use) |

## 3.2 EWM104-BT60SP2 Mechanical Dimensions and Pin Definitions




| No | Name | Pin Function |
|---|---|---|
| 1 | AUDL_R | Audio Left Channel Positive Output |
| 2 | AUDL_N | Audio Left Channel Negative Output |
| 3 | GND | Ground |
| 4 | AUDR_N | Audio Right Channel Negative Output |
| 5 | AUDR_P | Audio Right Channel Positive Output |
| 6 | NC | Reserved pin; users need not concern themselves with this. Leave floating when not in use. |
| 7 | MICBAIS | Microphone Bias Input; leave floating when not in use. |
| 8 | MIC_P | Microphone Channel Positive Input; leave floating when not in use. |
| 9 | VBAT | Power Input Pin (Must be connected during power supply operation; 3.0–4.3V) |
| 10 | VUSB | USB Charging Input (5V) |
| 11 | LED_A | Audio Connection Status Pin, Active High |
| 12 | LED_L | BLE Connection Status Pin, Active High |
| 13 | RXD | Serial Data RX Input |
| 14 | TXD | Serial Data TX Output |
| 15 | GND | Ground |
| 16 | ANT | Stamp Pad Antenna (Internal jumper resistor adjustment required when in use) |

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# 4 Quick Command Test

## 4.1 Audio Usage

After powering on the module, you can scan for Bluetooth devices using your phone. Search for the E104-BT60_BR/EDR broadcast and connect to it. Audio playback can then begin immediately.

## 4.2 SPP Usage

After powering on the module, use the SPP debugging software on your phone to scan and connect to the E104-BT60_BR/EDR broadcast. The module will then enter configuration mode upon receiving the input “+++”. In configuration mode, send the command AT+TRANSMODE=2 to set it to SPP transmission mode. Finally, send AT+EXIT to exit configuration mode, enabling transparent data transmission.

## 4.3 BLE Usage

After powering on the module, use a mobile BLE debugging app to scan and connect to the E104-BT60_BLE broadcast. Once connected, open the FFF1 notification channel to enable transparent data transmission from the module to the mobile device. Data can be transmitted from the mobile device to the module via the FFF2 channel and ultimately printed through the serial port.

# 5 Instructions and Factory Settings

## 5.1 Command Format

The module supports parameter reading and writing. The default baud rate for the module's serial port is 115200 bps, 8N1 format.

| Command Format | Description | Example |
|---|---|---|
| AT+XXX | Run Command | AT+RESET |
| AT+XXX=? | Query Command | AT+TRANSMODE=? |
| AT+XXX=YYYY | Set Command | AT+TRANSMODE=1 |

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## 5.2 Return Value Description

| AT Command Return Value | Explanation |
|---|---|
| AT_OK | Correct |
| +ERROR：Error code | +ERROR：Error code |

| Error code | Error Description |
|---|---|
| -1 | Length error |
| -2 | Hyperparameter range |
| -3 | No parameters |
| -4 | Not supported |
| -5 | Flash write error |
| -6 | Format error |

## 5.3 AT Command List

| Command Type | Instruction | Description |
|---|---|---|
| Basic Commands | AT | AT Test Commands |
| | AT+RESTORE | Restore Factory Settings |
| | +++ | Enter AT Mode |
| | AT+TRANSMODE | Data Pass-Through Channel Commands |
| | AT+VER | Read Version Number |
| | AT+RESET | Reboot |
| | AT+EXIT | Exit AT Mode |
| | AT+BAUD | Baud Rate Commands |
| | AT+POWER | Transmit Power Commands |
| BT command | AT+NAME | BR/EDR Name Commands |
| | AT+MAC | BR/EDR MAC Commands |
| | AT+BLE_NAME | BLE Name Commands |
| | AT+BLE_MAC | BLE MAC Commands |
| | AT+BLEDISCON | Disconnect BLE Connection |
| | AT+BTDISCON | Disconnect BR/EDR Connection |
| | AT+PLAYPAUSE | Play/Pause Commands |
| | AT+NEXT | Next Track Commands |
| | AT+PREV | Previous Track Commands |
| | AT+VOLP | Volume Up |
| | AT+VOLM | Volume Down |

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## 5.4 AT Command Reference

### 5.4.1 AT Test Command

| Command | Response | Instruction |
|---|---|---|
| AT | +OK\r\n | **Test Command**<br>**Send: AT**<br>**Return: +OK\r\n** |

### 5.4.2 AT+RESTORE Command

| Command | Response | Instruction |
|---|---|---|
| AT+RESTORE | +OK\r\n | **Restore Factory Settings**<br>**Send: AT+RESTORE**<br>**Return: +OK\r\n** |

### 5.4.3 Enter AT commands

| Command | Response | Instruction |
|---|---|---|
| +++ | AT_MODE | **Enter AT Mode**<br>**Send: +++**<br>**Return: AT_MODE** |

### 5.4.4 AT+TRANSMODE command

| Command | Response | Instruction |
|---|---|---|
| AT+TRANSMODE | TRANSMODE:BLE\r\n | **Query/Set Data Pass-Through Channel**<br>**Send: AT+TRANSMODE=<CMD>\r\n**<br>**Return: TRANSMODE: <CMD>\r\n**<br>**<Cmd> Parameter Description**<br>**?: Read**<br>**BLE: BLE channel**<br>**SPP: SPP channel** |

### 5.4.5 AT+VER command

| Command | Response | Instruction |
|---|---|---|
| AT+VER | VER:xxxx-x-xx\r\n | **Read version number**<br>**Send: AT+VER** |

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| | | |
|---|---|---|
| | | **Return: VER:xxxx-x-xx\r\n Read version number Send: AT+VER Return: VER:xxxx-x-xx\r\n** |

### 5.4.6 AT+RESET command

| Command | Response | Instruction |
|---|---|---|
| AT+RESET | +OK\r\n | **Reset Module**<br>**Send: AT+RESET**<br>**Return: +OK\r\n AT+RESET** |

### 5.4.7 AT+EXIT command

| Command | Response | Instruction |
|---|---|---|
| AT+EXIT | +OK\r\n | **Exit AT Mode**<br>**Send: AT+EXIT**<br>**Return: +OK\r\n** |

### 5.4.8 AT+BAUD command

| Command | Response | Instruction |
|---|---|---|
| AT+BAUD=<cmd> | BOND:<cmd>\r\n | **Query/Set Baud Rate**<br>**<Cmd> Parameter Description**<br>**?: Read**<br>0:4800<br>1:9600<br>2:19200<br>3:38400<br>4:57600<br>5:115200 (Default)<br>6:230400<br>7:460800<br>8:921600<br>9:2000000 |

### 5.4.9 AT+POWER command

| Command | Response | Instruction |
|---|---|---|
| AT+POWER=<cmd> | POWER:<cmd>\r\n | **Query/Set Transmission Power**<br>**cmd Parameter Description**<br>**?: Read**<br>0: 8dBm |

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| | | |
|---|---|---|
| | | 1: 3dBm<br>2: 0dBm<br>3: -4dBm |

### 5.4.10 AT+NAME command

| Command | Response | Instruction |
|---|---|---|
| AT+NAME=<cmd> | BR/EDR_NAME:<cmd>\r\n | **Query/Set BR/EDR Name**<br>**CMD Parameter Description**<br>**?: Read**<br>**String within 1-25 bytes**<br>**Example: AT+NAME=E104-BT60_BR/EDR** |

### 5.4.11 AT+MAC command

| Command | Response | Instruction |
|---|---|---|
| AT+MAC=? | MAC:xxxxxxxxxxxx\r\n | **MAC Read Command** |

### 5.4.12 AT+BLE_NAME command

| Command | Response | Instruction |
|---|---|---|
| AT+BLE_NAME=<cmd> | BLE_NAME:<cmd>\r\n | **Query/Set BLE Name**<br>**CMD Parameter Description**<br>**?: Read**<br>**String within 1-25 bytes**<br>**Example: AT+BLE_NAME=E104-BT60_BLE** |

### 5.4.13 AT+BLE_MAC command

| Command | Response | Instruction |
|---|---|---|
| AT+BLE_MAC=<cmd> | BLE_MAC=<cmd>\r\n | **Query/Set BLE_MAC**<br>**CMD Parameter Description**<br>**?: Read**<br>**String within 12 bytes**<br>**Example: AT+BLE_MAC=112233445566** |

### 5.4.14 AT+BLEDISCON command

| Command | Response | Instruction |
|---|---|---|
| AT+BLEDISCON | +OK\r\n | Disconnect BLE connection |

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| | | |
|---|---|---|
| | | Send: AT+BLEDISCON<br>Return: +OK\r\n |

### 5.4.15 AT+BTDISCON command

| Command | Response | Instruction |
|---|---|---|
| AT+BTDISCON | +OK\r\n | **Disconnect Bluetooth connection**<br>**Send: AT+BTDISCON**<br>**Return: +OK\r\n** |

### 5.4.16 AT+PLAYPAUSE Command

| Command | Response | Instruction |
|---|---|---|
| AT+PLAYPAUSE | +OK\r\n | **Pause/Play**<br>**Send: AT+PLAYPAUSE**<br>**Return: +OK\r\n** |

### 5.4.17 AT+NEXT command

| Command | Response | Instruction |
|---|---|---|
| AT+NEXT | +OK\r\n | **Next Track**<br>**Send: AT+NEXT**<br>**Return: +OK\r\n** |

### 5.4.18 AT+PREV command

| Command | Response | Instruction |
|---|---|---|
| AT+PREV | +OK\r\n | **Previous Track**<br>**Send: AT+PREV**<br>**Return: +OK\r\n** |

### 5.4.19 AT+VOLP command

| Command | Response | Instruction |
|---|---|---|
| AT+VOLP | +OK\r\n | **Volume Up**<br>**Send: AT+VOLP**<br>**Return: +OK\r\n** |

### 5.4.20 AT+VOLM command

| Command | Response | Instruction |
|---|---|---|

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| | | |
|---|---|---|
| AT+VOLM | +OK\r\n | **Volume Down**<br>**Send: AT+VOLM**<br>**Return: +OK\r\n** |

# 6 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);
- Try to stay away from some TTL protocols where the physical layer is also 2.4GHz, e.g. USB3.0;
- The antenna mounting structure has a big impact on the module performance, make sure the antenna is exposed and preferably vertically upward;
- When the module is installed inside the chassis, use a good quality antenna extension cable 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.

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# 7 Common problems

## 7.1 Power-on module shows no response

- Communication distance will decrease when there are direct line-of-sight obstructions;
- Temperature, humidity, and co-channel interference can increase packet loss rates;
- Ground absorption and reflection of radio waves result in poor testing performance near the ground;
- Seawater strongly absorbs radio waves, leading to poor testing results near the coast;
- Metal objects near the antenna or housing it in a metal enclosure cause severe signal attenuation;
- Incorrect power register settings or excessively high air interface rate (higher rates reduce communication distance);
- Power supply voltage below recommended levels at room temperature reduces transmit power;
- Using antennas poorly matched to the module or of inferior quality.

## 7.2 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.

## 7.3 Short transmission distance/becoming shorter

- Module transmission performance degradation (low transmit power, reduced receive sensitivity), module damage, return for factory repair;
- Antenna loosening, corrosion, or damage, tighten antenna connections, replace antenna;
- New interference sources, prioritize channel change, adjust/upgrade antenna;

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# 8 Welding instructions

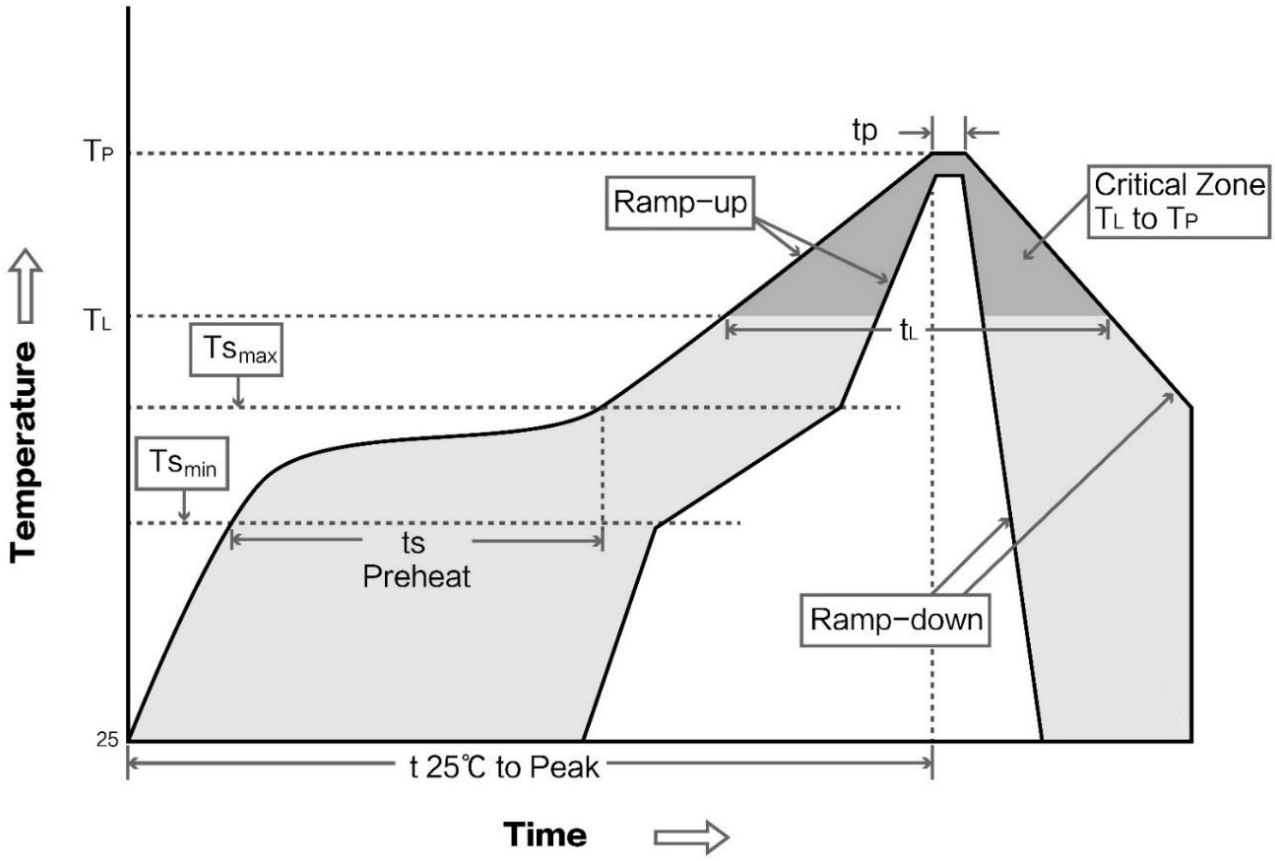
## 8.1 Reflow temperature

| 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） | 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 |

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## 8.2 Reflow temperature




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# Revision history

| Version | Date | Description | Issued by |
|---|---|---|---|
| 1.0 | 2025-9-22 | Initial version | Lei |
| 1.1 | 2025-11-12 | Update the mechanical dimension drawing | Lei |
| 1.2 | 2026-06-03 | Modify pad dimensions | Lei |

# About us

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