EWM104-BT61SX/SP Product Specification Sheet

Bluetooth audio broadcast transceiver module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1.Overview

1.1 Product Introduction

The EWM104-BT61SX/SP module is a dual-mode Bluetooth module based on Bluetooth 5.4, supporting LE Audio and classic Bluetooth, Bluetooth stereo, and a maximum transmit power of 8dBm.

The EWM104-BT61SX/SP module supports AT command configuration parameters, one-to-many broadcasting, USB sound card input, Bluetooth wireless input , and dual-channel analog signal input. It also supports dual-channel analog signal output and Bluetooth wireless broadcast output, offering simple and quick operation. The module is available in IPEX and PCB antenna versions, allowing users to choose the appropriate model based on their needs.



EWM104-BT61SX



EWM104-BT61SP

1.2 Features and Functions

- Bluetooth audio transceiver module;
- Supports LE Audio;
- It uses a 160MHz 32-bit dual-core DSP ;
- Supports Bluetooth 5.4 protocol ;
- It operates in the global unlicensed ISM 2.4 GHz band;
- Maximum transmit power 8dBm;
- Supports SBC/AAC decoding;
- sampling rates of 8kHz / 11.025kHz / 16kHz / 22.05kHz / 24kHz / 32kHz / 44.1kHz / 48kHz .
- The DAC supports sampling rates of 8kHz / 11.025kHz / 16kHz / 22.05kHz / 24kHz / 32kHz / 44.1kHz / 48kHz / 64kHz / 88.2kHz / 96kHz ;
- Supports Bluetooth audio broadcasting;
- It supports three audio input methods, including Bluetooth wireless input, USB differential signal input, and IN_L/IN_R analog signal input ;
- It supports two audio output modes: OUT_L/OUT_R analog signal output and Bluetooth broadcast channel output;
- The module provides playback control button pins;
- The module supports AT command configuration ;
- EWM104-BT61SX features a reserved IPEX-1 antenna mount, stamp hole package, and 14×16.8 mm dimensions.
- The EWM104-BT61SP comes with a built-in PCB antenna, uses a stamp hole package, and measures 14*22mm.
- The communication range can reach over 160 meters (8dBm, antenna height 1.5m, in clear and open conditions).

1.3 Application scenarios

- Bluetooth stereo speaker
- Bluetooth audio receiver
- Audio broadcast transmitter
- Audio receiver

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2. Specifications

Main parameters		performance			Remark
		Minimum value	Typical value	Maximum value	
VBAT operating voltage (V)		3.0	3.7	4.4	≥ 3.3V can guarantee output power
VPWR charging voltage (V)		4.5	5	5.5	
Operating temperature (° C)		- 40	-	+85	-
Operating frequency band (MHz)		2,400	-	2,480	-
Power consumption	Transmit power consumption (mA)	-	86	-	-
	Receiver power consumption (mA)	-	80		-
	Sleep power consumption (uA)	-	4	-	Turn off all broadcasts.
Transmit power (dBm)		-	-	8	-
Receiver sensitivity (dBm)		-	- 9 5	-	-

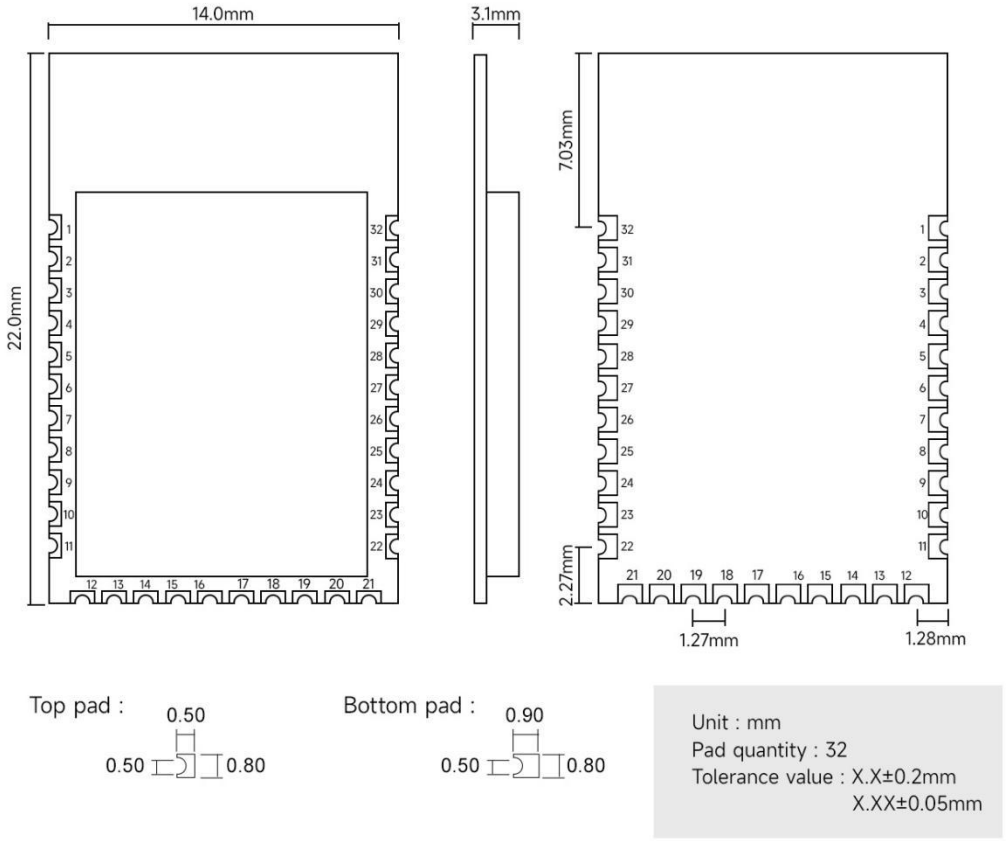
Main parameters		describe	Remark
Communication distance		160m	Transmit power 8dBm, clear and open environment, antenna gain 5dBi, height 1.5 meters.
Bluetooth protocol		V5.4	-
Communication interface		UART serial port	-
Packaging method		patch	-
Interface method		1.27 mm	stamp perforation
External dimensions	EWM104-BT61SX	14*16.8mm	IPEX-1 Antenna Interface
	EWM104-BT61SP	14*22mm	PCB antenna
Product weight	EWM104-BT61SX	1.0g	±0.1g
	EWM104-BT61SP	1.1g	±0.1g
Antenna Interface	EWM104-BT61SX	IPEX-1	Equivalent impedance approximately 50 Ω
	EWM104-BT61SP	PCB onboard antenna	

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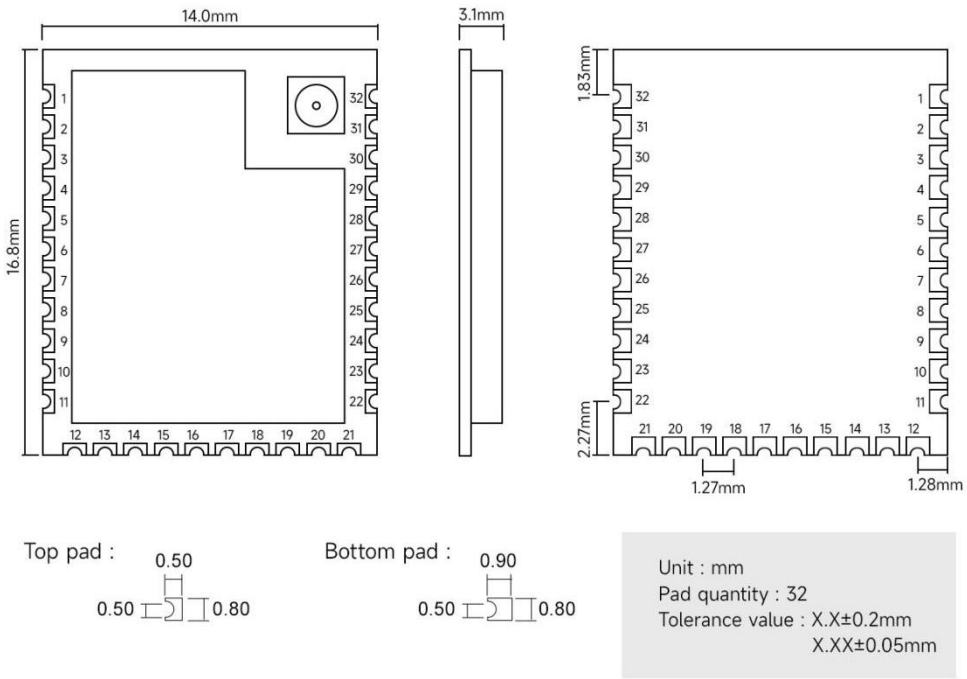
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3.Mechanical Dimensions and Pin Definitions

EWM104-BT61SP



EWM104-BT61SX



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Pin number	Pin Definitions	Pin direction	Pin Function	illustrate
1	WKP	enter	Sleep pin	The sleep/wake pin is left floating by default. Holding it at a low voltage for more than 3 seconds will switch between sleep and wake-up states.
2	D1	enter	Address bit D1	Default pull-up
3	D2	enter	Address D2	Default pull-up
4	GND	-	power ground	-
5	D3	enter	Address D3	Default pull-up
6	D4	enter	Address bit D4	Default pull-up
7	D5	enter	Address D5	Default pull-up
8	D6	enter	Address bit D6	Default pull-up
9	USB_DM	Input/Output	USB_D-	USB differential data negative polarity
10	USB_DP	Input/Output	USB_D+	USB differential data positive polarity
11	SW	enter	Connection confirmed	Used to confirm pairing; can be connected to a button; defaults to pull-up; effective on falling edge.
12	GND	-	power ground	-
13	TX/RX	enter	Transmit/Receive Mode Settings	This port operates in receive mode when left floating, and in transmit mode when connected to GND.
14	LINK	Output	Connection status output indication	TX: A periodic double flashing pattern with a 5-second cycle of 300ms on, 100ms off, and 300ms on again. RX: Before receiving, it flashes periodically for 0.5 seconds on and 0.5 seconds off, with a period of 1 second. After receiving the broadcast, the flashing pattern is the same as TX.
15	UART_RXD	enter	Serial port RXD	TTL input, connected to the external TXD output pin
16	UART_TXD	Output	Serial port TXD	TTL output, connected to external RXD input pin
17	NC	-	NC	Reserved pins, users don't need to worry about them.
18	AGND	-	Simulated land	audio signal ground
19	OUT_R	Output	Right channel audio output	The output has a DC component, so an external DC blocking capacitor is required.
20	OUT_L	Output	Left channel audio output	The output has a DC component, so an external DC blocking capacitor is required.
21	LINE_IN	enter	Audio input detection	Pull-up by default, active low.
22	IN_R	enter	Audio right channel input	-
23	IN_L	enter	Audio left channel input	-
24	GND	-	power ground	-
25	KEY1	enter	Play/Pause	Active low, momentary low level plays/pauses

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26	KEY2	enter	Volume down/Previous track	Active low level; falling edge switches to the previous track; volume decreases if low level is maintained for more than 1 second.
27	KEY3	enter	Volume up/Next track	Active low level, falling edge switches to the next track, volume increases if low level is maintained for more than 1 second.
28	VPWR	enter	charging pin	Operating voltage: 4.5V~5.5V
29	VBAT	enter	Battery power supply pin	Operating voltage 3.0V~4.4V, this pin can be connected to a battery for power supply.
30	IOVDD	Output	IO voltage 3.4V	Used for powering peripherals, maximum current 120mA
31	GND	-	power ground	-
32	GND	-	power ground	-

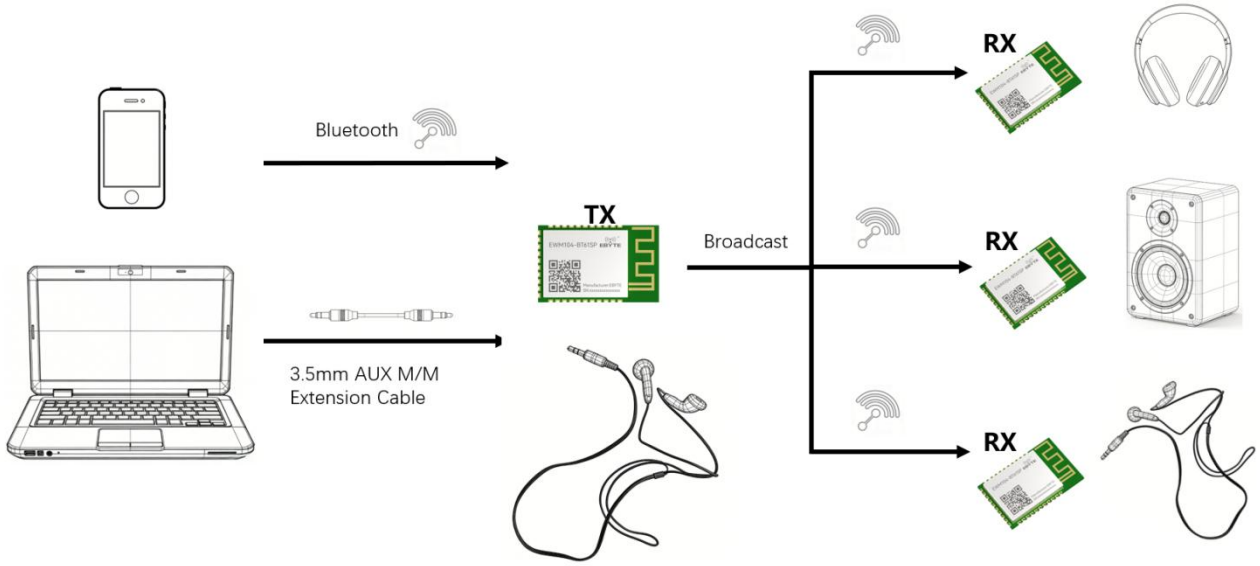
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4.Function Description

4.1 Three Input Methods

Mode , three channels can be selected as inputs: Bluetooth wireless input, USB differential signal input, and IN_L/IN_R analog signal input .



4.2Two output methods

In module TX mode, two output channels are supported: analog signal output via OUT_L/OUT_R and Bluetooth broadcast output.

In module RX mode, it supports OUT_L/OUT_R analog signal output;

4.3 Mobile Phone Connection Authorization

In TX mode, it supports connecting to a mobile phone via Bluetooth to play music locally as a Bluetooth receiver, and can also forward music to other RX mode devices on the same channel.

confirmation is made via the falling edge of the SW pin when a pairing request pops up .

4.4 Channel Selection

The module provides D1~D6 as pairing codes. By switching the high and low levels of D1~D6, a 6-bit binary channel selection is achieved. When the corresponding bit levels of D1~D6 of the module in TX transmit mode and the module in RX receive mode are the same, broadcast communication can be achieved. D1~D6 are high level by default.

4.5 Button Control

The module provides button interfaces KEY1~KEY3, which can realize play/pause, volume down/previous track, and volume up/next track control;

4.6 Lithium Battery Charging Management

Supports VBAT lithium battery power supply, and can also be powered/charged via VPWR pin;

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4.7 Default notification sound

Default prompt sound during operation

state	Prompt content
When turning on and off	Power on/off
When the battery is low	Low battery (recurring reminder)
When the broadcast is turned on	Broadcast speaker mode
When switching input sources	Bluetooth mode (default) / Audio input mode / Slave mode
Bluetooth connection disconnection time state	Bluetooth connected/Bluetooth disconnected

5.Quick Use

5.1 Bluetooth audio local reception and playback

Ground the module's TX /RX pins to set it to transmit mode . After powering on, you can use your phone to scan for Bluetooth, search for the soundbox broadcast, and connect (confirmation is required via the falling edge signal on the SW pin) . After that, you can directly play audio.

5.2 Audio broadcast retransmission

The module's MODE pin sets it to transmit mode . Broadcasting is enabled by default, and audio signals can be input via Bluetooth wireless input, USB differential signal input, or IN_L/IN_R analog signal input .

5.3 Audio Broadcast Reception

Keep the MODE pin floating/high to set it to receive mode. Once powered on, audio signals can be output through the OUT_L/OUT_R pins .

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6. AT Commands

6.1 Instruction Description

1. The module's serial port supports a default baud rate of 2000000bps and 8N1 format.

2. AT commands end with <\R> or <\F>, which will not be repeated in the following description. <\R>: Carriage return character; <\F>: Newline character.

6.2 AT Command Table

Serial Number	Configuration instructions	describe
1	AT	AT communication link check
2	AT+RESET	Reset command
3	AT+RESTORE	Factory reset instructions
4	AT+VOL+	Volume up (for slave devices only) step size is 5.
5	AT+VOL-	Volume down (only for slave devices) step size is 5.
6	AT+NEXT	Next track (only for devices in Bluetooth or USB mode)
7	AT+PREV	Previous track (only applies when the device is in Bluetooth or USB mode)
8	AT+PAUSE	Pause/Play (for consoles only)
9	AT+VER?	Check firmware version number
10	AT+MODE?	Query current mode
11	AT+BAT?	Check current battery level
12	AT+AURAROLE?	Query current broadcast role
13	AT+ PAIR	Set up Bluetooth connection pairing permissions
14	AT+VOL	Query/Set Current Volume
15	AT+BTNAME	Query/Set Bluetooth Name

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6.3 Instruction Description

6.3.1 AT Test Commands

Instruction	Answer	Example
AT	OK	Send: AT\r\n Return: OK
Note: AT link test		

6.4.2 AT+RESET Reset Command

Instruction	Answer	Example
AT+RESET	Reset initiated... OK	Send: AT+RESET\r\n Returns: Resetinitiated... OK
illustrate: 1. Effective immediately; 2. All audio inputs must be disconnected before use.		

6.4.3 AT+RESTORE factory reset command

Instruction	Answer	Example
AT+RESTORE	Factory reset initiated... OK	Send: AT+RESTORE\r\n Returns: Factory reset initiated... OK
illustrate: 1. Restart for the changes to take effect. Restart immediately after successful setup; 2. During the factory reset process, any form of resetting is prohibited, and power should not be cut off before the operation is completed.		

6.4.4 AT+VOL+ Volume up

Instruction		Answer	Example
Query	AT+VOL+	Volume increased to: <vol> OK	Send: AT+VOL+\r\n Return: Volume Increased to: 45 OK
illustrate	1. <vol>: The current volume value increment is 5, and the maximum value is 100. 2. Only applies locally.		

6.4.5 AT+VOL- Volume down

Instruction		Answer	Example
set up	AT+VOL-	Volume Decreased to: <vol> OK	Send: AT+VOL-\r\n Return: Volume Decreased to: 45 OK
illustrate	1. <vol>: The current volume value increment is 5, with a minimum value of 0.		

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	2. Only applies locally.

6.4.6 AT+NEXT Next song

Instruction		Answer	Example
Query	AT+NEXT	Playing Next Track OK	Send: AT+NEXT\r\n Return: Playing Next Track OK
illustrate	1. Effective immediately. 2. This function only works when transmitting via TX; it cannot be switched during reception. 3. Only works on USB input and Bluetooth audio input.		

6.4.7 AT+PREV Last song

Instruction		Answer	Example
set up	AT+PREV	Playing Previous Track OK	Send: AT+PREV\r\n Return: Playing Previous Track OK
illustrate	Effective immediately. It only works in TX transmit mode and cannot be switched during receive. 3. Only applies to USB input and Bluetooth audio input.		

6.4.8 AT + PAUSE Pause/Play

Instruction		Answer	Example
set up	AT+PAUSE	Play/Pause Toggle OK	Send: AT+PAUSE \r\n Return: Play/Pause Toggle OK
illustrate	Effective immediately		

6.4.9 AT+VER ? Query firmware version number

Instruction		Answer	Example
Query	AT+VER ?	SDK Version: <ver> OK	Send: AT+VER? \r\n Returns: SDK Version: <ver> OK
illustrate	<ver>: Current firmware version number.		

6.4.10 AT+MODE ? Query the current input mode

Instruction		Answer	Example
Query	AT+MODE?	Current Mode: <mode>	Send: AT+MODE?\r\n Return: Current Mode: BT
illustrate	<mode> | describe BT | Bluetooth input mode: Audio data is input wirelessly via		

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		Bluetooth.		
	LINEIN	Audio input mode: Audio data is input from the IN_L/IN_R interface.		
	PC	Slave mode: Audio data is input from the USB_DM/USB_DP differential input channel.		
	UNKNOWN	If you try to query during startup, it will return "UNKNOW". Please query later.		

6.4.11 AT+BAT ? Query current battery level

Instruction		Answer	Example
Query	AT+ BAT ?	Battery Level: <per> OK	Send: AT+BAT?\r\n Return: Battery Level: 89% OK
illustrate	<per>: Current battery level.		

6.4.12 AT+AURAROLE ? Query the current send/receive mode

Instruction			Answer	Example
Query	AT+AURAROLE ?		AURACAST role: <role> OK	Send: AT+AURAROLE?\r\n Return: AURACAST role: SOURCE OK
illustrate	<role>	describe		
	SOURCE	Launch mode		
	SINK	Receive mode		

6.4.13 AT+PAIR Bluetooth pairing license

Instruction					answer	Example
set up	AT+PAIR=<param>				Pairing <rep> OK Or <error description>	Send: AT+PAIR=1 Return: Pairing accepted OK
parameter	<param>	describe		<Rep>	describe	
	0	Reject Matching		accepted	allow	
	1	Pairing allowed		rejected	reject	
				<error description>	Error message	
illustrate	1. An authorization command needs to be sent for the first pairing. A prompt tone will play when pairing is successful, and it can automatically reconnect. 2. If your phone or computer cannot find the Bluetooth name, please check the status of the MODE pin;					Send: AT+PAIR=0\r\n Return: Pairing rejected OK

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	3. When a mobile phone or computer pairs with the module via Bluetooth, after the pairing code pops up, send the command: AT+PAIR=1\r\n to complete the authorization; the same applies if the pairing is refused.	

6.4.14 AT+VOL Query /Set Current Volume

Instruction		Answer	
Query	AT+ VOL ?	Volume Level: <value> OK	Send: AT+VOL?\r\n Return: Volume Level: 40 OK
set up	AT+VOL=<value>	Volume Level: <value> OK	Send: AT+VOL=62\r\n Return: Volume Level: 62 OK
illustrate	1. <value> Volume range 0-100. 2. Default volume is 40.		

6.4.15 AT+BTNAME Query/Set Bluetooth Name

Instruction		Answer	Example
Query	AT+BTNAME ?	Bluetooth Name: <new name> OK	Send: AT+BTNAME?\r\n Return: Bluetooth Name: <new name> OK
set up	AT+BTNAME=<name>	Bluetooth name change to：<name> OK Or <error description>	Send: AT+BTNAME=BT61\r\n Return: Bluetooth name changed to: BT61 OK
parameter	<bt name> : Length not exceeding 32 bytes <error description>:Bluetooth name unchanged OK		
illustrate	1. Settings take effect immediately upon completion and are saved even after power failure; 2. Default Bluetooth name: soundbox.		

7.Hardware Design

- It is recommended to use a DC regulated power supply to power this module, with the power supply ripple coefficient as small as possible, and the module must be reliably grounded;
- Please ensure the correct connection of the power supply positive and negative terminals. Reversing the connection may cause permanent damage to the module.
- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module.
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently.
- When designing power supply circuits for modules, it is often recommended to retain a margin of more than 30% to ensure long-term stable operation of the entire unit.
- The module should be kept as far away as possible from power supplies, transformers, high-frequency traces, and

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other parts with high electromagnetic interference.

- High-frequency digital traces, high-frequency analog traces, and power traces must avoid the area under the module. If it is absolutely necessary to run the traces under the module, assuming the module is soldered on the Top Layer, lay ground copper on the Top Layer of the module contact area (all copper and well grounded), and run the traces close to the digital part of the module on the Bottom Layer .
- Assuming the module is soldered or placed in the Top Layer, it is also wrong to arbitrarily route traces in the Bottom Layer or other layers, as this will affect the module's stray emissions and receiver sensitivity to varying degrees .
- If there are devices around the module that cause significant electromagnetic interference, it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If there are traces around the module that cause significant electromagnetic interference (high-frequency digital, high-frequency analog, power supply traces), it will greatly affect the module's performance. Depending on the intensity of the interference, it is recommended to keep them away from the module. If possible, appropriate isolation and shielding can be implemented.
- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, as there is still a risk of damage) ;
- Try to stay away from TTL protocols that also use a physical layer of 2.4GHz, such as USB 3.0;
- The antenna mounting structure has a significant impact on module performance; therefore, it is essential to ensure that the antenna is exposed, ideally vertically upwards. When the module is installed inside the housing, a high-quality antenna extension cable can be used to extend the antenna to the outside of the housing.
- Antennas should never be installed inside a metal casing, as this will greatly reduce the transmission distance.

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8.Frequently Asked Questions

8.1 Transmission distance is not ideal

- When there are obstacles in line-of-sight communication, the communication distance will be reduced accordingly ;
- Temperature, humidity, and co-channel interference can all lead to increased packet loss rates in communications .
- The ground absorbs and reflects radio waves, and the test results are poor when the ground is close to the ground .
- Seawater has a strong ability to absorb radio waves, so testing results are poor at the seaside .
- If there are metal objects near the antenna, or if it is placed inside a metal casing, the signal attenuation will be very severe .
- Power register settings are incorrect; air speed setting is too high .
- At room temperature, the power supply voltage is lower than the recommended value; the lower the voltage, the lower the power output .
- The antenna may be poorly matched with the module or have quality issues.

8.2 Module is easily damaged

- Please check the power supply and ensure it is within the recommended voltage range. Exceeding the maximum value will cause permanent damage to the module .
- Please check the power supply stability; the voltage should not fluctuate significantly or frequently .
- Please ensure anti-static operation during installation and use, as high-frequency devices are sensitive to electrostatic discharge .
- Please ensure that the humidity is not too high during installation and use, as some components are humidity-sensitive .
- Unless there are special requirements, it is not recommended to use it at excessively high or low temperatures.

8.3 The bit error rate is too high .

- If there is interference from a co-channel signal nearby, move away from the source of interference or change the frequency or channel to avoid the interference.
- An inadequate power supply can also cause garbled characters, so it is essential to ensure the reliability of the power supply.
- Poor quality or excessive length of extension lines or feeders can also lead to a high bit error rate.

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9.Welding Operation Instructions

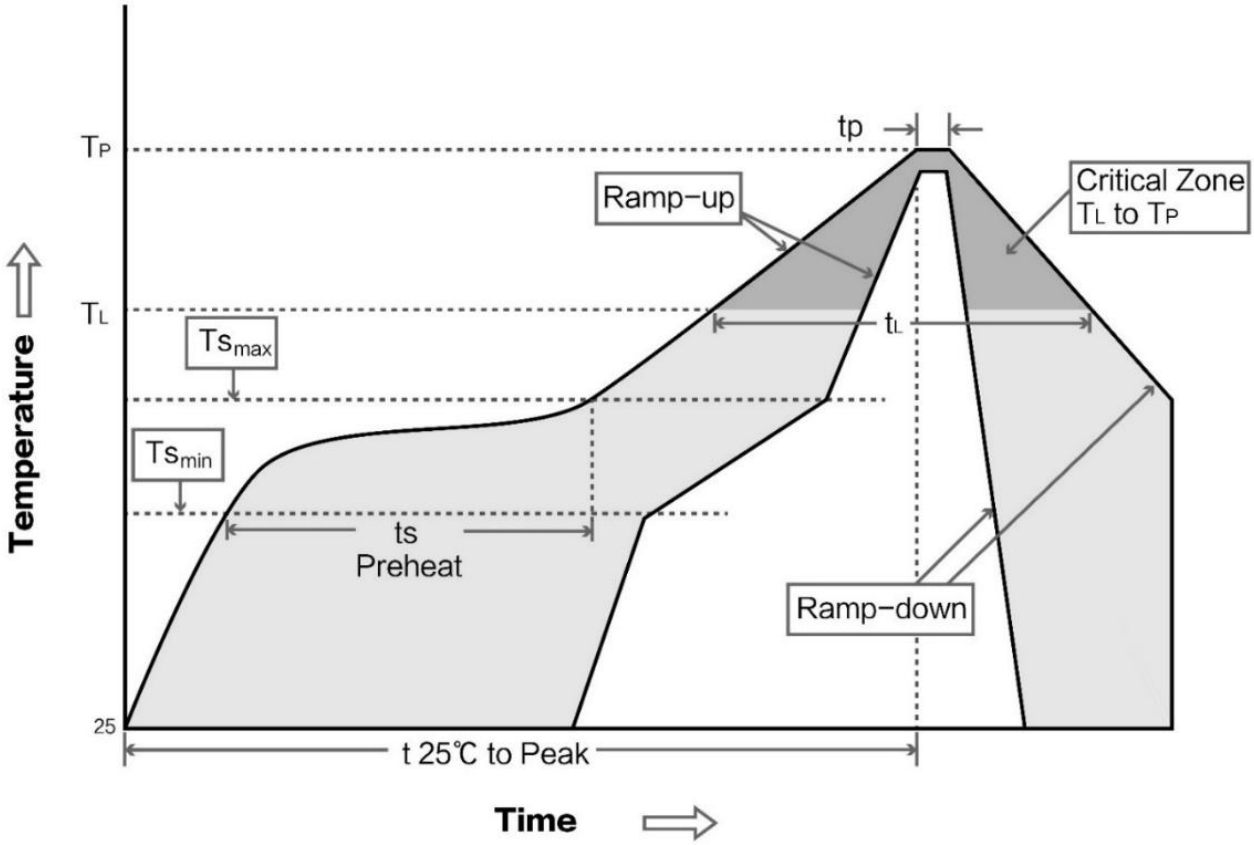
9.1 Reflow soldering temperature

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)	Minimum preheating temperature	100 ℃	150 ℃
Preheat temperature max (Tsmax)	Maximum preheating temperature	150 ℃	200 ℃
Preheat Time (Tsmin to Tsmax)(ts)	preheating time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average rate of ascent	3 ℃ /second max	3 ℃ /second max
Liquidous Temperature (TL)	Liquid phase temperature	183 ℃	217 ℃
Time(tL)Maintained Above(TL)	Time above the liquidus 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	from 25 ℃ to peak temperature	6 minutes max	8 minutes max

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9.2 Reflow Soldering Profile



Revision History

Version	Revision Date	Revision Notes	maintainer
1.0	2025-01-27	Initial version	Lei

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