



HJ-180IMH-15(OTA slave high-speed version)_ DataSheet

FULL support flow control
Based on Nordic NRF52810
LHFC ultra-small chip-level(5.5x5x1.3mm)
Ultra-low power consumption BLE5.4 module

Version: V5.7
Date: 2025/10/15

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State:	published

Preface

Thank you for using the Bluetooth module provided by HJSIP. The HJ-180IMH-15 series standard Bluetooth module is a high-performance IOT Bluetooth transceiver based on Nordic NRF52810. The module adopts LGA24 packaging and supports both built-in and external antennas. The product also has features of low power consumption, small size and strong anti-interference ability, and is suitable for a variety of application scenarios.

This module is mainly used for data communication, and the company does not assume responsibility for property losses or personal injuries caused by improper operations of users. Please develop the product according to the technical specifications and reference design in the manual. At the same time, pay attention to the general safety matters that should be concerned about when using mobile products.

Before the announcement, the company has the right to modify the content of this manual according to the needs of technological development.

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Version History

Version	Date	Change Description	Reviser	Reviewer
V1.0	2019/07/05	The first version	LMY	LJH
V2.0	2020/01/08	Add configuration pins	LMY	ZYP
V3.0	2020/10/18	Add serial port flow control to achieve higher transmission rates	LMY	LJH
V5.0	2022/01/06	Framework upgrade, updated to V5.0, enhancing performance and increasing stability	LMY	LJH
V5.1	2022/02/11	Update the pins and package diagrams, and complete the documentation.	LMY	LJH
V5.2	2023/07/07	Format adjustment, change the working temperature range	FJW	LMY
V5.3	2023/10/09	The name has been changed to "HJ-180IMH-15"	FJW	LMY
V5.5	2024/09/30	Update the reference design drawings and models	LMY	LYF
V5.6	2025/10/11	1) Unify the manual format; 2) Adjust the key characteristics in Table 2-1: The RX sensitivity is adjusted from -96 dBm to -97 dBm; 3) The duration of the reset low level is changed from 10ms to 1 second. 4) Add the core chip model: Nordic NRF52810; 5) Modify the "Antenna Application Reference Instructions", for details see 3.2. 6)Table 2-1: The open-air transmission distance of the external antenna has been adjusted from 40-80m to 30-120m.	WYW	LMY
V5.7	2025/10/15	1) The BLE version has been updated from BLE5.2 to BLE5.4; 2) Table 2-2: Update Notes Explanation; 3) 3.2.1: Instructions for Using Built-in Antenna Update.	WYW	LMY

Applicable module selection

No.	Module model	Type	Description
1	HJ-180IMH-15_high client	Serial port transparent transmission high-speed version	It is equipped with built-in serial port transparent transmission firmware. This firmware module serves as a bridge for two-way communication between Bluetooth devices or mobile phones and the MCU. Users do not need to understand the Bluetooth protocol stack. They can operate and send and receive serial port data through serial port instructions. The operation is simple, shortening the user's development cycle and accelerating product launch.

1 Introduction

The HJ-180IMH-15 series standard Bluetooth module is a high-performance IOT Bluetooth transceiver based on Nordic NRF52810. The module adopts LGA24 packaging and supports both built-in and external antennas. The product also has the features of low power consumption, small size and strong anti-interference ability, and is suitable for a variety of application scenarios.



Figure 1.1: HJ-185IMH-15 top and bottom view

2 Product overview

2.1 Key features

Table 2-1: HJ-180IMH-15 (OTA slave high-speed version) key characteristics

Characteristic	Description
Function	<u>- This version is a configurable high-speed rate flow control version. At low rates, the maximum rate is 30K Bytes/s. In the high-speed mode, it can achieve a rate of >70K Bytes/s with most Android phones (set to hardware flow control mode), and >60K Bytes/s with iOS phones (set to hardware flow control mode).</u> - Support BLE 5.4, embed low-power BLE protocol stack and GATT services - Support slave of BLE (supporting OTA over-the-air upgrade function) - Built-in high-speed transmission firmware - Add the selection of serial port RTS and CTS flow control to achieve the maximum communication rate and the minimum packet loss rate.
Frequency band	2.402~2.480GHz(2.4GHz ISM Band)
TX power	-20dBm ~ +4dBm
Transmission distance	- The wireless transmission distance of the built-in antenna in open areas: 5~10m - The wireless transmission distance of the external antenna in open areas: 30~120m
RX sensitivity	-97dBm @1Mbps
Power Supply	1.7V~3.6V, TYP. 3.3V;
TX-RX Peak current	TX: 4.6mA@0dBm RX: 4.6mA
Low power consumption	- Dormant current<2μA - Broadcast current at 1-second intervals 12.2μA(0dBm) or 15.5μA(+4dBm) - Broadcast current at 2-second intervals 6.5μA
Size	5.5mm*5mm*1.3mm (L*W*H, With built-in antenna)
Package	LGA24, pad spacing: 0.75mm and 0.8mm
Weight	0.1g
Operation Temperature	-40 ~ +85°C
Storage Temperature	-40 ~ +85°C

GPIO Ports	10 (Max)
ROHS	Comply with the ROHS standard

2.2 Application Scenarios

- 2.4GHz Bluetooth Low Energy system;
- Smart home, wireless remote control;
- Consumer electronics products such as sports and healthcare;
- Industrial monitoring;
- Intelligent transportation, etc.

2.3 Functional block diagram

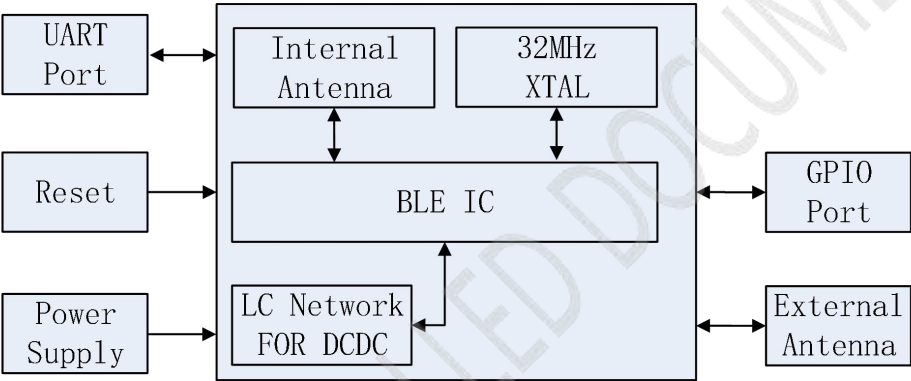


Figure 2.1: HJ-180IMH-15 functional block diagram

2.4 Pins distribution diagram

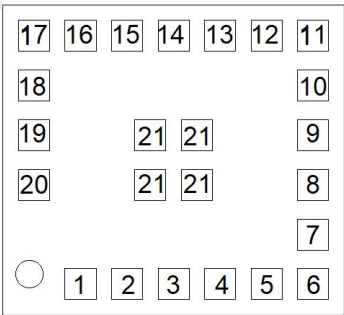


Figure 2.2: HJ-180IMH-15 Pins distribution diagram(top view)

2.5 Pins description table

Table 2-2: HJ-180IMH-15 (slave high-speed version) pins definition table

PIN	Name	Type	Description	Function
1	SWDCLK	INPUT	Burn and debug interface clock	Can be suspended without usage

2	NC	/	NC	Stay suspended
3	P0.14	OUTPUT (UART RTS)	Serial port flow control RTS	BLE serial port flow control RTS output (Enables external serial data transmission) After enabling flow control, when the RTS pin outputs a low level 0, it allows external devices to send data to the BLE; When the RTS pin outputs a high level 1, it indicates that the BLE is busy and prohibits external devices from sending data to the BLE;
4	P0.12	OUTPUT	BLE UART TX	The serial port TX pin of the BLE module (In transparent mode, this pin serves as the serial port's TX pin and is connected to the RX pin of the MCU)
5	P0.05/ AIN3	INPUT	BLE UART RX	The serial port RX pin of the BLE module (In transparent mode, this pin serves as the serial port's RX pin and is connected to the TX pin of the MCU)
6	P0.04/ AIN2	OUTPUT	Slave connection status indication	Connection status indicator pin of the slave (When the output is at a high level, the module has successfully been connected as a slave by the host; when the output is at a low level, the module has been disconnected from the host as a slave.)
7	VCC_IN	POWER INPUT	Power In	DC1.7V ~ 3.6V
8	NC	/	NC	Stay suspended
9	P0.01	INPUT	BLE serial port reception enable	Serial port reception enable pin (configurable, default active low) When set to low level effective: P0.01 = 0, the serial port reception function of the module is enabled. At this time, the module operates at full speed and can perform command sending or data transmission. The module's power consumption will increase by 300-400 μ A; P0.01 = 1, the serial port reception function of the module is disabled, and the module operates in a low power consumption state. At this time, if a broadcast is performed once every second, the power consumption is <15 μ A. If the broadcast is stopped, the power consumption is <2 μ A. When set to high level effective: P0.01 = 1, the serial port reception function of the module is enabled; P0.01 = 0, the serial port reception function of the module is disabled.
10	P0.00	OUTPUT	APP data arrival prompt	Data reception indicator pin of the APP When the module receives data sent by the mobile phone APP or an external device connected to this module, the BLE module needs to send the data through the module's serial port TX pin. Whether the module is the host or the slave, this pin will be pulled high for T1 (ms) (T1 can be set and the range is 1-255ms) before sending the data through the module's serial port TX pin. The data transmission is completed than the pin can be pulled low. Usually, this pin remains at a low level to indicate idle. This pin is used as the wake-up signal for long connection low-power devices.
11	NC	/	NC	Stay suspended
12	NC	/	NC	Stay suspended

13	NC	/	NC	Stay suspended
14	P0.16	INPUT	APP configuration enabled	Enable APP configuration function When this pin is input with a high voltage, it enables the mobile APP to send instructions to configure all parameters of the module. When this pin is input with a low voltage, it prohibits the mobile APP from configuring or reading the parameters of the module. This pin is defaulted to be pulled down.
15	P0.18	IO	Temporarily useless	It can be configured for other functions. For now, just keep it in the suspended state.
16	nRESET	IO/ Reset Pin	GPIO/Reset	External hardware reset pin Active low. The duration of the low level should be more than 1 second. When as the reset pin, it is connected to the external IO. If not connected, a 1k strong pull-up resistor must be added.
17	SWDIO	Debug Port	Simulation debugging port	Can be suspended without usage
18	P0.20	INPUT(UART CTS)	Serial port flow control CTS	BLE serial port flow control CTS input (Enable BLE serial port to send data externally) After enabling serial port flow control, when CTS is externally input with a low level of 0, the Bluetooth serial port allows data to be sent externally; When CTS is externally input with a high level of 1, the Bluetooth serial port stops sending data externally.
19	EXT-ANT	EXT ANT RF OUTPUT	RF output	The RF output pin. If there is sufficient space, it is advisable to connect an external antenna through a π -type filter circuit.
20	OB-ANT	Onboard ANT	Built-in antenna interface	If an internal antenna is used, connect PIN19 and PIN20 through a π-type filter circuit . For details, see 3.2.1.
21	GND	Ground	Power GND	/

2.6 Serial Port Flow Control Instructions

The HJ-180IMH-15 high-speed flow control version can enable and disable serial port flow control through instructions. When serial port flow control is enabled, the BLE-CTS and BLE-RTS pins are enabled.

BLE-CTS is in an input state and is connected to the MCU-RTS of the external device. When BLE-CTS is externally input with a low level of 0, the Bluetooth serial port allows data to be sent outward; when BLE-CTS is externally input with a high level of 1, the Bluetooth serial port stops sending data outward.

The external MCU controls the BLE-CTS pin through IO to allow and disable the frequency and time of BLE serial port data transmission, thereby ensuring that its own buffer does not overflow and achieving the highest speed and the lowest packet loss rate.

BLE-RTS is in an output state and is connected to the MCU-CTS of the external device. When the BLE-RTS pin outputs a low level of 0, it allows the external device to send data to the Bluetooth;

when the BLE-RTS pin outputs a high level of 1, it indicates that the Bluetooth is busy and prohibits the external device from sending data to the Bluetooth.

When the BLE-RTS outputs a high level, we still reserve some resources to receive external data because the external device may not be able to immediately stop sending.

3 RF Features

The module is set up in two ways: built-in antenna and external antenna.

3.1 Antenna interface and operating frequency band

Module antenna interface characteristic impedance 50 ohms.

The radio frequency working band is 2.402 ~ 2.480GHz.

3.2 Antenna application reference

3.2.1 Use module built-in antenna wiring diagram

Connect PIN19 to the PIN20 through a π -type filter circuit, as shown in Figure 3.1 below. The communication distance in the open area is 5 to 10m.

It should be noted that no devices or traces should be placed near the antenna, and no devices should be placed on the back of the module. The copper coating should avoid the internal antenna area, (Except for the antenna part) the copper coating on the module's GND should be large enough, and the antenna should have as much clear space as possible.

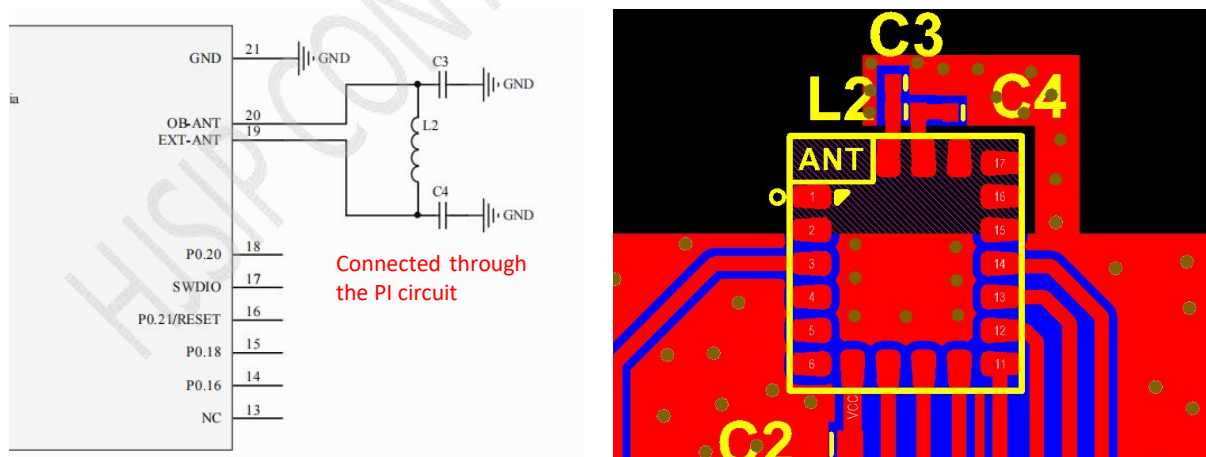


Figure 3.1: Use the module's built-in antenna

3.2.2 Use the external PCB antenna wiring diagram

The PIN20 is suspended, and the PIN19 is connected to the PCB antenna through a π filter circuit, as shown in Figure 3.2 below, and the communication distance in open ground can reach 30~120 meters.

*** Special attention ***

1) If you have requirements for the distance of the product and the external π circuit needs to be matched, please send the PCBA circuit board to our company to complete this task.

2) When designing the circuit, no devices or wires should be placed near the antenna, and no devices should be placed on the back of the module. The copper cladding should cover the module and the π -shaped filter circuit, avoiding the PCB antenna.

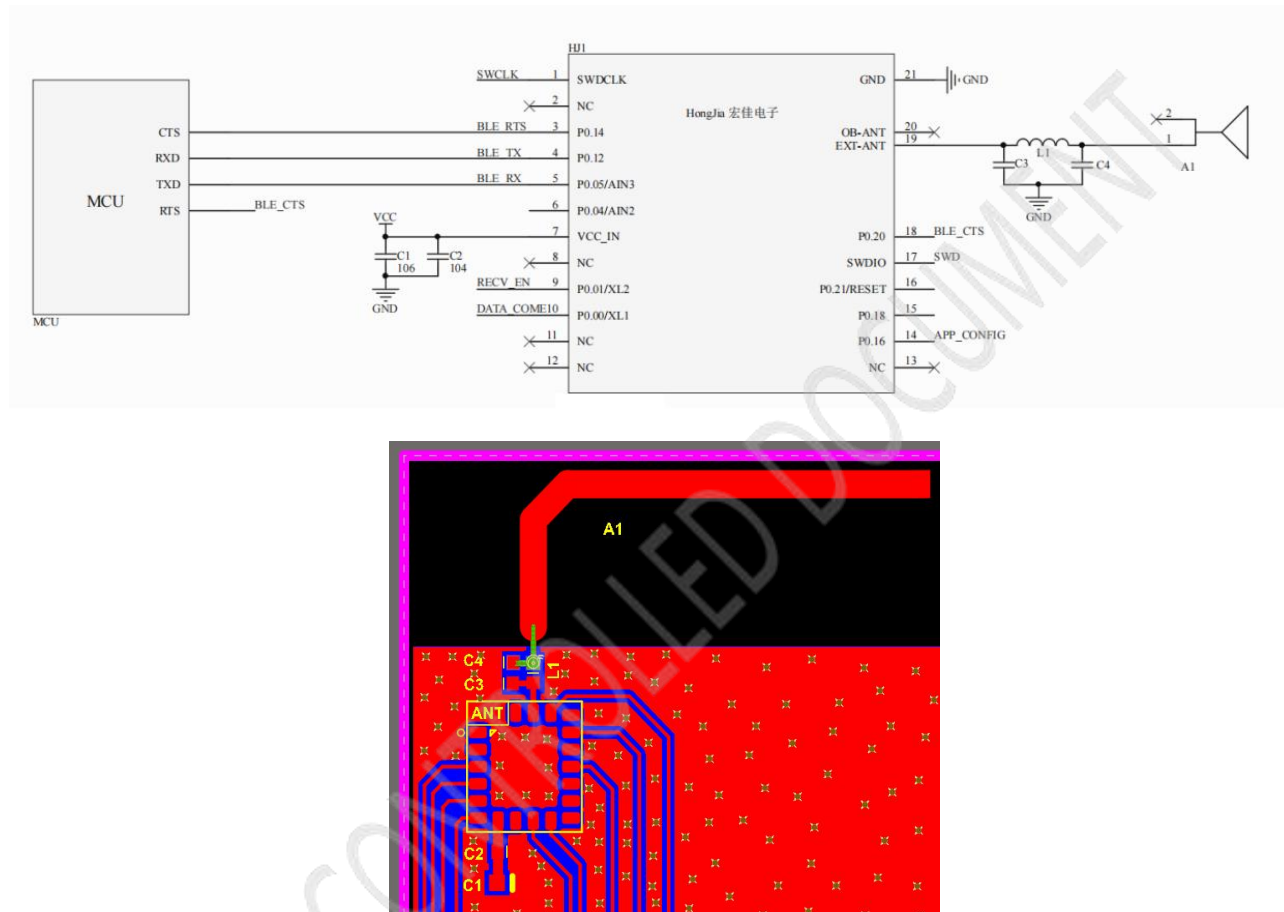


Figure 3.2: Use the external antenna

3.3 RF Features

Table 3-1: RF features

Attribute	Value	Remarks
Wireless modulation mode	(G)FSK	/
Frequency range	2.402 ~ 2.480GHz	bandwidth: 2MHz
Number of channels	40	/
Air speed	1Mbps、2Mbps	/
Rf port impedance	50Ω	/
Max TX power	+4dBm	/
TX peak current	4.6mA	@0dBm
RX peak current	4.6mA	/
RX sensitivity	-97dBm	@1Mbps

Antenna	Built-in antenna	An external antenna can also be connected
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4 Electrical Parameters

4.1 Absolute Maximum Ratings

Table 4-1: Absolute Maximum Ratings

Parameter	MIN	MAX	Unit
Supply voltage	1.7	3.9	V
IO port voltage	0	VCC+0.3(3.9)	V
Operating Temperature	-40	+85	°C
Storage Temperature	-40	+85	°C

4.2 DC Characteristics

Table 4-2: Recommended Operating Conditions

Parameter	MIN	TYP	MAX	Unit
Supply voltage	1.7	3.3	3.6	V
IO port voltage	0	3.3	VCC	V
Dormant current	/	<2	/	μA
Maximum working current	/	<5	/	mA
Operating Temperature	-40	+25	+85	°C

Table 4-3: Dc features of I/O ports

IO	Drive capability	Min	Max	Unit
Input low level	/	0	0.3*VCC	V
Input high level	/	0.7*VCC	VCC	V
Output low level	5mA	0	0.4	V
Output high level	5mA	VCC-0.4	VCC	V

Table 4-4: Power consumption

Test condition	TYP	Unit
sleep mode	<2	μA
Broadcast at 20ms interval in slave mode	705	μA
Broadcast in slave mode with 1S gap	13.5	μA
Maintain the connection in slave mode with a 20ms connection gap	138	μA
Maintain the connection in slave mode with a 7.5ms connection gap	350	μA

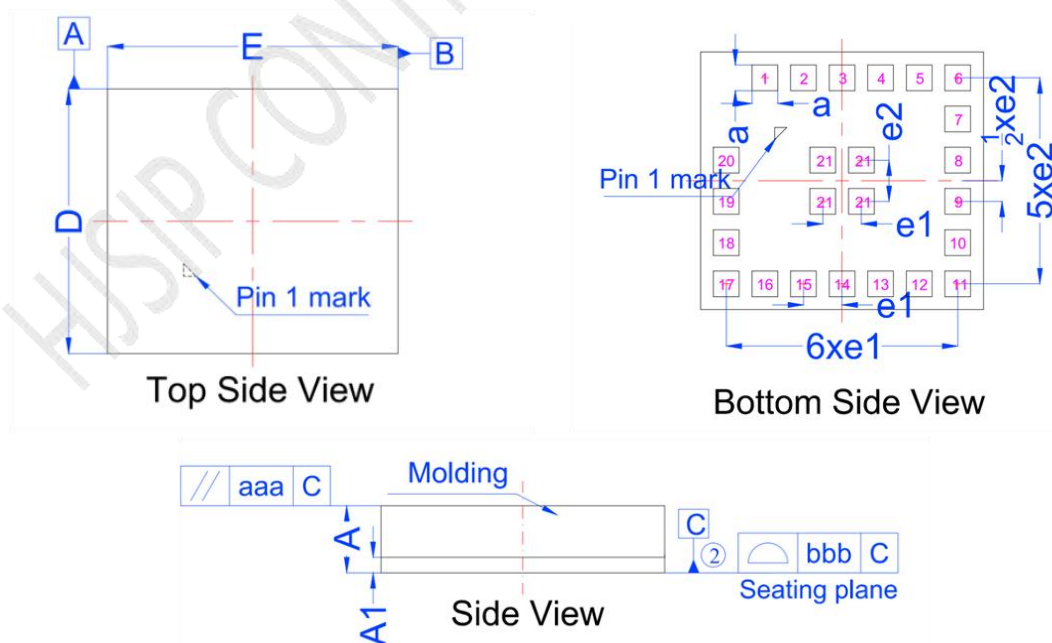
5 Notices for Hardware Design

- The module antenna should be placed at the edge of the circuit board, close to the main board edge or corner. It is best to place the module in the corner of the circuit board.
- No other components should be placed near the antenna of the Bluetooth module or on its back, and no traces should be routed there, otherwise it will affect the Bluetooth performance.
- Each layer of the circuit board should be fully covered with copper and connected to GND, and the copper coverage area should be large enough (except for the antenna part), and well

grounded.

- As many vias as possible should be drilled in the copper coverage area of the entire circuit board, especially near the module and antenna.
- If there are high-power devices or high-voltage conversion circuits on the circuit board, the GND copper coverage of the module should be isolated from the GND copper coverage of other parts, and connected by a single point grounding method. As many vias as possible should be drilled to reduce interference to the RF signal.
- The module should not be placed in a metal shell. If a metal shell must be used, the antenna should be led out.
- For products with this Bluetooth module, some metal components such as screws and inductors should be kept as far away as possible from the RF antenna part of the Bluetooth module.
- The filter capacitor at the power supply should be placed as close as possible to the power input pin of the module. If it is capacitor-powered or space is limited, the filter capacitor at the power input can be removed as the module has an internal filter capacitor.
- Please refer to the pin diagram for all pins and pay attention to the IO mode and status of the IO connected to them.
- When the input power is not battery power ,and mains power with voltage reduction, it is recommended to use a magnetic bead or inductor for filtering in series.
- Unused pins can be left floating.

6 Machine Dimension



DIMENSIONAL REFERENCES Units:mm

SYMBOL	DIMENSIONAL REQMTS			SYMBOL	Tolerance of Form & Position
	MIN	NOM	MAX		
A	1.26	1.30	1.34	aaa	0.10
AI	0.27	0.30	0.33	bbb	0.10
D	4.90	5.00	5.10		
E	5.40	5.50	5.60		
a	0.45	0.50	0.55		
e1	0.75 REF				
e2	0.80 REF				

Figure 6.1: HJ-180IMH-15 dimension

7 SMT production

7.1 Precautions for ultrasonic welding

Please carefully consider using ultrasonic welding technology. If it is necessary to use ultrasonic welding technology, please use 40KHz high frequency ultrasound welding technology. Keep the module away from the ultrasonic soldering line and the fixing column during the design method to prevent damage to the module!

For specific ultrasonic welding matters, please contact our company for technical consultation.

7.2 Soldering Recommendations

HJ-180IMH-15 module use high temperature resistant materials, manufacturing by Lead-free Process. The maximum temperature resistance is 265°C. Ten continuous reflow soldering has no effect on properties and strength. Specific parameters as shown in Table 7-1.

Table 7-1: Reflow soldering parameters

Parameter	Value
Features	Lead-free process
Average ramp up rate($T_{S\text{MAX}}$ to T_p)	max3°C/sec. max
Temperature Min($T_{S\text{min}}$)	150°C
Temperature Max($T_{S\text{max}}$)	200°C
Preheat time (Min to Max) (tS)	80~100sec
Peak Temperature (T_p)	250±5°C
Ramp-down Rate	6°C/sec. max
Time 25°C to Peak Temp (T_p)	8 min. max

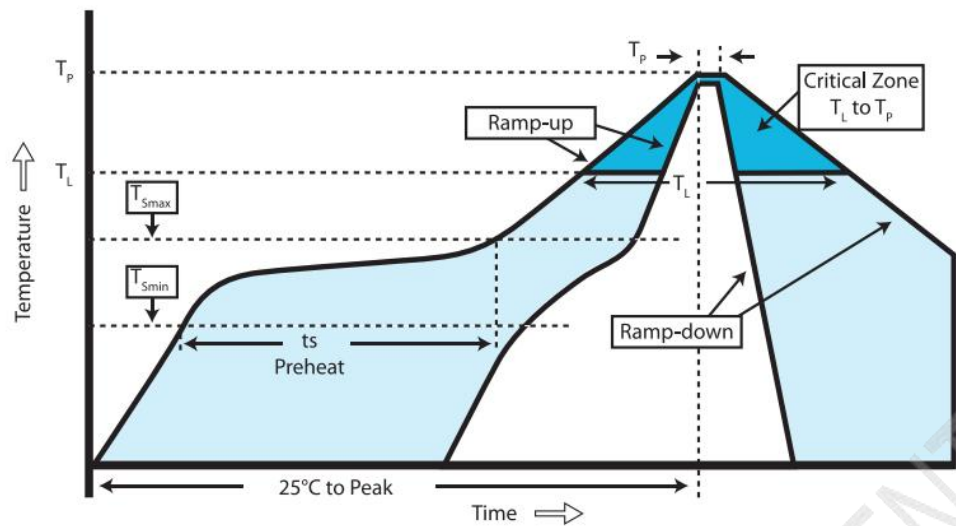


Figure 7.1: Temperature Curve of Reflow Welding

7.3 Humidity sensing properties

The HJ-180IMH-15 module has a humidity sensitivity of level 3.
If any of the following two conditions are met, the HJ-180IMH-15 module should be fully baked prior before reflow soldering, otherwise the module may cause permanent damage during reflow soldering.

- After unpacking or vacuum packaging is damaged and air leaks, the module needs to be SMT within 168 hours when the temperature is less than 30 degrees and the relative humidity is less than 60%. If the above conditions are not met, bake.
- Vacuum packaging is not opened, but beyond the shelf life, also need to be baked.

8 Packaging

8.1 Packaging method

Table 8-1: Packaging method

Type	Packaging method	Pack quantity (PCS)
HJ-180IMH-15_XX	Roll tape	4000

Use chip-grade anti-static aluminum foil bags to seal and pack with braid. Each bag is put in desiccant. Industrial grade vacuum pump ensures no air leakage, moisture, water and dust (IP65). The actual packaging effect is shown in Figure 8.1.



Figure 8.1:package figure

8.2 Label information

All packages are labeled with cargo information, ROHS label, anti-static label, etc.

【A】	Tangshan Hongjia electronic Technology Co., LTD
【B】	HJ-XXX-XXX
【C】	Pb Free Reflow(260°C)
【D】	Date Code:2508 HJ0218
【E】	Note: Must be stored in a vacuum Seal
【F】	Warning: Humidity sensitivity level MSL:XX
【G】	QTY:1500PCS SEAL DATE:20250218

Figure 8.2:Product label drawing

Table 8-2: Module information description

No.	Description
A	company name
B	product model
C	Lead-free reflow mark and reflow temperature setting value
D	Production date Example: 2508 HJ0218 represents the product produced in the 8th week of 2025, on February 18
E	Storage precautions
F	Humidity sensitivity level
G	Quantity of product + date of sale