

HJSIP®

HJ-568IMH_Hardware Design Manual

Based on OnMicro OM6626

8.5*9.2mm

onboard/ceramic/external antenna

BLE6.1 wireless transmission module

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Preface

Thanks for using the Bluetooth module provided by HJSIP. The HJ-568IMH series standard Bluetooth module is a product based on the high-performance and low-power IoT Bluetooth transceiver of OnMicro OM6626. The module is packaged in a stamp-type enclosure and supports onboard/ ceramic/external antennas. It features low power consumption, small size, and strong anti-interference capability, and is suitable for various 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	2025/03/28	Initial Version	WYW	LMY
V1.1	2025/08/19	1) Changed BLE5.4 to BLE6.1; 2) Add the description of the reset duration for the RST pin, and the connection instructions; 3) 6 mechanical dimensions: The module's size has been changed from 8.5*9 to 8.5*9.2 mm. 4) Antenna type change: From onboard antenna to: onboard / ceramic / external antenna.	WYW	LMY

Applicable module selection

No.	Module model	Type	Description
1	HJ-568IMH_SPPv2	Serial port transparent transmission standard version	Built-in serial port transparent firmware, the firmware module is a two-way communication bridge between Bluetooth devices or mobile phones and MCU, users do not need to understand the Bluetooth protocol stack, through the serial port command operation and serial port data can be received, simple operation, shorten the user development cycle, speed up the product to market.
2	HJ-568IMH_CUSv2	Customized version for customers	This version supports customer customized firmware, customers according to product needs to propose functions, we will customize modules with dedicated firmware versions to supply to customers.
3	HJ-568IMH_DEV	Customer development version	Provide standard SDK to facilitate users' secondary development with "OPEN CPU".

1 Introduction

The HJ-568IMH series standard Bluetooth module is a high-performance IoT Bluetooth transceiver. The module is packaged in a postage stamp-sized format and supports onboard/ ceramic/ external antennas. The product also features low power consumption, small size, and strong anti-interference capability, and is suitable for various application scenarios.

2 Product overview

2.1 Key features

Table 2-1: HJ-568IMH key characteristics

Characteristic	Description
Function	- Supports BLE 6.1, embeds low-power Bluetooth protocol stack and GATT services - Supports BLE master-slave integration (supports up to 20 connections, enables master and slave to work simultaneously without interfering with each other) - Supports data transmission, or provides bare modules for customers to develop their own firmware independently
supply voltage	1.71V ~ 3.6V
RF characteristics	- Working frequency: 2.4GHz, supporting free ISM band - Transmit power: -30dBm ~ +8dBm - High receiving sensitivity: -98dBm@1Mbps -95dBm@2Mbps - TX peak current < 4mA@0 dBm RX peak current < 3mA@1Mbps - Wireless transmission distance of the onboard/ceramic antenna in open areas: 30~100m
Size	8.5mm*9.2mm
Packaging	Stamp hole packaging, with pad spacing of 0.8mm and 1mm
weight	0.16g
current	- Sleep current < 0.8μA (No RAM retention, wake on by GPIO) - Sleep current < 1.2μA (16K RAM retention, wake on by RTC) - Broadcasting current at a one-second interval 9μA(0dBm) or 12.5μA(+4dBm) - Broadcasting current at a 2-second interval 4.8μA(0dBm)
Operation temperature	-40 ~ +85°C
storage temperature	-40 ~ +85°C
GPIO Port	15 (The RST pin is used as a GPIO.)
Product standards	Compliant with the ROHS standards

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

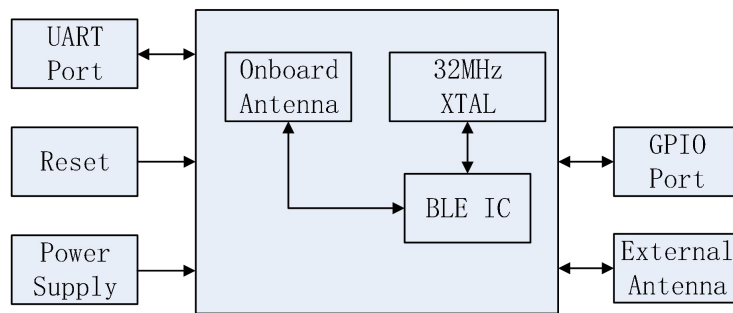


Figure 2.1: HJ-568IMH functional block diagram

2.4 Pins distribution diagram

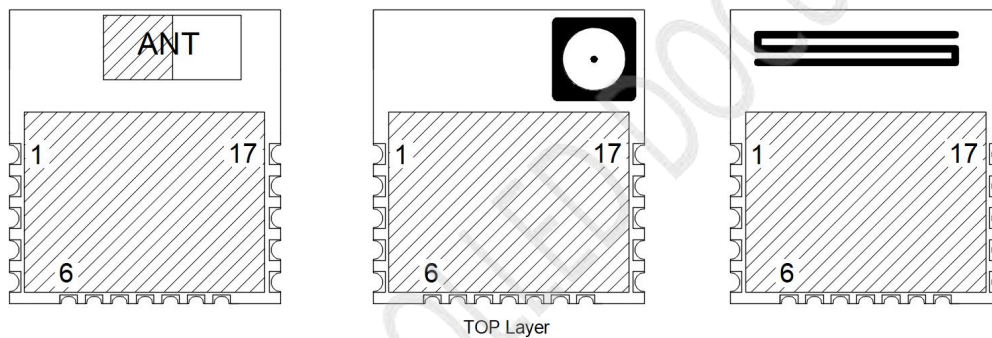


Figure 2.2: HJ-568IMH pins distribution diagram(front view)

2.5 Pins description table

Table 2-2: HJ-568IMH pins definition table

PIN	Name	Type	Description	Remarks
1	RST/GPIO	nReset Pin/IO	Low effective external reset Reset duration > 1s	The reset function can be disabled and it can be used as an ordinary IO; When used for reset, it should be connected to an external IO. If not connected, a 1k strong pull-up resistor must be added.
2	P04	IO	GPIO	Can be customized with other functions
3	P21 (Connection status indication in slave mode)	OUTPUT	Connection status indication in slave mode	The indicator pin for the connection status of the slave module 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.
4	P01	IO	GPIO	Can be customized with other functions
5	P05	IO	GPIO	Can be customized with other functions
6	P10 (BLE-TX)	OUTPUT	UART-TX	The serial port TX pin of the Bluetooth module (In transparent transmission mode, this pin serves as the serial port's TX pin and is connected to the RX pin of the MCU)

7	P00	IO	GPIO	Can be customized with other functionsan
8	P09 (BLE-RX)	INPUT	UART-RX	The serial port RX pin of the Bluetooth module (When in transparent mode, this pin serves as the serial port's RX pin and is connected to the TX pin of the MCU)
9	P08 (UART RECEIV E ENABLE)	INPUT	Serial port receive enable pin	Serial port receive enable pin When the external needs to send serial port data to the BLE module, first change this pin from high level 1 to low level 0 to enable serial port receive. After at least 1ms after changing to low level 0, send data to the serial port. (If power consumption is not considered, this pin can be kept low 0 all the time), after the data transmission is completed, pull this pin high 1 to save power consumption.
10	P02 (UART flow control RTS)	OUTPUT (UART RTS)	Serial port flow control RTS	BLE serial port flow control RTS output (Enables external serial port data transmission) After enabling flow control, when the RTS pin outputs a low level of 0, it allows the external device to send data to the Bluetooth; When the 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;
11	P03 (APP_DA TA_IND)	OUTPUT	APP data reception indicator	APP data reception indicator pin When the module receives data sent by the host or mobile phone, it will first raise this pin to maintain it at a high level for T1 (ms) (T1 can be set, with a range of 1-255ms, and the default is 20ms) before the data is output through the serial port. After the data transmission is completed, it will automatically become a low 0 level. Normally, this pin remaining at a low level represents an idle state. This pin is used as a wake-up signal for long connection low-power devices.
12	P07 (UART flow control CTS)	INPUT(U ART 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.
13	GND	Power Ground	Power GND	/
14	VCC	Power In	Power supply	DC1.71V ~ 3.6V
15	P06	IO	GPIO	Can be customized with other functionsan
16	P22 (APP enables control)	INPUT Down	Enable APP configuration	Enable APP configuration When the pin is changed from a low level 0 to a high level 1, it enables the mobile APP to send instructions to configure all parameters of the module. When the pin is changed from a high level 1 to a low level 0, it prohibits the mobile APP from configuring or reading the parameters of the module. By default, this pin is set to pull-down mode.
17	P23 (Host mode connectio n status indicator)	OUTPUT	Host connection status indicator	Host connection status indicator pin When the output is a high voltage level, the module has successfully connected to the external slave device; when the output is a low voltage level, the module has disconnected from the external slave device.

3 RF Features

The module is equipped with an onboard/ ceramic/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 BLE RF features

Table 3-1: RF features

Attribute	Value	Remarks
Wireless modulation mode	GFSK	/
Frequency range	2.402 ~ 2.480GHz	bandwidth: 2MHz
Number of channels	40	/
Air speed	1Mbps、2Mbps	/
Rf port impedance	50Ω	/
Transmission power	Max. +8dBm	/
Emission current	4mA (@0dBm,1Mbps); 15mA (@8dBm,1Mbps)	/
Receive current	TYP. 3mA	1Mbps
Receiving sensitivity	-98dBm (@1Mbps) -95dBm (@2Mbps)	/
Antenna	onboard/ceramic/external antenna	/

4 Electrical Parameters

4.1 Absolute Maximum Ratings

Table 4-1: Absolute Maximum Ratings

Parameter	MIN	MAX	Unit
VCC	1.7	3.7	V
IO Supply Voltage	0	VCC	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
VCC	1.71	3.3	3.6	V
IO Supply Voltage	0	3.3	VCC	V
Dormant working current	/	<2	/	μA
Maximum Operating Current	/	4.5	/	mA
Operating Temperature	-40	+25	+85	°C

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

IO Pin	Drive capability	Min	Max	Unit
Input low level	/	0	0.4	V
Input high level	/	1.8	VCC	V
Output low level	5mA	0	0.6	V
Output high level	5mA	1.8	VCC	V

Table 4-4: Electricity consumption

Test condition	TYP	Unit
sleep mode	<2	μA
Broadcast at 20ms interval in slave mode	505	μA
Broadcast in slave mode with 1S gap	9	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
Scan in host mode	5.1	mA
In host mode, the connection is maintained at a 20ms interval	150	μA

5 Notices for Hardware Design

- All IO ports can be used for connection.
- The module cannot be placed in a metal casing. If a metal casing is used, the antenna must be led out.
- The circuit board on each layer is fully copper-covered and connected to GND. Ensure that the copper-covered area is large enough (except for the antenna part), and ensure good grounding.
- For products installing this wireless module, metal components such as screws and inductors should be kept as far away as possible from the RF antenna part of the wireless module.
- Do not place other components on the antenna of the wireless module to prevent shielding from affecting the wireless performance.
- The wireless module should be placed on the sides of the motherboard as far as possible, and the antenna part should be close to the sides or corners of the motherboard. The motherboard PCB under the antenna of the module should be hollowed out with keepout layer. If can't hollow out, copper or cable should not be placed under the antenna, otherwise, the RF performance will be affected.
- Please pay attention to checking the pin diagrams for all pins, and for the IOs connected to them, please pay attention to the IO mode and status.
- For input power that is not battery-powered and is powered by a mains power supply, it is recommended to use a magnetic bead or inductor for filtering.

6 Machine Dimension

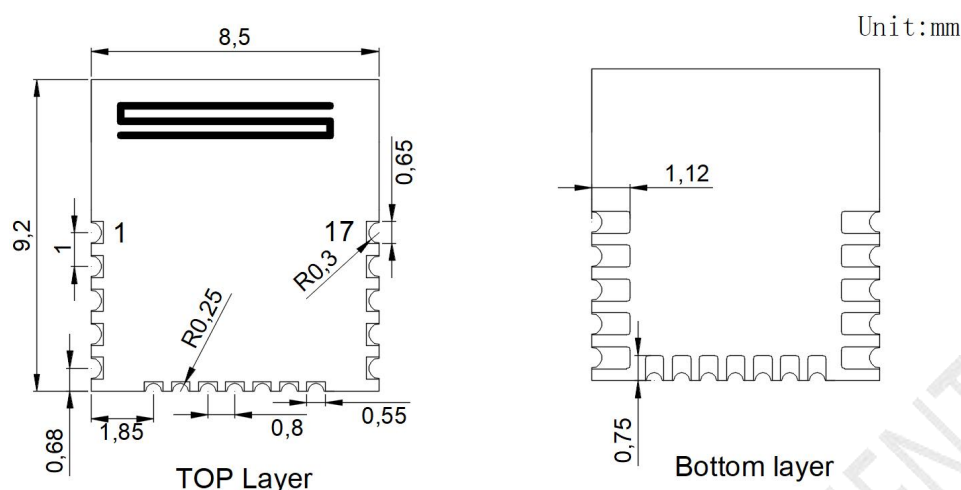


Figure 6.1:HJ-568IMH dimension

Note:

The mechanical dimension of different types of antenna modules are the same.

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-580XP 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($T_{S\max}$ to T_p)	max3°C/sec. max
Temperature Min($T_{S\min}$)	150°C
Temperature Max($T_{S\max}$)	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

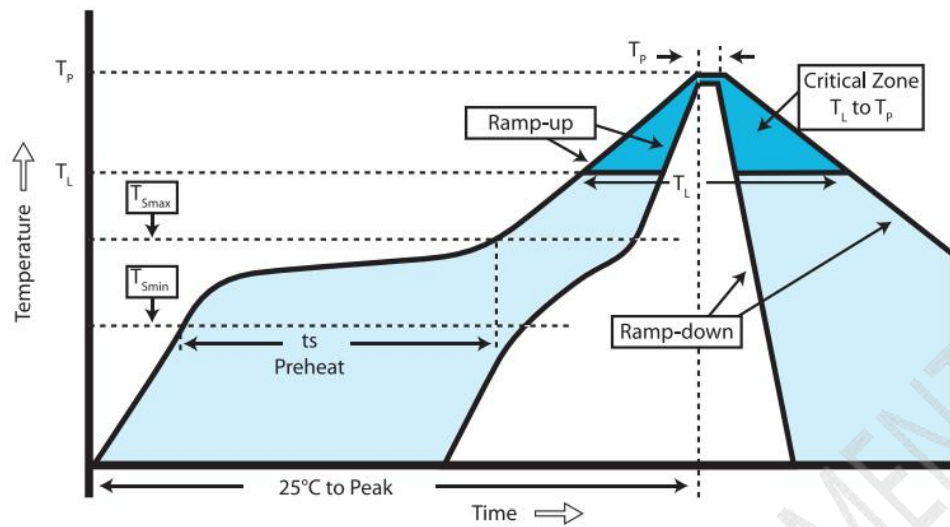


Figure 7.1: Temperature Curve of Reflow Welding

7.3 Humidity sensing properties

The HJ-568IMH module has a humidity sensitivity of level 3.

If any of the following two conditions are met, the HJ-568IMH 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
HJ-568IMH_XX	Roll tape

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

FCC Statements

(OEM) Integrator has to assure compliance of the entire end-product incl. the integrated RF Module. For 15 B (§15.107 and if applicable §15.109) compliance, the host manufacturer is required to show compliance with 15 while the module is installed and operating.

Furthermore the module should be transmitting and the evaluation should confirm that the module's intentional emissions (15C) are compliant (fundamental / out-of-band). Finally the integrator has to apply the appropriate equipment authorization (e.g. Verification) for the new host device per definition in §15.101.

Integrator is reminded to assure that these installation instructions will not be made available to the end-user of the final host device.

The final host device, into which this RF Module is integrated has to be labeled with an auxiliary label stating the FCC ID of the RF Module, such as "Contains FCC ID: 2AGPM-HJ568IMH".

The Integrator will be responsible to satisfy SAR/ RF Exposure requirements, when the module integrated into the host device.

Module statement

The single-modular transmitter is a self-contained, physically delineated, component for which compliance can be demonstrated independent of the host operating conditions, and which complies with all eight requirements of § 15.212(a)(1) as summarized below.

- 1) The radio elements have the radio frequency circuitry shielded.**
- 2) The module has buffered modulation/data inputs to ensure that the device will comply with Part 15 requirements with any type of input signal.**
- 3) The module contains power supply regulation on the module.**
- 4) The module contains a permanently attached antenna.**
- 5) The module demonstrates compliance in a stand-alone configuration.**
- 6) The module is labeled with its permanently affixed FCC ID label.**
- 7) The module complies with all specific rules applicable to the transmitter, including all the conditions provided in the integration instructions by the grantee.**
- 8) The module complies with RF exposure requirements.**

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio

frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help

This device complies with part 15 of the FCC rules. Operation is subject to the following two conditions:

- 1) this device may not cause harmful interference, and
- 2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Warning

Integration instructions for host product manufacturers according to KDB 996369 D03
OEM Manual v01

2.2 List of applicable FCC rules

FCC Part 15.247

2.3 Specific operational use conditions

This transmitter/module and its antenna(s) must not be co-located or operating in conjunction with any transmitter. This information also extends to the host manufacturer's instruction manual.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

It is "not applicable" as trace antenna which is not used on the module.

2.6 RF exposure considerations

This device and its antenna(s) must not be co-located or operation in conjunction with any other antenna or transmitter.

The device has been evaluated to meet general RF exposure requirement in portable exposure condition without restriction. The host product manufacturer would provide the above information to end users in their end-product manuals.

2.7 Antennas

Antenna 1: Ceramic Antenna with max peak gain 2.12dBi

Antenna 2: PCB Antenna with max peak gain 1.35dBi

Antenna 3: FPC Antenna with max peak gain 2.91dBi

Antenna 4: Rod Antenna (HJ2400-BA261001TQ) with max peak gain
2.61dBi

Antenna 5: Rod Antenna (HJ2400-XLJ261001WQ) with max peak
gain 3.04dBi;

2402 - 2480 MHz

2.8 Label and compliance information

The end product must carry a physical label or shall use e-labeling followed KDB 784748 D01 and KDB 784748 stating "Contains Transmitter Module FCC ID: 2AGPM-HJ568IMH.

2.9 Information on test modes and additional testing requirements

For more information on testing, please contact the manufacturer.

2.10 Additional testing, Part 15 Subpart B disclaimer

The modular transmitter is only FCC authorized for the specific rule parts (FCC Part 15.247) listed on the grant, and that the host product manufacturer is responsible for compliance to any other FCC rules that apply to the host not covered by the modular transmitter grant of certification. The final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed when contains digital circuitry.

2.11 Note EMI Considerations

Note that a host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional non-compliant limits due to module placement to host components or properties

2.12 How to make changes

Since only Grantees are permitted to make permissive changes, it is recommended that module manufactures provide contact information and some guidance to host providers in the integration instructions if they expect their module will be used differently than granted.