

HJSIP®

HJ-802IMH_Hardware Design Manual

Based on Nordic nRF51802/nRF51822

17.4x22.7mm

Low power consumption BLE4.2 module

Version: V1.3

Date: 2026/06/29

Version:	V1.3
Date:	2026/06/29
State:	published

Preface

Thanks for using the Bluetooth module provided by HJSIP. HJ-802IMH series standard Bluetooth module, is a high-performance iot Bluetooth transceiver. The module is packaged with a stamp port and supports an onboard PCB antenna and an external antenna. The product also has the characteristics of low power consumption, small size, strong anti-interference ability, etc., 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	2019/10/22	Initial Version	LMY	LJH
V1.1	2023/11/10	Update pages	FJW	LMY
V1.2	2025/03/10	1) Unified manual format; 2) Update 6 mechanical dimensions drawing; 3) Update 8.2 Label Information. 4)Module selection remove "Serial port transparent wechat version"	WYW	LMY
V1.3	2026/06/29	Added contact information.	WYW	LMY

Applicable module selection

No.	Module type	Type	Description
1	HJ-802IMH_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-802IMH_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-802IMH_EMP	Customer development version	Provide standard SDK to facilitate customers' secondary development of OPEN CPU.

Note:

The above three models are based on the chip NRF51802;

If based on NRF51822, add a note (NRF51822) to the above three models, that is, HJ-802IMH_XXXX (NRF51822).

1 Introduction

HJ-802IMH series standard Bluetooth module, is a high-performance iot Bluetooth transceiver. The module is packaged with a stamp port and supports an onboard PCB antenna and an external antenna. The product also has the characteristics of low power consumption, small size, strong anti-interference ability, etc., suitable for a variety of application scenarios.

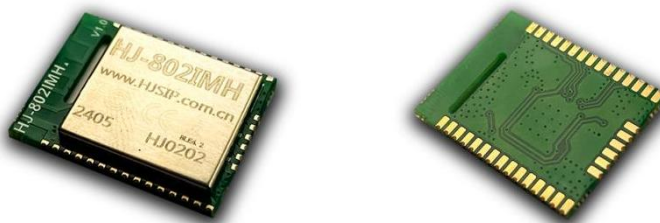


Figure 1.1: HJ-802IMH Top and bottom view

2 Product overview

2.1 Key features

Table 2-1: HJ-802IMH key characteristics

Characteristic	Description
Function	- Supports BLE 5.4, embedded Bluetooth Low Energy stack and GATT services - Support BLE Master slave integration (master slave work at the same time, do not affect each other) - Support transparent transmission, or no program module for customers to develop firmware
RF characteristics	- The operating frequency is 2.4GHz, which supports the ISM free band - Transmit power:-20~+4dBm - High receiving sensitivity: -91dBm - Transmit and receive peak current: TX 10.5mA@0dBm, RX 13mA - Built-in high-performance antenna (external antenna available as well) - Wireless transmission distance of onboard antenna in open area: 30~50m
Size	17.4mm * 22.7mm (Includes onboard antenna)
Package	Stamp hole pad, pin spacing 1.27mm
Weight	2.5g
supply voltage	1.8V~3.6V
power consumption	- Sleep current < 2uA - 1-second interval broadcast current 28uA - 2-second interval broadcast current 17uA
Operation Temperature	-40 ~ +85°C
Storage Temperature	-40 ~ +85°C
GPIO Port	31 ↑ (Max)
Product standards	Compliant with 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

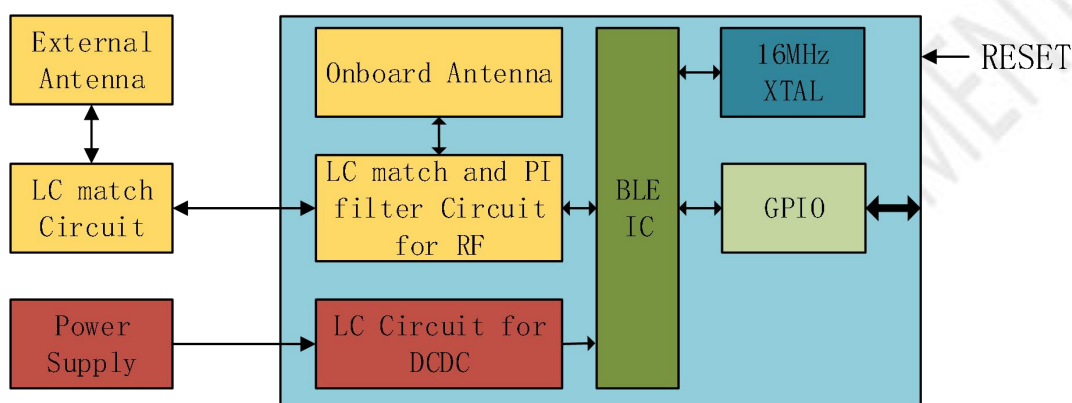


Figure 2.1: HJ-802IMH functional block diagram

2.4 Pins distribution diagram

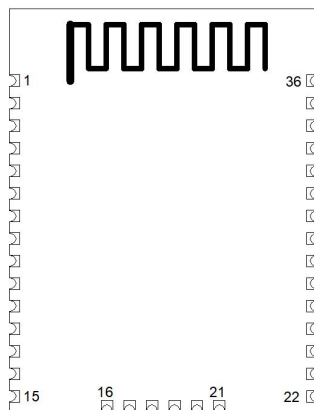


Figure 2.2: HJ-802IMH Pins distribution diagram(front view)

2.5 Pins description table

Table 2-2: HJ-802IMH Pins definition table

PIN	Name	Type	Description	Remarks
1	GND	Ground	Power GND	/
2	EX-ANT	RF out	RF output	If you are using an external antenna, please contact our company in advance. Additionally,

				a PI circuit must be added to achieve the best antenna performance.
3	VCC_NRF	POWER INPUT	Power supply	DC1.8V ~ 3.6V
4	P21	IO	GPIO	/
5	P22	IO	GPIO	/
6	P23	IO	GPIO	/
7	P24	IO	GPIO	/
8	P25	IO	GPIO	/
9	XL2/P26	LF_XO P	32.768K input/GPIO	<u>By default, the internal 32768Hz crystal oscillator is not connected. If you need it, please make a special declaration for its addition.</u>
10	XL1/P27	LF_XO N	32.768K output/GPIO	<u>By default, the internal 32768Hz crystal oscillator is not connected. If you need it, please make a special declaration for its addition.</u>
11	P28	IO	GPIO	/
12	P29	IO	GPIO	/
13	P30	IO	GPIO	/
14	P00	IO	GPIO	/
15	P01	IO	GPIO	/
16	P02	IO	GPIO	/
17	P03	IO	GPIO	/
18	P04	IO	GPIO	/
19	P05	IO	GPIO	/
20	P06	IO	GPIO	/
21	P07	IO	GPIO	/
22	P08	IO	GPIO	/
23	P09	IO	GPIO	/
24	P10	IO	GPIO	/
25	P11	IO	GPIO	/
26	P12	IO	GPIO	/
27	P13	IO	GPIO	/
28	P14	IO	GPIO	/
29	P15	IO	GPIO	/
30	P16	IO	GPIO	/
31	SWDIO/ nRSET	Debug Port	Simulation debugging download data / external reset	System reset (low level valid). Also supports hardware debugging operations.
32	SWCLK	Debug Port	Programming debugging interface clock	-
33	P17	IO	GPIO	/
34	P18	IO	GPIO	/
35	P19	IO	GPIO	/
36	P20	IO	GPIO	/

3 RF Features

The module can be configured in two modes: onboard antenna and external antenna.

The onboard antenna will be used by default; if you connect an external antenna, please contact us in advance. To achieve the best antenna effect, it must be connected through the PI circuit.

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 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、250kbps	/
Rf port impedance	50Ω	/
Transmission power	Max. +4dBm	/
The peak current of TX	TYP. 10.5mA	@0dBm
The peak current of RX	TYP. 13mA	/
Receiving sensitivity	TYP. -91dBm	/
antenna	Onboard antenna	Can also be connected to an external antenna

4 Electrical Parameters

4.1 Absolute Maximum Ratings

Table 4-1: Absolute Maximum Ratings

Parameter	MIN	MAX	Unit
supply voltage VCC	1.8	3.9	V
IO Supply Voltage	0	VCC+0.3	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 VCC(LDO)	1.8	3.3	3.6	V
Supply voltage VCC(DCDC)	2.1	3.3	3.6	
I/O port Voltage	0	3.3	VCC	V
Dormant working current	/	<2.0	/	uA
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	0.3*VCC	V
Input high level	/	0.7*VCC	VCC	V
Output low level	0.5mA/5mA	0	0.3	V
Output high level	0.5mA/5mA	VCC-0.3	VCC	V

Note:

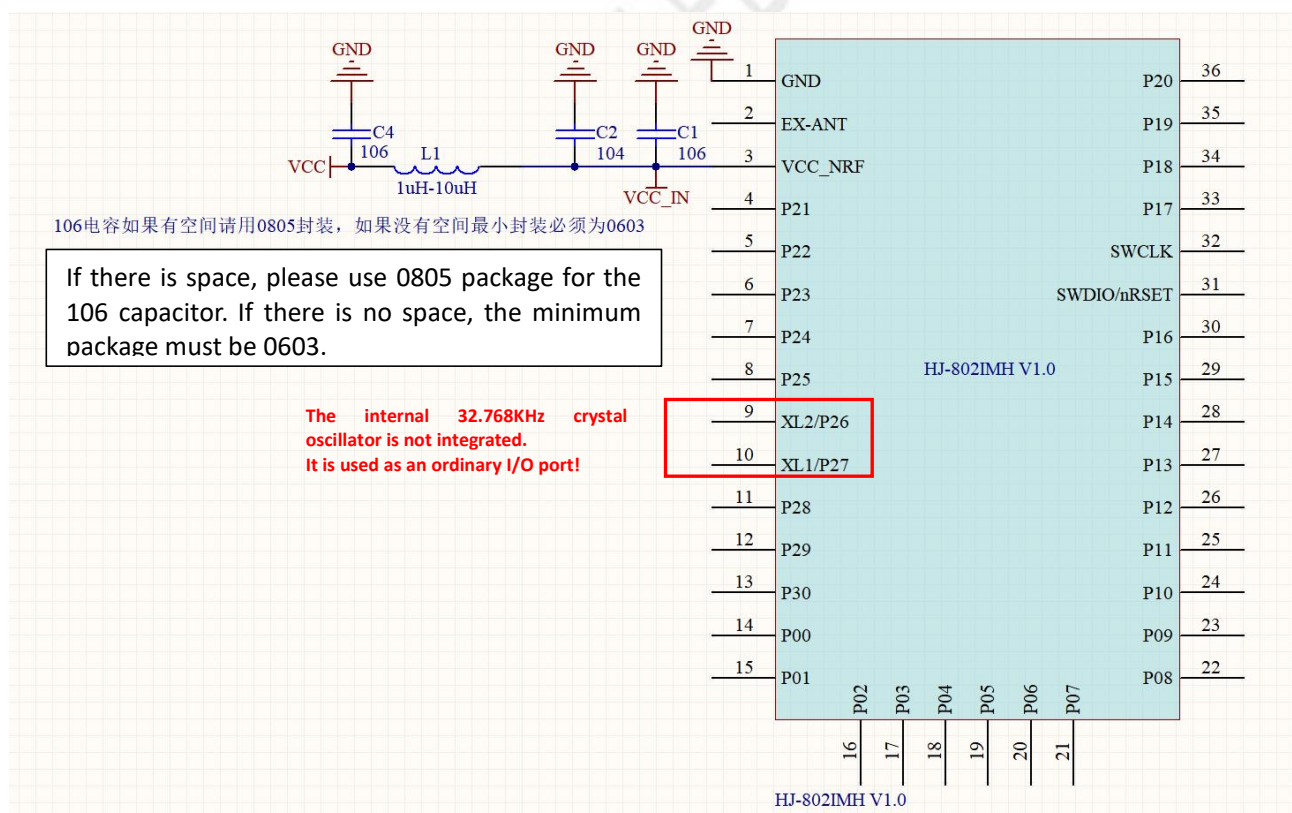
The maximum number of pins driven by 5mA is 3.

Table 4-4: Electricity consumption

Test condition	TYP	Unit
sleep mode	<2.0	uA
Broadcast at 20ms interval in slave mode	150	uA
Broadcast in slave mode with 1S gap	28	uA
Maintain the connection in slave mode with a 20ms connection gap	380	uA
Scan in host mode	14	mA
In host mode, the connection is maintained at a 20ms interval	400	uA

5 Reference Design

5.1 Reference design figure

**Figure 5.1: HJ-802IMH reference design figure**

Tip: Pins that are not needed can be suspended.

5.2 Notices for Hardware Design

- The module should not be placed in a metal casing. If a metal casing is used, the antenna must be led out.
- For products equipped with this wireless module, some metal components, such as screws and inductors, should be kept as far away as possible from the RF antenna part of the wireless module.
- On the wireless module antenna, try to avoid placing other components to prevent obstruction and interference with the wireless performance.
- The copper foil on each layer of the circuit board should be fully covered and connected to GND, and ensure that the copper foil area is large enough (except for the antenna part), and be well grounded.
- As many vias as possible should be drilled in the copper-covered area of the entire circuit board, especially near the module and the antenna.
- The wireless module should be placed as close as possible to the four edges of the main board, with the antenna part close to the edge or corner of the main board. The PCB under the module antenna should be annotated with keepout layer to be hollowed out. If it cannot be hollowed out, copper plating or wiring is not allowed under the antenna, otherwise it will affect the RF performance.
- Please pay attention to checking the pin diagrams for all pins, and for the connected IOs, please pay attention to the IO mode and status.
- For non-battery-powered input power supply or power supply with voltage reduction from the mains, it is recommended to use magnetic beads or inductors for filtering.

6 Machine Dimension

Size: 17.4mm*22.7mm; Pad spacing: 1.27mm。

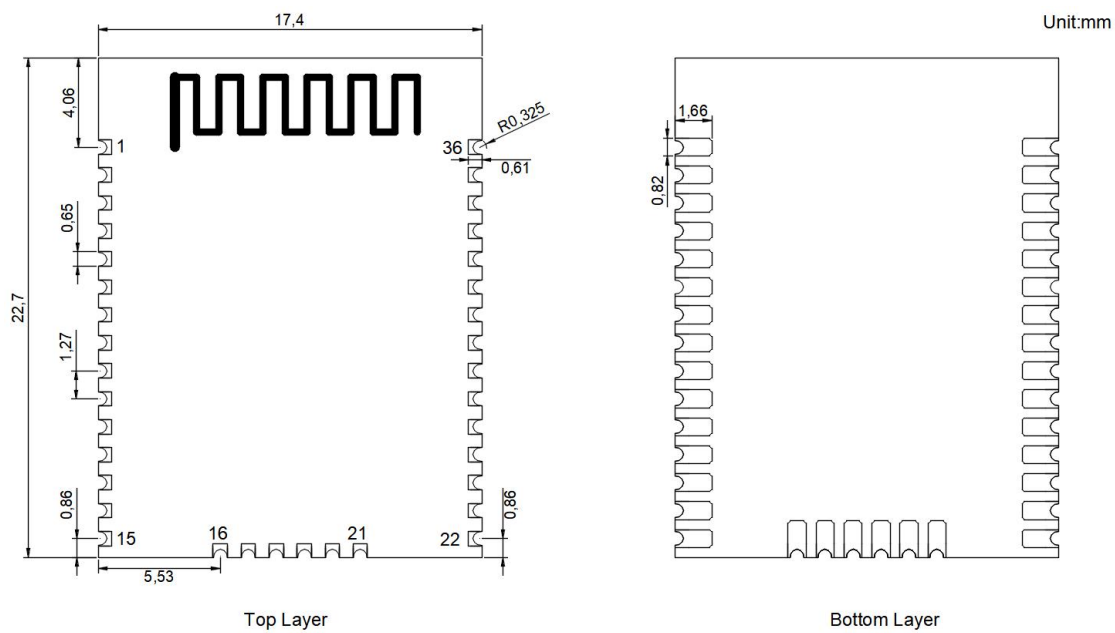


Figure 6.1: HJ-802IMH dimension

7 SMT production

7.1 Precautions for ultrasonic welding

Warning:

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-802IMH 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

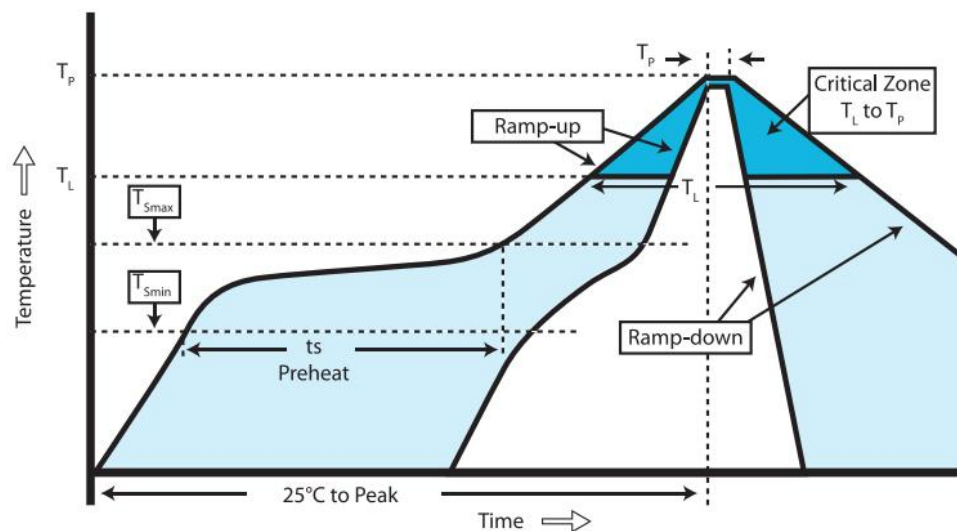


Figure 7.1: Temperature Curve of Reflow Welding

7.3 Humidity sensing properties

The HJ-802IMH module has a humidity sensitivity of level 3.

If any of the following two conditions are met, the HJ-802IMH 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	Minimum packing quantity(PCS)
HJ-802IMH-XX	Roll tape	750

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

Appendix 1: BQB Certification



Project Details

Project Name	Bluetooth 4.2 ultra-low power module (HJ-802IMH)
Product Type	End Product
TCRL Version:	TCRL 2019-2
Referenced Qualified Design(s)	
Previously Qualified Design Used in this Qualification(s)	144374 144724
Listing Date	2020-10-21
Declaration ID	D052148
Product Listing(s)	

Name	Website	Category	Publish Date	Model Number	Description
HongJia Bluetooth 4.2 ultra-low power module		Unique Products	10/21/2020 12:00:00 AM	HJ-802IMH	Bluetooth 4.2 ultra-low power module
HongJia Bluetooth 4.2 ultra-low power module		Unique Products	10/21/2020 12:00:00 AM	HJ-801IMH	Bluetooth 4.2 ultra-low power module
HongJia Bluetooth 4.2 ultra-low power module		Unique Products	10/21/2020 12:00:00 AM	HJ-803IMH	Bluetooth 4.2 ultra-low power module
HongJia Bluetooth 4.2 ultra-low power module		Unique Products	10/21/2020 12:00:00 AM	HJ-805IMH	Bluetooth 4.2 ultra-low power module

Member Company	Tangshan HongJia electronic technology co., LTD.
Declaring Member Contact / Listing Contact Person	
Name	Ying Liu
Address	352 No. 2# building power springs in Qianxi County, Tangshan City, Hebei Province
City	
State	
Country	China
Postal Code	

Appendix 2: FCC Certification

TCB

GRANT OF EQUIPMENT
AUTHORIZATION
Certification
Issued Under the Authority of the
Federal Communications Commission
By:

TCB

Eurofins Product Service GmbH
Storkower Strasse 38c
D-15526 Reichenwalde,
Germany

Date of Grant: 11/06/2020
Application Dated: 11/06/2020

Tangshan HongJia electronic technology co., LTD.
352 No. 2 # building power springs in Qianxi
County, Tangshan City, Hebei Provin
Tangshan,
China

Attention: Liu Ying

NOT TRANSFERABLE

EQUIPMENT AUTHORIZATION is hereby issued to the named GRANTEE, and is VALID ONLY for the equipment identified hereon for use under the Commission's Rules and Regulations listed below.

FCC IDENTIFIER: 2AGPMHJ-802IMH
Name of Grantee: Tangshan HongJia electronic technology co., LTD.
Equipment Class: Digital Transmission System
Notes: Bluetooth 4.2 ultra-low power module
Modular Type: Single Modular

Grant Notes

FCC Rule Parts
15C

Frequency
Range (MHZ)
2402.0 - 2480.0

Output
Watts
0.00026

Frequency
Tolerance

Emission
Designator

Power listed is conducted. Singular Modular Approval. Compliance of this device in all final host configurations is the responsibility of the Grantee. OEM integrators and end-users must be provided with specific operating instructions for satisfying RF exposure compliance. OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. SAR evaluation is valid for portable applications with a minimum distance of 5mm to human bodies.

Appendix 3: CE Certification

			
EU – TYPE EXAMINATION CERTIFICATE RADIO EQUIPMENT DIRECTIVE 2014/53/EU Annex III Module B			
MANUFACTURER			
Name	:	Tangshan Hongjia electronic technology Co., LTD.	
Address	:	352 No. 2 # building power springs in Qianxi County, Tangshan City, Hebei Province	
Contact Name & Title	:	Liu Jia	
Email	:	liujia@tshjdz.com	
Phone number	:	18513587805	
PRODUCT DESCRIPTION			
Trademark/Trade Name	:	Hongjia	
Model Number	:	HJ-802IMH, HJ-801IMH, HJ-803IMH, HJ-805IMH	
Product Description	:	Bluetooth 4.2 ultra-low power module	
NOTIFIED BODY			
Certificate issued by	:	Notified Body 1177, TIMCO Engineering, Inc.	
Certificate number	:	1177-200544	
Name and Signature	:	Bruno Clavier	Date: November 10, 2020
The device shall be marked as follows: CE Based on the evidence presented in the Technical Documentation, TIMCO Engineering, Inc., as appointed Notified Body, has issued this EU-Type Examination Certificate in accordance with Annex III Module B. The product described appears to be in conformity with the essential requirements Article 3.1(a), 3.1(b), and 3.2 of RED 2014/53/EU. This certificate relates only to the documents as provided to Timco Engineering, Inc. and is valid up to (1) the date of cessation of presumption of conformity of any of the superseded standards which were used for testing this product and assessed by Notified Body or (2) the date of modifications to the approved type that may affect the conformity of the apparatus with the essential requirements of this Directive or the conditions for validity of that certificate, whichever comes first.			
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