HJ-185IMH

Ultra-small Chip (5mm*5.5mm), ultra-low power Bluetooth 5.1 module

DataSheet version: V1.1

Based on NRF52810

TangShan HongJia Electronic Technology Co., Ltd.

目录

1 Version History

Table 1-1 Revision History

No.	Version Number	Release Time	Reviser	Checker	Description
1	V1.0	20190905	LMY	LJH	First edition

2 Overview

2.1 Features

●Power supply: 1.7V~3.6V

●GPIO maximum number: 17

●Built-in high performance antenna(External antenna can also be used)

●Function

  - Support BLE 5.1, embedded Bluetooth low energy protocol stack and GATT service

  - BLE supported master-slave integration(Support 1 slave and 1 host. Host and slave work at the same time without affecting each other)

  - Supported standard edition of UART transparent transmission, supported WeChat, MiSDK. You also can develop your own firmware and download to the unprogrammed module.

●RF Features

  - Operating Frequency: 2.4GHz, Support ISM free Frequency band

  - Transmit Power: -20dBm ~ +4dBm

  - High Receive sensitivity: -96dBm

  - Peak Current at Transmitting and Receiving ＜4.6mA

  - On the open land and use built-in antenna, the transmission distance of wireless signal can spread more than 10 metres and less than 20 metres.

  - On the open land and use external antenna, the transmission distance of wireless signal can spread more than 40 metres and less than 80 metres.

●Low Power Dissipation

  - Dormant current＜2μA

  - One second broadcast current: 12.2μA(0dBm)or 15.5μA(+4dBm)

  - Two second broadcast current: 6.5μA

●Package: LGA24, pad spacing: 0.75mm and 0.8mm

●Size: 5mm*5.5mm*1.3mm(Built-in antenna inside)

●Weight: 0.10g

●Operating temperature range: -40 ~ +105℃(Maximum temperate limit +120℃)

●RoHS compliant

3 Hardware specification

3.1 Package and dimensions

The package of HJ-185 IMH is LGA24, welding pad spacing is 0.75 mm transversely and 0.8 mm longitudinally. Detailed dimensions are shown in the figure 3-1, 3-2, 3-3, 3-4.
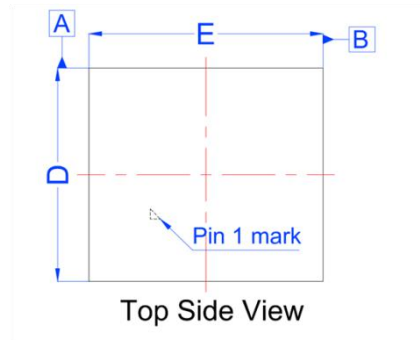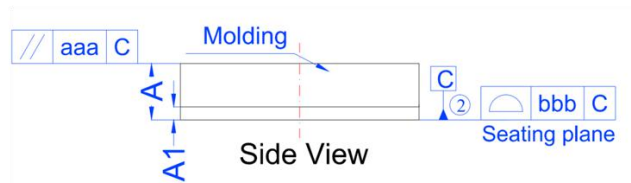

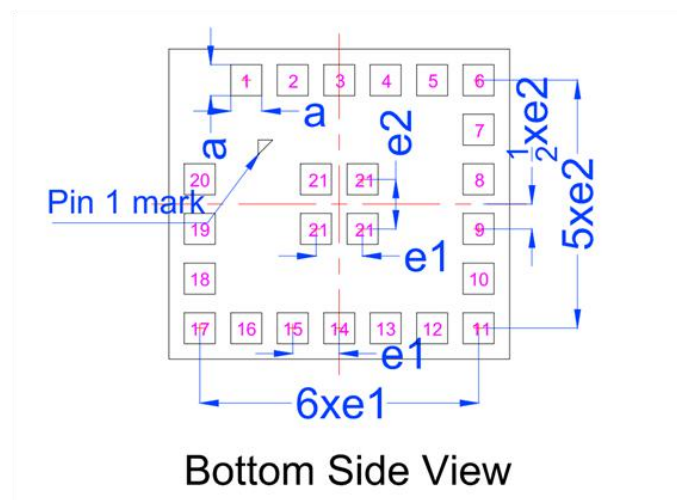Figure 3-1 Top view

Figure 3-2 Side view

Figure 3-3 Bottom view

DIMENSIONAL REFERENCES   Units:mm

SYMBOL	DIMENSIONAL REQMTS			SYMBOL	Tolerance of Form &Position
	MIN	NOM	MAX	aaa	0.10
A	1.26	1.30	1.34	bbb	0.10
A1	0.27	0.30	0.33		
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 3-4 Dimensions picture

3.2 Pin Definition

Table 3-1 Pin definition table

Pin	Name	Type	Description	Functions of transparent transmission mode
1	SWDCLK	INPUT	Clock Line of SWD Interface	
2	NC			
3	P0.14	IO	general purposed io port	**Host Connection Status Indicator Pin** When this pin's output is high level, the module has been successfully connected to the external slave. When this pin's output is low level, the module has disconnected from the external slave.
4	P0.12	IO	general purposed io port	**BLE-TX Pin** In the transparent transmission mode, this pin is the TX pin of the serial port, which is connected to the RX pin of the MCU.
5	P0.05/AIN3	IO/AI	general purposed io port/Analog input 3	**BLE-RX Pin** In the transparent transmission mode, this pin is the RX pin of serial port, which is connected to the TX pin of the MCU.
6	P0.04/AIN2	IO/AI	general purposed io port/Analog input 2	**Slave Connection Status Indicator Pin** When this pin's output is high level, the module as slave has been successfully connected by the mobile phone. When this pin's output is low level, the module as slave has been disconnected by the mobile phone.
7	VCC_IN	POWER INPUT	Power input port, supply volrage: DC1.7V ~ 3.6V	

8	NC			
9	P0.01/XL2	IO/LF_XO P	general purposed io port/external 32.768KHz crystal input port	**Serial Port Receiving Function Enabling Pin (Can Be Set, The Default Is Active Low)** When the setting is active low, P0.01=0, serial port receiving function enabled. At this time, the module works at full speed. It can send instructions or transmit data in transparent transmission mode.The current consumption of the module will be up 300-400μA ; P0.01=1, the serial port receiving function has been disabled. Module working in low power mode. If you broadcast once a second, the current consumption of the module will be less than 15μA. If the broadcast is stopped, the current consumption of the module will be less than 2μA. When the setting is active high, P0.01=1, serial port receiving function enabled;P0.01=0, the serial port receiving function has been disabled.
10	P0.00/XL1	IO/LF_XO N	general purposed io port/external 32.768KHz crystal input port	**APP Receiving Data Indicator Pin** When the module receives the data sent by the mobile APP or the external device which connected to the module, the BLE module needs to send data through the TX pin of the module's serial port. Whether the module is a host or slave, this pin is raised T1 before data is sent out through the TX pin of the module's serial port, and this pin can be lowered only after data is sent out. T1 is a parameter, it can be set 1~255, It's in milliseconds. Usually this pin keeps a low level to represent idleness. This pin is used as a wake-up sign for long-time connections to low-power devices.
11	NC			
12	NC			
13	NC			
14	P0.16	IO	general purposed io port	**App's Configuration Function Enable Pin** When this pin is input to a high level, module allows APP to send instructions to configure all parameters of the module. When this pin is input to low level, it is forbidden for APP to configure or read the parameters of the module.

				The default input mode for this pin is Pulldown.
15	P0.18	IO	general purposed io port	**Transmit Path Selection Pin for Data Received by Serial Port** Assuming that the module has been connected to the slave. When this pin is input at high level, the data received by the module from the serial port is sent to the connected slaves. When this pin is input at low level or not connected, the data received by the module from the serial port is sent to the host or mobile APP which connected to module. When the module is not connected to the external slave, no matter what the state of this pin is, the data is sent to the host or mobile APP which connected to the module.
16	P0.21/nRESET	IO/Reset Pin	general purposed io port/External reset pin(Active low)	This pin function can be selected by an instruction. (Check the software manual for details.) **At the host mode, successful flag for writing data with feedback response** When sending data to slave devices which has the function of sending data with feedback response, if P0.04=0, the slave is idle at this time, and the module can continue to send data. If P0.04=1, data is being sent, you need to wait until P0.04=0 to send the next data. **External reset pin(Active low)** If reset is required, this pin needs to be kept at least 10 ms low.
17	SWDIO	Debug Port	Input and Output Ports of SWD Interface	
18	P0.20	IO	general purposed io port	**the Control Pin of Whether the Slave Can Enter the Simple Matching Mode** When this pin is input to high level, then the slave enter the simple matching mode, the HJ-185IMH can binding this slave. When this pin is input to low level, then the slave exit the simple matching mode.
19	EXT-ANT	EXT ANT RF OUTPUT	Interface of External Antenna, it can realize the output of	

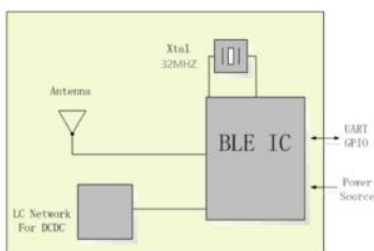| 20	OB-ANT	Onboard ANT	On-board antenna input port	If you want to use a On-board antenna, Short-circuit the Pin19 and Pin20.
21	GND	Ground	power ground	

3.3 Internal Structure

Figure 3-5 HJ-185IMH internal structure frame

3.4 Reference Design

3.4.1 Utilizing the Internal 32.768KHz Low Frequency Clock

(1)The connection method of using internal antenna
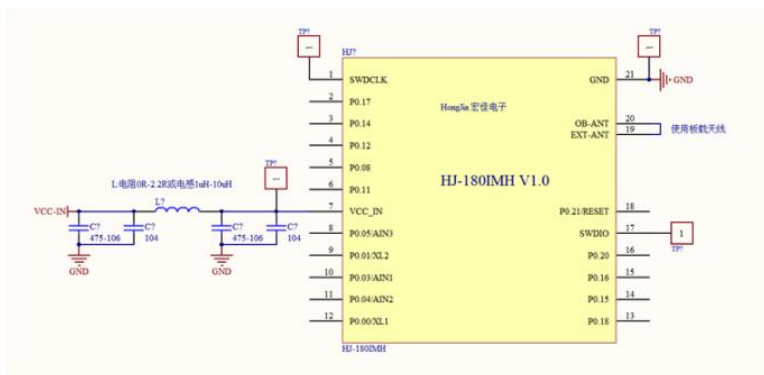

Figure 3-6 Use internal clocks and antennas

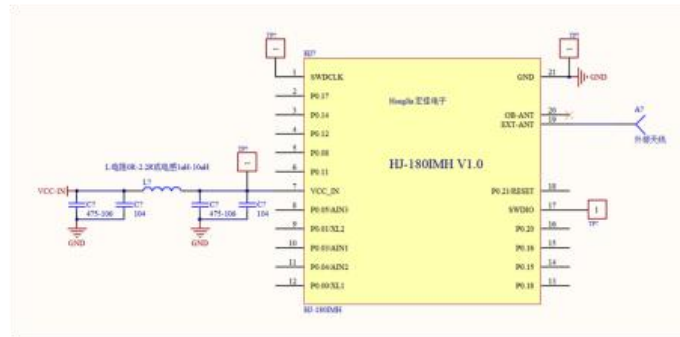**(2)The connection method of using external antenna**

Figure 3-7 Use internal clocks and external antennas

3.4.2 Utilizing External 32.768KHz Low Frequency Clock

Simply connect XL1 and XL2 to external clock on the basis of the two design schemes shown in Section 3.4.1. As shown in Figure 3-8.
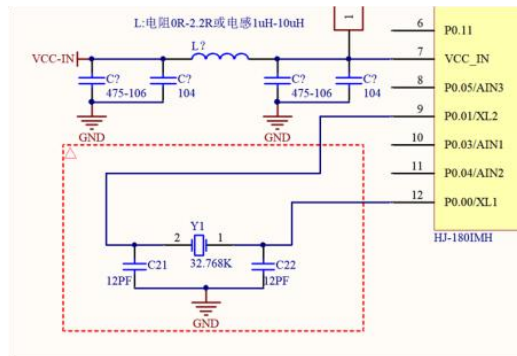
Figure 3-8 Use External clocks

3.4.3 Notices for Hardware Design

A. All I/Os can be used.

B. PI filter is added to the power input. L? can be selected to resistance or inductance. When space is limited, L? can also be omitted. A 475-106 µF capacitor can be directly connected in parallel with the outside.

C. The TP? is the test points, if necessary, add it.

D. When using external antenna, you must contact our company to confirm whether the PCB design of your external PCB antenna or IPEX extraction antenna is reasonable.

E. External 32.768KHz low frequency crystal oscillation is not necessary, an internal LF oscillator can be used instead, simply modify the SDK, it can be used. Consult us if you have any questions.

3.4.4 Matters needing attention in the use of products

A. The module should not be placed in a metal-based enclosure. If a metal enclosure is required, the antenna must be taken out.

B. Among the products that need to install this wireless module, some metal materials such as screws, inductors, etc. should be kept away from the RF antenna part of the wireless module.

C. On the wireless module antenna, Do not place other components. Because other components can degrade wireless performance.

D. The wireless module should be placed on the four sides of the motherboard as much as possible. The antenna part should be close to the side or corner of the motherboard. The motherboard PCB under the module antenna should be hollowed out with the keepout layer. If the request cannot be hollowed out, no copper or trace is allowed under the antenna. Otherwise it will affect RF performance.

E. Please pay attention to the pin diagram for all pins. Please pay attention to the IO mode and status of the IO connected to it.

F. GND must be sound grounding.

G. It is recommended that magnetic beads or inductance filters be applied to the input power supply.

4 Electrical Parameters

4.1 Absolute Maximum Ratings

Table 4-1 Absolute maximum ratings

Parameter	MIN	MAX	Unit
Power Supply Voltage (VCC)	1.7	3.6	V
IO Supply Voltage	0	VCC	V
Operating Temperature	-45	+120	℃
Storage Temperature	-55	+135	℃

4.2 Recommended Operating Conditions

Table 4-2 Recommended operating conditions

Parameter	MIN	TYP	MAX	Unit
Power Supply Voltage (VCC)	1.8	3.3	3.6	V
IO Supply Voltage	0	3.3	VCC	V
Dormant working current		<2		μA
Maximum Operating Current		5		mA
Operating Temperature	-40	+25	+85	℃

4.3 I/O DC Characteristics

Table 4-3 I/O DC Characteristics

I/O Pin	Driving Capability	MIN	MAX	Unit
Input low voltage		0	0.4	V
Input high voltage		0.7	VCC	V
Output low voltage	5mA	0	0.6	V
Output high voltage	5mA	3.3	VCC	V

4.4 RF Features

Table 4-4 RF Features

Attribute	Value	Remarks
Modulation	GFSK	
Frequency range	2.402 ~ 2.480Ghz	Bandwidth: 2Mhz
Number of channels	40	
Air speed	1Mbps、2Mbps	
RF Port Impedance	50Ω	
Transmit Power	MAX: +4dbm	
TX Current consumption	TYP: 4.6mA	
RX Current consumption	TYP: 4.6mA	
Receive sensitivity	TYP: -96dbm, MAX: -97dbm	
Antenna	Onboard PCB Antenna	External antenna can be used

4.5 Power Dissipation

Table 4-5 Power Dissipation

Test conditions	TYP	Unit
Dormancy mode	<2	μA
20ms Interval Broadcasting in Slave Mode	705	μA
1S Interval Broadcasting in Slave Mode	13.5	μA
20ms Connection Gap Holding Connection in Slave Mode	138	μA
7.5ms Connection Gap Holding Connection in Slave Mode	350	μA
Scanning in Host Mode	4.4	mA
20ms Connection Gap Holding Connection in Host Mode	150	μA

5 Reflow Soldering Information

Reflow soldering is recommended for welding.

HJ-185IMH module use high temperature resistant materials, manufacturing by Lead-free Process. The maximum temperature resistance is 265℃. Ten continuous reflow soldering has no effect on properties and strength. Specific parameters as shown in Table 5-1.

Table 5-1 Reflow soldering parameters

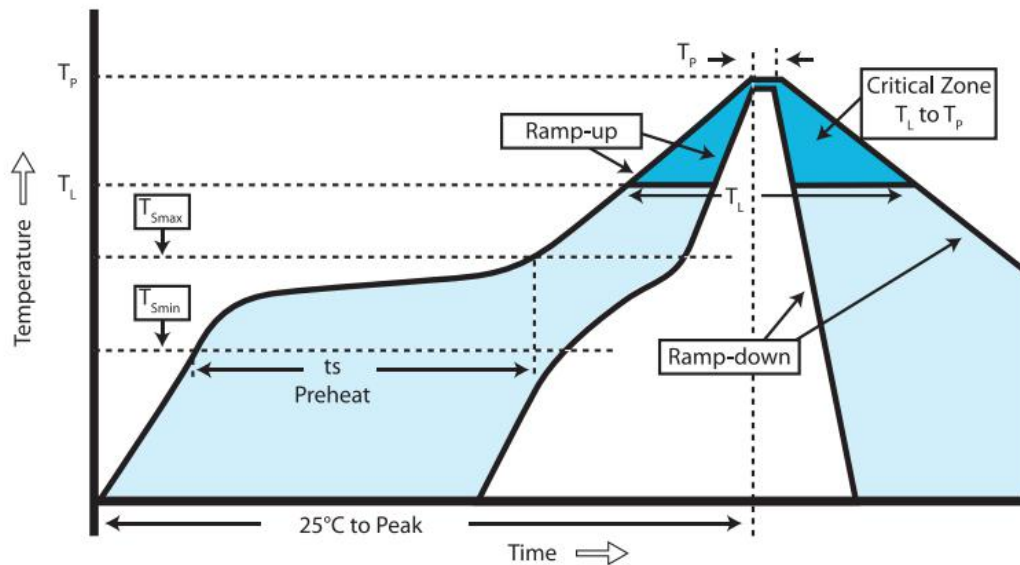| Parameter	Value
Features	Lead-free process
Average ramp up rate(T_{SMAX} to Tp)	3℃/sec. max
Temperature Min($T_S$min)	150℃
Temperature Max(TSmax)	200℃
Preheat time (Min to Max) (tS)	80~100sec.
Peak Temperature (T_P)	250±5℃
Ramp-down Rate	6℃/sec. max
Time 25℃ to Peak Temp (T_P)	8 min. max

Figure 5-1 Temperature Curve of Reflow Welding

6 Notices for Ultrasound 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 Supply Information

7.1 Model Definition

Table 7-1 Model Definition

Type	Model	Description
Standard Edition of uart transparent transmission	HJ-185IMH_SPPv2	Include UART port transparent transmission firmware, the firmware module is a bridge between the Bluetooth device or the mobile phone and the MCU. The Customer does not need to understand the BLE protocol stack, and control the UART port command operation and the UART port data, and the operation is simple, short Development cycle to speed up product launch.
Custom version	HJ-185IMH_CUSv2	This version supports custom firmware, the customer proposes functions according to the product requirements, and we will customize the module with the special version firmware to supply the customer.
MI profile Version	HJ-185IMH_MICv2	This version of the firmware is similar to the "Custom Version", but it include Xiaomi MISDK certification protocol, other functional requirements are also customized according to customer requirements.
WeChat Edition of uart transparent transmission	HJ-185IMH_WSPPv2	This version of the firmware adds the WeChat serial port transparent transmission function based on the "Standard Edition of uart transparent transmission" version. The external GPIO can select the WeChat data transmission and reception method.
Customer development Version	HJ-185IMH_EMP	This version of the module has no built-in firmware, customer can develop their own firmware according to the Nordic official chip datasheet and support documents, and only need to provide firmware for us to burn.

7.2 Packaging method

Packaging with tapes and reel. Sealed with chip-level anti-static aluminum foil bag, each bag contains desiccant, use industrial grade vacuum machine to ensure airtight, moisture-proof, waterproof and dustproof (IP65). The actual packing effect is shown in Figure 7-1.

Figure 7-1 External Packing Image

All packages will be labeled with goods information. All packages will be marked with the cargo information, including ROHS and anti-static signs. The production batch information in the item number is 15 bits.

TangShan HongJia Electronic Technology Co., Ltd.

HJ-185IMH_SPPv2

Pb Free   Reflow(260℃)

DATE CODE:P16aI15bS17c001

QTY:500PCS   SEAL DATE:20170504

Remarks: P16a I15b S17c001 represents PCB production in January 2016, IC production in February 2015, and SMT patch in the first time in March 2017.

Figure 7-2 Label Sample Diagram