

HJSIP-Low Cost And Small Size HJ-E16 Supports Multi-master Multi-slave BLE5.3 Module DateSheet

Version: V1.0

Revision history

No.	Release time	Description
1	2024-10-30	First edition
2		

CATALOG

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1、Features

- Operating Frequency is 2.4GHz, support ISM free Frequency band
- Embedded Bluetooth low energy protocol stack and GATT service
- Support BLE5.3 protocol stack, support master-slave integration and multi-master multi-slave (working simultaneously)
- Maximum Transmit Power:+8dBm
- High Receive sensitivity:-95dBm
- Onboard PCB antenna
- Voltage supply:1.8V-3.8V
- Low Power Dissipation:
 - ✓ Dormant current < 6uA
 - ✓ One second broadcast current:35uA
 - ✓ Two second broadcast current: 18uA
- GPIO maximum number:21
- Open field distance of onboard antenna:50-200 meter
- Size: 12mm * 15mm (**Includes onboard antenna**) ,weight:0.5g, ROHS compliant
- 1 mmPad spacing package, Stamp type half-hole pin
- Industrial grade operating temperature range::-40-+85°C
- Built-in firmware support transparent transmission, wechat mini program basic functions

2、 Model Definition

Type	Model	Description
Standard Edition Of Uart Transparent Transmission (Support wechat mini program)	HJ-E16_SPP	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-E16_CUS	Custom version

3、Electrical Parameters

3.1 Absolute Maximum Ratings

Parameter	MIN	MAX	Unit
Power Supply Voltage (VCC)	1.8	3.9	V
IO Supply Voltage	0	VCC	V
Operating Temperature	-40	+85	°C
Storage Temperature	-40	+105	°C

3.2 Recommended Operating Conditions

Parameter	MIN	TYP	MAX	Unit
Power Supply Voltage (VCC)	1.8	3.3	3.8	V
IO Supply Voltage	0	3.3	3.4	V
Dormant working current		<6.0		uA
Maximum Operating Current		7.5(@+0dBm)		mA
Operating Temperature	-40	+25	+85	°C

3.3 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	5.0mA	0	0.6	V
Output high voltage	5.0mA	3.3	VCC	V

3.4 RF Features

Modulation	GFSK	
Frequency range	2.402 - 2.480GHz	Bandwidth:2MHz
Number of channels	40	
Air speed	1Mbps 2Mbps 125Kbps	
RF Port Impedance	50Ω	
Transmit Power	MAX. +12dBm	
TX Current consumption	MAX:7.5mA	@+0dBm
RX Current consumption	MAX:7.8mA	
Receive sensitivity	TYP.-95dBm,MAX.-96dBm	
Antenna	Onboard PCB Antenna	

3.5 Power Dissipation

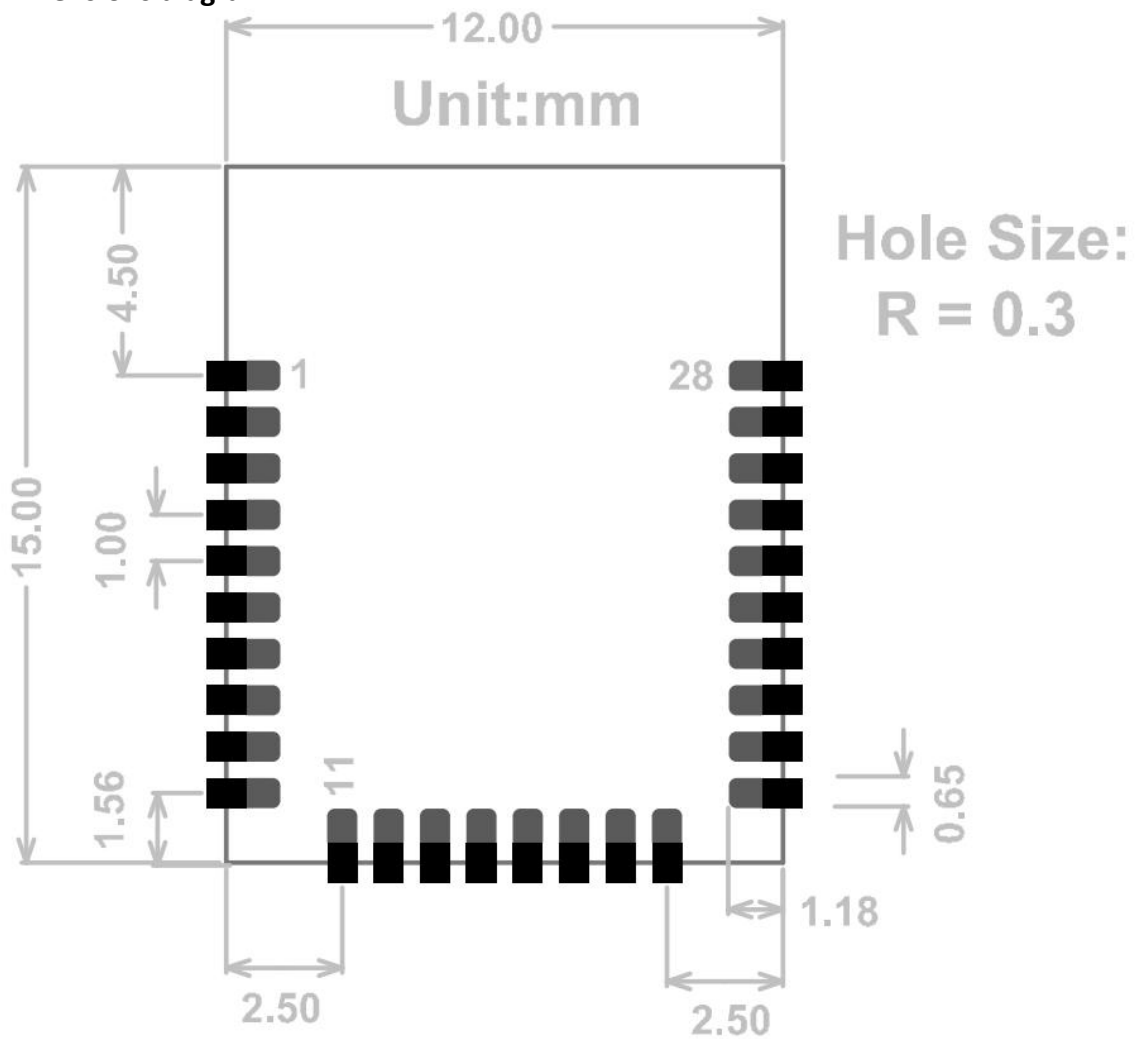
Test conditions	TYP	Unit
Dormancy mode	6	uA
1S Interval Broadcasting in Slave Mode	35	uA
20ms Connection Gap Holding Connection in Slave Mode	1.5	mA

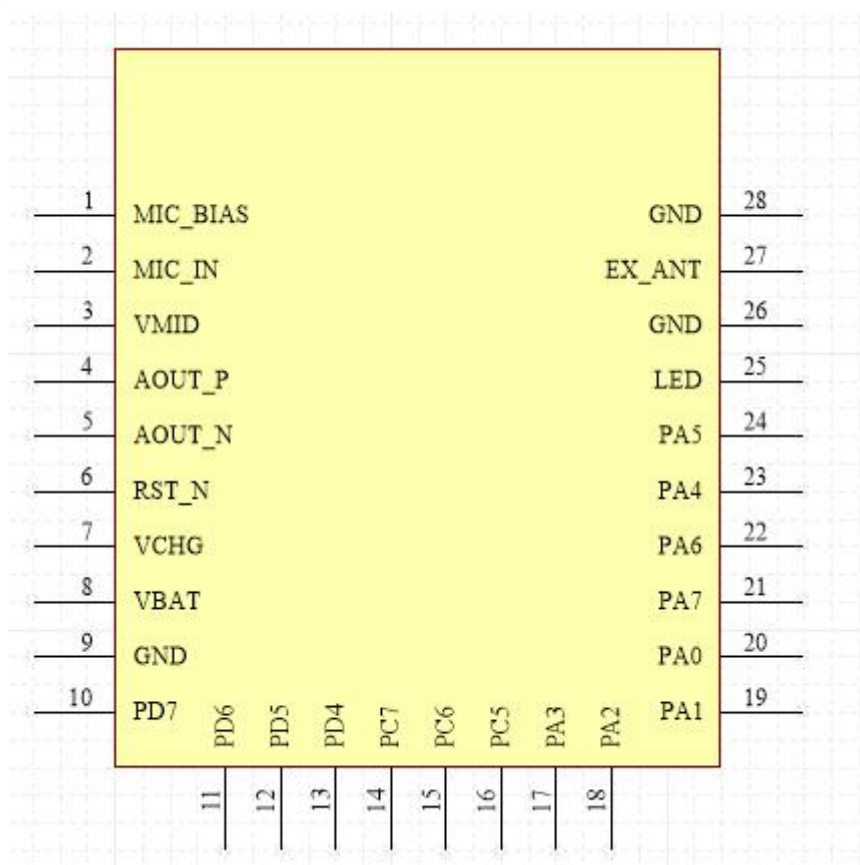
4、Package and Dimensions

4.1 Interface mode

Type Of Welding Pad	Stamp hole pattern
Pad Spacing	1.00mm

4.2 Dimensions diagram





4.3 Pin definition table

Pin	Name	Type	Description	Remarks
1	MIC_BIAS	AO	Microphone offset output	Do not use to keep suspended
2	MIC_IN	AI	Microphone input	Do not use to keep suspended
3	VMID	AI	Audio CODEC common-mode voltage input	Do not use to keep suspended
4	AOUT_P	AO	Audio output+	Do not use to keep suspended
5	AOUT_N	AO	Audio output-	Do not use to keep suspended
6	RST_N	INPUT	RESET Pin	Low level effective reset
7	VCHG	PWR	Charge management power supply voltage input	Do not use to keep suspended
8	VBAT	Power In	Power input pin	Range 1.8V - 3.9V
9	GND	Power Ground	GND	
10	PD7	IO		Can be customized for other functions
11	PD6	IO		Can be customized for other functions
12	PD5	IO		Can be customized for other functions
13	PD4	IO		Can be customized for other functions
14	PC7	IO		Can be customized for other functions
15	PC6	IO		Can be customized for other functions
16	PC5	IO		Can be customized for other functions
17	PA3	IO		Can be customized for other functions
18	PA2	IO		Can be customized for other functions
19	PA1	IO		Can be customized for other functions
20	PA0	IO		Can be customized for other functions
21	PA7	IO		Can be customized for other functions
22	PA6	IO		Can be customized for other functions

23	PA4	IO		Can be customized for other functions
24	PA5	IO		Can be customized for other functions
25	LED	O	LED Output control	This pin can only be used as output
26	GND	Power Ground	GND	
27	EX-ANT	RF_OUT	Radio frequency output	Can be connected to external antenna
28	GND	Power Ground	GND	

5、 Hardware design precautions

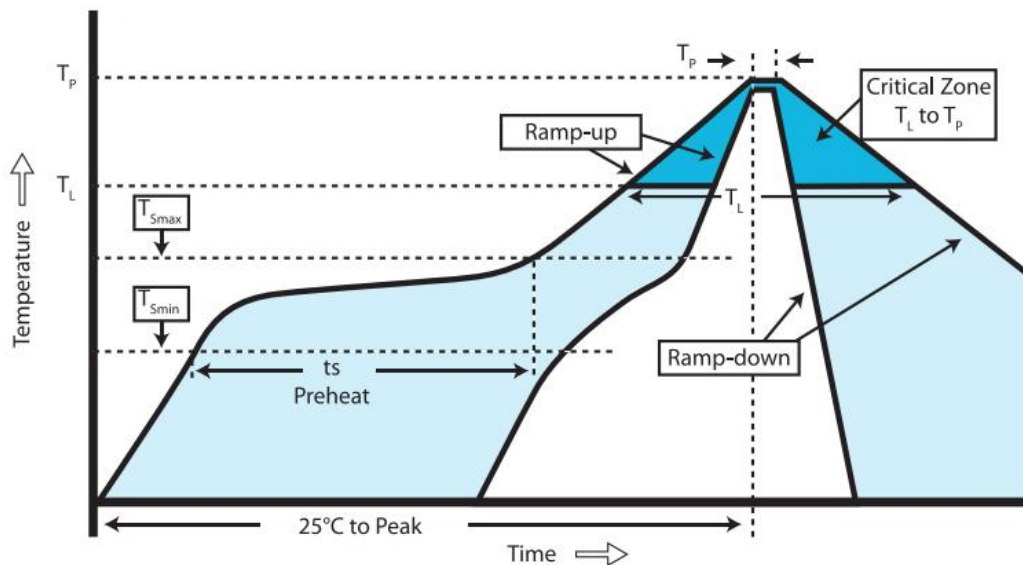
- 1、 The module should not be placed in a metal-based enclosure. If a metal enclosure is required, the antenna must be taken out.
- 2、 Among the products that need to install this wireless module, some metal materials such as screws, inductors, etc. should be kept away from the RF antenna part of the wireless module.
- 3、 On the wireless module antenna, Do not place other components. Because other components can degrade wireless performance.
- 4、 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.
- 5、 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.
- 6、 GND must be sound grounding.
- 7、 It is recommended that magnetic beads or inductance filters be applied to the input power supply.

6、Humidity control and reflow welding reference

This module belongs to MSL Level 3. After unpacking and plastic sealing, it must be baked and dried for more than 168 hours before welding. The maximum temperature resistance of the packaging tape of this module is 50°C. Do not bake with the tape at high temperature.

HJ-E16 module boards are high temperature resistant boards, all using lead-free process, the maximum test temperature of 265°C for 10 consecutive reflow welding has no impact on performance and strength, as follows:

Features	Lead-free process
Average ramp up rate($T_{S\text{MAX}}$ to T_P)	3°C/sec max
Temperature Min($T_{S\text{min}}$)	150°C
Temperature Max($T_{S\text{max}}$)	200°C
Preheat time (Min to Max) (t_S)	80-100 sec
Peak Temperature (T_P)	250+5°C
Ramp-down Rate	6°C/sec max
Time 25°C to Peak Temp (T_P)	8min max



7、Packaging method

(Braid packaging related pictures and braid size information)

1、The chip grade anti-static aluminum foil bag is sealed and packed with braid. Each bag is put in desiccant and pumped by industrial vacuum machine to ensure no air leakage, moisture, water and dust (IP65).(as shown below)



2、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-E16 Pb Free Reflow(260℃) DATE CODE:P16aI15bS17c001 QTY:1500PCS 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.

8、 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.

FCC Statement

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 not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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 important announcement

Important Note:

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 5cm between the radiator and your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/Canada.

This device is intended only for OEM integrators under the following conditions:

1. The antenna must be installed such that 5cm is maintained between the antenna and users, and
2. The transmitter module may not be co-located with any other transmitter or antenna,

As long as the three conditions above are met, further transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following"

Contains FCC ID: **2BB85-HJ-E16**

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01r01

2.2 List of applicable FCC rules

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable

2.5 Trace antenna designs

Not applicable

2.6 RF exposure considerations

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

2.7 Antennas

This radio transmitter **FCC ID: 2BB85-HJ-E16** has been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Antenna No.	Model No. of antenna:	Type of antenna:	Gain of the antenna (Max.)		Frequency range:
			Antenna 1	Antenna 2	
Bluetooth	/	PCB Antenna	1.76	N/A	2402-2480MHz

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following" Contains **FCC ID:2AMM6-8822CSE3AA**".

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

2.11 Note EMI Considerations

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

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.

ISED Statement

English: This device complies with Industry Canada license - exempt RSS standard(s). Operation is subject to the following two conditions: (1) This device may not cause interference, and (2) This device must accept any interference, including interference that may cause undesired operation of the device.

The digital apparatus complies with Canadian CAN ICES - 3 (B)/NMB - 3(B).

- French: Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

L'appareil numérique du CIEM conforme canadien peut - 3 (b) / nmb - 3 (b).

This device meets the exemption from the routine evaluation limits in section 2.5 of RSS 102 and compliance with RSS 102 RF exposure, users can obtain Canadian information on RF exposure and compliance.

Cet appareil est conforme à l'exemption des limites d'évaluation courante dans la section 2.5 du CNR - 102 et conformité avec RSS 102 de l'exposition aux RF, les utilisateurs peuvent obtenir des données canadiennes sur l'exposition aux champs RF et la conformité.

This equipment complies with Canada radiation exposure limits set forth for an uncontrolled environment.

Cet équipement est conforme Canada limites d'exposition aux radiations dans un environnement non contrôlé.

This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Cet équipement doit être installé et utilisé à une distance minimale de 20 cm entre le radiateur et votre corps.

ISED Modular Usage Statement

NOTE 1: When the ISED certification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use the wording "Contains transmitter module IC: 33161-HJE16"

NOTE 1: Lorsque le numéro de certification ISED n'est pas visible lorsque le module est installé dans un autre appareil, l'extérieur de l'appareil dans lequel le module est installé doit également afficher une étiquette faisant référence au module inclus. Cette étiquette extérieure peut être libellée "Contient le module émetteur IC: 33161-HJE16"