

Specification

Product Name: Bluetooth Audio Module
Product Model: JWBT-NA-201 / BT201

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Revision History

edition	date	take notes	author
1.0	2020/06/01	Initial version	GELLA
1.1	2024/06/01	Update the document table of contents and pin descriptions	QIN

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Catalogue

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1. product presentation

Product Overview

The JWBT-NA-201 is a Bluetooth module developed by Jiewei Intelligent Internet of Things Technology (Changzhou) Co., Ltd., featuring BLE, SPP, and audio capabilities. It supports analog audio, DRC, 10-band EQ, and multiple protocols including BLE, SPP, AVRCP, and I²S.

The JWBT-NA-201 uses UART as its programming interface, allowing customers to read or write module configurations via AT commands. This provides greater flexibility for customer applications. For programming instructions, refer to the user manual.

Product Features

- stamps hole encapsulation
- Transmit power level
- The default UART baud rate is 115200bps, supporting speeds from 1200bps to 921.6Kbps.
- Supports Bluetooth decoding: SBC, AAC
- Supported audio interfaces: analog audio, I²S, PCM, SPDIF, HDMI, USB sound card
- support TWS
- Supports built-in charging management

2. General Specifications

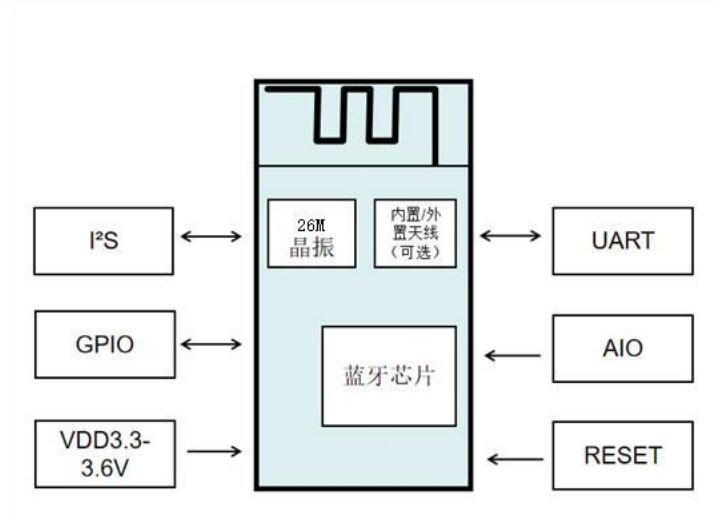
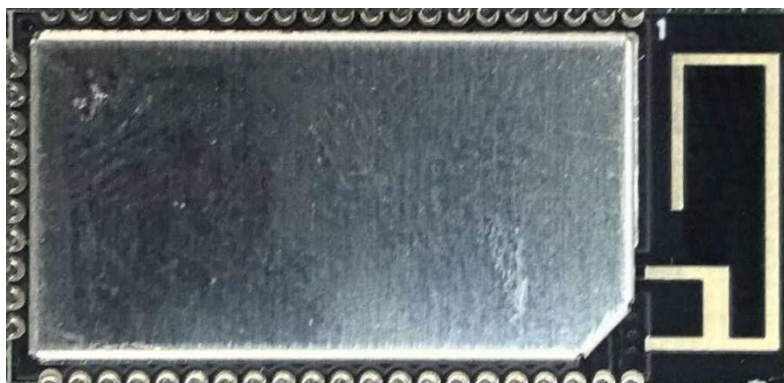
Table 1: General Specifications

name	Bluetooth audio module
model	JWBT-NA-201
size	13mm(W) X 27mm(L) X 2.2mm(H)
Bluetooth version	Bluetooth 5.3
operating voltage range	3.0~4.2V
transmitting power	Maximum 6 dBm
sensitivity	-97dBm@0.1%BER
frequency range	2.402GHz -2.483GHz ISM band
modulation mode	GFSK, $\pi/4$ -DQPSK, 8-DPSK
baseband crystal oscillator	26MHz
Frequency hopping and channel	1600hops per second, 1MHz channel bandwidth, 80 channels
RF input impedance	50 ohms
Antenna type	PCB board antenna/position antenna
hardware interface	UART/I ² S

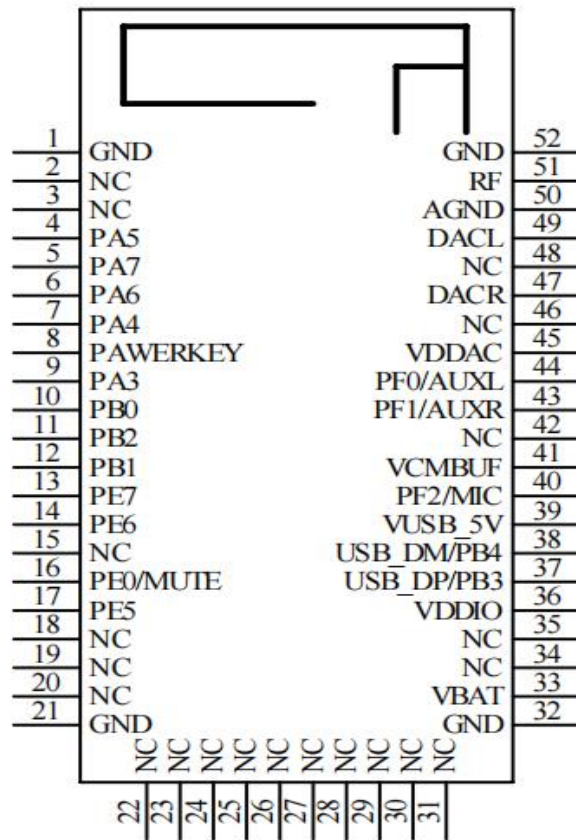
protocol	HID、BLE、SPP、AVRCP、A2DP、HFP、PBAP
Other features	Supports low power consumption
working temperature	-40°C to +80°C
storage temperature	-40°C to +105°C
humidity	10%~95% non-condensing
environment	accord with RoHS
apply	Car DSP/DSD audio system, Bluetooth audio system, car central control system, conference system, Bluetooth earphones, Bluetooth receiver, Bluetooth USB sound card

3. Hardware Specifications

3.1 Product Images



JWBT-NA-201 Block Diagram (Top View)



JWB-T-NA-201 Pin Definition Diagram (Top View)

3.2 Pin Definition

Table 2: Pin Definitions

pin	Pin name	type	Pin Description
1	GND	VSS	power supply ground
2	NC	NC	NC
3	NC	NC	NC
4	PA5	I/O	Programmable Input/Output Pin/I2S_CLK
5	PA7	I/O	programmable input/output pin
6	PA6	I/O	Programmable Input/Output Pin/I2S Out
7	PA4	I/O	Programmable Input/Output Pin/I2S WS
8	PAWERKEY	I	Button/Reset, Low Effective
9	PA3	I/O	programmable input/output pin

10	PB0	I/O	programmable input/output pin
11	PB2	I/O	programmable input/output pin
12	PB1	I/O	programmable input/output pin
13	PE7	I/O	Programmable I/O pins, default TX serial port, external RX
14	PE6	I/O	Programmable I/O pins, default serial port RX, external TX
15	NC	NC	NC
16	PE0/MUTE	I/O	programmable input/output pin
17	PE5	I/O	programmable input/output pin
18	NC	NC	NC
19	NC	NC	NC
20	NC	NC	NC
21	GND	VSS	power supply ground
22	NC	NC	NC
23	NC	NC	NC
24	NC	NC	NC
25	NC	NC	NC
26	NC	NC	NC
27	NC	NC	NC
28	NC	NC	NC
29	NC	NC	NC
30	NC	NC	NC
31	NC	NC	NC
32	GND	VSS	power supply ground
33	VBAT	PWR	Power input (3.3V~4.2V recommended)
34	NC	NC	NC
35	NC	NC	NC

36	VDDIO	VDD	Power output (1.8V~3.3V)
37	PB3/USB_DP	I/O	Programmable I/O pins/USB interface
38	PB4/USB_DM	I/O	Programmable I/O pins/USB interface
39	VUSB_5V	I	Built-in USB 5V charging port
40	PE2/MIC	I/O	Programmable I/O pins, default MIC input
41	VCMBUF	A	channel negative output
42	NC	NC	NC
43	PE1/AUXR	I/O	Programmable input/output pin/AUXR right channel positive input
44	PE0/AUXL	I/O	Programmable input/output pin/AUXL left channel negative input
45	VDDAC	PWR	MIC bias power supply
46	NC	NC	NC
47	DACR	R	right channel positive output
48	NC	NC	NC
49	DACL	L	left channel positive output
50	AGND	AGND	simulated ground
51	ANT	antenna	external antenna interface
52	GND	VSS	power supply ground

4. Physical Interface

4.1 Universal Digital IO Ports

The module features 17 universal GPIOs. All these GPIOs can be configured via software to perform various functions, such as button control, LED driving, or interrupt signals for the main controller. They remain idle when not in use and do not require any circuit connections. The software allows individual configuration of each I/O pin's type to either input or output mode.

4.2 RF interface

2402-2480 MHz Bluetooth 5.3

The maximum output power of TX is 6dBm

Maximum sensitivity of RX-97dBm@0.1%BER

4.3 UART Interface

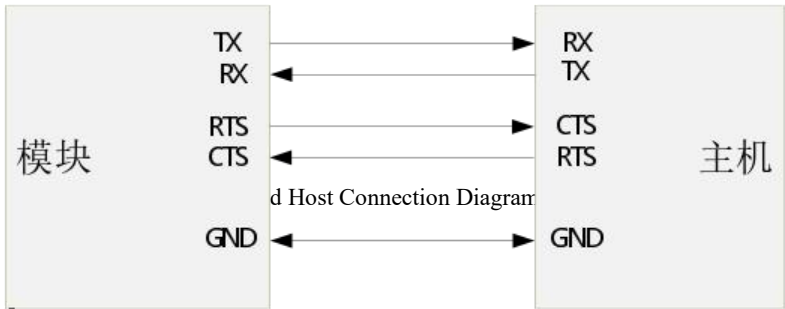
Pins 13 and 14 of the module implement UART functionality. When the JWBT-NA-201 connects to another digital device, UART_RX and UART_TX facilitate data transfer between the two devices. The additional pins UART_CTS and UART_RTS can be configured for RS232 hardware flow control (firmware

support required), both being low-level active—active at low voltage to transmit and inactive at high voltage to halt transmission.

Table 3: Possible UART Settings

parameter	probable value	
Baud rate	minimum margin	1200 baud ($\leq 2\%$ Error)
	standard	115200bps($\leq 1\%$ Error)
	maximum	921600bps($\leq 1\%$ Error)
flow control		RTS/CTS (default: none)
even-odd check		No, odd or even
Number of stop bits		1
bits per channel		8

Schematic diagram of UART connection between module and host



4.4 EQ 10band

Supports 10-band EQ adjustment.

5. Electrical Characteristics

5.1 Maximum Rated Value

The following lists the absolute maximum rated power supply voltages and voltages on the digital and analog pins of the module. Exceeding these values may cause permanent damage. The average GPIO pin output current is defined as the average current value flowing through any corresponding pin within a 100mS cycle. The total average GPIO pin output current is defined as the average current value flowing through all corresponding pins within a 100mS cycle. The maximum output current is defined as the peak current value flowing through any corresponding pin.

Table 4: Maximum Rated Value

parameter	least value	crest value	unit
VIN-I/O power supply voltage (VDDIO)	-0.3	+3.3	V
VIN-Analog/Digital Power Supply Voltage (VDD)	-0.3	+4.2	V
TOT-Operating temperature	-40	+80	°C
TST-Storage Temperature	-40	+105	°C

5.2 Recommended Working Conditions

Table 5: Recommended working conditions

parameter	least value	typical case	crest value	unit
VIN-Core supply voltage (VDD)	3.0	3.3	4.2	V

6. Humidity sensitivity level & Anti-static level

Table 6: Humidity Sensitivity Grades and Anti-static Grades

parameter	price
Humidity sensitivity level:	Level 3
Antistatic rating:	Human discharge pattern: Class-2 Machine discharge mode: Class-B

7. Reflow soldering

Prior to any reflow soldering, ensure the module is packaged in moisture-proof packaging. The packaging contains desiccant (to absorb moisture) and a humidity indicator card to show the dryness level maintained during storage and shipping. If baking the module is required, refer to the table below and follow the instructions specified in IPC/JEDEC J-STD-033.

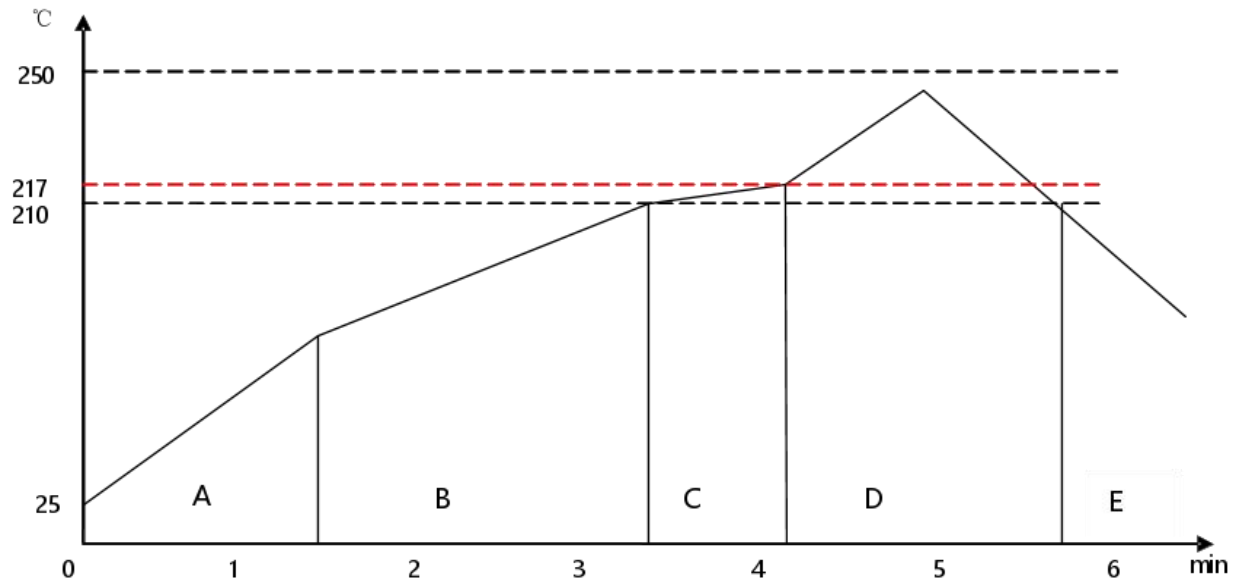
Note: The tray must not be heated above 65°C. If the high-temperature baking method (above 65°C) specified in the table below is used, the module must be removed from the transport tray.

Any module that has been unpacked but has not been affixed with the patch within the specified time should be repackaged, with effective desiccant and temperature/humidity indicator cards placed inside the packaging. Under ambient conditions of 30°C/60% RH, the storage time of MSL (Moisture-Sensitive Level) 3 modules in air should be less than 168 hours.

Table 7: Recommended baking time and temperature

MSL	Baking temperature: 125°C		90°C/≤ 5%RH baking temperature		40°C/ ≤ 5%RH baking temperature	
	Saturated at 30°C/85%	Minimum limit + 72 hours @ 30°C/60%	Saturated at 30°C/85%	Minimum limit + 72 hours @ 30°C/60%	Saturated at 30°C/85%	Minimum limit + 72 hours @ 30°C/60%
3	9 hours	7 hours	33 hours	23 hours	13 days	9 days

Surface-mount modules are designed for easy manufacturing, including reflow soldering onto PCB boards. Ultimately, customers are responsible for selecting the appropriate solder paste and ensuring the furnace temperature during reflow meets the paste's requirements. Surface-mount modules comply with the J-STD-020D1 standard for reflow soldering temperatures. The soldering configuration depends on various parameters required for each application. The data provided here is intended solely as guidance for reflow soldering.



Typical lead-free reflow

Preheating Zone (A) -This zone is heated at a controlled rate, typically 0.5-2°C/s. Its purpose is to preheat the PCB board and components to 120-150°C. During this stage, heat must be evenly distributed across the PCB board, and the solvent must be completely removed to minimize thermal shock to the components.

Balancing Zone 1 (B) -During this phase, the flux softens and uniformly encapsulates solder particles while spreading across the PCB board to prevent re-oxidation. As temperature rises and the flux liquefies, each activator and rosin component becomes activated, beginning to remove the oxide film formed on both solder particles and the PCB surface. For this zone, the recommended temperature range is 150°C to 210°C, with a treatment duration of 60 to 120 seconds.

Balancing Zone 2 (C) (optional) -To address the upright component issue, it is recommended to maintain the temperature at 210-217 °C for approximately 20 to 30 seconds.

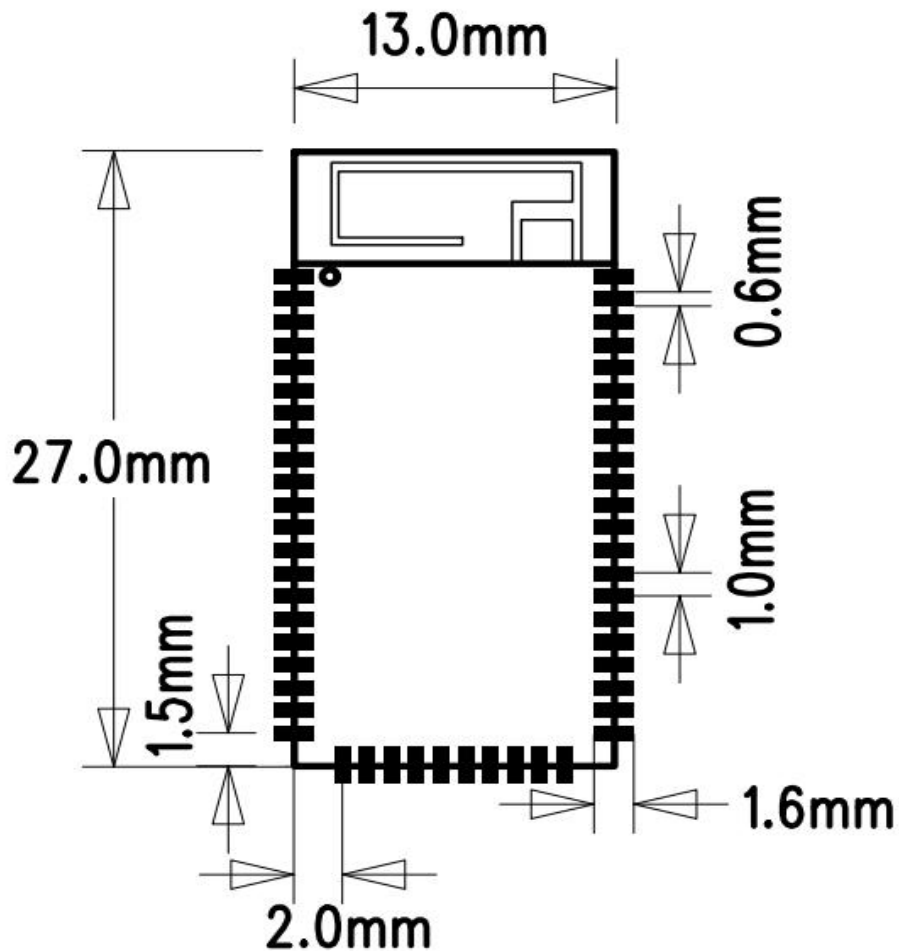
Reflow zone (D) -The curve in the diagram is designed for Sn/Ag3.0/Cu0.5 and can serve as a reference for other lead-free soldering processes. The peak temperature should be sufficiently high to ensure good wetting, but not excessively high to cause component discoloration or damage. Prolonged soldering time may lead to intermetallic growth, resulting in brittle solder joints. The recommended peak temperature (T_p) ranges from 230 to 250°C. When temperatures exceed 217°C, the soldering time should be maintained between 30 to 90 seconds.

Cooling zone (E) -The cooling rate must be rapid to maintain fine solder particles, ensuring a more durable solder joint. The standard cooling rate is 4°C.

8. Module structure parameters

8.1 Physical Dimensions

- Module dimensions: 27mm (L) x13mm (W) x 2.2mm (H) Tolerance: $\pm 0.2\text{mm}$
- Paddle size: 1.6mm $\times$ 0.6mm, tolerance: $\pm 0.1\text{mm}$
- Pads spacing: 1.0mm tolerance: $\pm 0.1\text{mm}$



JWBT-NA-201 package (top view)

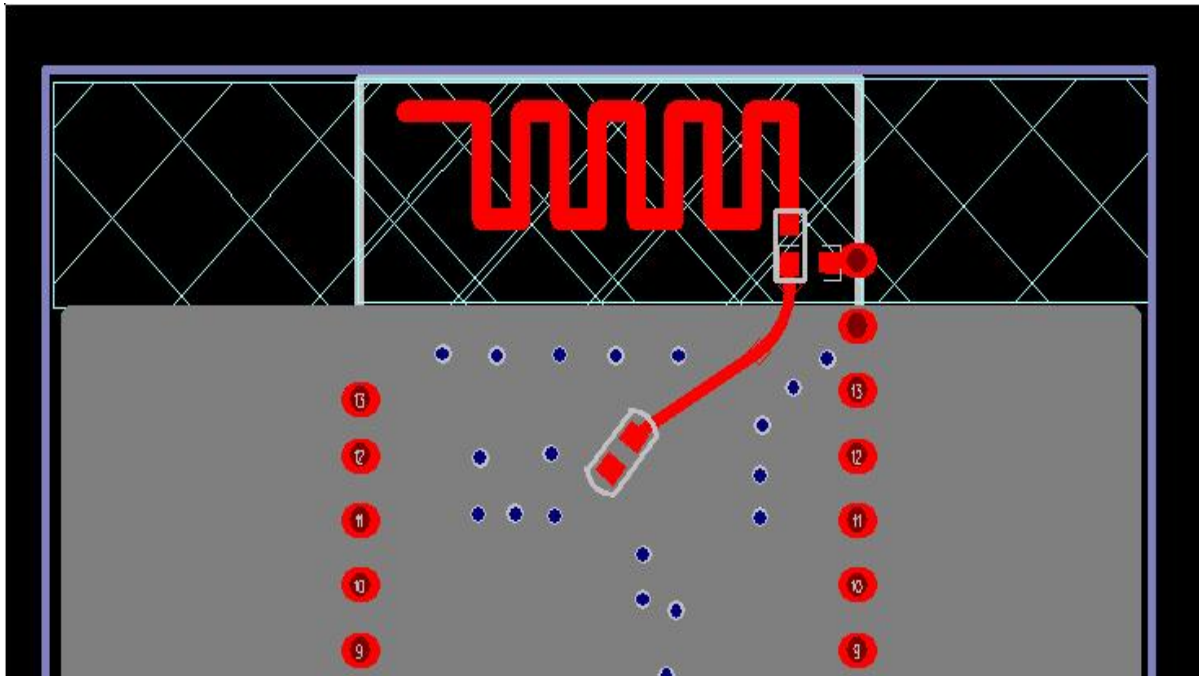
9. Hardware design suggestion

9.1 Welding Recommendations

The JWBT-NA-201 is compatible with industry-standard reflow curves for lead-free solder. The specific reflow curve depends on the thermal mass of the assembled PCB, the oven's heat transfer efficiency, and the type of solder paste used. Refer to the datasheet of the specific solder paste for profile configuration to ensure reliable solder joints and operational performance of the post-soldering module.

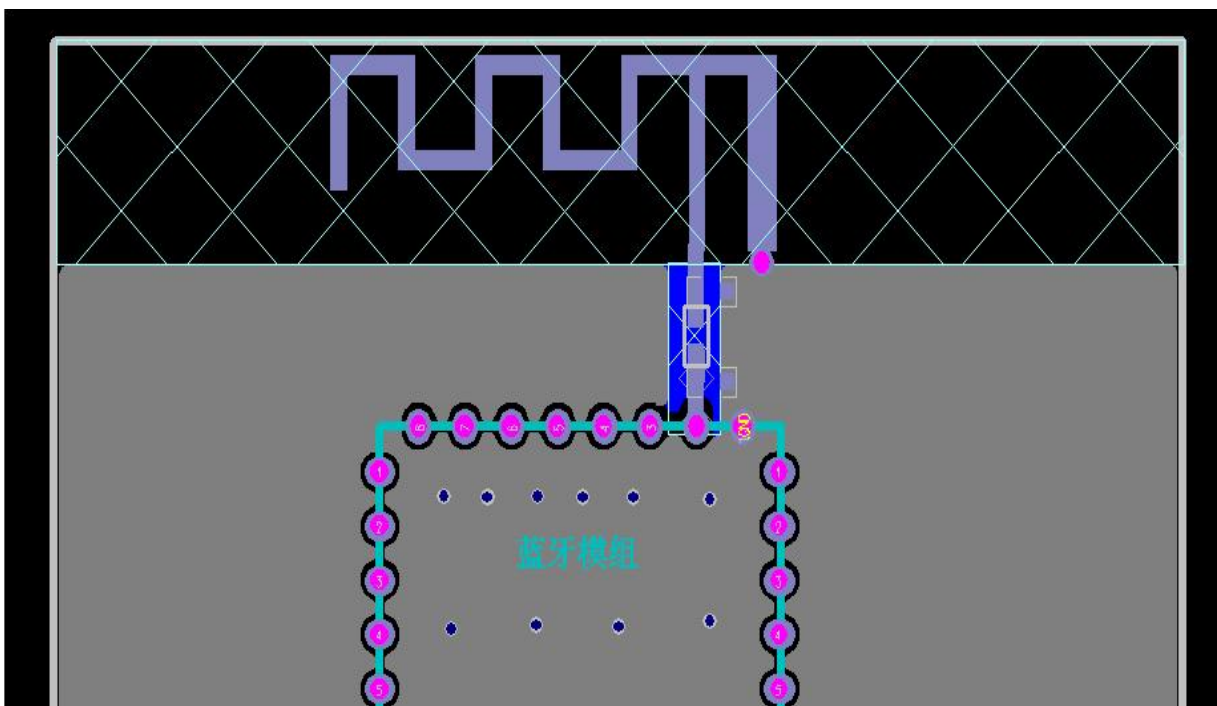
9.2 Layout Guide (Built-in Antenna)

To ensure proper antenna operation, follow the antenna clearance principle by leaving all three sides of the PCB-mounted antenna unconnected. This prevents interference from other components on the PCB. Avoid routing or copper plating beneath the antenna. The module should be positioned as far away as possible from power components and electromagnetic devices such as transformers, thyristors, relays, inductors, buzzers, and speakers. The module's ground should be separated from those of power and electromagnetic components. Implementing proper layout practices is recommended to ensure optimal module performance.



9.3 Layout Guide (External Antenna)

In the absence of a built-in antenna design, module placement and PCB layout are critical for optimizing RF performance. 1. Microstrip lines (wiring from the antenna to the module's EXT_ANT port) should have 50-ohm impedance. 2. Microstrip lines should be routed in straight lines and kept as short as possible; if bends are unavoidable, they should follow curved paths. 3. The line width should be approximately 0.5mm, with a recommended distance of 0.5mm between the copper-clad layer and the microstrip line. 4. To avoid signal interference, external antennas and the module's EXT_ANT port should be positioned away from noise sources and digital circuits. The antenna should be placed near the board edge, with no components or copper-clad layers around it, and wiring should be minimized to maintain integrity. 5. A Π -matching network circuit should be placed between microstrip lines and positioned as close to the antenna as possible to ensure optimal impedance matching. 6. The module's RF critical circuits should be clearly separated from any digital circuits on the system board.



9.4 External Antenna

Designing general wireless products requires avoiding external metal enclosures and minimizing the length of large metal components, PCB traces, or connections. The distance between top-layer connections and ground planes should be at least equal to the dielectric thickness. RF components should be kept away from digital parts on system boards. To reduce signal loss, avoid sharp-angle microstrip traces; chamfered or rounded traces are preferable to rectangular ones, and 45-degree angled traces are better than pure 90-degree angles. RF connections should not be placed on the opposite side of modules. The distance between microstrip traces and the receiver's bottom ground plane is minimal and subject to tolerance. Since impedance control for this trace segment is unattainable, use vias extensively to connect to the ground plane.

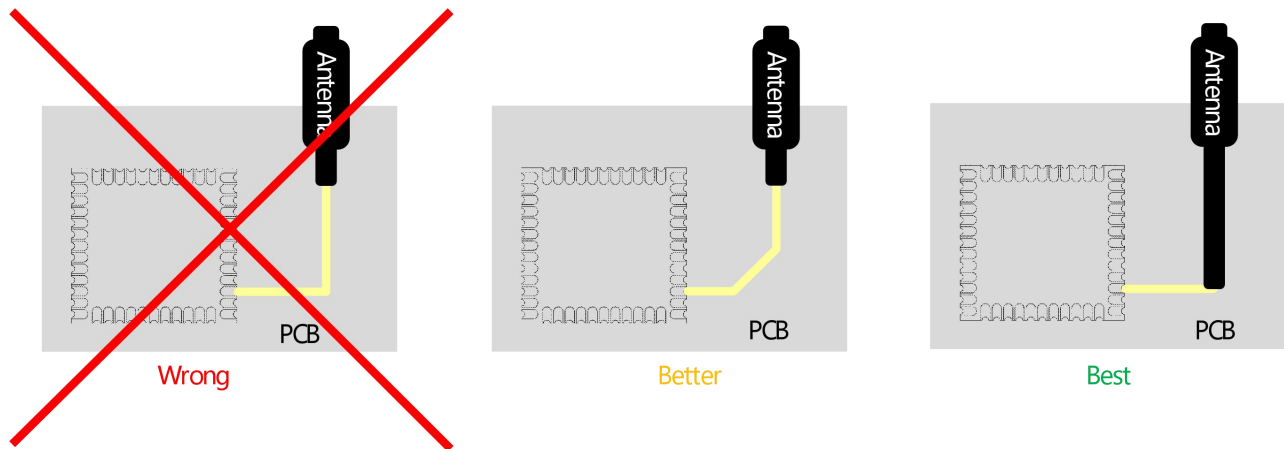


Figure 11: Recommended routing for antenna and module connection

10. Product Packaging Information

pallet packing

Pallet size: 180mm * 195mm

50 pieces per tray

Minimum packaging: 1000 pieces



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 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 20cm 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 20 cm 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 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: **2BUJN-JWBT-NA-201** "

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: 2BUJN-JWBT-NA-201** 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	1.7	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: 2BUJN-JWBT-NA-201**".

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.