

Ultra Low Power Bluetooth 5.0 BLE Module

User Manual of JDY-23 Slave Bluetooth Module



JDY-23 Ultra Low Power Bluetooth 5.0 BLE Module

Version

Version	Date	Description
V1.2	2018-08-07	Release version

Content

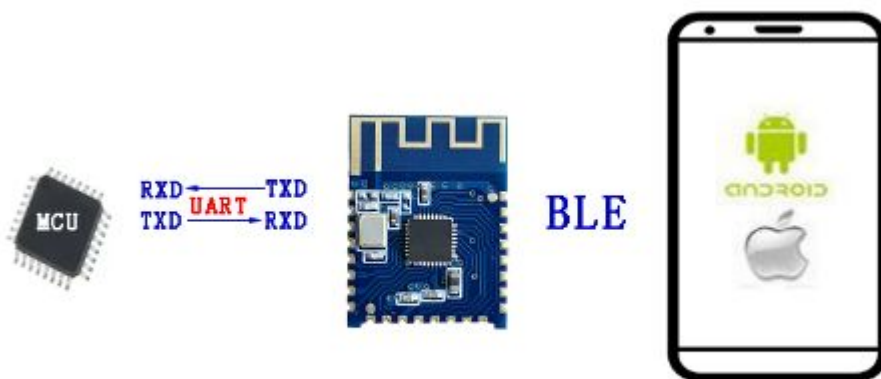
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I . Product Introduction

JDY-23 transparent transmission module is based on Bluetooth 5.0 protocol standard, with the working frequency range of 2.4GHz, the modulation mode of GFSK, the maximum transmission power of 4db, the maximum transmission distance of 60m. It adopts the imported original chip design, and supports the user to modify the device name, baud rate and other instructions through AT command, which is convenient, quick and flexible.

The JDY-23 Bluetooth module can realize the data transmission between the module and the mobile phone. By default, it can use BLE Bluetooth for product application quickly without configuration.

Make BLE more convenient in product application



模块与手机APP或微信小程序通信

Module communicates with mobile APP or Wechat applet

II. Debugging Tools

2.1 IOS test tool Apple store input JDY-LED Download

Android test tools included in the package

2.2 Serial port tools (included in the data package)



Serial port tool instruction for use

No input is required to send instructions using the serial port tool attached to the data package, selecting send return on the serial tool is equivalent to add `\r\n` at the end of the command.

III. Module Parameter Details

3.1 Module parameter

JDY-23 Product Parameter	
Type	JDY-23
Working frequency range	2.4G
Transmit power	4db (Max)
Communication interface	UART
Working voltage	1.8V – 3.6V
Working temperature	-40°C - 80°C
Antenna	Built-in PCB antenna
Receiving sensitivity	-97dbm
Transmission distance	60m
Master-slave support	Slave
Module size	19.6 * 14.94 *1.8 mm (Length, width and height)
Bluetooth version	BLE 5.0 (Compatible with BLE4.0、BLE4.2)
Wake up state current	800uA (Broadcast)
Light sleep state current	<50uA (Broadcast)
Deep sleep current	9uA (No broadcast)
Instruction parameter saving	Parameter configuration power down data saved
SMT welding temperature	<260°C
rf-TX/RX peak current	5mA

3.2 Working current

Working mode	State	Average current	Note
Wake up serial port transparent transmission	Unconnected	800uA	Generally, it is recommended to connect and communicate with APP, and broadcast should not be set too long, which will affect the connection time. It is recommended to be between 100 and 500mS. For fast
Deep no broadcast sleep	No broadcast	3uA	
Light sleep with broadcast	100mS broadcast interval	200uA	
	200mS broadcast	80uA	

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Average power consumption	interval		connection and no power consumption requirement, you can set the broadcast interval to the shortest.
	300mS broadcast interval	50uA	
	400mS broadcast interval	The following currents are lower	
Wake up transparent transmission state	Connected	About 1mA	In the connected state, you can send AT command by pulling down PWRC pin or directly set working mode. For details, please refer to AT+STARTEN command

3.3 JDY-23 sleep mode description

Sleep mode	Instruction	Function description
Power on wake up (Broadcast)	AT+STARTEN1	Mode 1: Power on wake up. If the user needs to sleep, it can be controlled by AT+SLEEP command, and can be waken up through PWRC pin low level
Power on sleep (Broadcast)	AT+STARTEN0	Mode 0: in this mode, the power consumption is very low, the connection wake-up transparent transmission current is 900uA, and the disconnection current is below 200uA (the broadcast interval current can be set as low as 30uA). After the PWRC pin wakes up in this mode, if the serial port does not send data or is not connected within 10 seconds, it will automatically enter sleep again

3.4 FAQ

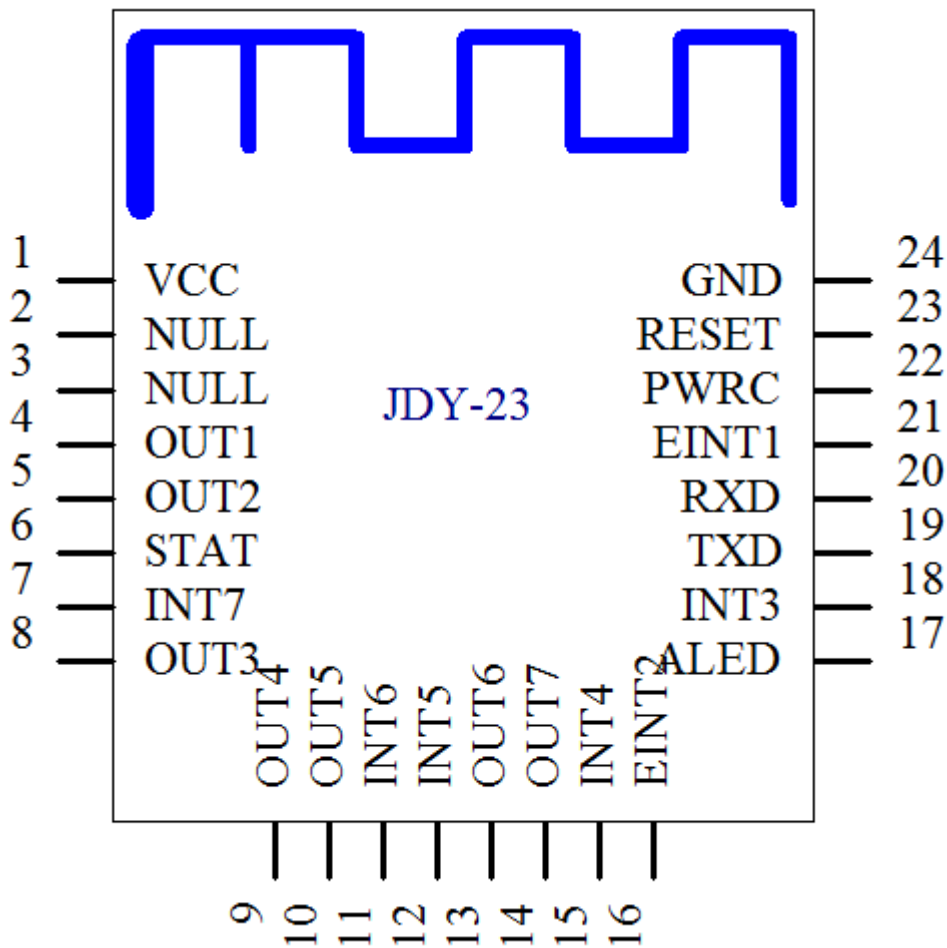
Question	Answer
1: How to disconnect the Bluetooth connection of MCU in the connection state	In connection state, serial port sends "AT+DISC\r\n" to disconnect
2: What is the current when the module wakes up and transparent transmission	About 1mA
3: How much data can the serial port write at one time	No byte limit at 9600 baud rate
4: After configuring parameter of serial port, does it need to restart to take effect	It is recommended to restart after setting the module parameter
5: How to test the deep sleep current of the test module	It is recommended to connect VCC and GND pin to test current

3.5 Factory common default parameter configuration

No.	Function	Factory default parameters	Instruction
1	Serial port baud rate	9600	AT+BAUD4
2	Sleep mode	Power on wake up	AT+STARTEN1
3	Broadcast name	JDY-23	AT+NAMEJDY-23
4	Broadcast interval	200MS	AT+ADVINT1

The above is the serial port transparent communication function. If there are special functions, please contact JDY technical support QQ: 2011811297

3.6 Pin definition



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3.7 Pin function description

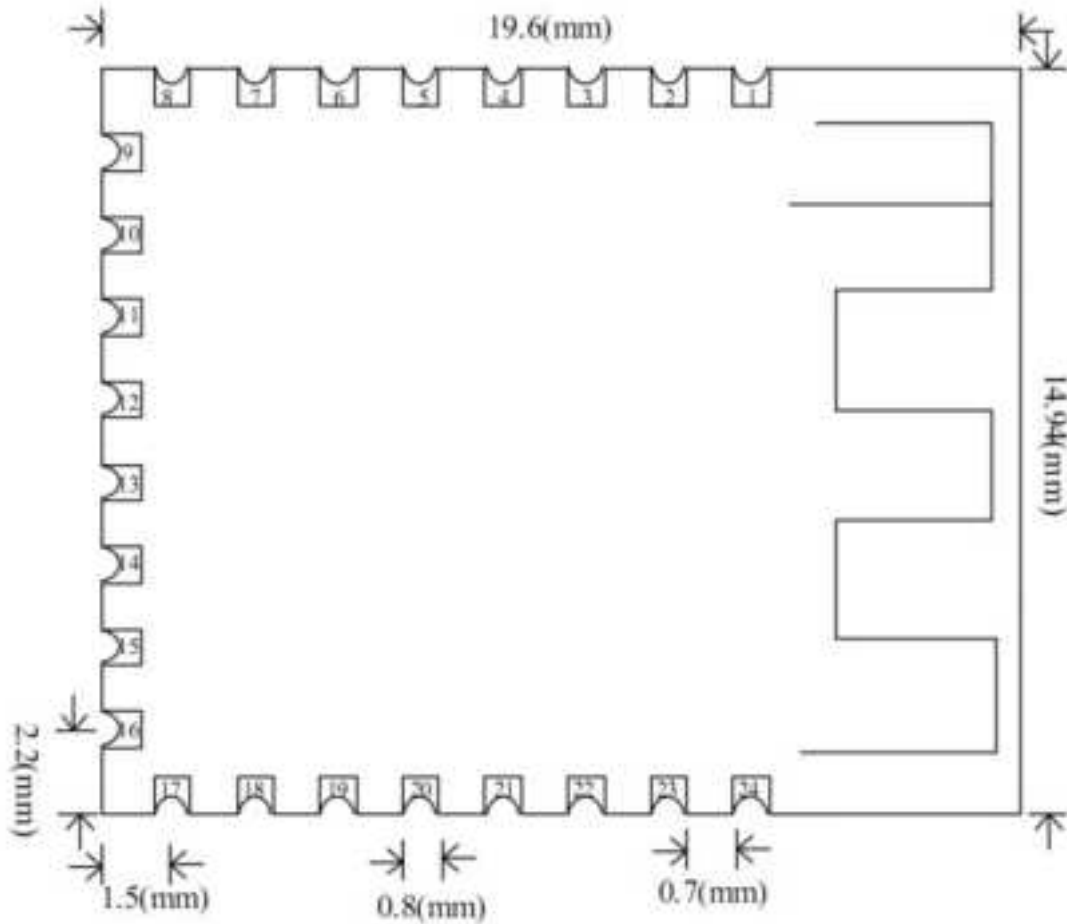
Pin	Function	Description
1	VCC	Power supply(1.8-3.6V)
2	NULL	None
3	NULL	None
4	OUTPUT1	IO1 output pin (supports APP to control high and low level)
5	OUTPUT2	IO2 output pin (supports APP to control high and low level)
6	STAT	Connected status pin, connected high level, not connected low level
7	INPUT7/PWM4	INPUT7 mode: input pin, the APP can read the status of this pin PWM mode: PWM4 output pin, APP can control PWM4 pulse width Default: INPUT7 mode
8	OUTPUT3	IO3 output pin (supports APP to control high and low level)
9	OUTPUT4	IO4 output pin (supports APP to control high and low level)
10	OUTPUT5	IO5 output pin (supports APP to control high and low level)
11	INPUT6/PWM3	INPUT6 mode: input pin, the APP can read the status of this pin PWM mode: PWM3 output pin, APP can control PWM3 pulse width Default: INPUT6 mode
12	INPUT5/PWM2	INPUT5 mode: input pin, the APP can read the status of this pin PWM mode: PWM2 output pin, APP can control PWM2 pulse width Default: INPUT5 mode
13	OUTPUT6	IO6 output pin (supports APP to control high and low level)
14	OUTPUT7	IO7 output pin (supports APP to control high and low level)
15	INPUT4	INPUT4 mode: input pin, the APP can read the status of this pin
16	EINT2	Interrupt input pin (press to actively send IO status to app in connection state)
17	ALED	Broadcast indicator pin
18	INPUT3/PWM1	INPUT3 mode: input pin, the APP can read the status of this pin PWM mode: PWM1 output pin, APP can control PWM1 pulse width Default: INPUT3 mode
19	TXD	Serial port output pin (TTL level)
20	RXD	Serial port input pin (TTL level)
21	EINT1	Interrupt input pin (Press to actively send IO status to app in connection state)
22	PWRC	Sleep wake-up pin, effective at low level In the connection state, the AT command can be sent by PWRC pin pull down
23	RST	Reset pin, effective at low level
24	GND	Power ground

By default, JDY-23 supports data transmission between modules and APP , and APP can control 7-channel IO high

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and low levels (OUTPUT1, OUTPUT2, OUTPUT3, OUTPUT4, OUTPUT5, OUTPUT6, OUTPUT7) of modules, APP can read 7 input IO level states (PWRC, EINT1, EINT2, INPUT3, INPUT4, INPUT5, INPUT6, INPUT7) of the module, in which EINT1 and EINT2 are interrupt input pins and can actively report IO level state under connection state.

3.8 PCB package size



IV. Serial Port AT Instruction Set

The AT command sent by the serial port of JDY-23 module must add \r\n

No.	Instruction	Function	Master / slave	Default
1	AT+VER	Version number	S	JDY-23-V1.2
2	AT+RST	Soft reset	S	-
3	AT+DISC	AT instruction disconnect	S	-
4	AT+STAT			00
5	AT+MAC	MAC address	S	-
6	AT+BAUD	Baud rate	S	9600
7	AT+SLEEP	Sleep	S	
8	AT+NAME	Broadcast name	S	JDY-23
9	AT+STARTEN	Power on sleep or wake up	S	0 (Power on wake up)
10	AT+ADVIN	Broadcast interval	S	1 (200mS)
11	AT+HOSTEN	Slave mode or IBEACON working mode	S	0 (slave)
12	AT+IBUID	UUID of IBEACO	S	FDA50693A4E24F B1AFCFC6EB0764 7825
13	AT+MAJOR	MAJOR of IBEACON	S	10
14	AT+MINOR	MINOR of IBEACON	S	7
15	AT+IBSING	Signal calibration at 1 meter		0x32
16	AT+ALED	Broadcast LED indicator switch		1
17	AT+IBPWR	The SING value of IBEACON	S	50
18	AT+DEFAULT	Restore factory settings	S	-
19	AT+POWR	Transmit power	S	8
20	AT+ENLOG	Serial port output LOG switch	S	0
21	AT+MTU	Set the serial port to send the number of packets to the APP	S	1
22	AT+BATT	Battery setting	S	0

Note: green text indicates new functions, red bold parts need special attention.

V. AT Instruction Description

Special note: JDY-23 module serial port AT instruction need to add end character `\r\n`

Query - version number

Instruction	Response	Parameter
AT+VER	+VER:JDY-23-V1.2	None

Setting - soft reset

Instruction	Response	Parameter
AT+RST	+OK	None

Setting - disconnect

Instruction	Response	Parameter
AT+DISC	+OK	None

Note: under the connected state, directly send AT + DISC to disconnect, or pull PWRC pin low to send AT command

Query - connection status

Instruction	Response	Parameter
AT+STAT	+STAT:<Param>	00: indicates not connected 01: indicates connected

Note: under the connected state, directly send AT + DISC to disconnect, or pull PWRC pin low to send AT command

Setting / query - MAC address

Instruction	Response	Parameter
AT+MAC<Param>	+OK	Param: (MAC address string)
AT+MAC	+MAC:<Param>	

Support AT instruction to modify MAC address, for example: AT+MAC112233445566\r\n

Setting / query - Baud rate

Instruction	Response	Parameter
AT+BAUD<Param>	+OK	Param: (1-9)
AT+BAUD	+BAUD:<Param>	0——11520 1——57600 2——38400 3——19200 4——9600 5——4800 6——2400 Default: 4

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Setting / query - sleep instruction

Instruction	Response	Parameter
AT+SLEEP<Param>	+OK	Param: (1-2)
AT+SLEEP		1: light sleep (with broadcast) 2: Deep sleep (no broadcast)

In the state of AT+STARTEN0, there is no need to send AT+SLEEP instruction, the module will automatically enter into SLEEP. The mobile phone will automatically wake up after connection, and enter into SLEEP after disconnection, PWRC pin falling edge wakes up. After wake up, the serial port has no data transmission or connection. After 15 seconds, it will automatically enter into sleep.

Setting / query - broadcast name

Instruction	Response	Parameter
AT+NAME<Param>	+OK	Param: module Bluetooth name
AT+NAME	+NAME:<Param>	Maximum: 24 bytes Default name: JDY-23

Setting / query - boot sleep and wake read and write

Instruction	Response	Parameter
AT+STARTEN<Param>	+OK	Param: (0-1)
AT+STARTEN	+STARTEN:<Param>	1: power on to wake up, sleep can be controlled through AT + SLEEP 0: power on sleep, connect wake-up, disconnect sleep

Setting / query - Broadcast interval

Instruction	Response	Parameter
AT+ADVINT<Param>	+OK	Param: (0-9)
AT+ADVINT	+ADVINT:<Param>	0: 100ms 1: 200ms 2: 300ms 3: 400ms 4: 500ms 5: 600ms 6: 700ms 7: 800ms 8: 900ms 9: 1000ms Default: 1

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Setting / query - Module operation mode

Instruction	Response	Parameter
AT+HOSTEN<Param>	+OK	Param: (0-3)
AT+HOSTEN	+HOSTEN:<Param>	0: transparent transmission from slave (APP, applet) 3: Slave (iBeacon) mode Default:

Setting / query - iBeacon UUID

Instruction	Response	Parameter
AT+IBUUID<Param>	+OK	Param: Hex UUID
AT+IBUUID	+IBUUID:<Param>	Default: FDA50693A4E24FB1AFCFC6EB07647825

Example: **AT+IBUUID** FDA50693A4E24FB1AFCFC6EB07647825

Setting / query - iBeacon Major

Instruction	Response	Parameter
AT+MAJOR<Param>	+OK	Param: (0000-FFFF)
AT+MAJOR	+ MAJOR:<Param>	Default: 000A

If the Major value is 10008, the AT instruction is: **AT+MAJOR2718** 2718 is 10008 hex data

Setting / query - iBeacon Minor

Instruction	Response	Parameter
AT+MINOR<Param>	+OK	Param: (0000-FFFF)
AT+MINOR	+MINOR:<Param>	Default: 0007

If the Minor value is 10180, the AT instruction is: **AT+MINOR27C4** 27C4 is 10180 hex data

Setting / query - iBeacon IBSING

Instruction	Response	Parameter
AT+IBSING<Param>	+OK	Param: (00-FF)
AT+IBSING	+IBSING:<Param>	Default: 40

This parameter is applied to the signal calibration value of iBeacon at 1m.

Setting / query - ALED broadcast indicates LED switch

Instruction	Response	Parameter
AT+ALED<Param>	+OK	Param: (0-1)
AT+ALED	+ALED:<Param>	0: turn off the broadcast LED indicator 1: turn on the broadcast LED indicator Default: 1

The broadcast indicator only works in AT+HOSTEN0 mode, and does not work in light sleep or try sleep mode.

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Restore factory configuration (restore to factory default configuration parameters)

Instruction	Response	Parameter
AT+DEFAULT	+OK	None

Setting / query - serial port output status information

Instruction	Response	Parameter
AT+ENLOG<Param>	+OK	Param: (0-1)
AT+ENLOG	+ENLOG:<Param>	0: serial port does not output (power on, connection, disconnection, etc.) information 1: serial port output status information Default: 0

Setting / query - MTU byte

Instruction	Response	Parameter
AT+MTU<Param>	+OK	Param: (1-2)
AT+MTU	+MTU:<Param>	1: 20 byte 2: 128 byte Default: 1

Setting - battery service charge

Instruction	Response	Parameter
AT+BATT<Param>	+OK	Param: (0-100)
AT+BATT	+BATT:<Param>	0: indicates the power is 0% 99: indicates the power is 99% Default: 0

VI. Mobile Terminal Instruction

6.1 APP UUID list

Service UUID: 0xFFE0 (Service UUID Default 0xFFE0)
 Feature UUID : 0xFFE1 (For transparent transmission Default 0xFFE1
 Attribute notify、 write)
 Feature UUID: 0xFFE2 (For IO control Default 0xFFE2 Attribute write)

6.2 APP controls OUT output pin level (Characteristic FFE2)

IO port No.	Instruction (HEX)	Function	Factory default level
OUT1	E7F100	Output low level	Low level
	E7F101	Output high level	
OUT2	E7F200	Output low level	Low level
	E7F201	Output high level	
OUT3	E7F300	Output low level	Low level
	E7F301	Output high level	
OUT4	E7F400	Output low level	Low level
	E7F401	Output high level	
OUT5	E7F500	Output low level	Low level
	E7F501	Output high level	
OUT6	E7F600	Output low level	Low level
	E7F601	Output high level	
OUT7	E7F700	Output low level	Low level
	E7F701	Output high level	
All OUT pin	E7FF01	All OUT pin high	Low level
	E7FF00	All OUT pin low level	

6.3 APP reads INT pin level status

APP sends all int pin level status query commands (HEX to feature UUID: FFE2

App sends to feature FFE: E7A1

Module returns INT pin level status to APP: E7A201010101010101

Format description, E7A2 is the data head

Color corresponding to INT pin: PWRCEINT1EINT2INT3INT4INT5INT6INT7

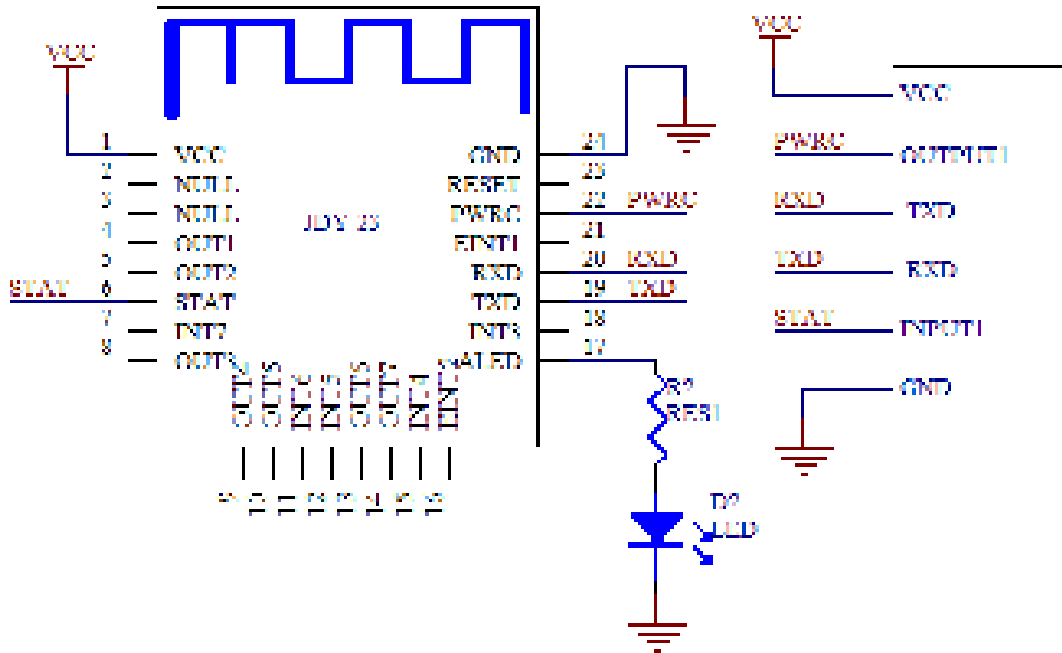
6.4 EINT pin is pressed to actively send data format to APP

Eint1 pin sends data format to APP: FC01010001

Eint2 pin sends data format to APP: FC01010001

VII. JDY-23 Basic Application Wiring Diagram

7.1 JDY-23 and 3.3V MCU serial port transparent transmission wiring diagram



If low power consumption is not required for transparent transmission or disconnection command is not required in connection state, PWRC pin can be disconnected.

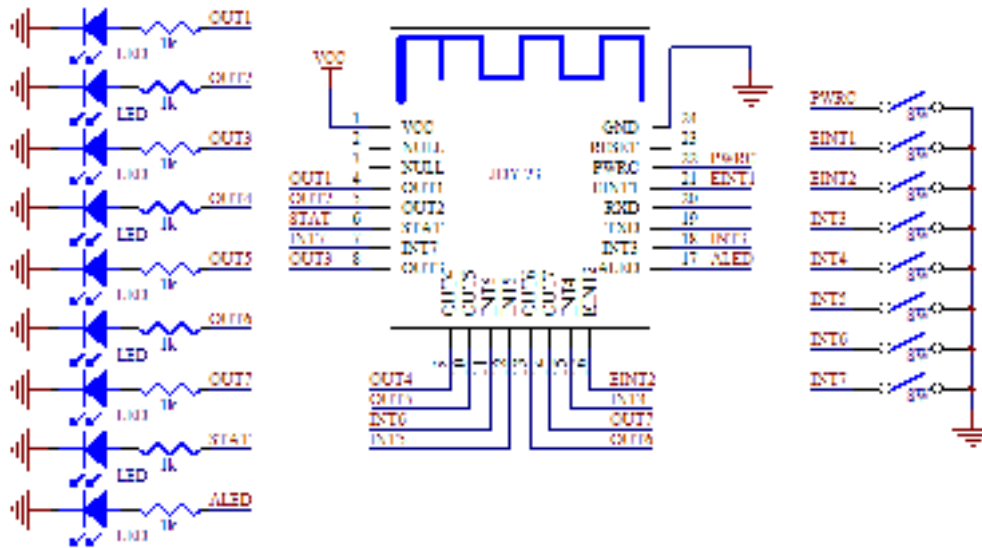
If low power consumption is not needed or connection status is not needed to be detected, it only needs four pins of VCC, GND, RXD and TXD to be connected.

MCU password verification instructions:

At present, JDY-23 does not add Bluetooth connection password function. If you need to judge the connection password to avoid other people's illegal connection, you can judge the password through the user's MCU. After the user app connects to JDY-23, the user app sends the password to the user MCU. If the user APP does not receive the correct password from the APP within 3 seconds after the connection, the MCU will not receive any data from the APP. Only when the password is correct, can it start to receive the transparent data of the APP. If the correct password is not sent to the user MCU within 3 seconds, the MCU will pull down the PWRC pin, sending the AT+DISC command to the Bluetooth module, and immediately disconnect the Bluetooth module from the APP.

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7.2 JDY-23 mobile phone APP controls OUT pin high and low level and reads INT pin level wiring diagram



APP can control the high and low level of output pins from OUT1 to OUT7, and APP can read the level state of all input pins of EINT and INT, and EINT1 and EINT2 can actively report the level state in the module connection state.

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.

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 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.

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

FCC Radiation Exposure Statement

This device complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

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

1) The transmitter module may not be co-located with any other transmitter or antenna.

As long as the condition above is met, further transmitter test 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 can not 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 can not 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. 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.

2.4 Limited module procedures

Additional testing and certification is necessary when specific host originally granted with this module.

2.5 Trace antenna designs

The module may be operated only with the PCB antenna with which it is authorized.

2.6 RF exposure considerations

Co-located issue shall be met as mentioned in "Specific operational use conditions" .

Product manufacturer shall provide below text in end-product manual

"Radiation Exposure Statement:

The product comply with the US portable RF exposure limit set forth for an uncontrolled environment and are safe for intended operation as described in this manual. The further RF exposure reduction can be achieved if the product can be kept as far as possible from the user body or set the device to lower output power if such function is available."

2.7 Antennas

Model name	Antenna type	Antenna gain
JDY23	PCB	-3dBi

2.8 Label and compliance information

Product manufacturers need to provide a physical or e-label stating

"Contains FCC ID: 2AXM8-JDY-23" with finished product

2.9 Information on test modes and additional testing requirements

Test tool: RF Test_V1.8.exe shall be used to set the module to transmit continuously

2.10 Additional testing, Part 15 Subpart B disclaimer

The module is only FCC authorized for the specific rule parts 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.