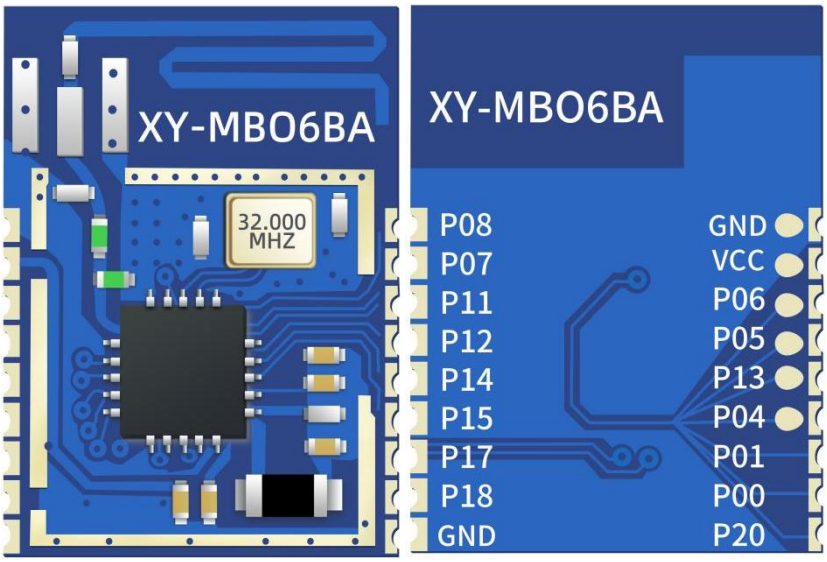


XY-MBO6BA Bluetooth Module

Data sheet

SHENZHEN NEWBIT INFORMATION TECHNOLOGY LTD.

Version 1.0

www.newbitsiot.com

Contents

目录

1 Device Overview

1.1 Description

XY-MBO6BA is a powerful, highly flexible, ultra-low power **Bluetooth® 5.3** module based on **OnChip OM6626B**, which has an Arm® Cortex™-M4+ CPU with the floating-point unit running at 64MHzrich configurable peripheral interfaces, and high-performance low-power Bluetooth RF, transmit power adjustable from -18dBm to +8.5dBm, receive sensitivity of -99dBm. In addition, the module also integrates a 32MHz crystal oscillator and IPEX port(RF PCB printed antenna), industrial-grade design, a RoHS process, and half-hole pins for easy production processing.

1.2 Key Features

1.2.1 Hardware Features

- Frequency: 2400 MHz ~ 2483.5 MHz
- Package: 11.80x17.93mm(Half-hole), 18pins
- BLE Compiles with Bluetooth V5.3
- Proprietary 2.4-GHz link controller
  - TX: Up to +8.5dBm transceiver output power

- RX: -99 dBm sensitivity @ 1 Mbps
- Link layer and AES/CCM integrated

- CPU
  - ARM® Cortex™-M4, max 64MHz
  - Hardware multiplier
- Memory
  - SRAM 80KB
  - Flash 1MB
- Power
  - Power supply range: 1.8 V ~ 3.3 V
- Clock and Timer
  - 32MHz crystal, 32MHz RC, 32.768KHz RC
  - Watchdog
- Peripherals
  - DMA x 8
  - UART x 2
  - Flexible general-purpose I/O
  - up to 25 GPIO
  - SPI master or slave interface x 2
  - PWM x 10
  - Watchdog to prevent system dead lock
  - 16-bit Timer x 3
  - single-end 12-bit GPADC x 8
  - AES HW encryption
- DMA
- Modulation: GFSK
  - Support internal RTC

1.2.2 Software Features

- Serial port transparent transmission, no need for any Bluetooth experience
- The connection interval is 30ms in default
- Support AT command to reset the module and get the MAC address
- Support AT command to adjust transmit power, modify broadcast interval, customize broadcast data, modify serial port baud rate, modify module name
- Support full-featured BT5.3 protocol
- Support tailor-made exclusive software to meet customer needs; CPU frequency is up to 64MHz, and interface resources are rich.
- Support OTA(over-the-air) upgrade function for easy maintenance

1.3 Applications

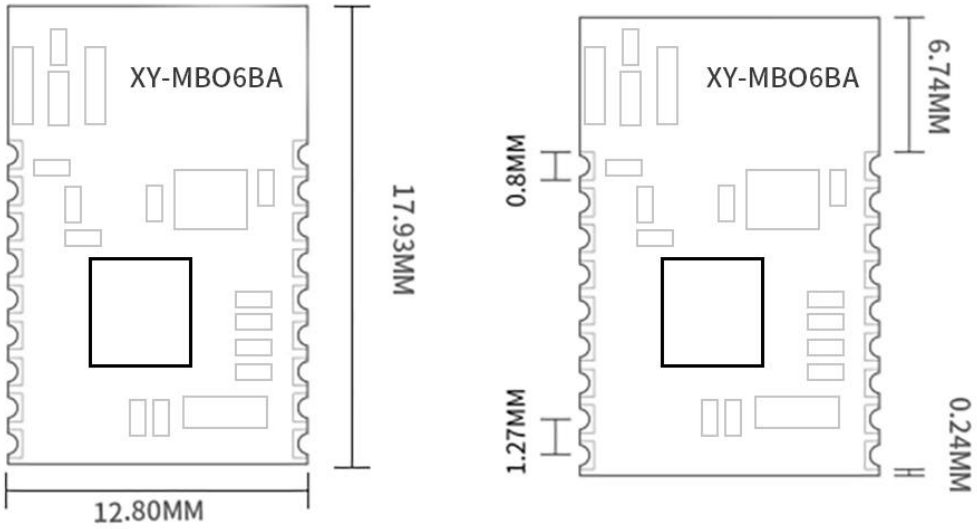
- **IoT**
  - Home automation
  - Sensor networks
  - Building automation
  - Industrial automation
- **Personal area networks**
  - Health/fitness sensor and monitor devices
  - Medical devices
  - Key fobs and wrist watches
- **Interactive entertainment devices**
  - Remote controls
  - Gaming controllers
  - VR/AR
- **Enterprise lighting**
  - Industrial
  - Commercial
  - Retail
- **Beacons**

2 Module default parameter configuration

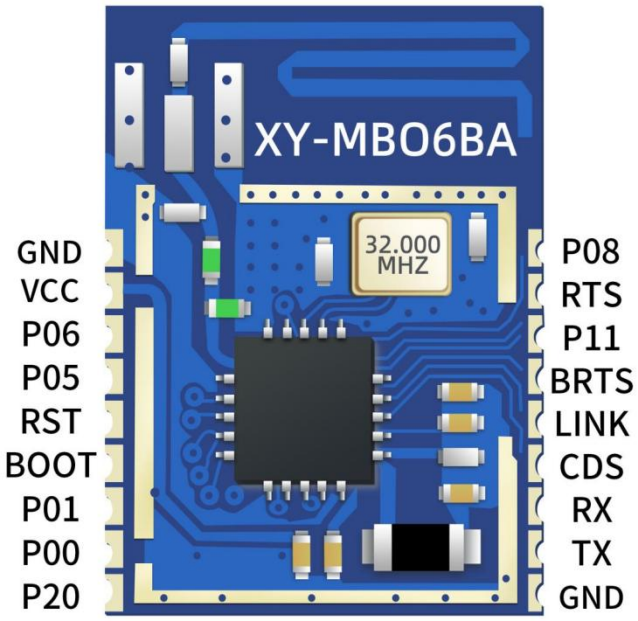
Parameter	Default value
Serial port configuration	115200bps
Module Name	NB-(MAC address)
Broadcast interval	200mS
Connection interval	30mS
TX power	0dBm
BLE Read/Write channel	FFF1/FFF2

3 Mechanical Details and Pin Assignment

3.1 Mechanical Details



3.2 Pin Assignment



Pin No.	Pin Name	Chip Pin Name	I/O	Description
Pin1	GND	GND	-	Ground
Pin2	VCC	VCC	-	Power Supply: 2V-3.6V
Pin3	-	P06	I/O	The pin of the burning program
Pin4	-	P05	I/O	The pin of the burning program
Pin5	RST	P13	I	Module Reset, Low Active
Pin6	BOOT	P04	I	Burn enable pin
Pin7	-	P01	I/O	Reserve
Pin8	-	P00	I/O	Reserve
Pin9	-	P20	I/O	Reserve
Pin10	GND	GND	-	Module ground
Pin11	TX	P18	O	UART_TX, Data transmit output pin
Pin12	RX	P17	I	UART_RX, Data transmit input pin
Pin13	CDS	P15	I	Low level: The AT command is not recognized, and all data is recognized as transparent data; High level: automatic recognition of AT commands and transparent transmission of data.

Pin14	LINK	P14	O	Connection status indication pin: High level: Bluetooth is connected, Low level: Bluetooth is not connected In the sleep state, this pin fails.
Pin15	BRTS	P12	I	Sleep pin: High level or floating: The module enters sleep mode Low level: The module exits sleep mode If low power consumption is not required, it can be directly grounded In sleep mode, the module's serial port can only receive data and cannot send data The MCU can control the module to enter or exit sleep mode through GPIO.
Pin16	-	P11	I/O	Reserve
Pin17	-	P07	I/O	The flow control pin indicates that a high level means disallowing the transmission of serial port data, while a low level means allowing the transmission of serial port data.
Pin18	-	P10	I/O	Reserve

4 Electrical Characteristics

4.1 Absolute Maximum Ratings

Parameter	Min	Max	Unit
Storage Temperature	-40	105	℃
VDD	-0.3	3.9	V
Other Pins	-0.2	VDD+0.3≤3.9	V

4.2 Recommended operating conditions

Parameter	Min	Recommended Value	Max	Unit
Operating Temperature	-40	—	85	℃
VDD	1.8	3.3	3.6	V

5 AT Commands List

Command	Command Description
AT+MAC?<CR><LF>	Query the MAC address
AT+MAC=<MAC><CR><LF>	Set the MAC address of the module
AT+NAME=<string><CR><LF>	Set the device name
AT+NAME?<CR><LF>	Query the device name
AT+ADV=<num><CR><LF>	Set the broadcasting status
AT+ADV? <CR><LF>	Query the broadcasting status
AT+UART=<num><CR><LF>	Set the baud rate
AT+UART?<CR><LF>	Query the baud rate
AT+DISCONN=<num><CR><LF>	Disconnect the Bluetooth connection
AT+DEV?<CR><LF>	Query the connected device currently
AT+UUIDS=<uuid><CR><LF>	Set the BLE main service channel

AT+UUIDS?<CR><LF>	Query the BLE main service channel
AT+UUIDN=<uuid><CR><LF>	Set the BLE read service channel
AT+UUIDN?<CR><LF>	Query the BLE read service channel
AT+UUIDW=<uuid><CR><LF>	Set the BLE write service channel
AT+UUIDW?<CR><LF>	Query the BLE write service channel
AT+AINTVL=<num><CR><LF>	Modify the broadcasting interval
AT+AINTVL?<CR><LF>	Query the broadcasting interval
AT+VER? <CR><LF>	Query the firmware version
AT+REST=1<CR><LF>	Restore
AT+REBOOT=1<CR><LF>	Set the module to reboot
AT+AMDATA=HEX<CR><LF>	Set custom broadcast data
AT+AMDATA?<CR><LF>	Query custom broadcast data

Remarks:

<CR><LF> is the ASCII code 0x0d and 0x0a；

The serial port prompt for successful power-up or restart(+READY <CR><LF>), the host MCU must receive this message before it can operate instruction and data transmission.

6 AT Commands Specific Description

Query the MAC address

Command Description: Query the address of the Bluetooth module
Read/Write: Read only
Command: AT+MAC? <CR><LF>
Supported parameters: N/A
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+MAC? <CR><LF>	+MAC: 000102030405<CR><LF>	Return the MAC address: 00:01:02:03:04:05

Set the MAC address of the module

Command Description: Set the MAC address of the Bluetooth module, which will take effect after restarting.
Read/Write: Write only
Command: AT+MAC=<mac><CR><LF>
Supported parameters: 000000000000-FFFFFFFFFFFF
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+MAC=<mac><CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Set the device name

Command Description: Set the device name, which will take effect immediately.
Read/Write:: Write only
Command: AT+NAME=<string><CR><LF>
Supported parameters: User-defined, the total length does not exceed 20 bytes.
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+NAME=<string><CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Query the device name

Command Description: Query the device name
Read/Write: Read only
Command: AT+NAME? <CR><LF>
Supported parameters: NA
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+NAME? <CR><LF>	+NAME: <string><CR><LF>	<string> is the current BLE device name

Set the broadcasting status

Command Description: Set the Bluetooth broadcast status of the device, which will take effect immediately, and resume broadcasting after reset and restart.
Read/Write: Write only
Command: AT+ADV=<num><CR><LF>
Supported parameters: 0-Turn off broadcasting 1-Turn on broadcasting
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+ADV=<num><CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Query the broadcasting status

Command Description: Get the hardware version of the module
Read/Write: Read only
Command: AT+ADV?<CR><LF>
Supported parameters: N/A
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+ADV?<CR><LF>	+ADV: X<CR><LF>	X=0 Device broadcast is turned off X=1 Device broadcasting is turned on

Set the baud rate

Command Description: Set the baud rate
Read/Write: Write only
Command: AT+UART=<num><CR><LF>
Supported parameters: 0:9600, 1:14400, 2:19200, 3:38400, 4:57600, 5:115200
Setup/Response:

R/W	Command Format	Response	Remarks

W	AT+UART=<num><CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Query the baud rate

Command Description: Query the baud rate
Read/Write: Read only
Command: AT+UART?<CR><LF>
Supported parameters: NA
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+UART?<CR><LF>	+UART: <num><CR><LF>	0:9600; 1:14400; 2:19200; 3:38400; 4:57600; 5:115200;

Disconnect the Bluetooth connection

Command Description: Get the current working status of the module
Read/Write: Write only
Command: AT+DISCONN=<num><CR><LF>

Supported parameters: 0-Disconnect all connected slave devices
1-Actively disconnect from the host device
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+DISCONN=<num><CR><LF>	+DISCONN: <num>, <MAC><CR><LF>	This machine is disconnected from the <mac> device.

Query the connected device currently

Command Description: Query the connected device currently
Read/Write: Read only
Command: AT+DEV?<CR><LF>

Supported parameters: NA
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+DEV?<CR><LF>	+DEV:<TYP>,<MAC> <CR><LF> …	TYP=0 means that the connected device is the main terminal connected device. TYP=1 means that the connected device is a slave-connected device. <MAC> is the MAC address corresponding to the connected device.

Set the BLE main service channel

Command Description: Set up the BLE main service channel, which will take effect after restarting.
Read/Write: Write only
Command Code: AT+UUIDS=<uuid><CR><LF>
Supported parameters: 16-bit or 128-bit UUID
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+UUIDS=<uuid> <CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Remarks:

16bit UUID example: FFF0
128bit UUID example: 11223344556677889900112233445566

Query the BLE main service channel

Command Description: Query the BLE main service channel.
Read/Write: Read only
Command: AT+UUIDS?<CR><LF>
Supported parameters: N/A
Setup/Response:

R/W	Command Format	Response	Remarks

R	AT+UUIDS?<CR><LF>	+UUIDS:<uuid><CR><LF>	Take the value of <UUID> UUID in 16bit format or 128bit format

Set the BLE read service channel

Command Description: Set the BLE read service channel
Read/Write: Write only
Command: AT+UUIDN=<uuid><CR><LF>
Supported parameters: 16-bit or 128-bit UUID
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+UUIDN=<uuid><CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Remarks:

16bit UUID example: FFF1
128bit UUID example: 11223344556677889900112233445566

Query the BLE read service channel

Command Description: Query the BLE read service channel
Read/Write: Read only
Command: AT+UUIDN?<CR><LF>
Supported parameters: NA
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+UUIDN?<CR><LF>	+UUIDN:<uuid><CR><LF>	Take the value of <UUID> UUID in 16bit format or 128bit format

Set the BLE write service channel

Command Description: Set the BLE write service channel, take effect after reboot.
Read/Write: Write only
Command: AT+UUIDW=<uuid><CR><LF>
Supported parameters: 16-bit or 128-bit UUID
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+UUIDW=<uuid><CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Remarks:

16bit UUID example: FFF2
128bit UUID example: 11223344556677889900112233445566

Query the BLE write service channel

Command Description: Query the BLE write service channel.
Read/Write: Write only
Command: AT+UUIDW?<CR><LF>
Supported parameters: N/A
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+UUIDW?<CR><LF>	+UUIDW:<uuid><CR><LF>	Take the value of <UUID> UUID in 16bit format or 128bit format

Modify the broadcasting interval

Command Description: Modify the broadcasting interval.
Read/Write: Write only
Command: AT+AINTVL=<num><CR><LF>
Supported parameters: 20 – 10240ms
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+AINTVL=<num><CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Query the broadcasting interval

Command Description: Query the broadcasting interval.
Read/Write: Read only
Command: AT+AINTVL?
Supported parameters: N/A
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+AINTVL?	+AINTVL:<num><CR><LF>	The interval is in ms.

Query the firmware version

Command Description: Query the firmware version.
Read/Write: Read only
Command: AT+VER?<CR><LF>
Supported parameters: N/A
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+VER?<CR><LF>	+VER:V1.0.0<CR><LF>	V1.0.0 is the firmware version.

Restore

Command Description: Restore factory settings, this command takes effect after reboot, MAC address cannot be restored after modification.
Read/Write: Write only
Command: AT+RESET=1<CR><LF>
Supported parameters: 1
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+RESET=1<CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Reboot

Command Description: Reboot.
Read/Write: Write only
Command: AT+REBOOT=1<CR><LF>
Supported parameters: 1
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+REBOOT=1<CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Set custom broadcast data

Command Description: Set custom broadcast data.
Read/Write: Write only
Command: AT+AMDATA=HEX<CR><LF>
Supported parameters: User-defined, HEX represents a 0-29 byte length HEX numerical value. For example, if the broadcast data is set to 5 bytes "12345", then the corresponding field would be "AT+AMDATA=3132333435<CR><LF>"
Setup/Response:

R/W	Command Format	Response	Remarks
W	AT+AMDATA=HEX<CR><LF>	OK<CR><LF>	Setup successfully
		ERROR<CR><LF>	Setup failure

Query custom broadcast data

Command Description: Query custom broadcast data.
Read/Write: Read only
Command: AT+AMDATA?<CR><LF>

Supported parameters: N/A
Setup/Response:

R/W	Command Format	Response	Remarks
R	AT+AMDATA? <CR><LF>	+AMDATA:HEX <CR><LF>	successfully set

7 BLE Protocol Description (APP Interface)

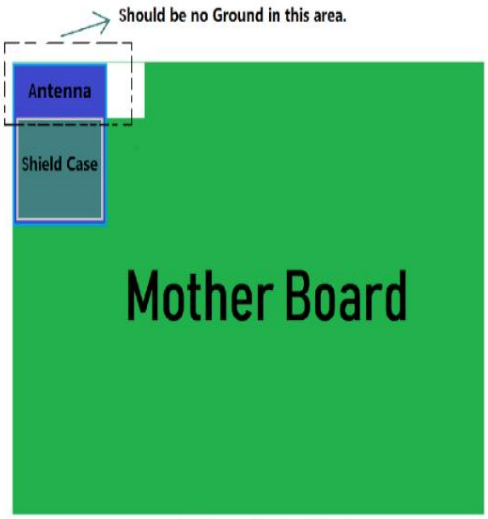
Transparent transmission data channel【Service UUID: 0xFFF0】

Characteristic values UUID	Executable operations	Default Value	Remarks
0xFFF2	Write	No	The written data will be output from the serial TX port.
0xFFF1	notify	No	Data input from the serial RX port will generate a notification to the mobile device on this channel.

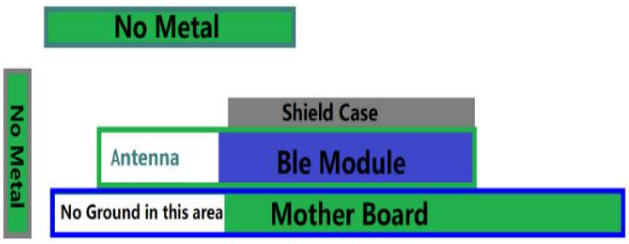
Description:

APP sends data to MCU via 0xFFF2 channel. MCU sends data to APP via 0xFFF1 channel. Users can also customize the read/write channel via AT commands.

8 Module Layout Reference Suggestions



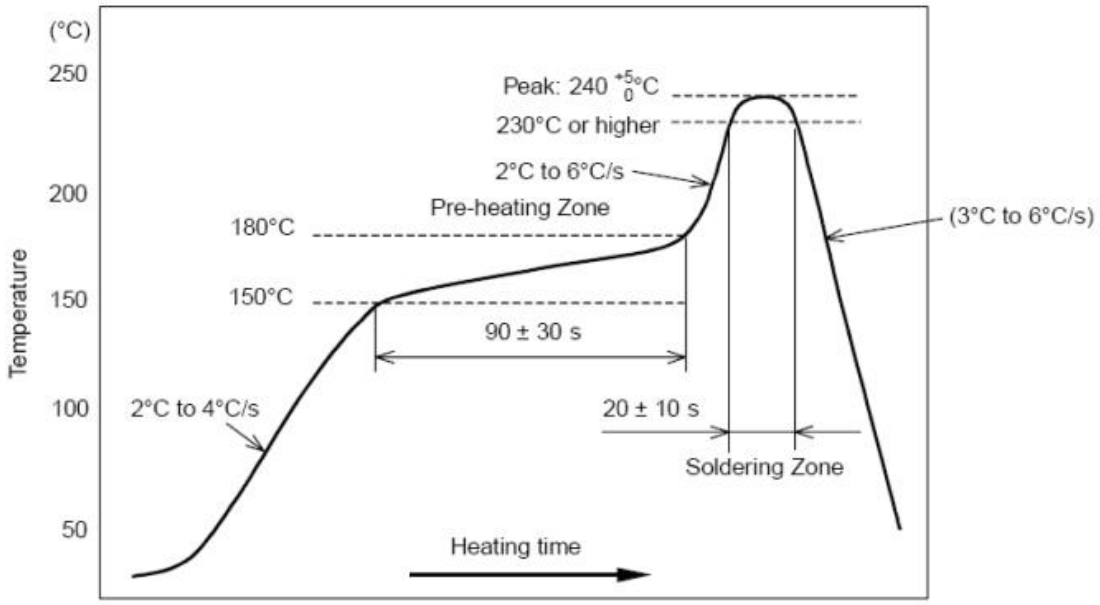
Recommended location in X-Y plane



Recommended location in Z plane

- The module antenna should be placed far away from other circuits, and there should be no wiring or copper plating below it.
- The part of the final user product's casing that is close to the antenna cannot be made of metal materials (including those with metal particle coatings or sprayed coatings).
- It is recommended to use magnetic beads for isolation when connecting the power supply to the module.
- Please check the stability of the power supply and ensure that the voltage does not fluctuate significantly or frequently.
- The grounding of the components should be good to reduce parasitic inductance.

When performing batch soldering for users, the reflow soldering temperature should not exceed 245℃.
Please refer to the temperature curve in the following figure.



9 Revision History

Revision	Description of changes	Approved	Revision Date
V1.0	Initial Release	Allen	2025.05.27

Notes:
Due to the continuous improvement of the hardware and software of the product, this document may be changed without further notice, and the latest version of the document shall prevail in the end.
For the latest information, please go to the website: www.newbitsiot.com to download, or contact us.

FCC Statement
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.

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.

The modular transmitter is only FCC authorized for FCC Part 15 Subpart C 15.247 & 15.207 & 15.209 & 15.205 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. If the grantee markets their product as being Part 15 Subpart B compliant (when it also contains unintentional-radiator digital circuity), then the grantee shall provide a notice stating that the final host product still requires Part 15 Subpart B compliance testing with the modular transmitter installed.

10 Contact Us

The contents of this data sheet are subject to change without prior notice for further improvement. Newbit team reserves all the rights for the final explanation.

Please contact Newbit sales team or visit www.newbitsiot.com for more related information if needed.

NEWBIT INFORMATION TECHNOLOGY CO., LTD.

16F, Huanancheng Building, Longgang District, Shenzhen, Guangdong, China

Tel: 86-755-23320814

info@newbitsiot.com

www.newbitsiot.com

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.

Radiation Exposure Statement:
This module support BT(2402-2480MHz) which compliance with part 15.249 and apply for single module approval .
The module is limited to OEM installation only.
The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.
OEM integrator shall equipped the antenna to compliance with antenna requirement part 15.203& 15.204 and must not be co-located or operating in conjunction with any other antenna or transmitters. And OEM host shall implement a Class II Permissive Change (C2PC) or a new FCC ID to demonstrate complied with FCC standard.
The OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.
The final end product must be labelled in a visible area with the following: “Contains FCC ID: 2A8QD-XY-MBO6BA”

ANT
The antenna is PCB antenna, and is permanent connection antenna. the antenna is -0.5dBi,This antenna is permanently paired with a product to sell. (Only antennas of the same type and with equal or less gains as shown below may be used with the The Bluetooth module. Other types of antennas and/or higher gain antennas may require additional uthorization for operation)

Module operation
1. According to the following requirements of the power supply, power up, about 3 seconds to to complete the initial。
2. Iphone/Android mobile phone BT function to open, search to the corresponding Bluetooth module name (name can be changed according to customer production requirements), click the name of the BT and select the connection.
3. open application software (need to install the company's specific application software development, application software interface can be customized according to customer's product requirements), click on the interface to see the scene。