WH-BLE102 User Manual

File Version: V1.0.2.02

Contents

Features

- Compatible with USR-BLE100's function and encapsulation.
- Support BLE 4.2 protocol and backward-compatible with earlier versions.
- Support low power consumption broadcast mode with average current 800uA and Hibernate mode with average current 500nA. Support various waking up ways.
- Support fast switch between master mode and slave mode.
- Support serial AT command mode and transparent transmission AT command mode.
- Support one-to-many broadcast mode and iBeacon protocol.
- Support Mesh networking mode.
- Support modifying 128bit format UUID.

1. Get Start

1.1. Application Diagram

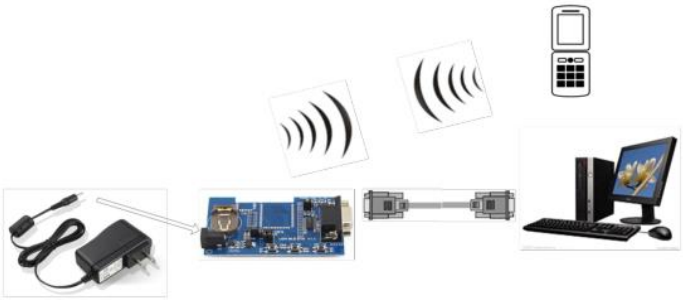

Figure 1 Application diagram

1.2. Hardware

1.2.1. LED

WH-BLE102 has one LED and LED has different status according to module status.

Module status	LED status
Searching in master mode	Blink three times every second
Broadcasting in slave mode	Blink once every second
Connection established	Light
Low-power mode	Off

Figure 2 LED

Note: LED will take effect in low level status, so the 'Light' status means LED pin status is in low level.

1.2.2. Dimension

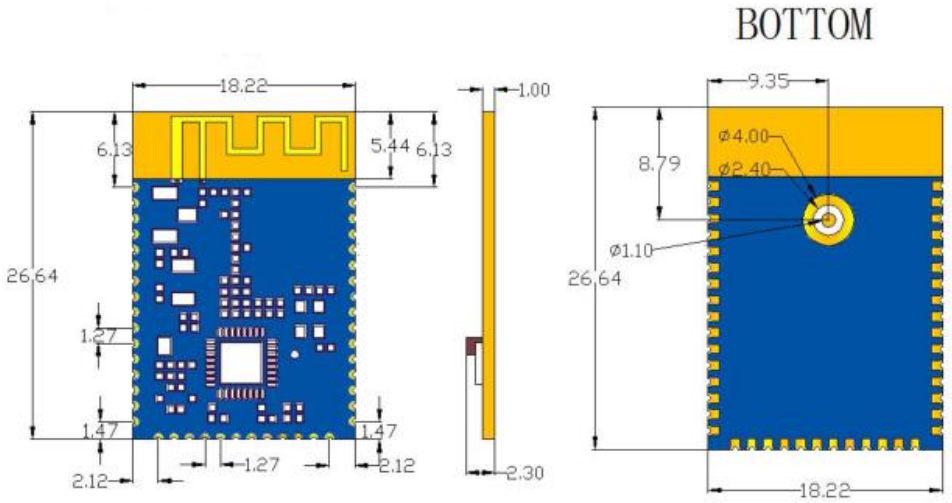

Figure 3 Dimension

2. Product Functions

2.1. Work mode

WH-BLE102 supports four work modes:

- Master mode
- Slave mode
- Broadcast mode
- Mesh networking mode

Note: Default work mode is slave mode and user can search the module by master device.

2.1.1. Master mode

WH-BLE102 supports master mode module can connect to one slave device. In this mode, module can search surrounding devices and choose slave device to connect. In this mode, user can also set MAC address of slave device and module will search and connect to this slave device after powering.

Figure 4 Master mode

Note: Generally, user needs to connect our company master device to our company salve device to do one-to-one data transmission. And if user wants to connect to other company slave device, user needs to know the UUID of this device and configure UUID of our company mater device(Only support 128bit format and only same configuration can realize data transmission).

Current firmware versions only support modifying 128bit format UUID and user can contact our technical support engineer for firmware customization if user needs to modify 16bit or 32bit format UUID.

2.1.2. Slave mode

WH-BLE102 supports slave mode. This mode fully conforms to BLE 4.2 protocol and is fully compatible with BLE 4.0 protocol, user can develop APP according to protocol. In this mode, module has a Service of serial port receiving/transmitting and user can find it by UUID(Service has 'read' and 'write' two channels and user can operate these two channels to do data transmission).

Figure 5 Slave mode

Note: User doesn't need to care about protocol of modules if user connect WH-BLE102 as master device to WH-BLE102 as salve device and this connection can realize data transparent transmission between two devices' serial port.

2.1.3. Broadcast mode

WH-BLE102 supports broadcast mode and module can realize one-to-many broadcast in this mode. User can send related AT commands to configure module's broadcast data and module can broadcast in low-power mode. In broadcast mode, module can only work as transmitting side and user can contact our technical support engineer for firmware customization if user wants to make module work as both transmitting side and receiving side simultaneously.

Figure 6 Broadcast mode

2.1.4. Mesh networking mode

WH-BLE102 supports mesh networking mode which can add multiple modules into network. By star network and relay technology, each network can connect over 65000 nodes. Network can also connect to other networks, so plenty of BLE modules can connect each other through mobile, PAD or PC without gateway(If one device breaks down, this device will be passed and choose the nearest device to transmit). Whole networking process only needs to power on and set communication password.

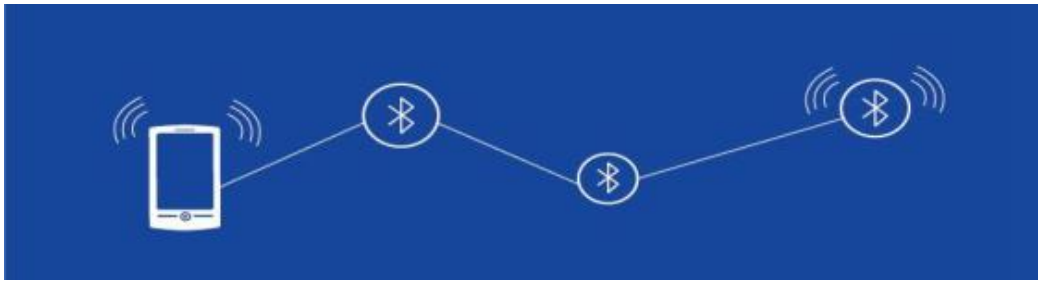

Figure 7 Mesh networking mode

Note: Mesh networking mode has certain limitations. Because module needs to continually switch mode during transmission, transmitted data will be restricted less than 20 bytes every time and transmission speed will have a few seconds delay. Mesh networking mode is similar to UDP method, it can't ensure data be transmitted to target module.

2.2. Serial package

WH-BLE102 serial port can receive at most 512 bytes data packet once. Module will automatically package data and send data packet after packaging according to size of data(According to standard, every wireless data packet at most 20 bytes). Data packet from mobile device to module must package(1-20 bytes every packet) and send, Module will transmit these data packets to serial side in sequence after receiving them.

There are two package mechanisms within the module, one is 20 bytes every packet(standard) and another is 100 bytes every packet(100 bytes every packet can only applied in using both our company modules do one master to one slave data transmission and please adopt 20 bytes every packet method when you use APP to communicate slave). Default package mechanism is 20 bytes every packet.

2.3. iBeacon protocol

WH-BLE102 supports iBeacon protocol which can transmit individual ID to surrounding by BLE broadcast technology and application software will take some actions after receiving ID.

iBeacon protocol has four parameters: UUID, Major, Minor, TX power.

- UUID: ID to distinguish your beacon to others' beacon. For example, multiple beacons belong to same group to provide specific services for customer in the shop, therefore these beacons in same group will be distributed same UUID.
- Major: To identify correlative beacons to a group. For example, all beacons in a same shop will be distributed same Major number. By this way, application software can know customer in which shop.
- Minor: To identify a specific beacon device. For example, every beacon in the shop has a unique Minor number and you can know the location of customer in the shop.
- TX power: To ascertain the distance between user and beacon(Its measured RSSI which has one meter distance to device). If user knows RSSI of one meter distance and current RSSI(Current RSSI can be acquired from received data), current distance can be calculated.

2.4. Low-power mode

WH-BLE102 supports three low-power modes:

- Automatic sleep mode: This mode needs user to send related AT command to configure time of entering sleep mode. When time of no connection and no serial data over set time, module will enter sleep mode automatically. In this mode, BLE broadcast is normal and can establish connection, module can also be waken up by serial data.
- Deep sleep mode: User needs to send related AT command to enter this mode. After entering this mode, module can broadcast and establish connection. There are two waking up ways, one is establishing connection and another is waking up by wake_up pin. Power consumption of this mode can arrive about 800uA and most of slave mode devices work in deep sleep mode.
- Hibernate mode: User needs to send related AT command to enter this mode and all peripheral devices of

module won't work in this mode. Power consumption of this mode can arrive about 500nA and user can wake up module from this mode by wake_up pin.

Note: Low-power mode only work when module works in slave mode or broadcast mode. When module works in master mode, user can make module stop running if module doesn't work.

2.5. Password matching

To ensure security, WH-BLE102 provides password matching function and user needs to send related AT command to enable function. After enabling this function, when user searches the module and tried to establish connection, user needs to write six bytes password through 'Write' channel of transparent transmission 'Service' within ten seconds firstly and then to keep connection and transmit data. Writing wrong password or writing password overtime will both disconnect to BLE102. And if user connects our company master device to our company slave device, user only needs to send six bytes password by serial port of master device to keep connection and transmit data after establishing connection.

2.6. Data transmission encryption

To ensure security of data transmission, WH-BLE102 provides data transmission encryption function and user can send related AT command to enable function. After enabling function, serial data will be PC1 encrypted by written password and received module only has same password can decode data correctly.

Data transmission encryption function adopts standard PC1 encryption and user can contact our technical support engineer for encryption word to develop own APP.

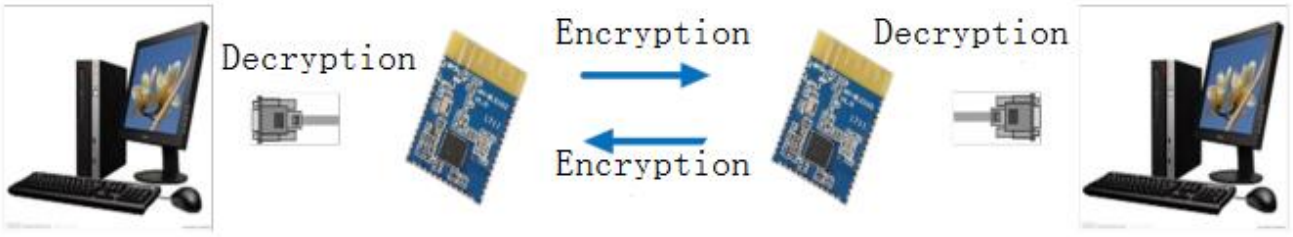

Figure 8 Data transmission encryption

2.7. Reconnecting function

To ensure stability of module connection and prevent abnormal phenomena to disconnect connection, WH-BLE102 provides reconnecting function and user can send related AT command to enable function. When abnormal phenomena lead to disconnection between modules and then working environment recover after abnormal phenomena disappearing, module in master mode will search module in salve mode automatically and reconnect automatically after searching successfully.

3. AT command mode

3.1. Serial AT command mode

In work mode, user can enter AT command mode and send AT commands to module to configure the module. For entering AT command mode, please refer to this FAQ:
https://www.usriot.com/support/faq/enter-serial-command-mode.html.

3.2. Transparent transmission AT command mode

WH-BLE102 supports transparent transmission AT command mode. In this mode, user can configure module though APP on mobile phone or other module which is connecting to module. User only needs to add six bytes password before AT command during data transparent transmission. Fox example, password is 000000 and user wants to query firmware version, so user can send: 000000,AT+CIVER? and carriage return.

4. Contact Us

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6. Update History

2018-01-02 V1.0.2.01 established based on Chinese version V1.0.2.
2018-06-14 V1.0.2.02 updated.