

# SDM16HA(LE5.1)HY-1.0

BLE transparent transmission module  
Specifications and instructions



Hobbywing Technology Co., LTD

Model: HW6187  
CMIIT ID: 2021DP16214  
Version: V1. 2  
Date: 2021-05-20

## Contents

|                                                                |    |
|----------------------------------------------------------------|----|
| FCC Warning .....                                              | 3  |
| 1 Features.....                                                | 4  |
| 1.1 Functional Overview.....                                   | 4  |
| 2 Product hardware layout and interface description.....       | 4  |
| 2.1 Module pin layout.....                                     | 4  |
| 2.2 BLE module pin description.....                            | 4  |
| 3 Hardware Design .....                                        | 5  |
| 3.1 Module simple application connection circuit diagram ..... | 5  |
| 4 Module Dimensions .....                                      | 5  |
| 4.1 The module size.....                                       | 5  |
| 5 Module Transparent Transmission Protocol .....               | 6  |
| 5.1 AT command configuration .....                             | 6  |
| 5.2 AT command overview.....                                   | 6  |
| 5.2.1 AT+NAME .....                                            | 7  |
| 5.2.2 AT+MODE .....                                            | 7  |
| 5.2.3 AT+SLEEP .....                                           | 8  |
| 5.2.4 AT+MAC.....                                              | 8  |
| 5.2.5 AT+CIVER.....                                            | 8  |
| 5.2.6 AT+ UART .....                                           | 8  |
| 5.2.7 AT+Z .....                                               | 9  |
| 5.2.8 AT+ +++ .....                                            | 9  |
| 5.2.9 AT+AUTO+++ .....                                         | 9  |
| 5.3.0 AT+FLASH .....                                           | 9  |
| 5.3.1 AT+ LINK .....                                           | 10 |
| 5.3.2 AT+ SCAN .....                                           | 10 |
| 5.3.3 AT+ CONN.....                                            | 10 |
| 5.3.4 AT+ CONNADD .....                                        | 10 |
| 5.3.5 AT+ DISCONN .....                                        | 11 |
| 5.3.6 AT+ UUID.....                                            | 11 |
| 5.3.7 AT+POWER.....                                            | 11 |
| 5.3.8 AT+ADVINT.....                                           | 12 |

## FCC Warning

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 1: 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.

NOTE 2: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

# 1 Features

This module is a BLE transparent transmission module designed based on the Bluetooth Low Energy standard published by Bluetooth SIG. This module is controlled through the serial port and also supports wireless control through the host side. Users do not need to pay attention to complex Bluetooth protocol application software, and can develop standard low-power Bluetooth products in a short period of time. After the connection is established through serial control, two-way data transmission can be realized between the BLE host and the slave.

## 1.1 Functional Overview

1. Support fully transparent transmission
2. Support serial port command to modify and get module settings
3. Power consumption and performance can be independently weighed and selected
4. The fastest one-way communication rate can exceed 3kBytes/s
5. Support serial large data packets of up to 200 bytes, and the module can buffer and sub-package independently
6. Serial port configuration {or read} parameters such as baud rate, device name, broadcast interval, etc.
7. Abundant I/O control and status indication functions, simpler and real-time control module and obtain module status
8. Simpler software and hardware design requirements

## 2 Product hardware layout and interface description

### 2.1 Module pin layout

Module pin layout as shown in Figure 2-1

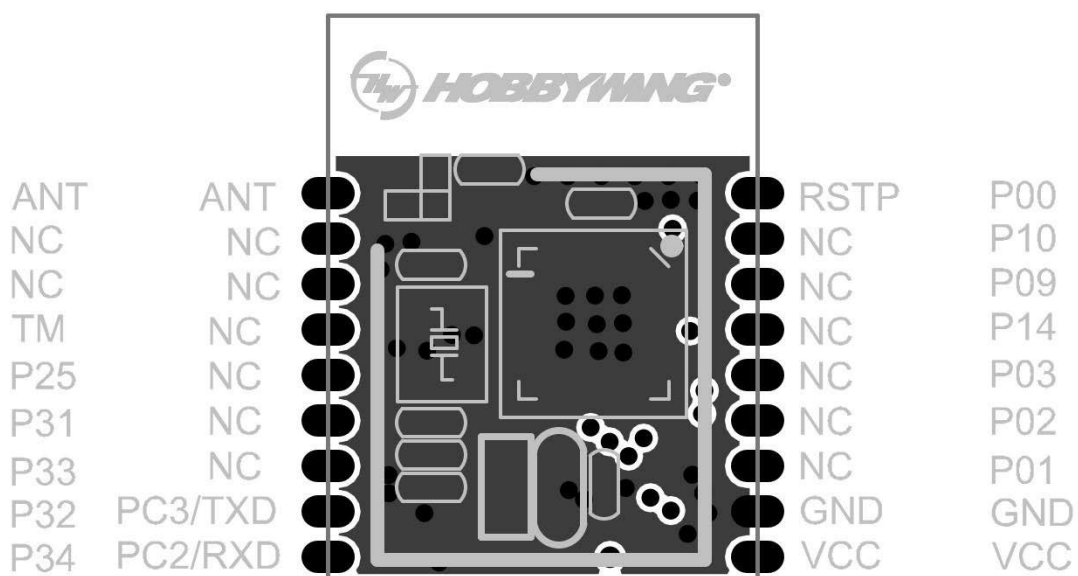


Figure 2-1

### 2.2 BLE module pin description

BLE module pin description in Table 2-1

| Number | Pin | Features         | Direction | Instruction              |
|--------|-----|------------------|-----------|--------------------------|
| 1      | ANT | external antenna | /         | Connect external antenna |
| 2      | NC  | NC               | /         | NULL                     |
| 3      | NC  | NC               | /         | NULL                     |
| 4      | TM  | NC               | /         | NULL                     |
| 5      | P25 | NC               | /         | NULL                     |
| 6      | P31 | NC               | /         | NULL                     |
| 7      | P33 | NC               | /         | NULL                     |
| 8      | P32 | BTX              | I/O       | UART Tx                  |
| 9      | P34 | BRX              | I/O       | UART Rx                  |
| 10     | P00 | RSTP             |           | Connect GND to Reset     |
| 11     | P10 | NC               | /         | NULL                     |
| 12     | P09 | NC               | /         | NULL                     |
| 13     | P14 | NC               | /         | NULL                     |
| 14     | P03 | NC               | /         | NULL                     |
| 15     | P02 | NC               | /         | NULL                     |
| 16     | P01 | NC               | /         | NULL                     |
| 17     | GND | GND              | /         | Connect GND              |
| 18     | VCC | VCC              | /         | Vbat 3.0-4.2v            |

Table 2-1

## 3 Hardware Design

### 3.1 Module simple application connection circuit diagram

Module simple application connection circuit diagram as shown in Figure 3-1

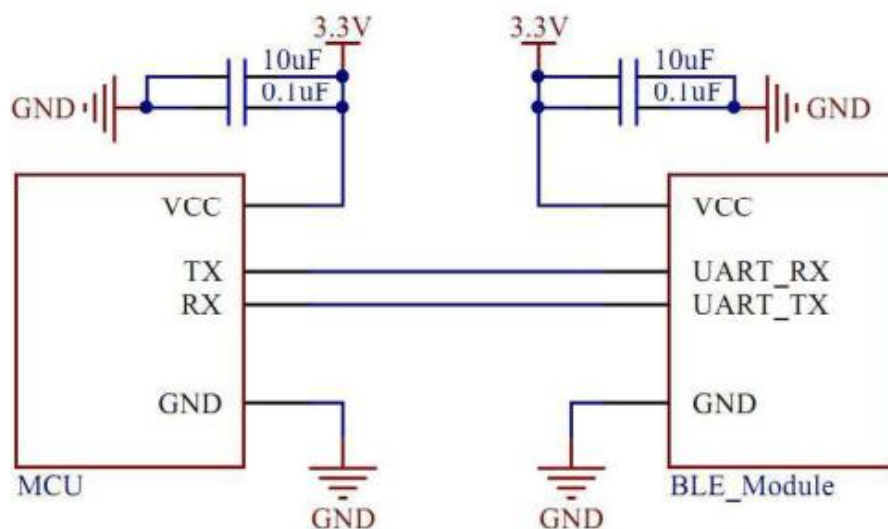


Figure 3-1

## 4 Module Dimensions

### 4.1 The module size

The module size is shown in Figure 4-1

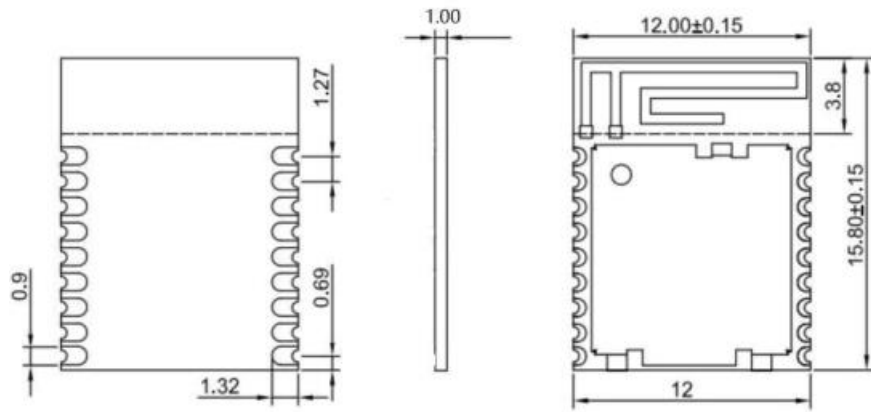


Figure 4-1

## 5 Module Transparent Transmission Protocol

### 5.1 AT command configuration

<AT+> command refers to the command set passed by user through UART and module input command in command mode. The usage format of AT+ command will be explained in detail later. After power-on and startup, you can set the default UART of the module through UART. The port parameters are z baud rate 115200, no parity, 8 data bits, and 1 stop bit.

### 5.2 AT command overview

<AT+ >commands can be input directly through serial debugging programs such as CRT, AT+ commands use command lines based on ASCII codes, and the format of the commands is as follows.

#### 1. Format description

< >: Indicates the part that must be included

[ ]: Optional part

#### 2. Command Message

AT+<CMD>[p][para-1,para-2,para-3,para-4] <CR><LF>

AT+: Command message prefix:

[op]: Command operator, specify parameter setting or query:

“=”: Indicates parameter setting

“?” : means query

[para-n]: Input for parameter setting, such as query does not need:

<CR>: end character, carriage return, ASCII code 0X0D;

<LF>: end character, line feed, ASCII code 0X0A;

#### 3. Response message

<CR><LF>+<RSP>[op] [para-1,para-2,para-3,para-4] <CR><LF>

+: Response message prefix:

RSP: Response string, including 2

“OK”: means success

“ERR”: Indicates failure

[para-n]: Return parameters when querying or error code when error occurs

<CR>: ASCII code 0x0D;

<LF>: ASCII code 0x0A;

#### 4. Instructions for instructions

##### General instructions

[NAME] resistance Query/set the name of the module

[MODE] query/set the mode of the module MAC query the MAC address of the module

[CIVER] query the software version number

[UART] setting/query module serial port parameters

[Z] control module restart

[+++] Enter transparent transmission mode

[AUTO+++] The query/setting module automatically enters the transparent transmission mode after being connected

[FLASH] stores the default configuration parameters to the flash, the specific parameters are explained later.

[SLEEP] sets the chip to start/stop sleep.

##### Connection instruction

[LINK] Query the connection status of the module

[SCAN] Search the surrounding slaves

[DISCONN] Set to disconnect the current connection

[CONN] Actively connect to the peer device scanned by [SCAN]

[CONNADD] Set the default peer MAC address for active connection Features z

[UUID] Set/Query UUID of the module

[POWER] Query/set the transmit power of the radio frequency

[ADVINT] query/set broadcast interval

#### 5.2.1 AT+NAME

**Function:**Query/set the name of the module

\* Query the current parameter value

AT+ NAME?{CR}{LF}

**Response**

{CR}{LF}+NAM E:na me{CR}{LF}OK{CR}{LF}

**\* Setting**

AT+NAME=name {CR}{LF}

**Response**

{CR}{LF}+NAM E:name{CR}{LF}OK{CR}{LF}

\* Parameter

name: name of the module {limit length 1" 15 bytes} setting exampleg

For example, if you want to set the module name to USR-BLEIOO, you need to set it as follows

AT+NAME=USR-BLEIOO {CR}{LF},the {CR}{LF} and carriage return in the above formula.

#### 5.2.2 AT+MODE

**Function:**Query/set the working mode of the module

\* Query the current parameter value z

AT+ MODE?{CR}{LF}

**Response**

{CR}{LF}+MODE:mode{CR}{LF}OK{CR}{LF}

### **★ Setting**

AT+MODE=mode{CR}{LF}

Response

{CR}{LF}+MODE:mode{CR}{LF}OK{CR}{LF}

★ Parameter

mode: the working mode of the module

I: wall idle mode, query display I, set the parameter to I (uppercase)

S: Slave mode, query display s, no need to set

M: In each mode of the main setting, the query displays M, and the parameter is set to M (uppercase)

B: Broadcast mode, query display B, set the parameter to B (uppercase) C: link mode in progress, query display c, no need to set X: abnormal mode, query display x, cannot be set

### 5.2.3 AT+SLEEP

**Function:**Start/stop the sleep function of the module, using AT+FLASH will record the current Sleep,Enable the setting, the last sleep setting will be automatically enabled when the power is turned on next time.

### **★ Setting**

AT+SLEEP=set{ CR}{LF}

**Response**

{CR}{LF}+SLEEP:set{CR}{LF}OK{CR}{LF}

★ Parameter

set: module sleep start or stop

S: Set the module to enter sleep E: Set the module to stop sleep

### 5.2.4 AT+MAC

**Function:**Query the MAC address of the module. Format z

\* Query the current parameter value 2

AT+MAC?{CR}{LF}

**Response**

{CR}{LF}+MAC:mac{CR}{LF}OK{CR}{LF}

★ Setting

AT+ MAC "nac{CR}{LF}

**Response**

{CR}{LF}+MAC:mac{CR}{LF}OK{CR}{LF}

★ Parameter

mac: MAC address of the device, such as FFFFFFFF

### 5.2.5 AT+CIVER

**Function:** Query software version number

\* Query the current version value 2

AT+CIVER? {CR}{LF}

**Response**

{CR}{LF}+VER: Version number {CR}{LF} OK{CR}{LF}

### 5.2.6 AT+ UART

**Function:**Set/query module serial port parameters

\* Query the current parameter value

AT+UART?{CR}{LF}

**Response**

{CR}{LF}+UART: baudrate ,databit,p cylinder i,stop{CR}{LF}OK{CR}{LF}

**\* Setting**

AT+ UART = baudrate ,databit,p cylinder i,stop {CR}{LF}

**Response**

{CR}{LF}+UART: baudrate ,databit,p cylinder i,stop{CR}{LF}OK{CR}{LF}

**\* Parameter**

baudrate: The serial port baud rate is any value from 2400 to 115200, the factory default is 115200  
databit: the data bit is 5, 7,8, and the factory default is 8.

pari: check digit, factory default no check

0: No parity

1: Odd parity

2: Even parity

stop: stop bit, factory default 1 stop bit

1: 1bit stop bit

### 5.2.7 AT+Z

**Function:**Control module restart

**\* Setting**

AT+Z{CR}{LF}

**Response**

{CR}{LF}+Z{CR}{LF}OK{CR}{LF}

### 5.2.8 AT+ +++

**Function:** Control module enters transparent transmission mode

**\* Setting**

AT+++++{CR} {LF}

**Response**

{CR}{LF}+←+{CR}{LF}OK{CR}{LF}

### 5.2.9 AT+AUTO+++

**Function:**Query/set whether the module automatically enters the transparent transmission mode after being connected.

\* Query the current parameter value 2

AT+AUTO+++?{CR} {LF}

**Response**

{CR}{LF}+AUTO ten 忡 set{CR}{LF}OK{CR}{LF}

**\* Setting**

AT+A stare at O+忡 set{CR}{LF}

**Response**

{CR}{LF}+AUTO material→: set {CR}{LF}OK{CR}{LF}

**\* Parameter**

set: Whether to automatically enter the transparent transmission after the module is linked

Y: Automatically enter transparent transmission

N: Do not enter transparent transmission automatically

### 5.3.0 AT+FLASH

**Function:**The control module stores UART, MAC (own address and the peer address of the default link), NAME, broadcast interval, whether to automatically enter the transparent transmission, whether to automatically enable the sleep function, and transmit power information to FLASH.

**\* Setting**

AT+FLASH{CR} {LF}

**Response**

{CR}{LF}+FLASH{CR}{LF}OK{CR} {LF}

### 5.3.1 AT+ LINK

**Function:**Query module connection status

\* Query the current parameter value z

AT+LINK? {CR}{LF}

**Response**

{CR}{LF}PeerAddr:MAC{CR} {LF}Rssi:RssidBm{CR}{LF}+LINK:syang"s

{CR}{LF}OK{CR}{LF}

**\* Parameter**

**MAC:** The address of the connected device, if there is no connection, it will not respond to this item

**Rssi:** The signal strength of the connected device, if there is no connection, it will not respond to this item

**status:** module connection status OnLine: connection is successful OffLine: module is not connected

### 5.3.2 AT+ SCAN

**Function:** Search surrounding slaves

Query the current parameter value z

AT+SCAN {CR}{LF}

**Response**

{CR}{LF}+SCAN:ON{CR}{LF}OK{CR}{LF}{LF} {LF}No: num

Addr:mac

Rssi:RssidBm{LF}{LF}{CR}{LF}Scan response: {CR}{LF} data{CR}{LF}

Thing parameter z

num: searched the index number of the slave device (up to 20 devices around it are displayed)

mac: The MAC address of the slave device is found

size: The signal strength of the searched slave device

data: The scan response data packet of each slave device is searched, if not, it will display NONE

### 5.3.3 AT+ CONN

**Function:** Quickly establish a connection by searching to the index number'

\* Set the current parameter value

AT+CONN [num]{CR}{LF}

**Response**

{CR}{LF}+CONN:num{CR}{LF}OK{CR}{LF}

Take parameter z

num: index number after searching

### 5.3.4 AT+ CONNADD

**Function:**Set/query the MAC address of the default connection module when the device is

powered on. Format z

'Query the current parameter value z

AT+CONNADD? {CR}{LF}

**Response**

{CR}{LF}+CONNADD:mac{CR}{LF}OK{CR}{LF}

**\* Setting**

AT+CONNADD 『nac{CR}{LF}

**Response**

{CR}{LF}+CO 网 ADD:mac{CR} {LF}OK{CR}{LF}

**\* Parameters**

mac: The default connection MAC address after power-on

### 5.3.5 AT+ DISCONN

**Function:** Set to disconnect the current connection

**\* Setting**

AT+DISCONN {CR}{LF}

**Response**

{CR}{LF}+DISCONN:OK{CR}{LF}OK{CR} {LF}

### 5.3.6 AT+ UUID

**Function:**Set/inquire each serial port service UUIDQuery the current parameter value

AT+ UUID? {CR}{LF}

**Response**

{CR}{LF}+bleUart\_Server 二\_l]uid:

{CR}{LF}DATA:UUID{CR} {LF}{CR}{LF}+bleU cylinder t\_Server\_Tx\_Uuid:

{CR}{LF}DATA:UUID{CR} {LF}{CR}{LF}+bleUart\_Server\_Rx\_Uuid:

{CR}{LF}DATA:UUID{CR} {LF}OK{CR}{LF}

**\* Setting**

AT+ UUID =NUM+UUID{CR}{LF}

**Response**

{CR}{LF}+bleUart\_Server\_Uuid:{CR} {LF}DATA:UUID{CR} {LF}{CR}{LF}successful{CR}{LF}or

{CR}{LF}+bleUart\_Server\_Tx\_Uuid:{CR} {LF}DATA:UUID{CR} {LF}{C R}{LF}successful{CR}{LF}or

{CR}{LF}+bleUart\_Server\_Rx\_Uuid:{CR} {LF}DATA:UUID{CR} {LF}{C R}{LF}success such as {CR}{LF}

**\* Parameter**

NUM: used to differentiate services

\* AA: bleUart Server Uuid: main service UUID

\* BB: bleUart\_Server\_Tx\_Uuid: serial port read service, a Notify service

\* CC: bleUart Server Rx Uuid: serial port write service, one WriteWithoutResponse service

### 5.3.7 AT+POWER

**Function:**Query/set the RF power of the module

\* Query the current parameter value 2

AT+ POWER?{CR}{LF}

**Response**

{CR}{LF}+POWER:set{CR} {LF}OK{CR}{LF}

**\* Setting**

AT+POWER=set{CR} {LF}

**Response**

{CR}{LF}+POWER:set{CR} {LF}OK{CR}{LF}

**\* Parameter**

set: RF power of the module

0: Sdb

1: 2.Sdb

2, odb

3: -Sdb

4: -lOdb

5: -17db

5.3.8 AT+ADVINT

**Function:** query/set broadcast interval

\* Query the current parameter value

AT+ ADVINT?{CR}{LF}

**Response**

{CR}{LF}+ADV T:set{CR}{LF}OK{CR} {LF}