



**Shenzhen Hi-Link Electronic Co., Ltd.**

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# **HLK-B35 User Manual**



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## 1. Product Introduction

### 1.1. Brief introduction

HLK-B35 is a low-cost embedded UART-WIFI (serial-wireless network) module launched by Hi-link Electronics. It is a Wi-Fi + BLE combined chipset for low-power and high-performance application development.

This product is based on an embedded module that conforms to network standards through a serial interface, with an embedded TCP/IP protocol stack, which can realize the conversion between the user's serial port and the wireless network (WIFI/BLE).

With the HLK-B35 module, the traditional serial device can transmit its own data through the Internet without changing any configuration, providing a complete and fast solution for the user's serial device to transmit data through the network.

### 1.2. Product Features

- Wireless subsystem includes 2.4G radio, Wi-Fi 802.11b/g/n and BLE 5.0 baseband/MAC design
- Microcontroller includes 32-bit RISC CPU with FPU (floating point unit), cache and memory power management unit to control low power consumption mode
- DFS (Dynamic Frequency Scaling) main frequency support from 1MHz to 192MHz
- Support XIP QSPI Flash hardware encryption
- Built-in 276KB RAM, 128KB ROM, 1KB eFus, 2M embedded Flash memory
- Working voltage supports 2.1-3.63V, typical value is 3.3V
- BLE assists in realizing Wi-Fi fast network configuration
- Support AP/STA and BLE coexistence mode, among which WiFi security support: WPS/WEP/WPA/WPA2 Personal/WPA2 Enterprise/WPA3
- Integrated balun, PA/LNA
- Abundant peripheral interfaces, 1\*SPI master/slave, 2\*UART,

- QSPI Flash Instant AES Decryption (OTFAD)-AES-128, CTR mode
- Support AES 128/192/256 bit encryption engine, true random number generator (TRNG), public key accelerator (PKA)
- Widely used in the Internet of Things

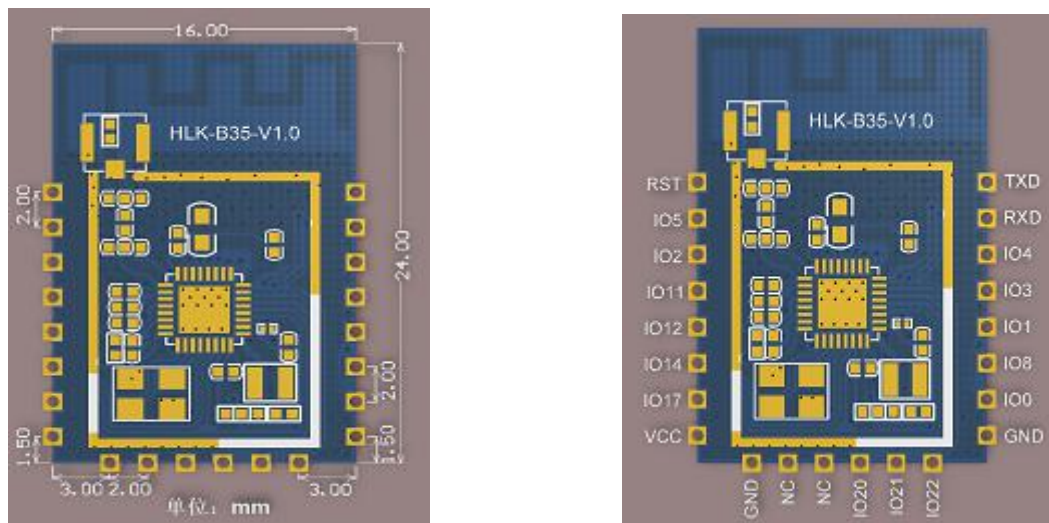
### 1.3. Performance and electrical parameters

Table 1 Performance and electrical parameters

Module	Model	HLK-B35
	encapsulation	In-line
WiFi Parameters	Wireless standard	IEEE 802.11 b/g/n
		Low energy consumption 5.0: supports BLE 5.0 channel selection #2, does not support 2M PHY/ADV extension
		Up to 40~100m in open environment
	Frequency Range	2.412GHz~2.484GHz
	Transmit power	11g - 6Mbps: 19 dBm
		11g - 54Mbps: 18 dBm
		11n - MCS0: 19 dBm
	Receiving sensitivity	11g - 6Mbps: -93 dBm
		11g - 54Mbps: -77 dBm
		11n - MCS0: -93 dBm
Bluetooth parameter	Antenna form	External: I-PEX connector
		Built-in: Built-in PCB antenna
	Frequency Range	2402~2480MHz
hardware parameter	Transmit power	0~15dBm Typical value: 9dBm
	Receiving sensitivity	-97dBm
hardware parameter	Hardware interface	1*SPI主/从, 2*UART, 5*PWM, 16*GPIO, 1*IIC主/从, 1*SDIO2.0从
	Operating	DC 2.1~3.63V Typical value 3.3V

	Voltage	
	GPIO driver ability	Max: 12.8 mA
	Working current Claim	$\geq 800\text{mA}$
	Module current Peak	700mA
	No-load operation Current	44mA
	Operating temperature	$-40^{\circ}\text{C} \sim 85^{\circ}\text{C}$
Serial port Penetrate	Transmission rate	9600-921600bps
	TCP Client	1
software parameter	wireless network Types of	STA/AP
	Security Mechanism	WPS/WEP/WPA/WPA2 Personal/WPA2 Enterprise/WPA3
	Encryption type	WEP64/WEP128/TKIP/AES
	Network protocol	IPv4, TCP/UDP, Lwip
	User configuration	AT+ instruction set

## 1.4. Product package size and pin definition



Pic1 HLK-B35 Product package size and pin definition

## 1.5. Pin introduction

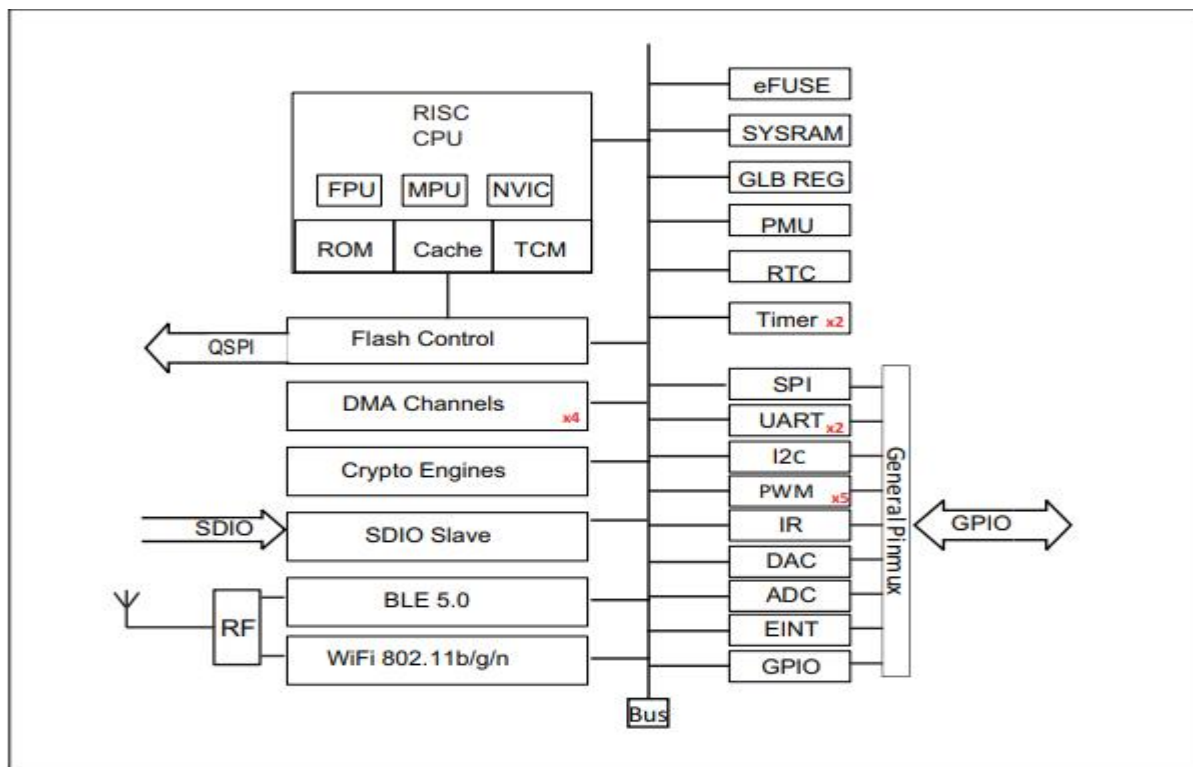
Table 2 Module pin interface

PIN	Network name	Type	Description
1	RST	I	Chip enable, high active, low reset
2	IO5	I/O	preserve
3	IO2	I/O	preserve
4	IO11	I/O	preserve
5	IO12	I/O	ES0 button, enter at command mode/restore factory settings, please pull up if not in use
6	IO14	I/O	preserve
7	IO17	I/O	preserve
8	VCC	P	3.3V power

9	GND	P	GND
10	NC	I/O	preserve
11	NC	I/O	preserve
12	IO20	I/O	preserve
13	IO21	I/O	WiFi connection 0: WiFi is not connected 1: WiFi is connected
14	IO22	I/O	TCP connection 0: Not connected to the TCP server 1: Connected to the TCP server
15	GND	P	GND
16	IO0	I/O	Module status indicator
17	IO8	I/O	Indicator light not used
18	IO1	I/O	preserve
19	IO3	I/O	Debug serial port (TX pin)
20	IO4	I/O	Debug serial port (RX pin)
21	RXD	I/O	Main serial port send pin
22	TXD	I/O	Main serial port Receive pin

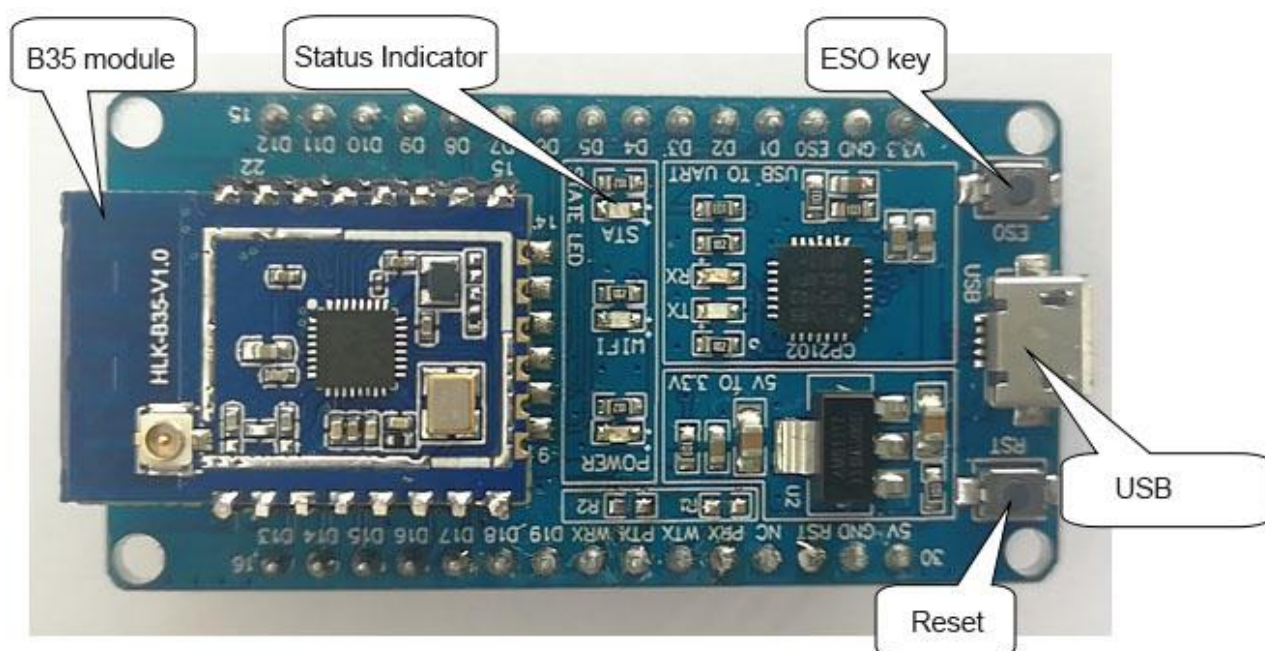


## 1.6. System Block Diagram



Pic 2. HLK-B35 Module architecture diagram

## 1.7. Test board introduction



Pic 3 Test board introduction

## 2. Function description

HLK-B35 supports serial port to WIFI STA, serial port to WIFI AP and serial port to BLE mode.

The module is powered on by default in AP mode (IP is fixed at 192.168.169.1), as a UPD server, port 9000, WiFi hotspot name is HLK\_B35\_WIFIxxxxxxx, where xxxxxxxx is the last 4 bytes of the module's MAC address.

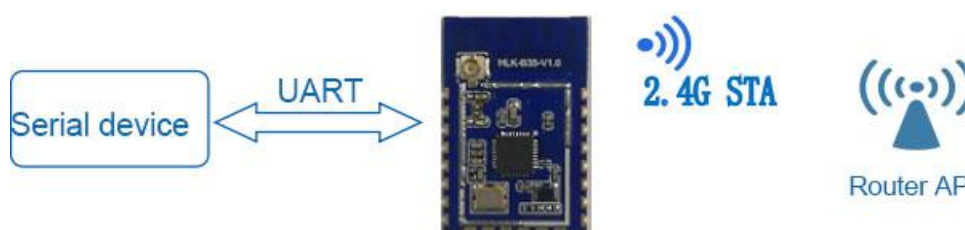
The Bluetooth name is HLK\_B35\_BLExxxxxxx, where xxxxxxxx is the last 4 bytes of the module's MAC address.

### 2.1. WIFI indicator flashing description

The module is indicated by the flashing of the LED indicator in different states, and the current operating state of the module can be quickly known from the table:

Module status		Light flashing method
STA mode	Not connected to the router	Periodic three flashes
	connected to the router	Fast flashes
	Non-TCP client Socket created successfully	Slow flashing
	TCP client Connect to the TCP server	Slow flashing
AP mode		Periodic four flashes

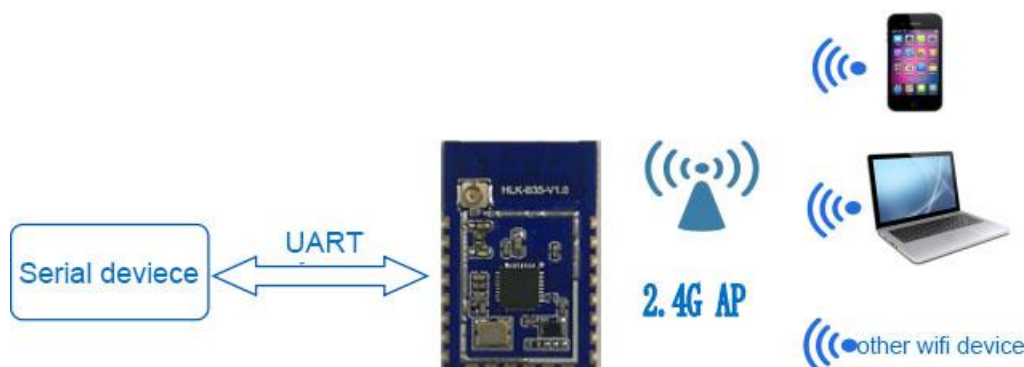
### 2.2. UART to WIFI STA



Pic 6 Module as STA

The module converts the serial port data of the device into wifi data to achieve the purpose of device networking.

## 2.3. UART to WIFI AP

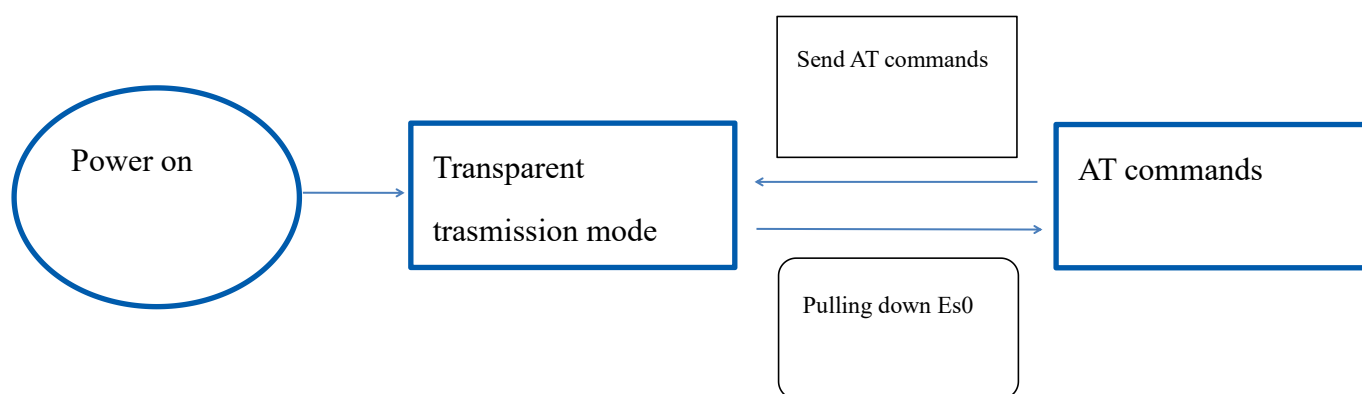


Pic 7 Module as AP

In AP mode, mobile phones, PCs or other wifi devices can be connected to the B35 module through wifi, and serial devices can transmit data through the B35 module and other wifi devices.

## 2.4. Serial port working status conversion

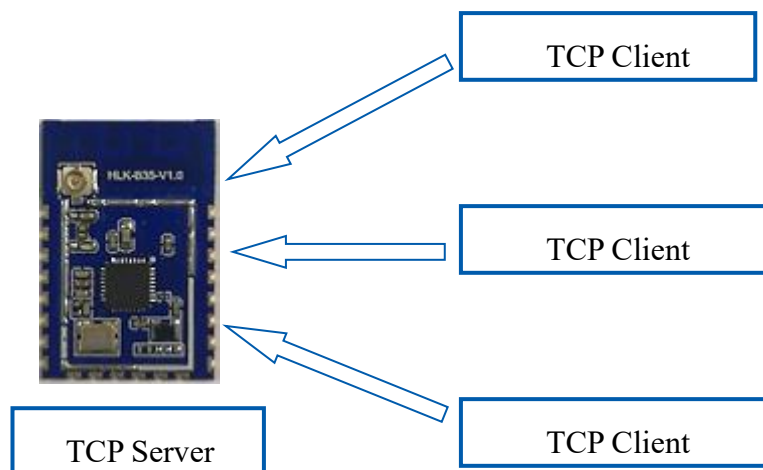
After the HLK-B35 is powered on, the default is the transparent transmission mode. By pulling down the pin ES0 (GPIO12) for less than 50ms to enter the at command mode, the module will treat the received data as an at command, and send the at command to let The module enters the transparent transmission mode. After the network is connected, the data received by the serial port will be transmitted as transparent transmission data.



Pic 8 Serial port working mode conversion

## 2.5. Serial-to-network data conversion

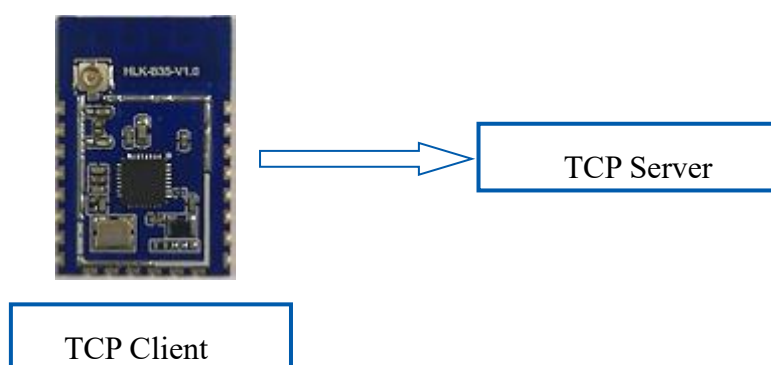
### 2.5.1. Module as TCP Server



Pic 9 TCP Server

In this mode, the module monitors the specified port and waits for the TCP Client to connect. After connection, all TCP data is sent directly to the serial port, and the data from the serial port is sent to all TCP Clients. When the module is used as a TCP Server, it supports up to 4 A TCP Client connects to the TCP Server.

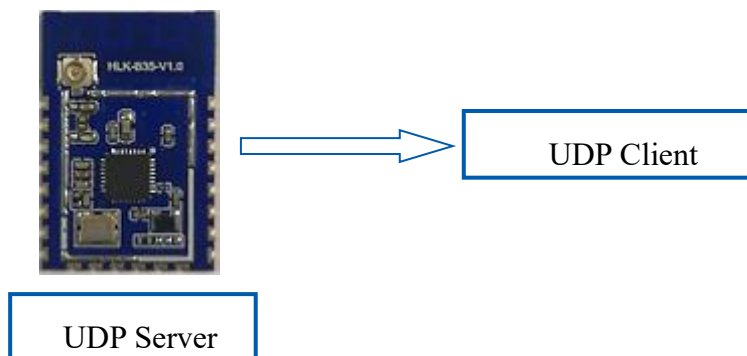
### 2.5.2. Module as TCP Client



Pic 10 TCP Client

In this mode, the module will actively connect to the specified IP and port. All data sent from the TCP Server will be sent directly to the serial port, and data from the serial port will be sent to the TCP Server. Abnormal network disconnection will cause the module to reconnect actively.

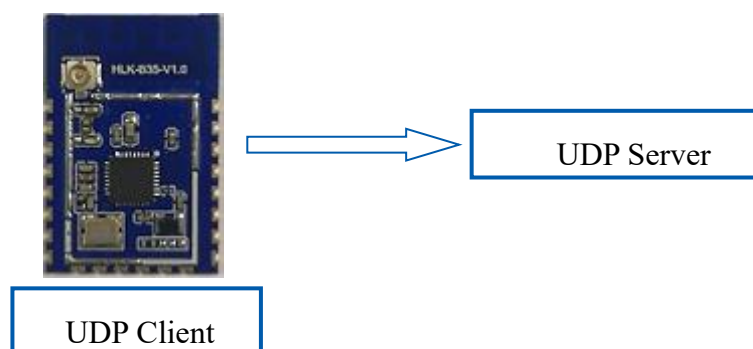
### 2.5.3. Module as UDP Server



Pic 11 UDP Server

In this mode, the module opens the local designated port. Once the data sent to this port is received, the module will send the data to the serial port and record the remote ip and port. The module will only record the remote information of the last connection, and the data sent by the serial port will be sent directly to the recorded remote ip and port.

### 2.5.4. Module as UDP Client



Pic 12 UDP Client

In this mode, the module will send serial port data to the specified ip port; the data returned by the server will be sent to the serial port.

## 3. AT command instructions

Command format: In the AT command mode, the system can be configured through the AT command of the serial port. The command format is as follows:

at+[command]=[value],[value],[value].....

All commands start with "at" and end with "\r\n". If the command is not sent in this format, the module will not proceed.

It does not return any data; after the effective instruction is recognized, the module will return the corresponding data or perform the corresponding operation, and

Return OK; invalid command module will directly return ERR. The instruction types are shown in the following table:

Type	Form	Description
Query instruction	at+<x>?	Get the parameter value or status currently set by the module
Set instruction	at+<x>=< . . . >	Set the relevant parameters of the module
Execute instructions	at+<x>	Execute the function of unchanged internal parameters of the module

## 3.1. Basic AT commands

### 3.1.1. Test response: at

Type	Grammar	Return and description
Execute instructions	at	OK Note: The module is in AT command mode, and the baud rate is correct When receiving ERROR, it indicates that the module is in AT mode, but the command is invalid When no data is received, it indicates that the module is in transparent transmission mode or working abnormally The module is in transparent transmission mode by default

### 3.1.2. Query software version number: at+ver=?

Type	Grammar	Return and description
Query instruction	at+ver=?	HLK-B35(V1.00Nov 9 2020-07:38:59) OK Note: current version number and firmware date

### 3.1.3. AT help instruction: at+help

Type	Grammar	Return and description
Execute instructions	at+help	at+help # at+help -- This text # ate=<1/0> -- echo on/off # at+ver=<?> -- version info ..... OK Note: List all current AT commands and parameter prompts

### 3.1.4. Switch echo: at+ate

Type	Grammar	Return and description
Set instruction	at+ate=1	at+ate=1 OK Note: The echo function is successfully turned on. After that, each reply command will first reply to the sent command, and then reply the related parameters and execution result of the command When this parameter is set to 0: Module directly responds to the relevant data of the command The module has the echo function turned on by default

### 3.1.5. Baud rate setting: at+uart

Type	Grammar	Return and description
Set instruction	at+uart=115200,8,n,1	at+uart=115200,8,n,1 Ok Note: The parameters are baud rate, data bit, validation, stop bit Note: The test board baud rate supports up to 921600 'Add' means even test, 'even': odd test, and 'n' means invalid test '1.5' is 1.5 stop bits, '2' is 2 stop bits, and '1' is 1 stop bit



Query instruction	at+uart=?	at+uart=? 115200,8,n,1 Note: Query the serial port baud rate, data bit, validation, stop bit
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### 3.1.6. Query MAC address: at+Get\_MAC

Type	Grammar	Return and description
Query instruction	at+Get_MAC=?	at+Get_MAC=? 40:d6:3c:15:5f:e8 Note: Reply to the mac address of the module

### 3.1.7. Rest: at+default

Type	Grammar	Return and description
Set instruction	at+default=1	at+default=1 OK Note: module reset

### 3.1.8. Save the set parameters: at+net\_commit

Type	Grammar	Return and description
Set instruction	at+net_commit=1	at+net_commit=1 Ok Note: Submit the setting parameters successfully

### 3.1.9. Module restart or enter transparent transmission mode: at+reconn

Type	Grammar	Return and description
Set instruction	at+reconn=1	at+reconn=1 Ok Note: when the instruction is executed before at+net_commit=1 Instruction, the module will restart When the at+net_commit=1 instruction has not been executed before executing this instruction, The module will enter the transparent transmission mode



## 3.2. WI-FI related AT commands

### 3.2.1. Set the network mode of the module: at+netmode

Type	Grammar	Return and description
Set instruction	at+netmode=2	at+netmode=2 Ok Note: Set the module to STA mode
Query instruction	at+netmode=?	at+netmode=? 2 Note: 2: STA mode 3: 2.4G AP mode

### 3.2.2. Set the name and password of the connection route/WiFi hotspot:

#### at+wifi\_conf

Type	Grammar	Return and description
Set instruction	at+wifi_conf=HI-LINK,none,12345678	at+wifi_conf=HI-LINK,none,12345678 Ok Description: When the module is in STA mode, this parameter is Set the ssid, encryption method and pwd of the connection route When the module is in AP mode, this parameter is Set up ssid, encryption method and pwd for establishing WiFi hotspot Note: The maximum length of the WiFi name and password is 32 bytes
Query instruction	at+wifi_conf=?	at+wifi_conf=? HI-LINK_5FE8,none,12345678 Note:SSID of the connection route, encryption method and pwd

### 3.2.3. Query the status of the connection route in STA mode: at+wifi\_ConState

Type	Grammar	Return and description
Query instruction	at+wifi_ConState=?	at+wifi_ConState=? Disconnected Note: The module is not connected to the router in sta mode, connected means the module is connected to the router in sta mode

### 3.2.4. Scan for nearby routes: at+scanap

Type	Grammar	Return and description
Execute instructions	at+scanap	at+scnfap +CWLAP: 0,IT-soft,e6:d3:32:06:e7:9d,11,-85,WPA2-PSK/WPA-PSK 1,yangyipeng,00:6b:8e:78:cd:c7,9,-61,WPA2-PSK/WPA-PSK 2,ChinaNet-vwnA,54:66:6c:c1:af:40,4,-98,WPA2-PSK/WPA-PSK 3,qfdz6868,bc:5f:f6:c3:fd:e6,13,-81,WPA2-PSK/WPA-PSK ..... OK Note:Scanned surrounding WiFi name, MAC address, channel, signal strength, encryption method

## 3.3. TCP/IP Related AT commands

### 3.3.1. Set the IP mode of the module: at+dhcpc

Type	Grammar	Return and description
Set instruction	at+dhcpc=1	at+dhcpc=1 Ok Note:Set the IP mode of the module to dynamic IP
Query instruction	at+dhcpc=?	at+dhcpc=? 1 Note: 1: Dynamic IP      0: Static IP

### 3.3.2. Set module static IP: at+net\_ip

Type	Grammar	Return and description
Set instruction	at+net_ip=192.168.16.25 4,2 55.255.255.0,192.168.16. 254	at+net_ip=192.168.16.254,255.255.255.0,192.168.16.254 Ok Note: Set the module's IP, subnet mask, and gateway successfully <b>The prerequisite for this instruction to be valid</b>

		<b>is that the instruction: at+dhcpc=0 has been executed, otherwise it is regarded as an invalid instruction</b> <b>In AP mode, the default address of the module is 192.168.169.1 and cannot be set</b>
Query instruction	at+net_ip=?	at+net_ip=? 192.168.16.254,255.255.255.0,192.168.16.254 Note: Module current IP, subnet mask, gateway

### 3.3.3. Set TCP connection type: at+mode

Type	Grammar	Return and description
Set instruction	at+mode=client	at+mode=client Ok Note: Successfully set the module to client mode
Query instruction	at+mode=?	at+mode=? Client Note: client: the module as the client server: the module as the server

### 3.3.4. Set the socket connection protocol: at+remotepro

Type	Grammar	Return and description
Set instruction	at+remotepro=tcp	at+remotepro=tcp OK Note: Set the socket protocol of the module to tcp successfully
Query instruction	at+remotepro=?	at+remotepro=? tcp Note: TCP: socket protocol is TCP UDP: socket protocol is UDP

### 3.3.5. Set the local port in client mode: at+CLport

Type	Grammar	Return and description
Set instruction	at+CLport=8080	at+CLport=8080 Ok Note: Successfully set the local port under the module client Note: The prerequisite for this instruction to be valid

		is that the instruction: at+mode=client has been executed, otherwise it is regarded as an invalid instruction
Query instruction	at+CLport=?	at+CLport=? 8080 Note: The local port of the module under the client is 8080

### 3.3.6. Set the remote IP in client mode: at+remoteip

Type	Grammar	Return and description
Set instruction	at+remoteip=192.168.11.102	at+remoteip=192.168.11.102 Ok Note: Set the remote IP under the module client successfully <b>The prerequisite for this instruction to be valid is that the instruction: at+mode=client has been executed, otherwise it is regarded as an invalid instruction</b>
Query instruction	at+remoteip=?	at+remoteip=? 192.168.11.102 Note: The remote IP of the module connected under the client is: 192.168.11.102

### 3.3.7. Set the remote port or local port in client/server mode: at+remoteport

Type	Grammar	Return and description
Set instruction	at+remoteport=9000	at+remoteport=9000 Ok Note: Instruction valid
Query instruction	at+remoteport=?	at+remoteport=? 9000 Note: When the module acts as a client, the remote port connected to the module is 9000 When the module is used as a server, the local port of the module is 9000

3.3.8. Set the framing length of the serial port: `at+uartpacklen` Not supported currently

3.3.9. Set the framing time of the serial port: `at+uartpacklen` Not supported currently

### 3.4. BLE related AT commands

3.4.1. Set Bluetooth broadcast name: `at+ble_name`

Type	Grammar	Return and description
Set instruction	<code>at+ble_name=B35_BLE</code>	<code>at+ble_name=B35_BLE</code> Ok <b>Note: The Bluetooth broadcast name supports up to 29 bytes</b>
Query instruction	<code>at+ble_name=?</code>	<code>at+ble_name=?</code> B35_BLE Note: The current Bluetooth broadcast name of the module is _BLE

### 3.5. Custom message prompt instruction

3.5.1. Set the prompt message after the module enters the transparent transmission mode: `at+cmd_node`

Type	Grammar	Return and description
Set instruction	<code>at+cmd_node=enter at cmd</code>	<code>at+cmd_node=enter at cmd</code> Ok Note: The prompt message after setting the module to switch to AT command mode is successful
Query instruction	<code>at+cmd_node=?</code>	<code>at+cmd_node=?</code> enter at cmd Note: When the module is switched to AT command mode, it will output: enter at cmd

3.5.2. Set the prompt message after the module enters the transparent transmission mode: `at+ds_node`

Type	Grammar	Return and description
------	---------	------------------------

Set instruction	at+ds_node=enter ds mode	at+ds_node=enter ds mode Ok Note: The prompt message after the module is switched to transparent transmission mode is successful
Query instruction	at+ble_name=?	at+ble_name=? enter ds mode Note: When the module is switched to transparent transmission mode, it will output: enter ds mode

### 3.5.3. Set the prompt message of TCP server connected to the module :

#### at+connected\_node

Type	Grammar	Return and description
Set instruction	at+connected_node=connected tcpserver	at+connected_node=connected tcpserver Ok Note: The prompt message after the module is connected to tcpserver is successful
Query instruction	at+connected_node=?	at+connected_node=? connected tcpserver Note: Output when the module is connected to tcpserver: connected tcpserver

### 3.5.4. Set the prompt message that the module is disconnected from TCP server :

#### at+disconnected\_node

Type	Grammar	Return and description
Set instruction	at+disconnected_node=tcp drop	at+disconnected_node=tcp drop Ok Note: Set the prompt message after the module is disconnected from TCP server successfully
Query instruction	at+disconnected_node=?	at+disconnected_node=? tcp drop Note: It will output when the module is disconnected from TCP server: TCP drop

**Note:** This type of command does not have a message prompt by default, and users can set it according to their own needs. The prompt string

The maximum length supports 30 bytes. Do not include the following characters: comma, colon, equal sign, front quotation mark, question mark.

## 4. AT command control code example

### 4.1. Query configuration information

#### code:

```
char *query="" //Define string pointer
at+ver=?\r\n\; //Query the firmware version number
at+uart=?\r\n\ //Query serial port parameters
at+netmode=?\r\n\ //Query distribution method
at+mode=?\r\n\ //Query tcp connection mode
at+dhcpc=?\r\n\ //Query dhcp
Com_send(query); //Send these data out from the serial port
```

#### feedback:

```
at+ver=?
HLK-B35(V1.00Nov 18 2020-23:54:48)
at+uart=?
115200,8,n,1
at+netmode=?
2
at+mode=?
client
at+dhcpc=?
1
```

### 4.2. Configure the module as a client (static ip address)

#### code:

```
char *commands_wifi_client_static=""
at+uart=115200,8,n,1\r\n\ //Set serial port parameters
at+netmode=2\r\n\ //Set the module to STA mode
at+wifi_conf=HI-LINK,wpa2_aes,12345678\r\n\ //Set the name, encryption method and
password of the connection route
at+dhcpc=0\r\n\ //Use static IP
at+net_ip=192.168.8.35,255.255.255.0,192.168.8.5\r\n\ //Set the IP of the module
```

```
at+remoteip=192.168.8.103\r\n\           //Set remote IP
at+remoteport=9000\r\n\                 //Set remote port
at+remotepro=tcp\r\n\                   //Set up TCP transmission
at+mode=client\r\n\                     //Module as client
at+net_commit=1\r\n\                   //Submit parameters
at+reconn=1\r\n\";                       //Restart module
Com_send(commands_wifi_client_static);    //Send parameters from the serial port
```

**Feedback:**

```
at+uart=115200,8,n,1
OK
at+netmode=2
OK
at+wifi_conf=HI-LINK,wpa2_aes,12345678
OK
at+dhcpc=0
OK
at+net_ip=192.168.8.35,255.255.255.0,192.168.8.5
OK
at+remoteip=192.168.8.103
OK
at+remoteport=9000
OK
at+remotepro=tcp
OK
at+mode=client
OK
at+net_commit=1
OK
at+reconn=1
OK
```

**Note:** When the module has not been connected after trying to connect to the web server 3 times, the local port of the module will become any port



### 4.3. Configure the module as a server (dynamic ip address)

## code:

```
char *commands_wifi_ap=""  
  
at+netmode=2\r\n\           //Set the module to STA mode  
  
at+wifi_conf=HI-LINK,wpa2_aes,00000000\r\n\ //Set the name, encryption method and password  
                                of the connection route  
  
at+dhcpc=1\r\n\           //Use dynamic IP  
  
at+remoteport=8000\r\n\       //Set local listening port  
  
at+remotepro=tcp\r\n\       //Set the socket connection method  
  
at+mode=server\r\n\       //Socket connects as server  
  
at+uart=115200,8,n,1\r\n\       //Set serial port parameters  
  
at+net_commit=1\r\n\       //Submit parameters  
  
at+reconn=1\r\n\";           //Restart module  
  
Com send(commands_wifi_ap);
```

## Feedback:

```
at+netmode=2
OK
at+wifi_conf=HI-LINK,wpa2_aes,00000000
OK
at+dhcpc=1
OK
at+remoteport=8000
OK
at+remotepro=tcp
OK
at+mode=server
OK
at+uart=115200,8,n,1
OK
at+net_commit=1
OK
at+reconn=1
OK
```

## 4.4. Reset

code:

```
char *commands_device_default=" at+default=1\r\n"; //reset
```

```
Com_send(commands_device_default);
```

feedback:

```
at+default=1
```

OK

Then the module will restart and restore the factory default configuration parameters

**The hardware reset method is :** Long press the ES0 button on the bottom plate for more than 3 seconds to restore the factory settings.

For more functions, please use the configuration software to set up. Figure 13 below shows the related instructions of the configuration software.

### Configuration software instruction



Pic 13 Serial port configuration interface

## 5. Bluetooth distribution network and data transparent transmission

### 5.1. Bluetooth distribution network

- (1) Ensure that the module is in STA mode, that is, at+netmode=2 AT command has been executed
- (2) Turn on the Bluetooth of the mobile phone, open the HLK-BLE.apk application APP, and find the default Bluetooth broadcast name of the module B35-BLE

Click, if the connection is successful, the APP interface will switch to the transparent transmission test interface.

- (3) Click the button in the upper right corner of the transparent transmission interface: Configure networking, enter the configuration networking interface, and enter the

The WiFi name and password are fine. As shown in Figure 14

Then the module will restart and connect to the route according to the WiFi name and password entered above.



Pic 14 Bluetooth distribution process

### 5.2. Bluetooth transparent transmission

As long as the first four characters in the string entered in the transparent transmission test interface are not “!%!” , they are considered as transparent data, and the module will send the string through the serial port at this time.



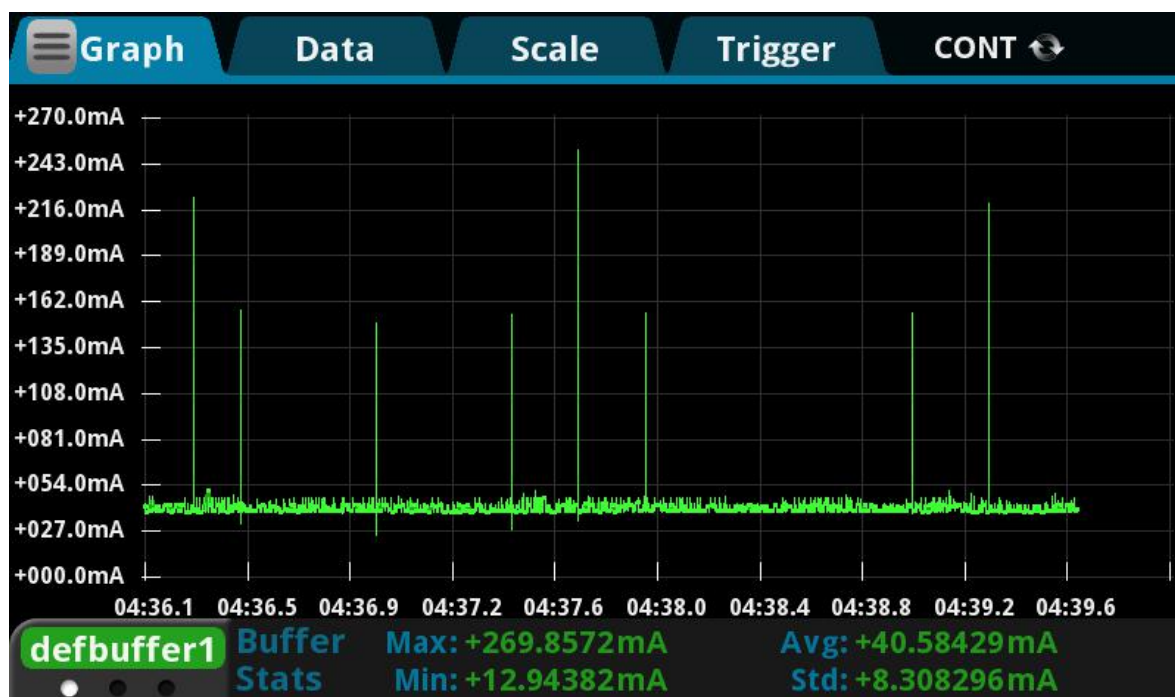
Pic 15 Send transparent data in APP



Pic 16 Receive transparent data

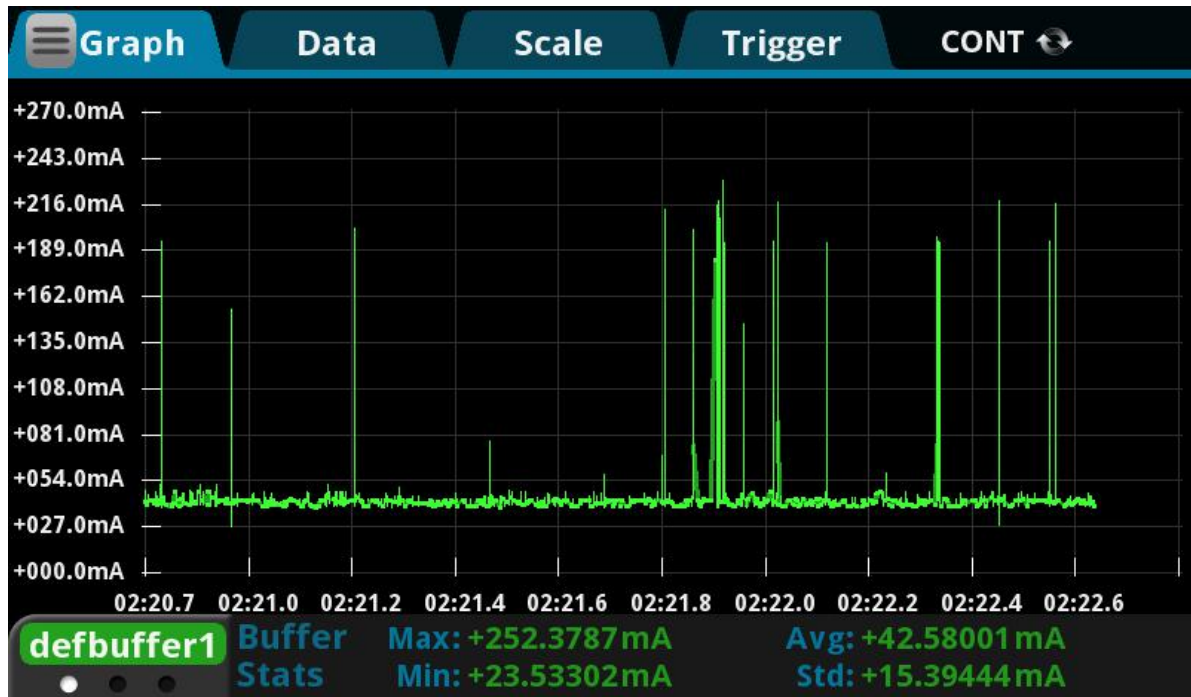
## 6. Module power consumption measured data

### 6.1. Power consumption in Sta mode



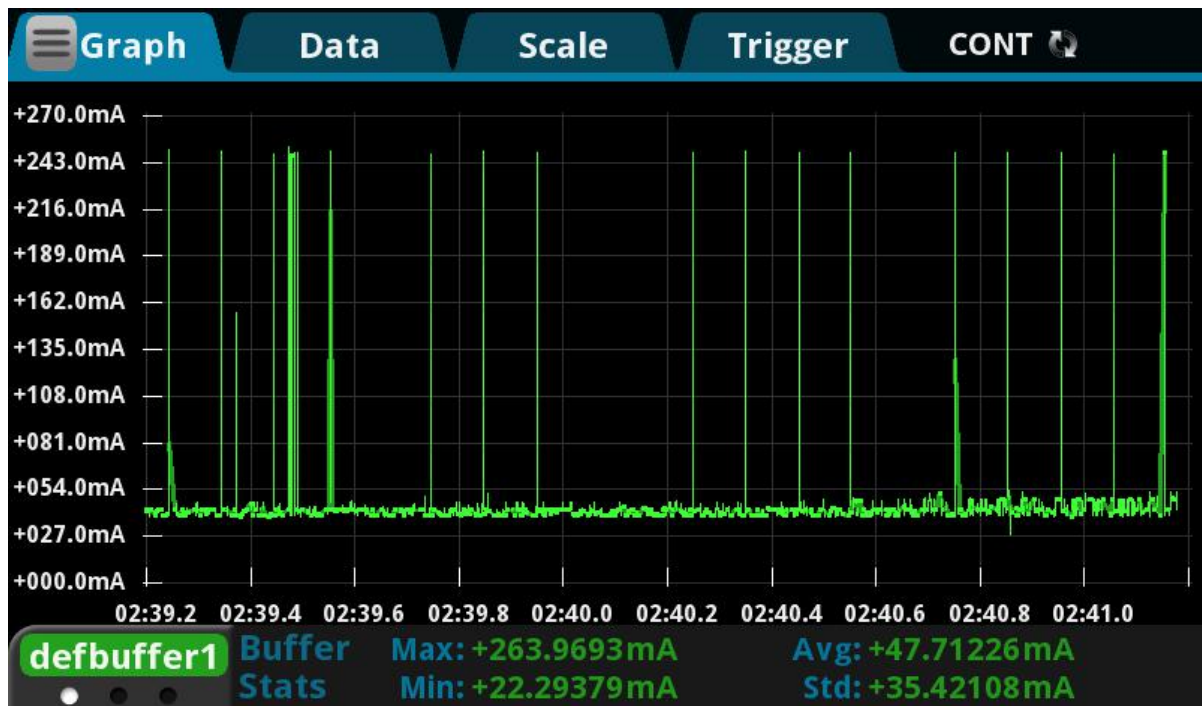
Pic 17 Bluetooth broadcast is turned on, and the module as a client keeps trying to connect to the working current of the remote server

## 6.2. Power consumption of transparent data transmission in Sta mode



Pic 18 Bluetooth broadcast is turned on, and the module acts as a working current for the client to connect to the remote server and continuously send data

## 6.3. Power consumption in AP mode



Pic19 Bluetooth broadcast is turned on, the module is used as the working current of the server

## 7. Appendix A Document Revision History

Version	Revision scope	Date
V1.0	First edition	2020-11-19