Shenzhen Hi-Link Electronic Co., Ltd.

HLK-B36 User Manual

CONTENTS

1.1. Product Introduction

HLK-B36 is a low-cost embedded UART-WIFI (serial port-wireless network) module launched by Hi-link Electronics.

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

Through the HLK-B36 module, the traditional serial device can transmit its own data through the Internet network 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

- Support 802.11b/g/n standard, integrate ARM9, WLAN MAC/Baseband/BLE 4.2 in one

- Main frequency support 120MHz

- Built-in   256KB RAM/ 2MB FLASH

- Working voltage 3.0-3.6V

- 2.4G/1T1R wifi, BLE 4.2

- Support BLE fast configurate network

- Support Station, Soft AP,

- Support SmartConfig，support WPA/WPA2 security mode，wupport STA/AP working mode

- Support 802.11b/g/n standard，HT-40

- Support AP,STA and BLE mix mode

- Rich peripheral interfaces, 1*SPI, 2*UART, 6*PWM, 19*GPIO

- Widely used in IOT

- Support multiple encryption methods WEP64/128, TKIP, AES, WPA, WPA2, WAPI

1.3. Technical Specifications

Table 1   Product Techinical Specification

Module	Model	HLK-B36		
	Package	In-line		
Wifi parameters	Wireless standard	IEEE 802.11 b/g/n bluetooth standard：BLE 4.2		
	Frequency Range	2.412GHz-2.484GHz		
	Transmit power	802.11b: +16 +/-2dBm (@11Mbps)		
		802.11g: +14 +/-2dBm (@54Mbps)		
		802.11n: +13 +/-2dBm (@HT20,HT40- MCS7)		
	Receiving sensitivity	802.11b: -88.4 dBm (@11Mbps ,CCK)		
		802.11g: -75.7dBm (@54Mbps, OFDM)		
		802.11n: -73.6dBm (@HT20, MCS7)		
	Antenna form	External: I-PEX connector		
		Built-in: Built-in PCB antenna		
Hardware parameters	Hardware interface	UART，IIC，PWM，GPIO, SPI		
	Operating Voltage	3.3V		
	GPIO drive capability	Max：16ma		
	Working current	Send continuously => Average value: ~130mA, peak value: 400mA In normal mode => Average: ~130mA, Peak: 400mA		
	Operating temperature	-40℃~80℃		
	Storage environment	Temperature：-40~40℃，Relative humidity：10%~90%R.H.		

Serial port transparent transmission	Transmission rate	110-921600bps
	TCP Client	1个
Software parameters	**Wireless network type**	STA/AP
	Security Mechanism	WEP/WPA-PSK/WPA2-PSK
	Encryption type	WEP64/WEP128/TKIP/AES
	Firmware upgrade	Firmware upgrade
	Network protocol	IPv4, TCP/UDP
	User configuration	AT+ command set, one-key intelligent configuration of network distribution

1.4. Pin introduction

Table 2   Module pin interface

Pin	Network name	Type	Directions
1	CEN	I	**Chip enable**, high effective
2	P26_PWM5	I/O	Bluetooth connection status indicator pin 1: Bluetooth is connected 0: Bluetooth is disconnected
3	P24_PWM4	I/O	P24,PWM4
4	P23_TDO_F_S0	I/O	P23,ADC3
5	P22_TDI_F_SI	I/O	ES0, enter at command mode/restore factory settings, please pull up if not used, same as P28

6	P21_TMS_F_CS	I/O	P21
7	P20_TCK_F_SC	I/O	P20
8	VBAT	P	3.3V power
9	P28	I/O	Enter at command mode/restore factory settings, please pull up if you don't use it, same as P22
10	P16	I/O	P16
11	P17	I/O	P17
12	P14	I/O	P14
13	P15	I/O	P15
14	P6_PWM0	I/O	P6,PWM0
15	GND	P	GND
16	P7_PWM1	I/O	Wifi indicator
17	P8_PWM2	I/O	Wifi connection status indicator 1: connected 0: Disconnected
18	P9_PWM3	I/O	Socket connection status indicator 1: connected 0: Disconnected
19	P1_URAT2_RXD	I/O	P1,UART2
20	P0_UART2_TXD	I/O	P0,UART2
21	P10_UART1_RXD	I/O	P10, UART1, used for upgrade, command setting and transparent transmission
22	P11_UART1_TXD	I/O	P11, UART1, used for upgrade, command setting and transparent transmission

1.5. Product packaging
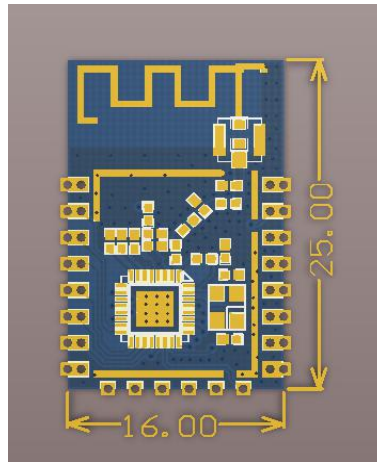
Figure 1 HLK-B36 package size

1.6. Block diagram
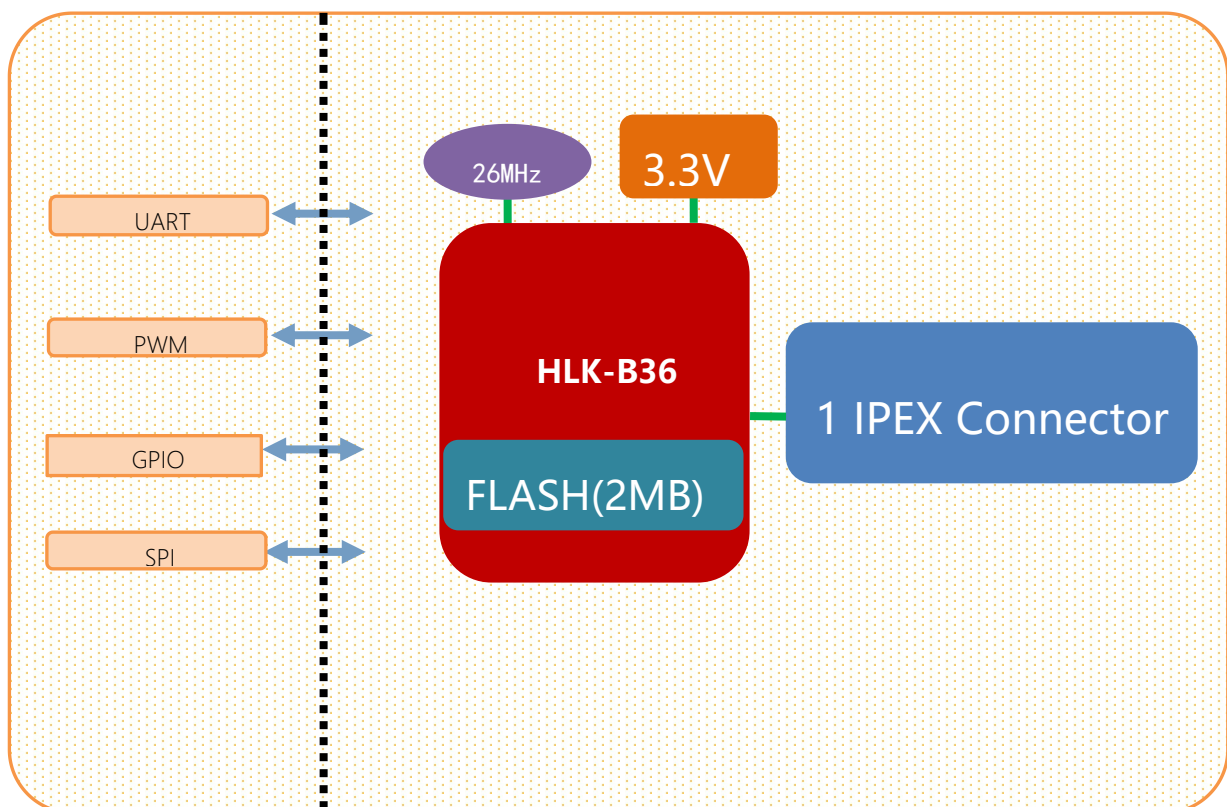
Figure 2. HLK-B36 Module architecture diagram

1.7. Testboard description
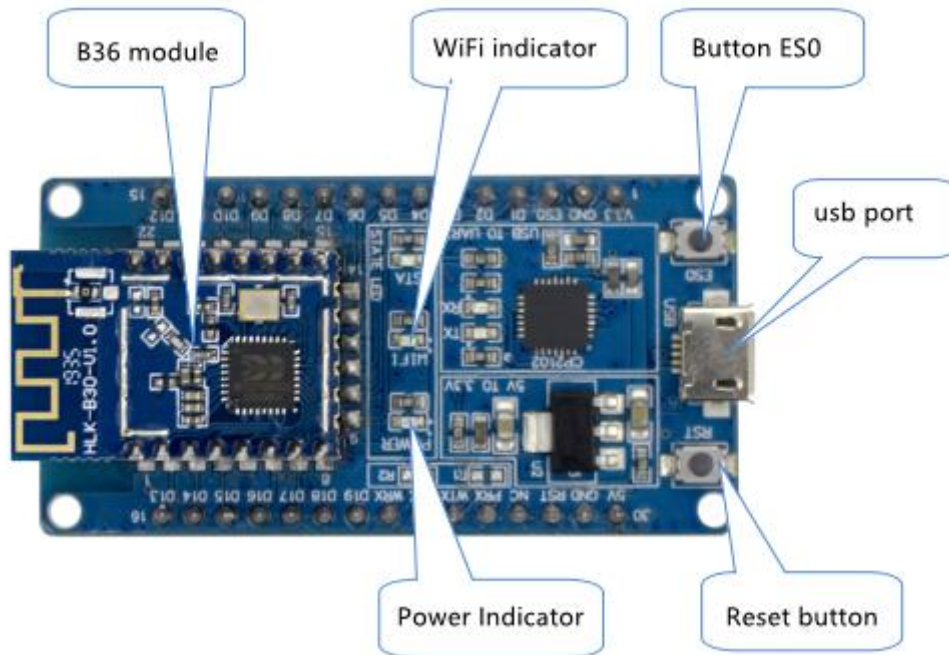
Figure 3 Test board description diagram

1.8.　 Power requirements

Power requirements	
Power input voltage	DC:3.3±0.3V
No-load running current	130±50mA
Supply current requirements	≥800mA

1.9. WIFI transmission power consumption

WIFI transmission power consumption			
Mode	Speed	Transmission power consumption	Current（ma）
11b	11Mbps	17.5dbm	280
11g	54Mbps	11dbm	150
11n	MCS7	10dbm	130

1.10. WIFI receiving power consumption

Mode	Speed	Current（ma）
11b	11Mbps	100
11g	54Mbps	100
11n	MCS7	100.5

1.11. Power consumption in each working mode of WIFI

State	Description	Average current （3v3）	Maximum current（3v3）	Unit
wifi initialization	Turn off the radio, the MCU is at full speed	45.2	46.3	ma
Keep wifi connection	Keep connected to the router	101	342	ma
Udp sending	After connecting to the AP, send packets at full speed through UDP	93	363	ma
SoftAP	SoftAP networking status	100.5	193.7	ma
SmartConfig	Module distribution network status	100.8	129.5	ma

1.12. Output power in each mode of WIFI

Paremeters	Minimum	Typical value	Maximum	Unit
RF average output power,802.11b cck Mode 11m	-	17.5	-	dBm
RF average output powe,802.11g OFDM Mode	-	15	-	dBm

54m				
RF average output power,802.11n OFDM Mode MCS7	-	13	-	dBm
Frequency error	-10	-	10	ppm

1.13. Receiving sensitivity in each mode of WIFI

Paremeters	Minimum	Typical value	Maximum	Unit
RF average output power,802.11b cck Mode 11m	-	-91	-	dBm
RF average output power,802.11g OFDM Mode 54m	-	-74	-	dBm
RF average output power,802.11n OFDM Mode MCS7	-	-70	-	dBm

2. Function description

HLK-B36 supports serial port to WIFI STA, serial port to WIFI AP and serial port to BLE mode.

2.1. wifi indicator flashing description

Through the blinking mode of the LED indicator, we can quickly know the running status of the module. The WiFi indicator of the module mainly has the following states:

1).The wifi indicator flashes periodically twice: it means that the module is in one-key configuration mode

2). The wifi indicator flashes three times periodically: it means that the module is in STA mode and has not been connected to the target AP hotspot

3). The wifi indicator flashes four times periodically: it means that the module is in 2.4g AP mode, but it cannot indicate whether there is a STA client device connected

4). The wifi indicator flashes quickly: it means that the module is in a STA mode and connected to the wifi hotspot. When there is data transmission, the module LED will flash quickly

2.2. One-key configuration mode

For the IOT wifi module, based on cost and performance considerations, there is no touch screen interactive interface like a mobile phone. The user can see the ap list on the mobile phone and click to enter the password to connect to the network. What should I do? One-key configuration is when the wifi module is in promiscuous mode (can capture all 802.11 frames in the air), the APP sends the SSID and password to the wifi module through UDP broadcast or multicast through a certain encoding rule, the module parses it out, and then connects to the router. Install the Android app HLK-TCPdemo, then select the configuration network, select the airkiss mode, enter the password, and click to start the configuration to start the configuration. When the network connection is successful, the module will change from double flashing to fast flashing, indicating successful networking.
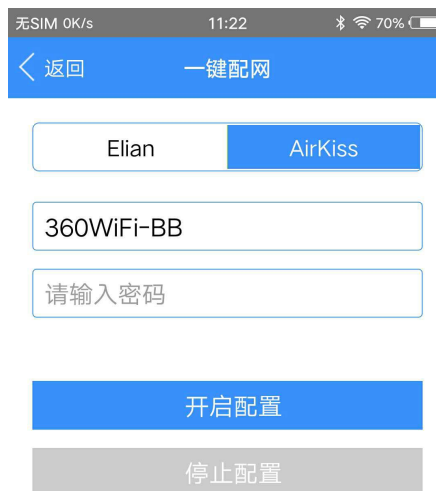

Figure 4 one-key configuration diagram

When the module is in one-key network configuration status, the module needs to be set to one-key network configuration mode. You can use the serial port configuration tool to set the module to one-key network configuration mode.
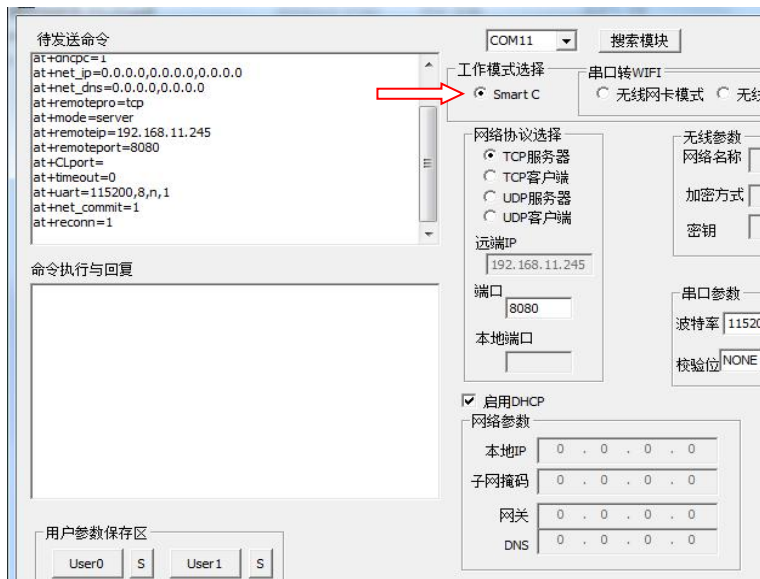
Figure 5 setting as one key configuration

2.3. Serial port to WIFI STA
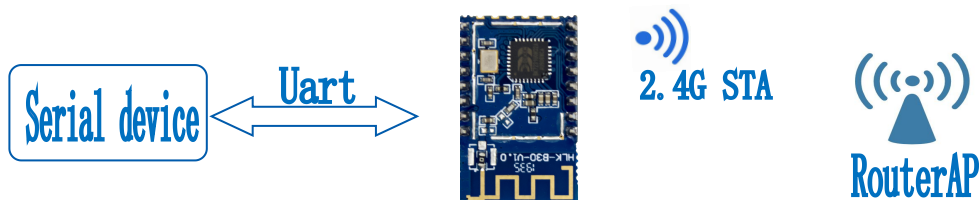
Figure 6 Moduel as STA

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

2.4. Serial port to WIFI AP
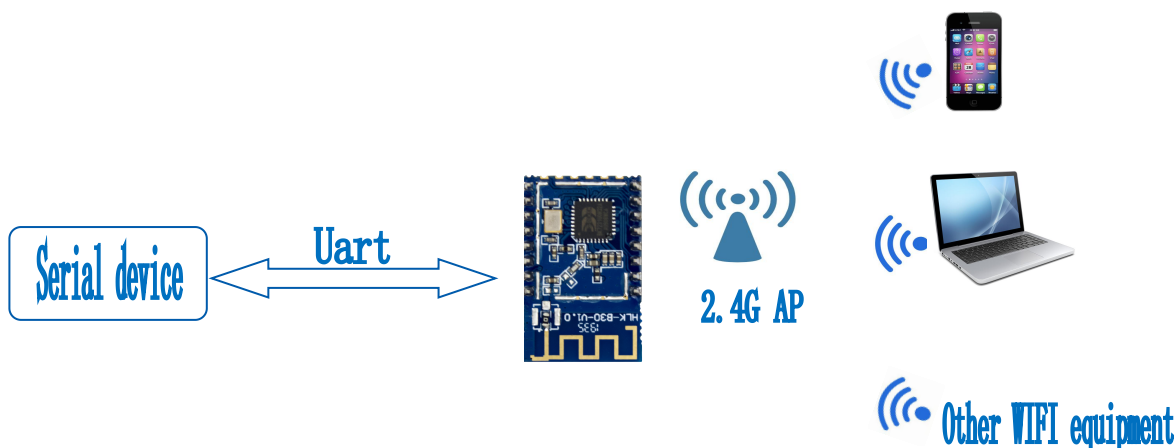
Figure 7 Module as ap

In AP mode, mobile phones, PCs or other wifi devices can be connected to the B36 module through wifi, and serial devices can transmit data through the B36 module and other wifi devices

2.5. Serial port working status conversion

After the HLK-B36 is powered on, the default is the transparent transmission mode. By pulling down the pin ES0 (PIN5) for more than 50ms and less than 2s to enter the at command mode, the module will treat the received data as an at command and send the at comand to makes the module enter the transparent transmission mode. After the network connection, the data received by the serial port will be transmitted as transparent transmission data.
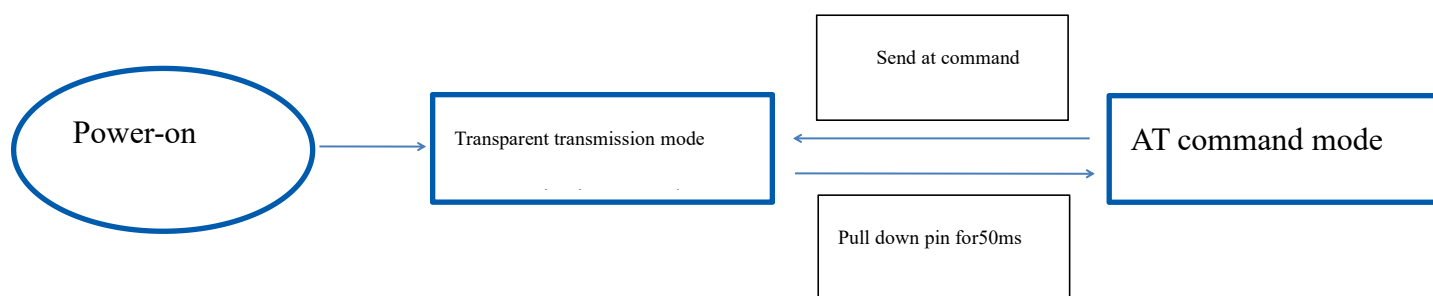
Figure 8 Serial port working status conversion

2.6. Serial-to-network data conversion

2.6.1. Module as TCP Server
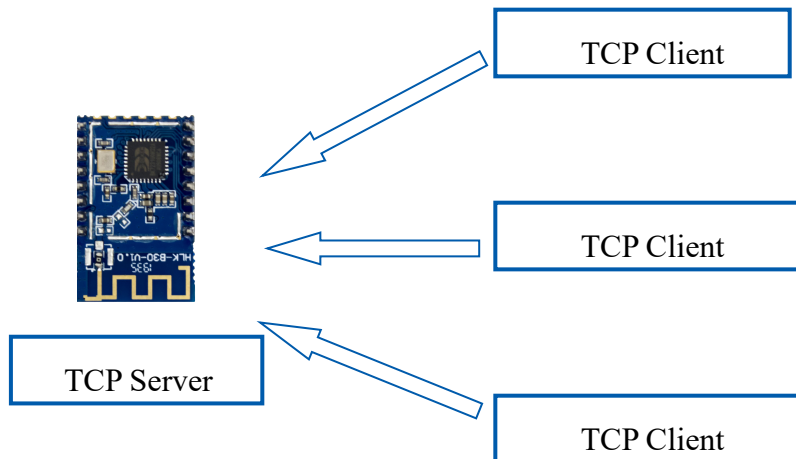
Figure 9 TCP   Server

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 5 A TCP Client connects to the TCP Server

2.6.2. Module as TCP Client
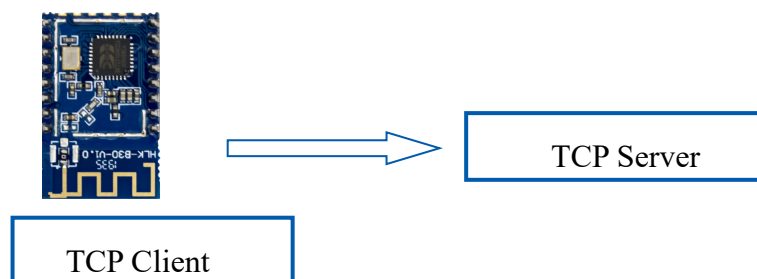
Figure 10   TCP   Client

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 the data from the serial port will be sent to

the TCP Server. Abnormal network disconnection will cause the module to reconnect actively.

2.6.3. Module as UDP Server
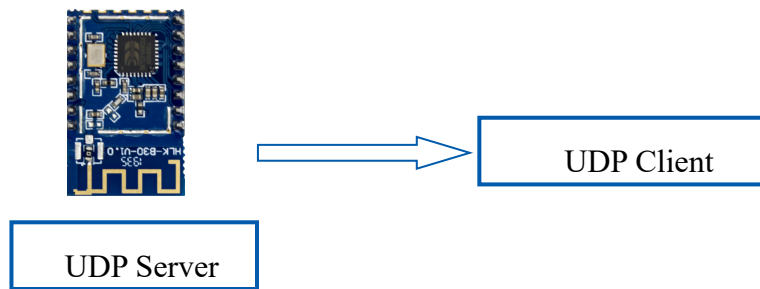
Figure 11　UDP　Server

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.

2.6.4. Module as UDP Client
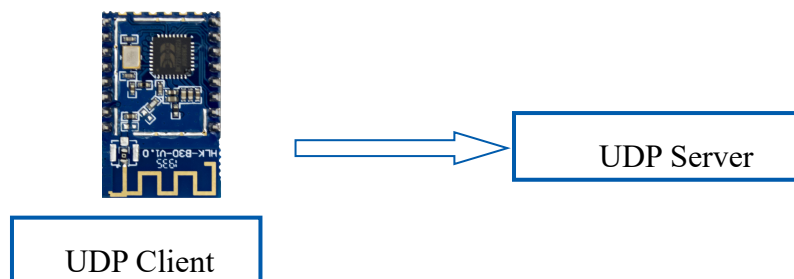
Figure 12　UDP Client

In this mode, the module directly sends serial port data to the specified ip and port, and the data

returned from the server will be sent to the serial port.

2.7. Application field

♦ Smart home；

♦ Instrumentation；

♦ Wi-Fi remote monitoring/control；

♦ Toy field；

♦ Color LED control；

♦ Intelligent integrated management of fire protection and security；

♦ Smart card terminals, wireless POS machines, handheld devices, etc.。

3. ATAT 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". If the command is not encapsulated in this format, it will not be processed, and the module will return different return values according to different commands.

For example: "at+ver=?"

The module will return: HLK-B36 (b.1.00.120191206180224)

Query command format:

at+[command]=?

3.1. Query the current module version:at+ver

Grammar rules：

Command type	Grammar	Return and description
Excuting an order	at+ver=?	at+ver=HLK-B36(b.1.00.120191206180224):current version

3.2. Local port operation:at+CLport

Command type	Grammar	Return and description
Set instruction	at+CLport=8080	at+CLport=8080 Ok Note: When the module is set to tcpclient, the local port of the module is set to port 8080. When the module is set to tcpserver, it is invalid. Range: (1-65535)
	at+CLport=?	at+CLport=? 8080 Note:Query local port

3.3. Set up the serial port:at+uart

Command type	Grammar	Return and description
Set instruction	at+uart=115200,8,n,1	at+uart=115200,8,n,1 Ok Note：Set serial port parameters
Query instruction	at+uart=?	at+uart=? 115200,8,n,1 Note：Query serial port parameters

3.4. SET DHCP:at+dhcpc

Command type	Grammar	Return and description
Set instruction	at+dhcpc=1	at+dhcpc=1 ok

Query instruction	at+dhcpc=?	at+dhcpc=? 1 Note：1：dhcp mode，0：static ip

3.5. Set wifi connection mode:at+netmode

Command type	Grammar	Return and description
Set instruction	at+netmode=3	at+netmode=3 Ok Note：Set the module to ap mode
Query instruction	at+netmode=?	at+netmode=? 3 Note：1:smartconfig 2：sta mode，3:2.4G ap mode

3.6. Set TCP connection mode:at+mode

Command type	Grammar	Return and description
Set instruction	at+mode=client	at+mode=client Ok Note：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

3.7. Set the remote IP when the module is used as a client:at+remoteip

Command 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 of module

Query instruction	at+remoteip=?	at+remoteip=? 192.168.11.102 Note：Query remote ip

3.8. Set the remote port when the module is used as client :at+remoteport

Command type	Grammar	Return and description
Set instruction	at+remoteport=1234	at+remoteport=1234 ok Note：1. When the module is set to tcpserver, this port is the listening port of the module 2.When the module is set to tcpClient, this port is the remote port connected to the module Range：（1-65535）
Query instruction	at+remoteport=?	at+remoteport=? 1234 Note：1. When the module is set to tcpserver, this port is the listening port of the module 2.When the module is set to tcpClient, this port is the remote port connected to the module

3.9. Set parameter submission:at+net_commit

Command type	Grammar	Return and description
Set instruction	at+net_commit=1	at+net_commit=1 Ok Note：Submit setting parameters

3.10. System restart /exit at command mode:at+reconn

Command type	Grammar	Return and description
Set instruction	at+reconn=1	at+reconn=1 Note：Quit at Command mode
Query instruction	at+net_commit=1 at+reconn=1	at+net_commit=1 ok

		at+reconn=1
		ok
		Note：System restart

3.11. Set the ssid and password of the module:at+wifi_conf

Command type	Grammar	Return and description
Set instruction	at+wifi_conf=HI-LINK_5FE8 ,none,12345678	at+wifi_conf=HLK-B36_1234,none,12345678 ok Note：Set the ssid and password of the module，none:No definition, format required
Query instruction	at+wifi_conf=?	at+wifi_conf=? HLK-B36_1234,none,12345678 Note：Query the ssid and password of the module

3.12. Set the socket connection protocol:at+remote pro

Command type	Grammar	Return and description
Set instruction	at+remotepro=tcp	at+remotepro=tcp ok Note：Set the module socket protocol to tcp
Query instruction	at+remotepro=?	at+remotepro=? tcp Note：Query socket connection protocol of module

3.13. Set network connection parameters：at+net_ip

Command type	Grammar	Return and description
Set instruction	at+net_ip=192.168.16.254, 255.255.255.0,192.168.16. 254	at+net_ip=192.168.16.254,255.255.255.0,192.168.16.254 ok Note：Set the IP of module，gateway，dns
Query instruction	at+net_ip=?	at+net_ip=? 192.168.16.254,255.255.255.0,192.168.16.254

		Note：Query the IP of module，gateway，dns

3.14. Query STA mode network connection status：at+wifi_ConState

Command type	Grammar	Return and description
Query instruction	at+wifi_ConState=?	at+wifi_ConState=? Disconnected Note：In sta mode, the module wifi is not connected, Connected means the network is connected.

3.15. Query module MAC address :at+Get_MAC

Command type	Grammar	Return and description
Query instruction	at+Get_MAC=? 40:D6:3C:15:5F:E8	at+Get_MAC=? 40:D6:3C:15:5F:E8 Note：Query the MAC address of module

3.16. Set the framing length：at+uartpacklen

Command type	Grammar	Return and description
Set instruction	at+uartpacklen=64	at+uartpacklen=64 ok NoteSet the framing length of module to 64 bytes, range: 5-500 If it exceeds the range during setting, it will automatically change to the maximum or minimum value
Query instruction	at+uartpacklen=?	at+uartpacklen=? 64 Note：Query the framing length of module is 64 bytes

3.17. Set framing time：at+uartpacktimeout

Command type	Grammar	Return and description
Set instruction	at+uartpacktimeout=200	at+uartpacktimeout=200 ok Note：Set the framing time of module to 200ms: range: 5-5000 If it exceeds the range during setting, it will automatically change to the maximum or minimum value
Query instruction	at+uartpacktimeout=?	at+uartpacktimeout=? 200 Note：Query the framing time of module is 200ms

3.18. Set Bluetooth name：at+ble_name

Command type	Grammar	Return and description
Set instruction	at+ble_name=aaaaa	at+ble_name=aaaaa ok Note：Set the Bluetooth name to aaaaa
Query instruction	at+ble_name=?	at+ble_name=? aaaaaa Note：Query the Bluetooth name to aaaaa

4. AT command control code routine

4.1. Query configuration information

code：

char *query="\\   //Define string pointer

at+netmode=?\r\n\   //Query WiFi connection mode

at+wifi_conf=?\r\n\   //Query the ssid and password of module

at+dhcpc=?\r\n\   //Query dhcp

at+net_ip=?\r\n\   //Query the ip of module

at+remoteip=?\r\n\   //Query remote ip

at+remoteport=?\r\n\   //Query port

at+remotepro=?\r\n\   //Query socket connection protocol

at+mode=?\r\n\   //Query tcp connection mode

at+uart=?\r\n\   //Query serial port parameters

at+uartpacklen=?\r\n\   //Query the framing length of serial port

at+uartpacktimeout=?\r\n\   //Query serial port framing time

at+ver=?\r\n\   //Query the firmware version number

";

Com_send(query);   //Send these data out from the serial port

feedback：

 at+netmode=? 0

 at+wifi_conf=? Hi-Link,none,12345678

    at+dhcpd=? 0

 at+dhcpc=? 1

 at+net_ip=? 192.168.15.254,255.255.254.0,192.168.11.1

 at+remoteip=? 192.168.11.245

 at+remoteport=? 8080

 at+remotepro=? tcp

 at+mode=? server

 at+uart=? 115200,8,n,1

 at+uartpacklen=? 64

 at+uartpacktimeout=? 10

 at+ver=? V1.39(Dec 6 2012)

4.2. Serial port to wifi client(static ip address)

code：

char *commands_wifi_client_static="\\

at+netmode=2\r\n\   //Set to wireless network card sta mode

at+wifi_conf=HI-LINK,none,12345678\r\n\   //Set wifi, encryption method and password

at+dhcpc=0\r\n\   //Use static ip

at+net_ip=192.168.11.254,255.255.255.0,192.168.11.1\r\n\   //Set the ip of module

at+remoteip=192.168.11.245\r\n\   //Set the IP address for remote connection

at+remoteport=8080\r\n\   //Set the remote port to be connected

at+remotepro=tcp\r\n\   //Set the socket connection method

at+mode=client\r\n\   //Connect to the remote server in client mode

at+uart=115200,8,n,1\r\n\   //Set serial port parameters

at+uartpacklen=64\r\n\   //Set the framing length

at+uartpacktimeout=10\r\n\   //Set framing time

at+net_commit=1\r\n\   //Submit parameters

at+reconn=1\r\n\";   //Restart the module

Com_send(commands_wifi_client_static);   //Send these data out from the serial port

feedback：

at+netmode=2 ok

at+wifi_conf=HI-LINK,none,123456

78 ok

at+dhcpc=1 ok

at+remoteip=192.168.11.245

ok at+remoteport=8080 ok

at+remotepro=tcp

at+mode=server

at+uart=115200,8,n,1 ok

at+uartpacklen=64 ok

at+uartpacktimeout=10 ok

at+net_commit=1

4.3. Serial port to wifi server(Dynamic ip address)

Code:

```
char *commands_wifi_ap="\
at+netmode=2\r\n\                               //Set to wireless network card mode
at+wifi_conf=Hi-Link_,none,0000000000\r\n\     //Set hotspot name and password of wifi
connection
at+dhcpc=1\r\n\                                 //Use dynamic IP
at+remoteport=8080\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+uartpacklen=64\r\n\                          //Set the framing length
at+uartpacktimeout=10\r\n\                      //Set framing time
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,none,12345678 ok

at+dhcpc=1

at+remoteip=192.168.11.245 ok

at+remoteport=8080 ok

at+remotepro=tcp

at+mode=server

at+uart=115200,8,n,1 ok

at+uartpacklen=64 ok

at+uartpacktimeout=10 ok

at+net_commit=1

4.4. Reset

Code:

```
char *commands_device_default="\\
at+default=1\r\n\   //reset
Com_send(commands_device_default);
```
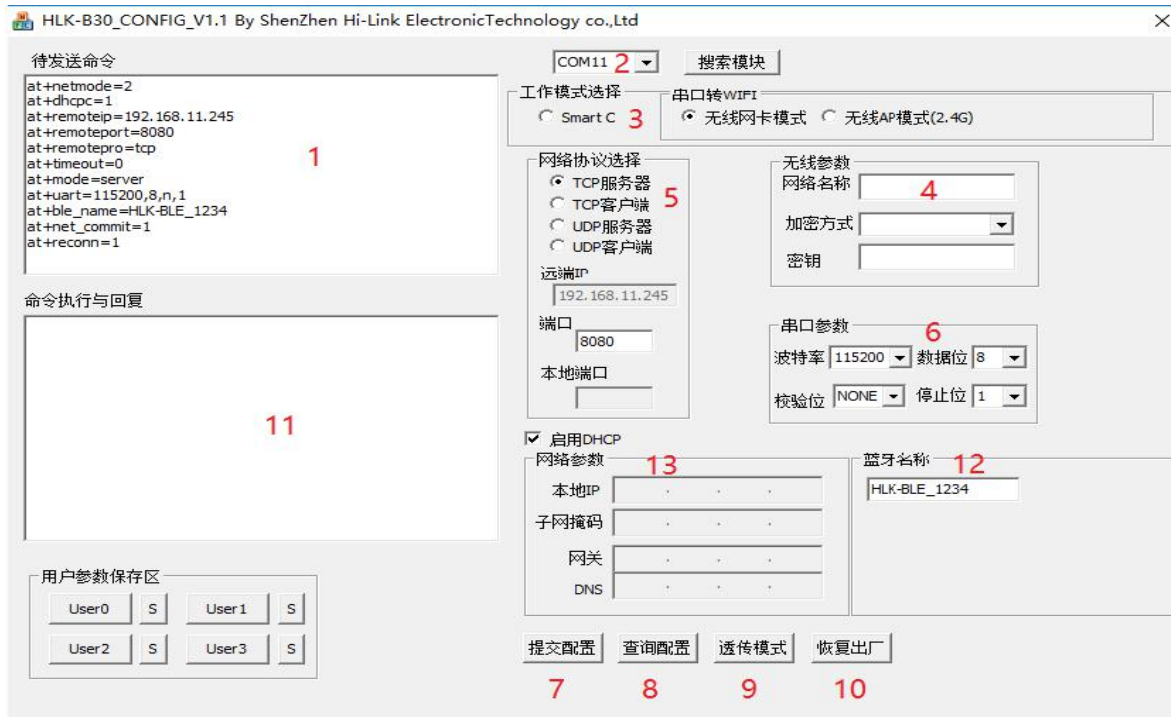
feedback：

at+default=1

1s later，Then the module will restart and restore the factory default configuration parameters

For more functions,please use the configuration uart and software to set up. The serial port on the left side of the software automatically generates the corresponding setting instructions.

4.5. Configuration software instruction

Pic 13   Serial port configuration interface

1：Pending command window

2：Serial number selection

3：Working mode selection

4：Wifi name and password

5：Network protocol selection

6：Serial port parameters

7：Submit configuration

8：Query configuration

9：Enter transparent transmission mode

10：Reset

11：Serial return command

12：Set Bluetooth name

13：Set ip

5. Restore factory settings method

Press and hold the ES0 button on the bottom panel for more than 6 seconds to restore the factory settings.

6. Bluetooth data transparent transmission

Bluetooth data transparent transmission means that after the Bluetooth connection successfully, the module will send the data received from the Bluetooth from the serial port, and the data received by the module's serial port will be sent from the Bluetooth.

The Bluetooth function of module only supports Bluetooth 4.2.

Install the Bluetooth mobile phone test software HLK-BLE.apk, turn on the Bluetooth function of mobile phone, and then open the application, the bluetooth name starting with HLK-BLE_ will be searched on the application.

Pic 14 Bluetooth searching list

Then enter the sent data in the send box, and then click send, the data will be received on the serial port, and the data sent by the serial port will be received on the application.
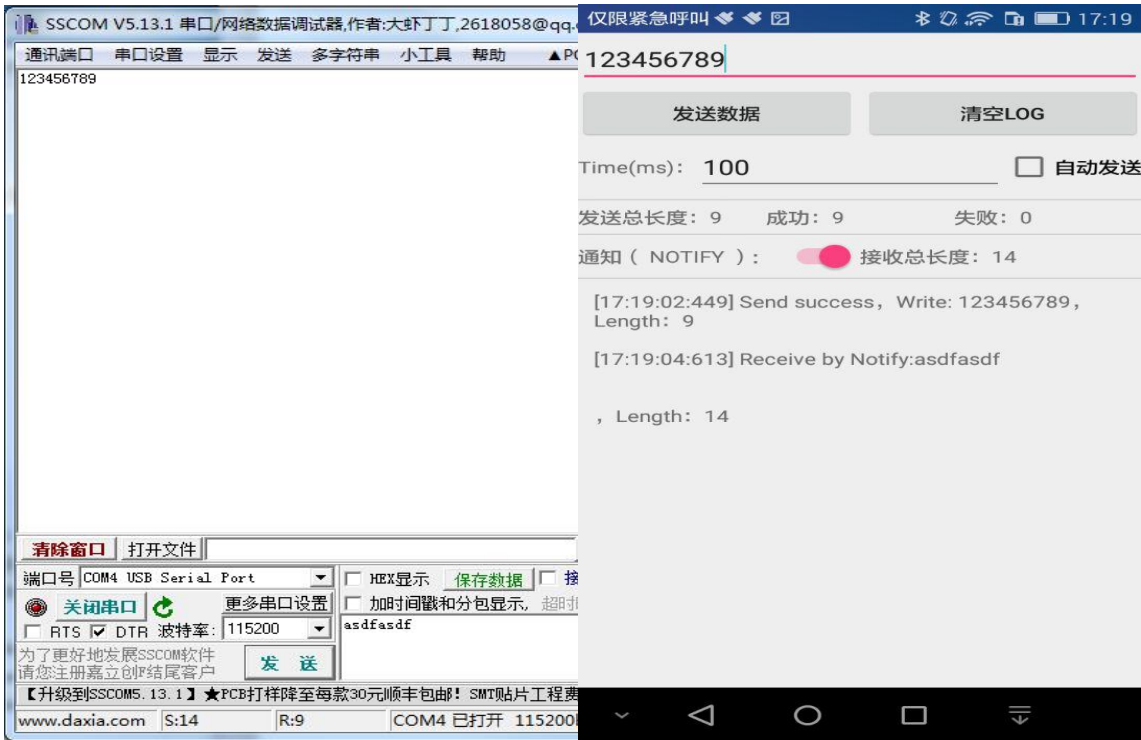
Pic 15 Bluetooth transmission test

7. Bluetooth distribution network

The Bluetooth configuration network is to connect to Bluetooth, send the wifi name and password to module, and then the module connects to router according to the received wifi name and password.

In sta and ap modes, Bluetooth is turned on, and the module can be connected through the Bluetooth of mobile phone.

After connecting the Bluetooth of module, click the Configure Networking button on the app to enter the network configuration interface.

Pic 16　Bluetooth distribution network interface

First enter the wifi name and password, and then click the "Start Configuration" button, the phone will send the hotspot name and password to module via Bluetooth, and the module will save it after receiving it, and then restart it, and proceed according to hotspot name and password sent by the phone wifi connection

8. Electrical characteristics

8.1.Electrical parameters

| Electrical parameters（for reference only）	
Power input voltage	DC:3.3±0.3V
No-load operation current	130±50mA
Module average power consumption	Approximately 350mW
Module current peak	400mA

Supply current requirement	≥800mA

8.2. Current waveform

Module test environment: single module without backplane test, single 2.4G, 3DB antenna.
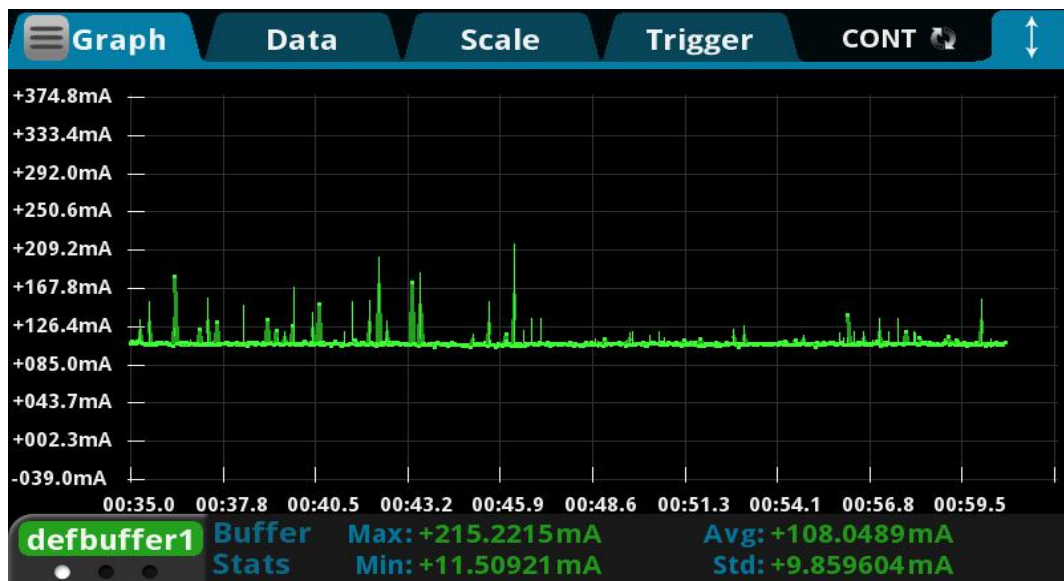
8.2.1. AP mode

Use 3.3V power supply, configure the module to test current in AP mode, average value:110mA,maximum value: 313mA. The detailed current waveform is shown below.
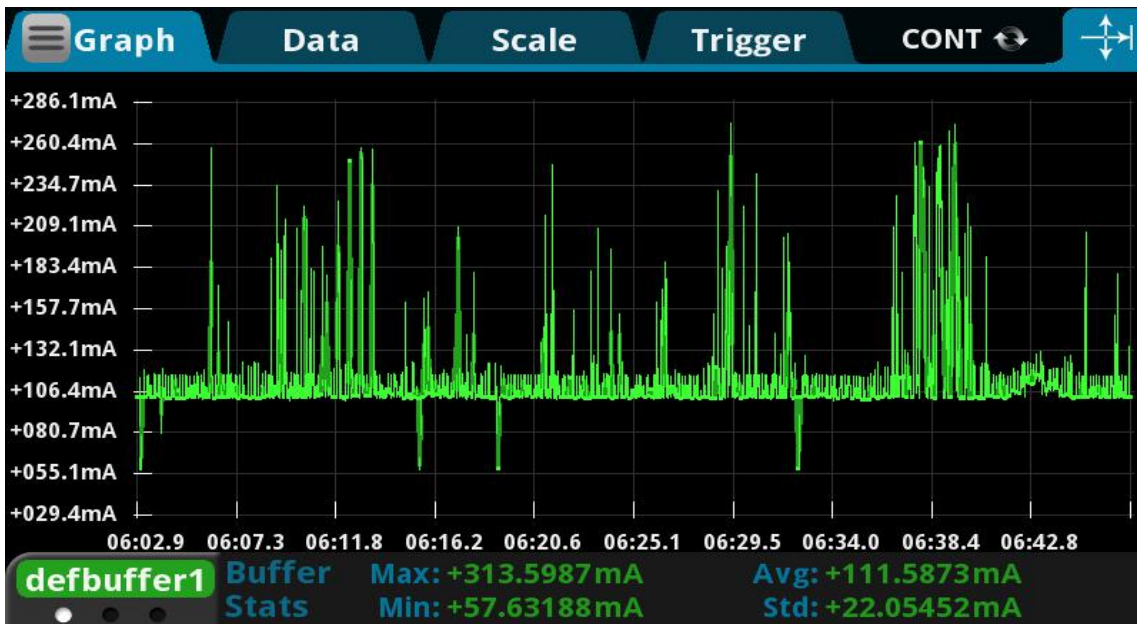
Pic 17   apMode transmission current test

8.2.2. WIFI+BLE Bluetooth

Use 3.3V power supply, configure the module to AP mode, BLE+WiFi transparent transmission test current, average value: 110mA, maximum value: 215mA. The detailed current waveform is shown below.

Pic 18. BLE+WiFi transparent transmission current test

8.2.3. STA mode

Use 3.3V power supply, configure the module in STA mode to connect to a 2.4g router, the current obtained from the WiFi transparent transmission test, the average value: 110mA, the maximum value: 231mA. The detailed current waveform is shown below.
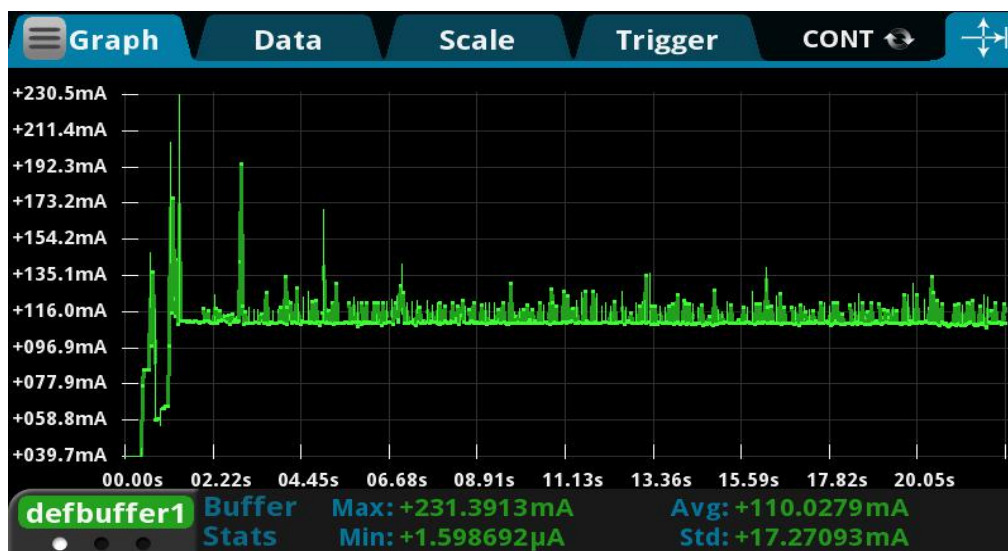
Pic 19. sta mode transmission current test

8.2.4. Default mode

Use 3.3V power supply, the current measured when the module is not configured, the average value: 71mA, the maximum value: 334mA. The detailed current waveform is shown below.
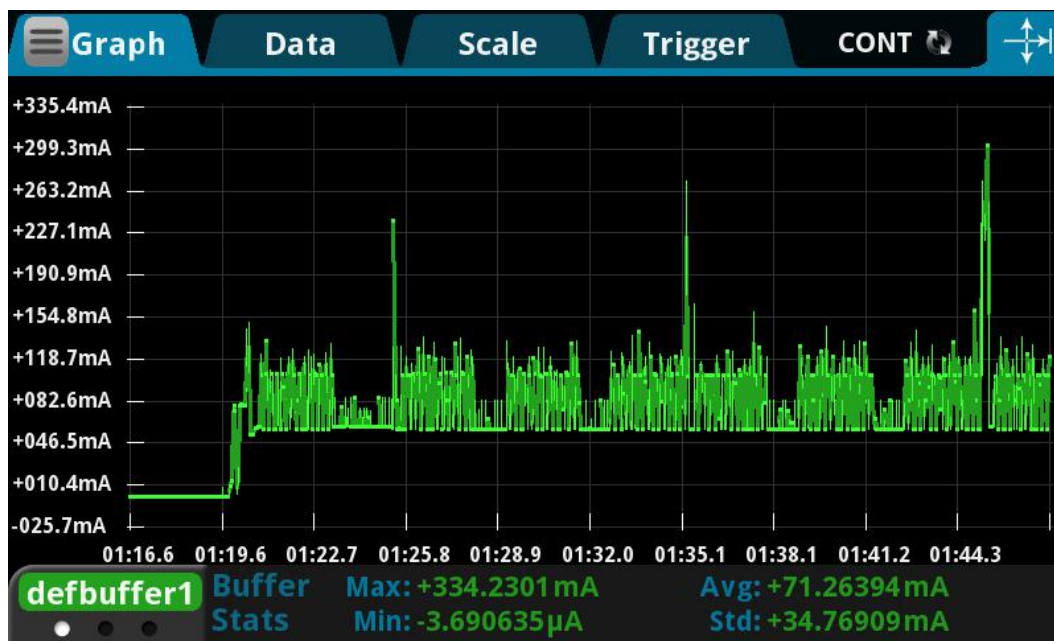
Pic 20. Default mode current test

9.Appendix A Document revision history

Version	Revision scope	Date
V1.00	First edition	2020-12-8