

HF-LPC3X0 Series

Low Power Wi-Fi + BLE4.2 Module

User Manual

V 1.2

**HF-LPC300****HF-LPC330**

Overview of Characteristic

- ◇ **Support Wi-Fi IEEE802.11b/g/n and BLE4.2 Wireless Standards**
- ◇ **Based on ARM9E SOC, 120MHz CPU, 256KB RAM, 2MB/2MB+8MB Flash**
- ◇ **Support UART Data Communication with Wi-Fi or BLE**
- ◇ **Support Wi-Fi STA/AP/AP+STA Mode**
- ◇ **Support BLE SmartBLELink Config**
- ◇ **Support Wi-Fi AP SmartAPLink Config**
- ◇ **Support Wireless and Remote Firmware Upgrade Function**
- ◇ **Support Software SDK for Develop**
- ◇ **Support Internal PCB or External IPEX Antenna Option**
- ◇ **Single +3.3V Power Supply**

◇ **Size:**

■ **HF-LPC300:23.1mm x 32.8mm x 3.5mm, SMT37**

■ **HF-LPC330:22mm x 15.6mm x 8mm, DIP10**

◇

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HISTORY

- Ed. V1.0** 03-26-2019 First Version.
- Ed. V1.1** 05-31-2019 Add HF-LPC330.
- Ed. V1.2** 09-12-2019 Add 8MB Flash type.

1. PRODUCT OVERVIEW

1.1. General Description

The HF-LPC3X0 series module is a fully self-contained small form-factor, single stream, 802.11b/g/n Wi-Fi + BLE4.2 module, which provide a wireless interface to any equipment with a Serial interface for data transfer. HF-LPC300 integrate MAC, baseband processor, RF transceiver with power amplifier in hardware and all Wi-Fi protocol and configuration functionality and networking stack, in embedded firmware to make a fully self-contained 802.11b/g/n Wi-Fi and BLE solution for a variety of applications.

The HF-LPC3X0 series module employs the world's lowest power consumption embedded architecture. It has been optimized for all kinds of client applications in the home automation, smart grid, handheld device, personal medical application and industrial control that have lower data rates, and transmit or receive data on an infrequent basis.

1.1.1 Key Application

- Remote equipment monitoring
- Asset tracking and telemetry
- Security
- Industrial sensors and controls
- Home automation
- Medical devices

1.1.2 Device Parameters

Table1. HF-LPC3X0 Series Module Technical Specifications

Class	Item	Parameters
Wi-Fi Parameters	Certification	TBD
	Wireless standard	802.11 b/g/n
	Frequency range	2.412GHz-2.484GHz
	Transmit Power	802.11b: +16 +/-2dBm (@11Mbps)
		802.11g: +14 +/-2dBm (@54Mbps)
		802.11n: +13 +/-2dBm (@HT20, MCS7)
Receiver Sensitivity	802.11b: -87 dBm (@11Mbps ,CCK)	
	802.11g: -73 dBm (@54Mbps, OFDM)	
	802.11n: -71 dBm (@HT20, MCS7)	
BLE Parameters	Certification	TBD
	Wireless standard	BLE4.2
	Frequency range	2.402GHz-2.480GHz
	Transmit Power	Max 20dBm
	Receiver Sensitivity	-90dBm
Hardware Parameters	Antenna Option	Internal: PCB antenna External: IPEX antenna
	Data Interface	UART
		GPIO, SPI, PWM, I2S, I2C, SDIO
	Operating Voltage	3.0~3.6V
	Operating Current	Peak (Continuous TX): 440mA Average(STA, No data): 25mA Average(STA, Continuous TX): 85mA Average(AP): 110mA Standby: 300uA(Reset Pin set to low)
	Operating Temp.	-25°C- 85°C
	Storage Temp.	-40°C- 125°C
	Humidity	<85%
Dimensions and Size	HF-LPC300: 23.1mm x 32.8mm x 3.5mm HF-LPC330: 22mm x 15.6mm x 8mm	
Software Parameters	Network Type	STA/AP/AP+STA
	Security Mechanisms	WEP/WPA-PSK/WPA2-PSK
	Encryption	WEP64/WEP128/TKIP/AES
	Update Firmware	Local Wireless, Remote OTA
	Customization	Support SDK for application develop
	Network Protocol	IPv4, TCP/UDP/HTTP/TLS(SDK)
	User Configuration	AT+instruction set. Android/ iOS SmartAPLink AP Config SmartBleLink BLE Config

1.2. Hardware Introduction

HF-LPC3X0 series Wi-Fi module appearance is as following.

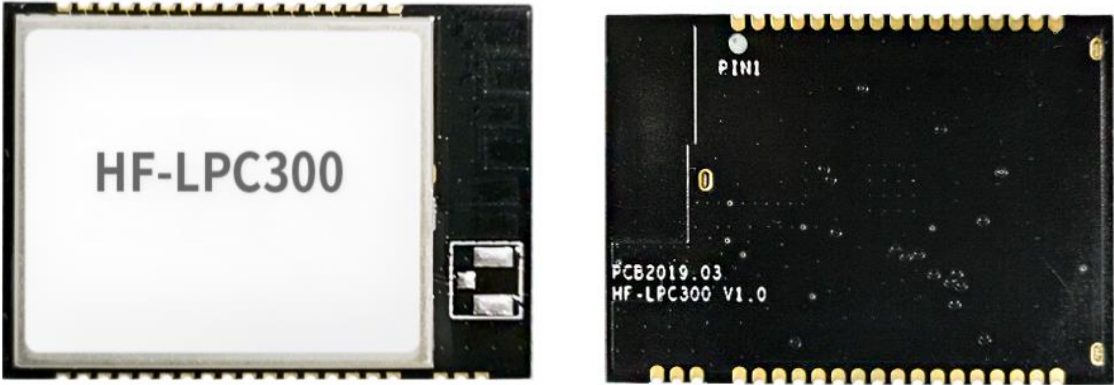


Figure 1. HF-LPC300 Appearance

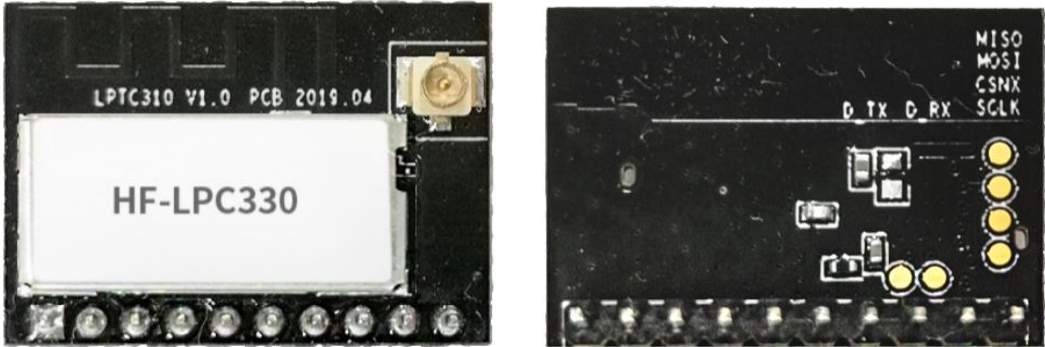


Figure 2. HF-LPC330 Appearance

1.2.1. HF-LPC300 Pins Definition

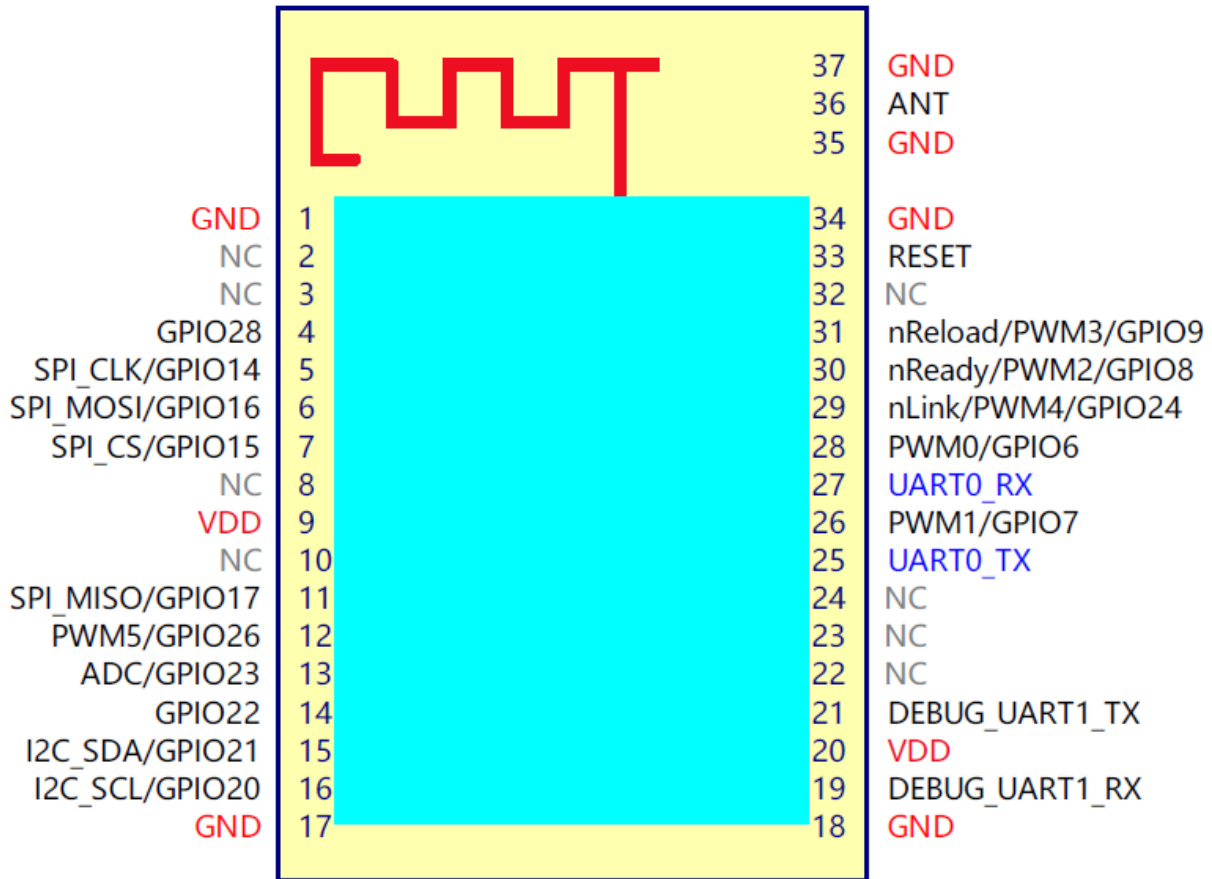


Figure 3. HF-LPC300 Pins Map

Table2. HF-LPC300 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1,17,18,34	Ground	GND	Power	Power Input
2		N.C		
3		N.C		
4	GPIO28	GPIO28	I/O	GPIO28, leave it open if not use
5	SPI_CLK	SPI_CLK	I/O	GPIO14, leave it open if not use Addition 8MB Flash use this pin
6	SPI_MOSI	SPI_MOSI	I/O	GPIO16, leave it open if not use Addition 8MB Flash use this pin
7	SPI_CS	SPI_CS	I/O	GPIO15, leave it open if not use Addition 8MB Flash use this pin
8		NC		
9,20	+3.3V	VDD	Power	Power Input
10		NC		
11	SPI_MISO	SPI_MISO	I/O	GPIO17, leave it open if not use Addition 8MB Flash use this pin

Pin	Description	Net Name	Signal Type	Comments
12		PWM5	I/O	GPIO26, leave it open if not use
13	GPIO23	GPIO23	I/O	GPIO23, leave it open if not use
14	GPIO22	GPIO22	I/O	GPIO22, leave it open if not use
15	GPIO21	GPIO21	I/O	GPIO21, leave it open if not use
16	GPIO20	GPIO20	I/O	GPIO20, leave it open if not use
19	UART1	DEBUG_UART1_RX	I	3.3V TTL Debug UART1 Input leave it open if not use
21	UART1	DEBUG_UART1_TX	O	3.3V TTL Debug UART1 Output leave it open if not use
22		N.C		
23		N.C		
24		N.C		
25	UART0	UART0_TX	O	3.3V TTL UART0 Output
26	PWM1	PWM1	I/O	GPIO7, leave it open if not use
27	UART0	UART0_RX	I	3.3V TTL UART0 Input
28	PWM0	PWM0	I/O	GPIO6, leave it open if not use
29	Wi-Fi Status	nLink	I/O	“0” – Wi-Fi connect to router “1” – Wi-Fi unconnected; Detailed functions see <Notes> GPIO24, leave it open if not use
30	Module Boot Up Indicator	nReady	I/O	“0” – Boot-up OK; “1” – Boot-up No OK; GPIO8, leave it open if not use
31	Multi-Function	nReload	I/O	Detailed functions see <Notes> GPIO9, leave it open if not use
32		N.C		
33	Module Reset	RESET	I,PU	“Low” effective reset input(>10ms). There is RC reset circuit internally. Leave it open if not use.
37	ANT	ANT		Antenna Pin, only for HF-LPC300-2

HF-LPC300 module SOC chip integrate 2MB Flash, but it has additional position for adding Flash, the Flash position is as following. This flash can be used for saving data using SDK.

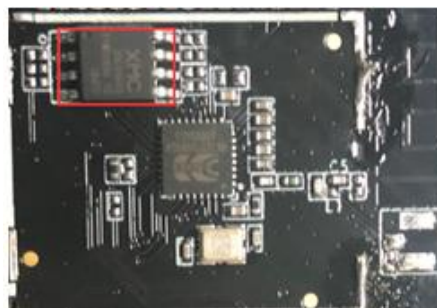


Figure 4. HF-LPC300-1(8M) Flash

1.2.2. HF-LPC330 Pins Definition

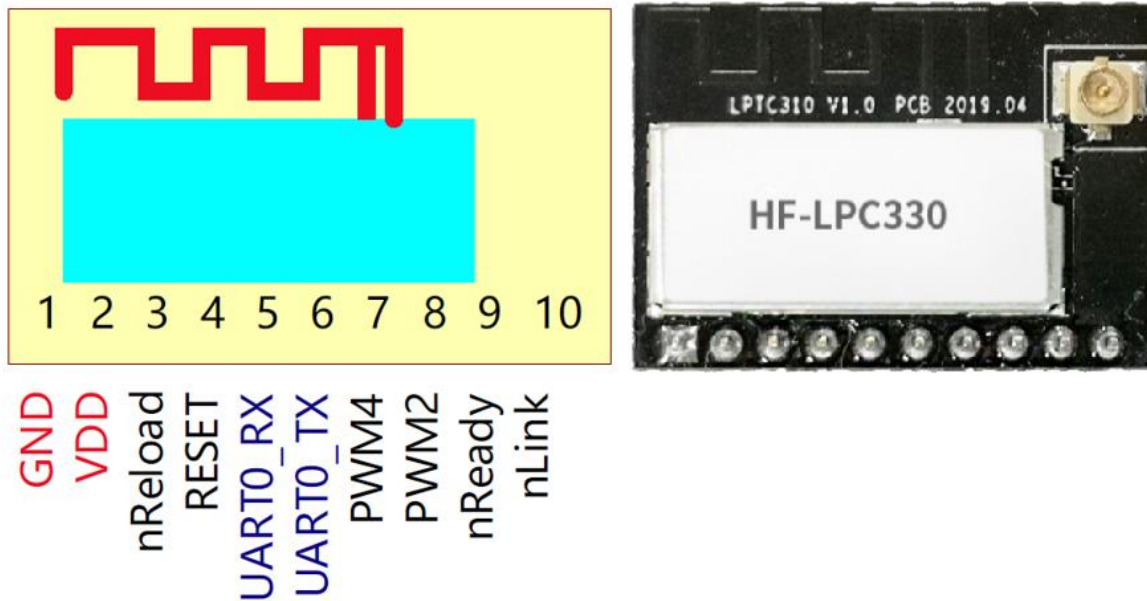


Figure 5. HF-LPC330 Pins Map

Table3. HF-LPC330 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	Ground	GND	Power	Power Input
2	+3.3V	VDD	Power	Power Input
3	Multi-Function	nReload PWM3	I/O	Detailed functions see <Notes> GPIO9, leave it open if not use
4	Module Reset	RESET	I,PU	“Low” effective reset input(>10ms). There is RC reset circuit internally. Leave it open if not use.
5	UART0	UART0_RX	I	3.3V TTL UART0 Input
6	UART0	UART0_TX	O	3.3V TTL UART0 Output
7	PWM4	PWM4	I/O	GPIO24, leave it open if not use
8	PWM2	PWM2	I/O	GPIO8, leave it open if not use
9	Module Boot Up Indicator	nReady PWM1	I/O	“0” – Boot-up OK; “1” – Boot-up No OK; GPIO7, leave it open if not use
10	Wi-Fi Status	nLink PWM0	I/O	“0” – Wi-Fi connect to router “1” – Wi-Fi unconnected; Detailed functions see <Notes> GPIO6, leave it open if not use

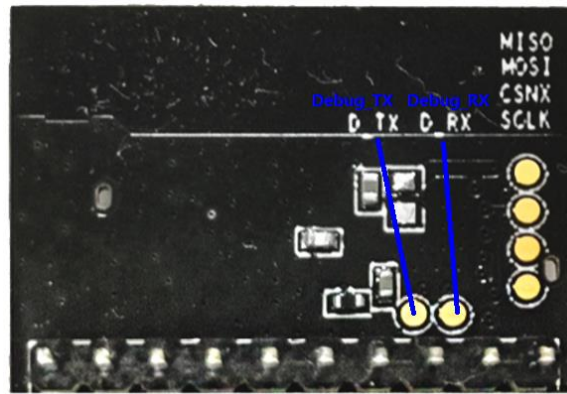


Figure 6. HF-LPC330 Debug Pins Map

Pin	Description	Net Name	Signal Type	Comments
	UART1	DEBUG_UART1_RX	I	3.3V TTL Debug UART1 Input
	UART1	DEBUG_UART1_TX	O	3.3V TTL Debug UART1 Output

<Notes>

I — Input; O — Output

PU—Internal Resistor Pull Up; I/O: Digital I/O; Power—Power Supply

nReload Pin (Button) function:

1. When this pin is set to “low” during module boot up, the module will enter wireless firmware and config upgrade mode. This mode is used for customer manufacture. See Appendix to download software tools for customer batch configuration and upgrade firmware during mass production.
2. After module is powered up, short press this button (0.2s < “Low” < 1.5s) and loose to make the module go into SmartLink V8 config mode, when in SmartLink V8 config mode and short press this button again to go into SmartAPLink and SmartBleLink config mode, waiting for APP to set router SSID and password, config module connect to router. **Recommend to use SmartBleLink BLE method config.** See Appendix to download SmartLink V8 and SmartAPLink APP
3. After module is powered up, long press this button (“Low” > 4s) and loose to make the module recover to factory setting.

High-Flying strongly suggest customer fan out this pin to connector or button for “Manufacture” upgrade or “SmartLink” application.

nReady Pin (LED) function(Low effective):

1. OS initial finished indicator. Only after this pin output low, can the UART function be used.

nLink Pin (LED) function(Low effective):

1. At wireless firmware and config upgrade mode , this LED used to indicate configure and upgrade status.
2. At “SmartLink” config mode, this LED is used to indicate APP to finish setting.

3. At normal mode, it's Wi-Fi link status indicator. Output Low when STA mode connect to router AP or other STA connect to it when in AP mode.
High-Flying strongly suggest customer fan out this pin to LED.

1.2.3. Electrical Characteristics

Table4. Absolute Maximum Ratings:

Parameter	Condition	Min.	Typ.	Max.	Unit
Work temperature range		-25		85	°C
Maximum soldering temperature	IPC/JEDEC J-STD-020			260	°C
ESD (Human Body Model HBM)	TAMB=25°C			2.5	KV
ESD (MM)	TAMB=25°C			0.25	KV

1.2.4. HF-LPC300 Mechanical Size

HF-LPC300 modules physical size (Unit: mm) as follows:

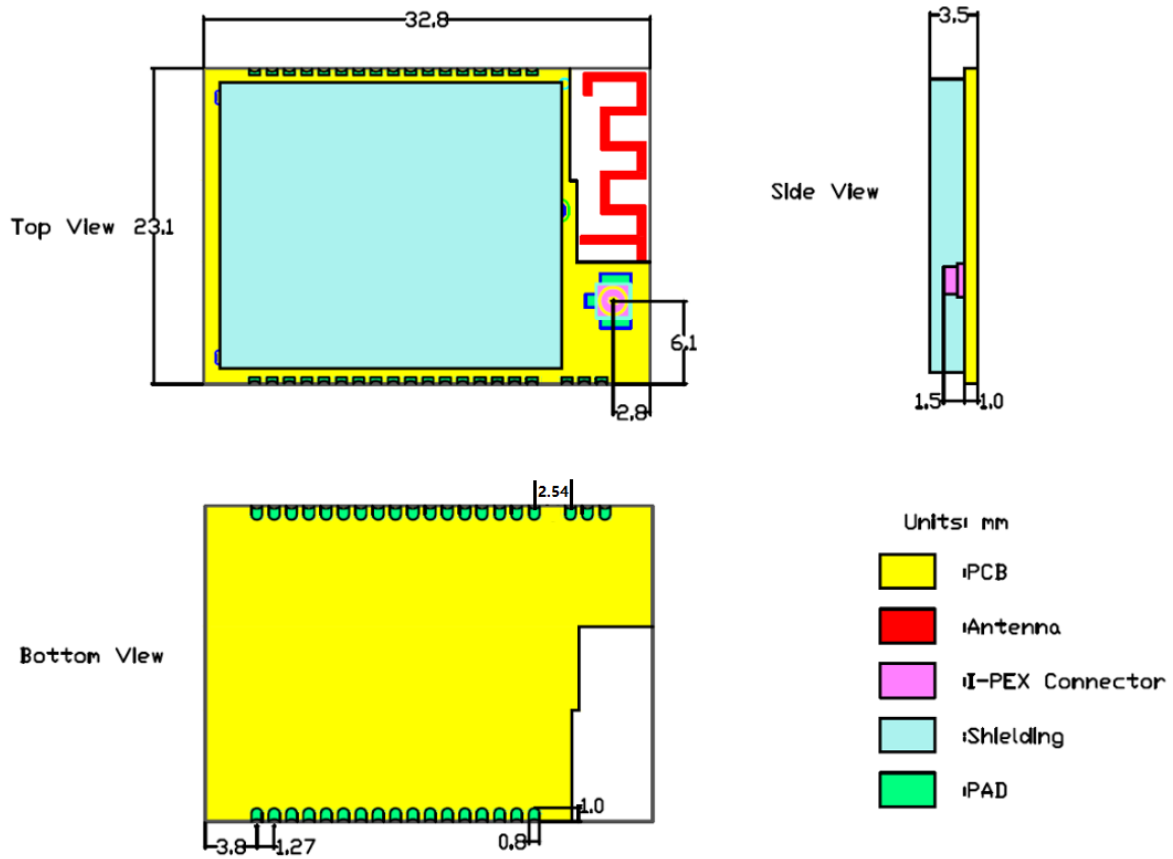


Figure 7. HF-LPC300 Mechanical Dimension

1.2.5. HF-LPC330 机械尺寸

HF-LPC330 物理尺寸 (单位: mm) 如下图, 22mm x 15.6mm:

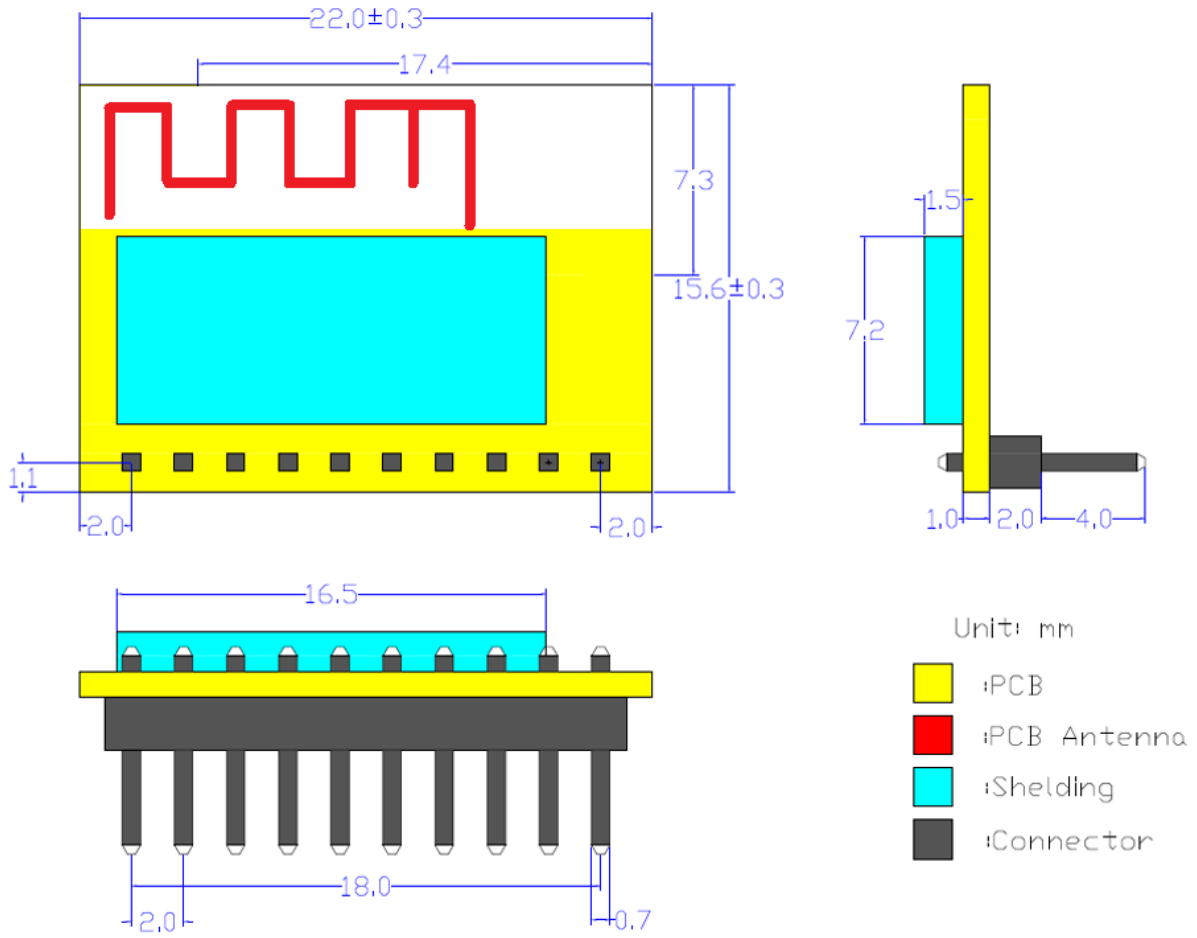


Figure 8. HF-LPC330 机械尺寸

1.2.6. HF-LPC300 On-board PCB Antenna

HF-LPC300 module support internal on-board PCB antenna option. When customer select internal antenna, you shall comply with following antenna design rules and module location suggestions:

- For customer PCB, RED color region (8.3x18.4mm) can't put componet or paste GND net;
- Antenna must away from metal or high components at least 10mm;
- Antenna can't be shielded by any metal enclosure;

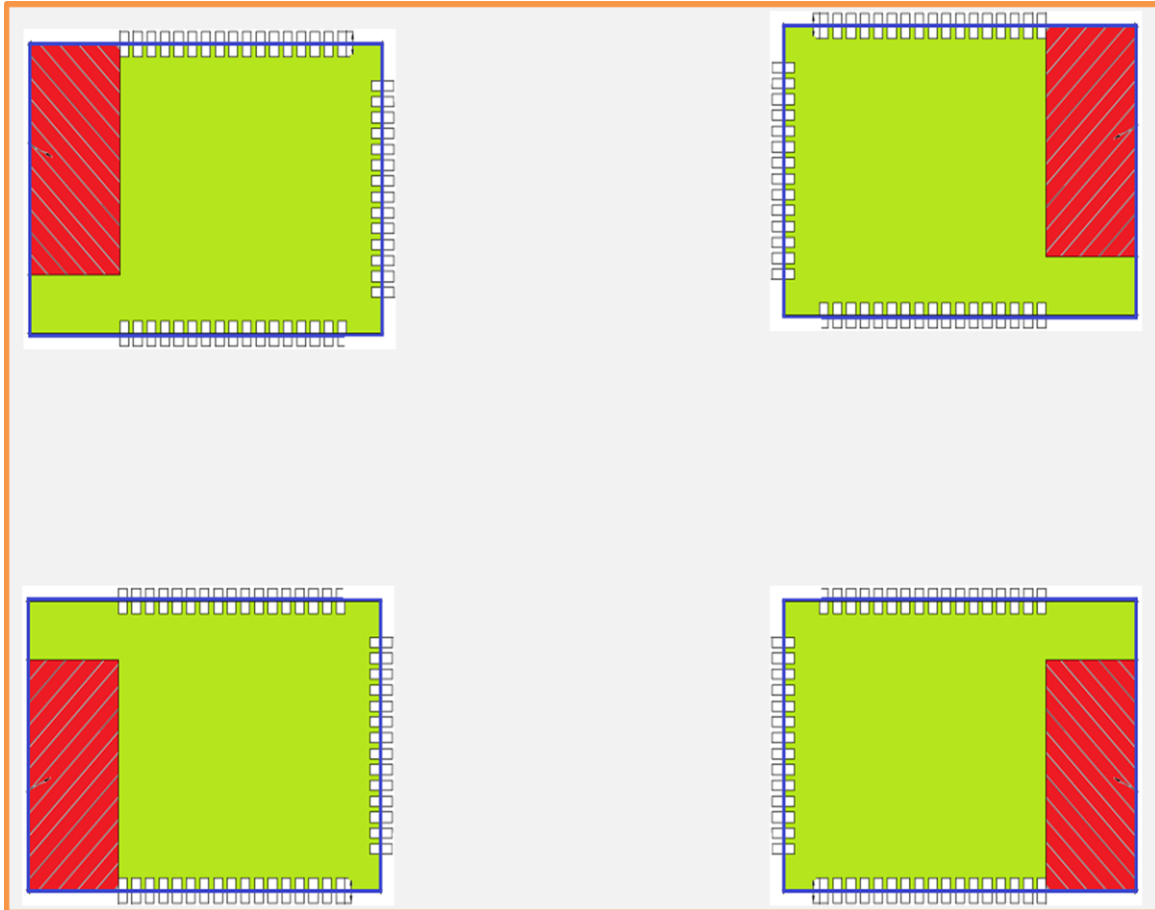


Figure 9. Suggested Module Placement Region

High-Flying suggest module better locate in following region at customer board, which to reduce the effect to antenna and wireless signal, and better consult High-Flying technical people when you structure your module placement and PCB layout.

1.2.7. HF-LPC330 On-board Antenna

HF-LPC330 module support internal antenna option. When customer select internal antenna, shall comply with following antenna design rules and module location suggestions:

- For customer PCB, RED color region (internal antenna area) can't put componet or paste GND net;
- Antenna must away from metal or high components at least 10mm;
- Antenna can't be shielded by any meal enclosure; All cover, include plastic, shall away from antenna at least 10mm;

High-Flying suggest module better locate in following region at customer board, which to reduce the effect to antenna and wireless signal, and better consult High-Flying technical people when you structure your module placement and PCB layout.

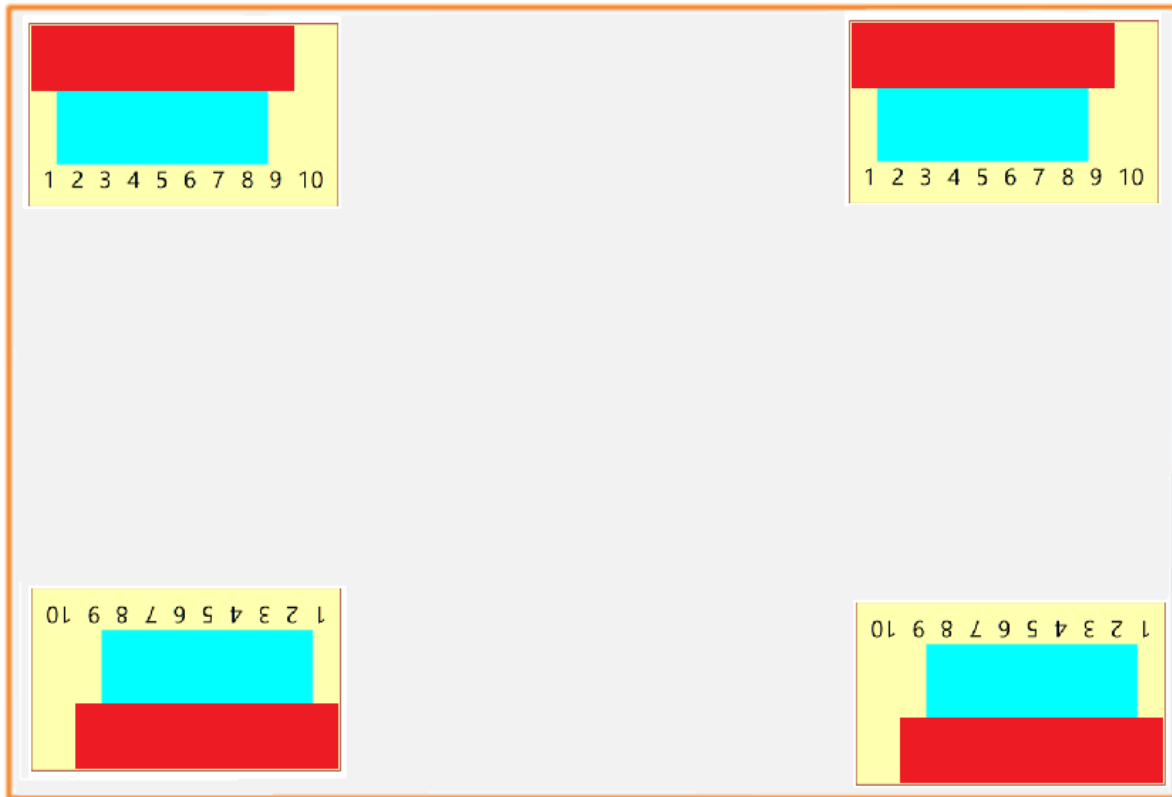


Figure 10. HF-LPC330 suggested Module Placement Region

1.2.8. External Antenna

HF-LPC3X0 series module supports external antenna(I-PEX) option for user dedicated application. If user select external antenna, HF-LPC3X0 series Wi-Fi modules must be connected to the 2.4G antenna according to IEEE 802.11b/g/n standards. We can provide external antenna if needed. Contact with our salesman.

The antenna parameters required as follows:

Table5. HF-LPC300 External Antenna Parameters

Item	Parameters
Frequency range	2.4~2.5GHz
Impedance	50 Ohm
VSWR	2 (Max)
Return Loss	-10dB (Max)
Connector Type	I-PEX or populate directly

1.2.9. Order Information

Base on customer detailed requirement, HF-LPC3X0 series modules provide different variants and physical type for detailed application.

HF-LPC300-X (8M)

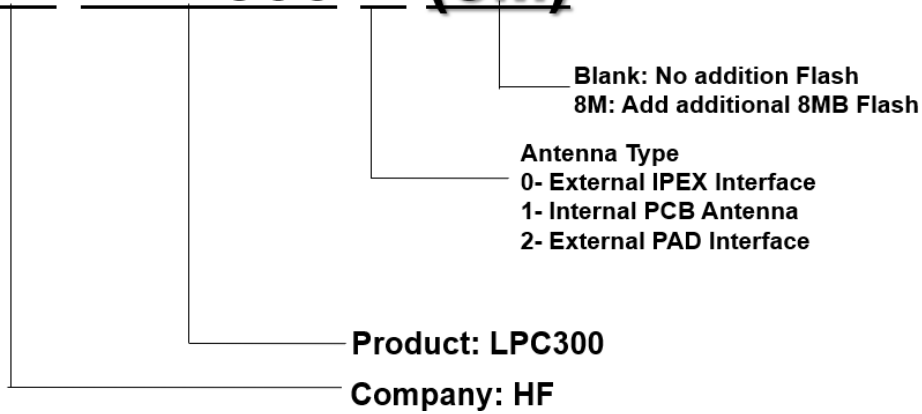
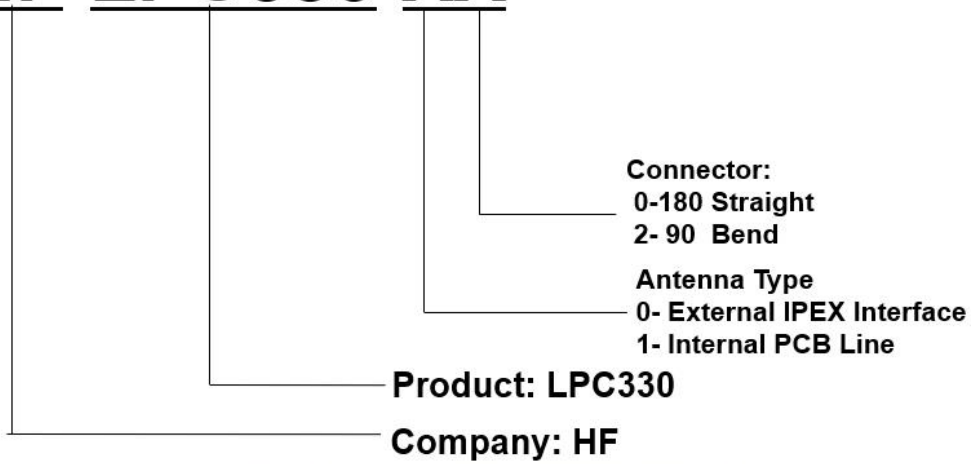


Figure 11. HF-LPC300 Order Information

HF-LPC330-XX



HF-LPC330-00



HF-LPC330-12

Figure 12. HF-LPC330 Order Information

1.2.10. Hardware Typical Application

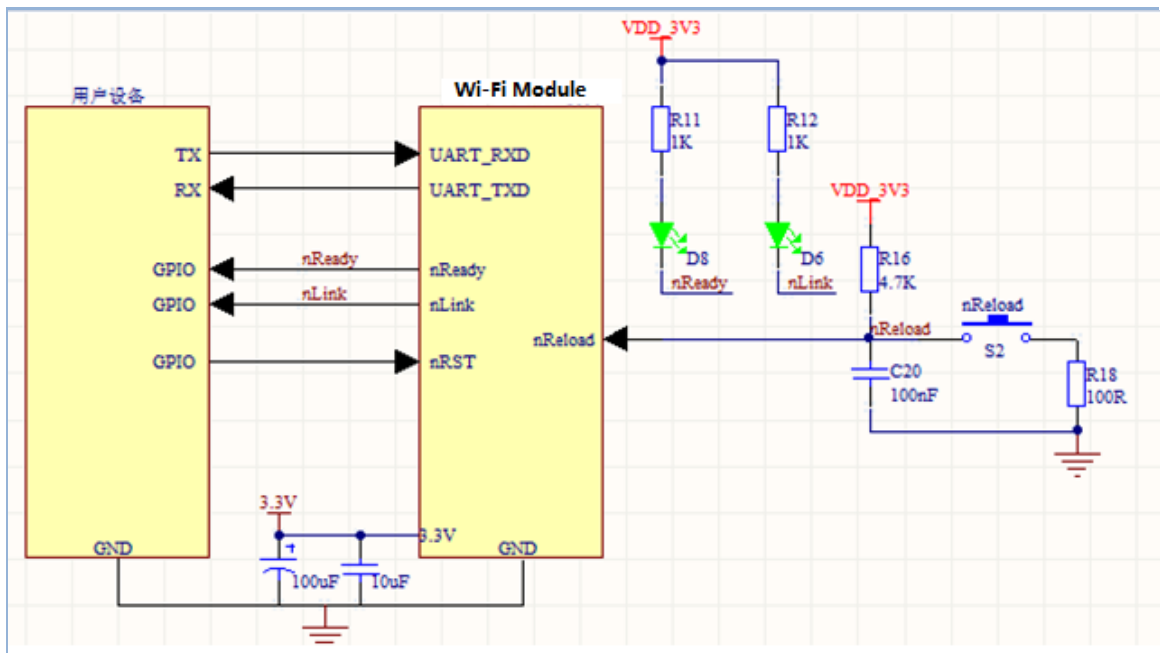


Figure 13. HF-LPC300 Hardware Typical Application

Notes:

nReset- Module hardware reset signal. Input. Logics “0” effective.

There is pull-up resistor internal and no external pull-up required. When module power up or some issue happened, MCU need assert nRST signal “0” at least 10ms, then set” 1” to keep module fully reset.

nLink- Module WIFI connection status indication. Output.

(This pin is recommend to connect to LED, indicate status when the module in wireless upgrade mode)

When module connects to AP (AP associated), this pin will output “0”. This signal used to judge if module already at WiFi connection status. There is pull-up resistor internal and no external pull-up required. If nLink function not required, can leave this pin open.

nReady- Module boot up ready signal. Output. Logics “0” effective.

The module will output “0” after normal boot up. This signal used to judge if module finish boot up and ready for application or working at normal mode. If nReady function not required, can leave this pin open.

nReload- Module restore to factory default configuration. Input. Logics “0” effective.

(This pin is recommend to connect to button, is used to enter wireless upgrade mode)

User can de-assert nReload signal “0” more than 4s through button or MCU pin, then release, module will restore to factory default configuration and re-start boot up process.. If nReload function not required, can leave this pin open.

UART0_TXD/RXD- UART port data transmit and receive signal.

2. FUNCTIONAL DESCRIPTION

2.1. Wi-Fi Wireless Networking

HF-LPC300 module can be configured as both wireless STA and AP base on network type. Logically there are two interfaces in HF-LPC300. One is for STA, and another is for AP. When HF-LPC300 works as AP, other STA equipments are able to connect to HF-LPC300 module directly. Wireless Networking with HF-LPC300 is very flexible.

Notes:

AP: that is the wireless Access Point, the founder of a wireless network and the centre of the network nodes. The wireless router we use at home or in office may be an AP.

STA: short for Station, each terminal connects to a wireless network (such as laptops, PDA and other networking devices) can be called with a STA device.

2.1.1. Basic Wireless Network Based On AP

Infrastructure: it's also called basic network. It built by AP and many STAs which join in.

The characters of network of this type are that AP is the centre, and all communication between STAs is transmitted through the AP. The figure following shows such type of networking.

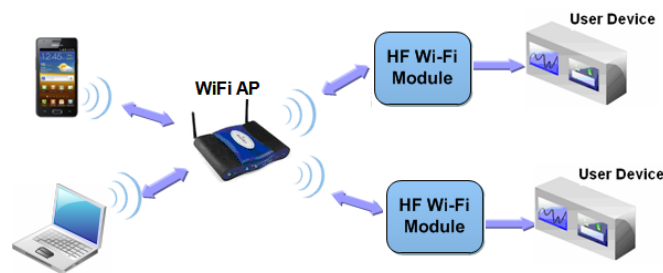


Figure 14. HF-LPC300 Basic Wireless Network Structure

2.1.2. Wireless Network Based On STA

HF-LPC300 module support STA network mode.

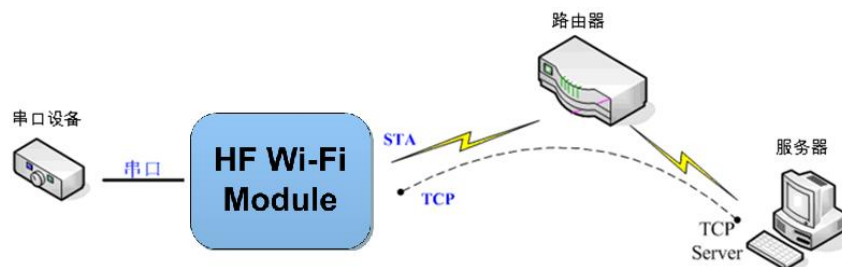


Figure 15. HF-LPC300 STA Network Structure

2.2. BLE Connection

HF-LPC300 support BLE, smart phone can direct connect to module, structure is as following.

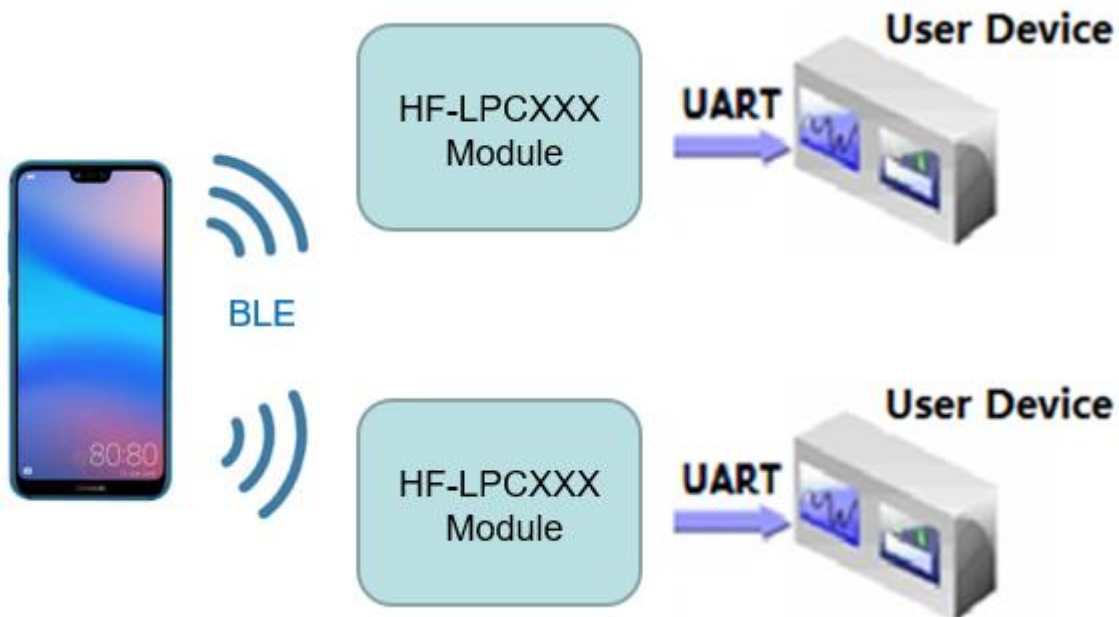


Figure 16. BLE Connection

2.3. Work Mode : Transparent Transmission Mode

HF-LPC300 module support serial interface transparent transmission mode. The benefit of this mode is achieves a plug and play serial data port, and reduces user complexity furthest. In this mode, user should only configure the necessary parameters. After power on, module can automatically connect to the default wireless network and server.

As in this mode, the module's serial port always work in the transparent transmission mode, so users only need to think of it as a virtual serial cable, and send and receive data as using a simple serial. In other words, the serial cable of users' original serial devices is directly replaced with the module; user devices can be easy for wireless data transmission without any changes.

The transparent transmission mode can fully compatible with user's original software platform and reduce the software development effort for integrate wireless data transmission.

The parameters which need to configure include:

- **Wireless Network Parameters**
 - Wireless Network Name (SSID)
 - Security Mode
 - Encryption Key
- **TCP/UDP Linking Parameters**
 - Protocol Type
 - Link Type (Server or Client)
 - Target Port ID Number
 - Target Port IP Address
- **Serial Port Parameters**

- Baud Rate
- Data Bit
- Parity (Check) Bit
- Stop Bit
- Hardware Flow Control

2.4. Encryption

Encryption is a method of scrambling a message that makes it unreadable to unwanted parties, adding a degree of secure communications. There are different protocols for providing encryption, and the HF-LPC300 module supports following:

- ◆ WEP
- ◆ WPA-PSK/TKIP
- ◆ WPA-PSK/AES
- ◆ WPA2-PSK/TKIP
- ◆ WPA2-PSK/AES

2.5. Parameters Configuration

HF-LPC300 module supports two methods to configuration parameters: **AT+instruction set**.

AT+instruction set configuration means user configure parameters through serial interface command.

Refer to “AT+instruction set” chapter for more detail.

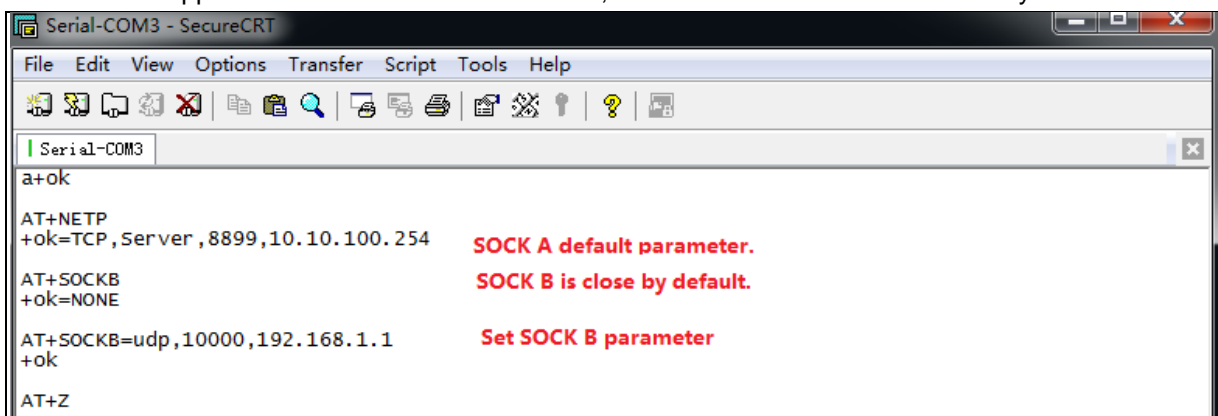
2.6. Firmware Update

HF-LPC300 module supports multiple upgrade methods:

- UART upgrade
- Local Network upgrade

2.7. SOCKET B Function

HF-LPC300 support double socket communication, the socket B function is disabled by default.



```

Serial-COM3 - SecureCRT
File Edit View Options Transfer Script Tools Help
Serial-COM3
a+ok
AT+NETP
+ok=TCP,Server,8899,10.10.100.254   SOCK A default parameter.
AT+SOCKB
+ok=NONE                           SOCK B is close by default.
AT+SOCKB=udp,10000,192.168.1.1     Set SOCK B parameter
+ok
AT+Z
  
```

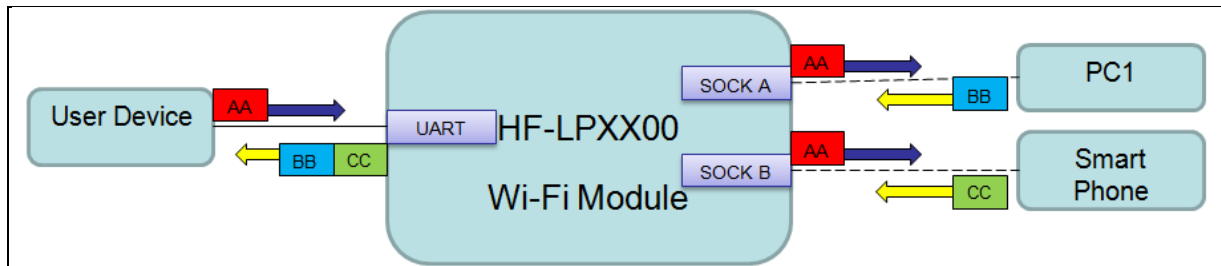


Figure 17. Socket B function demo

2.8. Multi-TCP Link Connection

When HF-LPC300 module SOCK A configured as TCP Server, it supports Multi-TCP link connection, and maximum 5 TCP clients permitted to connect to HF-LPC300 module. User can realize multi-TCP link connection at each work mode.

Multi-TCP link connection will work as following structure:

Upstream: All dates from different TCP connection or client will be transmitted to the serial port as a sequence.

Downstream: All data from serial port (user) will be replicate and broadcast to every TCP connection or client.

Detailed multi-TCP link data transmission structure as following figure:

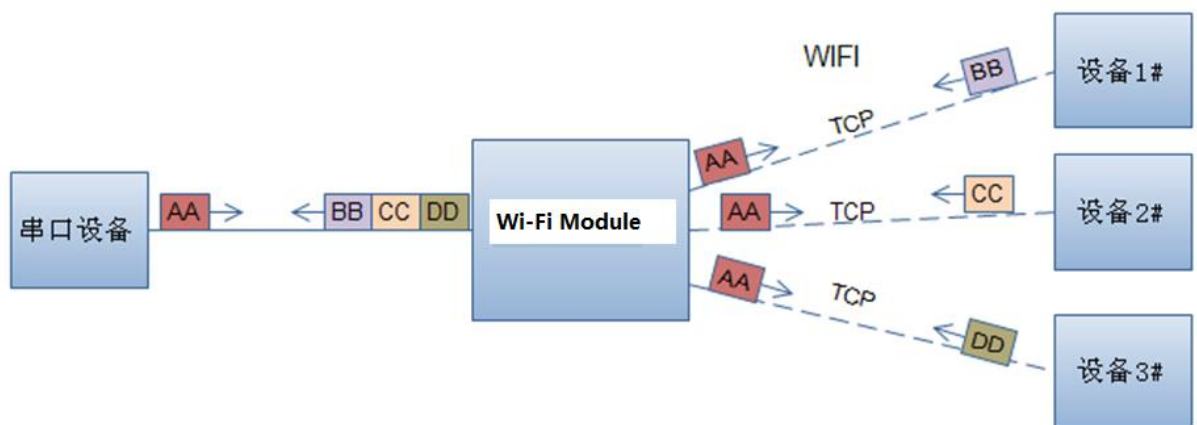


Figure 18. Multi-TCP Link Data Transmission Structure

3. OPERATION GUIDELINE

3.1. Configuration

When first use HF-LPC3X0 series modules, user may need some configuration. User can connect to HF-LPC300 module's wireless interface with following default setting information and configure the module through laptop.

Table6. HF-LPC300 Web Access Default Setting

Parameters	Default Setting
SSID	HF-LPC300
IP Address	10.10.100.254
Subnet Mask	255.255.255.0
Account	admin
Password	admin

3.1.1. Open Web Management Interface

There is internal webpage and external webpage in modules. The external webpage is for web management. The internal webpage is only for upgrading. But the internal webpage is the same.

Step 1: Connect laptop to module AP via wireless LAN card;

Step 2: After wireless connection OK. Open Wen browser and access "<http://10.10.100.254>";

Step 3: Then input user name and password in the page as following and click "OK" button.



Figure 19. Open Web Management page

The HF-LPC300 web management page support English and Chinese language. User can select language environment at the top right corner and click "Apply" button.

The main menu include nine pages: "System", "Work Mode", "STA Setting", "AP Setting", "Other Setting", "Account", "Upgrade SW", "Restart", "Restore".

3.1.2. System Page

At this page, user can check current device's important information and status such as: device ID (MID), software version, wireless work mode and related Wi-Fi parameters.

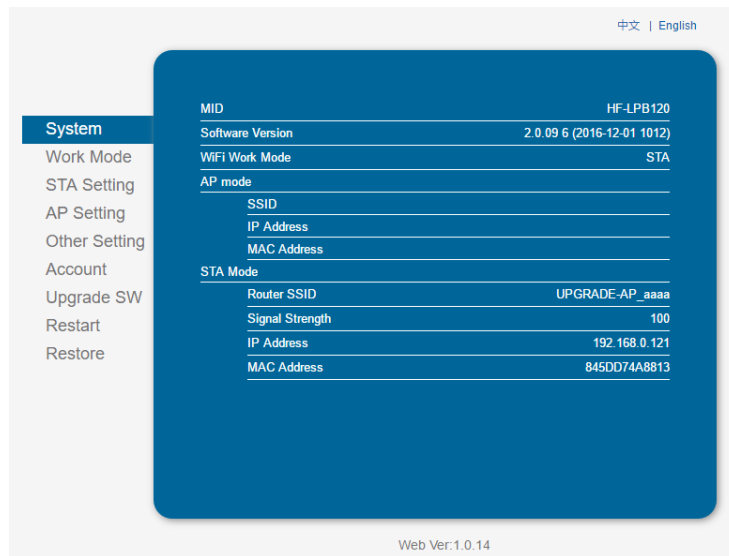


Figure 20. System Web Page

3.1.3. Work Mode Page

HF-LPC300 module can works at AP mode to simplify user's configuration, can also works at STA to connect remote server through AP router.

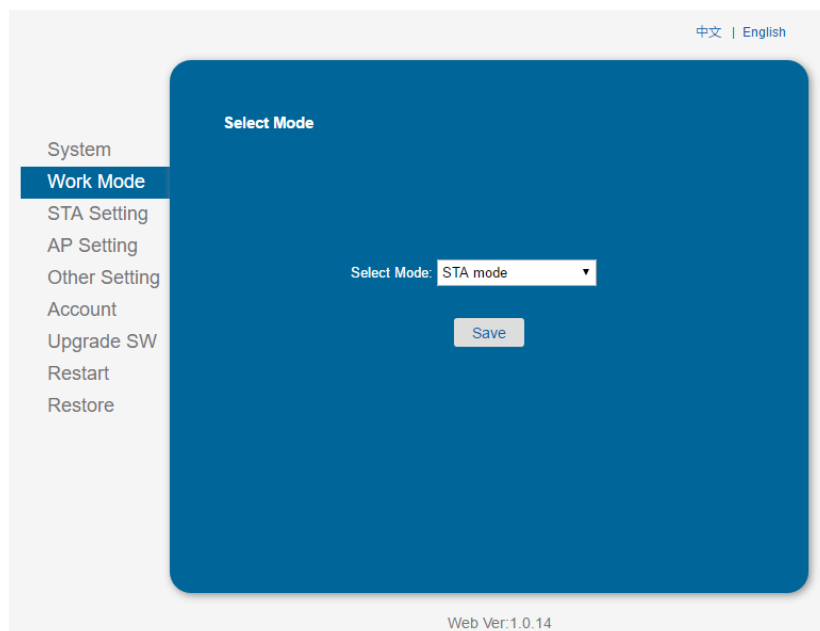


Figure 21. Work Mode Page

3.1.4. STA Setting Page

User can push “Scan” button to auto search Wi-Fi AP router nearby, and can connect with associate AP through some settings. Please note the encryption information input here must be fully same with Wi-Fi AP router’s configuration, and then it can link with AP correctly.

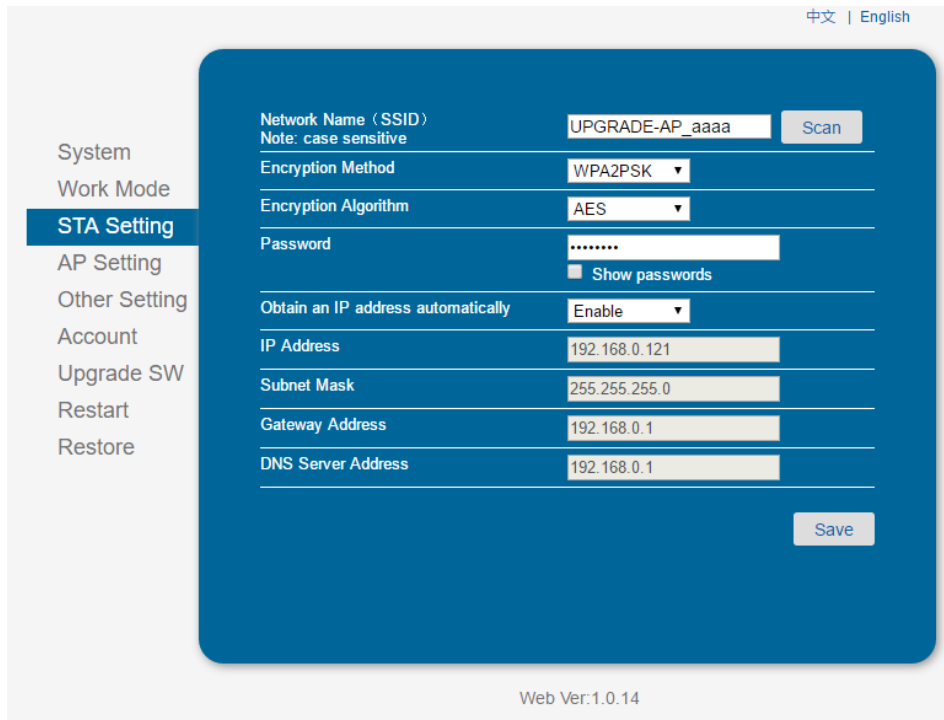


Figure 22. STA Setting Page

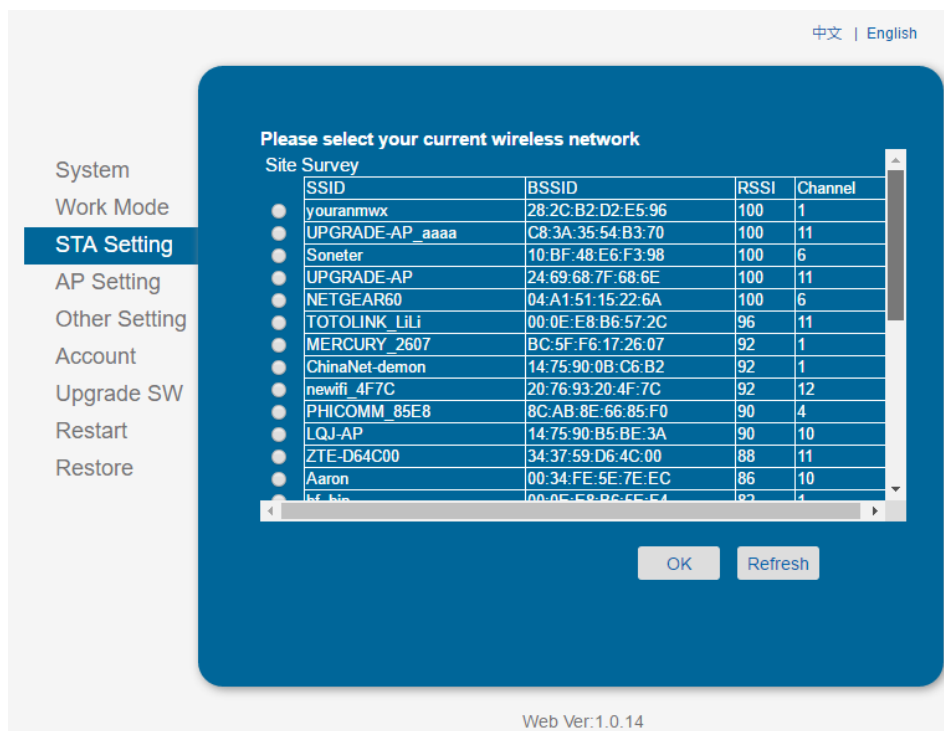


Figure 23. STA Scan Page

3.1.5. AP Setting Page

When user select module works at AP and AP+STA mode, then need setting this page and provide wireless and network parameters. Most of the system support DHCP to achieve IP address, so we suggest to “Enable” DHCP server in most applications.

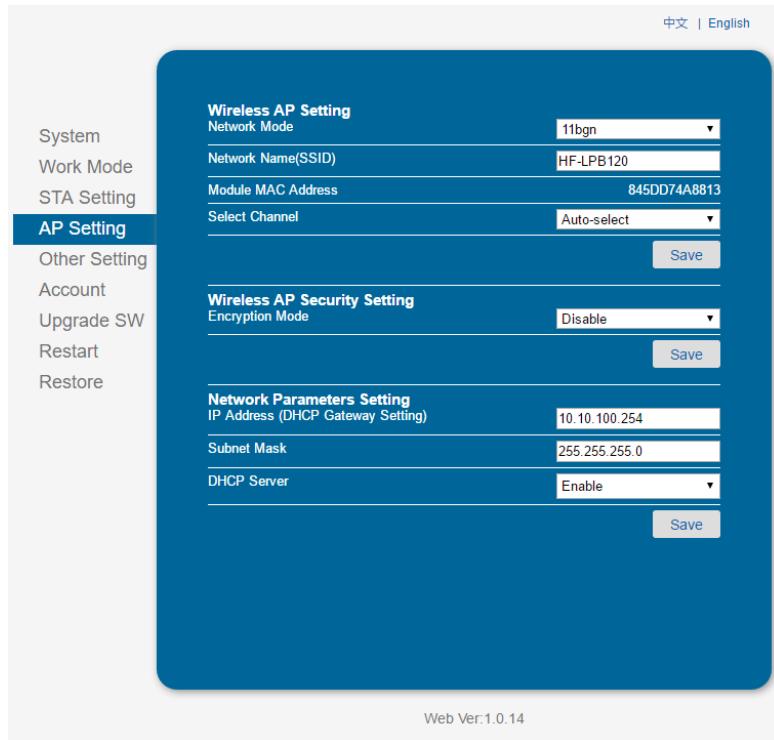


Figure 24. AP Setting Page

3.1.6. Other Setting Page

HF-LPC300 usually works at data transparent transmission mode. At this mode, the user device which connected with HF-LPC300 will connect and communicate with remote PC or server. At this page, user need setting serial port communication parameters and defines TCP related protocol parameters.

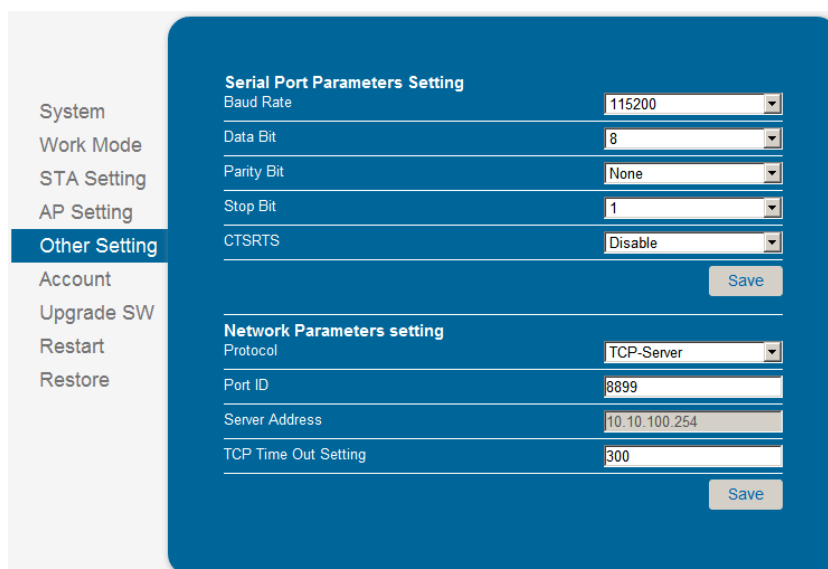


Figure 25. Other Setting Page

3.1.7. Account Management Page

This page set web server’s user name and password.

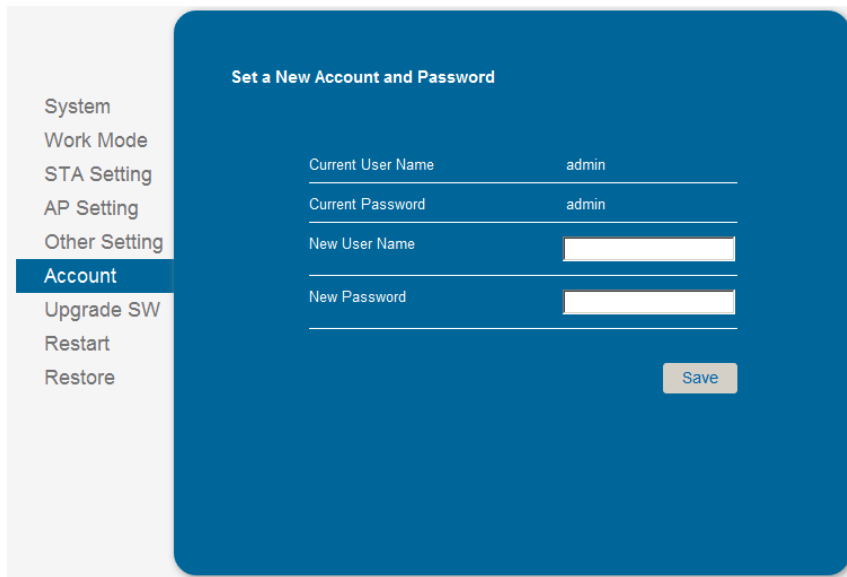


Figure 26. Account Page

3.1.8. Upgrade Software Page

User can upgrade new software (firmware) version through Wi-Fi. After upgrade success, need reboot it manually before new firmware valid.

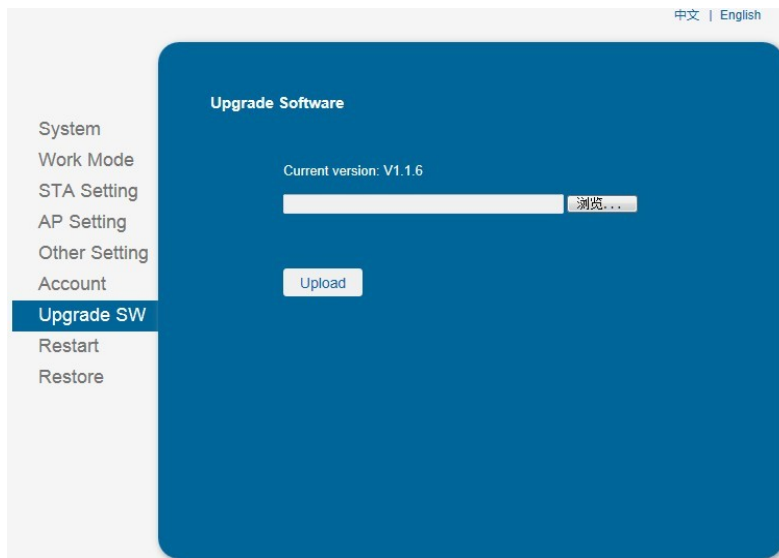


Figure 27. Upgrade SW page

3.1.9. Restart Page

Most of the setting and configuration can only effective after system restart. User shall restart after finish all setting.

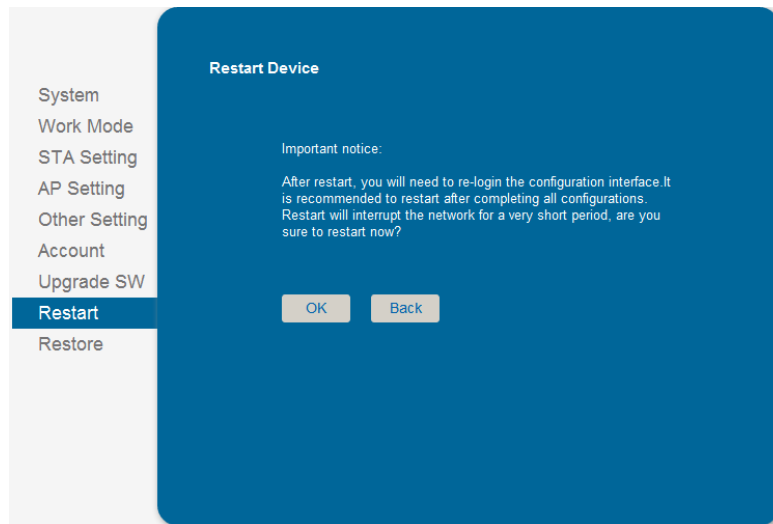


Figure 28. Restart Page

3.1.10. Restore Page

After module restore factory default setting, all user configuration profile will lose.

User can access <http://10.10.100.254> to set again, and user name and password is “admin”. HF-LPC300 will restore to AP mode for factory default setting.

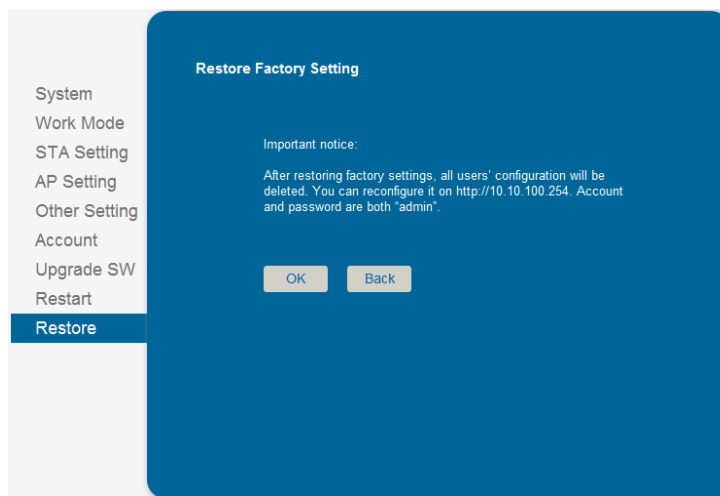


Figure 29. Restore Page

3.1.11. Internal Webpage

After wireless connection is OK. Open Wen browser and access “<http://10.10.100.254/iweb.html>”; It is for upgrading application and external webpage..

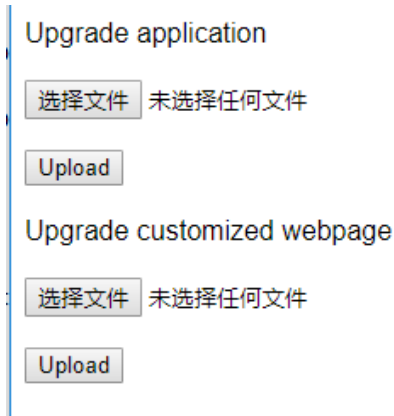




Figure 30. Internal Webpage

3.2. Usage Introduction

3.2.1. Software Debug Tools

High-Flying use two common software tools debugging and applying HF-LPC300 module. (User can also select other tools used to debug serial port).

- Serial Debugging Software: ComTools  **ComTools.exe**
- Ethernet Debugging Software: TCPUDPDbg  **TCPUDPDbg.exe**

3.2.2. Network Connection

User can select two methods to connect HF-LPC300 module base on dedicated application.

- **Use HF-LPC300 STA interface.** HF-LPC300 and debug PC2 connect to a wireless AP, another PC1 (or user device) connect to HF-LPC300 module with serial port:



Figure 31. STA Interface Debug Connection

- **Use HF-LPC300 AP interface.** Debug PC2 connect to HF-LPC300 through wireless connection, another PC1 (or user device) connect to HF-LPC300 module with serial port.



Figure 32. AP Interface Debug Connection

3.2.3. Default Parameter Setting

- Default SSID: HF-LPC300;

- Deault security mode: open,none;
- User UART parameter setting:115200,8,1,None;
- Default network parameter setting:TCP,Server,8899,10.10.100.254;
- Module IP address: dhcp,0.0.0.0,0.0.0.0,0.0.0.0;

3.2.4. Module Debug

PC1 open “CommTools” program, setting the same serial port parameters with HF-LPC300 module and open serial port connection.

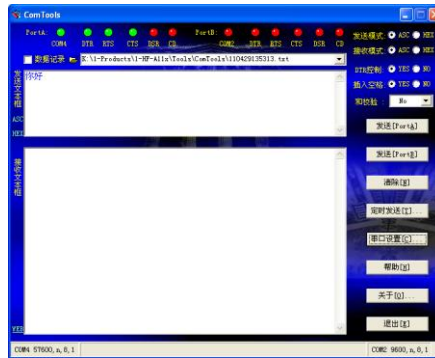


Figure 33. “CommTools” Serial Debug Tools

PC2 open “TCPUDPDbg” program, and create a new connection. If HF-LPC300 configured as Server mode, “TCPUDPDbg” Tools shall create “Client” mode connection. Or otherwise, create a “Server” mode connection.

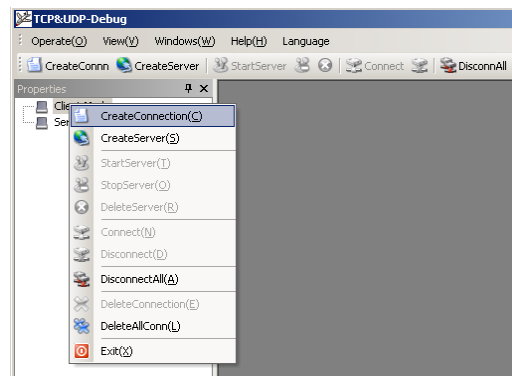


Figure 34. “TCPUDPDbg” Tools Create Connection

Then setting the TCP/UDP connection parameters. Default as following:

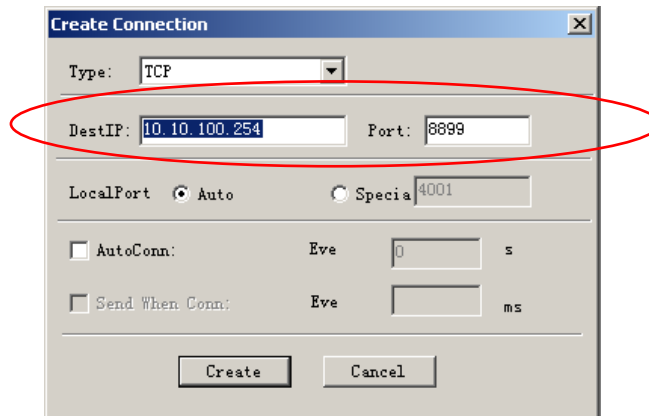


Figure 35. “TCPUDPDbg” Tools Setting

Then, click “Create” button to create a connection.

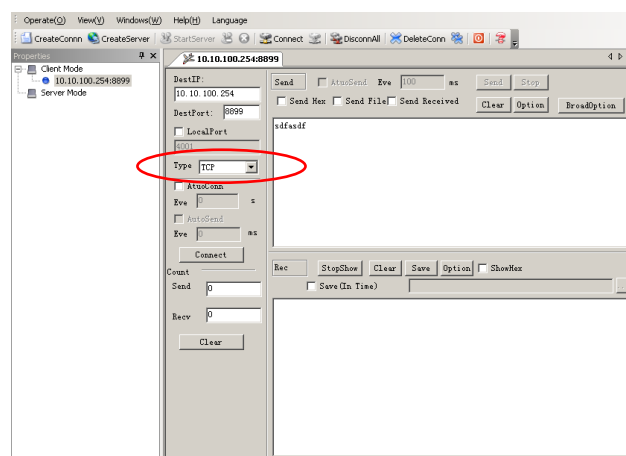


Figure 36. “TCPUDPDbg” Tools Connection

Now, in transparent transmission mode, data can be transferred from “CommTools” program to “TCPUDPDbg” program, or in reverse. You can see data in receiver side will keep same as in sender side.

3.3. Typical Application Examples

3.3.1. Wireless Control Application



Figure 37. Wireless Control Application

For this wireless control application, HF-LPC300 works as AP mode. Module’s serial port connects to user device. So, control agent (Smart phone for this example) can manage and control the user device through the wireless connection with HF-LPC300 module.

3.3.2. Remote Management Application

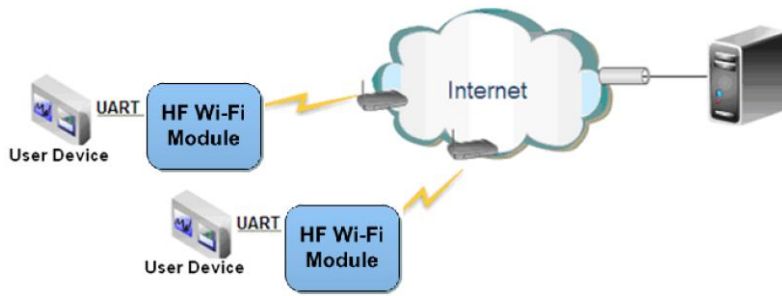


Figure 38. Remote Management Application

For this remote management application, HF-LPC300 works as STA mode and connects to Internet through wireless AP. Module configured as TCP Client and communicates with remote TCP server at Internet. Module's serial port connects to user device.

So, user device's data or sampling information can send to remote TCP server for storage or processing. Also remote TCP server can send command to control and manage the user device through the wireless network.

3.3.3. Transparent Serial Port Application

For this transparent serial port application, two HF-LPC300 modules connect as below figures to build up a transparent serial port connection. One HF-LPC300 works as AP mode, another HF-LPC300 works as STA mode. Make the STA device connects to AP.



Figure 39. Transparent Serial Port Application

4. AT+INSTRUCTION INTRODUCTION

4.1. Configuration Mode

When HF-LPC300 power up, it will default works as transparent transmission mode, then user can switch to configuration mode by serial port command. HF-LPC300 UART default parameters setting as below figure,

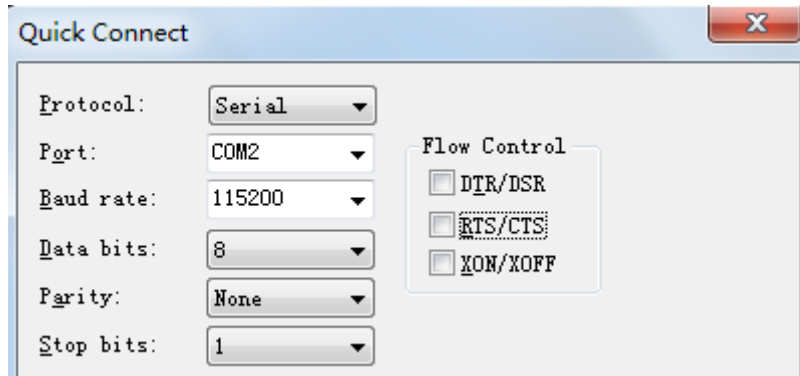


Figure 40. HF-LPC300 Default UART Port Parameters

In configuration mode, user can setting the module through AT+instruction set, which cover all web page setting function.

4.1.1. Switch to Configuration Mode

Two steps to finish switching from transparent transmission mode to configuration mode.

- **UART input “+++”, after module receive “+++”, and feedback “a” as confirmation.**
- **UART input “a”, after module receive “a” and feedback “+ok” to go into AT+instruction set configuration mode.**

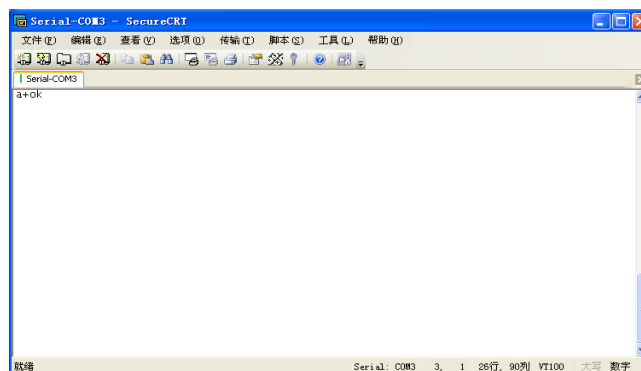
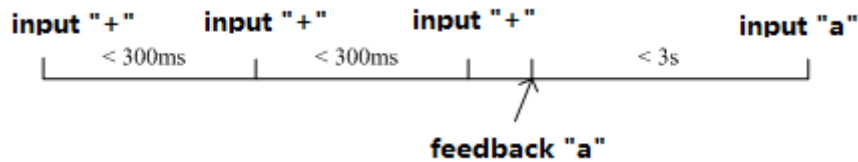


Figure 41. Switch to Configuration Mode

Notes:

1. When user input “+++” (No “Enter” key required), the UART port will display feedback information “a”, and not display input information “+++” as above UART display.

2. Any other input or wrong step to UART port will cause the module still works as original mode (transparent transmission).
3. “+++” and “a” should be input in a certain period of time to make the module switch to configuration mode. Like the following sequence.



4.1.2. Send AT Command in Transparent Transmission Mode

After set AT+CMDPW command value, the module support response AT command for special data format as “prefix”+”AT comman”+”\r”, it is very useful for query some status in transparent transmission mode. It saves the steps of changing to AT command mode.

The following example, we first set AT+CMDPW=HF, then send the following data in transparent mode, and get the AT command response. This data won't be sent to socket.

The screenshot shows a serial terminal application with two panes. The left pane, titled 'COM port data receive', shows the ASCII output: 'HFAT+WMODE=STA'. Below this, it is labeled 'in ASCII'. The right pane, also titled 'COM port data receive', shows the hex output: '2B 6F 6B' on the first line and '48 46 41 54 2B 57 4D 4F 44 45 3D 53 54 41 0D' on the second line. A red box highlights the '0D' character, with a note above it: 'Note this 0x0D command end data'. Below the hex output, it is labeled 'In HEX'. Both panes have 'COMSettings' and 'Close' buttons.

4.2. AT+Instruction Set Overview

User can input AT+Instruction through hyper terminal or other serial debug terminal, also can program the AT+Instruction to script. User can also input “AT+H” to list all AT+Instruction and description to start.

AT+H
+ok

```

AT+: NONE command, reply "+ok".
AT+ASWD: Set/Query WiFi configuration code.
AT+E: Echo ON/off, to turn on/off command line echo function.
AT+ENTM: Goto Through Mode.
AT+NETP: Set/Get the Net Protocol Parameters.
AT+UART: Set/Get the UART Parameters.
AT+UARTF: Enable/disable UART AutoFrame function.
AT+UARTFT: Set/Get time of UART AutoFrame.
AT+UARTFL: Set/Get frame length of UART AutoFrame.
AT+UARTTE: Set/Query UART free-frame triggerf time between two byte.
AT+PING: General PING command.
AT+WAP: Set/Get the AP parameters.
AT+WKEY: Set/Get the Security Parameters of WIFI AP Mode.
AT+WMODE: Set/Get the WIFI Operation Mode (AP or STA).
AT+WSKEY: Set/Get the Security Parameters of WIFI STA Mode.
AT+WSSID: Set/Get the AP's SSID of WIFI STA Mode.
AT+WSLK: Get Link Status of the Module (Only for STA Mode).
AT+WSQL: Get Link Quality of the Module (Only for STA Mode).
AT+WSCAN: Get The AP site Survey (only for STA Mode).
AT+WEBU: Set/Get the Login Parameters of WEB page.
AT+TCPK: Get The state of TCP link.
AT+TCPTO: Set/Get TCP time out.
AT+TCPDIS: Connect/Dis-connect the TCP client link
AT+RCV: Rcv data from UART
AT+SEND: Send data to UART
AT+WANN: Set/Get The WAN setting if in STA mode.
AT+LANN: Set/Get The LAN setting if in ADHOC mode.
AT+RELD: Reload the default setting and reboot.
AT+RLDEN: Put on/off the GPIO12.
AT+Z: Reset the Module.
AT+MID: Get The Module ID.
AT+VER: Get application version.
AT+H: Help.
  
```

Figure 42. "AT+H" Instruction for Help

4.2.1. Instruction Syntax Format

AT+Instruction protocol is based on the instruction of ASCII command style, the description of syntax format as follow.

- **Format Description**
 - < >: Means the parts must be included
 - []: Means the optional part

- **Command Message**

AT+<CMD>[op][para-1,para-2,para-3,para-4...]<CR>

- AT+: Prefix of command message;
- CMD: Command string;
- [op]: Symbol of command operator,
 - ◆ "=" : The command requires parameters input;
 - ◆ "NULL": Query the current command parameters setting;
- [para-n]: Parameters input for setting if required;
- <CR>:"Enter" Key, it's 0x0a or 0x0d in ASCII;

Notes: When input AT+Instruction, "AT+<CMD>" character will display capital letter automatic and other_parts will not change as you input.

- **Response Message**

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

- +: Prefix of response message;
- RSP: Response string;
 - ◆ “ok” : Success
 - ◆ “ERR”: Failure
- [op] : =
- [para-n]: Parameters if query command or Error code when error happened;
- <CR>: ASCII 0x0d;
- <LF>: ASCII 0x0a;

➤ Error Code

Table7. Error Code Description

Error Code	Description
-1	Invalid Command Format
-2	Invalid Command
-3	Invalid Operation Symbol
-4	Invalid Parameter
-5	Operation Not Permitted

4.2.2. AT+Instruction Set

Table8. AT+Instruction Set List

Instruction	Description
<null>	NULL
Management Instruction Set	
E	Open/Close show back function
WMODE	Set/Query Wi-Fi work mode (AP/STA)
ENTM	Set module into transparent transition mode
TMODE	Set/Query module data transfer mode
MID	Query module ID information
VER	Query module software version information
BVER	Query Bootloader version
RELD	Restore to factory default setting
FCLR	Erase factory setting
Z	Re-start module
H	Help
Configure Parameters Instruction Set	
CFGTF	Copy User Parameters to Factory Default Parameters
UART Instruction Set	
UART	Set/Query serial port parameters
Network Instruction Set	
PING	Network "Ping" Instruction
NETP	Set/Query SOCKA network protocol parameters
MAXSK	Set/Query SOCKA TCP Client connection number
TCPLK	Query if SOCKA TCP link already build-up
TCPTO	Set/Query SOCKA TCP timeout

Instruction	Description
TCPDIS	Open/Close SOCKA TCP link
SEND	Send Data at Command Mode
RECV	Receive Data at Command Mode
SOCKB	Set/Query SOCKB parameters
TCPDISB	Open/Close SOCKB TCP link
TCPTOB	Set/Query SOCKB TCP timeout
TCPLKB	Query if SOCKB TCP link already build-up
SNDB	Send data to SOCKB in Command Mode
RCVB	Receive data from SOCKB in Command Mode
Wi-Fi STA Instruction Set	
WSKEY	Set/Query STA security parameters
WSSID	Set/Query associated AP SSID parameters
WANN	Set/Query STA's network parameters
WSMAC	Set/Query module MAC address
WSLK	Query STA Wi-Fi link status
WSLQ	Query STA Wi-Fi signal strength
WSCAN	Scan AP
Wi-Fi AP Instruction Set	
LANN	Set/Query AP's network parameters
WAP	Set/Query AP Wi-Fi parameters
WAKEY	Set/Query AP security parameters
WADHCP	Set/Query AP DHCP Server status
WALK	Query MAC address of STA device connecting to module AP
WALKIND	Enable/Disable indication of connection status.
WAPMXSTA	Set/Query max STA devices supported for AP.
Remote Upgrade Instruction Set	
OTA	Upgrade Firmware
UPURL	Set/Query remote upgrade URL address
Webpage Set	
PLANG	Set/Query webpage language
WEBU	Set/Query webpage login account
Others Instruction Set	
WRMID	Set module ID
ASWD	Set/Query WiFi configuration code
SMTLK	Start SmartLink function
NDBG	Set UART debug information
SMEM	Query RAM malloc status
WIFI	Enable/Disable Wi-Fi
SMARTAPCONFIG	Config SmartAPLink function
SMARTAPSTART	Start SmartAPLink function
SMARTBTSTART	Start SmartBleLink function
BLE	Config/Query BLE UART throughput function
BLENAME	Config/Query BLE broadcast name
BLENTFUUID	Config/Query BLE server UUID

4.2.2.1. AT+E

- Function: Open/Close show back function;
- Format:
 - ◆ Set Operation

AT+E=<status><CR>

+ok<CR><LF><CR><LF>

- Parameters:
 - ◆ status: Echo status
 - ◇ on: Open echo
 - ◇ off: Close echo

When HF-LPC300 module firstly switch from transparent transmission to configuration mode, show back status is open, input “AT+E” to close show back function, input“AT+E” again to open show back function, use AT+E=on/off command to save the echo status..

4.2.2.2. AT+CMDPW

- Function: Set/Query AT command prefix character for sending AT command in throughput mode. Setting is valid after reset;
- Format:
 - ◆ Query Operation

AT+CMDPW<CR>

+ok=<data><CR><LF><CR><LF>

- ◆ Set Operation

AT+CMDPW=<data><CR>

+ok<CR><LF><CR><LF>

- Parameters:
 - ◆ mode: Default is blank for disable t 是 his function. The maximum is 20 chacter length, once has been set, the AT command in transparent transmission mode function is enabled (AT+H and AT+WSCAN are not supported). Do restore to factory operation to disable and clear the setting

When set this value to “HF”, then can get response of “+ok=STA”(Hex: 2B 6F 6B 3D 53 54 41) for send “HFAT+WMODE\r”(Hex: 48 46 41 54 2B 57 4D 4F 44 45 0D, AT command should end with 0D or 0A).

4.2.2.3. AT+WMODE

- Function: Set/Query Wi-Fi work mode. Setting is valid after reset;
- Format:
 - ◆ Query Operation

AT+WMODE<CR>

+ok=<mode><CR><LF><CR><LF>

- ◆ Set Operation

AT+WMODE=<mode><CR>

+ok<CR><LF><CR><LF>

- Parameters:
 - ◆ mode:Wi-Fi work mode
 - ◇ AP
 - ◇ STA
 - ◇ APSTA

4.2.2.4. AT+ENTM

- Function: Set module into transparent transmission mode;
- Format:

AT+ENTM<CR>

+ok<CR><LF><CR><LF>

When operate this command, module switch from configuration mode to transparent transmission mode.

4.2.2.5. AT+TMODE

- Function: Set/Query module data transfer mode. Setting is valid after reset.

- Format:

- ◆ Query Operation

AT+TMODE<CR>

+ok=<tmode><CR><LF><CR><LF>

- ◆ Set Operation

AT+TMODE=<tmode><CR>

+ok<CR><LF><CR><LF>

- Parameters:

- ◆ tmode: data transfer mode, include:
 - ✧ throughput: throughput mode
 - ✧ cmd: command mode

4.2.2.6. AT+MID

- Function: Query module ID information;

- Format:

- ◆ Query Operation

AT+MID<CR>

+ok=<module_id><CR><LF><CR><LF>

- Parameters:

- ◆ module_id: Module ID information;
 - ✧ HF-LPC300;

Notes: User can set this parameter through AT+WRMID.

4.2.2.7. AT+VER

- Function: Query module software version information;

- Format:

- ◆ Query Operation

AT+VER<CR>

+ok=<ver><CR><LF><CR><LF>

- Parameters:

- ◆ ver: Module software version information;

4.2.2.8. AT+BVER

- Function: Query Bootloader software version information;

- Format:
 - ◆ Query Operation
- ```
AT+BVER<CR>
+ok=<ver><CR><LF><CR><LF>
```
- Parameters:
    - ◆ ver: Ex:1M\_U06 V3.0.06, 0xC09F8

#### 4.2.2.9. AT+RELD

- Function: module restore to factory default setting;
- Format:
  - ◆ Set Operation

```
AT+RELD<CR>
+ok=rebooting...<CR><LF><CR><LF>
```

When operate this command, module will restore to factory default setting and reboot.

#### 4.2.2.10. AT+FCLR

- Function: Erase factory setting;
- Format:
  - ◆ Query Operation

```
AT+FCLR<CR>
+ok=<status><CR><LF><CR><LF>
```

#### 4.2.2.11. AT+Z

- Function: Re-start module;
- Format:

```
AT+Z<CR>
```

#### 4.2.2.12. AT+H

- Function: Help;
- Format:
  - ◆ Query Operation

```
AT+H<CR>
+ok=<command help><CR><LF><CR><LF>
```

- Parameters:
  - ◆ command help: command introduction;

#### 4.2.2.13. AT+CFGTF

- Function: Copy User Parameters to Factory Default Parameters;
- Format:
  - ◆ Query Operation

```
AT+CFGTF<CR>
+ok=<status><CR><LF><CR><LF>
```

- Parameters:
  - ◆ status: feedback operation status;

## 4.2.2.14. AT+UART

- Function: Set/Query serial port parameters. Setting is valid after reset.
- Format:

- ◆ Query Operation

**AT+UART[=uart\_num]<CR>**

**+ok=<baudrate,data\_bits,stop\_bit,parity,flowctrl><CR><LF><CR><LF>**

- ◆ Set Operation

**AT+UART=<baudrate,data\_bits,stop\_bit,parity,flowctrl>[,uart\_num]<CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - ◆ uart\_num:UART Channel, the default is UART0.
    - 0:UART0 Channel
  - ◆ baudrate:
    - ◇ 4800,9600,19200,38400,57600,115200,230400,380400,460800,921600
  - ◆ data\_bits:
    - ◇ 8
  - ◆ stop\_bits:
    - ◇ 1
  - ◆ parity:
    - ◇ NONE
    - ◇ EVEN
    - ◇ ODD
  - ◆ Flowctrl: (CTSRTS)
    - ◇ NFC: No hardware flow control
    - ◇ **FC: hardware flow control(Reserved)**

## 4.2.2.15. AT+PING

- Function: Network "PING" Instruction.
- Format:
  - ◆ Set Operation

**AT+PING=<ip[,count,size]><CR>**

**+ok=<sta><CR><LF><CR><LF>**

- Parameters:
  - ◆ ip: ip address or domain name.
  - ◆ count: Ping command execute count times. Default is 1.
  - ◆ size: Ping packet size. Default is 32 bytes.
  - ◆ sta: feedback result
    - ◇ Success
    - ◇ Timeout
    - ◇ Unknown host

## 4.2.2.16. AT+NETP

- Function: Set/Query SOCKA network protocol parameters. Setting is valid immediately.



- Format:
  - ◆ Query Operation
 

```
AT+NETP<CR>
```

```
+ok=<protocol,CS,port,IP><CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+NETP=<protocol,CS,port,IP><CR>
```

```
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ protocol:
    - ◇ TCP
    - ◇ UDP
  - ◆ CS: Network mode:
    - ◇ SERVER
    - ◇ CLIENT
  - ◆ Port: protocol port ID: Decimal digit and less than 65535
  - ◆ IP: Server's IP address when module set as client

If set as UDP SERVER, the module will save the IP address and port of the latest UDP packet received. The data will be sent to the saved IP address and port. If the module hasn't saved any IP address and port when power up. The data will be sent to the IP address and port which is set by this command.

If set as UDP,CLIENT, the data will always be sent to the IP address and port set by this command.

#### 4.2.2.17. AT+MAXSK

- Function:Set/ Query SOCKA TCP Client connection number.
- Format:
  - ◆ Query Operation
 

```
AT+MAXSK<CR>
```

```
+ok=<num><CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+MAXSK=<num><CR>
```

```
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ num: TCP Client connection number. Range: 1~5. 5 is the default value it means when the module work in TCP server , it accepts max 5 TCP client connect to it.

#### 4.2.2.18. AT+TCPLK

- Function: Query if SOCKA TCP link already build-up;
- Format:
 

```
AT+TCPLK<CR>
```

```
+ok=<sta><CR><LF><CR><LF>
```
- Parameters:
  - ◆ sta.: if module already setup TCP link;
  - ◇ on: TCP link setup;

✧ off: TCP link not setup;

#### 4.2.2.19. AT+TCPTO

■ Function: Set/Query SOCKA TCP timeout; Setting is valid after reset.

■ Format:

◆ Query Operation

**AT+TCPTO<CR>**

**+ok=<time><CR><LF><CR><LF>**

◆ Set Operation

**AT+TCPTO=<time ><CR>**

**+ok<CR><LF><CR><LF>**

■ Parameters:

◆ time: TCP timeout time.

✧ <= 600, (600s);

✧ >=0, (0 means no timeout);

✧ Default, 300s;

Module begin to count time when TCP channel don't receive any data, clecherar time counter when TCP channel receive any data. If the time counter reaches the TCPTO, the tcp channel will be break. If the module work in TCP Client, it will connect the TCP server instantly and when the module work in TCP Server, the TCP client device should make the connection itself.

#### 4.2.2.20. AT+TCPDIS

■ Function: Open/Close SOCKA TCP link;

■ Format:

◆ Query Opera

**AT+TCPDIS<CR>**

**+ok=<sta><CR><LF><CR><LF>**

◆ Set Operation

**AT+TCPDIS =<on/off><CR>**

**+ok<CR><LF><CR><LF>**

■ Parameters:

When query, sta.: Feedback if TCP Client can be link,

✧ On, TCP link close

✧ off, TCP link on

When setting, "off" means close TCP link. After finish this command, module disconnect TCP link and not connect again. "On" means open TCP link. After finish this command, module re-connect TCP server right away.

#### 4.2.2.21. AT+SEND

■ Function: Send Data to SOCKA at Command Mode.

■ Format:

**AT+SEND=<data\_lenth><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - ◆ data\_lenth: Lenth of send data. Range: 0~1000 Byte

The UART port will wait 3 seconds for input after this command is sent OK. The data received from UART port is sent to SOCKA. If the interval of two bytes is more than 10ms, the data will be sent instantly.

#### 4.2.2.22. AT+RECV

- Function: Receive Data from SOCKA at Command Mode.
- Format:
 

```
AT+RECV=<data_lenth><CR>
+ok=< data_lenth, data_content><CR><LF><CR><LF>
```
- Parameters:
  - ◆ data\_lenth: Lenth of receive data. Range: 0~1000 Byte
  - ◆ data\_content: contents of receive data.

If not receive any data in 3 second, then feedback +ok=0.

#### 4.2.2.23. AT+SOCKB

- Function: Set/Query SOCKB parameters. Setting is valid immediately.
- Format:
  - ◆ Query Operation
 

```
AT+SOCKB<CR>
+ok=<protocol,port,IP><CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+SOCKB=<protocol,port,IP><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ Protocol: Protocol type:
    - ◇ TCP: Only for TCP Client
    - ◇ UDP: UDP Client
    - ◇ UDPS: UDP Server
  - ◆ Port: Protocol Port in decimal, less than 65535
  - ◆ IP: Destination IP address, domain name is support

If set as UDP SERVER, the module will save the IP address and port of the latest UDP packet received. The data will be sent to the saved IP address and port. If the module hasn't saved any IP address and port when power up. The data will be sent to the IP address and port which is set by this command.

If set as UDP,CLIENT, the data will always be sent to the IP address and port set by this command.

#### 4.2.2.24. AT+TCPDISB

- Function: Open/Close SOCKB connection
- Format:
  - ◆ Query Operation
 

```
AT+TCPDISB<CR>
```

**+ok=<sta><CR><LF><CR><LF>**

- ◆ Set Operation

**AT+TCPDISB =<on/off><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

When setting, "off" means close TCP link. After finish this command, module disconnect TCP link and not connect again. "On" means open TCP link. After finish this command, module re-connect TCP server right away.

#### 4.2.2.25. AT+TCPTOB

- Function: Set/Query Operation SOCKB TCP timeout. Setting is valid after reset.

- Format:

- ◆ Query Operation

**AT+TCPTOB<CR>**

**+ok=<time><CR><LF><CR><LF>**

- ◆ Set Operation

**AT+TCPTOB=<time ><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters

- ◆ Time: TCP timeout

- ◇ ≤ 600:600s
- ◇ ≥ 0:0 means no timeout
- ◇ Default:300s

If the SOCKB TCP don't receive any data from TCP server for TCP tmeout setting, the module will break and reconnect the TCP server. If it receive data from server, the timeout counter will be clear.

#### 4.2.2.26. AT+TCPLKB

- Function:Query SOCKB connection status

- Format:

**AT+TCPLKB<CR>**

**+ok=<sta><CR><LF><CR><LF>**

- Parameters:

- ◆ sta.: SOCKB connection status

- ◇ on: TCP connected
- ◇ off: TCP disconnected

#### 4.2.2.27. AT+SNDB

- Function: Send datas to SOCKB at Command Mode

- Format:

**AT+SNDB=<data\_lenth ><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:

- ◆ data\_lenth: Lenth of send data. Range: 0~1000 Byte

The UART port will wait 3 seconds for input after this command is sent OK. The data received from UART port is sent to SOCKB. If the interval of two bytes is more than 10ms, the data will be sent instantly.

#### 4.2.2.28. AT+RCVB

- Function: Receive datas from SOCKB at Command Mode
- Format:
  - AT+RCVB=<data\_lenth><CR>**
  - +ok=< data\_lenth, data\_content><CR><LF><CR><LF>**
- Parameters:
  - ◆ data\_lenth: Lenth of receive data. Range: 0~1000 Byte
  - ◆ data\_content: contents of receive data.

If not receive any data in 3 second, then feedback +ok=0.

#### 4.2.2.29. AT+UDPLCPT

- Function: Set/Query UDP local port of Socket A and Socket B..
- Format:
  - ◆ Query Operation
    - AT+UDPLCPT<CR>**
    - +ok=<porta,portb><CR><LF><CR><LF>**
  - ◆ Set Operation
    - AT+UDPLCPT=<porta,portb><CR>**
    - +ok<CR><LF><CR><LF>**
- Parameters
  - ◆ porta: UDP local port of Socket A, 0: do not fix local UDP port.
  - ◆ portb: UDP local port of Socket B, 0: do not fix local UDP port.

#### 4.2.2.30. AT+WSSSID

- Function: Set/Query Wi-Fi associated AP SSID parameters. Setting is valid after reset.
- Format:
  - ◆ Query Operation
    - AT+WSSSID<CR>**
    - +ok=<ap's ssid><CR><LF><CR><LF>**
  - ◆ Set Operation
    - AT+WSSSID=<ap's ssid ><CR>**
    - +ok<CR><LF><CR><LF>**
- Parameters:
  - ◆ ap's ssid: AP's SSID (Within 32 character);

#### 4.2.2.31. AT+WSKEY

- Function: Set/Query STA security parameters. Setting is valid after reset.
- Format:
  - ◆ Query Operation
    - AT+WSKEY<CR>**
    - +ok=<auth,encry,key><CR><LF><CR><LF>**

◆ Set Operation

**AT+WSKEY=< auth,encry,key><CR>**

**+ok<CR><LF><CR><LF>**

■ Parameters:

◆ auth: Authentication mode

- ◇ OPEN
- ◇ SHARED
- ◇ WPAPSK
- ◇ WPA2PSK

◆ encry:Encryption algorithm

- ◇ NONE: When “auth=OPEN”, effective
- ◇ WEP-H: When “auth=OPEN” or “SHARED”, effective, in HEX format
- ◇ WEP-A: When “auth=OPEN” or “SHARED”, effective, in ASCII format
- ◇ TKIP: When “auth= WPAPSK” or “WPA2PSK”, effective
- ◇ AES: When “auth= WPAPSK” “WPA2PSK”, effective

◆ key: password. When encry is WEP-H, password is in HEX format, password length is 10 or 26. When encry is WEP-A, password is in ASCII format, password length is 5 or 13. When encry is TKIP or AES, password is in ASCII code, password length shall be 8~63.

#### 4.2.2.32. AT+WANN

■ Function: Set/Query STA network setting. Setting is valid after reset.

■ Format:

◆ Query Operation

**AT+WANN<CR>**

**+ok=<mode,address,mask,gateway><CR><LF><CR><LF>**

◆ Set Operation

**AT+WANN=< mode,address,mask,gateway ><CR>**

**+ok<CR><LF><CR><LF>**

■ Parameters:

◆ mode: STA's IP network setting

- ◇ static: Static IP
- ◇ DHCP: Dynamic IP

◆ address: STA IP address;

◆ mask: STA subnet mask;

◆ gateway: STA gateway address;

#### 4.2.2.33. AT+WSMAC

■ Function: Set/Query Module STA MAC address parameters. Setting is valid after reset.

■ Format:

◆ Query Operation

**AT+WSMAC<CR>**

**+ok=<mac\_address><CR><LF><CR><LF>**

◆ Set Operation

```
AT+WSMAC=<code,mac_address,key><CR>
```

```
+ok<CR><LF><CR><LF>
```

- Parameters:
  - ◆ code: security code
    - ◇ 8888 (default value)
  - ◆ Mac\_address: module MAC address, such as ACCF23FF1234
  - ◆ key: encryption key. It is not allowed to change, contact us if need to change MAC.

#### 4.2.2.34. AT+WSLK

- Function: Query STA WiFi link status
- Format:
  - ◆ Query Operation

```
AT+WSLK<CR>
```

```
+ok=<ret><CR><LF><CR><LF>
```

- Parameters:
  - ◆ ret
    - ◇ "Disconnected", if no WiFi connection;
    - ◇ "AP' SSID (AP's MAC" ) , if WiFi connection available;

#### 4.2.2.35. AT+WSLQ

- Function: Query STA WiFi signal strength;
- Format:
  - ◆ Query Operation

```
AT+WSLQ<CR>
```

```
+ok=<ret><CR><LF><CR><LF>
```

- Parameters:
  - ◆ ret
    - ◇ "Disconnected", if no WiFi connection;
    - ◇ "AP's WiFi signal strength" , if WiFi connection available;

#### 4.2.2.36. AT+WSCAN

- Function: Scan AP, max show 50 item;
- Format:

```
AT+WSCAN<CR>
```

```
+ok=<ap_site><CR><LF><CR><LF>
```

- Parameters:
  - ◆ ap\_site: AP searched.

```
AT+WSCAN
+ok=
Ch,SSID,BSSID,Security,Indicator
4,TP-LINK_686E,24:69:68:7F:68:6E,WPAPSKWPA2PSK/AES,100
7,Upd,7C:B5:40:4F:B2:CD,WPAPSKWPA2PSK/AES,100
5,UPGRADE-AP_aaaa,C8:3A:35:54:B3:70,WPA2PSK/AES,100
7,LBLINK,3C:33:00:A8:35:2C,WPAPSKWPA2PSK/AES,100
```

#### 4.2.2.37. AT+LANN

- Function: Set/Query AP's network parameters. Setting is valid after reset.

- Format:
  - ◆ Query Operation
 

```
AT+LANN<CR>
```

```
+ok=<ipaddress,mask><CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+LANN=< ipaddress,mask><CR>
```

```
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ ipaddress: AP's IP address;
  - ◆ mask: AP's net mask;

#### 4.2.2.38. AT+WAP

- Function: Set/Query AP Wi-Fi parameters. Support maximum 5 STA connection. Setting is valid after reset.
- Format:
  - ◆ Query Operation
 

```
AT+WAP<CR>
```

```
+ok=<wifi_mode,ssid,channel><CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+WAP =<wifi_mode,ssid,channel><CR>
```

```
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ wifi\_mode: Wi-Fi mode, include:
    - ◇ 11B
    - ◇ 11BG
    - ◇ 11BGN (Default Value)
  - ◆ ssid:SSID at AP mode, the maximum length is 32.
  - ◆ channel: Wi-Fi channel selection:
    - ◇ AUTO;(Default CH1)
    - ◇ CH1~CH11;

#### 4.2.2.39. AT+WKEY

- Function: Set/Query AP Wi-Fi security parameters. Setting is valid after reset.
- Format:
  - ◆ Query Operation
 

```
AT+WKEY<CR>
```

```
+ok=<auth,encry,key><CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+WKEY=< auth,encry,key><CR>
```

```
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ auth: include
    - ◇ OPEN
    - ◇ WPA2PSK



- ◆ Encry: include
  - ◇ NONE: When “auth=OPEN” available;
  - ◇ AES: When “auth=WPA2PSK” available;
- ◆ key: security code, ASCII code, 8~63 bytes.

#### 4.2.2.40. AT+WADHCP

- Function: Set/Query AP DHCP server status; Setting is valid after reset.
- Format:
  - ◆ Query Operation
 

```
AT+WADHCP<CR>
```

```
+ok=<status>,<ip1>,<ip2><CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+WADHCP=<status>[,<ip1>,<ip2>]<CR>
```

```
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ status:AP’s DHCP server function status:
    - ◇ on:DHCP Server Open;
    - ◇ off:DHCP Server Close:
  - ◆ ip1: DHCP allocate IP start value.
  - ◆ ip2: DHCP allocate IP end value.

#### 4.2.2.41. AT+WALK

- Function: Query MAC address of STA device connecting to module AP
- Format:
  - ◆ Query Operation
 

```
AT+WALK<CR>
```

```
+ok=<status> <CR><LF><CR><LF>
```
- Parameters:
  - ◆ status: MAC address of STA device connecting to module AP.
    - ◇ No Connection: No STA device connecting to module AP;

#### 4.2.2.42. AT+WALKIND

- Function: Enable/Disable indication of module AP connection status.
- Format:
  - ◆ Query Operation
 

```
AT+WALKIND<CR>
```

```
+ok=<status> <CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+WALKIND=<status><CR>
```

```
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ status: indication of module AP connection status.
    - ◇ on: Enable nLink indication function. When STA device connecting to module AP, nLink output Low, otherwise output High.

- ◇ off: Disable nLink indication function. **(default mode)**.

#### 4.2.2.43. AT+WAPMXSTA

- Function: Set/Query max STA number supported for AP.
- Format:
  - ◆ Query Operation
 

```
AT+WAPMXSTA<CR>
+ok=<num> <CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+WAPMXSTA=<num><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
  - ◆ num: max STA number supported for AP.
    - ◇ 1~5: Support max 1~5 STA devices connects to module AP. **5 is default value for max 5 STA device supported.**

#### 4.2.2.44. AT+OTA

- Function: Set OTA Upgrade
- Format:
  - ◆ Set Operation
 

```
AT+OTA<CR>
+ok=<CR><LF><CR><LF>
```

Note: See Appendix C Module Upgrade for detail

#### 4.2.2.45. AT+UPURL

- Function: Set/ Query remote upgrade URL address;
- Format:
  - ◆ Query Operation
 

```
AT+UPURL<CR>
+ok=<url><CR><LF><CR><LF>
```
  - ◆ Set Operation
 

```
AT+UPURL=<url,filename><CR>
+ok=<result><CR><LF><CR><LF>
```
- Parameters:
  - ◆ url: the upgrade file url address; the last charter shall be "/" (within 20 characters).
  - ◆ filename: the upgrade file name, it's optional and not saved parameter. If provide this file name here, the module will start upgrade right away;
  - ◆ result: the download operation result.
    - Download failed: Url is error or file is not valid.
    - Update success: Need reboot to run new the download new firmware.

#### 4.2.2.46. AT+DISPS

- Function: Set/Query power save parameters;
- Format:
  - ◆ Query Operation

**AT+DISPS<CR>****+ok=<ret><CR><LF><CR><LF>**

- ◆ Set Operation

**AT+DISPS=<mode[,time]><CR><LF><CR><LF>**

## ■ Parameters:

- ◆ ret:

- ◇ No: Enable power save
- ◇ Yes: Disable power save
- ◇ Auto: Auto power save mode(default), enter power saving mode after receive or send data in time seconds.

- ◆ mode:

- ◇ No: Enable power save
- ◇ Yes: Disable power save
- ◇ Auto: Auto power save mode(default), enter power saving mode after receive or send data in time seconds.

- ◆ time: Only valid in auto mode, >=2 integer value, default is 3 seconds. when value is 0, the default waiting time is still 3 seconds.

## 4.2.2.47. AT+PLANG

- Function: Set/Query webpage language option;

## ■ Format:

- ◆ Query Operation

**AT+PLANG<CR>****+ok=<language><CR><LF><CR><LF>**

- ◆ Set Operation

**AT+PLANG=<language> <CR>****+ok<CR><LF><CR><LF>**

## ■ Parameters:

- ◆ language: webpage's language
  - ◇ CN: Chinese Version (Default);
  - ◇ EN: English Version;

## 4.2.2.48. AT+WEBU

- Function: Set/ Query webpage user name and password; Setting is valid after reset.

## ■ Format:

- ◆ Query Operation

**AT+WEBU<CR>****+ok=<username,password> <CR><LF><CR><LF>**

- ◆ Set Operation

**AT+WEBU=<username,password><CR>****+ok<CR><LF><CR><LF>**

## ■ Parameters:

- ◆ username: User Name, within 15 characters, not support empty.
- ◆ password: password, within 15 characters, support empty.

## 4.2.2.49. AT+WRMID

- Function: Set module ID;
  - Format:
    - ◆ Set Operation
- AT+WRMID=<wrmid> <CR><LF><CR><LF>**
- Parameters:
    - ◆ wrmid: set module's ID (within 20 characters).

## 4.2.2.50. AT+ASWD

- Function: Set/Query WiFi Configuration Password;
  - Format:
    - ◆ Query Operation
- AT+ASWD<CR>**
- +ok=<aswd> <CR><LF><CR><LF>**
- ◆ Set Operation
- AT+ASWD=<aswd><CR><LF><CR><LF>**
- Parameters:
    - ◆ aswd: WiFi Configuration Password (within 20 characters).

## 4.2.2.51. AT+SMTLK

- Function: Start SmartLink function
- Format:
  - ◆ Query Operation

**AT+SMTLK<CR>**

SmartLink is a One-Key config function. Config the module connecting to router easily. After start SmartLink function, the module work in SmartLink status and nLink LED is fast flashing waiting for APP to push information. See the Appendix for more details.

## 4.2.2.52. AT+NDBGL

- Function: Enable/Disable UART debug information
  - Format:
    - ◆ Query Operation
- AT+NDBGL<CR>**
- +ok=<debug\_level,uart\_num> <CR><LF><CR><LF>**
- ◆ Set Operation
- AT+NDBGL=<debug\_level,uart\_num><CR>**
- +ok<CR><LF><CR><LF>**
- Parameters:
    - ◆ debug\_level: UART debug level value
      - ✧ 0: Disable debug information output
      - ✧ 1~XX: Output internal UART debug information which is same or higher then this set value
    - ◆ uart\_num: UART debug information output channel
      - ✧ 0: UART0

- ✧ 1: UART1, 921600bps, with more system information output.

#### 4.2.2.53. AT+SMEM

- Function: Query the RAM malloc status.
- Format:
  - ◆ Query Operation

**AT+SMEM<CR>**

**+ok=<status><CR><LF><CR><LF>**

- Parameters:
  - ◆ status: The RAM malloc status. Ex for 1MB:  
current\_size:47016, max\_size:41696, total\_size:89984, alloc\_cnt:42968, alloc\_fail\_cnt:0

#### 4.2.2.54. AT+WIFI

- Function: Enable/Disable Wi-Fi Command
- Format:
  - ◆ Query Operation

**AT+WIFI<CR>**

**+ok=<status> <CR><LF><CR><LF>**

- ◆ Set Operation

**AT+WIFI =<status><CR>**

**+ok<CR><LF><CR><LF>**

- Parameters:
  - ◆ status: Wi-Fi status.
    - ✧ UP(boot default status): Enable Wi-Fi Chip
    - ✧ DOWN: Disable Wi-Fi Chip, it will take several seconds(max 10) to disable the Wi-Fi, if response with +ERR=-5 means disable failed, usually it is already in disable status.

Note: Some Wi-Fi status change command(AT+WMODE and so on)need to reboot before valid. But may use this command only to reboot the Wi-Fi Chip to make the corresponding command valid.This is AT+WIFI=DOWN,AT+WSSSID to set router information and then AT+WIFI=UP.

#### 4.2.2.55. AT+SMARTAPCONFIG

- Function: Config SmartAPLink function
- Format:
  - ◆ Query Operation

**AT+SMARTAPCONFIG<CR>**

**+ok=<status,[ap\_prefix,ap\_key]><CR>< LF><CR>< LF>**

- ◆ Set Operation

**AT+SMARTAPCONFIG=<status,[ap\_prefix,ap\_key]><CR>**

**+ok<CR>< LF><CR>< LF>**

- Parameters:
  - ◆ status: Enable/Disable SmartAPLink function

- ✧ on: Enable SmartAPLink function, after enabled, use AT+SMARTAPSTART or nReload to start config.
- ✧ off: Disable SmartAPLink. Default.
- ◆ ap\_prefix: module AP SSID prefix, default is hiflying\_softap
- ◆ ap\_key: module AP password, blank for no password, password length 8~20.

#### 4.2.2.56. AT+SMARTAPSTART

- Function: Start SmartAPLink function, only valid if SmartAPLink is enabled.
- Format:
  - ◆ Query Operation

```
AT+SMARTAPSTART<CR>
+ok<CR>< LF><CR>< LF>
```

Note: Reset to quit this config mode.

#### 4.2.2.57. AT+SMARTBTSTART

- Function: Start SmartBleLink function.
- Format:
  - ◆ Query Operation

```
AT+SMARTBTSTART<CR>
+ok<CR>< LF><CR>< LF>
```

Note: Reset to quit this config mode.

#### 4.2.2.58. AT+BLE

- Function: Config/Query BLE UART throughput function
- Format:
  - ◆ Query Operation

```
AT+BLE<CR>
+ok=<status><CR>< LF><CR>< LF>
```

- ◆ Set Operation

```
AT+BLE=<status><CR>
+ok<CR>< LF><CR>< LF>
```

- Parameters:
  - ◆ status: Enable/Disable BLE UART throughput function
    - ✧ on: Enable, default.
    - ✧ off: Disable.

#### 4.2.2.59. AT+BLENAM

- Function: Config/Query BLE broadcast name
- Format:
  - ◆ Query Operation

```
AT+BLENAM<CR>
+ok=<name><CR>< LF><CR>< LF>
```

- ◆ Set Operation

```
AT+BLENAM=<name><CR>
+ok<CR>< LF><CR>< LF>
```

- Parameters:
  - ◆ name: BLE name, default is AZ, 12 characters max.

#### 4.2.2.60. AT+BLENTFUUIID

- Function: Config/Query BLE server UUID
- Format:
  - ◆ Query Operation

**AT+BLENTFUUIID<CR>**

**+ok=<serverUUID,read,write><CR>< LF><CR>< LF>**

- ◆ Set Operation

**AT+BLENTFUUIID=<serverUUID,read,write><CR>**

**+ok<CR>< LF><CR>< LF>**

- Parameters:
  - ◆ serverUUID: Server UUID, default is UUID-FEE7
  - ◆ read: read UUID, default is FEC8
  - ◆ write: write UUID, default is FEC7

## 5. PACKAGE INFORMATION

### 5.1. Recommended Reflow Profile

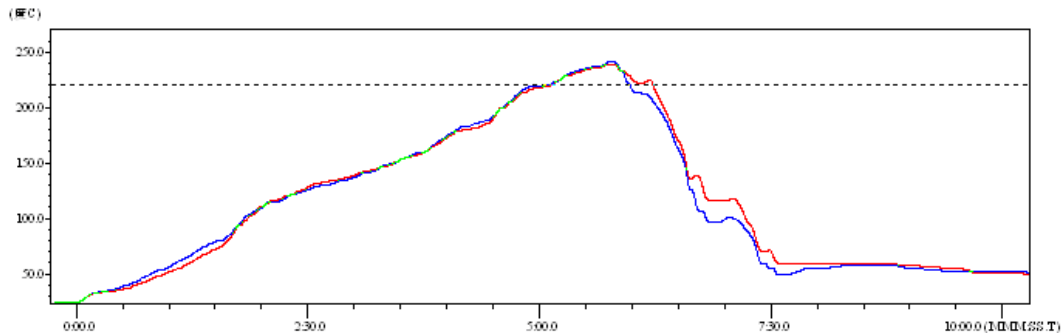


Figure 43. Reflow Soldering Profile

Table9. Reflow Soldering Parameter

| NO. | Item        | Temperature (Degree) | Time(Sec) |
|-----|-------------|----------------------|-----------|
| 1   | Reflow Time | Time of above 220    | 35~55 sec |
| 2   | Peak-Temp   | 260 max              |           |

- Note:** 1. Recommend to supply N2 for reflow oven.  
 2. N2 atmosphere during reflow (O2<300ppm)

### 5.2. Device Handling Instruction (Module IC SMT Preparation)

1. Shelf life in sealed bag: 12 months, at <30°C and <60% relative humidity (RH).
2. After bag is opened, devices that will be re-baked required after last baked with window time 168 hours.
3. Recommend to oven bake with N2 supplied
4. Recommend end to reflow oven with N2 supplied
5. Baked required with 24 hours at 125+/-5°C before rework process.
6. Recommend to store at ≤10% RH with vacuum packing
7. If SMT process needs twice reflow:
  - (1) Top side SMT and reflow
  - (2) Bottom side SMT and reflow

Case 1: Wifi module mounted on top side. Need to bake when bottom side process over 168 hours window time, no need to bake within 168 hours

Case 2: Wifi module mounted on bottom side, follow normal bake rule before process

**Note:** Window time means from last bake end to next reflow start that has 168 hours space.



# APPENDIX A: HW REFERENCE DESIGN

Refer to HF-LPX30 Series EVK.

## APPENDIX B: HTTP PROTOCOL TRANSFER

HF-LPC300 module support http data transfer in throughput mode. If any detailed HTTP protocol, contact us and we may support customization.

### B.1. Sending HTTP Raw Data in Throughput Mode

Step 1、Configure HTTP server information

```
AT+NETP=tcp,client,80,testnewjava.gotoip4.com
+ok
```

Step 2、Configure module connecting to router AP and reboot.

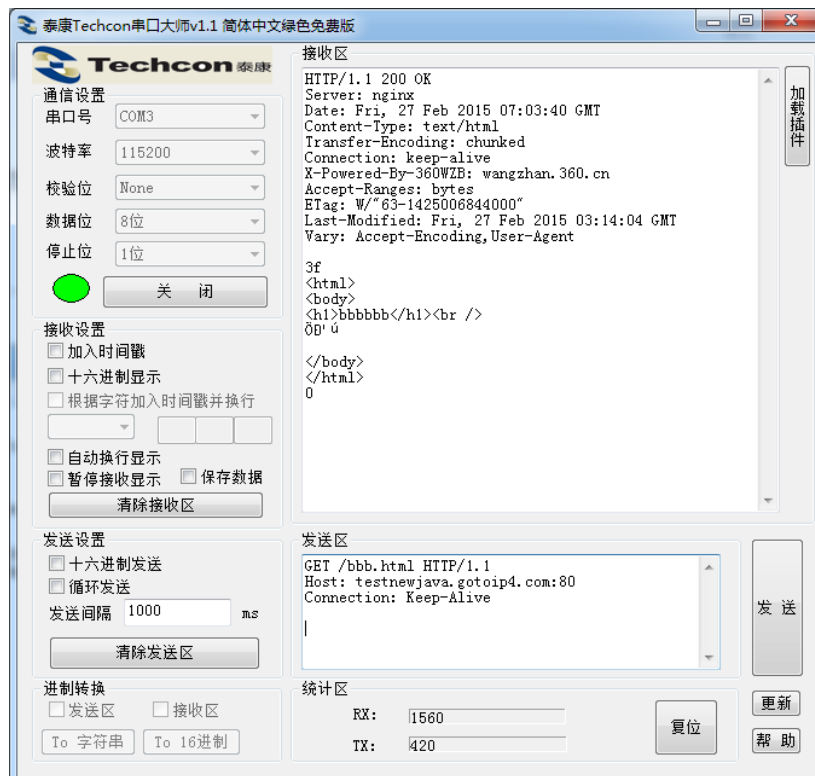
```
AT+WSSSID=Tenda_GYH
+ok

AT+WSKEY=wpa2psk,aes,12345678
+ok

AT+WMODE=sta
+ok

AT+Z
```

Step 3、Sending HTTP raw data via UART, end the data with<CR><LF><CR><LF>



## APPENDIX C:REFERENCES

### C.1. High-Flying Mass Production Tool

Download Address: <http://www.hi-flying.com/download-center-1/applications-1/download-item-production-tool>

### C.2. SmartLink V8

Download Address: <http://www.hi-flying.com/download-center-1/applications-1/download-item-smartlink-v8>

### C.3. SmartAPLink

Download Address: <http://www.hi-flying.com/download-center-1/applications-1/download-item-smartaplink>

### C.4. SmartBleLink

Download Address: <http://www.hi-flying.com/download-center-1/applications-1/download-item-smartblelink>

### C.5. Firmware

Download Address: [http://www.hi-flying.com/index.php?route=download/category&path=1\\_3](http://www.hi-flying.com/index.php?route=download/category&path=1_3)

### C.6. SDK

Download Address: [http://www.hi-flying.com/index.php?route=download/category&path=1\\_2](http://www.hi-flying.com/index.php?route=download/category&path=1_2)

## APPENDIX D: CONTACT INFORMATION

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**Web:** [www.hi-flying.com](http://www.hi-flying.com)

**Service Online:** [400-189-3108/18616078755](tel:400-189-3108/18616078755)

**Sales Contact:** [sales@hi-flying.com](mailto:sales@hi-flying.com)

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For more information about High-Flying modules, applications, and solutions, please visit our web site <http://www.hi-flying.com/en/>

**<END OF DOCUMENT>**

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