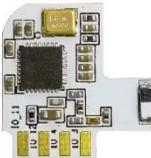


HF-LPX70 Series

Low Power Wi-Fi + BLE Module

User Manual V2.3

HF-LPX70 series include the following modules:

	
HF-LPT270 SMT18: 22.5 x 13.5 x 3.5mm	HF-LPT170 DIP10: 22 x 15.6 x 8mm
	
HF-LPT271 SMT16: 24 x 16 x 3mm	HF-LPT272 Finger8: 16.7 x 15 x 2.2mm
	
HF-LPB170 SMT34: 23.1 x 32.8 x 3.5mm	HF-LPB175 XH2.54-4P: 41.3 x 24.1 x 6mm
	
HF-LPT570 SMT14: 30mm x 17.7mm x 3.6mm	

Overview of Characteristic

- ❖ **Support Wi-Fi IEEE802.11b/g/n and BLE5.0 Wireless Standards**
- ❖ **Based on RISC SOC, 160MHz CPU, 276KB RAM, 2MB Flash**
- ❖ **Support UART Data Communication with Wi-Fi or BLE**
- ❖ **Support Wi-Fi STA/AP Mode**
- ❖ **Support BLE SmartBLELink Config**
- ❖ **Support Wi-Fi AP SmartAPLink and Sniffer SmartLink V8 Config**
- ❖ **Support Wireless and Remote Firmware Upgrade Function**
- ❖ **Support Software SDK for Develop**
- ❖ **Support Different Antenna Option**
 - HF-LPT270: Internal PCB or External 1st IPEX or Antenna Pad Out
 - HF-LPT170: Internal PCB or External 1st IPEX
 - HF-LPT271: Internal PCB
 - HF-LPT272: Internal Chip Antenna
 - HF-LPB170: Internal PCB or External 1st IPEX
 - HF-LPB175: Internal PCB or External 1st IPEX
 - HF-LPT570: Internal PCB or External 1st IPEX
- ❖ **Single +3.3V Power Supply for HF-LPT270, HF-LPT170, HF-LPT271, HF-LPB170, HF-LPT272, HF-LPT570**
- ❖ **Single +5V Power Supply for HF-LPB175**
- ❖ **Size:**
 - HF-LPT270: 22.5±0.2mm x 13.5±0.2mm x 3.5±0.2mm, SMT18 package
 - HF-LPT170: 22±0.3mm x 15.6±0.3mm x 8±0.5mm, DIP10 package
 - HF-LPT271: 24mm x 16mm x 3mm, SMT16 package
 - HF-LPT272: 16.7mm x 15mm x 2.2mm, Golden Finger 8 package
 - HF-LPB170: 23.1±0.3mm x 32.8±0.3mm x 3.5±0.2mm, SMT34 package
 - HF-LPB175: 41.3±0.3mm x 24.1±0.3mm x 6±0.5mm, 4Pin 2.54mm connecter

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HISTORY

- Ed. V1.0** 06-09-2020 First Version.
- Ed. V1.1** 06-10-2020 Update some error description
- Ed. V1.2** 07-16-2020 Update 1MB and 2MB software difference.
- Ed. V1.3** 08-24-2020 Add HF-LPT170, HF-LPB170, HF-LPB175 type.
- Ed. V1.4** 09-16-2020 Delete 1MB version, and Add HF-LPT271 type.
- Ed. V1.5** 10-27-2020 Update HF-LPB170 PIN definition, add HF-LPT170 external Antenna, add support for WPA3 encryption. Update AT+BLENANE
- Ed. V1.6** 11-24-2020 Update GPIO description, add AT+FLASH, AT+UARTBUF, AT+UARTTM, AT+WSKEY, AT+NETPIDEN command, update order information.
- Ed. V1.7** 12-28-2020 Update HF-LPT271 hardware description, add HF-LPT272 type.
- Ed. V1.8** 02-20-2021 Update HF-LPB175 power supply range, HF-LPT272 size.
- Ed. V1.9** 08-27-2021 Update HF-LPT272 Pin definition
- Ed. V2.0** 09-17-2021 Update HF-LPT272 height, add HF-LPT270-PAD information
- Ed. V2.1** 10-08-2021 Add HF-LPT570 type
- Ed. V2.2** 11-29-2021 Add flow control support, Update HF-LPT170 size.
- Ed. V2.2** 12-23-2021 Update HF-LPT270-1 appearance.
- Ed. V2.3** 03-31-2022 Update V3.0.13 version software function, update AT+WAP, AT+NETP, AT+RECV, AT+RCVB, AT+SOCKB, AT+DISPS, AT+BLEADV, AT+WSCAN, add AT+WPS function.

1. PRODUCT OVERVIEW

1.1. General Description

The HF-LPX70 series module is a fully self-contained small form-factor, single stream, 802.11b/g/n Wi-Fi + BLE module, which provide a wireless interface to any equipment with a Serial interface for data transfer. This module 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-LPX70 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.

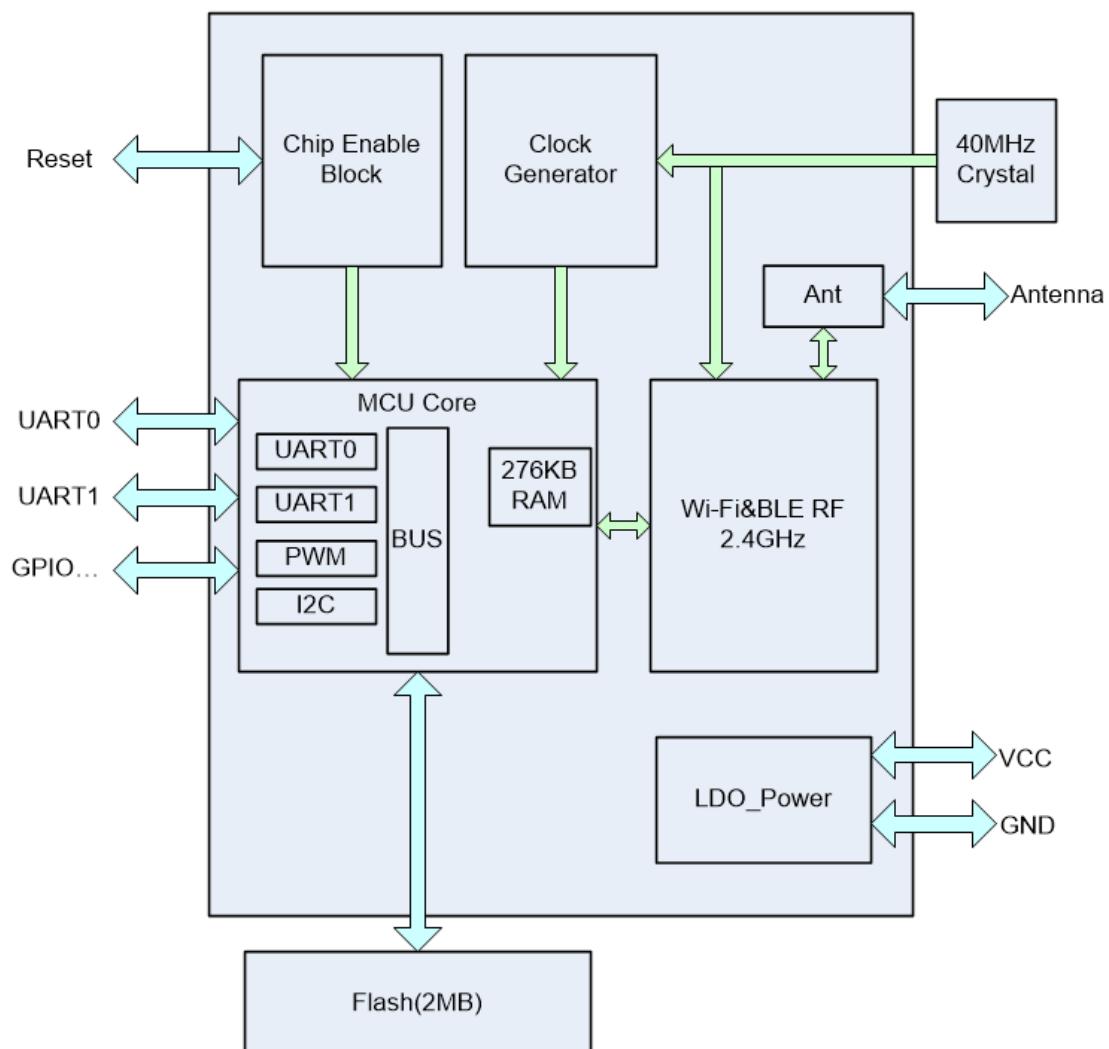


Figure 1. Block Diagram

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-LPX70 Series Module Technical Specifications

Class	Item	Parameters
Wi-Fi Parameters	Wireless standard	802.11 b/g/n
	Frequency range	2.412GHz-2.472GHz
	Transmit Power	802.11b: +17dBm ± 1.5dBm (@11Mbps)
		802.11g: +15dBm ± 1.5dBm (@54Mbps)
		802.11n: +14dBm ± 1.5dBm (@HT20, MCS7)
	Receiver Sensitivity	802.11b: -96dBm (@1Mbps)
		802.11b: -89dBm (@11Mbps)
		802.11g: -91dBm (@6Mbps)
		802.11g: -76dBm (@54Mbps)
		802.11n: -91dBm (@MCS0)
		802.11n: -73dBm (@MCS7)
BLE Parameters	Wireless standard	BLE5.0
	Frequency range	2.402GHz-2.480GHz
	Transmit Power	Max 15dBm
	Receiver Sensitivity	-97dBm
Hardware Parameters	Antenna Option	HF-LPT270: Internal: PCB antenna External: 1 st IPEX antenna or PAD out
		HF-LPT170: Internal: PCB antenna External: 1 st IPEX antenna
		HF-LPT271: Internal: PCB antenna
		HF-LPT272: Internal: chip antenna
		HF-LPB170: Internal: PCB antenna External: 1 st IPEX antenna
		HF-LPB175: Internal: PCB antenna External: 1 st IPEX antenna
		HF-LPT570: Internal: PCB antenna External: 1 st IPEX antenna
Data Interface	UART	
	GPIO, SPI, PWM, ADC, I2C, DAC	

	GPIO Driver Ability	Source and Sink Current: 3mA (GND+0.3V or VCC-0.3V)
	Operating Voltage	2.7~3.6V: HF-LPT270, HF-LPB170, HF-LPT170, HF-LPT271, HF-LPT272, HF-LPT570 4.7~6V: LPB175
	Operating Current	Peak (1ms for every 100ms): <350mA Average (STA, No data): 40mA Average (STA, Continuous TX): 60mA Average (AP): 70mA Standby: 310uA (Reset Pin set to low)
	Operating Temp.	-40°C- 85°C: HF-LPT270, HF-LPB170, HF-LPT170, HF-LPB175, HF-LPT570 -40°C- 105°C: HF-LPT271, HF-LPT272
	Storage Temp.	-40°C- 125°C
	Humidity	<85%
	MSL	Level 3
	Dimensions and Size	HF-LPT270: 22.5±0.2mm x 13.5±0.2mm x 3.5±0.2mm HF-LPT170: 22±0.3mm x 15.6±0.3mm x 8±0.5mm HF-LPT271: 24±0.4mm x 16±0.4mm x 3±0.2mm HF-LPT272: 16.7mm x 15mm x 2.2mm HF-LPB170: 23.1±0.3mm x 32.8±0.3mm x 3.5±0.2mm HF-LPB175: 41.3±0.3mm x 24.1±0.3mm x 6±0.5mm HF-LPT570: 41.3±0.3mm x 24.1±0.3mm x 6±0.5mm
Software Parameters	Network Type	STA/AP
	Security Mechanisms	WEP/WPA-PSK/WPA2-PSK/WPA3-SAE
	Encryption	WEP64/WEP128/TKIP/AES
	Update Firmware	Local Wireless, Remote OTA
	Customization	Support SDK for application develop
	Network Protocol	IPv4, TCP/UDP/HTTP/TLS 1.2
	User Configuration	AT+instruction set. SmartBLELink BLE Config SmartAPLink AP Config SmartLink Config

1.2. Hardware Introduction

HF-LPX70 series Wi-Fi module appearance is as following.

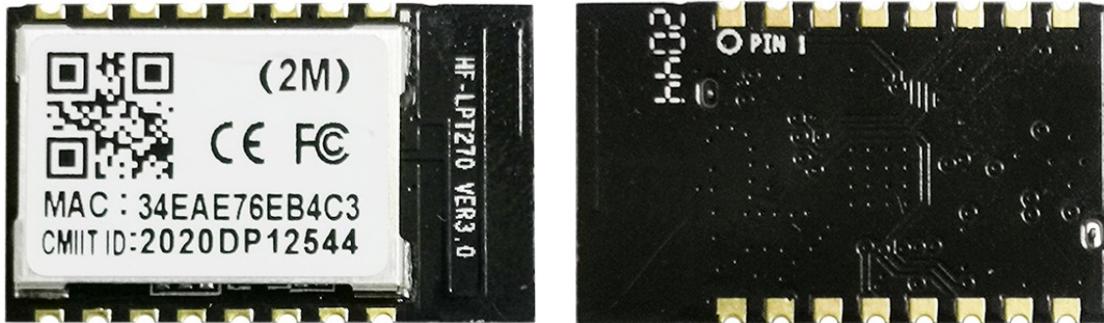


Figure 2. HF-LPT270-1 Appearance

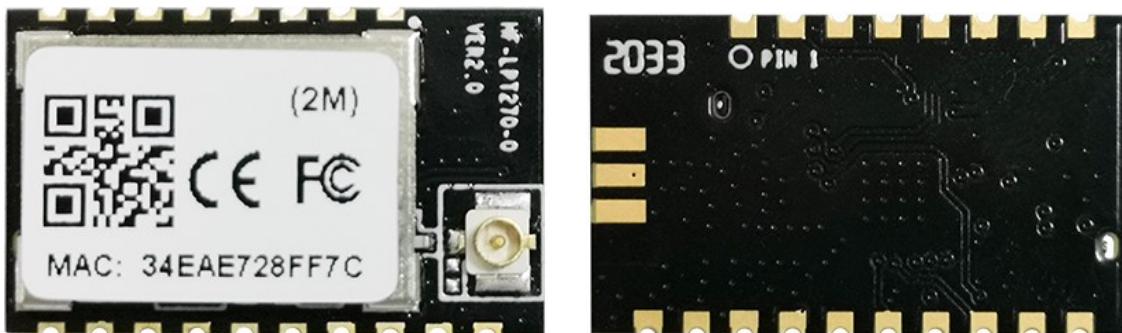


Figure 3. HF-LPT270-0 Appearance

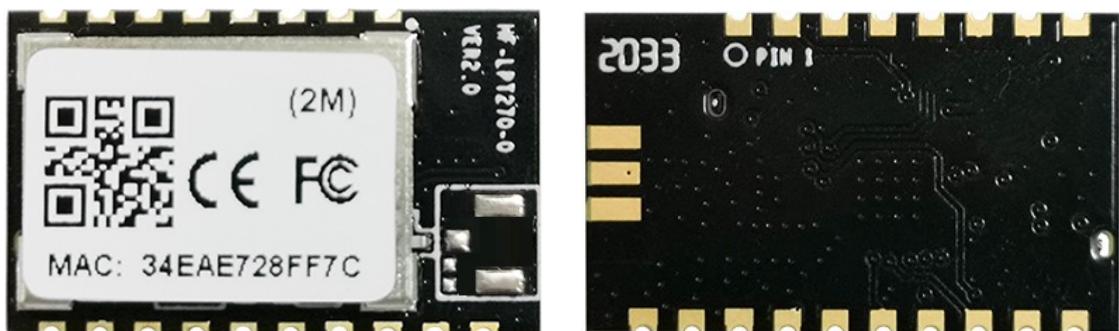


Figure 4. HF-LPT270-2 Appearance

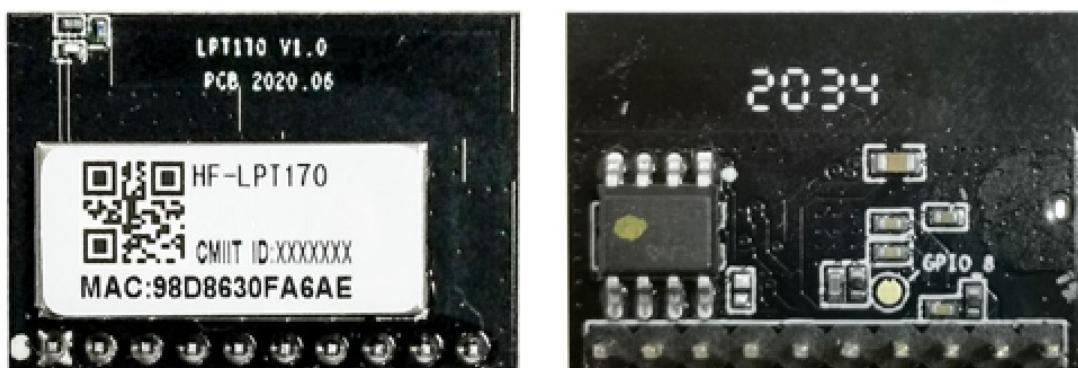


Figure 5. HF-LPT170-10 Appearance

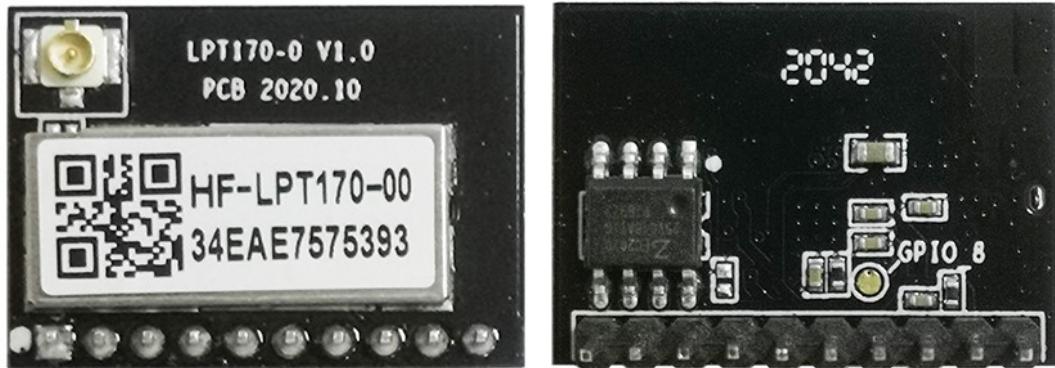


Figure 6. HF-LPT170-00 Appearance

HF-LP271 exist two version V2 and V3, V2 will be suspended sooner.



Figure 7. HF-LPT271 V3 Appearance

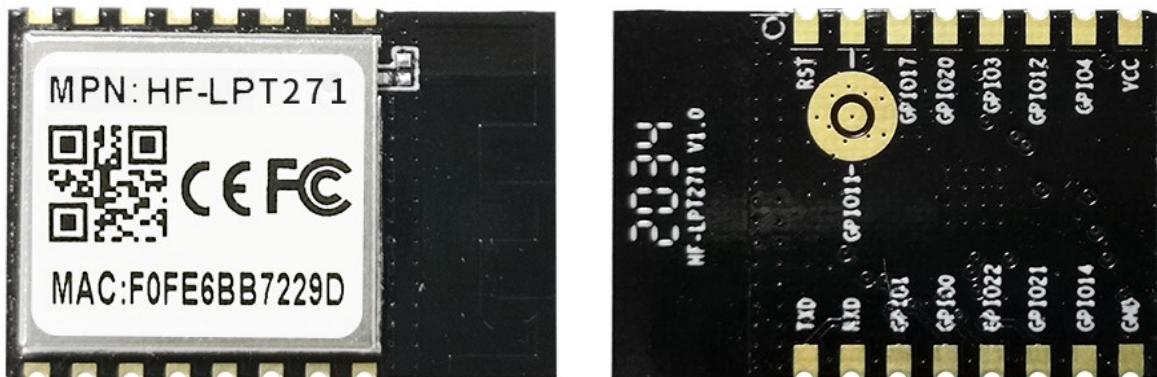


Figure 8. HF-LPT271 V2 Appearance

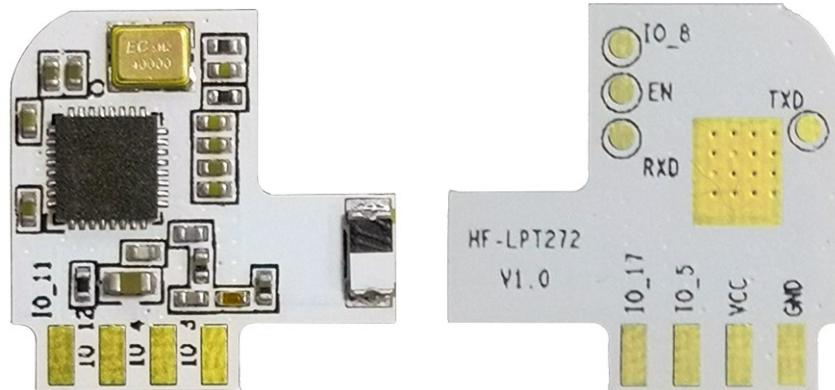


Figure 9. HF-LPT272 Appearance



Figure 10. HF-LPB170 Appearance

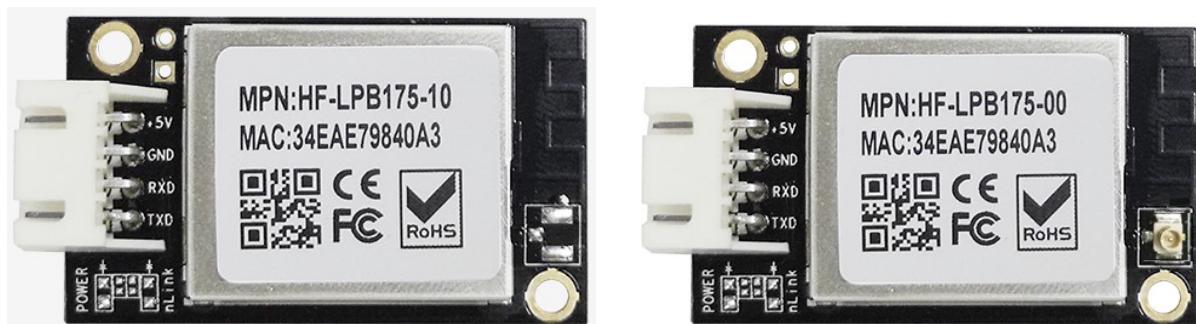


Figure 11. HF-LPB175 Appearance

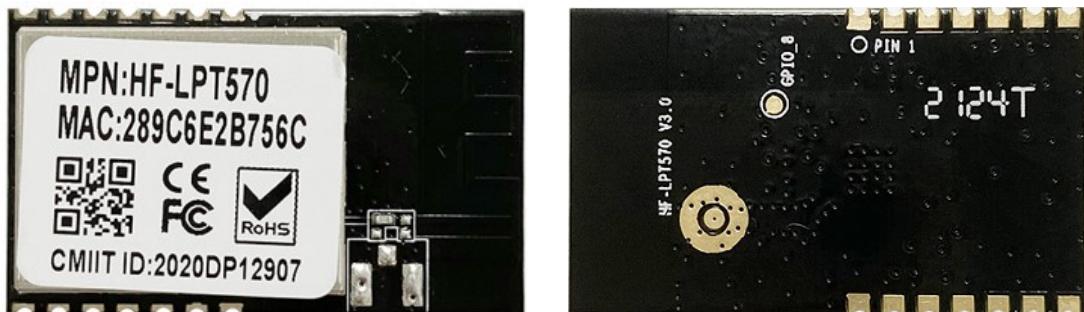


Figure 12. HF-LPT570 Appearance

1.2.1. HF-LPT270 Pins Definition

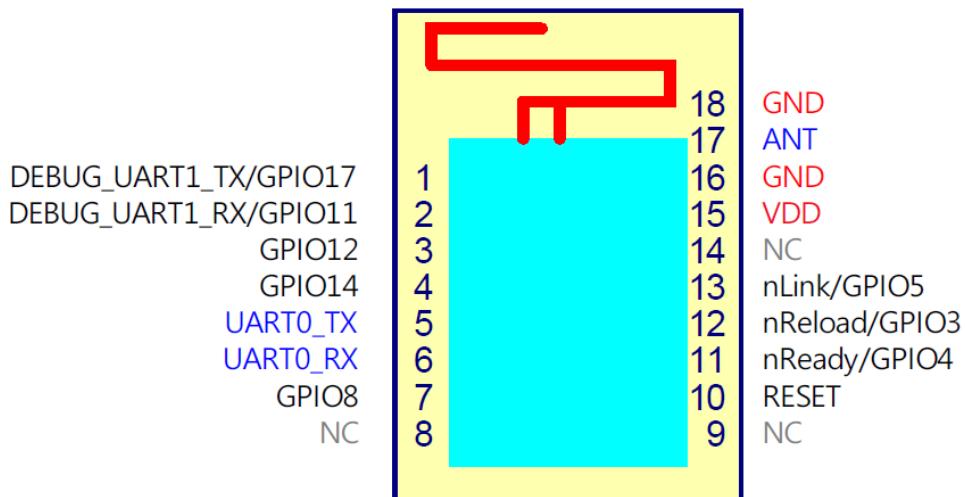


Figure 13. HF-LPT270 Pins Map

Table2. HF-LPT270 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	UART1_TX	DEBUG_UART1_TX	O	3.3V TTL UART1 Debug Output GPIO17, SPI function
2	UART1_RX	DEBUG_UART1_RX	I	3.3V TTL UART1 Debug Input GPIO11, SPI, PWM1 function
3	UART0_RTS	GPIO12	O	used as RTS when enable flow control GPIO12, SPI, PWM2, ADC function
4	UART0_CTS	GPIO14	I	used as CTS when enable flow control GPIO14, SPI, DAC, ADC function
5	UART0	UART0_TX	O	3.3V TTL UART0 Communication Output GPIO16
6	UART0	UART0_RX	I	3.3V TTL UART0 Communication Input GPIO7
7	GPIO8	GPIO8	IPD	Internal 10K pull-down resistor, Boot select: Low: boot from module flash. High: boot from external UART. This is used for HF factory firmware program, leave it unconnected for user application
8		NC		
9		NC		
10	Module Reset	RESET	I,PU	“Low” effective reset input. There is RC reset circuit internally. No need of external RC reset circuit.
11	Module Boot Up Indicator	nReady	O	“0” – Boot-up OK; “1” – Boot-up Fail; GPIO4, PWM4
12	Multi-Function	nReload	I,PU	Detailed functions see <Notes> GPIO3, PWM3

Pin	Description	Net Name	Signal Type	Comments
13	Wi-Fi Status	nLink	O	"0" – Wi-Fi connect to router "1" – Wi-Fi unconnected; Detailed functions see <Notes> GPIO5, PWM5
14		NC		
15	+3.3V Power	VDD	Power	
16	Ground	GND	Power	
17		ANT	Signal	Only -0 and -2 have these two pins
18	Ground	GND	Power	Antenna Pad Out. See following for detailed.

- -0 use external IPEX antenna, PIN17 is useless.
- -2 use PIN17 antenna PAD out
- -PAD use the back for antenna, see as following picture.

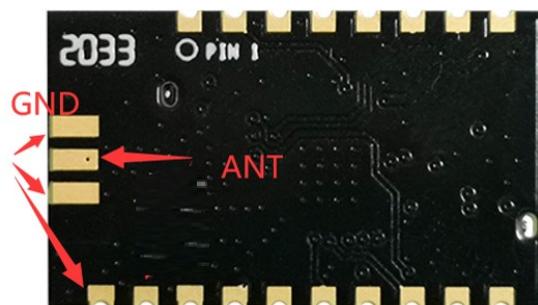
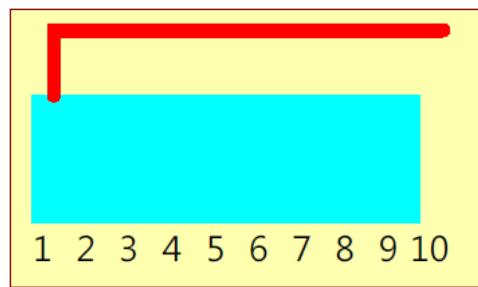


Figure 14. HF-LPT270-PAD Antenna Out

1.2.2. HF-LPT170 Pins Definition



GND	VDD	nReload/GPIO3	Reset	UART0_RX	UART0_TX	DEBUG_UART1_RX/GPIO17	DEBUG_UART1_TX/GPIO11	nReady/GPIO4	nLink/GPIO5
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Figure 15. HF-LPT170 Pins Map

Table3. HF-LPT170 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	Ground	GND	Power	
2	+3.3V Power	VDD	Power	
3	Multi-Function	nReload	I,PU	Detailed functions see <Notes> GPIO3, PWM3
4	Module Reset	RESET	I,PU	"Low" effective reset input. There is RC reset circuit internally. No need of external RC reset circuit.
5	UART0	UART0_RX	I	3.3V TTL UART0 Communication Input GPIO7
6	UART0	UART0_TX	O,PU	3.3V TTL UART0 Communication Output GPIO16
7	UART1_TX	DEBUG_UART1_TX	O	3.3V TTL UART1 Debug Output GPIO17
8	UART1_RX	DEBUG_UART1_RX	I	3.3V TTL UART1 Debug Input GPIO11
9	Module Boot Up Indicator	nReady	O	"0" – Boot-up OK; "1" – Boot-up Fail; GPIO4, PWM2
10	Wi-Fi Status	nLink	O	"0" – Wi-Fi connect to router "1" – Wi-Fi unconnected; GPIO5, Detailed functions see <Notes>

1.2.3. HF-LPT271 Pins Definition

HF-LP271 exist two version V2 and V3, V2 version will be suspended sooner.

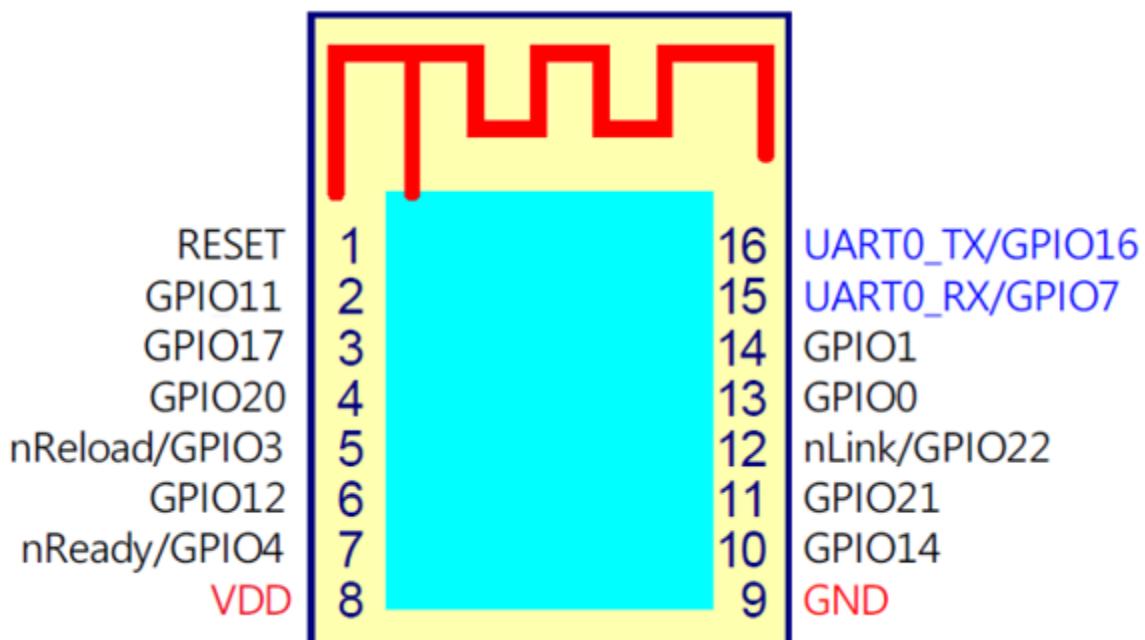


Figure 16. HF-LPT271 V3 Pins Map

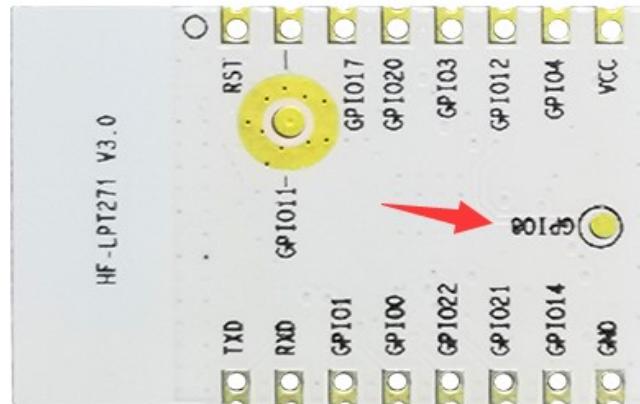
Table4. HF-LPT271 V3 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	Module Reset	RESET	I,PU	“Low” effective reset input. There is RC reset circuit internally. No need of external RC reset circuit.
2	GPIO11	GPIO11	I/O	GPIO11
3	GPIO8	GPIO8	I/O	Boot Select, default low, leave it unconnected. Low: boot from flash. High: boot from UART.
4	GPIO20	GPIO20	I/O	GPIO20
5	Multi-Function	nReload	I,PU	Detailed functions see <Notes> GPIO3, PWM3
6	UART0_RTS	GPIO12	O	used as RTS when enable flow control GPIO12, SPI, PWM2, ADC function
7	Module Boot Up Indicator	nReady	O	“0” – Boot-up OK; “1” – Boot-up Fail; GPIO4, PWM2
8	+3.3V Power	VDD	Power	
9	Ground	GND	Power	
10	UART0_CTS	GPIO14	I	used as CTS when enable flow control GPIO14, SPI, DAC, ADC function
11	GPIO21	GPIO21	I/O	GPIO21
12	Wi-Fi Status	nLink	O	“0” – Wi-Fi connect to router “1” – Wi-Fi unconnected; Detailed functions see <Notes> GPIO22
13	GPIO0	GPIO0	I/O	GPIO0
14	GPIO1	GPIO1	I/O	GPIO1
15	UART0	UART0_RX	I	3.3V TTL UART0 Communication Input GPIO7
16	UART0	UART0_TX	O,PU	3.3V TTL UART0 Communication Output GPIO16

HF-LP271 V2 version PIN3 is different from V3, it is GPIO8 as following.

Pin	Description	Net Name	Signal Type	Comments
3	GPIO8	GPIO8	IPD	Internal 10K pull-down resistor, Boot select: Low: boot from module flash. High: boot from external UART. This is used for HF factory firmware program, leave it unconnected for user application

HF-LP271 V3 version GPIO8 program Pin is at module back.



1.2.4. HF-LPT272 Pins Definition

This module is mainly for LED market, it support 5 channel PWM output, connect to MOS or transistor to control LED. Firmware need customized. Contact us to get more information.

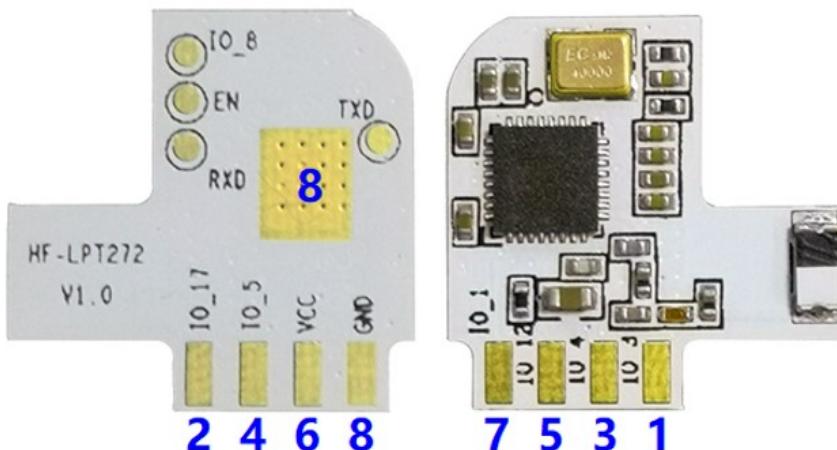


Figure 17. HF-LPT272 Pins Map

Table5. HF-LPT272 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	nReload	IO_3	I,PU	Detailed functions see <Notes> GPIO3, PWM3
2	DEBUG_UART1_TX	IO_17	O	3.3V TTL UART1 Debug Output GPIO17, SPI, PWM. function
3	nReady Module Boot Up Indicator	IO_4	O	"0" – Boot-up OK; "1" – Boot-up Fail; GPIO4, PWM2
4	nLink Wi-Fi Status	IO_5	O	"0" – Wi-Fi connect to router "1" – Wi-Fi unconnected; GPIO5, Detailed functions see <Notes>
5	GPIO12	IO_12	I/O	PWM2
6	+3.3V Power	VDD	Power	+3.3V Power
7	DEBUG_UART1_RX	IO_11	I	3.3V TTL UART1 Debug Input

Pin	Description	Net Name	Signal Type	Comments
				GPIO11, SPI, PWM. function
8	Ground	GND	Power	
The following test point is for factory test usage, leave it unconnected.				
	Reset	EN	I,PU	“Low” effective reset input.
	GPIO8	IO_8	IPD	Internal 10K pull-down resistor, Boot select: Low: boot from module flash. High: boot from external UART. This is used for HF factory firmware program, leave it unconnected for user application
	UART0	RXD	I	3.3V TTL UART0 Communication Input GPIO7
	UART0	TXD	O,PU	3.3V TTL UART0 Communication Output GPIO16

1.2.5. HF-LPB170 Pins Definition

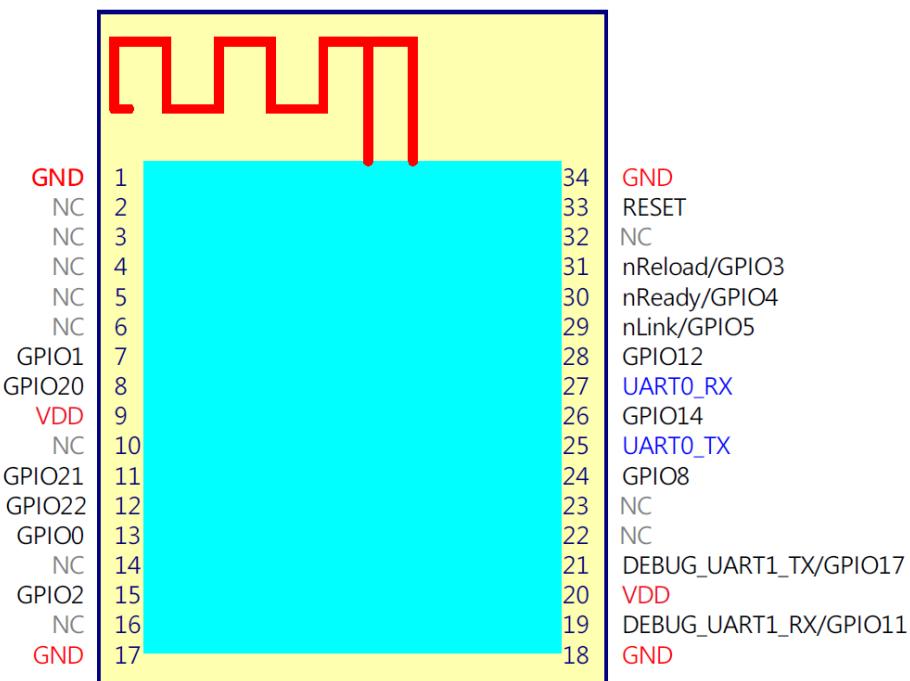


Figure 18. HF-LPB170 Pins Map

Table6. HF-LPB170 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1,17,18,34	Ground	GND	Power	
2, 3, 4, 5, 6		N.C		No Connection
7	GPIO1	GPIO1	IPU/O	
8	GPIO20	GPIO20	IPU/O	

Pin	Description	Net Name	Signal Type	Comments
9,20	+3.3V Power	VDD	Power	
10		N.C		
11	GPIO21	GPIO21	IPU/O	
12	GPIO22	GPIO22	IPU/O	
13	GPIO0	GPIO0	IPU/O	
14		N.C		
15	GPIO2	GPIO2	IPU/O	
16		N.C		
19	UART1_RX	DEBUG_UART1_RX	I	3.3V TTL UART1 Debug Input GPIO11, SPI, PWM. function
21	UART1_TX	DEBUG_UART1_TX	O	3.3V TTL UART1 Debug Output GPIO17, SPI, PWM. function
22, 23		N.C		
24	GPIO8	GPIO8	IPD	Internal 10K pull-down resistor, Boot select: Low: boot from module flash. High: boot from external UART. This is used for HF factory firmware program, leave it unconnected for user application
25	UART0	UART0_TX	O,PU	3.3V TTL UART0 Communication Output GPIO16
26	UART0_CTS	GPIO14	I	used as CTS when enable flow control GPIO14, SPI, DAC, ADC function
27	UART0	UART0_RX	I	3.3V TTL UART0 Communication Input GPIO7
28	UART0_RTS	GPIO12	O	used as RTS when enable flow control GPIO12, SPI, PWM2, ADC function
29	Wi-Fi Status	nLink	IPU/O	“0” – Wi-Fi connect to router “1” – Wi-Fi unconnected; Detailed functions see <Notes> GPIO5
30	Module Boot Up Indicator	nReady	O	“0” – Boot-up OK; “1” – Boot-up Fail; GPIO4, PWM2
31	Multi-Function	nReload	I,PU	Detailed functions see <Notes> GPIO3, PWM3
32		N.C		
33	Module Reset	RESET	I,PU	“Low” effective reset input. There is RC reset circuit internally. No need of external RC reset circuit.

1.2.6. HF-LPB175 Pins Definition

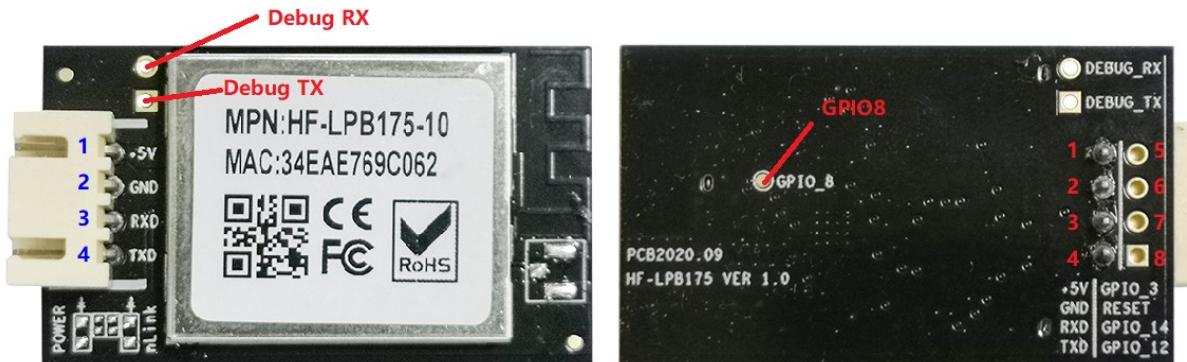


Figure 19. HF-LPB175 Pins Map

Table7. HF-LPB175 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	+5V Power	DVDD	Power	5V@300mA
2	Ground	GND	Power	Ground
3	UART0	UART0_RX	I	5V TTL UART0 Communication Input GPIO7
4	UART0	UART0_TX	O,PU	5V TTL UART0 Communication Output GPIO16
5	Multi-Function	nReload	I,PU	3.3V TTL Detailed functions see <Notes> GPIO3, PWM3
6	Module Reset	RESET	I,PU	3.3V TTL “Low” effective reset input. There is RC reset circuit internally. No need of external RC reset circuit.
7	GPIO14	GPIO14	I/O	3.3V TTL GPIO14
8	GPIO12	GPIO12	I/O	3.3V TTL GPIO12
	UART1_RX	Debug RX	I	3.3V TTL UART1 Debug Input GPIO11
	UART1_TX	Debug TX	O	3.3V TTL UART1 Debug Output GPIO17
	GPIO8	GPIO8	IPD	3.3V TTL Internal 10K pull-down resistor, Boot select: Low: boot from module flash. High: boot from external UART. This is used for HF factory firmware program, leave it unconnected for user application

1.2.7. HF-LPT570 Pins Definition

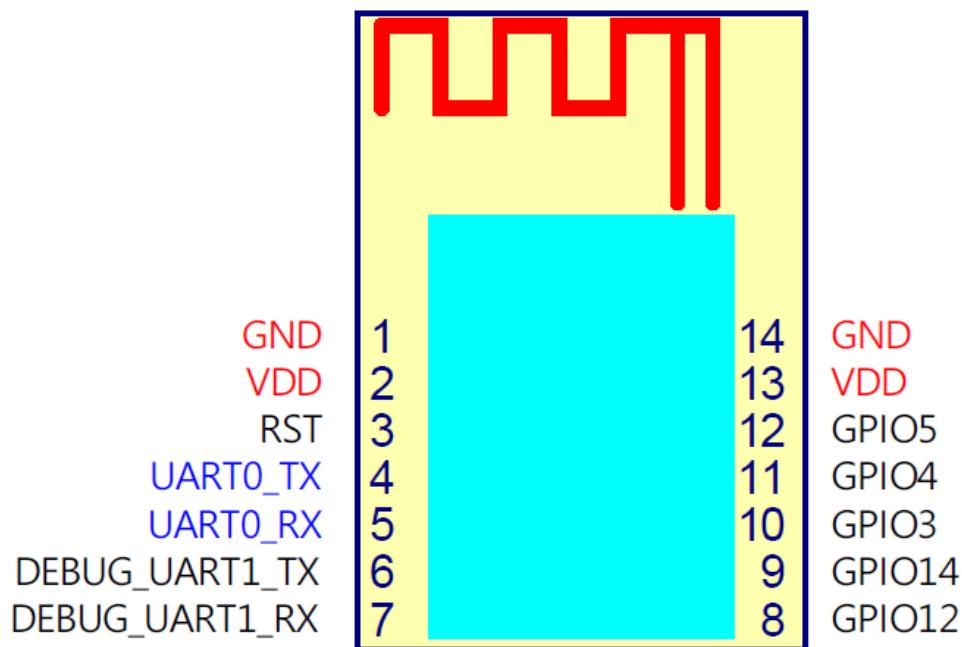


Figure 20. HF-LPT570 Pins Map

Table8. HF-LPT570 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	Ground	GND	Power	
2	+3.3V Power	VDD	Power	
3	Module Reset	RESET	I,PU	"Low" effective reset input. There is RC reset circuit internally. No need of external RC reset circuit.
4	UART0	UART0_TX	O,PU	3.3V TTL UART0 Communication Output GPIO16
5	UART0	UART0_RX	I	3.3V TTL UART0 Communication Input GPIO7
6	UART1_TX	Debug TX	O	3.3V TTL UART1 Debug Output GPIO17
7	UART1_RX	Debug RX	I	3.3V TTL UART1 Debug Input GPIO11
8	GPIO12	GPIO12	I/O	3.3V TTL GPIO12
9	GPIO14	GPIO14	I/O	3.3V TTL GPIO14
10	nReload Multi-Function	GPIO3	I,PU	Detailed functions see <Notes>

				GPIO3, PWM3
11	nReady Module Boot Up Indicator	GPIO4	O	“0” – Boot-up OK; “1” – Boot-up Fail; GPIO4, PWM2
12	nLink Wi-Fi Status	GPIO5	IPU/O	“0” – Wi-Fi connect to router “1” – Wi-Fi unconnected; Detailed functions see <Notes> GPIO5
13	+3.3V Power	VDD	Power	

GPIO8 is for manufacture program usage.

Pin	Description	Net Name	Signal Type	Comments
	GPIO8	GPIO8	IPD	Internal 10K pull-down resistor, Boot select: Low: boot from module flash. High: boot from external UART. This is used for HF factory firmware program, leave it unconnected for user application

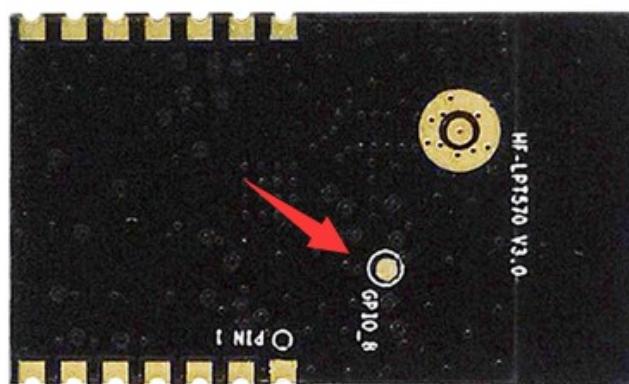


Figure 21. HF-LPT570 GPIO8 PIN

<Notes>

I — Input; O — Output

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

GPIO0, GPIO1, GPIO2, GPIO5, GPIO14, GPIO20, GPIO21, GPIO22 is input pull-up when bootup, pull-up resistor is 44K. If user application use these GPIO, must be noted about this.

nReload Pin (Button) function:

- 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.
- After module is powered up, short press this button (0.2s < “Low” < 1.5s) and loose to make the module go into SmartBLELink config mode, waiting for APP to set router SSID and password, config module connect to router. Recommend to use SmartBLELink BLE method config, may use AT+SMARTCONFIG to choose other config mode(SmartLink V8 and SmartAPLink).

See Appendix to download SmartBLELink, 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.
4. Flash when in WPS config mode

High-Flying strongly suggest customer fan out this pin to LED.

UART1 Debug :

1. Is used for debug log or firmware program, baud rate 921600.

1.2.8. Electrical Characteristics

Table9. Absolute Maximum Ratings:

Parameter	Condition	Min.	Typ.	Max.	Unit
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

1.2.9. HF-LPT270 Mechanical Size

HF-LPT270 modules physical size (Unit: mm) as follows:

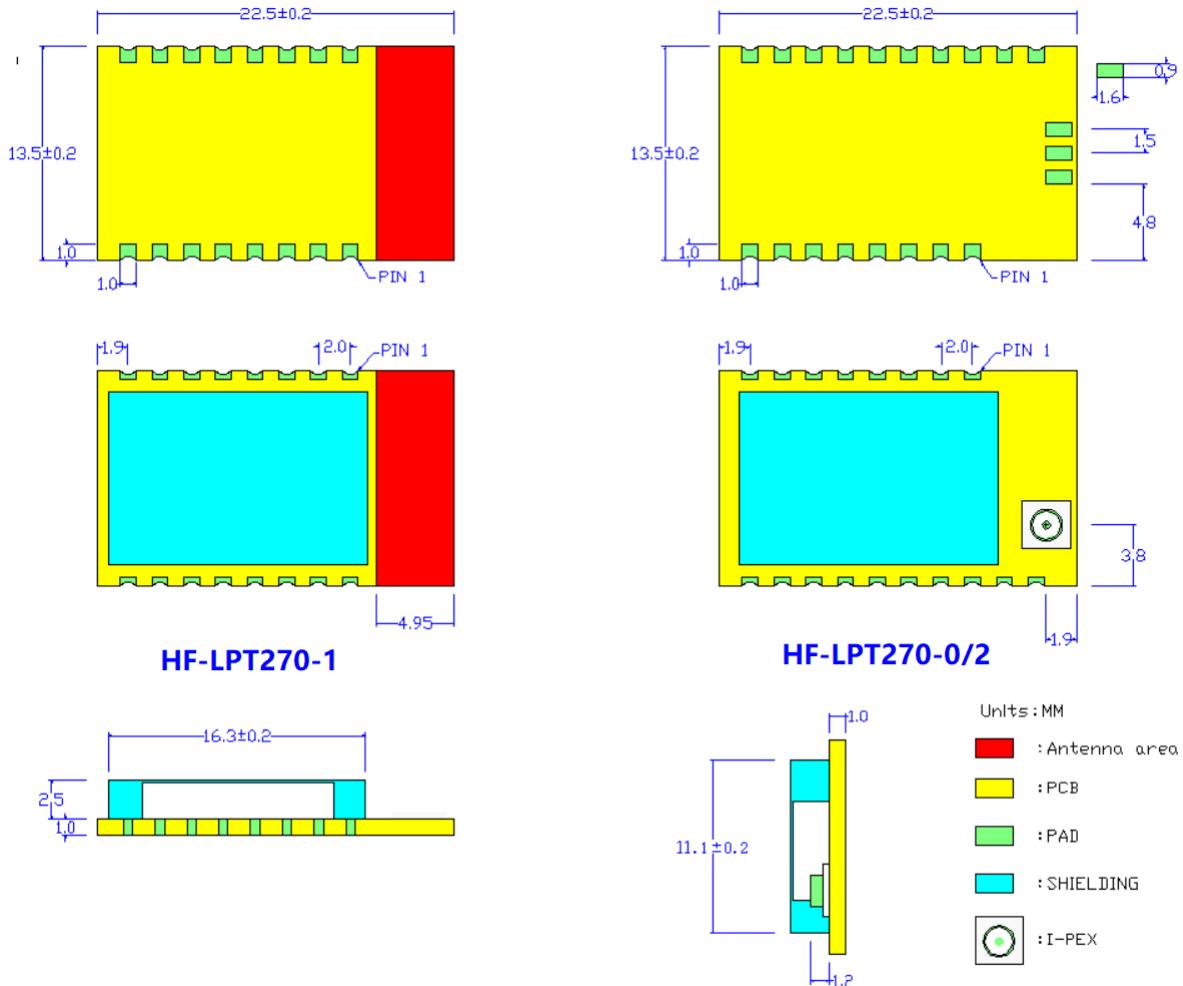


Figure 22. HF-LPT270 Mechanical Dimension

1.2.10. HF-LPT170 Mechanical Size

HF-LPT170 modules physical size (Unit: mm) as follows:

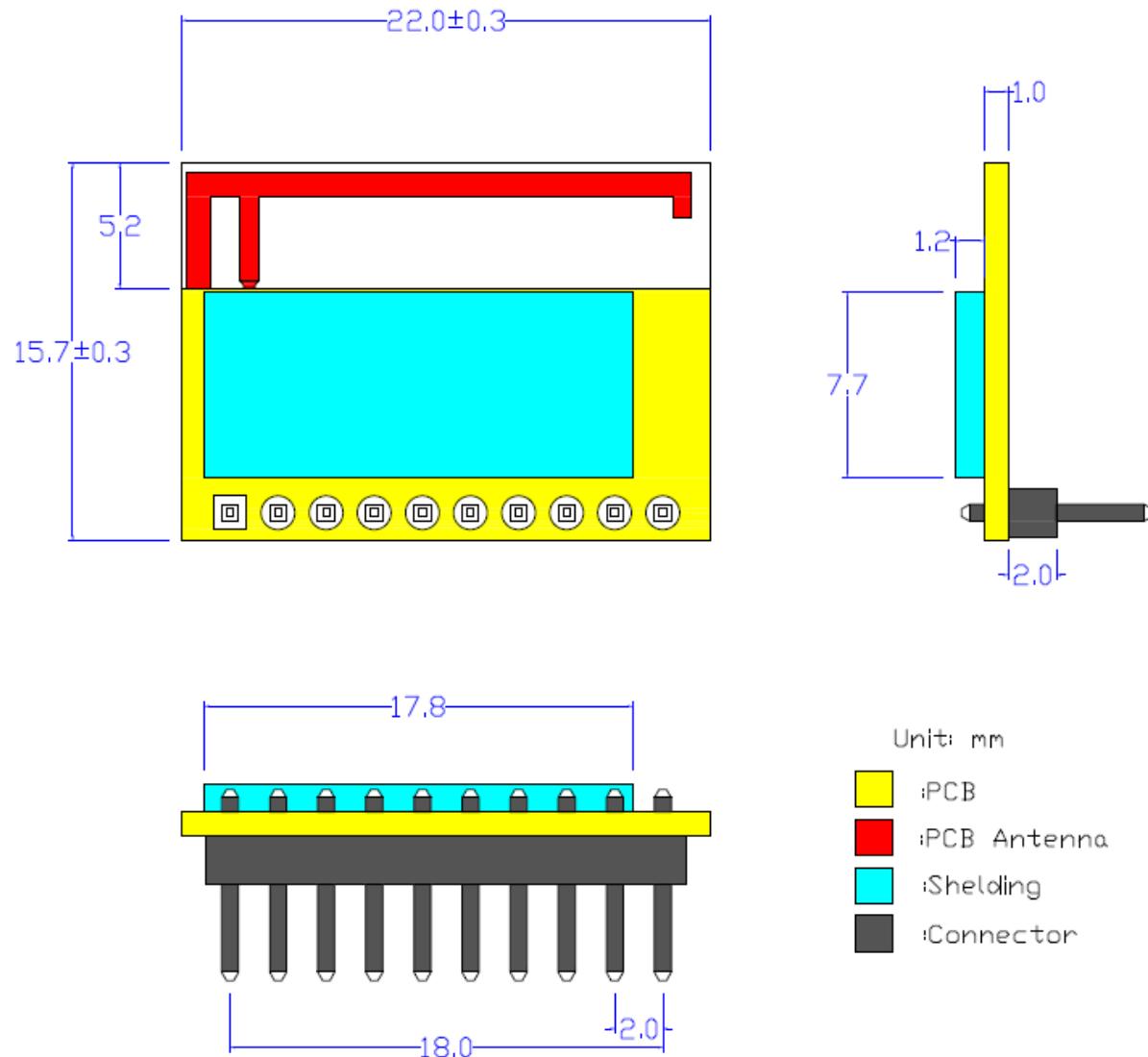


Figure 23. HF-LPT170 Mechanical Dimension

1.2.11. HF-LPT271 Mechanical Size

HF-LPT271 modules physical size (Unit: mm) as follows:

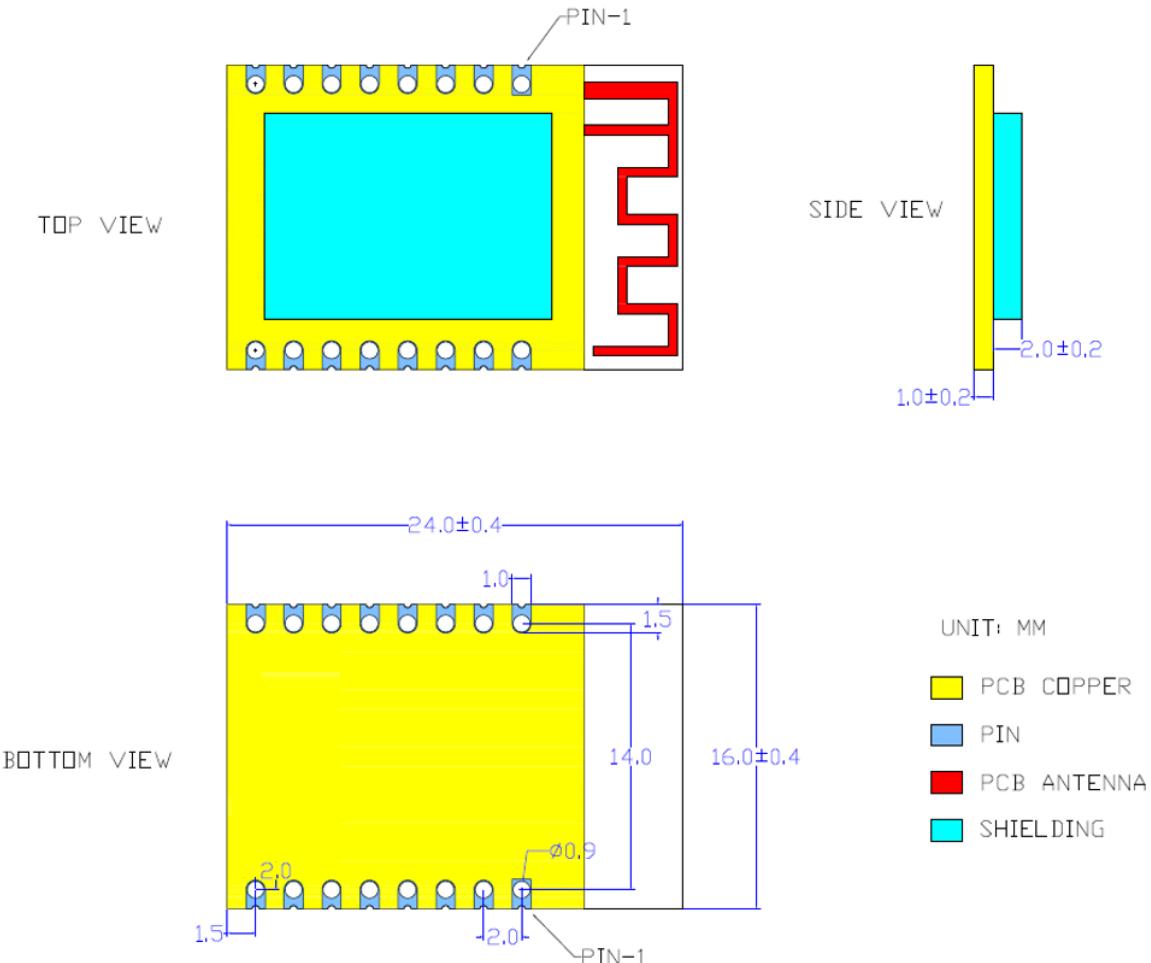


Figure 24. HF-LPT271 Mechanical Dimension

1.2.12. HF-LPT272 Mechanical Size

HF-LPT272 modules physical size (Unit: mm) as follows:

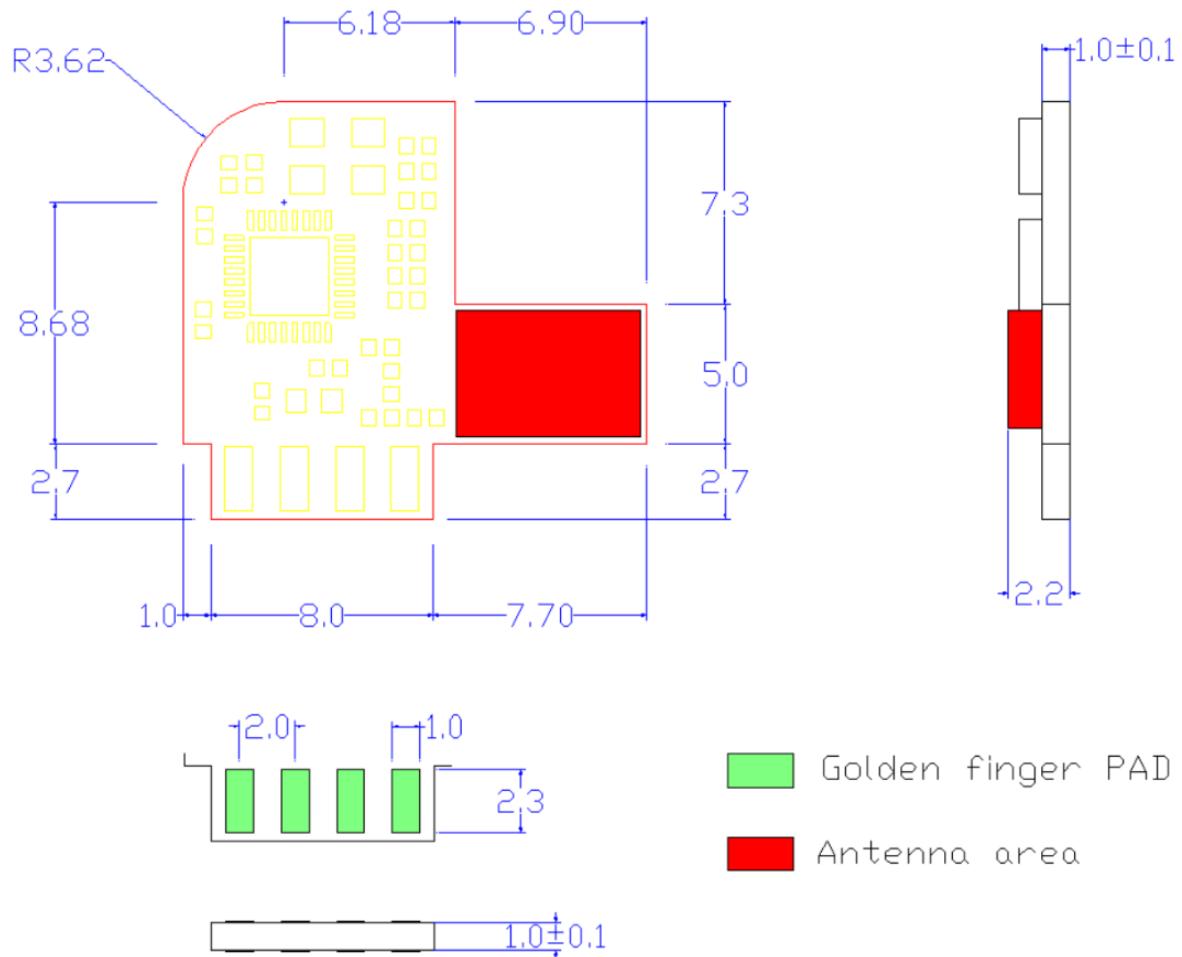


Figure 25. HF-LPT272 Mechanical Dimension

1.2.13. HF-LPB170 Mechanical Size

HF-LPB170 modules physical size (Unit: mm) as follows:

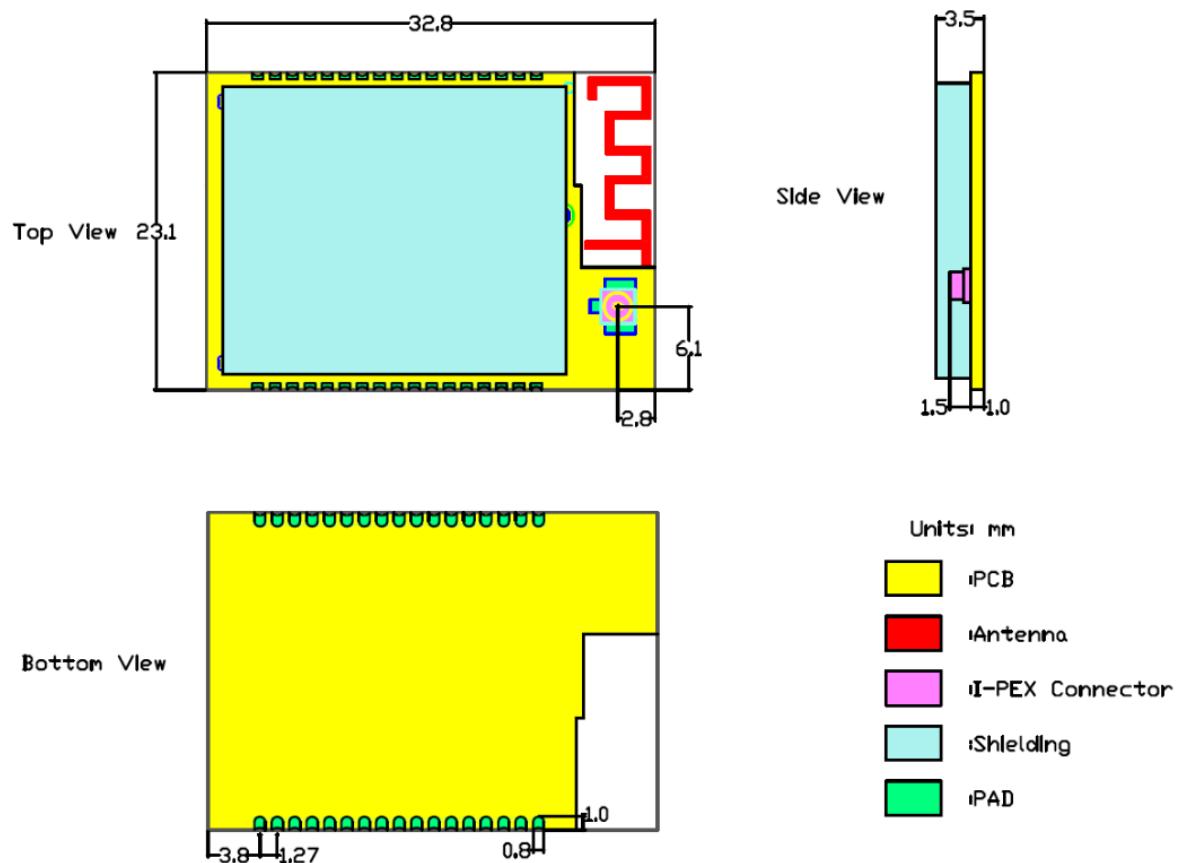


Figure 26. HF-LPB170 Mechanical Dimension

1.2.14. HF-LPB175 Mechanical Size

HF-LPB175 modules physical size (Unit: mm) as follows:

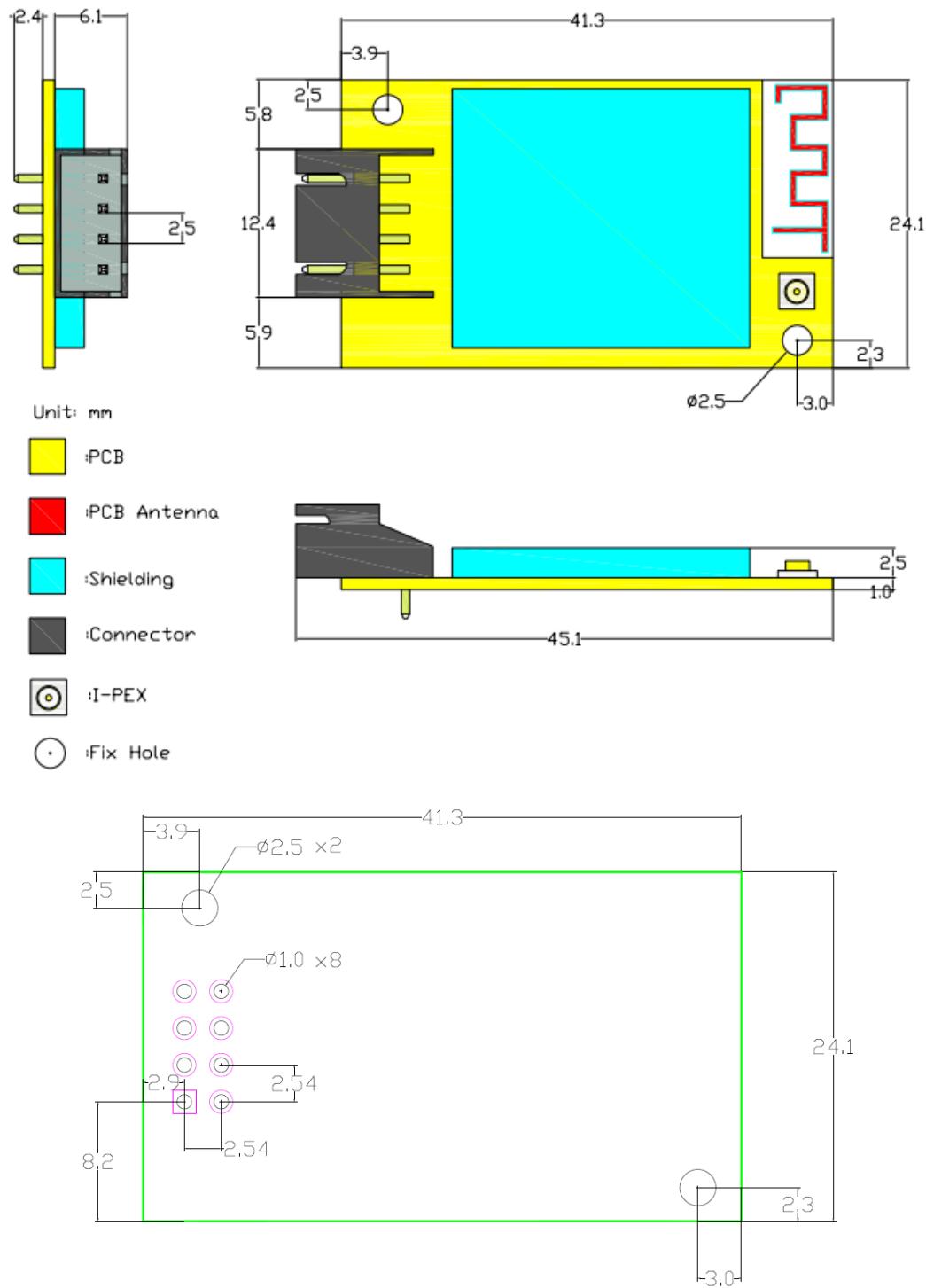


Figure 27. HF-LPB175 Mechanical Dimension

1.2.15. HF-LPT570 Mechanical Size

HF-LPT570 modules physical size (Unit: mm) as follows:

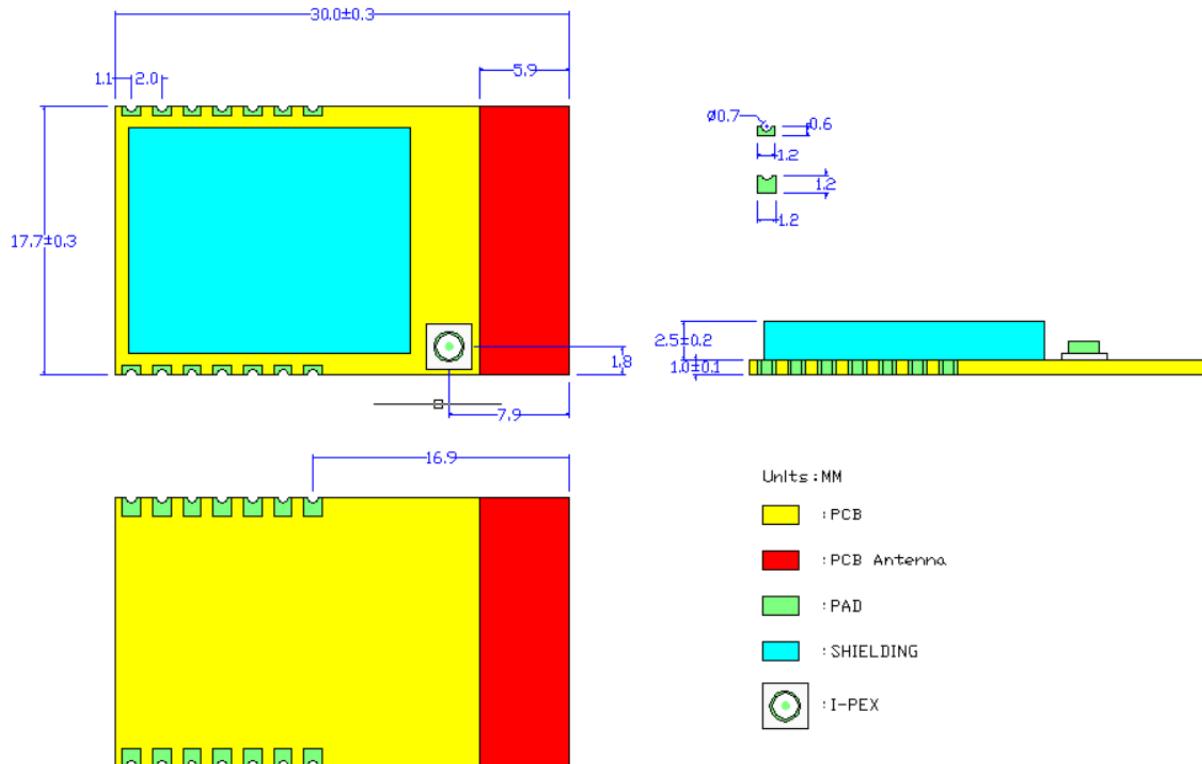


Figure 28. HF-LPT570 Mechanical Dimension

1.2.16. On-board Chip Antenna

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

- For customer PCB, module antenna area can't put component or paste GND net;(See the following red arrow area)
- Antenna must away from metal or high components at least 16mm;
- Antenna can't be shielded by any metal enclosure; All cover, include plastic, shall away from antenna at least 16mm;

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.

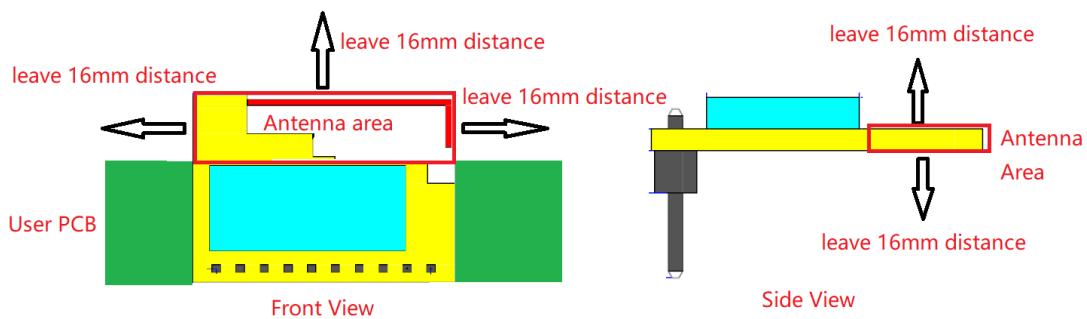


Figure 29. Suggested Module Placement Region

1.2.17. External Antenna

HF-LPX70 series module supports external antenna(I-PEX) option for user dedicated application.

If user select external antenna, HF-LPX70 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.

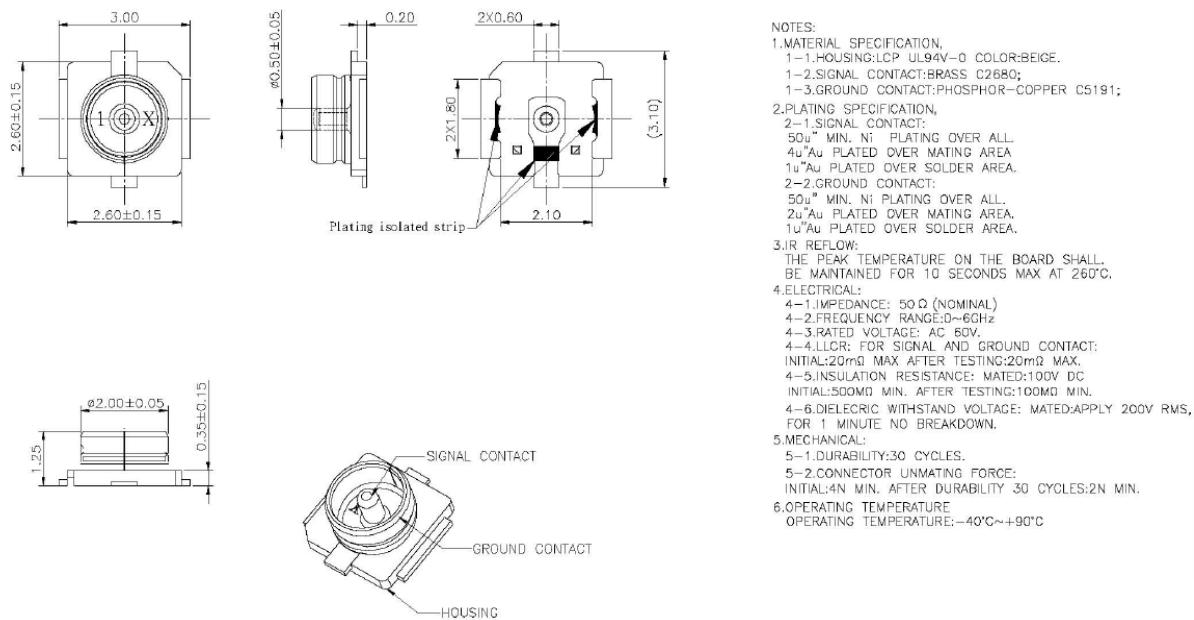


Figure 30. 1st IPEX Connector

The antenna parameters required as follows:

Table10. 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

1.2.18. Evaluation Kit

High-Flying provides the EVK to promote user to familiar the product and develop the detailed application. The evaluation kit shown as below, user can connect to module with the RS-232 UART, USB (Internal USB to UART converter) or Wireless interface to configure the parameters, manage the module or do the some functional tests.

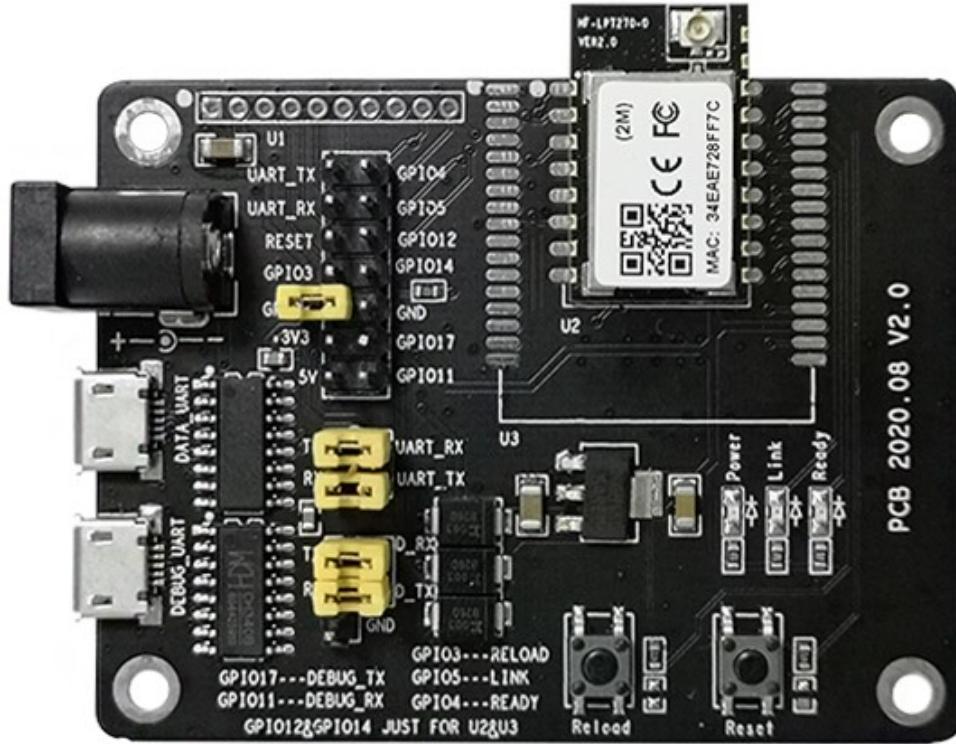


Figure 31. HF-LPX70 EVK

Notes: User need download USB to UART port driver from High-Flying web or contact with technical support people for more detail.

The external interface description for evaluation kit as follows:

Table11. Evaluation Kit Interface Description

Function	Name	Description
External Interface	DATA_UART	Power In and communication UART0 port.
	DEBUG_UART	Power In and debug UART1 port
	DC	DC jack for power in, 5V input. When USB power supply is not enough, may use external adapter.
LED	Power	Power LED
	Ready	nReady LED
	Link	nLink LED
Button	Reload	Smart Config and Restore factory default configuration.
	Reset	Reboot module

1.2.19. Order Information

Base on customer detailed requirement, HF-LPX70 series modules provide different variants and physical type for detailed application.

Mark ★ in Red is our main modules										
Type	Function	Antenna	Footprint	PIN Num	GPIO Num	Size	Power Input	Function	UART	UART Num
★HF-LPT270-1(2M)		Internal PCB	SMT	16	7	22.5 x 13.5 x 3mm	3.3VDC	Wi-Fi&BLE	3.3V TTL	1 Comm+1 Debug
★HF-LPT270-0(2M)		External 1st IPEX		18						
HF-LPT270-2(2M)		External PAD		18						
★HF-LPT170-10		Internal PCB	DIP	10	5	22 x 15.6 x 8mm	3.3VDC	Wi-Fi&BLE	3.3V TTL	1 Comm+1 Debug
HF-LPT170-00		External 1st IPEX								
HF-LPT271		Internal PCB	SMT	16	10	24 x 16 x 3mm	3.3VDC	Wi-Fi&BLE	3.3V TTL	1 Comm+1 Debug
HF-LPT272		Internal chip	Golden Finger	8	6	15.2 x 15 x 2.2mm	3.3VDC	Wi-Fi&BLE	3.3V TTL	None
★HF-LPB170-1		Internal PCB	SMT	34	13	23.1 x 32.8 x 3.5mm	3.3VDC	Wi-Fi&BLE	3.3V TTL	1 Comm+1 Debug
HF-LPB170-0		External 1st IPEX								
★HF-LPB175-10		Internal PCB	4PIN 2.54mm Slot	4	0	41.3 x 24.1 x 6mm	5VDC	Wi-Fi&BLE	5V TTL	1 Comm+1 Debug
HF-LPB175-00		External 1st IPEX								
★HF-LPT570-1		Internal PCB	SMT	14	5	30 x 17.7 x 3.6mm	3.3VDC	Wi-Fi&BLE	3.3V TTL	1 Comm+1 Debug
HF-LPT570-0		External 1st IPEX								

Figure 32. HF-LPX70 Order Information

1.2.20. Hardware Typical Application

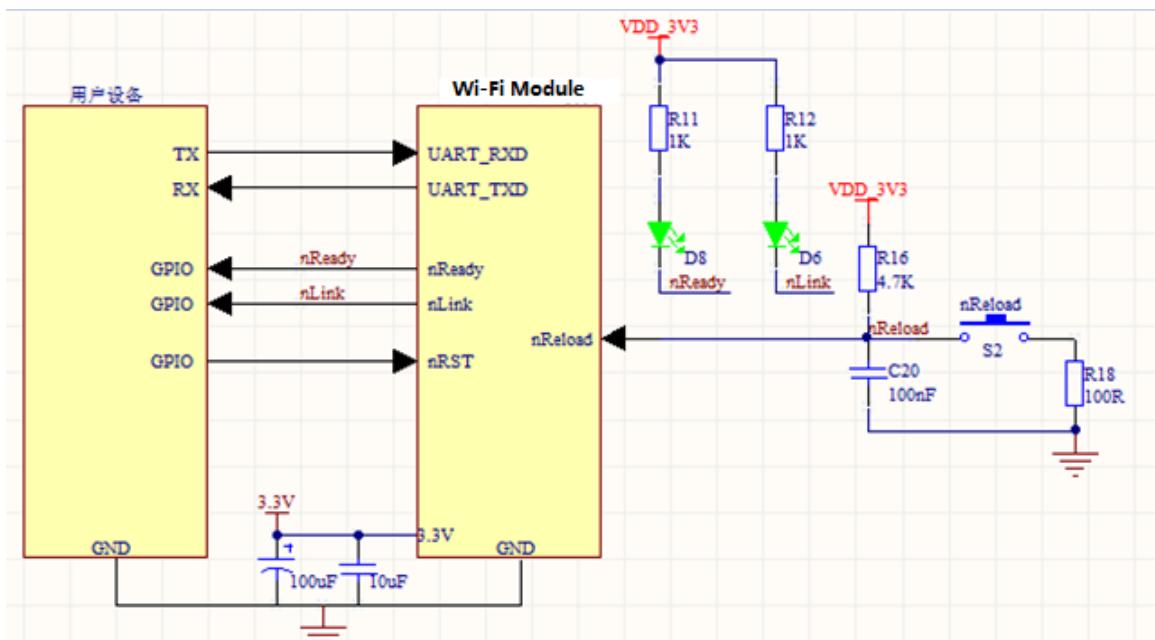


Figure 33. HF-LPT270 Hardware Typical Application

Notes:

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

There is pull-up resister internal and no external pull-up required. If need reset, set low at least 10ms abd then set high.

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. Thers is pull-up resister 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-LPT270 module can be configured as both wireless STA and AP base on network type. Logically there are two interfaces in HF-LPT270. One is for STA, and another is for AP. When HF-LPT270 works as AP, other STA equipments are able to connect to HF-LPT270 module directly. Wireless Networking with HF-LPT270 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.

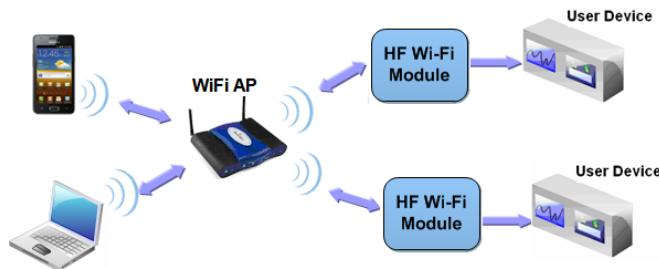


Figure 34. HF-LPT270 Basic Wireless Network Structure

2.1.2. Wireless Network Based On STA

HF-LPT270 module support STA network mode.

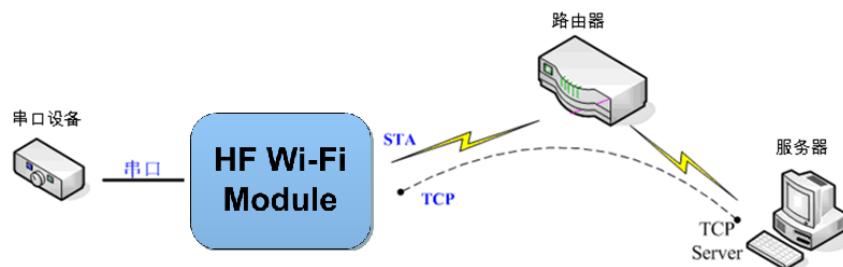


Figure 35. HF-LPT270 STA Network Structure

2.2. BLE Connection

HF-LPT270 support BLE, smart phone can direct connect to module, structure is as following.

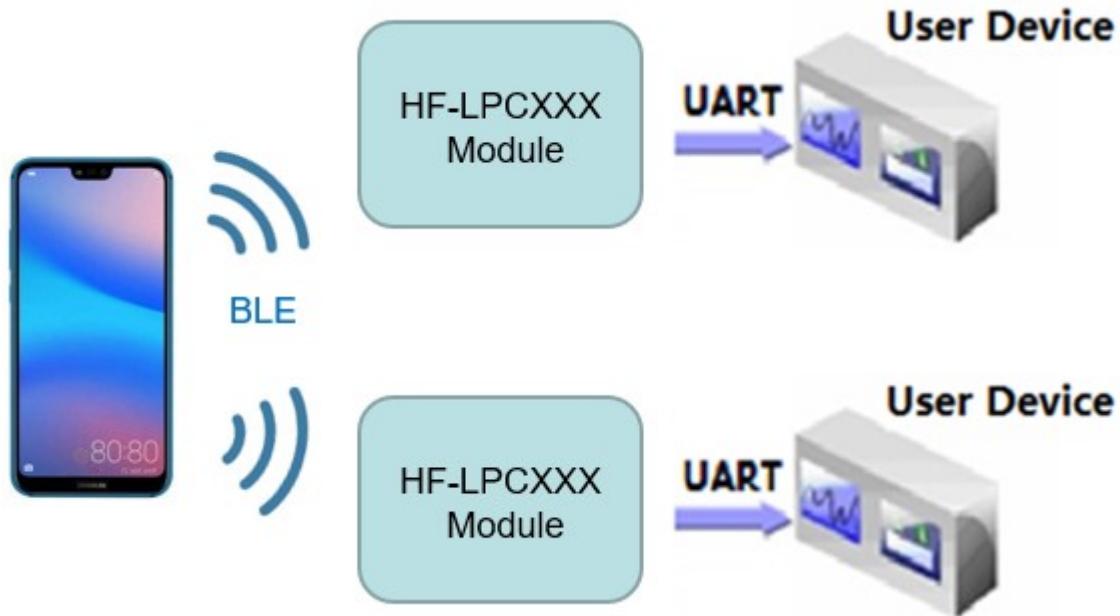


Figure 36. BLE Connection

2.3. Work Mode : Transparent Transmission Mode

HF-LPT270 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. Registration Package Function

Under the transparent transmission mode, the registration package function can be enabled. When the connection is established (TCP only) or the serial port data is received, the content of the registration package is automatically added to the server, and the content of the registration package can be used with the signal strength, MAC, etc. Details refer to AT+NREGDT command.

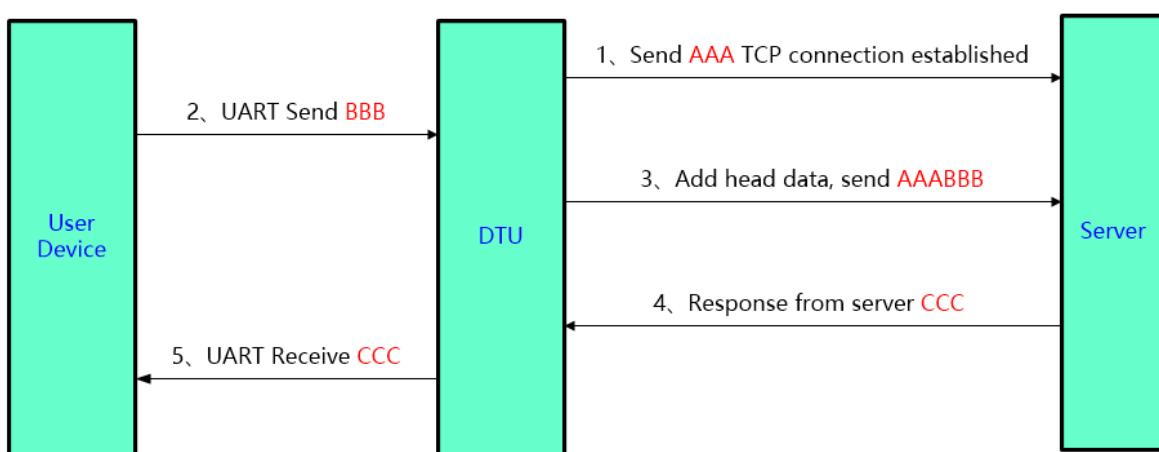


Figure 37. Transparent Transmission Mode Registration Packet Function Transmission

The example of registration package function is as follows: The following commands respectively enable the registration function of SOCKA, set the content of the registration package to MAC+ ABCD, enable the registration package when establishing connection and sending data.

```

AT+NREGEN=A, on
+ok

AT+NREGDT=A,%MACABCD
+ok

AT+NREGSND=A, both
+ok
  
```

Figure 38. Transparent Transmission Mode Registration Package Function Example

2.5. Heartbeat Package Function

In the transparent transmission mode, the heartbeat packet function can be enabled, and the module periodically sends heartbeat data to the server or the serial port. For details, refer to the AT+HEART command.

The user can also choose to send a heartbeat packet to the serial device.

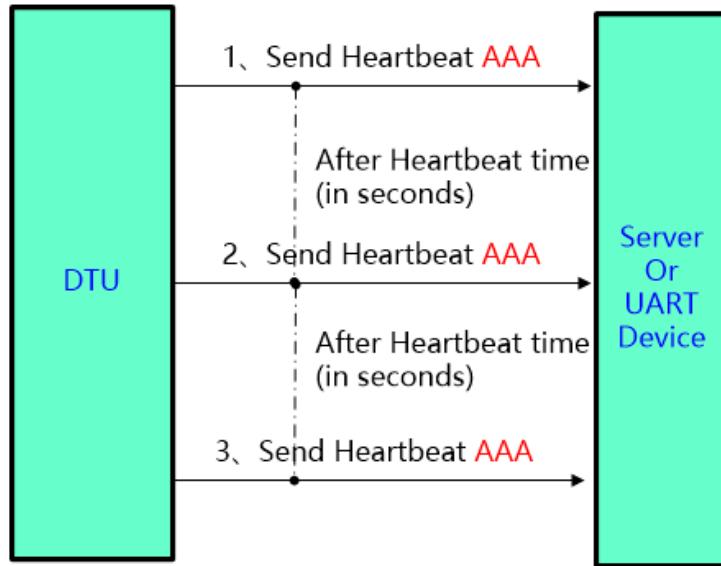


Figure 39. Transparent Transmission Mode Heartbeat Packet Function Transmission

2.6. SOCKA HTTP Mode

SOCKA channel support HTTP protocol. Under this mode, the user's terminal device can send request data to the specified HTTP server through this module. The module will receive the data from the HTTP server, parses the data and sends the results to the serial device. The user does not need to pay attention to the data conversion process between the serial port data and the network data packet, and the data request of the serial port device to the HTTP server can be realized by simple parameter setting.

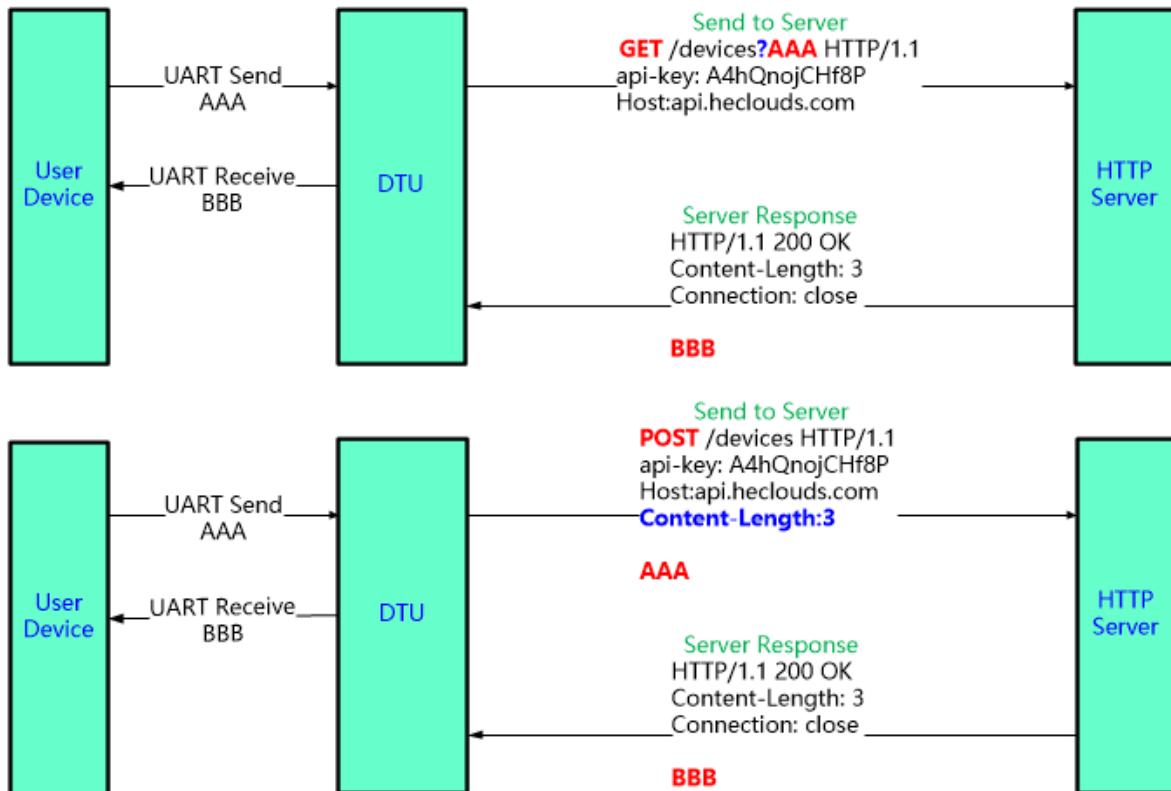


Figure 40. HTTP Mode Transmission

For GET request, the received UART packet AAA will put after the HTTP path (auto add "?" between path and parameters), for POST request, packet is put in the content (auto add Content-Length header information).

Product will **create connection to HTTP server** and send the data when UART receive "pppp" data for GET request.

`GET /1111?pppp HTTP/1.1`

`Host: 192.168.83.107`

Product will output "DDDDD" when get response from the HTTP server. Then active or passive to close connection according to AT+HTPPARA command parameters.

`HTTP/1.1 200 OK`

`Server: nginx`

`Content-Length: 5`

`DDDDD`

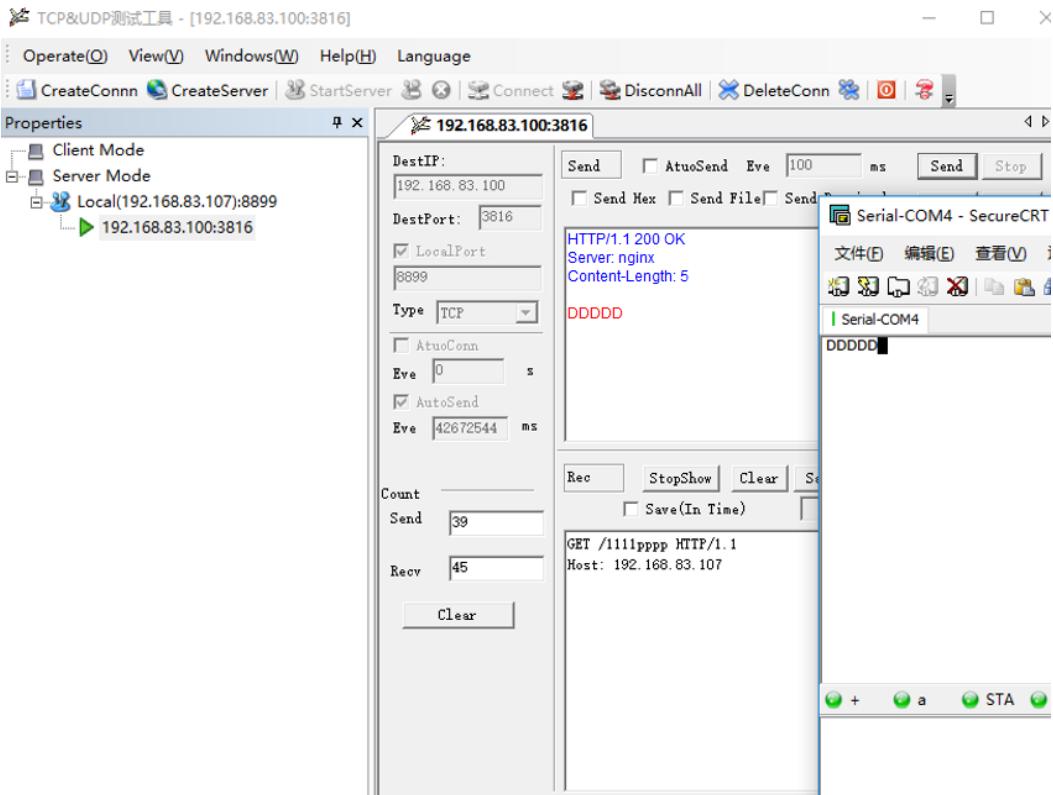


Figure 41. HTTP GET Request Example

Product will send the below data to HTTP Server when UART receive “pppp” data for POST request.

POST /1111 HTTP/1.1

Host: 192.168.83.107

Content-Length:4

pppp

Product will output “DDDD” when get response from the HTTP server.

HTTP/1.1 200 OK

Content-Length: 4

Connection: close

DDDD

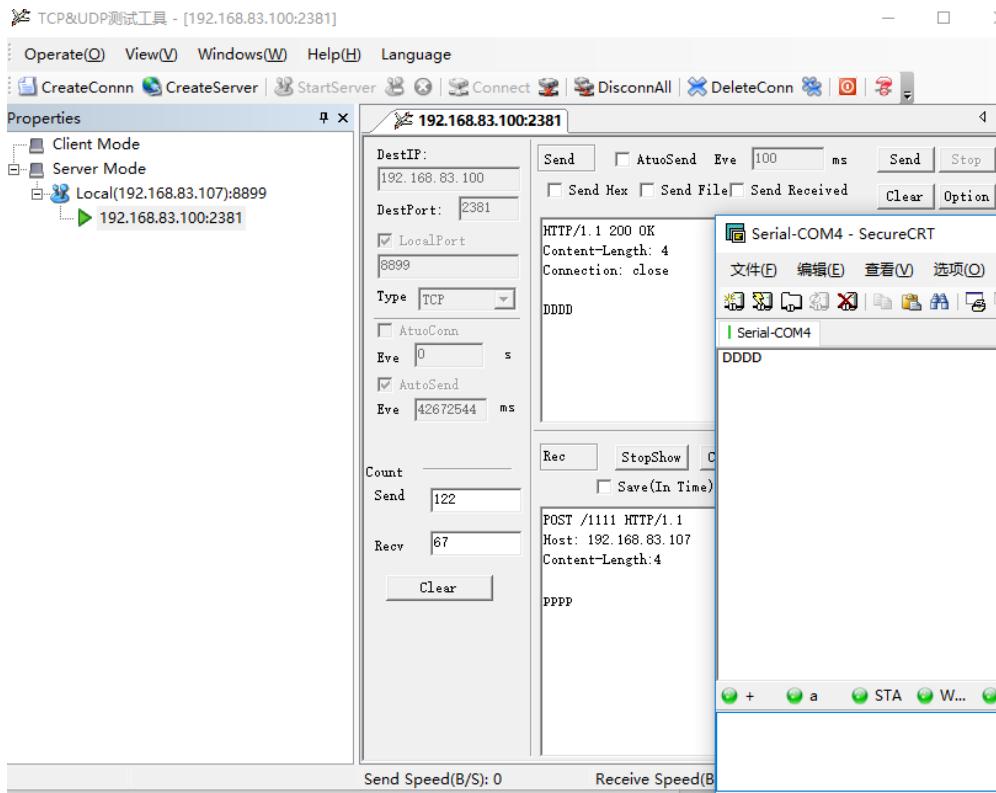


Figure 42. HTTP POST Request Example

The HTTP AT command example is as following.

- AT+NETP=HTTP,8899,192.168.83.106,8899
- AT+HTPTP=POST
- AT+HTPURL=/abcde,1.1
- AT+HTPHEAD=Host:192.168.83.106:8899<CRLF><CRLF>Connection: keep-alive<CRLF><CRLF>

If need put received packet to URL in POST request like GETrequest, config it with AT+HTPTP command.

2.7. SOCKA MQTT Mode

Device support MQTT Client send data to MQTT Server.

More MQTT Case refer to following link.

<http://www.hi-flying.com/download-center-1/application-notes-1/download-item-industry-products-application-manual-20180415>

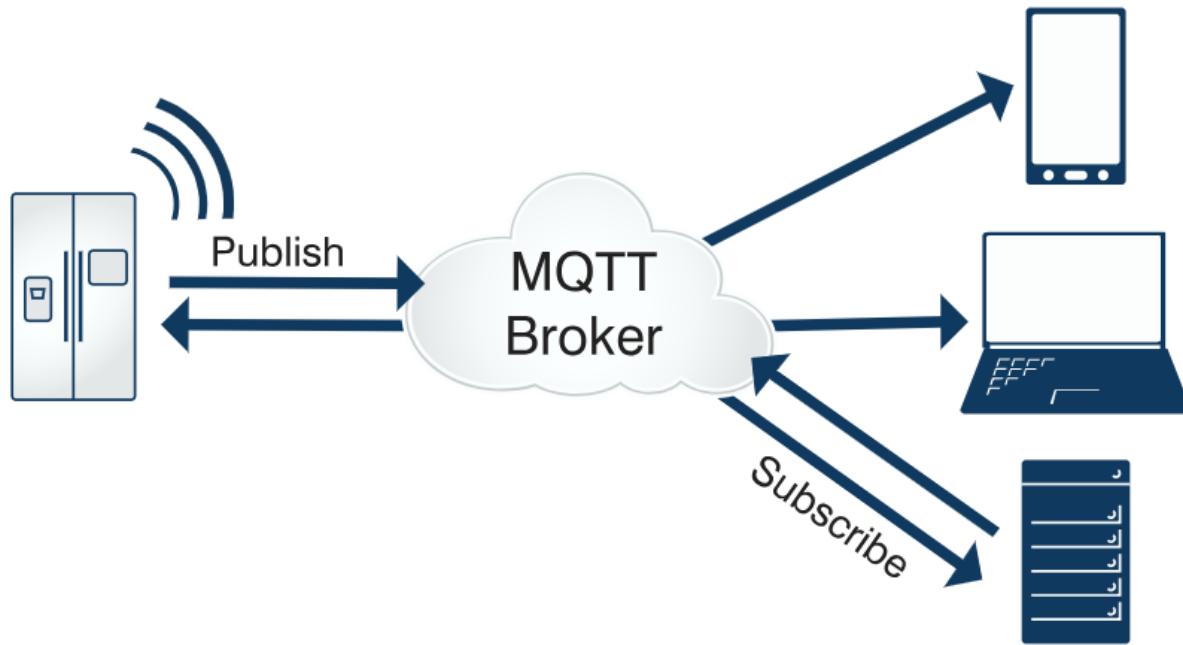


Figure 43. MQTT Concept

Setting example

- AT+NETP=MQTT,1883,47.99.135.189
- AT+MQLOGIN=admin,public
- AT+MQID=F0FE6BEF8702
- AT+MQTOPIC=deviceid/up,deviceid/down
- AT+MQTOPIC=%MAC/up,%MAC/down

2.8. UART Frame Scheme

Support UART free-frame function. If user select open this function, module will check the intervals between any two bytes when receiving UART data. If this interval time exceeds defined value (50ms default), module will think it as the end of one frame and transfer this free-frame to WiFi port, or will receive UART data until 1400 bytes, then transfer 1400 bytes frame to WiFi port. This buffer size can be modified by AT+UARTBUF

The default UART frame interval is 20ms, AT+UARTTM can set this.

2.9. 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-LPT270 module supports following:

- ◆ WEP
- ◆ WPA-PSK/TKIP
- ◆ WPA-PSK/AES
- ◆ WPA2-PSK/TKIP
- ◆ WPA2-PSK/AES
- ◆ WPA3-SAE

2.10. Parameters Configuration

HF-LPT270 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.

2.11. Firmware Update

HF-LPT270 module supports multiple upgrade methods:

- UART upgrade
- Local Network upgrade

2.12. SOCKB Function

HF-LPT270 support double socket communication, the SOCKB function is disabled by default.

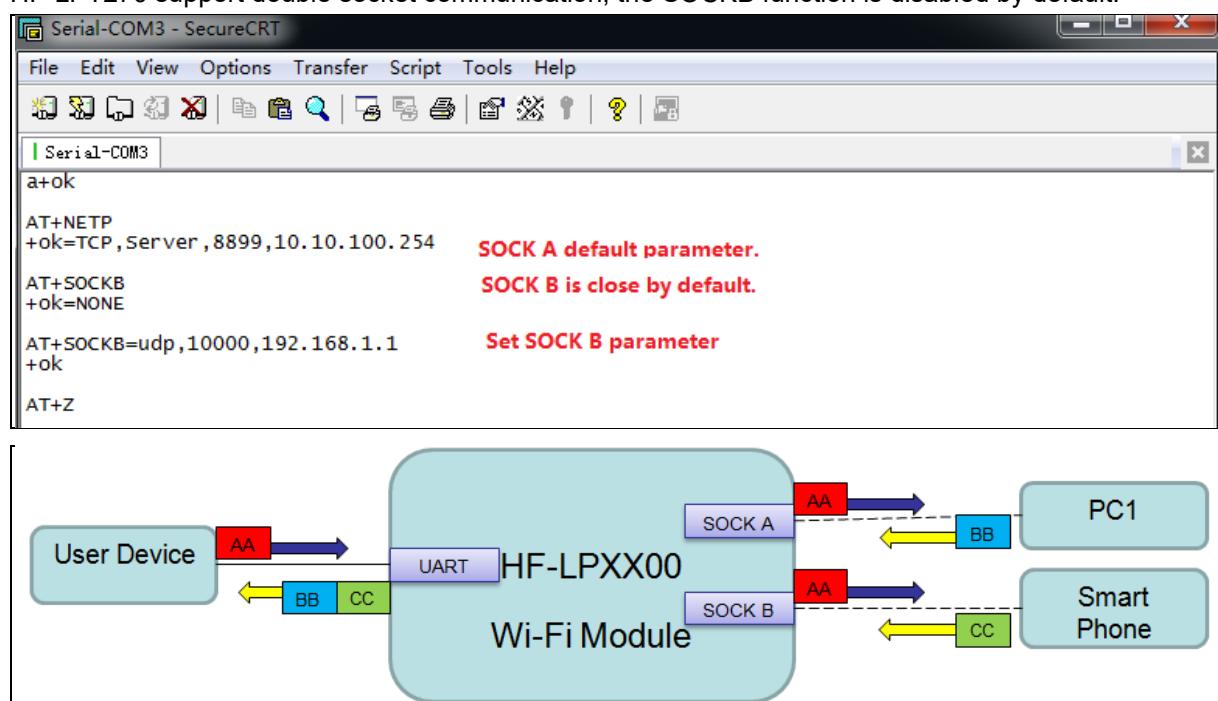


Figure 44. SOCKB function demo

Use AT+NETPIDEN, AT+NETPID command to distinguish the data packet.

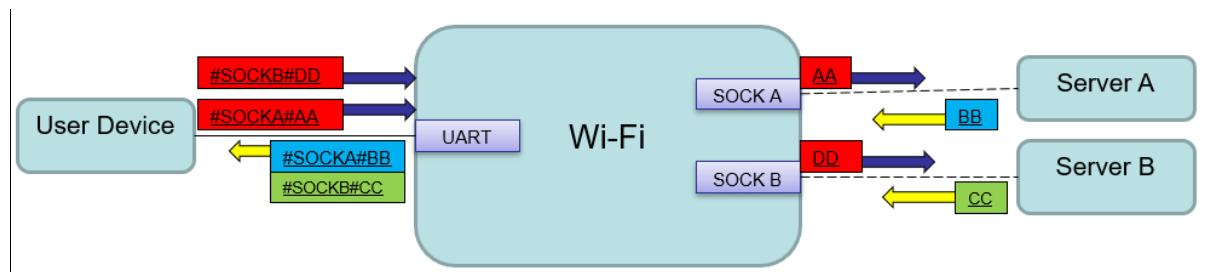


Figure 45. Two Socket Data Separation

2.13. Multi-TCP Link Connection

When HF-LPT270 module SOCK A configured as TCP Server, it supports Multi-TCP link connection, and maximum 5 TCP clients permitted to connect to HF-LPT270 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:

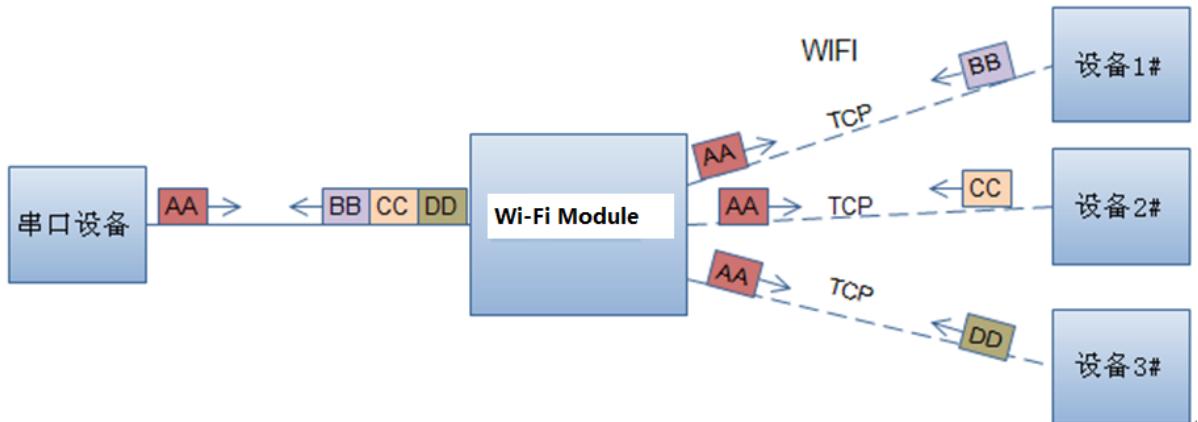


Figure 46. Multi-TCP Link Data Transmition Structure

2.14. Event Notification Function

AT+EVENT=on to enable event notification function, if module working status changed, it will output UART data initiatively.

Table12. Event Notification

Event Notification Data	Condition
+EVENT=SOCKA_ON	SOCKA connection success (TCP Client/Server, HTTP, MQTT)
+EVENT=SOCKA_OFF	SOCKA connection break (TCP Client/Server, HTTP, MQTT)
+EVENT=SOCKB_ON	SOCKB connection success (TCP Client)
+EVENT=SOCKB_OFF	SOCKB connection break (TCP Client)
+EVENT=CON_ON	STA Connect to router success
+EVENT=CON_OFF	STA Disconnect with router
+EVENT=DHCP_OK	STA DHCP got IP

3. OPERATION GUIDELINE

3.1. Configuration

When first use HF-LPX70 series modules, user may need some configuration. User can connect to HF-LPT270 module's wireless interface with following default setting information and configure the module through laptop.

Table13. Web Access Default Setting

Parameters	Default Setting
SSID	HF-LPT270 HF-LPT170 HF-LPB170 HF-LPB175
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.

Step 1: Connect laptop to SSID “HF-LPT270” 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 47. Open Web Management page

The 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 48. System Web Page

3.1.3. Work Mode Page

HF-LPT270 module can works at AP mode to simplify user's configuration, can also works at STA to connect remote server through AP router.

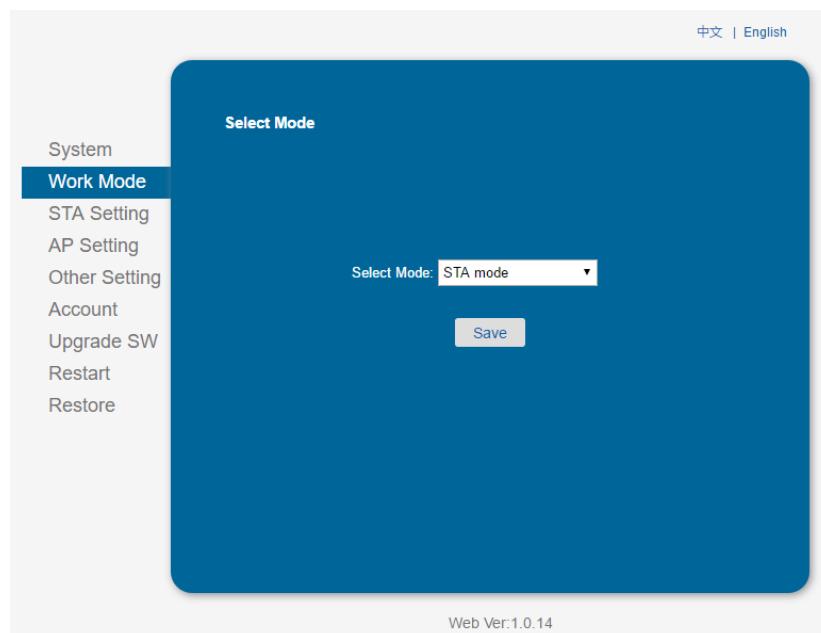


Figure 49. Work Mode Page

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.

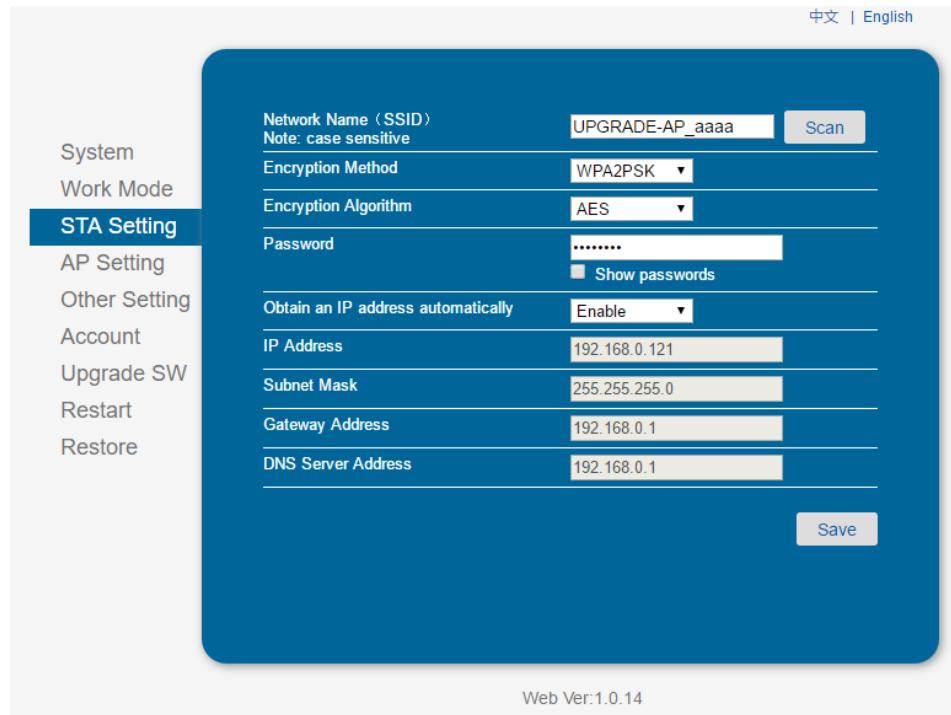


Figure 50. STA Setting Page

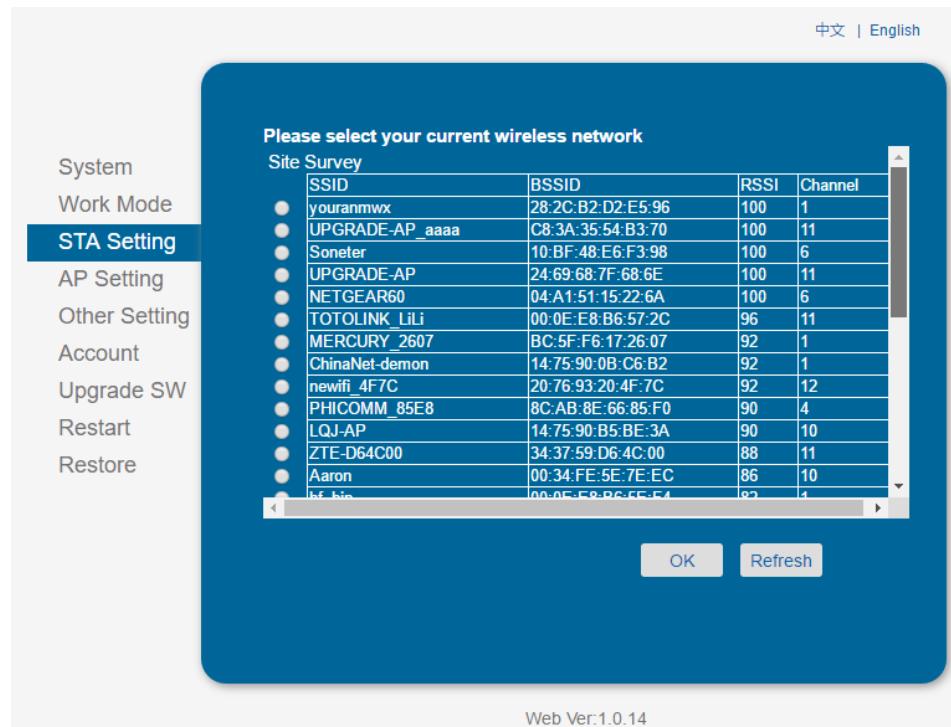


Figure 51. STA Scan Page

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.

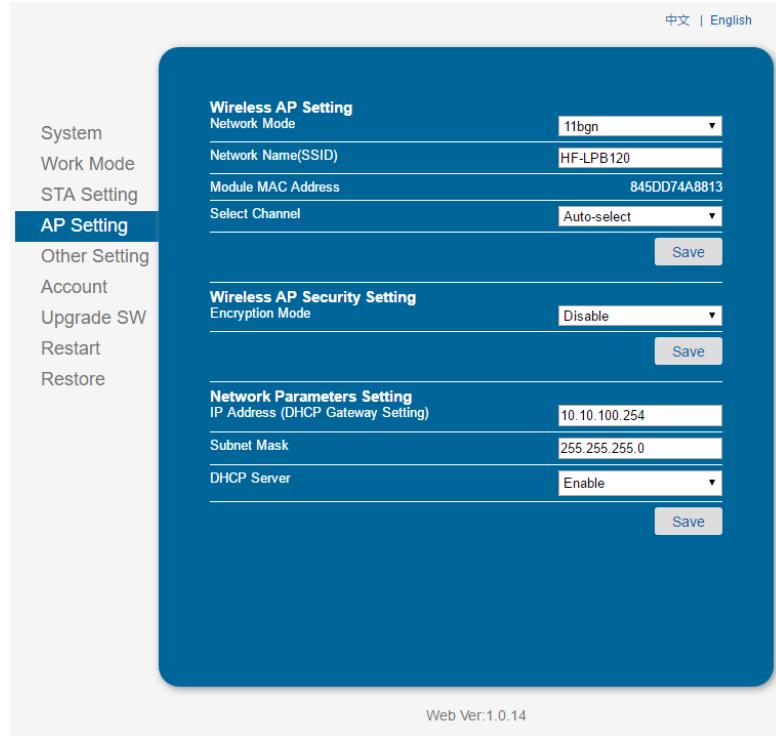


Figure 52. AP Setting Page

3.1.6. Other Setting Page

HF-LPT270 usually works at data transparent transmission mode. At this mode, the user device which connected with HF-LPT270 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.

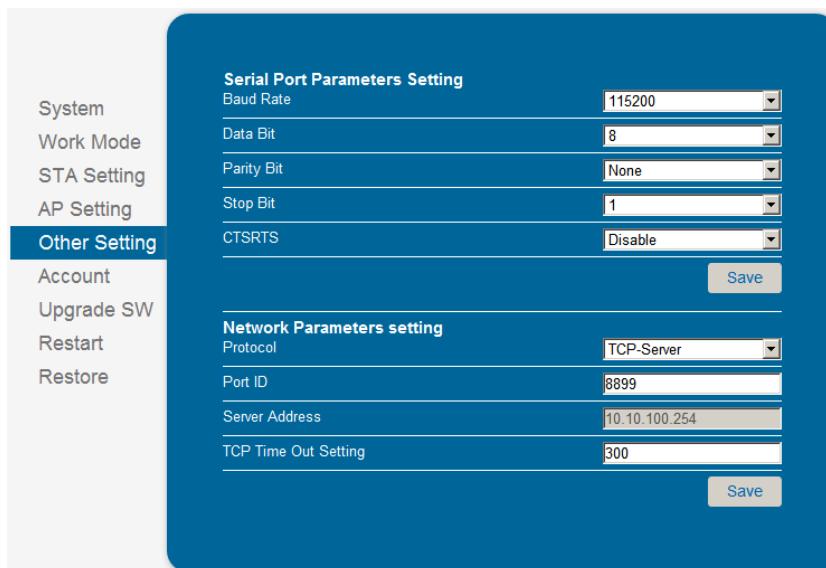


Figure 53. Other Setting Page

3.1.7. Account Management Page

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

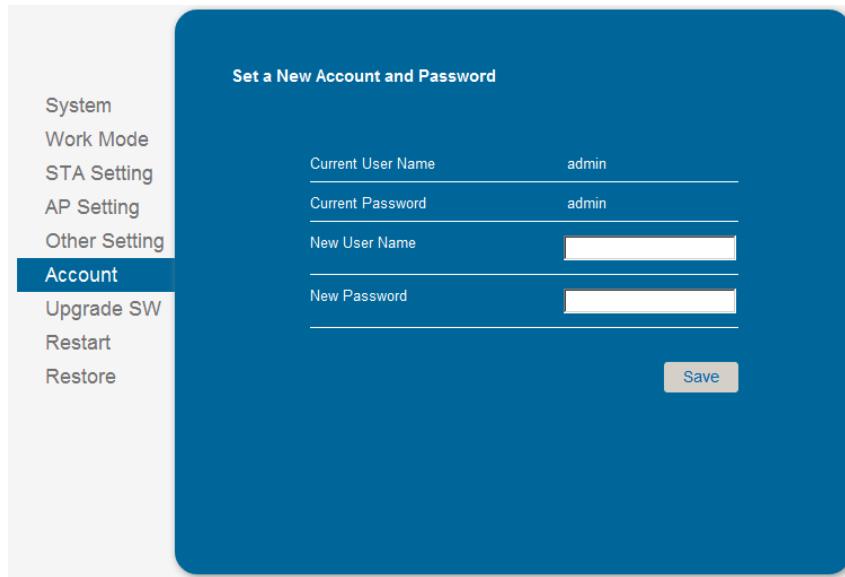


Figure 54. Account Page

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.

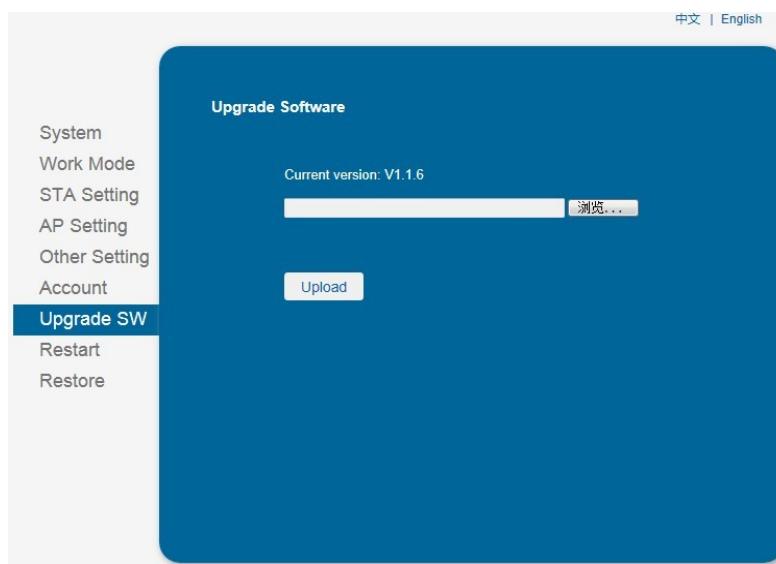


Figure 55. Upgrade SW page

3.1.9. Restart Page

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

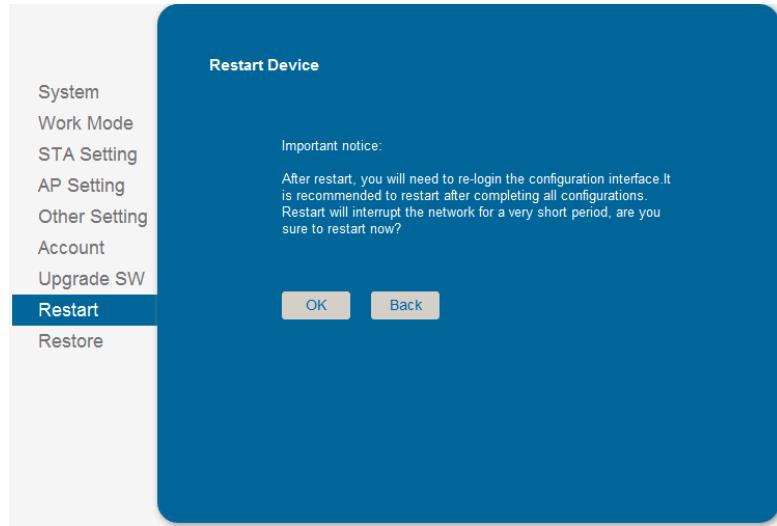


Figure 56. Restart Page

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-LPT270 will restore to AP mode for factory default setting.

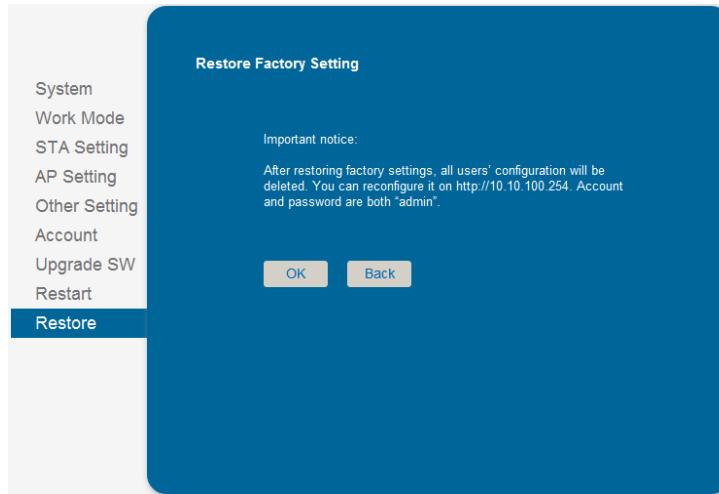


Figure 57. Restore Page

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..

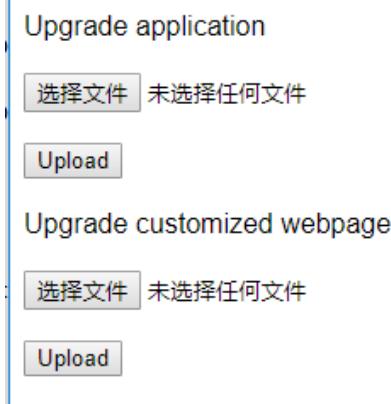


Figure 58. Internal Webpage

3.2. Usage Introduction

3.2.1. Software Debug Tools

High-Flying use two common software tools debugging and applying HF-LPT270 module.
(User can also select other tools used to debug serial port).

- Serial Debugging Software: ComTools 
- Ethernet Debugging Software: TCPUDPDBG 

3.2.2. Network Connection

User can select two methods to connect HF-LPT270 module base on dedicated application.

- **Use HF-LPT270 STA interface.** HF-LPT270 and debug PC2 connect to a wireless AP, another PC1 (or user device) connect to HF-LPT270 module with serial port:



Figure 59. STA Interface Debug Connection

- **Use HF-LPT270 AP interface.** Debug PC2 connect to HF-LPT270 through wireless connection, another PC1 (or user device) connect to HF-LPT270 module with serial port.



Figure 60. AP Interface Debug Connection

3.2.3. Default Parameter Setting

- Default SSID: HF-LPT270;

- Default 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-LPT270 module and open serial port connection.

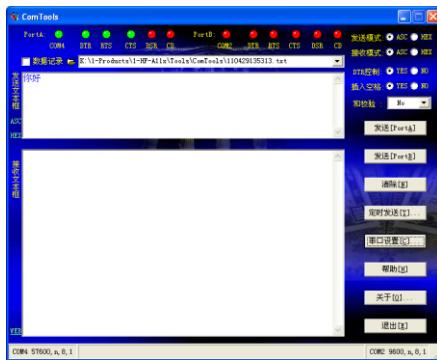


Figure 61. “CommTools” Serial Debug Tools

PC2 open “TCPUDPDbg” program, and create a new connection. If HF-LPT270 configured as Server mode, “TCPUDPDbg” Tools shall create “Client” mode connection. Or otherwise, create a “Server” mode connection.

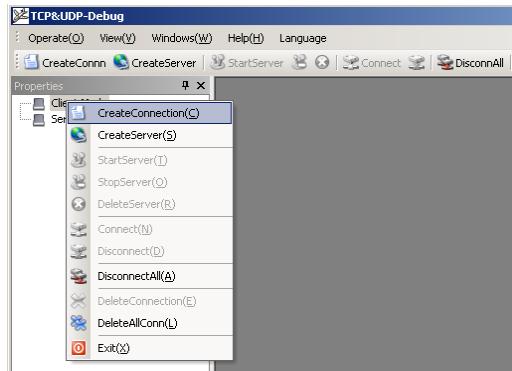


Figure 62. “TCPUDPDbg” Tools Create Connection

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

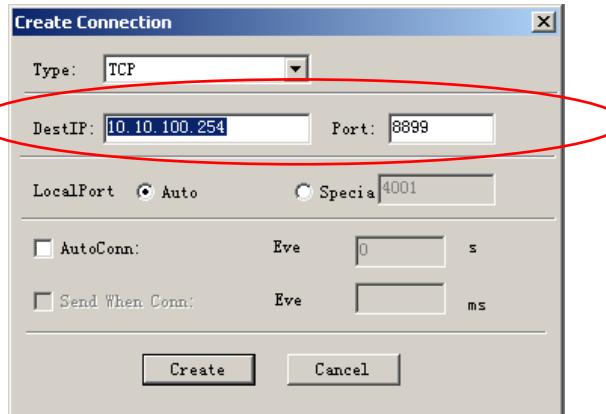


Figure 63. "TCPUDPDbg" Tools Setting

Then, click "Create" button to create a connection.

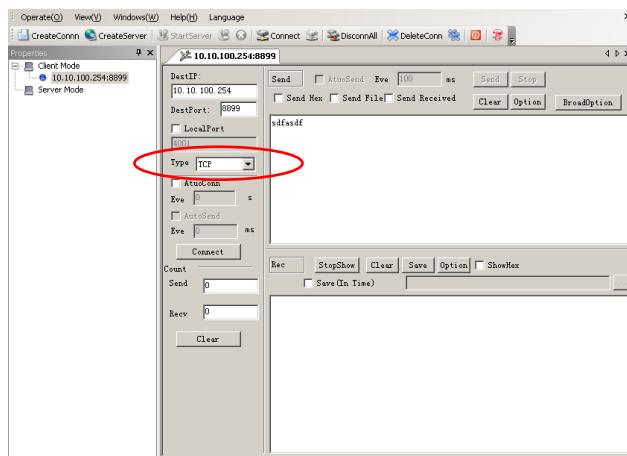


Figure 64. "TCPUDPDbg" Tools Connection

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 65. Wireless Control Application

For this wireless control application, HF-LPT270 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-LPT270 module.

3.3.2. Remote Management Application

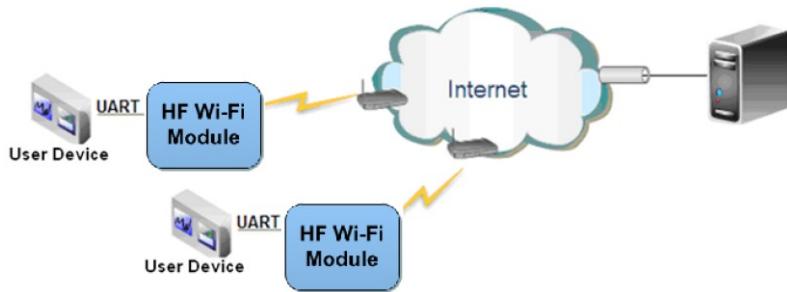


Figure 66. Remote Management Application

For this remote management application, HF-LPT270 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-LPT270 modules connect as below figures to build up a transparent serial port connection. One HF-LPT270 works as AP mode, another HF-LPT270 works as STA mode. Make the STA device connects to AP.



Figure 67. Transparent Serial Port Application

4. AT+INSTRUCTION INTRODUCTION

4.1. Configuration Mode

When HF-LPT270 power up, it will default works as transparent transmission mode, then user can switch to configuration mode by serial port command. HF-LPT270 UART default parameters setting as below figure,

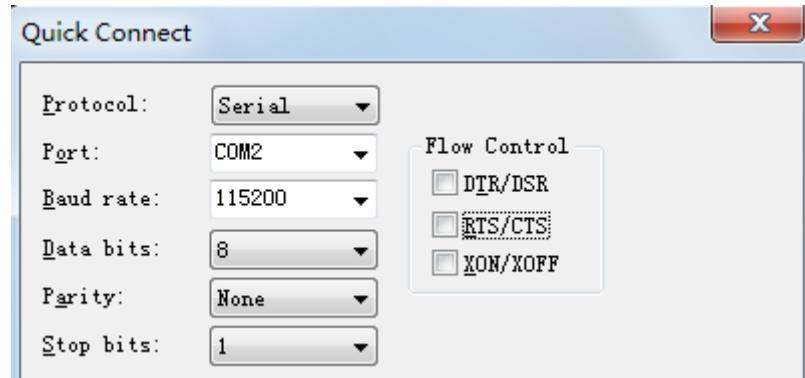


Figure 68. HF-LPT270 Default UART Port Parameters

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.**

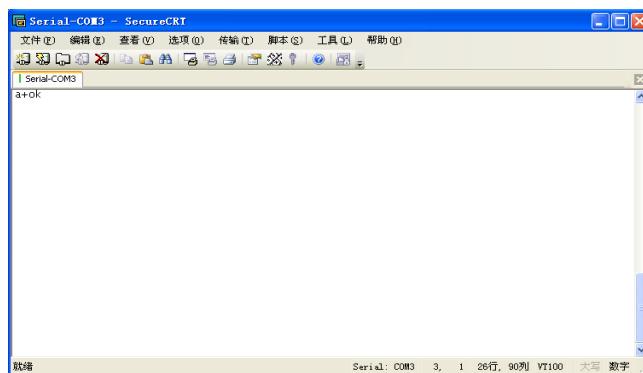
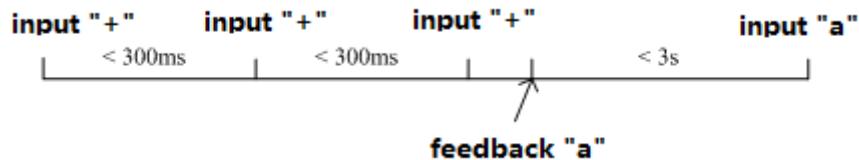


Figure 69. Switch to Configuration Mode

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.

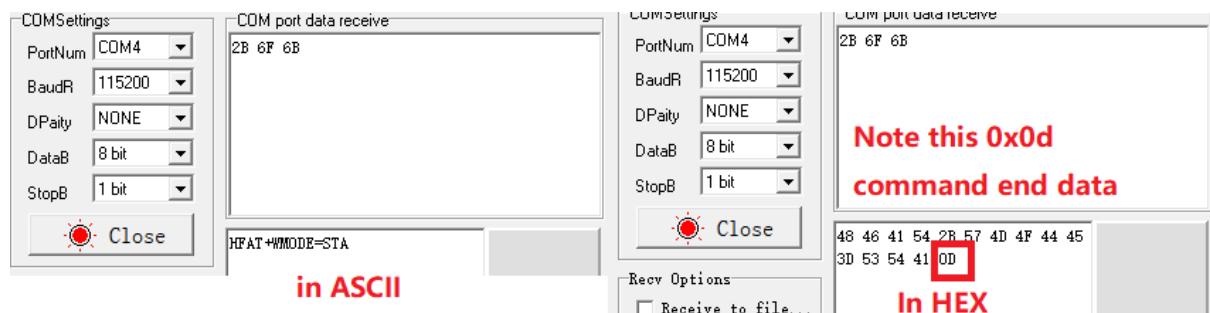
2. Any other input or wrong step to UART port will cause the module still works as original mode (transparent transmission).
3. “+++” and “a” should be input in a certain period of time to make the module switch to configuration mode. Like the following sequence.



4.1.2. Send AT Command in Transparent Transmission Mode

After set AT+CMODE=HF(default is enabled), the module support response AT command for special data format as “prefix”+“AT command”+“\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+CMODE=HF(default is enabled), then send the following data in transparent mode, and get the AT command response. This data won't be sent to socket.



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 trigger 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+WSLQ: 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+TCPBK: Get the state of TCP link.
AT+TCPOT: Set/Get TCP time out.
AT+TCPDIS: Connect/Dis-connect the TCP client link
AT+RECV: Recv 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 70. "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

Table14. 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 Special Character

AT+Instruction has special meaning for “=?” and “\r\n”, if parameters use these characters, need to do format transform. Transform rules is using 【\\ + character Hex format】 , see following example

, : 0x2C
= : 0x3D
? : 0x3F

AT+WSSSID=DDDDDD\\2C\\3D\\3FSSSS, the response will show the exact character.

```
AT+WSSSID=DDDDDD\\2C\\3D\\3FSSSS
+ok

AT+WSSSID
+ok=DDDDD,=?SSSS
```

4.2.3. Management Command

4.2.3.1. AT+: Null command, used for if module in AT command mode

- Format:
 - ◆ Query Operation

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

If response with +ok, then module is in AT command mode.

4.2.3.2. AT+E: 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-LPT270 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..

4.2.3.3. AT+CMDPW: 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 【HF】 , set 【off】 to disable this function. The maximum is 20 character 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).

4.2.3.4. AT+WEL: Set/Query boot welcome message

■ Format:

◆ Query Operation:

AT+WEL<CR>

+ok=<message><CR><LF><CR><LF>

◆ Set Operation:

AT+WEL=<message><CR>

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

■ Parameter:

◆ message: Bootup welcome message output, default is product type such as 【HF-LPT270】 ; If it is 【off or blank】 , means this function be closed, max 10 bytes.

4.2.3.5. AT+EVENT: Set/Query event notification function. Setting is valid after reset

■ Format:

◆ Query Operation:

AT+EVENT<CR>

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

◆ Set Operation:

AT+EVENT=<status><CR>

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

- Parameter:
 - ◆ status: Enable/Disable event notification function
 - off: Disable
 - on: Enable event notification function, default value.

Meet with following condition, module output UART data initiatively.

Event Notification Data	Condition
+EVENT=SOCKA_ON	SOCKA connection success (TCP Client/Server, HTTP, MQTT)
+EVENT=SOCKA_OFF	SOCKA connection break (TCP Client/Server, HTTP, MQTT)
+EVENT=SOCKB_ON	SOCKB connection success (TCP Client)
+EVENT=SOCKB_OFF	SOCKB connection break (TCP Client)
+EVENT=CON_ON	STA Connect to router success
+EVENT=CON_OFF	STA Disconnect with router
+EVENT=DHCP_OK	STA DHCP got IP

4.2.3.6. AT+ENTM: 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.

4.2.3.7. AT+TMODE: 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

4.2.3.8. AT+MID: Query module ID information

- Format:

- ◆ Query Operation

```
AT+MID<CR>
+ok=<module_id><CR><LF><CR><LF>
```

- Parameters:

- ◆ module_id: Module ID information;
 - ❖ HF-LPT270;

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

4.2.3.9. AT+WRMID: Set module ID

- Format:

- ◆ Set Operation
- AT+WRMID=<wrmid> <CR><LF><CR><LF>**
- Parameters:
 - ◆ wrmid: set module's ID, range within 20 characters.

4.2.3.10. AT+BTWAIT: Enable/Disable UART booloader function

- Format:
 - ◆ Query Operation
- AT+BTWAIT<CR>**
- +ok=<status><CR><LF><CR><LF>**
- ◆ Set Operation
- AT+BTWAIT=<status><CR>**
- +ok<CR><LF><CR><LF>**
- Parameters:
 - ◆ status: Enable/Disable UART bootloader,
 - ◊ Enable: Enable UART bootloader, default value.
 - ◊ Disable: Disable.

Note: For LED application using nReload PIN for PWM output, if disable this UART bootloader, it will save about 1 second for bootup make the LED on more quickly.

4.2.3.11. AT+NDBGL: 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 than this set value
 - ◆ uart_num: UART debug information output channel
 - ◊ 0: UART0
 - ◊ 1: UART1, 921600bps, with more system information output.

4.2.3.12. AT+SMEM: Query the RAM malloc status

- Format:
 - ◆ Query Operation
- AT+SMEM<CR>**
- +ok=<status><CR><LF><CR><LF>**
- Parameters:
 - ◆ status: The remained RAM status, bytes. Ex: current_size: 126736

4.2.3.13. AT+FLASH: Set/Query Flash content

■ Format:

- ◆ Query Operation

AT+FLASH<CR>

+ok=<value><CR><LF><CR><LF>

- ◆ Set Operation

AT+FLASH=<type,address[,range]><CR>

+ok[=result]<CR><LF><CR><LF>

■ Parameters:

- ◆ value: flash type query

- 2MB(Int): SOC internal 2MB Flash
- 2MB(Ext): SOC external 2MB Flash
- 8MB(Ext): SOC external 8MB Flash

- ◆ type:

- R: Read
- W: Write, Xmodem to transfer file
- C: MD5 check

- ◆ address: flash address relative address, start from 0, 4K (0x1000) Hex format, the absolute flash address refer to following flash mapping table.

0x0000 0000	BOOT(68KB) Bootloader area
0x0001 1000	CODE (916KB) Run code area
0x000F 6000	USER_BIN_FILE (4KB) hffile_userbin_write API interface actual physical address
0x000F 7000	USER_BIN_BACK_FILE (4KB) hffile_userbin_write API interface actual physical address backup area
0x000F 8000	BOOT_CONFIG(8KB) System use
0x000F A000	USERPAGE (4KB) User parameter storage area
0x000F B000	USERPAGE_BACKUP (4KB) User parameter save and backup area
0x000F C000	F_SETTING (4KB) Factory parameter storage area
0x000F E000	SYSTEM_SECTOR (8KB) System use
0x0010 0000	WEB (200KB) External web page
0x0013 2000	OTA UPGRADE(580KB) OTA upgrade backup area
0x001C 3000	UFLASH (200KB)  User flash
0x001F 5000	Unused area(44KB)

- ◆ range: Range

- R read operation, define the length of read, hex format, write 1000 for reading 1000 bytes content. Following is 96 bytes for example.

```
00000000 00 01 F0 FE 23 FF 80 60 64 36 78 44 51 6A 35 6D 4D 6E 6B 72 45 53 47 52
00000018 F9 86 3D 30 97 ED AA 7B AD EA B5 A4 BF FC EC 48 FB F5 36 B3 0B 64 98 AC
00000030 36 20 47 22 CA 1B 94 6C 48 04 C1 79 A3 FB 85 53 42 5F D8 D3 78 F0 38 51
00000048 52 CE 42 61 69 0D 04 83 A1 38 EC 24 92 8B 46 0C F0 64 E1 00 90 45 C4 42
```

- W operation leave it blank, the actual size is according to the file. max is user flash area (200KB)
- C check operation, hex format, write 1000 to check 1000 bytes.
- ◆ result:
 - Invalid: operation invalid.
 - md5: return md5 for C operation

4.2.3.14. AT+VER: Query module software version information

- Format:
 - ◆ Query Operation
- AT+VER<CR>

+ok=<ver><CR><LF><CR><LF>
- Parameters:
 - ◆ ver: Module software version information;

4.2.3.15. AT+WEBVER: Query module webpage software version information

- Format:
 - ◆ Query Operation
- AT+WEBVER<CR>

+ok=<ver><CR><LF><CR><LF>
- Parameters:
 - ◆ ver: Module webpage version information;

4.2.3.16. AT+Z: Restart module

- Format:
 - AT+Z<CR>

4.2.3.17. AT+H: Help

- Format:
 - ◆ Query Operation
- AT+H<CR>

+ok=<command help><CR><LF><CR><LF>
- Parameters:
 - ◆ command help: command introduction;

4.2.4. Factory Parameter Command

4.2.4.1. AT+RELD: 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.

4.2.4.2. AT+FCLR: Erase factory setting

- Format:
 - ◆ Query Operation

AT+FCLR<CR>

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

4.2.4.3. AT+CFGTF: Copy User Parameters to Factory Default Parameters;

- Format:
 - ◆ Query Operation
- AT+CFGTF<CR>
- +ok=<status><CR><LF><CR><LF>
- Parameters:
 - ◆ status: feedback operation status;

4.2.5. UART Parameter Command

4.2.5.1. AT+UART: 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:
 - ◇ 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 380400, 460800, 921600
 - ◆ data_bits:
 - ◇ 7, 8
 - ◆ stop_bits:
 - ◇ 1, 2
 - ◆ parity:
 - ◇ NONE
 - ◇ EVEN
 - ◇ ODD
 - ◆ Flowctrl: (CTSRTS)
 - ◇ NFC: No hardware flow control
 - ◇ FC: hardware flow control (2.00.09 or higher version support this)

4.2.5.2. AT+UARTTM: Set/Query the Two-Frame Time Interval When the Serial Port Receives Data

■ Format:

- ◆ Query Operation:

```
AT+UARTTM<CR>
```

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

- ◆ Set Operation:

```
AT+UARTTM=<interval><CR>
```

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

■ Parameter:

- ◆ interval: Serial port division interval, default 【10】 ms, range 10~1000ms

4.2.5.3. AT+UARTBUF: Set/Query the maximum Serial Port frame size

■ Format:

- ◆ Query Operation:

```
AT+UARTBUF<CR>
```

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

- ◆ Set Operation:

```
AT+UARTBUF=<size><CR>
```

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

■ Parameter:

- ◆ size: Serial port maximum frame size, default 【1400】 bytes, range 32~1400.

4.2.6. Network Protocol Command

4.2.6.1. AT+PING: 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, range 1~100

- ◆ size: Ping packet size. Default is 32 bytes, range <=1472

- ◆ sta: feedback result

- ◆ Success

- ◆ Timeout

- ◆ Unknown host

4.2.6.2. AT+NETP: Set/Query SOCKA network protocol parameters. Setting is valid immediately

■ Format:

- ◆ Query Operation

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

```
+ok=<protocol,CS,port,IP[,opt]><CR><LF><CR><LF>
```

- ◆ Set Operation

```
AT+NETP=<protocol[,CS,port,IP[.opt]]><CR>
```

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

- Parameters:
 - ◆ protocol:
 - ◊ TCP
 - ◊ UDP
 - ◊ HTTP
 - ◊ MQTT
 - ◊ IGMP: multicast function
 - ◆ CS: Network mode:
 - ◊ SERVER
 - ◊ CLIENT
 - ◆ Port: protocol port ID: Decimal digit and less than 65535
 - ◆ IP: Server's IP address or domain name when module set as client, domain name length length <= 100
 - ◆ opt: optional parameter, 【TLS, contact us for this special TLS function firmware】

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.

Setting Example

- AT+NETP=TCP,CLIENT,8899,192.168.1.1
- AT+NETP=TCP,CLIENT,80,www.baidu.com
- AT+NETP=MQTT,80,www.XXXX.com
- AT+NETP=HTTP,80,www.XXXX.com
- AT+NETP=http,443,XXXX.cn,NULL,TLS
- AT+NETP=TCP,client,8899,192.168.1.1,TLS
- AT+NETP=TCP,client,443,XXXX.cn,TLS
- AT+NETP=MQTT,80,www.XXXX.com,NULL,TLS

multicast function

AT+NETP=IGMP,CLIENT,8899,239.255.0.1 //Socket A is used for UDP multicast communication, 8899 is destination port, 239.255.0.1 is multicast IP. is protocol is IGMP, IP is not multicast IP, response with ERR.

AT+SOCKB=IGMP,9999,239.255.0.2 //Socket B is used for UDP multicast communication

AT+UDPLCPT=XXXX,XXXXX, //set UDP local port, also applicable for multicast UDP.

4.2.6.3. AT+NETPIDEN: Set/query whether display from which communication channel the data comes from, and the setting will take effect after reset

- Format:
 - ◆ Query Operation:

```
AT+NETPIDEN=<id><CR>
+ok=<id,status,flag><CR><LF><CR><LF>
```

- ◆ Set Operation:

```
AT+NETPIDEN=<id,status[,flag]><CR>
+ok<CR><LF><CR><LF>
```

- Parameter:
 - ◆ id: Communication channel number, including the following parameters.
 - ✧ A: SOCKA channel.
 - ✧ B: SOCKB channel.
 - ✧ C: BLE Channel
 - ◆ status: Status values, including the following parameters.
 - ✧ on: Enable.
 - ✧ off: Close, default 【off】.
 - ◆ flag: Only valid for BLE channel, it means if sending the channel number tag value to UART when BLE receive data.
 - ✧ 0 or not set: send tag value.
 - ✧ 1: omit the tag value.

Under enabled status, increase the communication channel number tag value in the received data header, such as receiving data 【abc】 , and the actual serial port output 【#SOCKA#abc】 .

Under serial port transmission mode, user must increase the communication channel number tag value in the header, so that the data will only be sent to the specified channel. For example, you need to send data 【abc】 to the SOCKA channel, and the actual serial port needs to send 【#SOCKA#abc】 .

Under disabling mode, the data output by the serial port does not distinguish the communication channel number, and the data received by the serial port is sent to all communication channels pointing to the serial port number.

4.2.6.4. AT+NETPID: Set/query the communication channel number tag value

- Format:
 - ◆ Query Operation:
AT+NETPID=<id><CR>
+ok=<id,value><CR><LF><CR><LF>
 - ◆ Set Operation:
AT+NETPID=<id,value><CR>
+ok<CR><LF><CR><LF>
- Parameter:
 - ◆ id: Communication channel number, including the following parameters.
 - ✧ A: SOCKA channel.
 - ✧ B: SOCKB channel.
 - ✧ C: BLE channel
 - ◆ value: Communication channel number mark, SOCKA default 【#SOCKA#】 , SOCKB default 【#SOCKB#】 , BLE default 【#BLE#】 and so on, up to 10 characters.

4.2.6.5. AT+MAXSK: 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.

4.2.6.6. AT+TCPLK: 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;

4.2.6.7. AT+TCPPTO: Set/Query SOCKA TCP timeout; Setting is valid after reset

■ Format:

- ◆ Query Operation

```
AT+TCPPTO<CR>
+ok=<time><CR><LF><CR><LF>
```

- ◆ Set Operation

```
AT+TCPPTO=<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, clear 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.

4.2.6.8. AT+TCPDIS: Open/Close SOCKA TCP client link

■ Format:

- ◆ Query Opera

```
AT+TCPDIS<CR>
+ok=<sta><CR><LF><CR><LF>
```

- ◆ Set Operation

```
AT+TCPDIS =<sta[,opt]><CR>
+ok<CR><LF><CR><LF>
```

■ Parameters:

- ◆ sta.: Response with TCP client connection setting status,
 - ◊ On: Allow TCP client connection, default value.
 - ◊ off: Forbidden or break TCP Client connection
- ◆ opt: function code, save to flash or not, option parameter. if not fill in, default is 0.
 - ◊ 0: setting not saved to flash
 - ◊ 1: setting saved to flash

When setting, “off” means close TCP client 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.

If set opt to 0, the setting won’t saved to flash, module AT+TCPDIS is on by default, if set opt to 1, setting saved to flash, AT+TCPDIS status depends on previous setting.

4.2.6.9. AT+SEND: 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.

4.2.6.10. AT+RECV: Receive Data from SOCKA at Command Mode

■ Format:

```
AT+RECV=<data_lenth[,timeout]><CR>
+ok=< data_lenth, data_content><CR><LF><CR><LF>
```

■ Parameters:

- ◆ data_lenth: Lenth of receive data. Range: 0~1000 Byte
- ◆ timeout: wait for timeout, 0~10 sec, default is 3 seconds if not be filled
- ◆ data_content: contents of receive data.

If not receive any data in timeout seconds, then feedback +ok=0.

SOCKA works as TCP client or UDP, buffer multiple packet (same LPB100 scheme) , wait for AT+RECV command to receive packet, support multiple AT+RECV to receive the whole buffered packet.

SOCKA works as TCP server, buffer latest one packet (same LPB100 scheme) , wait for AT+RECV command to receive packet, support multiple AT+RECV to receive the whole buffered packet.

4.2.6.11. AT+SOCKB: 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
- ❖ IGMP: UDP Multicast
- ◆ Port: Protocol Port in decimal, less than 65535
- ◆ IP: Destination IP address or domain name, domain name length <= 100

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.

4.2.6.12. AT+TCPDISB: Open/Close SOCKB TCP client link

■ Format:

- ◆ Query Opera

AT+TCPDISB<CR>

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

- ◆ Set Operation

AT+TCPDISB=<sta[,opt]><CR>

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

■ Parameters:

- ◆ sta.: Response with SOCKB TCP client connection setting status,
 - ❖ On: Allow TCP client connection, default value.
 - ❖ off: Forbidden or break TCP Client connection
- ◆ opt: function code, save to flash or not, option parameter. if not fill in, default is 0.
 - ❖ 0: setting not saved to flash
 - ❖ 1: setting saved to flash

When setting, "off" means close TCP client 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.

If set opt to 0, the setting won't saved to flash, module AT+TCPDISB is on by default, if set opt to 1, setting saved to flash, AT+TCPDISB status depends on previous setting.

4.2.6.13. AT+TCPTOB: 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.

4.2.6.14. AT+TCPLKB: 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

4.2.6.15. AT+SNDB: 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.

4.2.6.16. AT+RCVB: Receive datas from SOCKB at Command Mode

■ Format:

```
AT+RCVB=<data_lenth[,timeout]><CR>
+ok=<data_lenth,data_content><CR><LF><CR><LF>
```

■ Parameters:

- ◆ data_lenth: Lenth of receive data. Range: 0~1000 Byte
- ◆ timeout: wait for timeout, 0~10 sec, default is 3 seconds if not be filled
- ◆ data_content: contents of receive data.

If not receive any data in timeout seconds, then feedback +ok=0.

SOCKB works as TCP client or UDP, buffer multiple packet (same LPB100 scheme) , wait for AT+RCVB command to receive packet, support multiple AT+RCVB to receive the whole buffered packet.

4.2.6.17. AT+UDPLCPT: Set/Query UDP local port of SOCKA and SOCKB

■ 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 SOCKA, 0: local port is same as destination.
 - ◆ porta: UDP local port of SOCKB, 0: local port is same as destination.

4.2.6.18. AT+NREGEN: Set/Query Communication Channel Number Registration Package Function

- Format:
 - ◆ Query Operation:
AT+NREGEN=<id><CR>
+ok=<id,status><CR><LF><CR><LF>
 - ◆ Set Operation:
AT+NREGEN=<id,status><CR>
+ok<CR><LF><CR><LF>
- Parameter:
 - ◆ id: Communication channel number, including the following parameters.
 - A: SOCKA channel.
 - B: SOCKB channel.
 - ◆ status: Status value, including the following parameter.
 - on: Enable.
 - off: Close, default 【off】.

4.2.6.19. AT+NREGDT: Set/query communication channel number registration package function

- Format:
 - ◆ Query Operation:
AT+NREGDT=<id><CR>
+ok=<id,value><CR><LF><CR><LF>
 - ◆ Set Operation:
AT+NREGDT=<id,value><CR>
+ok<CR><LF><CR><LF>
- Parameter :
 - ◆ id: Communication channel number, including the following parameters.
 - A: SOCKA channel.
 - B: SOCKB channel.
 - ◆ data: Custom data, up to 40bytes, % wildcard has special function, as an escape character, Use % to send data in HEX format(Ex. %25), it also support special strings as following.
 - %MAC: MAC address
 - %WSLQ: Wi-Fi status, 2 bytes, the first for Wi-Fi status(1: Connect rotuer OK, 0: Not connect to router), the second for Wi-Fi signal strength, HEX format, Ex: 01 16

There are several ways to match custom data, such as:

The contents of the registration package are ASCII code 【ABCDEFG】

➤ AT+NREGDT=A, ABCDEFG

The contents of the registration package are hexadecimal 【0x01 0x02 0x03 0x04 0x05】

➤ AT+NREGDT=A,%01%02%03%04%05

The content of the registration package is MAC+ data 【355837089512343 0x00 0x01 0x02 0x03】

➤ AT+NREGDT=A,%MAC%00%01%02%03

4.2.6.20. AT+NREGSND: Set/Query the Transmission Method of the Communication Channel

Number Registration Package

- Format:
 - ◆ Query Operation:
AT+NREGSND=<id><CR>
+ok=<id,type><CR><LF><CR><LF>
 - ◆ Set Operation:

```
AT+NREGSND=<id,type><CR>
+ok<CR><LF><CR><LF>
```

- Parameter:
 - ◆ id: Communication channel number, including the following parameters.
 - A: SOCKA channel.
 - B: SOCKB channel.
 - ◆ type: Sending method, including
 - link: Send when the connection is established, default 【link】
 - data: The registration packet as the header of each packet of data
 - both: Support both methods at the same time

4.2.6.21. AT+HEART: Set/query communication channel number heartbeat packet data

- Format:
 - ◆ Query Operation:


```
AT+HEART=<id><CR>
+ok=<id,time,mode,type,value><CR><LF><CR><LF>
```
 - ◆ Set Operation:


```
AT+HEART=<id,time,mode,type,value><CR>
+ok<CR><LF><CR><LF>
```
- Parameter:
 - ◆ id: channel number, send heartbeat packets to a specific channel, including the following parameters.
 - A: SOCKA channel.
 - B: SOCKB channel.
 - 1: Serial port 1 channel.
 - ◆ time: Heartbeat interval, default 【0】 seconds, stands for disable heartbeat function, range 0~65535, this time is valid after reboot.
 - ◆ data: Custom data, up to 38 bytes, support escape characters, please refer to AT+NREGDT command for details. When SOCKA is used for MQTT, this content is of no use.

4.2.7. SOCKA Channel HTTP Command (Need Set to HTTP mode)

4.2.7.1. AT+HTPTP: Set/query HTTP request type. Setting will take effect after reset

- Format:
 - ◆ Query Operation:


```
AT+HTPTP<CR>
+ok=<type,method><CR><LF><CR><LF>
```
 - ◆ Set Operation:


```
AT+HTPTP=<type[,method]><CR>
+ok<CR><LF><CR><LF>
```
- Parameter:
 - ◆ type: HTTP request type
 - GET: GET request
 - POST: POST request
 - ◆ method: HTTP data method, optional value, if not fill, default is 0 only POST request valid.
 - 0: Default value, received UART data is put in HTTP body.
 - 1: received UART data is put in HTTP url parameters, auto add "?" between url and parameters(UART received data)

4.2.7.2. AT+HTPURL: Set/query HTTP url resources and version. Setting will take effect after reset

- Format:
 - ◆ Query Operation:


```
AT+HTPURL<CR>
+ok=<path,version><CR><LF><CR><LF>
```
 - ◆ Set Operation:


```
AT+HTPURL=<path,version><CR>
```

- +ok<CR><LF><CR><LF>
- Parameter:
 - ◆ path: url resource, 50 characters length maximum, default: /abcd
 - ◆ version: HTTP protocol version, 1.0 or 1.1 default: 1.1

4.2.7.3. AT+HTPHEAD: Set/query HTTP header. Setting will take effect after reset

- Format:
 - ◆ Query Operation:
- AT+HTPHEAD<CR>
+ok=<header><CR><LF><CR><LF>
- ◆ Set Operation:
- AT+HTPHEAD=<header><CR>
+ok<CR><LF><CR><LF>
- Parameter:
 - ◆ header: HTTP header, for new line in header use "<CRLF><CRLF>". 180 characters maximum.
- AT+HTPHEAD=Host:1.1.1.1<CRLF><CRLF>
+ok

4.2.7.4. AT+HTPPARA: Set/query HTTP parameters. Setting will take effect after reset

- Format:
 - ◆ Query Operation:
- AT+HTPPARA<CR>
+ok=<time><CR><LF><CR><LF>
- ◆ Set Operation:
- AT+HTPPARA=<time><CR>
+ok<CR><LF><CR><LF>
- Parameter:
 - ◆ time: HTTP short link break time after sent packet to HTTP server, default is 5 seconds, range 0~60, 0 for disable this scheme, always keep connection to server.

4.2.8. SOCKA Channel MQTT Command (Need Set to MQTT mode)

4.2.8.1. AT+MQTOPIC: Set/query MQTT topic content. Setting will take effect after reset

- Format:
 - ◆ Query Operation:
- AT+MQTOPIC<CR>
+ok=<publish,subscribe><CR><LF><CR><LF>
- ◆ Set Operation:
- AT+MQTOPIC=<publish,subscribe[,opt]><CR>
+ok<CR><LF><CR><LF>
- Parameter:
 - ◆ publish: publish topic, default: %MAC/up, %MAC is module MAC address, show real MAC when query. Max 60 characters.
 - ◆ subscribe: subscribe topic, default: %MAC/down, max 60 characters
- AT+MQTOPIC=%MAC/up,%MAC/down
+ok

 AT+MQTOPIC
+ok=F0FE6BBD4656/up,F0FE6BBD4656/down
- Parameter:
 - ◆ opt: option parameter, default is saved to flash if not fill in this.
 - ◆ 0: Not save to flash, used for scene that change topic frequently.
 - ◆ 1: Save to flash.

4.2.8.2. AT+MQLOGIN: Set/query MQTT login content. Setting will take effect after reset

- Format:

- ◆ Query Operation:
AT+MQLOGIN<CR>
+ok=<user,password><CR><LF><CR><LF>
- ◆ Set Operation:
AT+MQLOGIN=<user,password><CR>
+ok<CR><LF><CR><LF>
- Parameter:
 - ◆ user: login user, max 32 characters.
 - ◆ login: login password, max 32 characters.

4.2.8.3. AT+MQID: Set/query MQTT login content. Setting will take effect after reset

- Format:
 - ◆ Query Operation:
AT+MQID<CR>
+ok=<id><CR><LF><CR><LF>
 - ◆ Set Operation:
AT+MQID=<id><CR>
+ok<CR><LF><CR><LF>
- Parameter:
 - ◆ id: Client ID, must be different for each device, recommend to use MAC for this Client ID, max 32 characters. Support %MAC for setting, show real MAC when query

```
AT+MQID=%MAC
+ok

AT+MQID
+ok=F0FE6BBD4656
```

4.2.8.4. AT+MQPARA: Set/query MQTT parameters. Setting will take effect after reset

- Format:
 - ◆ Query Operation:
AT+MQPARA<CR>
+ok=<heartbeat,QoS><CR><LF><CR><LF>
 - ◆ Set Operation:
AT+MQPARA=<heartbeat, QoS><CR>
+ok<CR><LF><CR><LF>
- Parameter:
 - ◆ heartbeat: MQTT heartbeat time, default is 60, range 0~300.
 - ◆ QoS: MQTT QoS, default is 0, range 0,1,2.

4.2.9. Wi-Fi STA Command

4.2.9.1. AT+WSSSID: 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);

4.2.9.2. AT+WSKEY: Set/Query STA security parameters. Setting is valid after reset

■ Format:

- ◆ Query Operation

```
AT+WSKEY<CR>
```

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

- ◆ Set Operation

```
AT+WSKEY=<key><CR>
```

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

■ Parameters:

- ◆ key: password needed for STA connecting to AP.

- ◆ No password: AT+WSKEY=OPEN,NONE

- ◆ Password: length is 5 or 8~63 bytes, response will add “WPA2PSK,AES” prefix for query command.

```
AT+WSKEY=12345678
+ok

AT+WSKEY
+ok=WPA2PSK,AES,12345678

AT+WSKEY=OPEN,NONE
+ok

AT+WSKEY
+ok=OPEN,NONE
```

If there is special character such as “=?” (These three are used for AT command parameters distinction), need do format transform.

```
AT+WSKEY=123\\2C\\3D\\3F678
+ok

AT+WSKEY
+ok=WPA2PSK,AES,123,=?678
```

4.2.9.3. AT+WANN: 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;

4.2.9.4. AT+WSMAC: 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, contach us if need to change MAC.

4.2.9.5. AT+WSLK: 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;

4.2.9.6. AT+WSLKO: Query/Set STA WiFi connection order function

■ Format:

- ◆ Query Operation

```
AT+WSLKO<CR>
```

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

- ◆ Set Operation

```
AT+WSLKO=<order><CR>
```

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

■ Parameters:

- ◆ Order: order scheme. When there is much same name and password SSID, If enable this order function, module will connect to the strongest signal strength. If disabled, it will connect to the first response AP(may connect to the weaker AP). Enable this function will cost 2 more seconds more first connect time.

◇ Enable: Enable order function.

◇ Disable: Disable order function, default.

4.2.9.7. AT+WSLQ: Query STA WiFi signal strength

■ Format:

- ◆ Query Operation

```
AT+WSLQ[=ssid]<CR>
```

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

■ Parameters:

- ◆ ssid: scan specific AP signal strength, can be used for factory test
- ◆ ret
 - ◊ Disconnected: if no WiFi connection;
 - ◊ Good, strength: strength > 70% shows Good
 - ◊ Normal, strength: 70% >= strength >40% shows Normal
 - ◊ Weak, strength: 40% >= strength shows Weak.
 - ◊ None: Specific SSID scanned not exist. shows None.

AT+WSLK
+ok=Sam401_bed(42:FC:8B:B6:E5:1B)

AT+WSLQ
+ok=Good, 100%

AT+WSLQ=TP-LINK_402
+ok=Good, 84%

RSSID and our defined percentage relationship is as following.

wifi_transform_rssi(int rssi_dbm)

```
{
    int ret;
    ret = (rssi_dbm+95)*2;
    if (ret < 70)
        ret = ret -(15 - ret/5);
    if(ret < 0)
        ret = 0;
    else if(ret >100)
        ret = 100;
    return ret;
}
```

4.2.9.8. AT+WSCAN: Scan AP, max show 50 item

■ Format:

AT+WSCAN[,ssid]<CR>
+ok=<ap_site><CR><LF><CR><LF>

■ Parameters:

- ◆ ap_site: AP searched.
- ◆ ssid: Scan specific AP SSID

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

```
AT+WSCAN=TP-LINK_402
+ok=
ch,SSID,BSSID,Security,Indicator
1,TP-LINK_402,78:A1:06:FF:03:AA,WPAPSKWPA2PSK/AES,78
+ok
```

4.2.9.9. AT+WSDNS: Set/Query STA static DNS server address

- Format:
 - ◆ Query Operation
- ```
AT+WSDNS<CR>
+ok=<address><CR><LF><CR><LF>
```
- ◆ Set Operation
- ```
AT+WSDNS =<address><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
 - ◆ address: STA's DNS server address; Effective right away.

4.2.10. Wi-Fi AP Command

4.2.10.1. AT+LANN: 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;

4.2.10.2. AT+WAMAC: Set/Query Module AP and BLE MAC address parameters

- Format:
 - ◆ Query Operation
- ```
AT+WAMAC<CR>
+ok=<mac_address><CR><LF><CR><LF>
```

AP and STA MAC is the same, BLE MAC is STA MAC+1.

Ex:

|                 |              |
|-----------------|--------------|
| AP and STA MAC: | 98D86323D16E |
| BLE MAC:        | 98D86323D16F |

##### 4.2.10.3. AT+WAP: Set/Query AP Wi-Fi parameters. 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[,hideSSID]><CR>

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

■ Parameters:

- ◆ wifi_mode: Wi-Fi mode, include:
 - ◊ 11BGN
- ◆ ssid:SSID at AP mode, the maximum length is 32.
- ◆ channel: Wi-Fi channel selection:
 - ◊ AUTO;(Default CH1)
 - ◊ CH1~CH11;
- ◆ hideSSID: hide AP SSID
 - ◊ 0 or not filled: not hide SSID
 - ◊ 1: hide SSID.

4.2.10.4. AT+WAKEY: Set/Query AP Wi-Fi security parameters. Setting is valid after reset

■ Format:

- ◆ Query Operation

AT+WAKEY<CR>

+ok=<auth,encry,key><CR><LF><CR><LF>

- ◆ Set Operation

AT+WAKEY=<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.

4.2.10.5. AT+WADHCP: 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.

4.2.10.6. AT+WALK: 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;

4.2.10.7. AT+WALKIND: 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).

4.2.10.8. AT+WAPMXSTA: 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.
 - ◊ 1~2: Support max 1~2 STA devices connects to module AP. 2 **is default value for max 2 STA device supported.**

4.2.11. Other Wi-Fi Command

4.2.11.1. AT+WMODE: 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

4.2.11.2. AT+MDCH: Set Wi-Fi Auto Switch Function. Setting is valid after reset

■ Format:

- ◆ Query Operation

AT+MDCH<CR>

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

- ◆ Set Operation

AT+MDCH=<mode><CR><LF><CR><LF>

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

■ Parameters:

- ◆ mode: Wi-Fi Auto Switch Mode
 - ◊ off: Disable Wi-Fi auto switch. When response with auto, it is the same as off.
 - ◊ on: Enable Wi-Fi auto switch. When the module(STA mode) fail to connect to router, it will switch to AP mode itself in one minute.

4.2.11.3. AT+ASWD: 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).

4.2.11.4. AT+DISPS: Set/Query power save parameters

■ Format:

- ◆ Query Operation

AT+DISPS<CR>

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

- ◆ Set Operation

AT+DISPS=<mode><CR><LF><CR><LF>

■ Parameters:

- ◆ mode: Disable power save mode setting
 - ◊ No: Enable power save, default value.
 - ◊ Yes: Disable power save

4.2.11.5. AT+WIFI: 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+WSSID to set router information and then AT+WIFI=UP.

4.2.11.6. AT+SMARTCONFIG: Config/Query Smart config method

■ Format:

- ◆ Query Operation

```
AT+SMARTCONFIG<CR>
```

```
+ok=<status,[ap_prefix,ap_key]><CR><LF><CR><LF>
```

- ◆ Set Operation

```
AT+SMARTCONFIG=<status,ap_prefix,ap_key><CR>
```

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

■ Parameters:

- ◆ status: Set Smart config mode function

- ◊ 0(Default): Enable SmartBLELink config.
 - Set reload pin (0.2s < “Low” < 1.5s) to trigger into this config mode.
- ◊ 1: Enable SmartAPLink config
 - Set reload pin (0.2s < “Low” < 1.5s) to trigger into this config mode.
- ◊ 2: Enable SmartBLELink and SmartAPLink config.
 - Set reload pin (0.2s < “Low” < 1.5s) to trigger into SmartBLELink config mode, When in SmartBLELink config mode, set reload again to trigger into SmartAPLink config mode. Repeat this cycle after set reload.
- ◊ 3: Enable SmartLink V8 config.
 - Set reload pin (0.2s < “Low” < 1.5s) to trigger into this config mode.
- ◊ 4: Enable SmartLink V8 and SmartAPLink config.
 - Set reload pin (0.2s < “Low” < 1.5s) to trigger into SmartLink config mode, When in SmartLink config mode, set reload again to trigger into SmartAPLink config mode. Repeat this cycle after set reload.

- ◆ ap_prefix: module AP SSID prefix, default is hiflying_softap

- ◆ ap_key: module AP password, blank for no password, password length 8~20.

4.2.11.7. AT+SMARTBTSTART: Start SmartBLELink function

- Format:
 - ◆ Query Operation

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

Note: Reset to quit this config mode.

4.2.11.8. AT+SMARTAPSTART: 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.

4.2.11.9. AT+SMTLK: 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.

4.2.11.10. AT+WPS: Start WPS function

- Format:
 - ◆ Query Operation

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

Note: The module will reboot itself and start WPS negotiation for 120 seconds. nLink Pin flash to indicate this status. If the router's WPS is enabled, once the module got information, it will change to STA mode and reboot again to connect router. If timeout, it also reboot and quit WPS status.

4.2.11.11. AT+DTIM: Set/Query Wi-Fi DTIM

- Format:
 - ◆ Query Operation

```
AT+DTIM<CR>
+ok=<value><CR><LF><CR><LF>
```

- ◆ Set Operation

```
AT+DTIM=<value><CR>
+ok<CR><LF><CR><LF>
```

- Parameters:

- ◆ value: 1~3, default is 1, means DTIM is 100ms

Note: Set to 3 for lower power consumption.

4.2.12. Upgrade Command

4.2.12.1. AT+OTA: Do Local OTA Upgrade

- Format:
 - ◆ Set Operation

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

Note: See Appendix C Module Upgrade for detail

4.2.12.2. AT+UPURL: Set/ Query remote upgrade URL address

- Format:
 - ◆ Query Operation

```
AT+UPURL<CR>
+ok=<url><CR><LF><CR><LF>
```

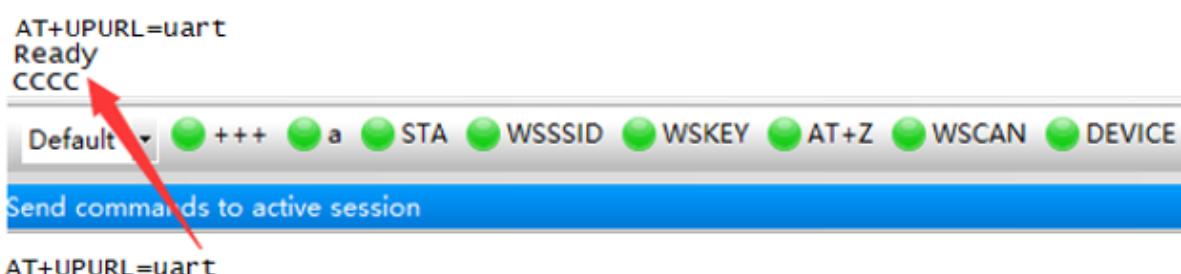
- Set Operation

```
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). If set to uart, use X modem UART to transfer the firmware.
- ◆ 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.

When in UART firmware upgrade, it will continuously transfer "C" in 115200 baud rate, wait for the firmware.



4.2.13. Webpage Command

4.2.13.1. AT+PLANG: 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;

4.2.13.2. AT+WEBU: 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.

4.2.14. Network Time Protocol Command

4.2.14.1. AT+NTPRF: Set /Query time calibration interval

- Format:
 - ◆ Query Operation
- AT+NTPRF<CR>**
- +ok=<num><CR><LF><CR><LF>**
- ◆ Set Operation
- AT+NTPRF=<num><CR>**
- +ok<CR><LF><CR><LF>**
- Parameters:
 - ◆ num: time calibration interval, range:0~720, default:30 minutes, 10 minutes for each step, set 0 means no time calibration automatically.

4.2.14.2. AT+NTPEN: Enable/Disable time calibration function. Setting is valid after reset

- Format:
 - ◆ Query Operation
- AT+NTPEN<CR>**
- +ok=<status><CR><LF><CR><LF>**
- ◆ Set Operation
- AT+NTPEN=<status><CR>**
- +ok<CR><LF><CR><LF>**
- Parameters:
 - ◆ status: status of time calibration
 - on: Enable time calibration
 - off: Disable time calibration

4.2.14.3. AT+NTPTM: Query network time, time zone is GMT+8 by default

- Format:
 - ◆ Query Operation
- ```
AT+NTPTM<CR>
+ok=<time><CR><LF><CR><LF>
```
- Parameters:
    - ◆ time: network time, for example: 2013-10-9 16:10:42 Wed, if it shows Not Available means that the time calibration function is not enabled or the module doesn't connect to the internet.

#### 4.2.14.4. AT+NTPSER: Set/Query NTP server IP address

- Format:
    - ◆ Query Operation
- ```
AT+NTPSER<CR>
+ok=<ipaddress><CR><LF><CR><LF>
```
- Set Operation
- ```
AT+NTPSER=<ipaddress><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
    - ◆ ipaddress: NTP network server IP address, cn.ntp.org.cn (default value).

### 4.2.15. BLE Command

#### 4.2.15.1. AT+BLE: Config/Query BLE UART throughput function

- Format:
    - ◆ Query Operation
- ```
AT+BLE<CR>
+ok=<status><CR><LF><CR><LF>
```
- Set Operation
- ```
AT+BLE=<status[,opt]><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
    - ◆ status: Enable/Disable BLE UART throughput function
      - ❖ on: Enable.
      - ❖ off: Disable, default.
    - ◆ opt: function code, save to flash or not, option parameter. if not fill in, default is 1.
      - ❖ 0: setting not saved to flash
      - ❖ 1: setting saved to flash

#### 4.2.15.2. AT+BLENANE: Config/Query BLE broadcast name, valid after reboot

- Format:
    - ◆ Query Operation
- ```
AT+BLENANE<CR>
+ok=<name1,name2><CR><LF><CR><LF>
```
- Set Operation

```
AT+BLENAME=<name1,name2><CR>
+ok<CR><LF><CR><LF>
```

- Parameters:
 - ◆ name1: SmartBLELink config mode BLE name, default is AZ, 26 characters max.
 - ◆ name2: Normal working BLE name, default is HF-LPT270, 26 characters max.

4.2.15.3. AT+BLENTFUUIDS: Config/Query BLE notification UUID

- Format:
 - ◆ Query Operation

```
AT+BLENTFUUIDS<CR>
+ok=<uuid><CR><LF><CR><LF>
```

- ◆ Set Operation

```
AT+BLENTFUUIDS=<uuid><CR>
+ok<CR><LF><CR><LF>
```

- Parameters:
 - ◆ uuid: BLE notification UUID

AT+BLENTFUUIDS

+ok=0000FEE700001000800000805F9B34FB

4.2.15.4. AT+BLENTFUUIDR: Config/Query BLE notification Receive UUID

- Format:
 - ◆ Query Operation

```
AT+BLENTFUUIDR<CR>
+ok=<uuid><CR><LF><CR><LF>
```

- ◆ Set Operation

```
AT+BLENTFUUIDR=<uuid><CR>
+ok<CR><LF><CR><LF>
```

- Parameters:
 - ◆ uuid: BLE notification receive UUID

AT+BLENTFUUIDR

+ok=0000FEC800001000800000805F9B34FB

4.2.15.5. AT+BLENTFUUIDW: Config/Query BLE notification Write UUID

- Format:
 - ◆ Query Operation

```
AT+BLENTFUUIDW<CR>
+ok=<uuid><CR><LF><CR><LF>
```

- ◆ Set Operation

```
AT+BLENTFUUIDW=<uuid><CR>
+ok<CR><LF><CR><LF>
```

- Parameters:
 - ◆ uuid: BLE notification write UUID

AT+BLENTFUUIDW

+ok=0000FEC700001000800000805F9B34FB

4.2.15.6. AT+BLEINDUUIDR: Config/Query BLE indication Receive UUID

- Format:
 - ◆ Query Operation
- ```
AT+BLEINDUUIDR<CR>
+ok=<uuid><CR><LF><CR><LF>
```
- ◆ Set Operation
- ```
AT+BLEINDUUIDR=<uuid><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
 - ◆ uuid: BLE indication receiveUUID

AT+BLEINDUUIDR

+ok=0000FED600001000800000805F9B34FB

4.2.15.7. AT+BLEINDUUIDW: Config/Query BLE indication Write UUID

- Format:
 - ◆ Query Operation
- ```
AT+BLEINDUUIDW<CR>
+ok=<uuid><CR><LF><CR><LF>
```
- ◆ Set Operation
- ```
AT+BLEINDUUIDW=<uuid><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
 - ◆ uuid: BLE indication write UUID

AT+BLEINDUUIDR

+ok=0000FED500001000800000805F9B34FB

4.2.15.8. AT+BLECON: Config/Query BLE connection parameters

- Format:
 - ◆ Query Operation
- ```
AT+BLECON<CR>
+ok=<value><CR><LF><CR><LF>
```
- ◆ Set Operation
- ```
AT+BLECON=<value><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
 - ◆ value: IntervalMin+IntervalMax+Slave Latency+connSupervision Timeout, Format: AAAA BBBB C DDDD, default: 0016003200200
 - IntervalMin: Connection minimum interval, AAAA position decimal value. 0016 x 1.25ms=20ms, minimum is 0016, that is 20ms
 - IntervalMax: Connection maximum interval, BBBB position decimal value. 0032 x 1.25ms=40ms, max 0800, that is 1000ms
 - Slave Latency: C Position value, range 0~4.
 - connSupervision timeout: Connection time out, DDDD position decimal value, actual timeout of 0200 is 0200 x 10ms=2000ms.

4.2.15.9. AT+BLEADP: Config/Query BLE advertising parameters

■ Format:

- ◆ Query Operation

```
AT+BLEADP<CR>
```

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

- ◆ Set Operation

```
AT+BLEADP=<value><CR>
```

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

■ Parameters:

- ◆ value: IntervalMin+IntervalMax+Type+Channel, format: AAAA BBBB C D, default:

0768128007

- IntervalMin: advertising minimum interval, AAAA position decimal value, 0768 x 0.625ms=480ms
- IntervalMax: advertising maximum interval, BBBB position decimal value, 1280 x 0.625ms=800ms
- Type: 0 or 1, 0 for public, 1 for random
- Channel: advertising channel, 3bit hex value, bit0 for channel37, bit1 for channel38, bit2 for channel39, value 7 is using all channel (37, 38 and 39)

4.2.15.10. AT+BLEADV: Config/Query BLE advertising content

■ Format:

- ◆ Query Operation

```
AT+BLEADV<CR>
```

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

- ◆ Set Operation

```
AT+BLEADV=<value[,ASCII]><CR>
```

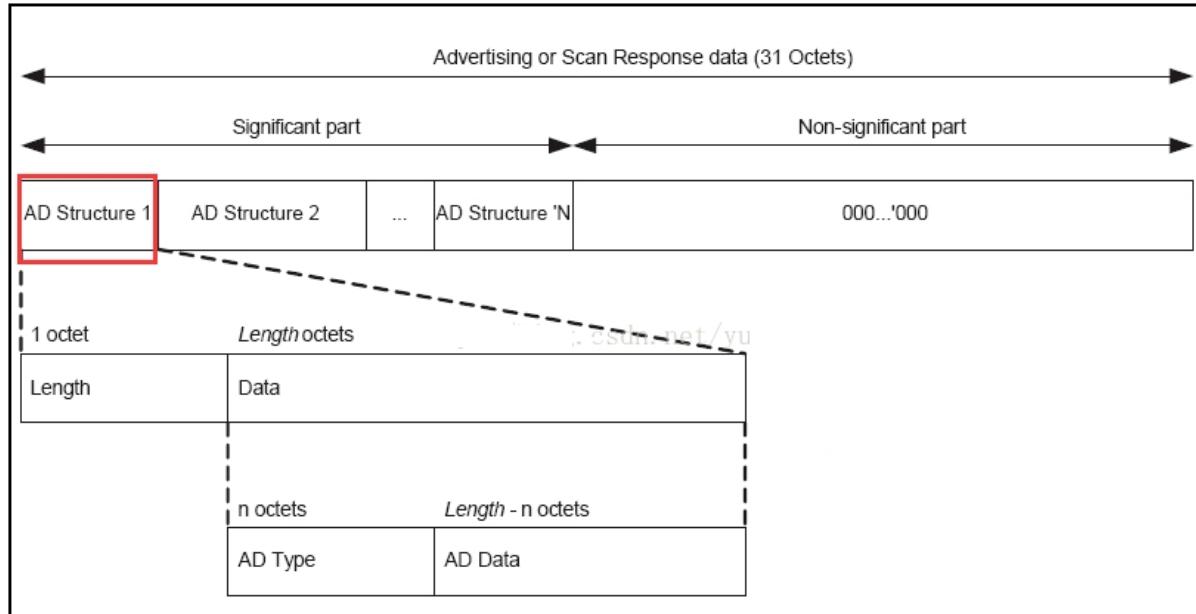
```
+ok<CR><LF><CR><LF>
```

■ Parameters:

- ◆ value: advertising content, maximum is 26 bytes together with BLE name (if BLE name is 10 characters, then this advertising content max is 16 bytes), hex format, content must obey the standard BLE protocol.
- ◆ ASCII: value is set in ASCII format, if value need some specific value such as 0D, 0A, 00, must define it packet in ASCII format

AT+BLEADV=0EFF019035055951001043185986090A,ASCII

Command Hex format example: 41 54 2B 42 4C 45 41 44 56 3D 03 09 05 06 0D 0A, value content of 03 (length) 09 (AD Type) 05 06 (DATA)



5. PACKAGE INFORMATION

5.1. Recommended Reflow Profile

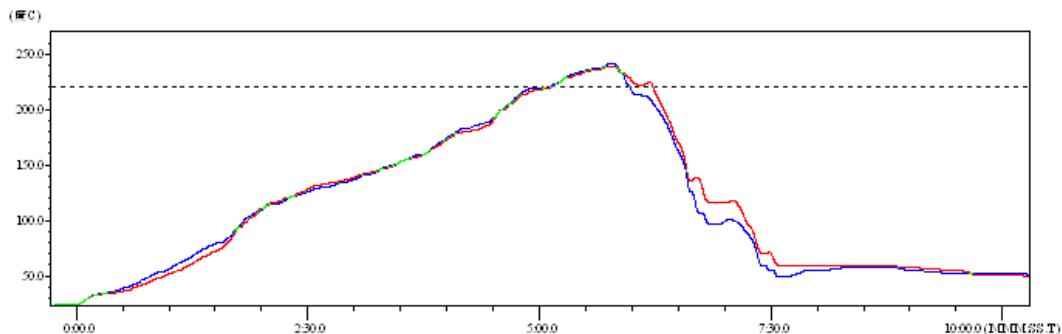


Figure 71. Reflow Soldering Profile

Table15. 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 ($O_2 < 300ppm$)

5.2. Device Handling Instruction (Module IC SMT Preparation)

1. Shelf life in sealed bag: 12 months, at $<30^\circ C$ 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 $125 \pm 5^\circ C$ before rework process.
6. Recommend to store at $\leq 10\%$ RH with vacuum packing
7. If SMT process needs twice reflow:
 - (1) Top side SMT and reflow
 - (2) Bottom side SMT and reflow

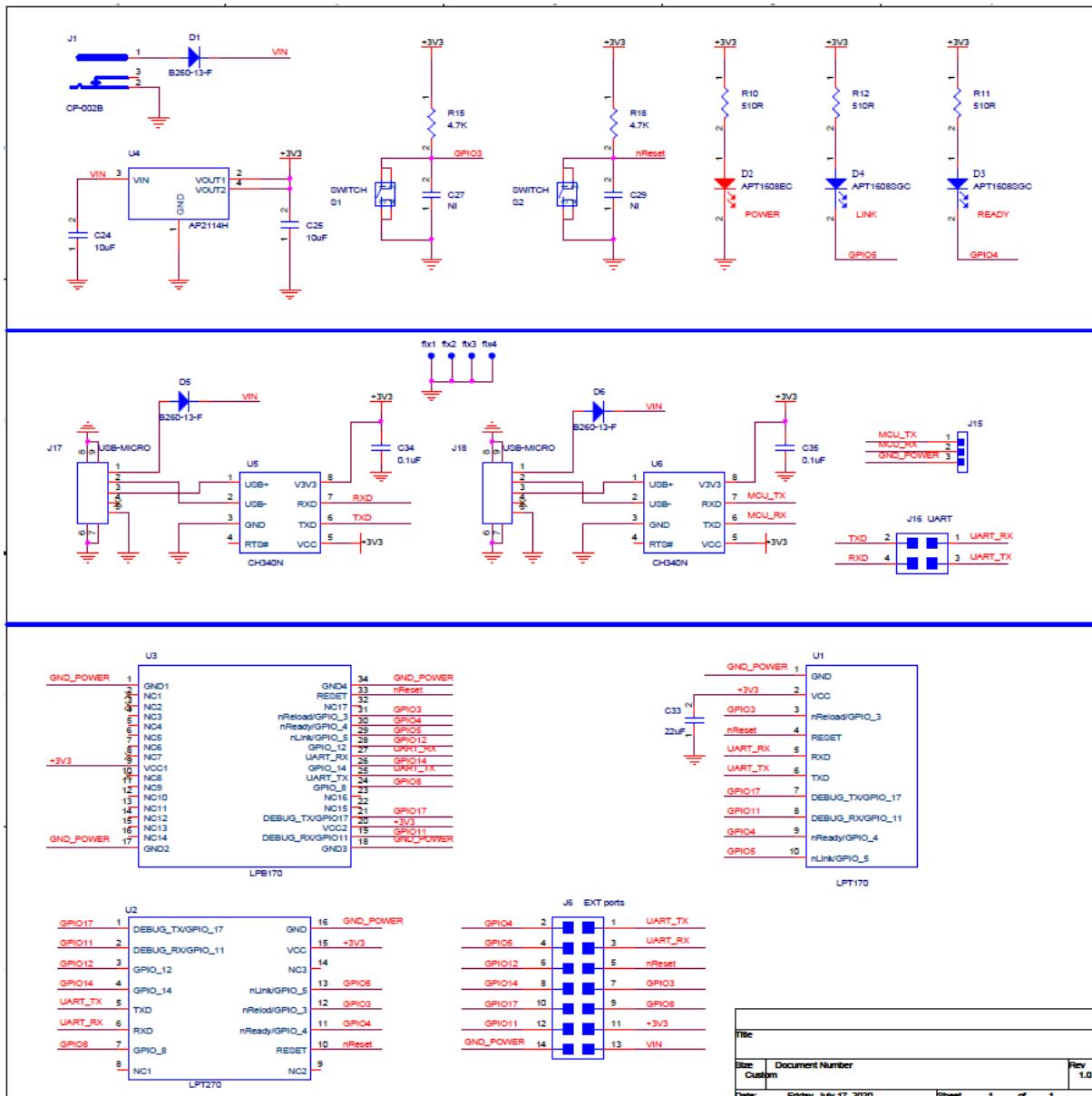
Case 1: Wifi module mounted on top side. Need to bake when bottom side process over 168 hours window time, no need to bake within 168 hours

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 EVK.



APPENDIX B: TCP RAW HTTP PACKET TRANSFER

HF-LPT270 module support http data transfer, but there is also another more general methods via send HTTP raw packet via TCP.

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.

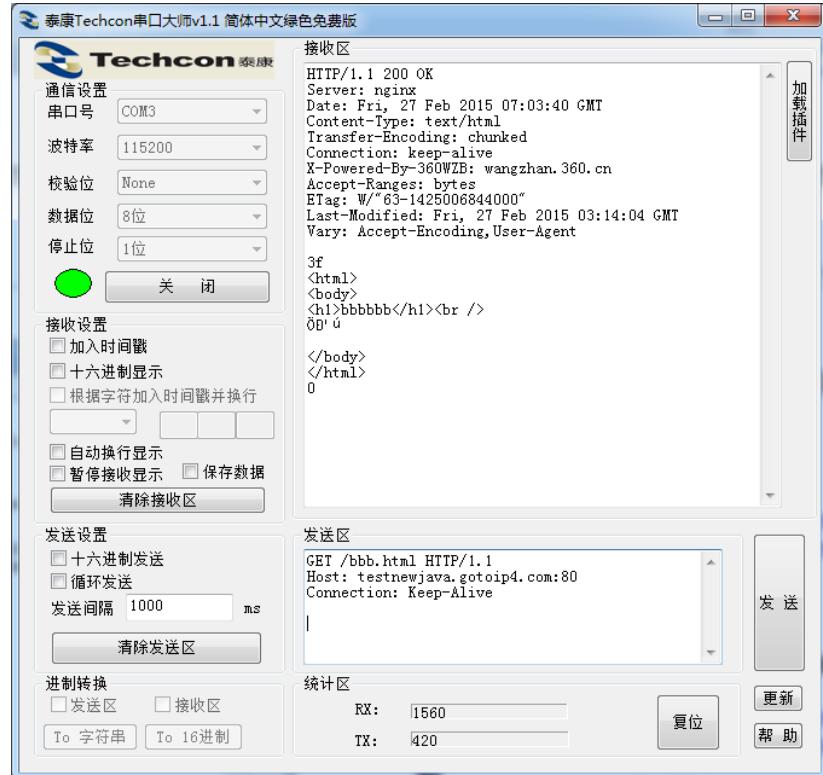
```
AT+WSSSID=Tenda_GYH
+ok

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. SmartBleLink

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

C.3. SmartAPLink

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

C.4. SmartLink V8

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

APPENDIX D: CONTACT INFORMATION

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