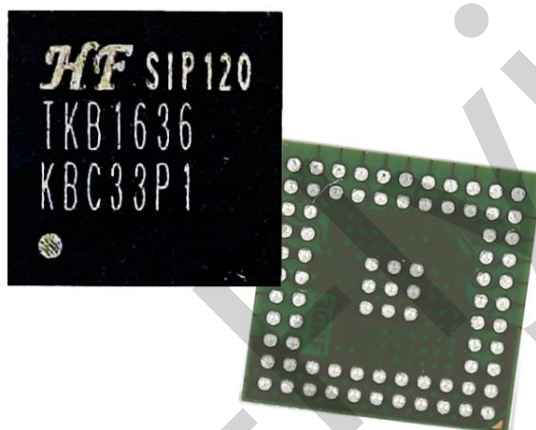


HF-SIP120

System In Package Data Sheet

V 1.5



Overview of Characteristic

- ◇ Support IEEE802.11b/g/n Wireless Standards
- ◇ Support UART/GPIO Data Communication Interface
- ◇ Support Work As STA/AP Mode
- ◇ Support Smart Link Function (APP program provide)
- ◇ Support Wireless and Remote Firmware Upgrade Function
- ◇ Single +3.3V Power Supply

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High-Flying

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HISTORY

- Ed. V1.0** 09-20-2016 First Version.
- Ed. V1.1** 10-08-2016 Modify PACKAGE INFORMATION
- Add Storage Condition
- Modify System Power Consumption (LDO mode)
- Add system block architecture
- Ed. V1.2** 10-09-2016 Modify GPIO description and reference design.
- Ed. V1.3** 10-20-2016 Correct the chip height.
- Ed. V1.4** 11-03-2016 Add AddCorrect the chip height, add more description for hardware design.
- Ed. V1.5** 12-26-2016 Update 2.09-6 firmware webpage function, add the whole function into this manual. Add HF-SIP120-M demo module description.

1. SYSTEM OVERVIEW

1.1. General Description

The HF-SIP120 WLAN is designed to support IEEE 802.11 b/g/n single stream with the state-of-the-art design techniques and process technology to achieve low power consumption and high throughput performance. The HF-SIP120 WLAN low power function uses the innovative design techniques and the optimized architecture which best utilizes the advanced process technology to reduce active and idle power, and achieve extreme low power consumption at sleep state to extend the battery life. The HF-SIP120 WLAN embedded all matching components, needed bypass cap, 16Mb flash, and 26MHz crystal in a BGA 6 x 6 mm package. The HF-SIP120 Internal architecture as following picture,

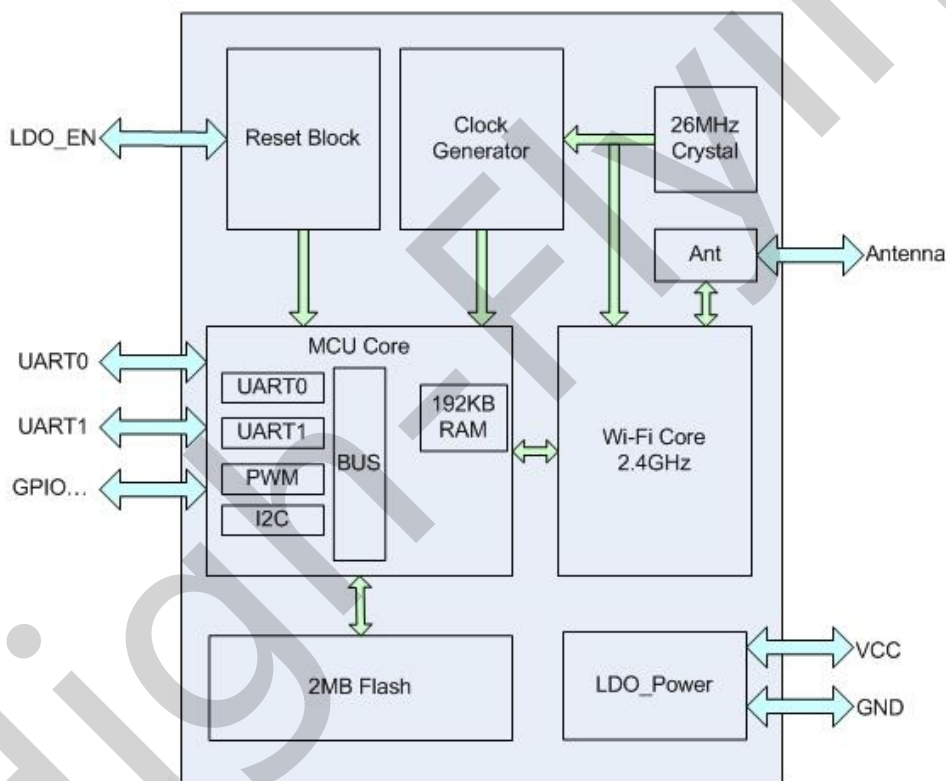


Figure 1. System Architecture

1.2. Device Features

- 802.11 b/g/n/e/i/d
- AP/STA mode, Soft-AP
- 802.11b, 11g, and 802.11n 1T1R
- Short Guard Interval
- Greenfield mode
- RIFS in RX mode

- STBC in RX mode
- Embedded all matching and bypass components
- **Embedded 26MHz crystal.**
- **Embedded 16Mbit flash.**

1.3. CPU

- 32-bit micro-controller.
- Support **192 KB Instruction SRAM** with Data SRAM in total.

1.4. GPIO

The HF-SIP120 has 10 GPIO pins with direct software access. Many are multiplexed with other functions such as the host interface, UART_DEBUG, UART_DATA, I2C_MASTER, PWM, etc. Each GPIO supports the following configurations via software programming:

1.5. System Clocking and Reset

The HF-SIP120 has a system clocking block and reset which controls the clocks and power going to other internal modules. Its inputs consist of sleep requests from these modules and its outputs consist of clock enable and power signals which are used to gate the clocks going to internal modules. The system clocking and reset block also manages resets going to other modules within the device.

1.6. Power-on Sequence

Figure 2. shows the power-on sequence of the HF-SIP120 from power-up to firmware download, including the initial device power-on reset evoked by LDO_EN signal. The LDO_EN input level must be kept the same as VDDIO voltage level. After initial power-on, the LDO_EN signal can be held low to turn off the HF-SIP120 or pulsed low to induce a subsequent reset. After LDO_EN is assert and host starts the power-on sequence of the HF-SIP120. From that point, the typical HF-SIP120 power-on sequence is shown below:

- Within 1.3 millisecond, the internal power-on reset (POR) will be done. And host could download firmware code of DPLL setting if the crystal is not default setting, 26MHz. The internal running clock is crystal frequency.
- After 100us of DPLL settling time, host could set internal clock to full speed and finish all the downloading of firmware code.

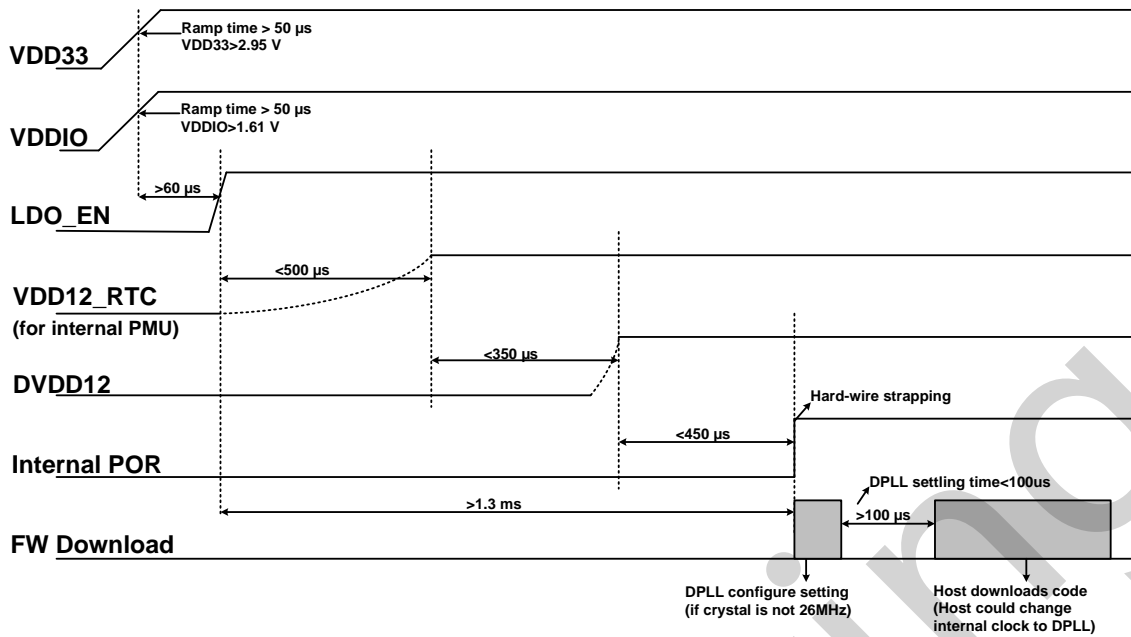


Figure 2. Power-on Sequence

1.7. Reset Control

The HF-SIP120 LDO_EN pin can be used to completely reset the entire chip. After this signal has been de-asserted, the HF-SIP120 is in off mode waits for host communication. Until then, the MAC, BB, and SOC blocks are powered off and all modules are held in reset. Once the host has initiated communication, the HF-SIP120 turns on its crystal and later on DPLL. After all clocks are stable and running, the resets to all blocks are automatically de-asserted.

2. DC CHARACTERISTICS

2.1. Absolute Maximum Ratings

The absolute maximum ratings in Table 1 indicate levels where permanent damage to the device can occur, even if these limits are exceeded for only a brief duration. Functional operation is not guaranteed under these conditions. Operation at absolute maximum conditions for extended periods can adversely affect long-term reliability of the device.

Table1. Absolute Maximum Ratings

Symbol	Description	Max Rating	Unit
EFUSE_VDD	VDD input for EFUSE burn-in. Pull low when read mode	-0.3 to 2.75	V
VBAT	VDD input	-0.3 to 3.6	V

2.2. Environmental Ratings

The environmental ratings are shown in Table 2

Table2. Environmental Ratings

Characteristic	Conditions/Comments	Value	Units
Ambient Temperature (TA)	Functional operation	-20 to +85	° C
Storage Temperature	-	-40 to +125	° C
Relative Humidity	Storage	Less than 60	%
	Operation	Less than 85	%

2.3. PMU Under Voltage Lock-out (UVLO) Characteristics

Table3. PMU UVLO characteristics

Symbol (domain)	Description	Min.	Typ.	Max.	Unit
Under Voltage Lock-Out (UVLO)					
Under voltage rising threshold of VBAT	VDD33: pin		2.95		V
Under voltage falling threshold of VBAT	VDD33: pin		2.85		V

2.4. Electrostatic Discharge Specifications

This is an ESD sensitive product! Observe precaution and handle with care. Extreme caution must be exercised to prevent electrostatic discharge (ESD) damage. Proper use of wrist and heel grounding straps to discharge static electricity is required when handling these devices.

Table4. ESD Specifications

Pin Type	Test Condition	ESD Rating	Unit
Human Body Mode (HBM)	refers to MIL-STD-883G Method 3015.7	Pass ± 2.5	KV
Machine Mode (MM)	refers to JEDEC EIA/JESD22-A115	Pass ± 250	V

2.5. Recommended Operating Conditions and DC Characteristics

Table5. Recommended Operating Conditions and DC Characteristics

Symbol (domain)	Description	Min.	Typ.	Max.	Unit
VDD16_DCDC_OUT	LDO/Buck converter 1.6V output		1.7		V
EFUSE_VDD	Debug usage, left it open.				V
VBAT	3.3V supply	3.14	3.3	3.46	V

3. ELECTRICAL SPECIFICATIONS

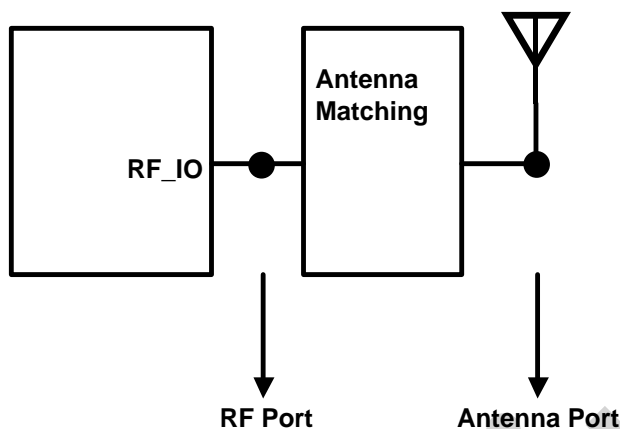


Figure 3. RF Front-End Reference Topology for RF Performance

3.1. WLAN RF Performance Specifications

Table6. WLAN RF Performance Specifications

Parameter	Condition/Notes	Min.	Typ.	Max.	Unit
Frequency Range		2412	-	2484	MHz
Rx Sensitivity (CCK)	CCK, 1 Mbps		-94.0		dBm
	CCK, 11 Mbps		-87.0		dBm
Rx Sensitivity (OFDM)	OFDM, 6 Mbps		-91.0		dBm
	OFDM, 54 Mbps		-73.0		dBm
Rx Sensitivity (HT20) Greenfield 800nS GI Non-STBC	HT20, MCS0		-91.0		dBm
	HT20, MCS7		-72.0		dBm
TX Output Power	CCK, 1-11 Mbps		17.5		dBm
	OFDM, 54 Mbps		14.0		dBm
	HT20, MCS7		14.0		dBm

Note: All specifications are measured at the Antenna Port unless otherwise specified.

3.2. Vcore Convertor Mode

The HF-SIP120 has additional LDOs and DCDC buck convertor that could provide noise isolation for digital and analog supplies and excellent power efficient with minimum BOM cost. Connect VDDLX_DCDC to VDD16_OUT for LDO mode or add a L/C filter between VDDLX_DCDC and VDD16_OUT for DCDC mode. Please refer to Appendix A for detail schematic. [If need low power consumption, make it work in DCDC mode. If need the lowest BOM cost, make it in LDO mode. The power consumption will be 20mA less then LDO mode.](#)

3.3. System Power Consumption

Note: All results are measured at VBAT is 3.3V and DCDC buck convertor is enabled.

Table7. System Power Consumption

WLAN Operational Modes	Typ.	Unit
Rx, CCK, 1 Mbps(Continuous)	91	mA
Rx, OFDM, 54 Mbps(Continuous)	101	mA
Rx, HT20, MCS7(Continuous)	103	mA
Tx, CCK, 1 Mbps, 19dBm(Continuous)	292	mA
Tx, OFDM, 54 Mbps, 16dBm(Continuous)	237	mA
Tx, HT20, MCS7, 15dBm(Continuous)	239	mA
Normal work(Avg)	30	mA
Tx&Rx (Avg for DCDC mode, normal usage)	80	mA
Tx&Rx (Avg for LDO mode, normal usage)	100	mA

4. PIN DESCRIPTIONS

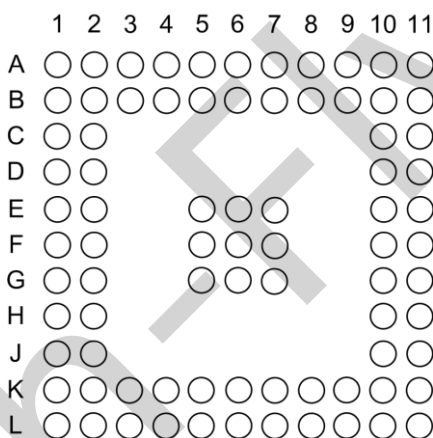
This section contains a listing of the signal descriptions (see Figure 4)

The following nomenclature is used for signal names:

NC No connection should be made to this pin

The following nomenclature is used for signal types described in Table 7:

- I Digital input signal
- IO Digital bidirectional signal
- O Digital output signal
- IOA Analog bidirectional signal
- P Power signal
- G Ground signal



	1	2	3	4	5	6	7	8	9	10	11
A	ANT	GND	NC	NC	VBAT	GPIO_20	GPIO_19	GPIO_18	GPIO_15	GPIO_6	NC
B	GND	GND	NC	NC	VBAT	NC	NC	NC	NC	NC	GPIO_27
C	GND	GND								NC	NC
D	GND	GND								NC	NC
E	GND	GND			GND	GND	GND			NC	NC
F	GND	GND			GND	GND	GND			NC	NC
G	GND	GND			GND	GND	GND			NC	NC
H	GND	GND								NC	NC
J	GND	GND								NC	NC
K	GND	GND	NC	NC	NC	NC	VDD16_0 UT	VDDLX_D CDC	NC	NC	LDO_EN
L	GND	GND	EFUSE_V DD	GPIO_26	GPIO_25	GPIO_8	VDD16_0 UT	VDDLX_D CDC	GPIO_1	GPIO_2	GPIO_3

Figure 4. HF-SIP120 BGA Ball Assignment (top view)

Table8. HF-SIP120 Package Pin-out

No.	Name	Description	Type (default)
A1	ANT	2.4 GHz RF input & output port	IOA
A2	GND	GND	G
A3	NC	No connection	NC
A4	NC	No connection	NC
A5	VBAT	3.3V supply. Connect to B5 and suggest to add 10uF capacitor, see reference design	P
A6	GPIO_20	General perpose input/output	O
A7	GPIO_19	General perpose input/output	I
A8	GPIO_18	General perpose input/output	O
A9	GPIO_15	General perpose input/output	O
A10	GPIO_6	General perpose input/output	I
A11	NC	No connection	NC
B1	GND	GND	G
B2	GND	GND	G
B3	NC	No connection	NC
B4	NC	No connection	NC
B5	VBAT	3.3V supply.	P
B6	NC	No connection	NC
B7	NC	No connection	NC
B8	NC	No connection	NC
B9	NC	No connection	NC
B10	NC	No connection	NC
B11	GPIO_27	General perpose input/output	I
C1	GND	GND	G
C2	GND	GND	G
C10	NC	No connection	NC
C11	NC	No connection	NC
D1	GND	GND	G
D2	GND	GND	G
D10	NC	No connection	NC
D11	NC	No connection	NC
E1	GND	GND	G
E2	GND	GND	G
E5	GND	GND	G
E6	GND	GND	G
E7	GND	GND	G
E10	NC	No connection	NC
E11	NC	No connection	NC
F1	GND	GND	G
F2	GND	GND	G
F5	GND	GND	G
F6	GND	GND	G
F7	GND	GND	G
F10	NC	No connection	NC
F11	NC	No connection	NC
G1	GND	GND	G

G2	GND	GND	G
G5	GND	GND	G
G6	GND	GND	G
G7	GND	GND	G
G10	NC	No connection	NC
G11	NC	No connection	NC
H1	GND	GND	G
H2	GND	GND	G
H10	NC	No connection	NC
H11	NC	No connection	NC
J1	GND	GND	G
J2	GND	GND	G
J10	NC	No connection	NC
J11	NC	No connection	NC
K1	GND	GND	G
K2	GND	GND	G
K3	NC	No connection	NC
K4	NC	No connection	NC
K5	NC	No connection	NC
K6	NC	No connection	NC
K7	VDD16_DCDC_OUT	Buck converter 1.6V output (refer Appendix A)	P
K8	VDDLX_DCDC	Buck converter feedback (refer Appendix A)	P
K9	NC	No connection	NC
K10	NC	No connection	NC
K11	LDO_EN	Reset signal to power down, "High" Enable	I, IUP
L1	GND	GND	G
L2	GND	GND	G
L3	EFUSE_VDD	For debug use, left open	P
L4	GPIO_26	General perpose input/output	I
L5	GPIO_25	General perpose input/output	Z
L6	GPIO_8	General perpose input/output	I
L7	VDD16_DCDC_OUT	Buck converter 1.6V output (refer Appendix A)	P
L8	VDDLX_DCDC	Buck converter feedback (refer Appendix A)	P
L9	GPIO_1	General perpose input/output	O
L10	GPIO_2	General perpose input/output. Need add 4.7K pull-up resistor, see reference design	I
L11	GPIO_3	General perpose input/output	I

Table 9 shows the others GPIO hardware functions except HOST control interface pins. These functions could be selected by GPIO register setting.

Table9. HF-SIP120 GPIO Hardware Function

Pin Name	GPIO hardware function
GPIO_26	
GPIO_25	
GPIO_8	PWM_HW
GPIO_1	UART1_DEBUG_TXD(For debug only, UART1)
GPIO_2	nReload Function(See nReload pin description for detail). Need add 4.7K pull-up resistor
GPIO_3	
GPIO_27	
GPIO_6	UART1_DEBUG_RXD(For debug only, UART1)
GPIO_15	nLink Function. (See nLink pin description for detail).
GPIO_18	nReady Function. (See nReady pin description for detail).
GPIO_19	UART0_DATA_RXD(For communication, UART0)
GPIO_20	UART0_DATA_TXD(For communication, UART0)

Pin Name	Programmable IO Selection	Output Status (OFF ^a)	Default IO Type (after POR)	Output Status (after POR)
GPIO_26	I/O/IO	Hi-z	Input	Internal weakly pulled low (~60K ohm)
GPIO_25	I/O/IO	Hi-z	None	Hi-z
GPIO_8	I/O/IO	Internal pulled high (4.7 Kohm strapping)	Input	Internal pulled high (4.7 Kohm strapping)
GPIO_1	I/O/IO	Internal pulled high (4.7 Kohm strapping)	Output	Output low (~400 ohm)
GPIO_2	I/O/IO	Hi-z	Input	Hi-z
GPIO_3	I/O/IO	Hi-z	Input	Hi-z
GPIO_27	I/O/IO	Hi-z	Input	Hi-z
GPIO_6	I/O	Hi-z	Input	Hi-z
GPIO_15	I/O/IO	Hi-z	Output	Output high (~400 ohm)
GPIO_18	I/O/IO	Hi-z	Output	Output high (~400 ohm)
GPIO_19	I/O/IO	Hi-z	Input	Hi-z
GPIO_20	I/O/IO	Internal pulled high (4.7 Kohm strapping)	Output	Output low (~400 ohm)

a. Test condition: VBAT=3.3V, VIO=3.3V, LDO_EN=0V

Note: Some of the GPIO pins also serve as boot strap inputs that are used for internal test modes or reset signal Inadvertently typing certain GPIOs in the configurations shown in the Table 9 below can result in undesired operation of the device. Therefore, it is recommended to check that those GPIO pins are not pulled low at customer’s board. **(GPIO1/GPIO8/GPIO20 must be high when bootup, otherwise it won’t work).**

Table10. GPIO Pull Combinations to avoid when bootup

Configuration No.	GPIO States to Avoid
1	GPIO_8 Low
2	GPIO_1 Low
3	GPIO_20 Low

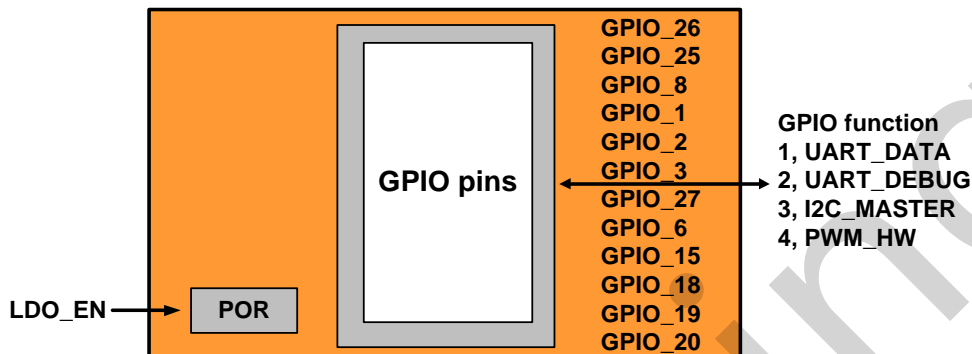
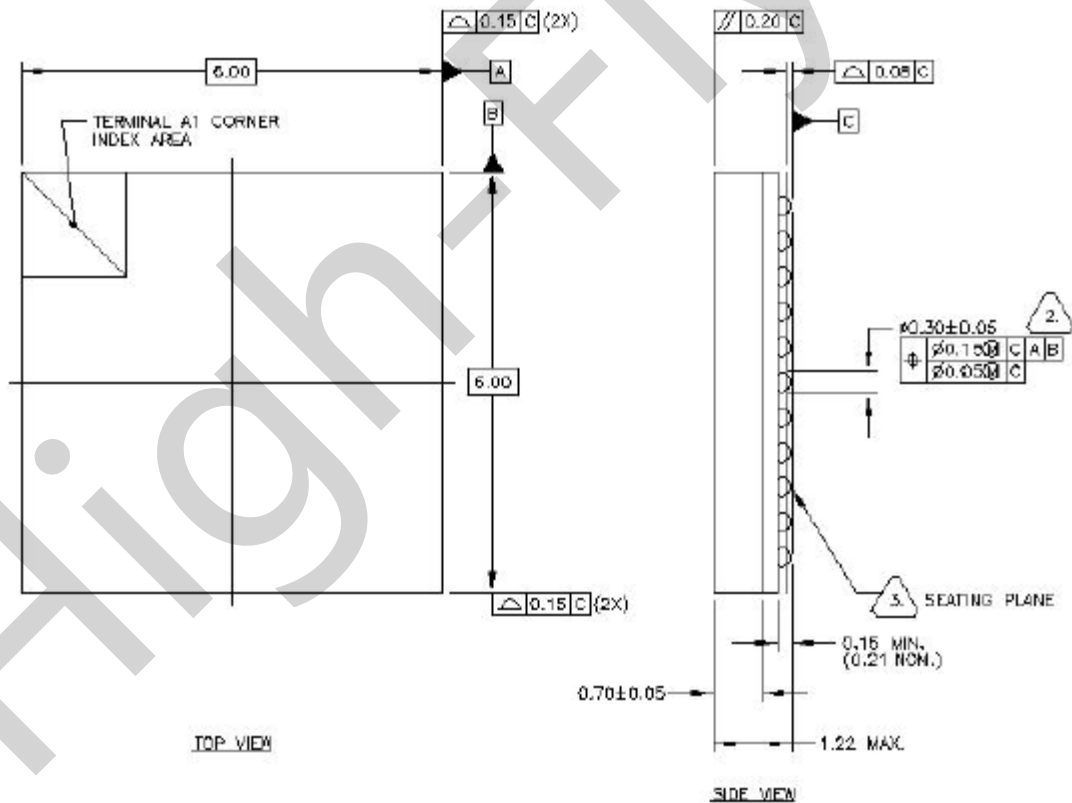
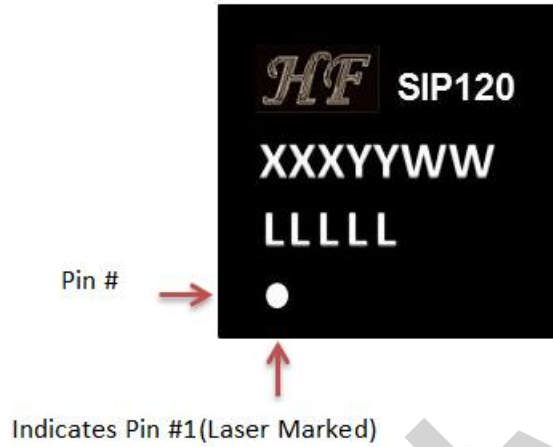


Figure 5. HF-SIP120 GPIO usage

5. PACKAGE INFORMATION

6 x 6 mm (body size), 0.5mm pitch BGA-81. Marking format (top view)



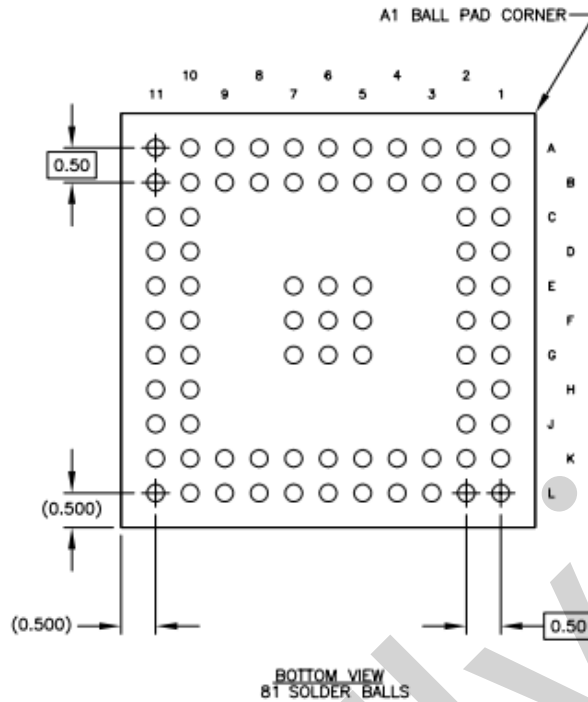


Figure 6. HF-SIP120 BGA 6 x 6 mm Package Dimensions

5.1. Lead-Free Solder Reflow Profile

Depends on Other Parts and Board Density

Follow Paste Manufacturer's Guideline

Max Temperature: As per package moisture qualification level

245 - 250 °C peak for Sn/Ag/Cu(SAC) solder is sufficient, depends on package and board size

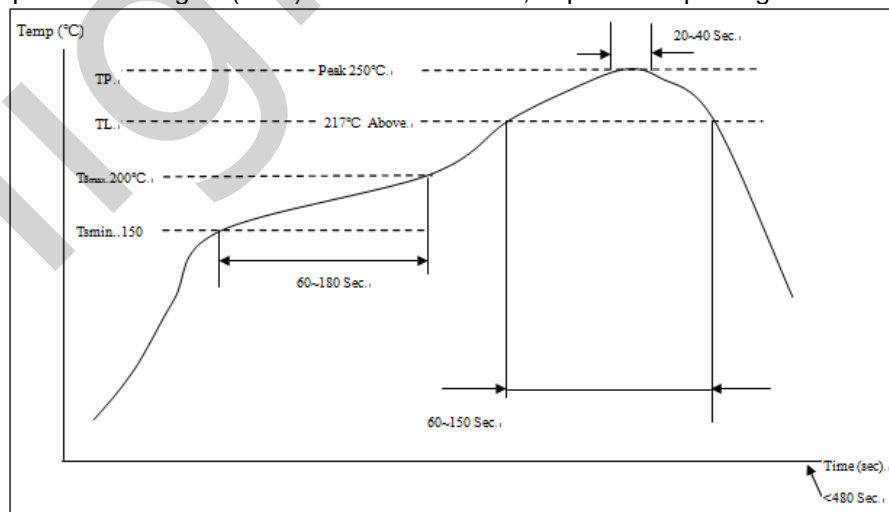


Figure 7. HF-SIP120 Lead-Free Solder Reflow Profile

Table11. Solder Profile Section

Profile Section	Profile Feature	Pb-free Package
1	Preheat - Temperature min.(T _{smin}) - Temperature max.(T _{smax}) - Time (min. to max.)	150°C 200°C 60 ~ 180 seconds
2	T _{smax} ro TL - Ramp-up rate	3°C /second max.
3	Time maintained above: - Temperature (TL) - Time	217°C 60 ~ 150 seconds
	Average ramp-up rate (TL to T _p)	3°C /second max.
4	Peak Temperature (T _p)	250±5°C
	Time within 5°C of actual peak temperature (t _p)	20 ~ 40 seconds
5	Ramp-down rate	6°C /second max.
	Time 25°C to peak temperature	8 minutes max.

5.2. Storage Condition

The calculated shelf life in sealed bag is 12 months if stored between 0°C and 40°C at less than 90% relative humidity (RH). After the bag is opened, devices that are subjected to solder reflow or other high temperature processes must be handled in the following manner:

- Mounted within 168-hours of factory conditions < 30 °C /60%RH(MSL 3 level)
- Storage humidity needs to maintained at <10% RH
- Baking is necessary if customer expose the component to air over 168 hours, baking condition: 125°C / 8hrs

6. ORDERING INFORMATION

Table12. HF-SIP120 Order Information

Part Number	Package
HF-SIP120	BGA 81, 6x6 mm

High-Flying

7. SHIPPING INFORMATION

Table13. Tray Information

Tray Matrix (Devices)	Devices per Tray	Trays per stack	Devices per stack
14 x 35	490	10 + 1 (empty)	4,900

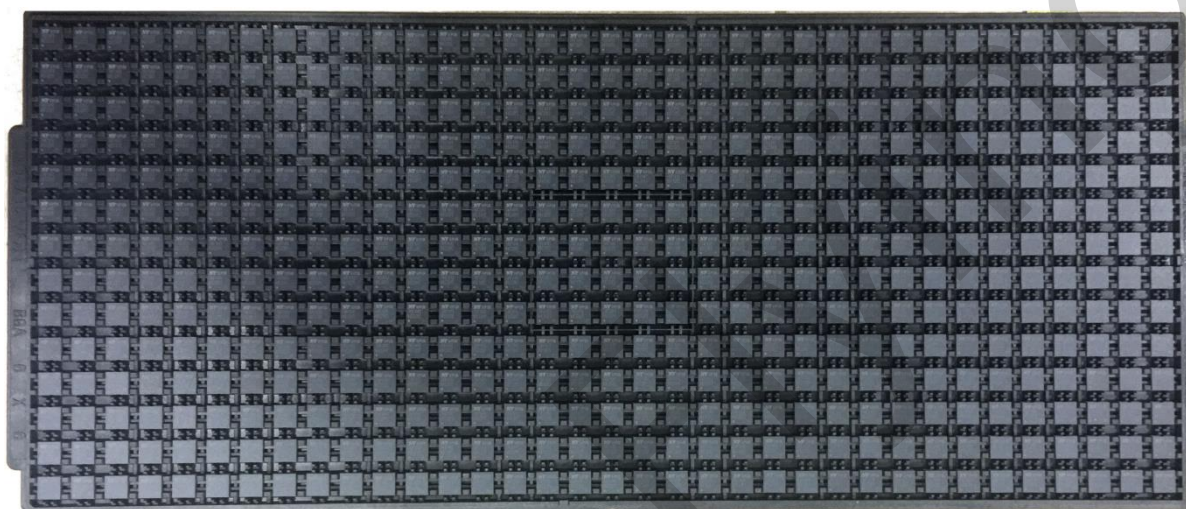


Table14. Tray Information

8. HF-SIP120-M MODULE

8.1. Hardware Introduction

HF-SIP120-M is demo module for HF-SIP120 chip, basically for test and develop usage.

8.1.1. Pins Definition

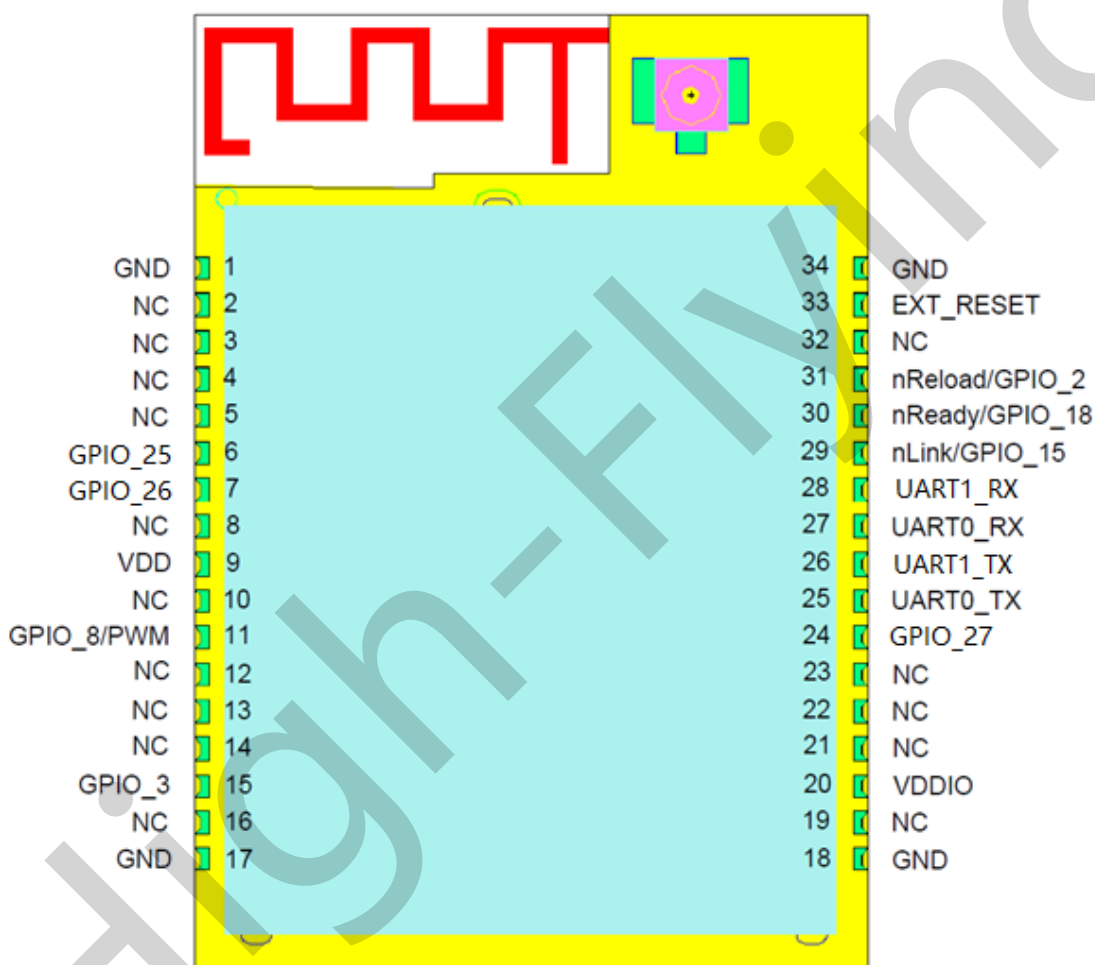


Figure 8. HF-LPB120 Pins Map

Table15. HF-LPB120 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1,17,18,34	Ground	GND	Power	
2		NC		No connect
3		NC		No connect
4		NC		No connect

Pin	Description	Net Name	Signal Type	Comments
5		NC		No connect
6	GPIO	GPIO_25	I/O	GPIO_25
7	GPIO	GPIO_26	I/O	GPIO_26
8		NC		No connect
9	+3.3V Power	DVDD	Power	
10		N.C		No connect
11	PWM/GPIO	GPIO_8	I/O,PU	GPIO8
12		NC		No connect
13		N.C		No connect
14		N.C		No connect
15	GPIO	GPIO_3	I/O	GPIO3
16		N.C		No connect
19		N.C		No connect
20	+3.3V IO Power	VDDIO	Power	PIN9,PIN20 connects internally
21		N.C		No connect
22		N.C		No connect
23		N.C		No connect
24		N.C		No connect
25	UART0	UART0_TX	O,PU	UART0 Communication Output GPIO_20
26	UART1_TXD	UART1_TX	I/O,PU	UART1 Debug Output GPIO_1, Leave it if not use Detailed functions see <Notes>
27	UART0	UART0_RX	I	UART0 Communication Input GPIO_19
28	UART1_RXD	UART1_RX	I/O	UART1 Debug Input GPIO_6, Leave it if not use Detailed functions see <Notes>
29	Wi-Fi Status	nLink	O	Detailed functions see <Notes> GPIO15
30	Module Boot Up Indicator	nReady	O	"0" – Boot-up OK; "1" – Boot-up No OK; No connect if not use.; GPIO18
31	Multi-Function	nReload	I,PU	Detailed functions see <Notes> GPIO2
32		N.C		No connect
33	Module Reset	EXT_RESETn	I,PU	"Low" effective reset input.

<Notes>

When bootup, module PIN12/25/26 must be high. Otherwise the module may fail to boot up.

I — Input; O — Output

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

nReload Pin (Button) function:

1. When this pin is set to “low” during module boot up, the module will enter wireless firmware and config upgrade mode. This mode is used for customer manufacture. (See Appendix to download software tools for customer batch configuration and upgrade firmware during mass production)
2. After module is powered up, short press this button (“Low” < 2s) and loose to make the module go into “Smart Link “ config mode, waiting for APP to set password and other information. (See Appendix to download SmartLink 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” and “ Smart Link” 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 “Smart Link “ config mode, this LED used to indicate APP to finish setting.
3. At normal mode, it’s Wi-Fi link status indicator

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

UART1 Debug :

1. Enable UART1 log information output by AT+NDBG1=1,1 via UART0, UART1 baud rate is fixed at 115200.
2. After UART1 is enabled, it will output system run log information and it can direct process AT command(No need to enter command mode like UART0)

8.1.2. Evaluation Kit

High-Flying provides the evaluation kit to promote user to familiar the product and develop the detailed application. The evaluation kit shown as below, user can connect to HF-SIP120-M module with the RS-232 UART, or Wireless interface to configure the parameters, manage the module or do the some functional tests. The EVK support .5V DC power supply.

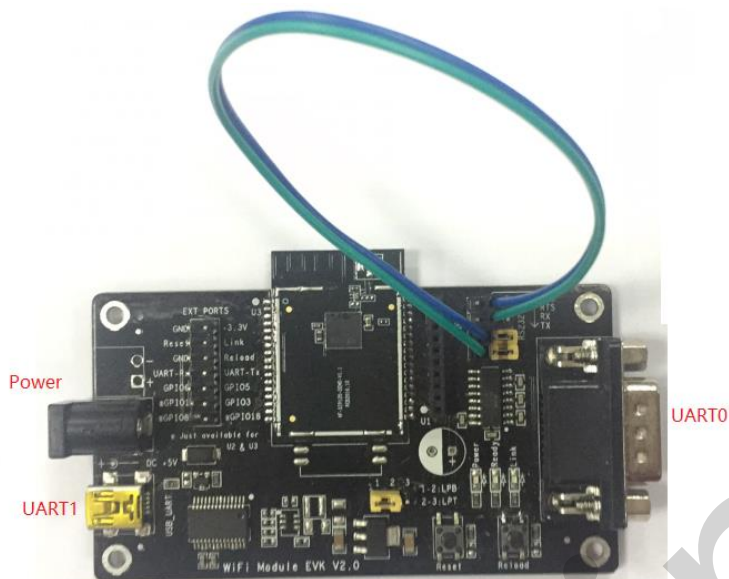


Figure 9. HF-SIP120-M EVK

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:

Table16. HF-SIP120-M Evaluation Kit Interface Description

Function	Name	Description
External Interface	RS232	Main data/command RS-232 interface
	USB	USB to UART interface
	DC5V	DC jack for power in, 5V input.
LED	Power	Power LED
	Ready	nReady LED
	Link	nLink LED
Button	nReload	Restore factory default configuration after push this pin more than 4s. See 1.2.1

9. FUNCTIONAL DESCRIPTION

9.1. Wireless Networking

HF-SIP120-M module can be configured as both wireless STA and AP base on network type. Logically there are two interfaces in HF-SIP120-M. One is for STA, and another is for AP. When HF-SIP120-M works as AP, other STA equipments are able to connect to HF-SIP120-M module directly. Wireless Networking with HF-SIP120-M 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.

9.1.1. Basic Wireless Network Based On AP (Infrastructure)

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.

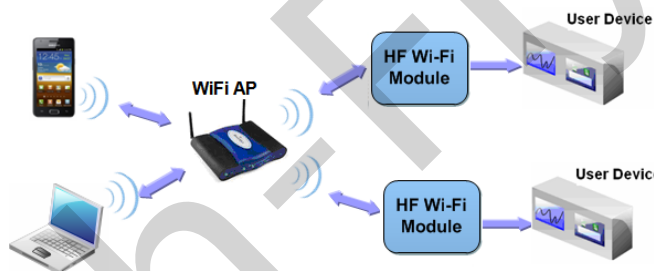


Figure 10. HF-SIP120-M Basic Wireless Network Structure

9.1.2. Wireless Network Based On STA

HF-SIP120-M module support STA network mode.

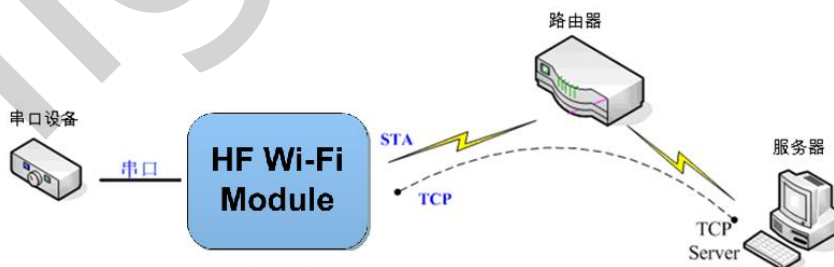


Figure 11. HF-SIP120-M STA Network Structure

9.2. Work Mode : Transparent Transmission Mode

HF-SIP120-M 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

9.3. 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-SIP120-M module supports following:

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

9.4. Parameters Configuration

HF-SIP120-M 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.

9.5. Firmware Update

HF-SIP120-M module supports multiple upgrade methods:

- UART upgrade
- Local Network upgrade
- Remote upgrade

HF-SIP120-M module support upgrade from remote HTTP server, keep module connects to AP router before excute remote HTTP upgrade.

Direct Download and Upgrade

AT+UPURL command to set the remote directory and file name, such as:

AT+UPURL=http://www.hi-flying.com/admin/down/lpb.bin

After excuate this command, the module will directly download the “lpb.bin” file from remote directory and start upgrade Application.

Notes: please contact with high-flying technical people before upgrade firmware, or maybe damage the module and can't work again.

9.6. SOCKET B Function

HF-SIP120-M support double socket communication, the socket B function is disabled by default.

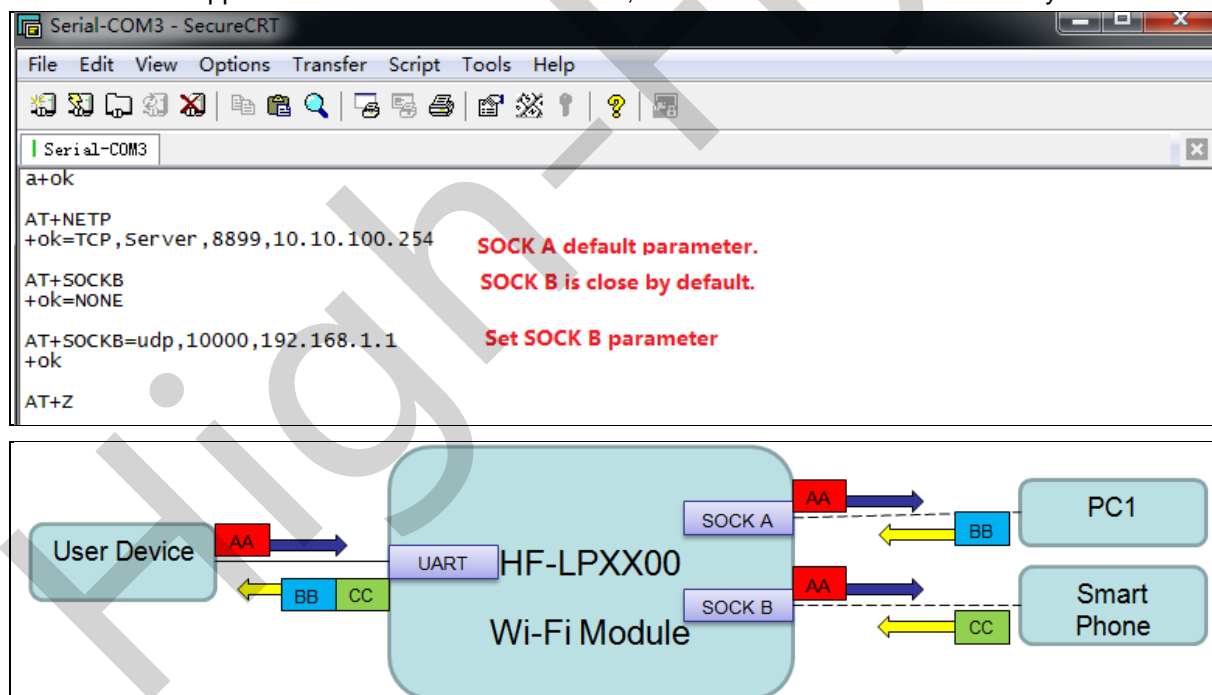


Figure 12. Socket B function demo

9.7. Multi-TCP Link Connection (Reserved)

When HF-SIP120-M module SOCK A configured as TCP Server, it supports Multi-TCP link connection, and maximum 5 TCP clients permitted to connect to HF-SIP120-M 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:

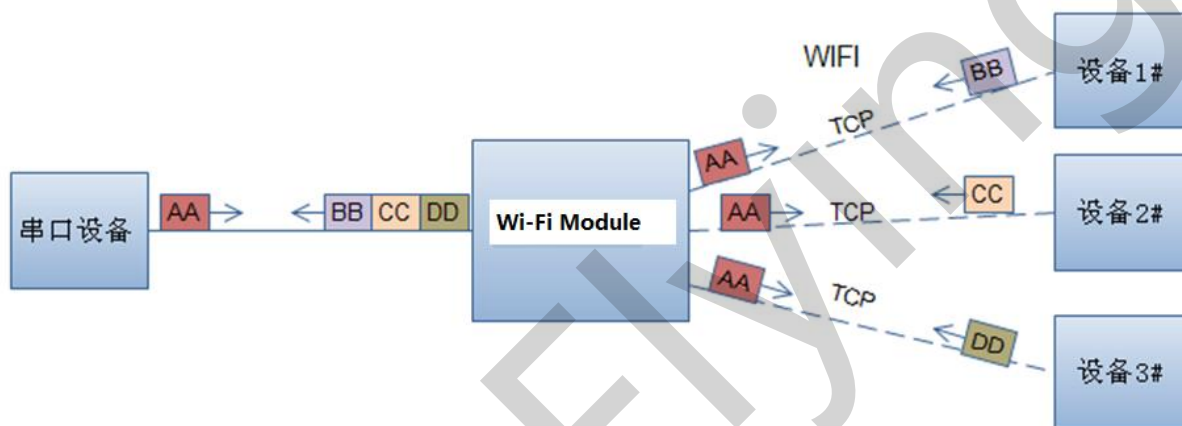


Figure 13. Multi-TCP Link Data Transmission Structure

10. OPERATION GUIDELINE

10.1. Configuration

When first use HF-SIP120-M modules, user may need some configuration. User can connect to HF-SIP120-M module’s wireless interface with following default setting information and configure the module through laptop.

Table17. HF-SIP120-M Web Access Default Setting

Parameters	Default Setting
SSID	HF-SIP120
IP Address	10.10.100.254
Subnet Mask	255.255.255.0
Account	admin
Password	admin

10.1.1. 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-SIP120” of HF-SIP120-M module 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 14. Open Web Management page

The HF-SIP120-M 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”.

Note: [Webpage function is 2.0.09-6 firmware new added.](#), so the previous software version does not support webpage, but after upgrade to our latest, it can support this, see appendix latest firmware on

our website. For current module, we may not ship it with default webpage support, please manual upgrade if need to use this function or tell our sales to upgrade to this latest function before shipment.

10.1.2. 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.

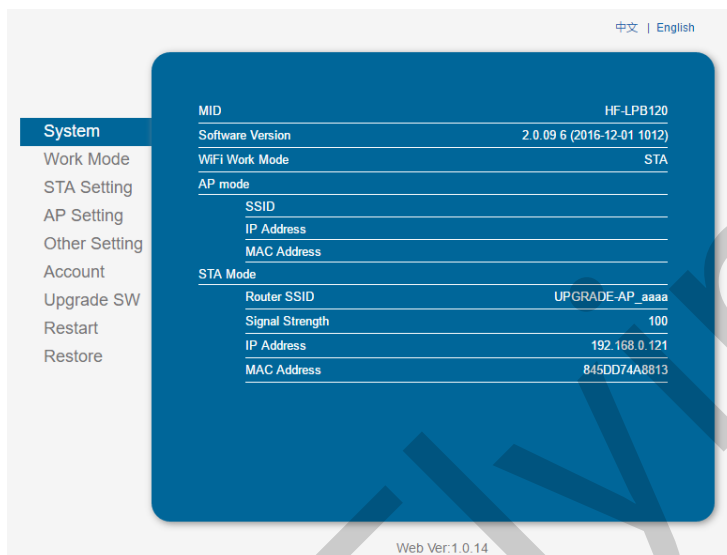


Figure 15. System Web Page

10.1.3. Work Mode Page

HF-SIP120-M module can works at AP mode to simplify user's configuration, can also works at STA to connect remote server through AP router.

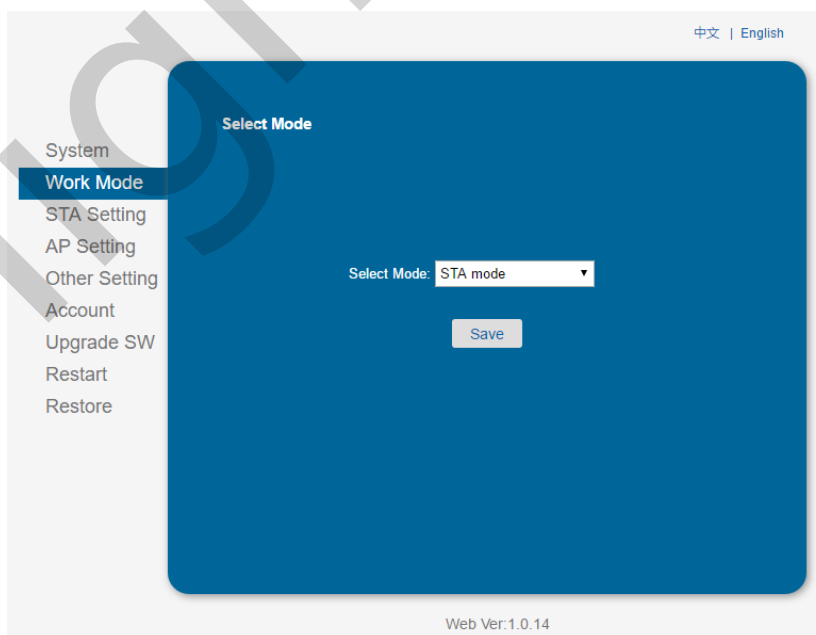


Figure 16. Work Mode Page

10.1.4. 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.

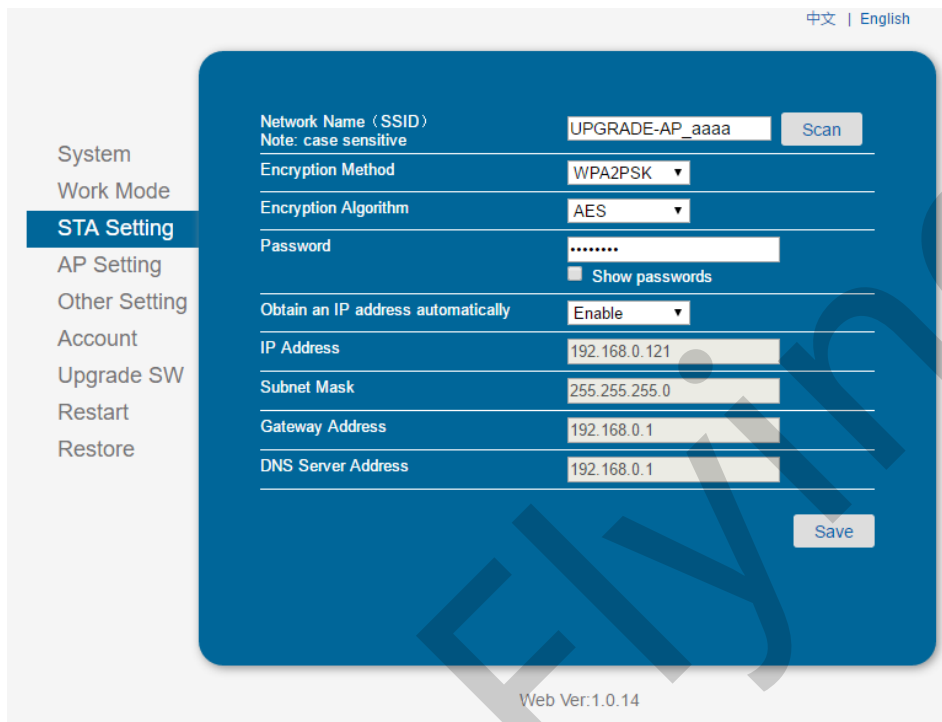


Figure 17. STA Setting Page

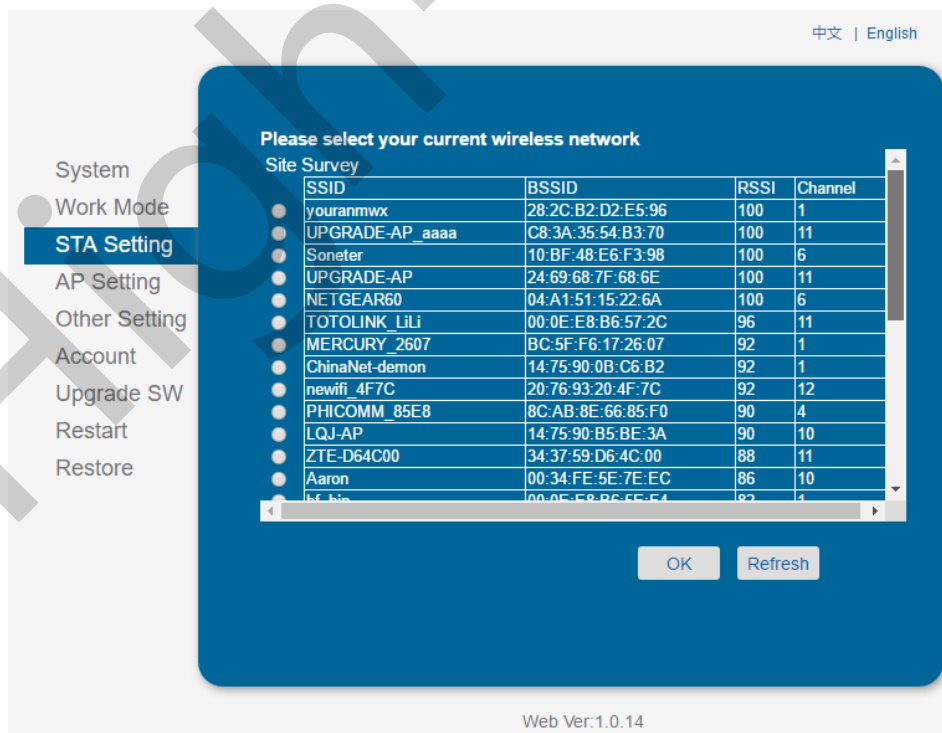


Figure 18. STA Scan Page

10.1.5. 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.

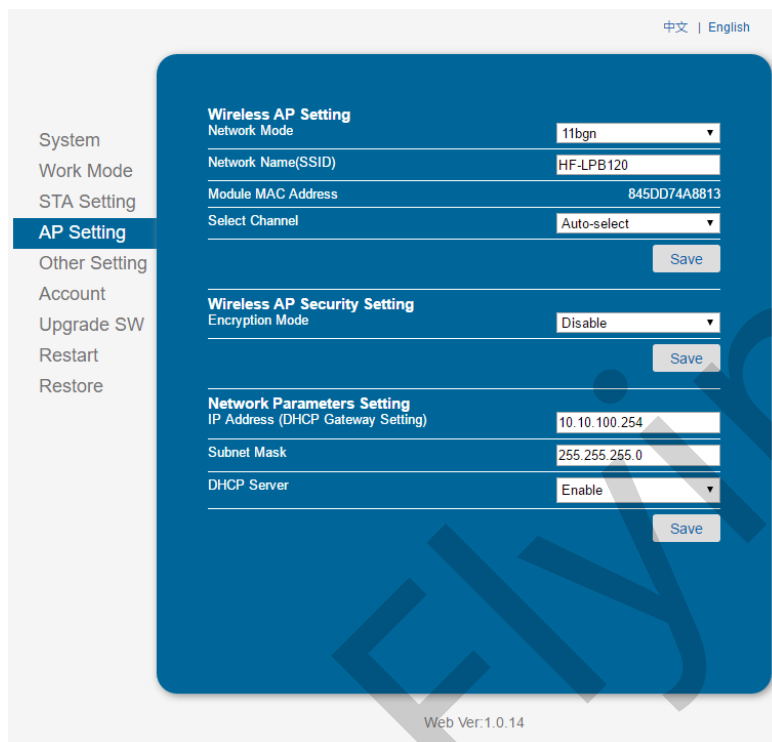


Figure 19. AP Setting Page

10.1.6. Other Setting Page

HF-SIP120-M usually works at data transparent transmission mode. At this mode, the user device which connected with HF-SIP120-M 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.

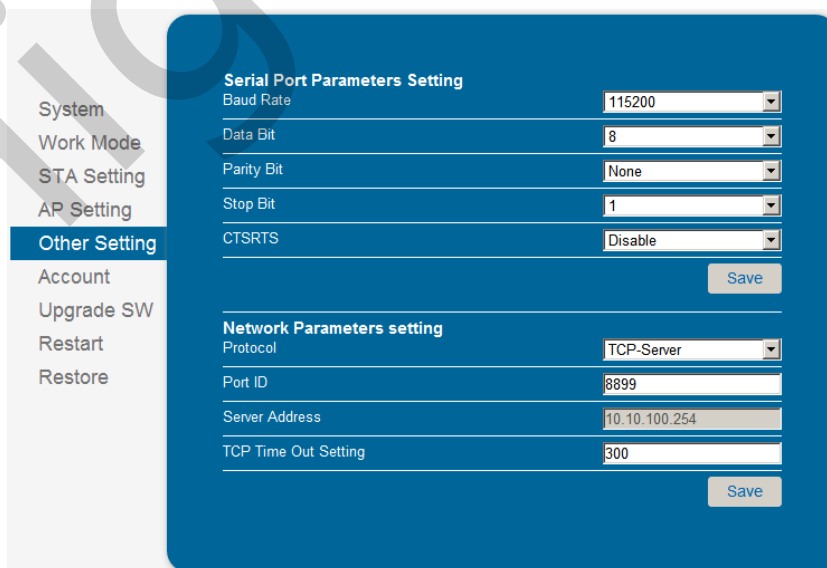


Figure 20. Other Setting Page

10.1.7. Account Management Page

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

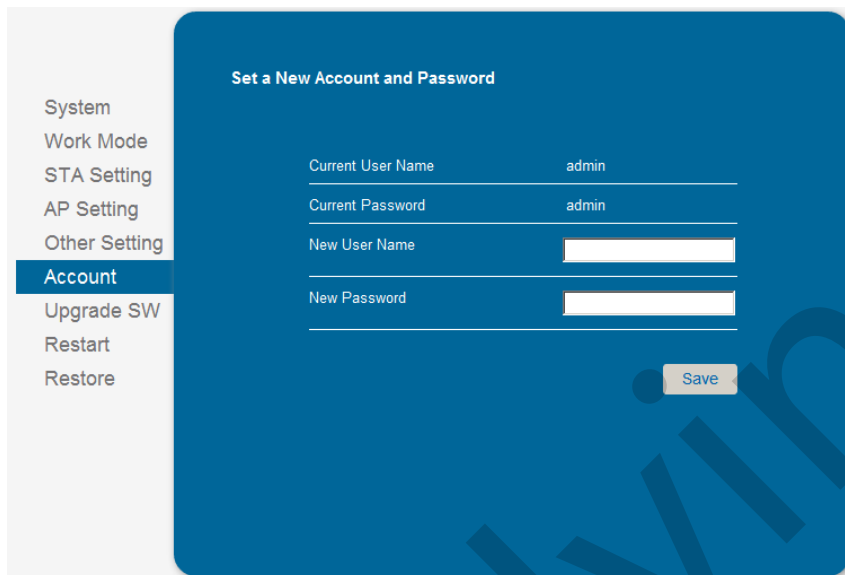


Figure 21. Account Page

10.1.8. Upgrade Software Page

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

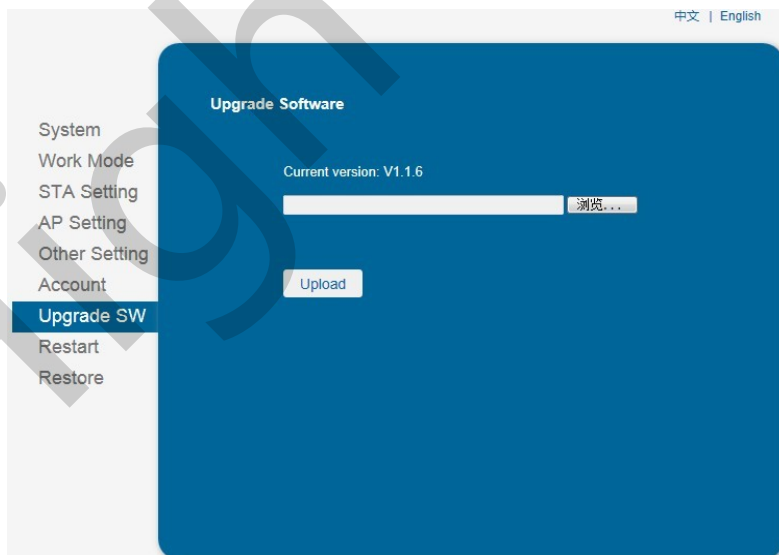


Figure 22. Upgrade SW page

10.1.9. Restart Page

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

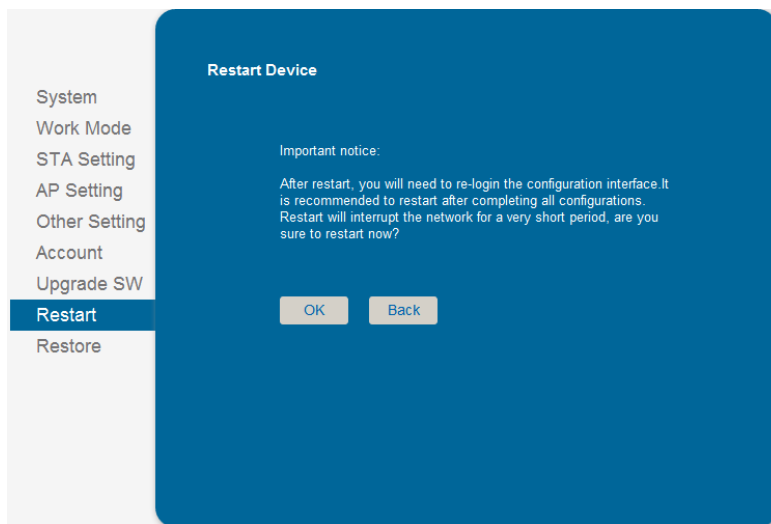


Figure 23. Restart Page

10.1.10. 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-SIP120-M will restore to AP mode for factory default setting.

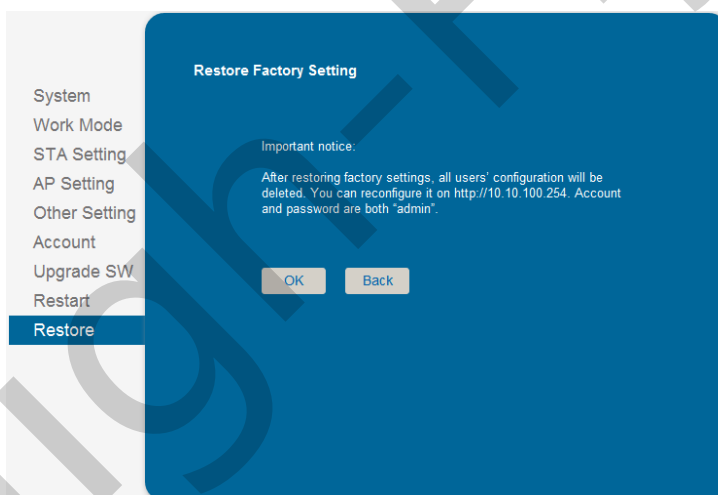


Figure 24. Restore Page

10.1.11. 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. After upgrade success, need reboot it manually before new firmware or webpage valid.





Figure 25. Internal Webpage

10.2. Usage Introduction

10.2.1. Software Debug Tools

High-Flying use two common software tools debugging and applying HF-SIP120-M module. (User can also select other tools used to debug serial port).

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

10.2.2. Network Connection

User can select two methods to connect HF-SIP120-M module base on dedicated application.

- **Use HF-SIP120-M STA interface.** HF-SIP120-M and debug PC2 connect to a wireless AP, another PC1 (or user device) connect to HF-SIP120-M module with serial port:



Figure 26. STA Interface Debug Connection

- **Use HF-SIP120-M AP interface.** Debug PC2 connect to HF-SIP120-M through wireless connection, another PC1 (or user device) connect to HF-SIP120-M module with serial port.



Figure 27. AP Interface Debug Connection

10.2.3. Default Parameter Setting

- Default SSID: HF-SIP120-M;

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

10.2.4. Module Debug

PC1 open “CommTools” program, setting the same serial port parameters with HF-SIP120-M module and open serial port connection.

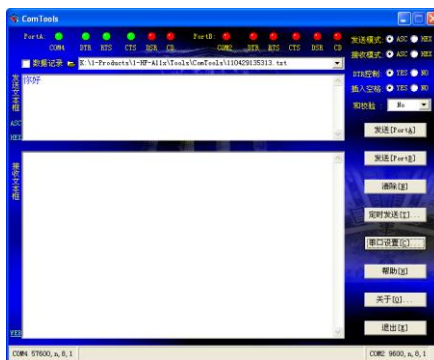


Figure 28. “CommTools” Serial Debug Tools

PC2 open “TCPUDPDbg” program, and create a new connection. If HF-SIP120-M configured as Server mode, “TCPUDPDbg” Tools shall create “Client” mode connection. Or otherwise, create a “Server” mode connection.

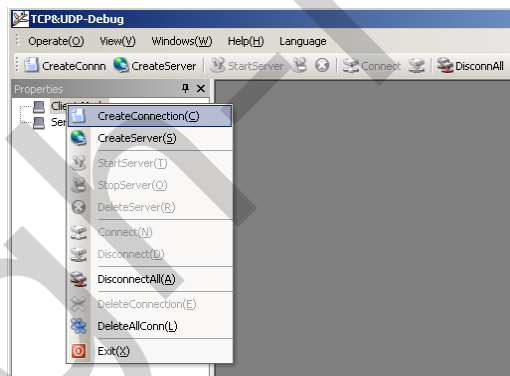


Figure 29. “TCPUDPDbg” Tools Create Connection

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

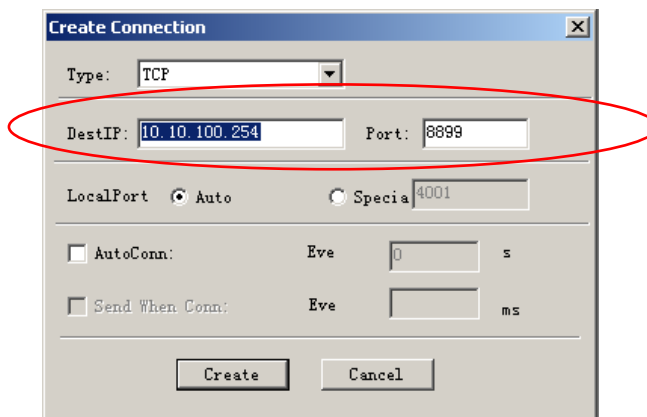


Figure 30. “TCPUDPDbg” Tools Setting

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

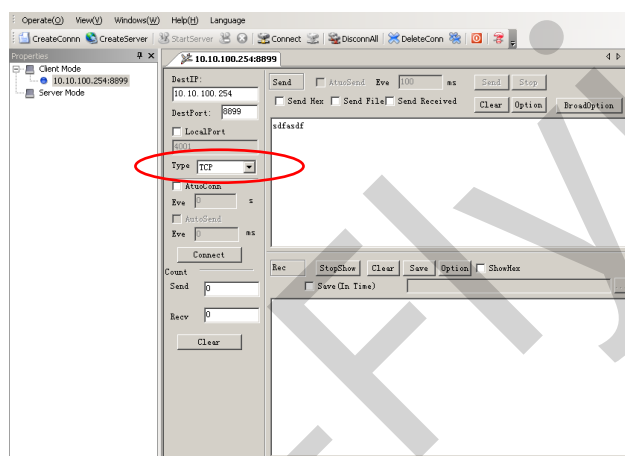


Figure 31. “TCPUDPDbg” Tools Connection

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.

10.3. Typical Application Examples

10.3.1. Wireless Control Application



Figure 32. Wireless Control Application

For this wireless control application, HF-SIP120-M 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-SIP120-M module.

10.3.2. Remote Management Application

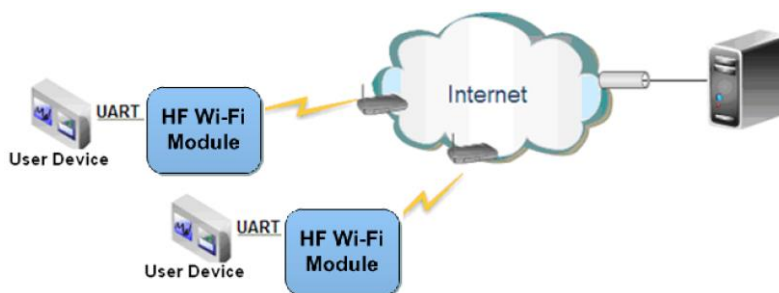


Figure 33. Remote Management Application

For this remote management application, HF-SIP120-M 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.

10.3.3. Transparent Serial Port Application

For this transparent serial port application, two HF-SIP120-M modules connect as below figures to build up a transparent serial port connection. One HF-SIP120-M works as AP mode, another HF-SIP120-M works as STA mode. Make the STA device connects to AP.



Figure 34. Transparent Serial Port Application

11. AT+INSTRUCTION INTRODUCTION

11.1. Configuration Mode

When HF-SIP120-M power up, it will default works as transparent transmission mode, then user can switch to configuration mode by serial port command. HF-SIP120-M UART default parameters setting as below figure,

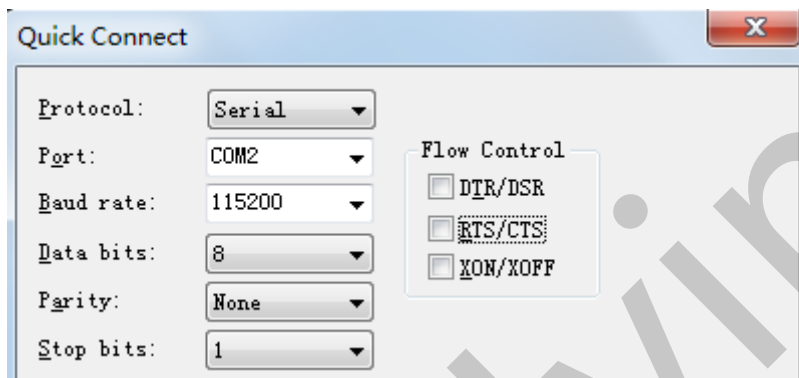


Figure 35. HF-SIP120-M Default UART Port Parameters

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

11.1.1. 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.**

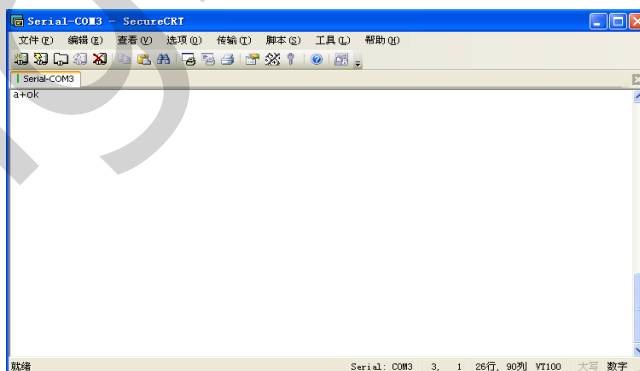
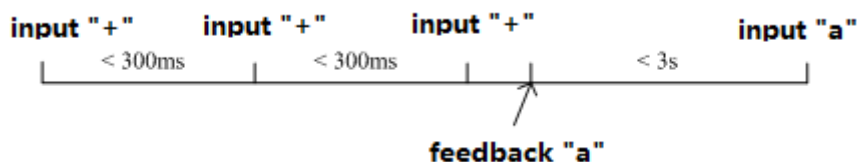


Figure 36. Switch to Configuration Mode

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.



11.2. AT+Instruction Set Overview

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

```

AT+H
+ok

AT+: NONE command, reply "+ok".
AT+ASWD: Set/Query WiFi configuration code.
AT+E: Echo ON/Off, to turn on/off command line echo function.
AT+ENTM: Goto Through Mode.
AT+NETP: Set/Get the Net Protocol Parameters.
AT+UART: Set/Get the UART Parameters.
AT+UARTF: Enable/disable UART AutoFrame function.
AT+UARTFT: Set/Get time of UART AutoFrame.
AT+UARTFL: Set/Get frame length of UART AutoFrame.
AT+UARTTE: Set/Query UART free-frame triggerf time between two byte.
AT+PING: General PING command.
AT+WAP: Set/Get the AP parameters.
AT+WAKEY: 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+WSQLQ: Get Link Quality of the Module (only for STA Mode).
AT+WSCAN: Get The AP site Survey (only for STA Mode).
AT+WEBU: Set/Get the Login Parameters of WEB page.
AT+TCPK: Get The state of TCP link.
AT+TCPPTO: 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 37. “AT+H” Instruction for Help

11.2.1. 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**

Table18. Error Code Description

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

11.2.2. AT+Instruction Set

Table19. AT+Instruction Set List

Instruction	Description
<null>	NULL
Managment Instruction Set	
E	Open/Close show back function
WMODE	Set/Query Wi-Fi work mode (AP/STA)
ENTM	Set module into transparent transition mode
MID	Query module ID information

Instruction	Description
VER	Query module software version information
BVER	Query module bootloader version
RELD	Restore to factory default setting
FCLR	Erase factory setting
Z	Re-start module
H	Help
Configure Parameters Instruction Set	
CFGTF	Copy User Parameters to Factory Default Parameters
UART Instruction Set	
UART	Set/Query serial port parameters
Network Instruction Set	
NETP	Set/Query network protocol parameters
MAXSK	Set/Query TCP Client connection number
TCPLK	Query if TCP link already build-up
TCPTO	Set/Query TCP timeout
TCPDIS	Open/Close TCP link
SOCKB	Set/Query SOCKB parameters
TCPDISB	Open/Close SOCKB TCP link
TCPTOB	Set/Query SOCKB TCP timeout
TCPLKB	Query if SOCKB TCP link already build-up
Wi-Fi STA Instruction Set (Effective when module works as STA)	
WSKEY	Set/Query STA security parameters
WSSID	Set/Query associated AP SSID parameters
WANN	Set/Query STA's network parameters
WSMAC	Set/Query module MAC address
WSLK	Query STA Wi-Fi link status
WSLQ	Query STA Wi-Fi signal strength
WSCAN	Scan AP
Wi-Fi AP Instruction Set (Effective when module works as AP)	
LANN	Set/Query AP's network parameters
WAP	Set/Query AP Wi-Fi parameters
WAKEY	Set/Query AP security parameters
WADHCP	Set/Query AP DHCP Server status
WALK	Query MAC address of STA device connecting to module AP
WALKIND	Enable/Disable indication of connection status.
WAPMXSTA	Set/Query max STA devices supported for AP.
Remote Upgrade Instruction Set	
OTA	Upgrade Firmware
UPURL	Set/Query remote upgrade URL address
Power Management Instruction Set	
DISPS	Set/Query power save parameters
Webpage Set	
PLANG	Set/Query webpage language
WEBU	Set/Query webpage login account
Others Instruction Set	
WRMID	Set module ID
ASWD	Set/Query WiFi configuration code
SMTLK	Start SmartLink function
SMEM	Query RAM status

Instruction	Description
NDBG	Set UART debug information

11.2.2.1. AT+E

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

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

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

When HF-SIP120-M 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..

11.2.2.2. AT+WMODE

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

```
AT+WMODE<CR>
+ok=<mode><CR><LF><CR><LF>
```

- ◆ Set Operation
- ```
AT+WMODE=<mode><CR>
+ok<CR><LF><CR><LF>
```
- Parameters:
    - ◆ mode:Wi-Fi work mode
      - ◇ AP
      - ◇ STA

11.2.2.3. AT+ENTM

- Function: Set module into transparent transmission mode;
- Format:
  - ◆ Query Operation

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

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

11.2.2.4. AT+MID

- Function: Query module ID information;
- Format:
  - ◆ Query Operation

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



- Parameters:
  - ◆ module\_id: Module ID information;
    - ◇ HF-SIP120-M;

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

#### 11.2.2.5. AT+VER

- Function: Query module software version information;
  - Format:
    - ◆ Query Operation
- ```
AT+VER<CR>
+ok=<ver><CR><LF><CR><LF>
```
- Parameters:
 - ◆ ver: Module software version information;

11.2.2.6. AT+BVER

- Function: Query module bootloader software version information
 - Format:
 - ◆ Query Operation
- ```
AT+BVER<CR>
+ok=<ver><CR><LF><CR><LF>
```
- Parameters:
    - ◆ ver: Module bootloader version information;

Bootloader is for module upgrade firmware via UART. See details on our website about the module firmware download page.

#### 11.2.2.7. AT+RELD

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

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

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

#### 11.2.2.8. AT+FCLR

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

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

#### 11.2.2.9. AT+Z

- Function: Re-start module;
- Format:

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

## 11.2.2.10. AT+H

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

**AT+H<CR>**

**+ok=<command help><CR><LF><CR><LF>**

- Parameters:
  - ◆ command help: command introduction;

## 11.2.2.11. AT+CFGTF

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

**AT+CFGTF<CR>**

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

- Parameters:
  - ◆ status: feedback operation status;

## 11.2.2.12. AT+UART

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

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

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

- ◆ Set Operation

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

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

- Parameters:
  - ◆ uart\_num: UART Channel, the default is UART0.
    - 0: UART0 Channel
  - ◆ baudrate:
    - ◇ 1200,1800,2400,4800,9600,19200,38400,57600,115200,230400,380400,460800,921600
  - ◆ data\_bits:
    - ◇ 8
  - ◆ stop\_bits:
    - ◇ 1,2
  - ◆ parity:
    - ◇ NONE
    - ◇ EVEN
    - ◇ ODD
  - ◆ Flowctrl: (CTSRTS),
    - ◇ NFC: No hardware flow control
    - ◇ **FC: hardware flow control(Not supported)**

## 11.2.2.13. AT+NETP

- Function: Set/Query network protocol parameters, Setting is valid after reset.

- Format:

- ◆ Query Operation

**AT+NETP<CR>**

**+ok=<protocol,CS,port,IP><CR><LF><CR><LF>**

- ◆ Set Operation

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

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

- Parameters:

- ◆ protocol:

- ◇ TCP

- ◇ UDP

- ◆ CS: Network mode:

- ◇ SERVER

- ◇ CLIENT

- ◆ Port: protocol port ID: Decimal digit and less than 65535

- ◆ IP: Server's IP address when module set as client

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

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

## 11.2.2.14. AT+MAXSK

- Function: Set/ Query 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.

## 11.2.2.15. AT+TCPLK

- Function: Query if 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;

#### 11.2.2.16. AT+TCPTO

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

- Format:

- ◆ Query Operation

**AT+TCPTO<CR>**

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

- ◆ Set Operation

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

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

- Parameters:

- ◆ time: TCP timeout time.

- ◇ ≤ 600, (600s);
- ◇ ≥ 0, (0 means no timeout);
- ◇ Default, 300s;

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

#### 11.2.2.17. AT+TCPDIS

- Function: Open/Close TCP link;

- Format:

- ◆ Query Opera

**AT+TCPDIS<CR>**

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

- ◆ Set Operation

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

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

- Parameters:

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

- ◇ On, TCP link close
- ◇ off, TCP link on

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

#### 11.2.2.18. AT+SOCKB

- Function: Set/Query SOCKB parameters. Setting is valid after reset.

- Format:

- ◆ Query Operation

**AT+SOCKB<CR>**

**+ok=<protocol,port,IP><CR><LF><CR><LF>**

- ◆ Set Operation

**AT+SOCKB=<protocol,port,IP><CR>**

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

- Parameters:

- ◆ Protocol: Protocol type:

- ◇ TCP: Only for TCP Client
- ◇ UDP: UDP Client
- ◇ UDPS: UDP Server

- ◆ Port: Protocol Port in decimal, less than 65535

- ◆ IP: Destination IP address, domain name is support

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

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

#### 11.2.2.19. AT+TCPDISB

- Function: Open/Close SOCKB connection

- Format:

- ◆ Query Operation

**AT+TCPDISB<CR>**

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

- ◆ Set Operation

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

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

- Parameters:

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

#### 11.2.2.20. AT+TCPTOB

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

- Format:

- ◆ Query Operation

**AT+TCPTOB<CR>**

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

- ◆ Set Operation

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

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

- Parameters

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

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

#### 11.2.2.21. AT+TCPLKB

- Function:Query SOCKB connection status
- Format:

**AT+TCPLKB<CR>**

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

- Parameters:
  - ◆ sta.: SOCKB connection status
    - ◇ on: TCP connected
    - ◇ off: TCP disconnected

#### 11.2.2.22. AT+WSSSID

- Function: Set/Query Wi-Fi associated AP SSID parameters. Setting is valid after reset.
- Format:

- ◆ Query Operation

**AT+WSSSID<CR>**

**+ok=<ap's ssid><CR><LF><CR><LF>**

- ◆ Set Operation

**AT+WSSSID=<ap's ssid ><CR>**

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

- Parameters:
  - ◆ ap's ssid: AP's SSID (Within 32 character);

#### 11.2.2.23. AT+WSKEY

- Function: Set/Query STA security parameters. Setting is valid after reset.
- Format:

- ◆ Query Operation

**AT+WSKEY<CR>**

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

- ◆ Set Operation

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

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

- Parameters:
  - ◆ auth: Authentication mode
    - ◇ OPEN
    - ◇ SHARED
    - ◇ WPAPSK

- ◇ WPA2PSK
- ◆ encry: Encryption algorithm
  - ◇ NONE: When “auth=OPEN”, effective
  - ◇ WEP-H: When “auth=OPEN” or “SHARED”, effective, in HEX format
  - ◇ WEP-A: When “auth=OPEN” or “SHARED”, effective, in ASCII format
  - ◇ TKIP: When “auth= WPAPSK” or “WPA2PSK”, effective
  - ◇ AES: When “auth= WPAPSK” “WPA2PSK”, effective
- ◆ key: password. When encry is WEP-H, password is in HEX format, password length is 10 or 26. When encry is WEP-A, password is in ASCII format, password length is 5 or 13. When encry is TKIP or AES, password is in ASCII code, password length shall be less than 64 and greater than 8.

#### 11.2.2.24. AT+WANN

- Function: Set/Query STA network setting. Setting is valid after reset.
- Format:
  - ◆ Query Operation  
**AT+WANN<CR>**  
**+ok=<mode,address,mask,gateway><CR><LF><CR><LF>**
  - ◆ Set Operation  
**AT+WANN=< mode,address,mask,gateway ><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters:
  - ◆ mode: STA's IP network setting
    - ◇ static: Static IP
    - ◇ DHCP: Dynamic IP
  - ◆ address: STA IP address;
  - ◆ mask: STA subnet mask;
  - ◆ gateway: STA gateway address;

#### 11.2.2.25. AT+WSMAC

- Function: Set/Query Module 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><CR>**  
**+ok<CR><LF><CR><LF>**
- Parameters:
  - ◆ code: security code
    - ◇ 8888 (default value)
  - ◆ Mac\_address: module MAC address, such as ACCF23FF1234

## 11.2.2.26. AT+WSLK

- Function: Query STA WiFi link status
- Format:

- ◆ Query Operation

**AT+WSLK<CR>**

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

- Parameters:

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

## 11.2.2.27. AT+WSQL

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

- ◆ Query Operation

**AT+WSQL<CR>**

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

- Parameters:

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

## 11.2.2.28. AT+WSCAN

- Function: Scan AP;
- Format:

**AT+WSCAN<CR>**

**+ok=<ap\_site><CR><LF><CR><LF>**

- Parameters:

- ◆ ap\_site: AP searched;

## 11.2.2.29. AT+LANN

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

- ◆ Query Operation

**AT+LANN<CR>**

**+ok=<ipaddress,mask><CR><LF><CR><LF>**

- ◆ Set Operation

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

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

- Parameters:

- ◆ ipaddress: AP's IP address;
- ◆ mask: AP's net mask;



## 11.2.2.30. AT+WAP

- Function: 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><CR>**

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

- Parameters:

- ◆ wifi\_mode: Wi-Fi mode, include:

- ◇ 11B
- ◇ 11BG
- ◇ 11BGN (Default Value)

- ◆ ssid:SSID at AP mode, the maximum length is 32.

- ◆ channel: Wi-Fi channel selection:

- ◇ AUTO;(Default CH1)
- ◇ CH1~CH11;

## 11.2.2.31. AT+WAKEY

- Function: 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, smaller than 64bit and bigger than 8 bit;

## 11.2.2.32. AT+WADHCP

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

- Format:

- ◆ Query Operation

**AT+WADHCP<CR>**

**+ok=<status>,<ip1>,<ip2><CR><LF><CR><LF>**

- ◆ Set Operation

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

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

- Parameters:
  - ◆ status:AP's DHCP server function status:
    - ✧ on:DHCP Server Open;
    - ✧ off:DHCP Server Close;
  - ◆ ip1: DHCP allocate IP start value.
  - ◆ ip2: DHCP allocate IP end value.

#### 11.2.2.33. AT+WALK

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

**AT+WALK<CR>**

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

- Parameters:
  - ◆ status: MAC address of STA device connecting to module AP.
    - ✧ No Connection: No STA device connecting to module AP;

#### 11.2.2.34. AT+WALKIND

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

**AT+WALKIND<CR>**

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

- ◆ Set Operation

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

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

- Parameters:
  - ◆ status: indication of module AP connection status.
    - ✧ on: Enable nLink indication function. When STA device connecting to module AP, nLink output Low, otherwise output High.
    - ✧ off: Disable nLink indication function. **(default mode)**.

#### 11.2.2.35. AT+WAPMXSTA

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

**AT+WAPMXSTA<CR>**

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

- ◆ Set Operation

**AT+WAPMXSTA=<num><CR>**

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

- Parameters:

- ◆ num: max STA number supported for AP.
  - ✧ 1~4: Support max 1~4 STA devices connects to module AP. **0 is default value for max 1 STA device supported.**

#### 11.2.2.36. AT+OTA

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

**AT+OTA<CR>**

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

Note: See Appendix C Module Upgrade for detail

#### 11.2.2.37. AT+UPURL

- Function: Set/ Query remote upgrade URL address;
  - Format:
    - ◆ Query Operation
- AT+UPURL<CR>**
- +ok=<url> <CR><LF><CR><LF>**
- ◆ Set Operation
- AT+UPURL=<url,filename> <CR>**
- +ok<CR><LF><CR><LF>**
- Parameters:
    - ◆ url: the upgrade file url address; the last charter shall be "/" (within 20 characters).
    - ◆ filename: the upgrade file name, it's optional and not saved parameter. If provide this file name here, the module will start upgrade right away;

#### 11.2.2.38. AT+DISPS

- Function: Set/Query power save parameters;
  - Format:
    - ◆ Query Operation
- AT+DISPS<CR>**
- +ok=<ret><CR><LF><CR><LF>**
- ◆ Set Operation
- AT+DISPS=<mode[,time]><CR><LF><CR><LF>**
- Parameters:
    - ◆ ret:
      - ✧ No: Enable power save
      - ✧ Yes: Disable power save
      - ✧ Auto: Auto power save mode(default), enter power saving mode after receive or send data in time seconds.
    - ◆ mode:
      - ✧ No: Enable power save
      - ✧ Yes: Disable power save

- ✧ Auto: Auto power save mode(default), enter power saving mode after receive or send data in time seconds.
- ◆ time: Only valid in auto mode, >=2 integer value, default is 3 seconds. when value is 0, the default waiting time is still 3 seconds.

## 11.2.2.39. AT+PLANG

- Function: Set/Query webpage language option;

- Format:

- ◆ Query Operation

**AT+PLANG<CR>**

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

- ◆ Set Operation

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

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

- Parameters:

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

## 11.2.2.40. AT+WEBU

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

- Format:

- ◆ Query Operation

**AT+WEBU<CR>**

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

- ◆ Set Operation

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

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

- Parameters:

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

## 11.2.2.41. AT+WRMID

- Function: Set module ID;

- Format:

- ◆ Set Operation

**AT+WRMID=<wrmid> <CR><LF><CR><LF>**

- Parameters:

- ◆ wrmid: set module's ID (within 20 characters).

## 11.2.2.42. AT+ASWD

- Function: Set/Query WiFi Configuration Password;

- Format:

- ◆ Query Operation

**AT+ASWD<CR>**

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

- ◆ Set Operation

**AT+ASWD=<aswd> <CR><LF><CR><LF>**

- Parameters:
  - ◆ aswd: WiFi Configuration Password (within 20 characters).

11.2.2.43. AT+SMTLK

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

**AT+SMTLK<CR>**

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

11.2.2.44. AT+SMEM

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

**AT+SMEM<CR>**

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

- Parameters:
  - ◆ status: The RAM status, the last number is the free memory size can be used.

```
AT+SMEM
+ok=mem:6624,6624,0,46324
uart send:0
uart recv:12
uart buffer full:0
socket send:0
socket recv:0
socket buffer full:0
```

11.2.2.45. AT+NDBGL

- Function: Enable/Disable UART debug information
- Format:
  - ◆ Query Operation

**AT+NDBGL<CR>**

**+ok=<debug\_level,uart\_num> <CR><LF><CR><LF>**

- ◆ Set Operation

**AT+NDBGL =<debug\_level,uart\_num><CR>**

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

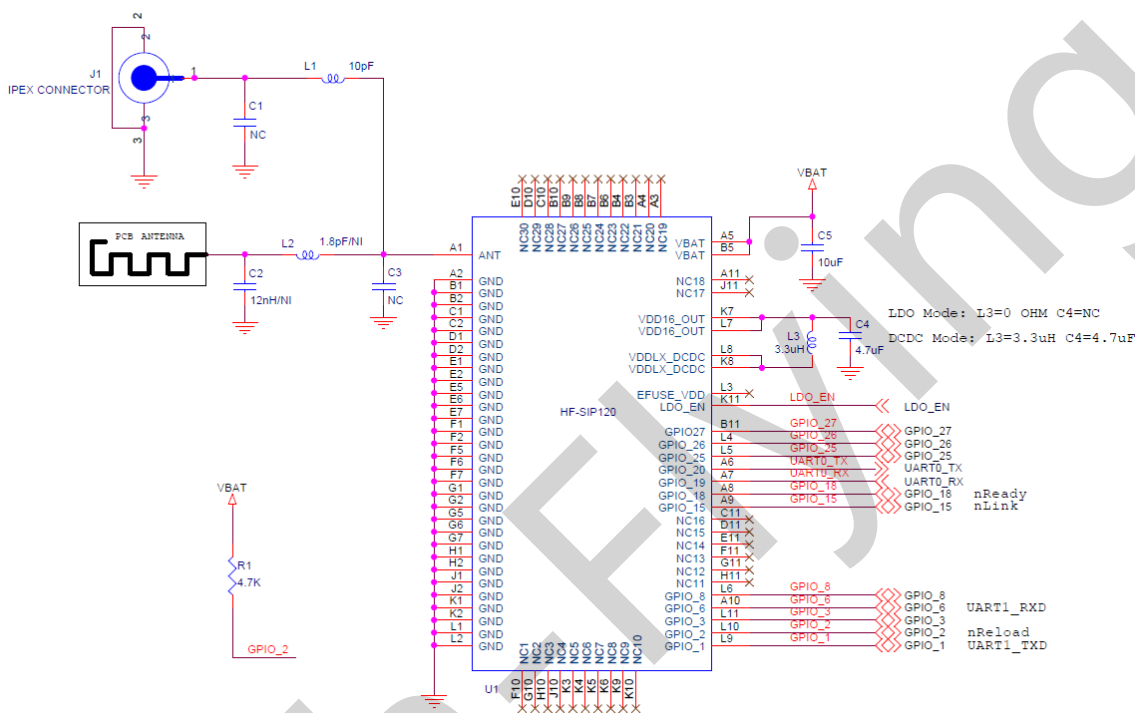
- Parameters:
  - ◆ debug\_level: UART debug level value
    - ◇ 0: Disable debug information output

- ✧ 1~XX: Output UART debug information which is with the same(and above) debug level value
- ◆ uart\_level: UART debug information output channel
  - ✧ 0: UART0
  - ✧ 1: UART1

High-Flying

# APPENDIX A: HW REFERENCE DESIGN

Detailed HF-SIP120 Evaluation Board design source files, pls access High-Flying web download page or contact with High-Flying technical support people to acquire.



**Notes:** To get better performance, we suggest user add 10uF or 22uF CAP near VBAT pins at customer's board.

GPIO\_1/GPIO\_6: Debug UART1, use this UART1 to check the module log information output and input AT command, suggest to layout the test point and place a jumper for test.

GPIO\_2: nReload, must add a pull-up resistor and connect to a button, it have the following function. See LPB120 module manual for detailed usage.

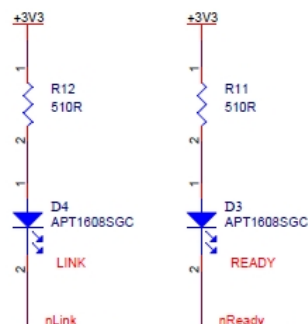
nReload:

1. When this pin is set to "low" during module boot up, the module will enter wireless firmware and config upgrade mode. This mode is used for customer manufacture. and upgrade firmware during mass production)
2. After module is powered up, short press this button ( "Low" <= 2s ) to make the module go into "Smart Link " config mode, waiting for APP to set password and other information.
3. After module is powered up, long press this button ( "Low" >= 4s ) to make the module recover to factory setting.

GPIO\_15: nLink, Wi-Fi connection status. See LPB120 module manual for detail.

GPIO\_18: nReady, boot status connection. See LPB120 module manual for detail

Suggest to connect to LED for nLink and nReady PIN. it is very useful for debug stage, may remove the LED for mass production.



GPIO\_19/GPIO\_20: Communication UART0. It is for data throughput and AT command.

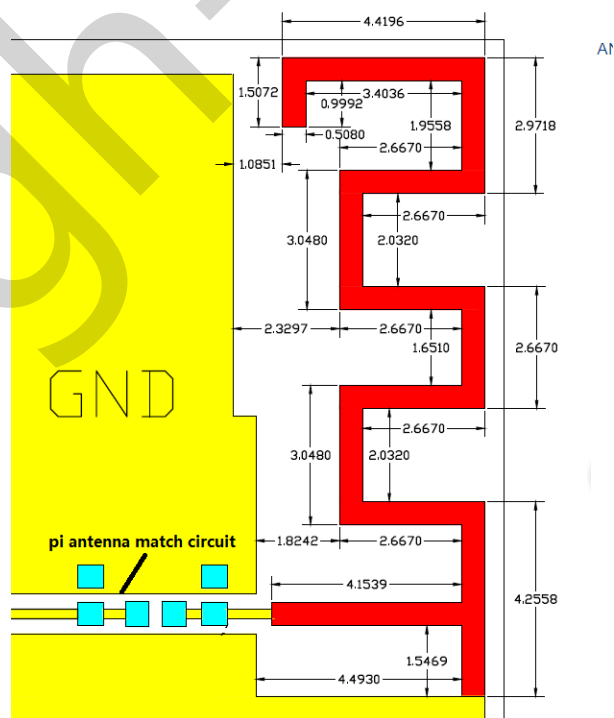
LDO\_EN: hardware reset pin. connect it if needed.

VDDLX\_DCDC: DCDC and LDO mode selection, refer to “Vcore Converter Mode” chapter for detail, if use DCDC mode, the hardware should be as the above value(L3 and C4) and the software should use AT+DCDC=on command to enable.

ANT: antenna pin out, need external pi antenna match circuit. High-Flying can provide external antenna or internal antenna reference, see the following for internal PCB antenna reference design.

Contact us if need customized PCB internal antenna on PCBA.

- board material: FR4
- dielectric constant: 3.7/4.2
- copper thickness: 1OZ
- copper width: 0.508mm
- Unit: mm





# APPENDIX B: HTTP PROTOCOL TRANSFER

HF-LPT120 module support http data transfer in throughput mode. If any detailed HTTP protocol, contact us and we may support customization.

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

Step 1、Configure HTTP server information

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

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

```
AT+WSSSID=Tenda_GYH
+ok

AT+WSKEY=wpa2psk,aes,12345678
+ok

AT+WMODE=sta
+ok

AT+Z
```

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



## APPENDIX C: REFERENCES

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

Download Address: [http://www.hi-flying.com/download\\_detail\\_dc/downloadsId=9.html](http://www.hi-flying.com/download_detail_dc/downloadsId=9.html)

### C.2. SmartLink APP V7 Config Tool

IOS Platform : [http://www.hi-flying.com/download\\_detail\\_dc/downloadsId=42.html](http://www.hi-flying.com/download_detail_dc/downloadsId=42.html)

Android Platform: [http://www.hi-flying.com/download\\_detail\\_dc/downloadsId=83.html](http://www.hi-flying.com/download_detail_dc/downloadsId=83.html)

### C.3. EVK Quick Start Guide

Download Address: <http://www.hi-flying.com/downloadsfront.do?method=picker&flag=all&id=a974580c-9a9b-4329-a554-6bd54aa8500d&fileId=99>

### C.4. Module Upgrade

Download Address: [http://www.hi-flying.com/download\\_detail\\_fir/downloadsId=75.html](http://www.hi-flying.com/download_detail_fir/downloadsId=75.html)

### C.5. Other Tools

Download Address: [http://www.hi-flying.com/download\\_list\\_dc/&downloadcategoryid=14&isMode=false&comp\\_stats=comp-FrontDownloadsCategory\\_show01-1376450727769.html](http://www.hi-flying.com/download_list_dc/&downloadcategoryid=14&isMode=false&comp_stats=comp-FrontDownloadsCategory_show01-1376450727769.html)

### C.6. SDK Software Develop Kit

Download Address: [http://www.hi-flying.com/download\\_detail\\_sdk/downloadsId=115.html](http://www.hi-flying.com/download_detail_sdk/downloadsId=115.html)

## APPENDIX D: CONTACT INFORMATION

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

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

**<END OF DOCUMENT>**

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