

HF-LPD1X0 Series

802.11a/b/g/n Dual Band WiFi

Module User Manual

V 1.6

HF-LPD1X0 series include the following modules:

 MPN:HF-LPD100-1 MAC:E8FDF808EA9C FCC ID: CMIIT ID: CE RoHS	HF-LPD100	SMT48: 23.1 x 32.8 x 2.5mm
 MPN:HF-LPD100E-1 MAC:E8FDF800EA9C FCC ID: CMIIT ID: CE RoHS	HF-LPD100E	SMT48: 23.1 x 32.8 x 3.5mm
 MPN:HFLPD130-00 MAC:E8FDF8122CBE CE RoHS	HF-LPD130	DIP10: 22 x 14.3 x 8mm
 MPN:HFLPD130E-00 MAC:E8FDF812FCBE CE RoHS	HF-LPD130E	DIP10: 22 x 14.3 x 8mm

Overview of Characteristic

- ✧ Support IEEE802.11 a/b/g/n Wireless Standards, work in 2.4GHz and 5GHz dual band
- ✧ Based on Andes Core, 160MHz CPU, 192KB RAM, 2MB 或 8MB Flash
- ✧ Support UART Data Communication Interface
- ✧ Support Work As STA/AP/AP+STA Mode
- ✧ Support Sniffer Method SmartLink V8 Config
- ✧ **Support SoftAP Method SmartAPLink Config**
- ✧ Support Wireless and Remote Firmware Upgrade Function
- ✧ Support Software SDK for Develop
- ✧ Support Different Antenna Option
 - HF-LPD100/HF-LPD100E: Internal PCB, External 3rd Generation IPEX or External Antenna Pad
 - HF-LPD130/HF-LPD130E: External 1st Generation IPEX
- ✧ Single +3.3V Power Supply
- ✧ Size:
 - HF-LPD100: $23.1 \pm 0.3\text{mm} \times 32.8 \pm 0.3\text{mm} \times 2.5 \pm 0.3\text{mm}$, SMT48 package
 - /HF-LPD100E: $23.1 \pm 0.3\text{mm} \times 32.8 \pm 0.3\text{mm} \times 3.5 \pm 0.3\text{mm}$, SMT48 package
 - HF-LPD130/HF-LPD130E: $22 \pm 0.2\text{mm} \times 14.3 \pm 0.2\text{mm} \times 8\text{mm}$, DIP10 package

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HISTORY

Ed. V0.1 08-24-2017 Internal Version.

Ed. V1.0 10-26-2018 Released Version

Ed. V1.1 06-04-2019 Add HF-LPD130 Version

Ed. V1.2 09-29-2019 Add HF-LPD100 external pin antenna

Ed. V1.3 12-14-2020 Update LPD130 PIN definition.

Ed. V1.4 2022-06-23 Add HF-LPD100E, HF-LPD130E module, add new HTTP, MQTT, EVENT AT command according to firmware 1.12.45 version.

Ed. V1.5 2023-06-16 Update Pin description, TX power.

Ed. V1.6 2023-08-18 Delete software function, put to depedent document.

1. PRODUCT OVERVIEW

1.1. General Description

The HF-LPD1X0 support 2.4GHz and 5GHz dual band. It is a fully self-contained small form-factor, single stream, 802.11b/g/n Wi-Fi module, which provide a wireless interface to any equipment with a Serial interface for data transfer. HF-LPD1X0 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 solution for a variety of applications.

The HF-LPD1X0 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.

[HF-LPD100E and HF-LPD130E uses external 2MB Flash, RF and software feature is the same, the following document description is applicable for HF-LPD100E and HF-LPD130E version.](#)

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-LPD1X0 Module Technical Specifications

Class	Item	Parameters
Wireless Parameters	Wireless standard	2.4GHz: 802.11 b/g/n 5GHz: 802.11 a
	Frequency range	2.412GHz-2.484GHz(CH1,13) 5.17GHz-5.25GHz(CH36,40,44,48) U-NII-1 5.725GHz-5.835GHz(CH149,153,157,161,165) U-NII-3
	2.4G Transmit Power	802.11b: +17±1.5dBm(@11Mbps)
		802.11g: +14±1.5dBm(@54Mbps)
		802.11n: +14±1.5dBm(@HT20, MCS7)
	5G Transmit Power	15±1.5dBm (OFDM 6Mbps)
		13±1.5dBm (OFDM 54Mbps)
		12±1.5dBm (HT20 MCS7)
		12±1.5dBm (HT40 MCS7)
	2.4G Receiver Sensitivity	802.11b: -95 dBm (@1Mbps ,CCK)
		802.11b: -85 dBm (@11Mbps ,CCK)
		802.11g: -72 dBm (@54Mbps, OFDM)
		802.11n: -70dBm (@HT20, MCS7)
		802.11n: -67dBm (@HT40, MCS7)
	5G Receiver Sensitivity	-90dBm (@6Mbps ,OFDM)
		-73dBm (@54Mbps ,OFDM)
		-70 dBm (HT20,MCS7)
		-67 dBm (HT40,MCS7)
	Antenna Option	HF-LPD100/HF-LPD100E: Internal: PCB antenna External: 3 rd Generation IPEX antenna or antenna PAD. HF-LPD130/HF-LPD130E: External: 1 st Generation IPEX antenna
Hardware Parameters	Data Interface	UART
		GPIO
	Operating Voltage	Normal 3.3V , range 3.13~3.46V, if power supply low to 3V, TX output power decrease 1dB.
	Operating Current	Peak (Continuous TX): 345mA Average(STA, No data): 44mA Standby: 1.23mA(Reset set to low)
	Operating Temp.	-40℃- 85℃
	Storage Temp.	-40℃- 125℃
	Density	<85%
	MSL	3
Software Parameters	Dimensions and Size	HF-LPD100/HF-LPD100E: 23.1±0.3mm x 32.8±0.3mm x 2.5±0.3mm
		HF-LPD130/HF-LPD130E: 22±0.2mm x 14.3±0.2mm x 8mm
	Network Type	STA/AP/AP+STA
	Security Mechanisms	WEP/WPA-PSK/WPA2-PSK
Software Parameters	Encryption	WEP64/WEP128/TKIP/AES

	Update Firmware	Local Wireless, Remote OTA
	Customization	Support SDK for application develop
	Network Protocol	IPv4, TCP/UDP/HTTP/TLS
	User Configuration	AT+instruction set. Android/ iOS SmartAPLink APP tools

1.2. Hardware Introduction

HF-LPD1X0 series Wi-Fi module appearance is as following.

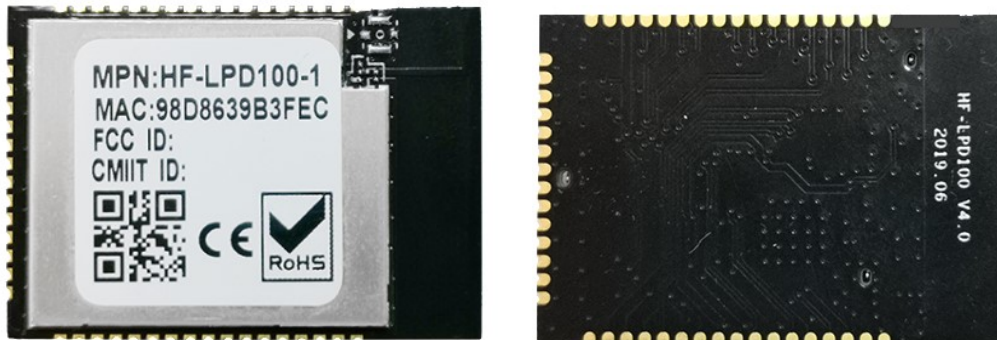


Figure 1. HF-LPD100-1 Appearance

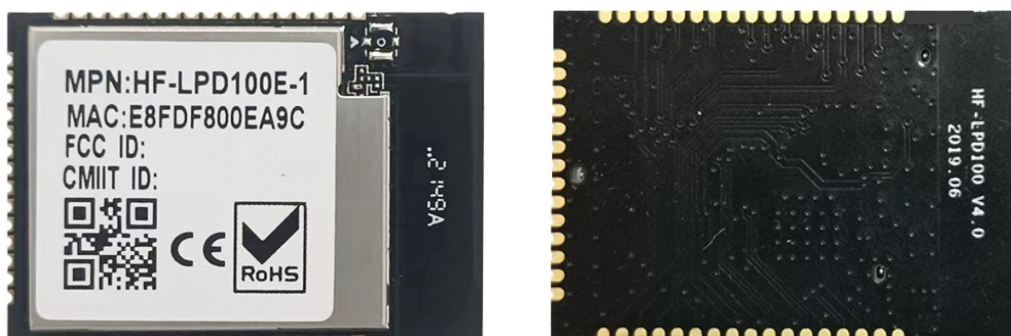


Figure 2. HF-LPD100E-1 Appearance



Figure 3. HF-LPD100-2 Appearance

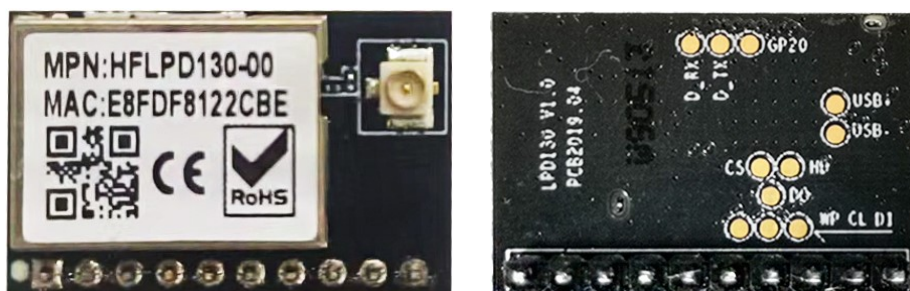


Figure 4. HF-LPD130-00 Appearance

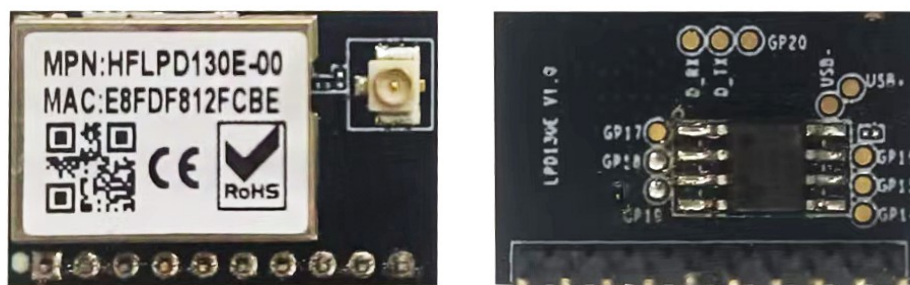


Figure 5. HF-LPD130E-00 Appearance

1.2.1. HF-LPD100/HF-LPD100E Pins Definition

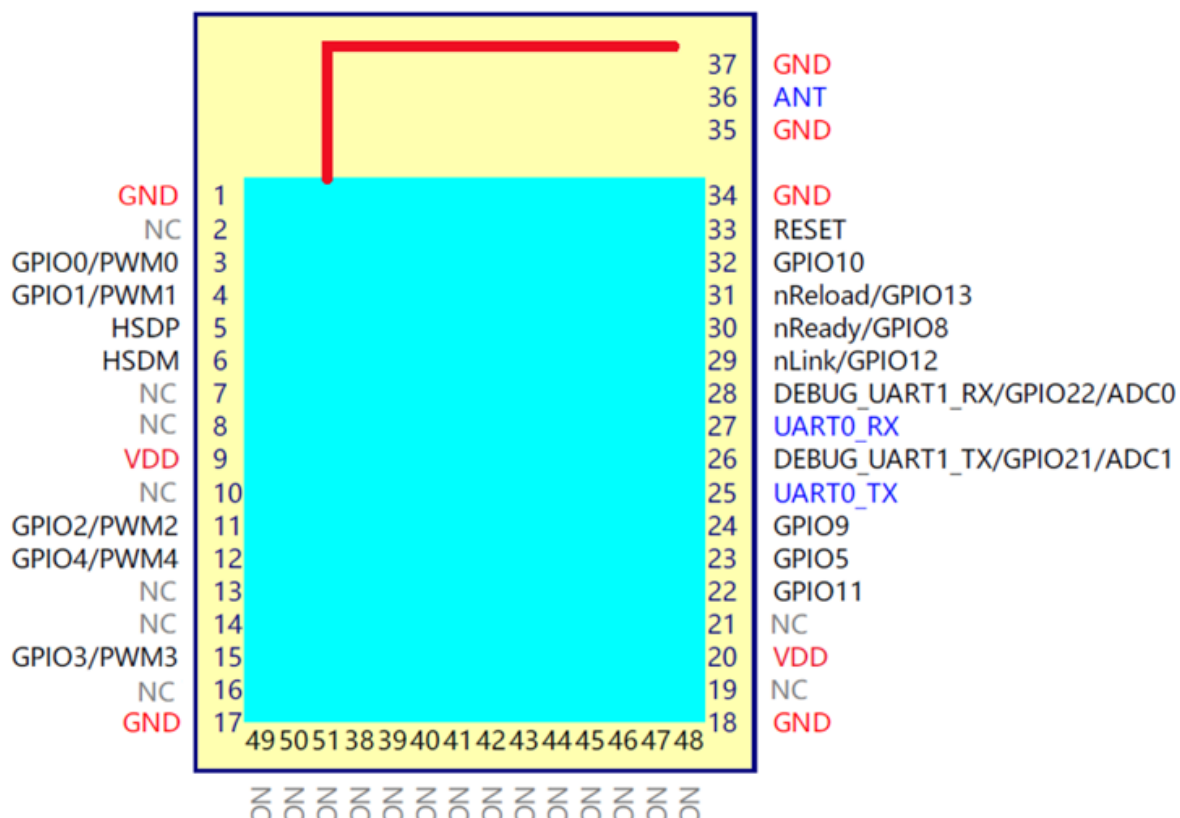


Figure 6. HF-LPD100/HF-LPD100E Pins Map

Table2. HF-LPD100/HF-LPD100E Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1,17,18 34,35,37	Ground	GND	Power	
2		NC		
3	GPIO00	GPIO00	I/O	PWM0
4	GPIO01	GPIO01	I/O	PWM1
5	USB+	HSDP	I/O	USB 2.0
6	USB-	HSDN	I/O	USB 2.0
7,8		NC		
9,20	+3.3V 电源	DVDD	Power	
10		NC		
11	GPIO02	GPIO02	I/O	PWM2
12	GPIO04	GPIO04	I/O	PWM4
13,14		NC		
15	GPIO03	GPIO03	I/O	PWM3
16,19,21		NC		
22	GPIO11	GPIO11	I/O	
23	UART0_RTS	GPIO05	O	Can be configured as Flow Contrl output
24	UART0_CTS	GPIO09	I	Can be configured as Flow Contrl input
25	UART0_TX	UART0_TX	O	3.3V TTL UART0 Output GPIO07
26	UART1_TX	DEBUG_UART1_TX	I/O	3.3V TTL Debug UART1_TX GPIO21, ADC1
27	UART0_RX	UART0_RX	I	3.3V TTL UART0 Input GPIO06
28	UART1_RX	DEBUG_UART1_RX	I/O	3.3V TTL Debug UART1_RX GPIO22, ADC0
29	Wi-Fi Status	nLink	IPD/O	“0” – Wi-Fi connect to router “1” – Wi-Fi unconnected; Detailed functions see <Notes> GPIO12
30	Module Boot Up Indicator	nReady	IPU/O	“0” – Boot-up OK; “1” – Boot-up No OK; GPIO08
31	Multi-Function	nReload	IPU/O	Detailed functions see <Notes> GPIO13
32	GPIO10	GPIO10	IO	
33	Module Reset	RESET	I,PU	“Low” effective reset input. There is RC reset circuit internally.
35,37	Ground	GND	Power	Only HF-LPD100-2 has this three pin for antenna interface
36		ANT		
38-51		NC		No pads for HF-LPD100-2

1.2.2. HF-LPD130/HF-LPD130E Pins Definition

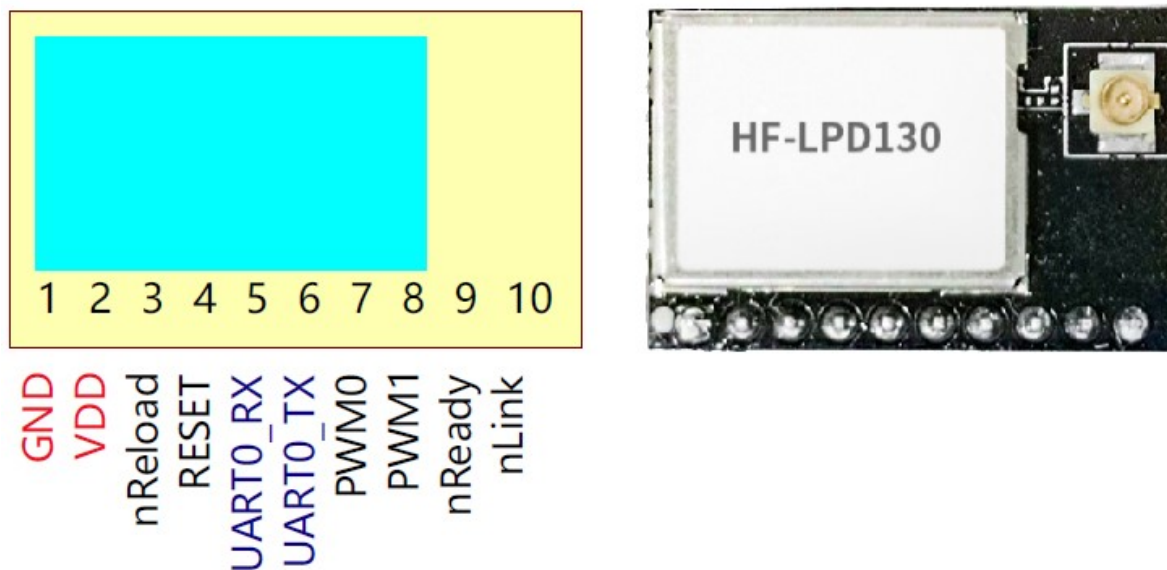


Figure 7. HF-LPD130/HF-LPD130E Pins Map

Table3. HF-LPD130/HF-LPD130E Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	Ground	GND	Power	
2	+3.3V Power	DVDD	Power	
3	Multi-Function	nReload	I,PU	Detailed functions see <Notes> GPIO4, PWM4
4	Module Reset	RESET	I,PU	“Low” effective reset input. There is RC reset circuit internally.
5	UART0	UART0_RX	I	3.3V TTL UART0 Communication Input
6	UART0	UART0_TX	O,PU	3.3V TTL UART0 Communication Output
7	PWM0	PWM0	IPU/O	GPIO3
8	PWM1	PWM1	IPU/O	GPIO2
9	Module Boot Up Indicator	nReady	O	“0” – Boot-up OK; “1” – Boot-up No OK; GPIO1
10	Wi-Fi Status	nLink	O	“0” – Wi-Fi connect to router “1” – Wi-Fi unconnected; Detailed functions see <Notes> GPIO0



Figure 8. HF-LPD130 Debug Pins Map

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

<Notes>

I — Input; O — Output

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

nReload Pin (Button) function:

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

Recommend to use SmartAPLink method config.

See Appendix to download SmartLink V8 and SmartAPLink APP

3. After module is powered up, long press this button (“Low” > 4s) and loose to make the module recover to factory setting.

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

nReady Pin (LED) function(Low effective):

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

nLink Pin (LED) function(Low effective):

1. At wireless firmware and config upgrade mode , this LED used to indicate configure and upgrade status.

2. At “SmartLink” config mode, this LED is used to indicate APP to finish setting.
3. At normal mode, it's Wi-Fi link status indicator. Output Low when STA mode connect to router AP or other STA connect to it when in AP mode.

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

UART1 Debug :

1. Is used for debug log, baud rate 115200

1.2.3. Electrical Characteristics

Table4. 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

1.2.4. HF-LPD100 Mechanical Size

HF-LPD100 modules physical size (Unit: mm) as follows:

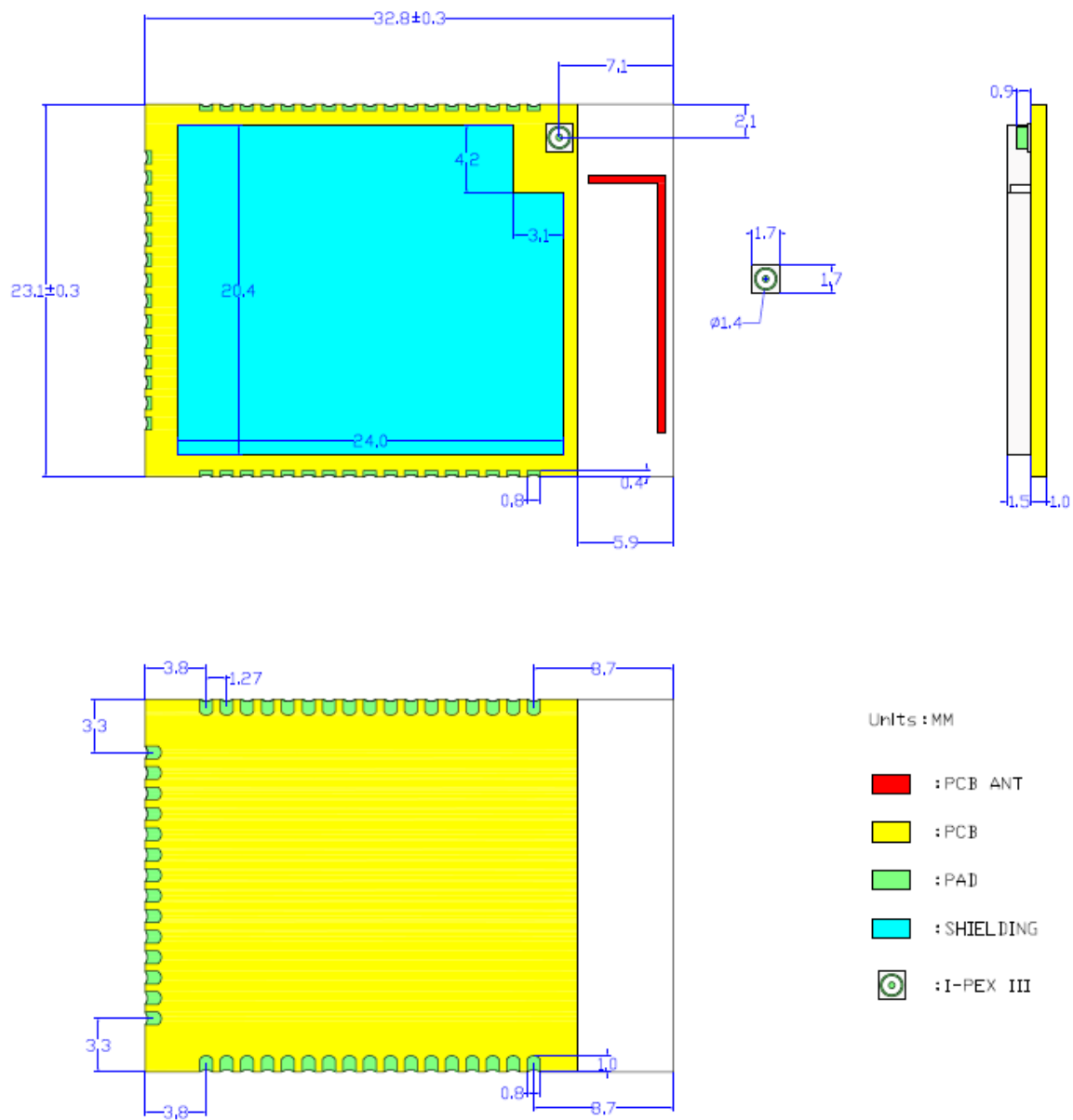


Figure 9. HF-LPD100-1 and -0 Mechanical Dimension

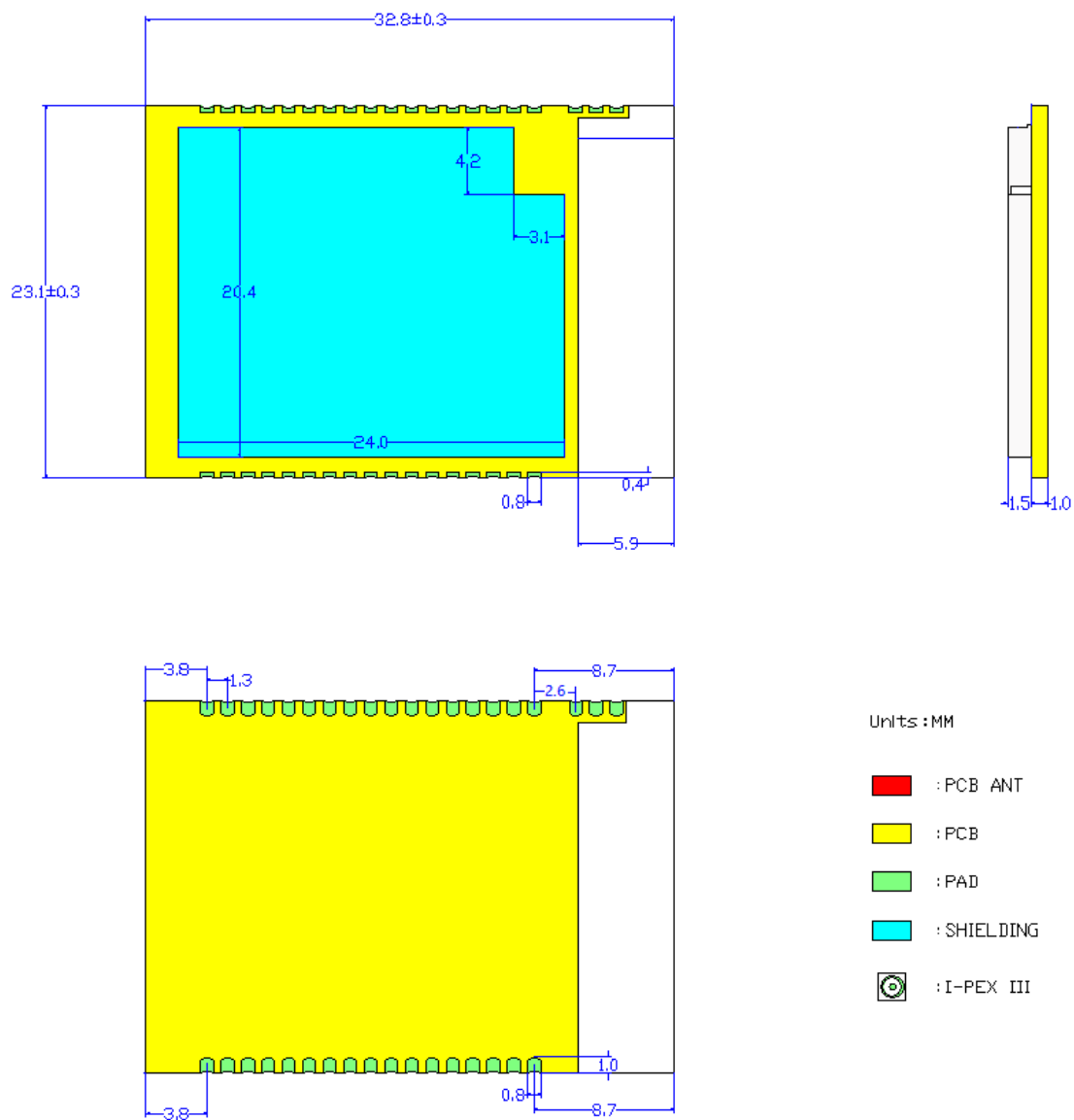


Figure 10. HF-LPD100-2 Mechanical Dimension

1.2.5. HF-LPD100E Mechanical Size

HF-LPD100E modules physical size (Unit: mm) as follows:

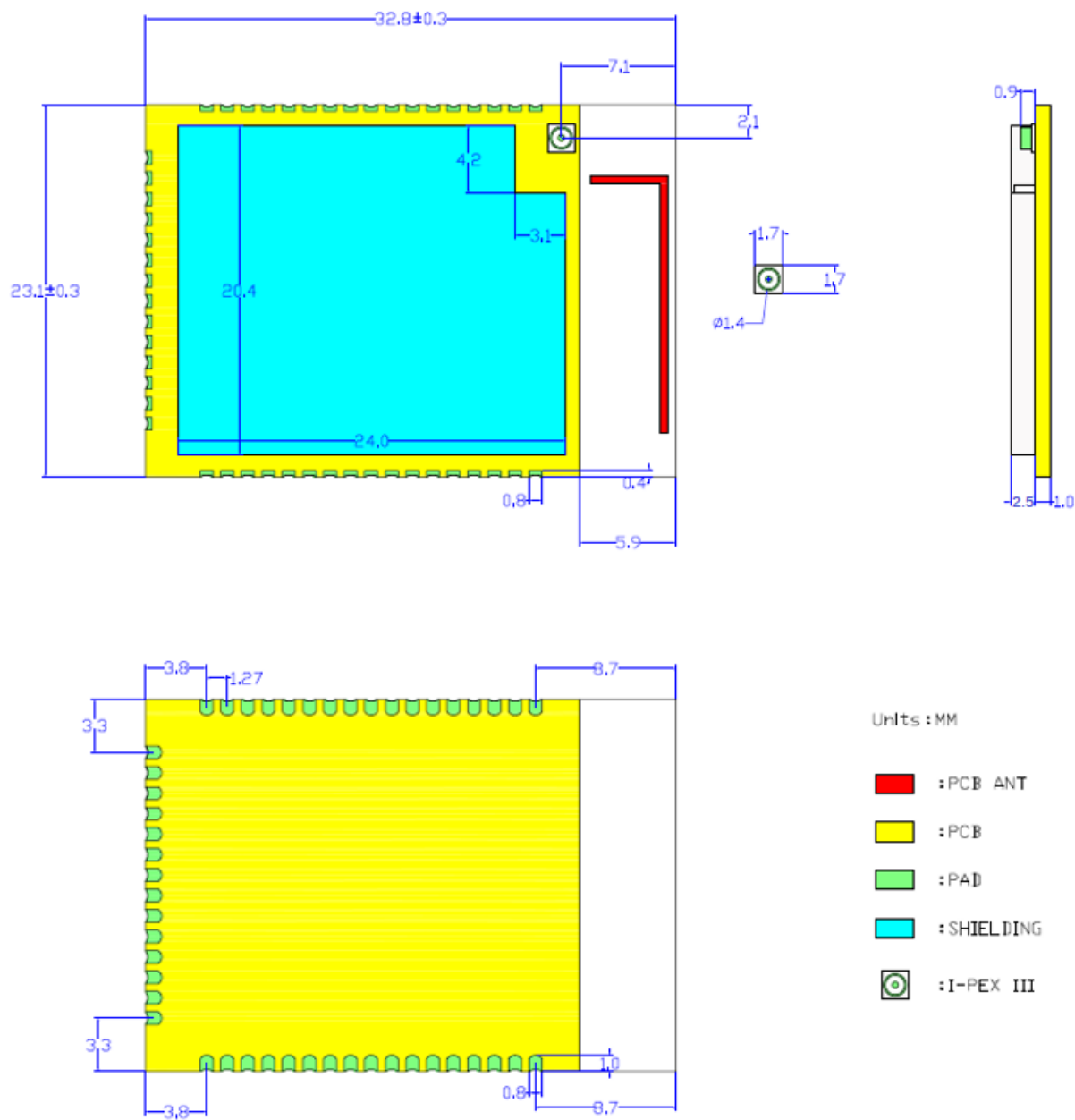


Figure 11. HF-LPD100E-1 and -0 Mechanical Dimension

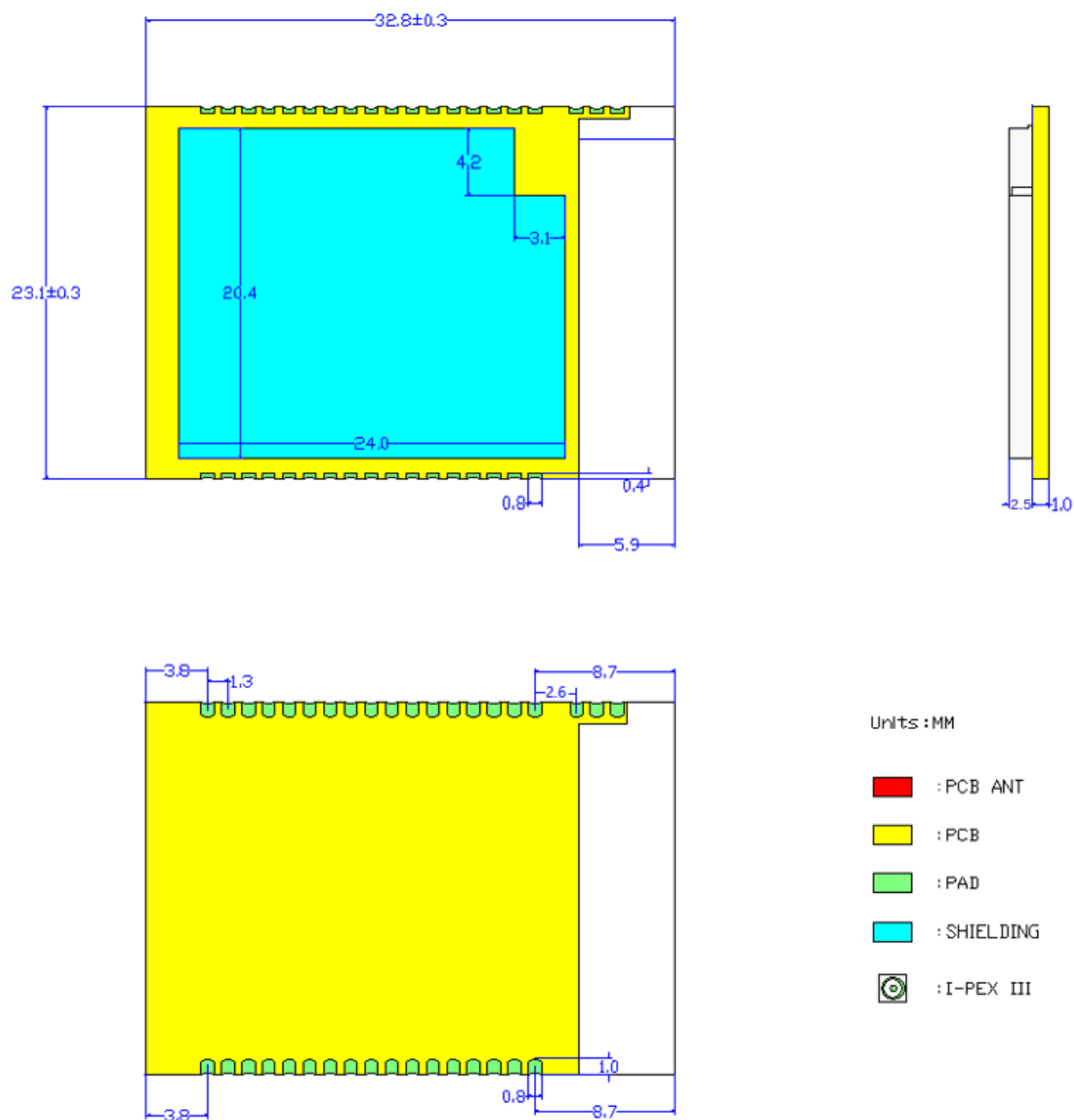


Figure 12. HF-LPD100E-2 Mechanical Dimension

1.2.6. HF-LPD130 Mechanical Size

HF-LPD130 modules physical size (Unit: mm) as follows:

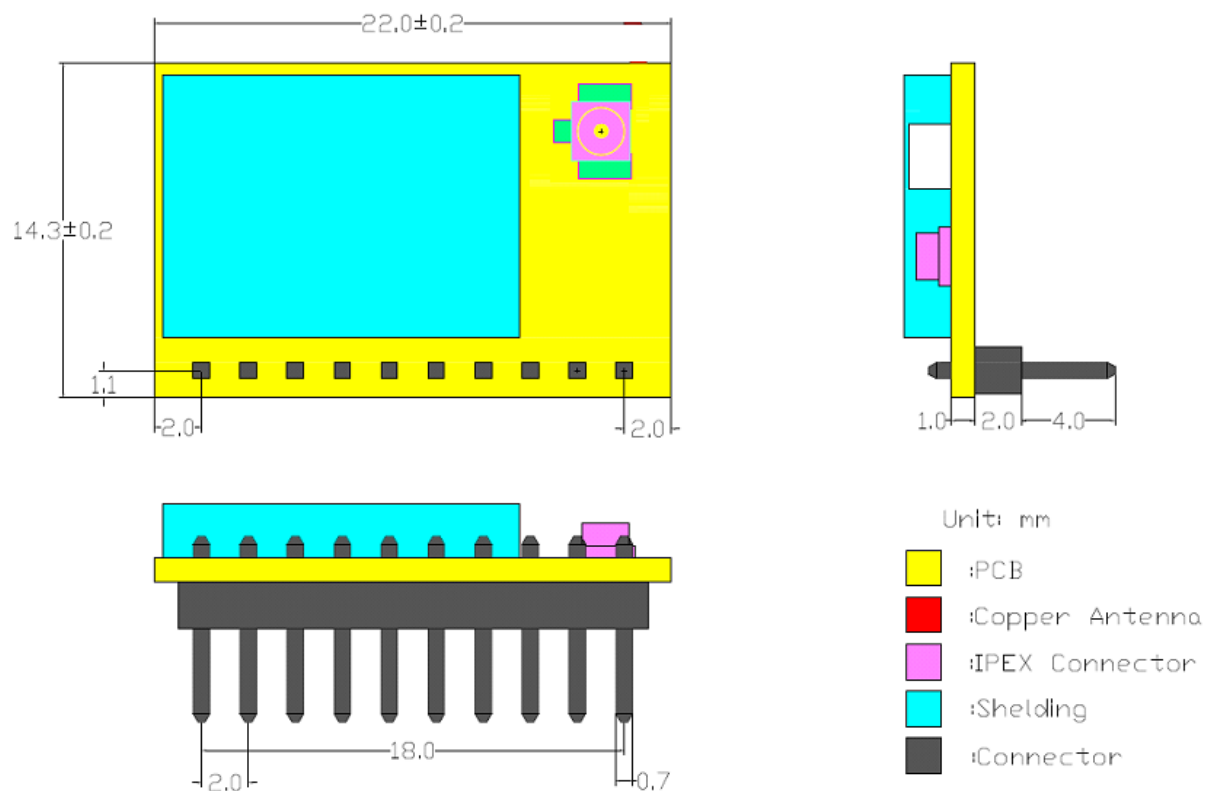


Figure 13. HF-LPD130 Mechanical Dimension

1.2.7. HF-LPD130E Mechanical Size

HF-LPD130E modules physical size (Unit: mm) as follows:

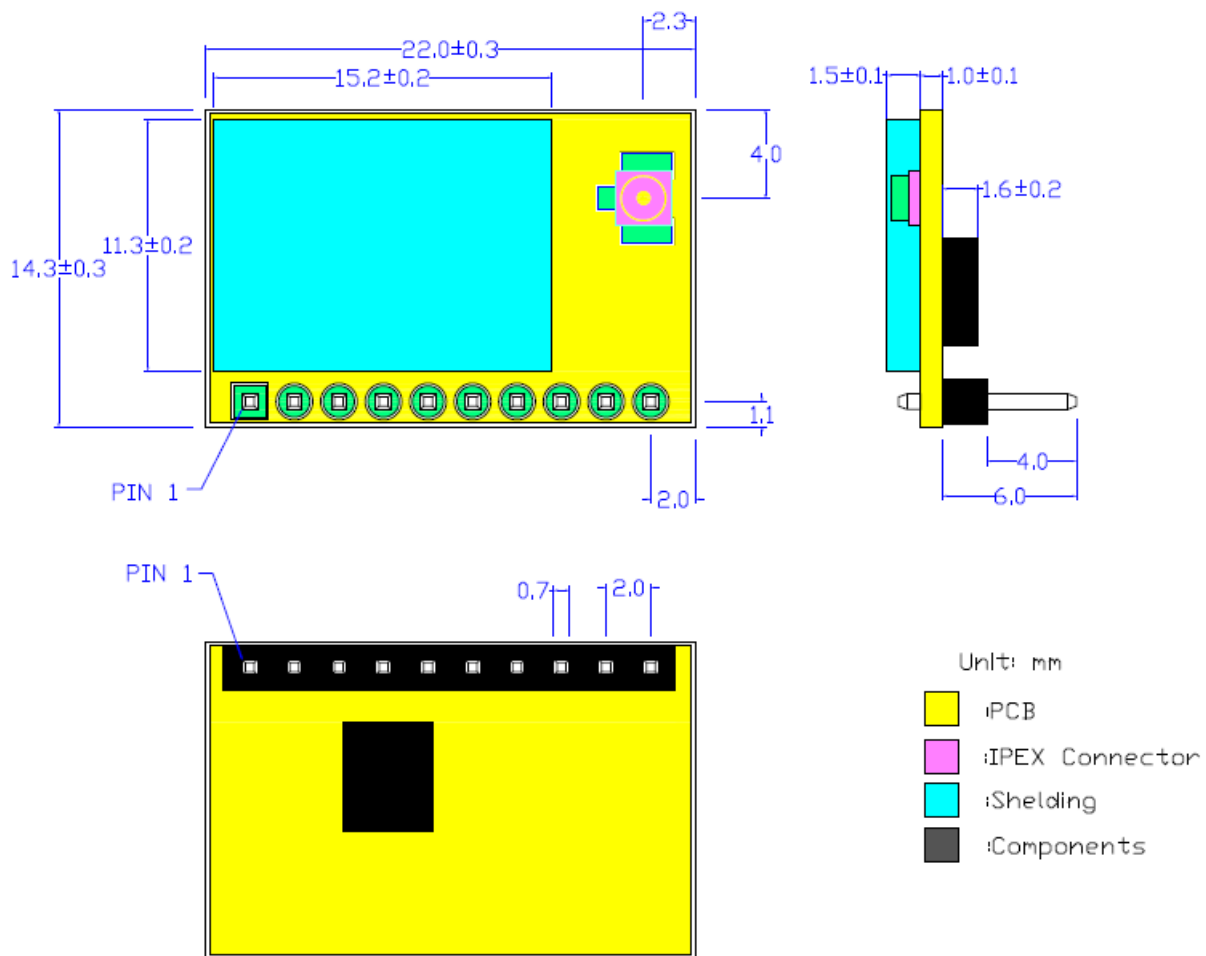


Figure 14. HF-LPD130E Mechanical Dimension

1.2.8. 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 componet 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 shieldedby any meal 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.

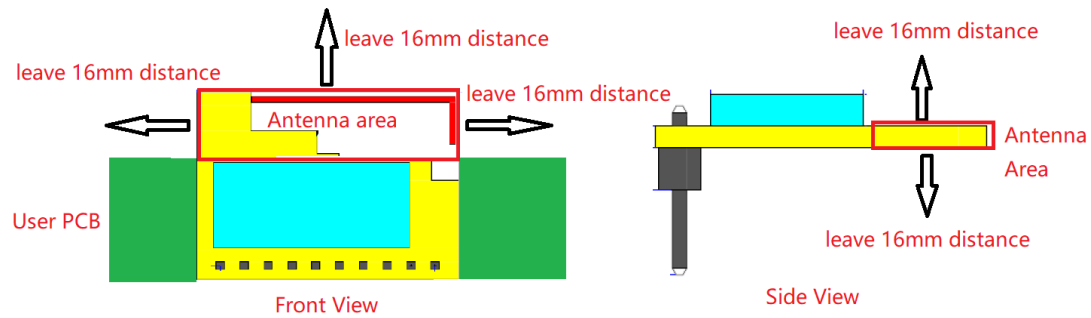


Figure 15. Suggested Module Placement Region

1.2.9. External Antenna

HF-LPD100 series module supports external antenna(I-PEX) option for user dedicated application. If user select external antenna, HF-LPD100 series Wi-Fi modules must be connected to the antenna according to IEEE 802.11b/g/n standards. We can provide external antenna if needed. Contact with our salesman.

The antenna parameters required as follows:

Table5. HF-LPD100 External Antenna Parameters

Item	Parameters
Frequency range	2.4/5GHz
Impedance	50 Ohm
VSWR	2 (Max)
Return Loss	-10dB (Max)
Connector Type	I-PEX or populate directly

1.2.10. 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-LPD100 series module with the RS-232 UART, USB (Internal USB to UART convetor) or Wireless interface to configure the parameters, manage the module or do the some functional tests.

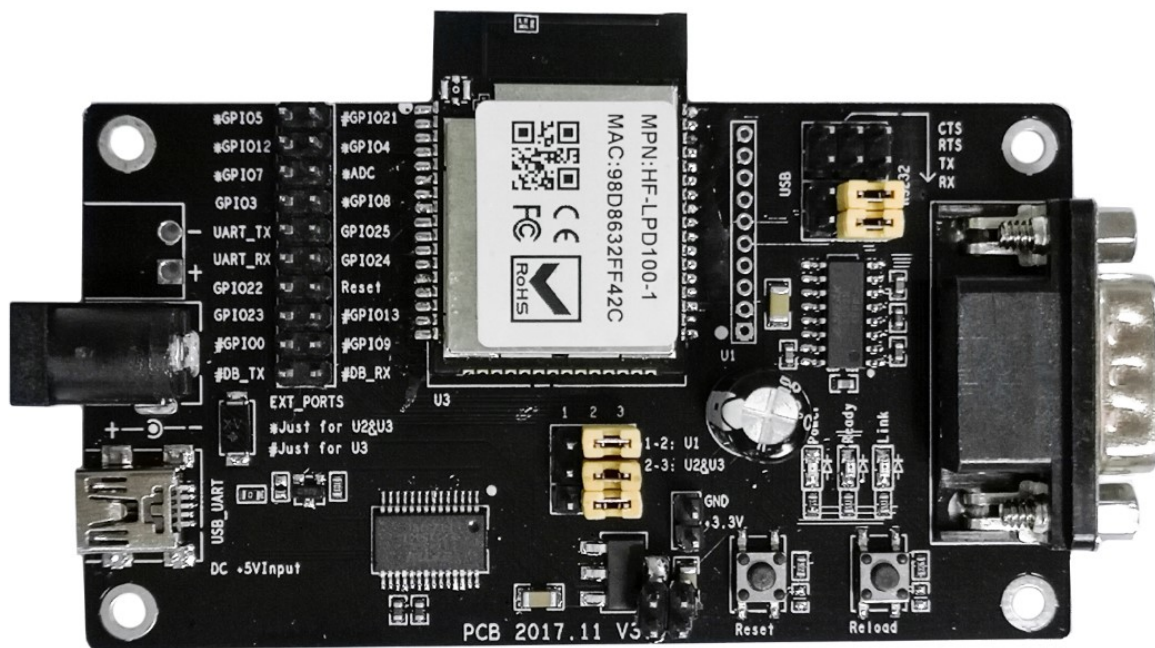


Figure 16. HF-LPD100 EVK

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:

Table6. HF-LPD100 Evaluation Kit Interface Description

Function	Name	Description
External Interface	RS232	Main data/command RS-232 interface
	USB	USB to UART interface, can be used for debug UART log
	DC5V	DC jack for power in, 5~9V input.
LED	Power	Power LED
	Ready	nReady LED
	Link	nLink LED
Button	nReload	Smartlink and Restore factory default configuration. See more for PIN Definition

1.2.11. Order Information

Base on customer detailed requirement, HF-LPD1x0 series modules provide different variants and physical type for detailed application.

Mark ★ in Red is our main modules				
Type	Function	Antenna	Footprint	PIN Num
★HF-LPD100-1		Internal PCB	SMT	48
HF-LPD100-0		External 3rd IPEX		48
HF-LPD100-2F		External PAD		34
★HF-LPD100E-1		Internal PCB	SMT	48
HF-LPD100E-0		External 3rd IPEX		48
HF-LPD100E-2		External PAD		34
★HF-LPD130-00		External 1st IPEX	DIP	10
★HF-LPD130E-00		External 1st IPEX		10

Figure 17. HF-LPD1X0 Order Information

1.2.12. Hardware Typical Application

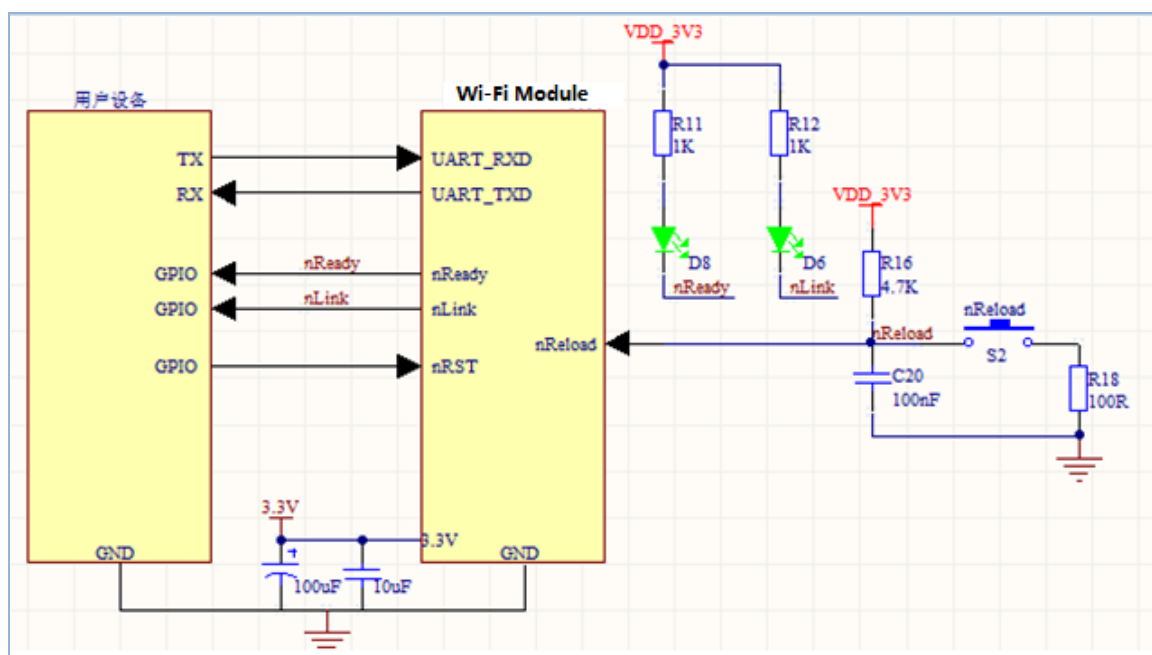


Figure 18. HF-LPD100 Hardware Typical Application

Notes:

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

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

nLink- Module WIFI connection status indication. Output.

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

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

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

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

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

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

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

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

2. SMT INFORMATION

2.1. Recommended Reflow Profile

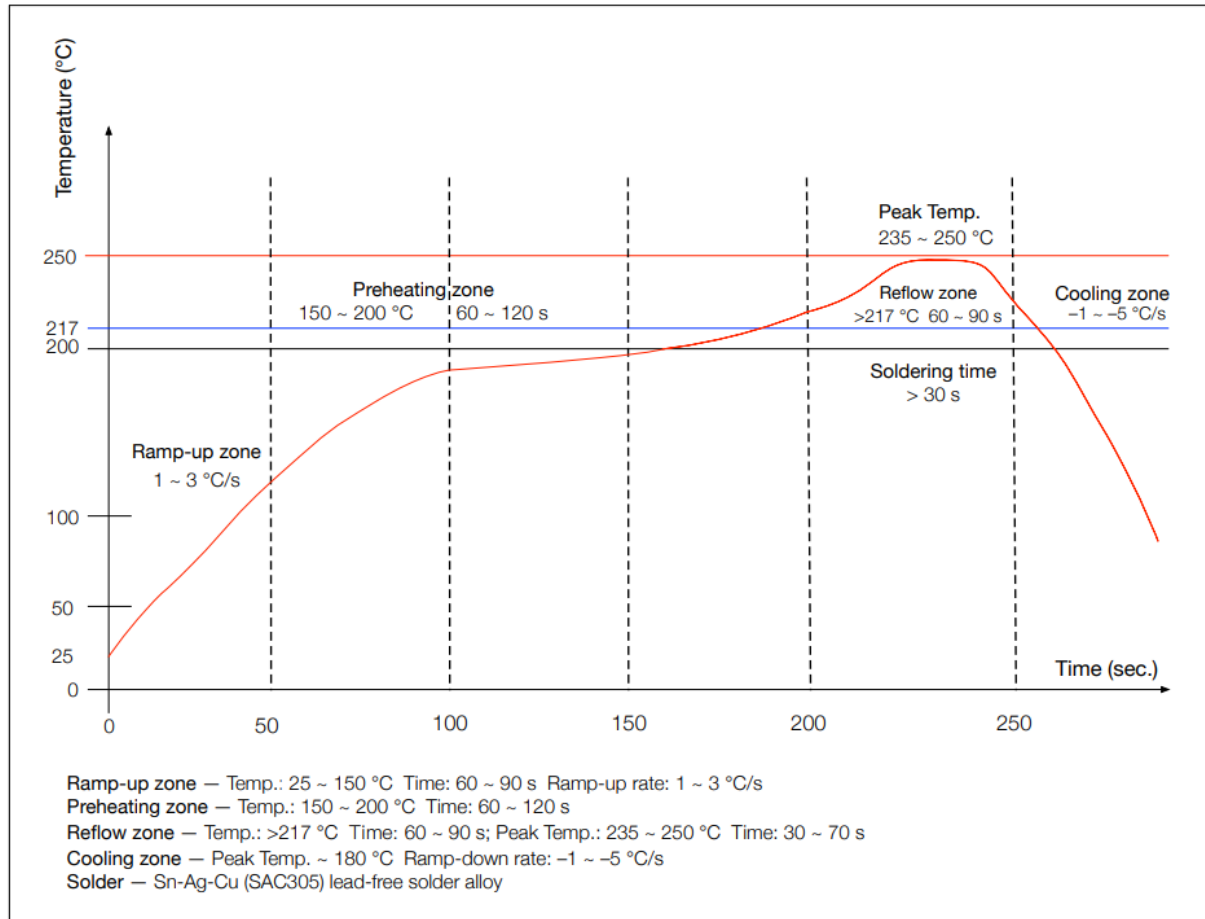


Figure 19. Reflow Soldering Profile

2.2. Device Handling Instruction (Module IC SMT Preparation)

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

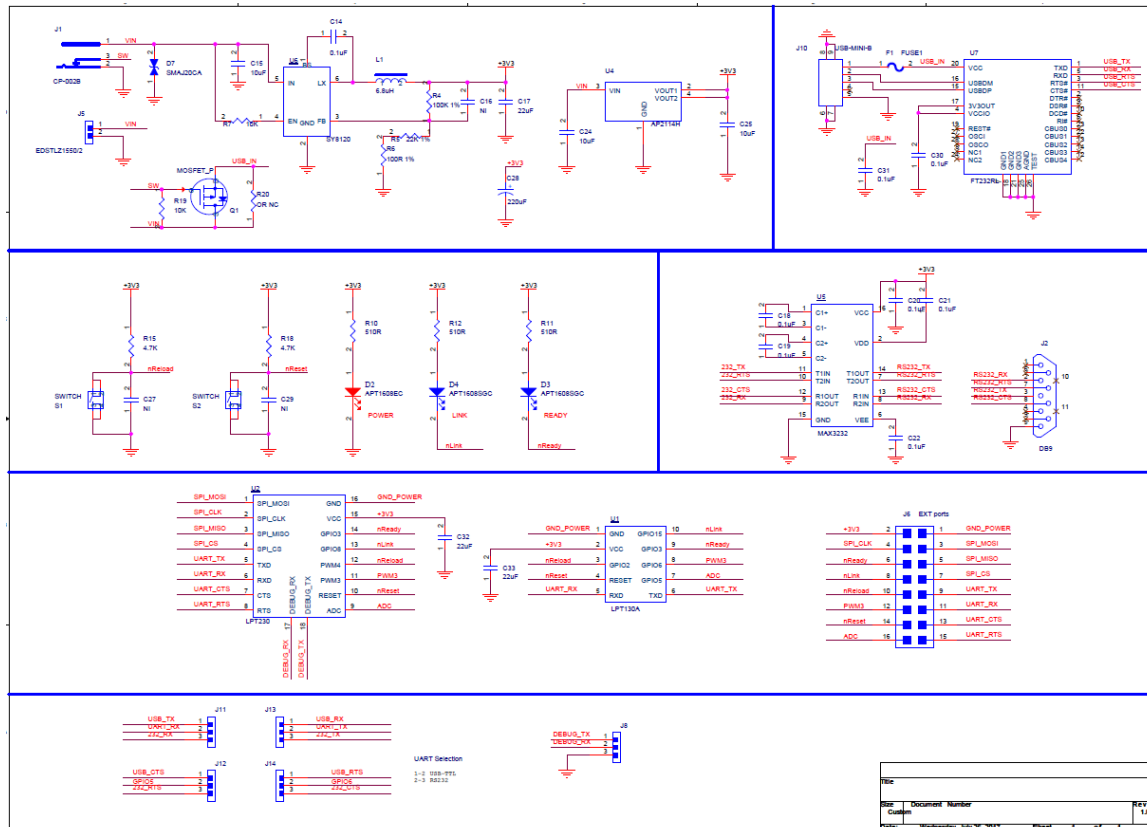
(1) Top side SMT and reflow (2) Bottom side SMT and reflow

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

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

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

APPENDIX A: HW REFERENCE DESIGN



Detailed HF-LPD100 Evaluation Board design source files, pls access High-Flying web download page or contact with High-Flying technical support people to acquire.

APPENDIX B:REFERENCES

B.1. High-Flying Mass Production Tool

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

B.2. SmartLink APP V8 Sniffer Config Tool

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

B.3. SmartAPLink

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

B.4. Firmware

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

B.5. SDK

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

APPENDIX C: CONTACT INFORMATION

Web: www.hi-flying.com

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

Sales Contact: sales@hi-flying.com

For more information about High-Flying modules, applications, and solutions, please visit our web site
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