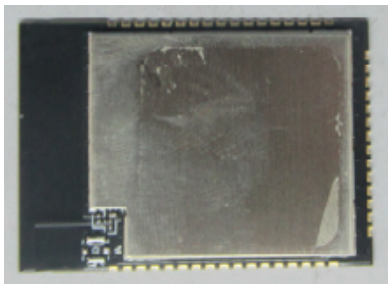
HF-LPD100

802.11a/b/g/n WiFi Module User Manual

V 1.3



HF-LPD100

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 or 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 WeChat Airkiss 2.0**
- ✧ **Support Wireless and Remote Firmware Upgrade Function**
- ✧ **Support Software SDK for Develop**
- ✧ **Support Different Antenna Option**
  - ■ **HF-LPD100：Internal PCB**

- **Single +3.3V Power Supply**
- **Size:**
  - **HF-LPD100: 23.1mm x 32.8mm x 3.5mm, SMT48 package**
- **FCC/CE/SRRC/RoHS Certificated (TBD)**

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	11-13-2019	Update PIN definition.

1. PRODUCT OVERVIEW

1.1. General Description

The HF-LPD100 support 2.4GHz and 5GHz dual band. It is a fully self-contained small form-factor, single stream, 802.11a/b/g/n Wi-Fi module, which provide a wireless interface to any equipment with a Serial interface for data transfer.HF-LPD100 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-LPD100 employs the world's lowest power consumption embedded architecture. It has been optimized for all kinds of client applications in the home automation, smart grid, handheld device, personal medical application and industrial control that have lower data rates, and transmit or receive data on an infrequent basis.

1.1.1 Key Application

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

1.1.2 Device Paremeters

Table1. HF-LPD100 Module Technical Specifications

Class	Item	Parameters
Wireless Parameters	Certification	TBD
	Wireless standard	2.4GHz：802.11 b/g/n 5GHz：802.11 a /n
	Frequency range	2.4G Wi-Fi:2412-2462 MHz 5G Wi-Fi B1: 5180-5240MHz, B4: 5745-5825MHz
	2.4G Transmit Power	802.11b:20.76dBm ;802.11g:21.94dBm 802.11n20:20.62dBm;802.11n40:21.10dBm
	5G Transmit Power	802.11a:14.82dBm ;802.11n20:15.31dBm 802.11n40:15.84dBm
	2.4G Receiver Sensitivity	802.11b: -87.5 dBm (@11Mbps ,CCK)
		802.11g: -73.5 dBm (@54Mbps, OFDM)
		802.11n: -72.5 dBm (@HT20, MCS7)
	5G Receiver Sensitivity	-73.5dBm (@54Mbps ,OFDM)
		-72 dBm (HT20,MCS7)
	Antenna	PCB antenna
Hardware Parameters	Data Interface	UART
		GPIO,SPI
	Operating Voltage	2.1~3.46V
	Operating Current	Peak (Continuous TX): 345mA Average(STA, No data): 44mA Standby: 1.23mA(Reset set to low)
	Operating Temp.	-20℃- 85℃
	Storage Temp.	-40℃- 125℃
	Density	<85%
	Dimensions and Size	HF-LPD100: 23.1mm x 32.8mm x 3.5mm
Software Parameters	Network Type	STA/AP/AP+STA
	Security Mechanisms	WEP/WPA-PSK/WPA2-PSK
	Encryption	WEP64/WEP128/TKIP/AES
	Update Firmware	Local Wireless, Remote OTA
	Customization	Support SDK for application develop
	Network Protocol	IPv4, TCP/UDP/HTTP/TLS(SDK)
	User Configuration	AT+instruction set. Android/ iOS SmartLink APP tools

1.2. Hardware Introduction

HF-LPD100 series Wi-Fi module appearance is as following.

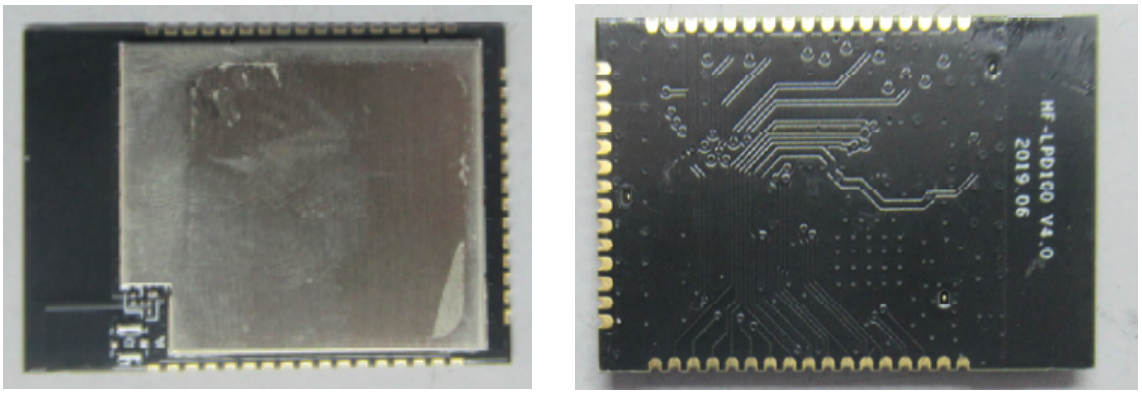


Figure 1. HF-LPD100 Appearance

1.2.1. HF-LPD100 Pins Definition

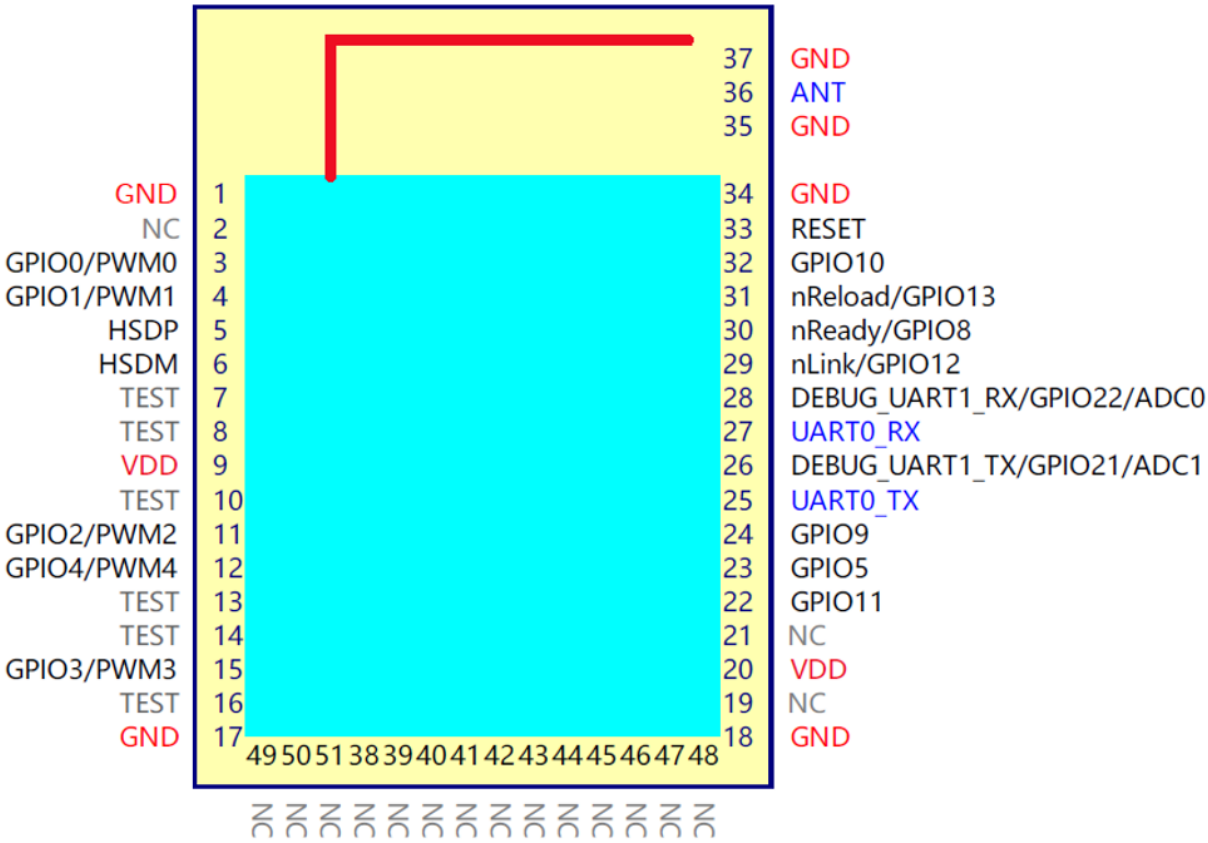


Figure 2. HF-LPD100 Pins Map

Table2. HF-LPD100 Pins Definition

Pin	Describtion	Net Name	Signal Type	Comments

Pin	Describtion	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		TEST		Test only. Leave it unconnected.
8		TEST		Test only. Leave it unconnected.
9,20	+3.3V	DVDD	Power	
10		TEST		Test only. Leave it unconnected.
11	GPIO02	GPIO02	I/O	PWM2
12	GPIO04	GPIO04	I/O	PWM4
13		TEST		Test only. Leave it unconnected.
14		TEST		Test only. Leave it unconnected.
15	GPIO03	GPIO03	I/O	PWM3
16		TEST		Test only. Leave it unconnected.
19		NC		
21		NC		
22	GPIO11	GPIO11	I/O	
23	GPIO05	GPIO05	I/O	
24	GPIO09	GPIO09	I/O	
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 unconncted; **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		N.C		
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		

<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**

1.2.2. Electrical Characteristics

Table3. Absolute Maximum Ratings:

Parameter	Condition	Min.	Typ.	Max.	Unit
Work temperature range		-20		85	°C
Maximum soldering temperature	IPC/JEDEC J-STD-020			260	°C
ESD (Human Body Model HBM)	TAMB=25°C			2.5	KV
ESD (MM)	TAMB=25°C			0.25	KV

Table4. Power Supply & Power Consumption:

Parameter	Condition	Min.	Typ.	Max.	Unit
Operating Supply voltage		2.1	3.3	3.46	V
Supply current, peak	Continuous Tx		260		mA
Supply current,	STA No data transfer		27		mA
Supply current,	STA Continuous data transfer		35		mA
Supply current,	AP		80		mA
GPIO sink current	GND+0.5V		20		mA
GPIO pull current	VCC-0.5V		20		mA

1.2.3. HF-LPD100 Mechanical Size

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

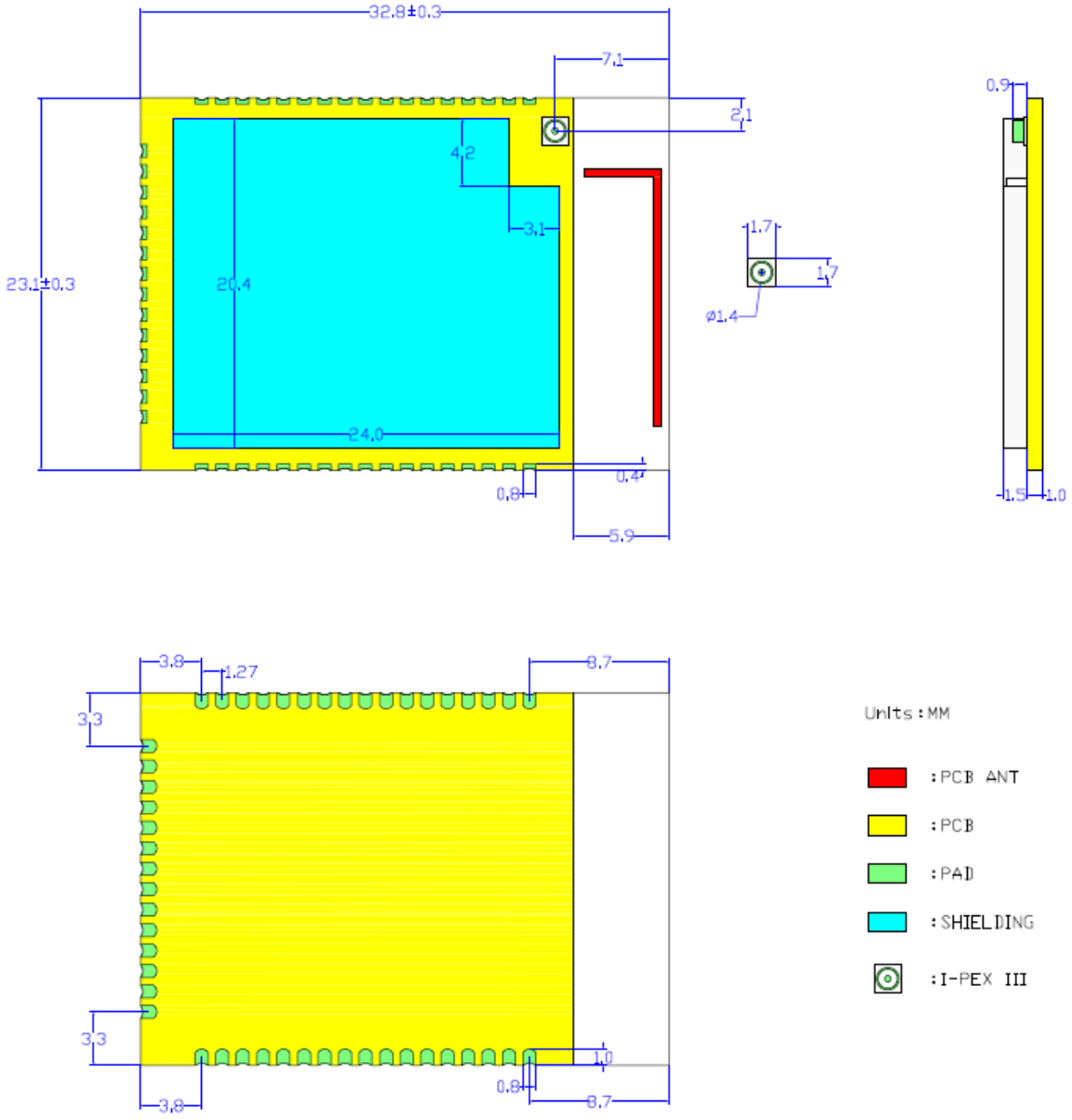


Figure 3. HF-LPD100-1 and -0 Mechanical Dimension

1.2.4. HF-LPD100 On-board PCB Antenna

HF-LPD100 module support internal on-board PCB antenna option. When customer select internal antenna, you shall comply with following antenna design rules and module location suggestions:

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

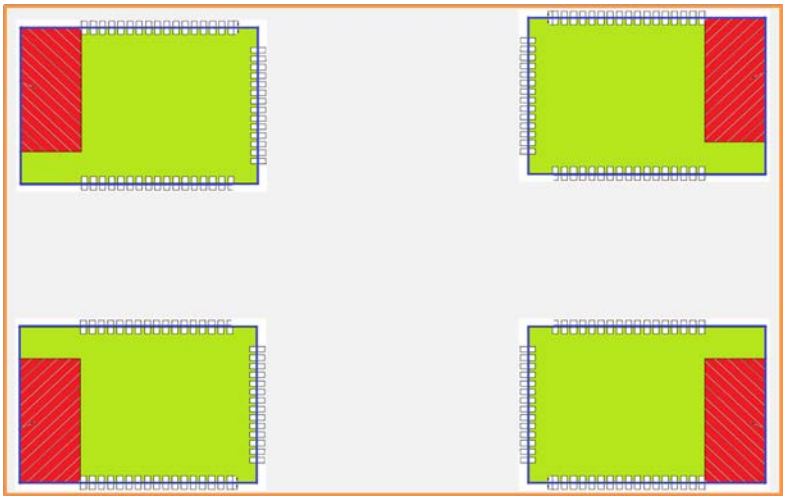


Figure 4. Suggested Module Placement Region

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

1.2.5. 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.

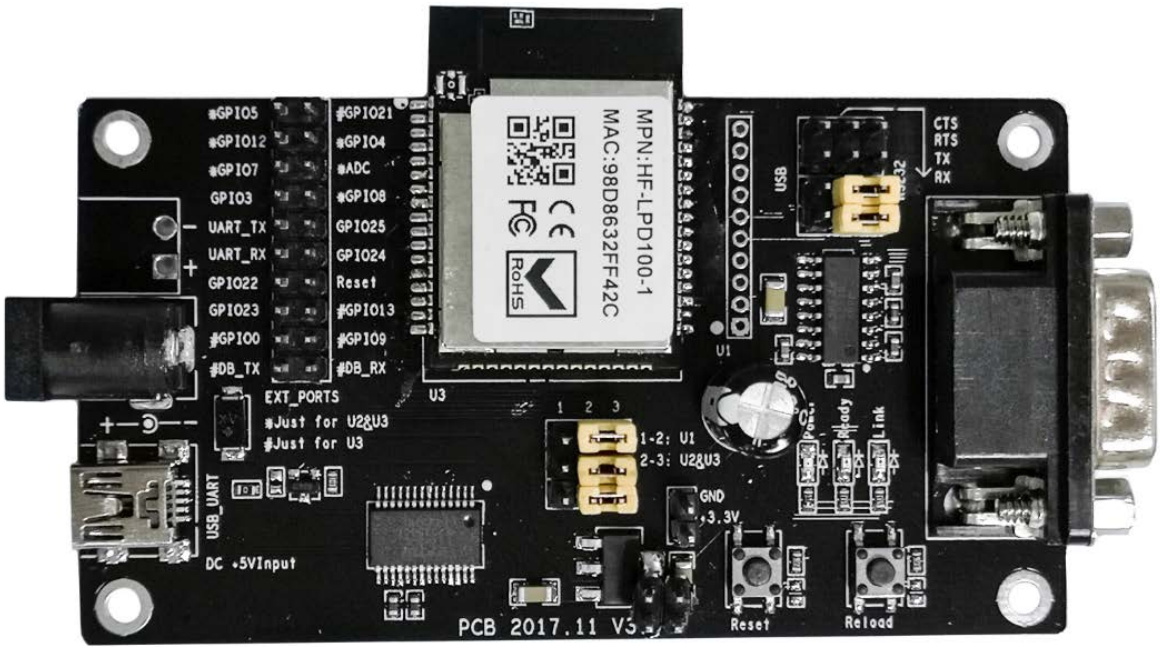


Figure 5. HF-LPD100 EVK

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

2. PACKAGE INFORMATION

2.1. Recommended Reflow Profile

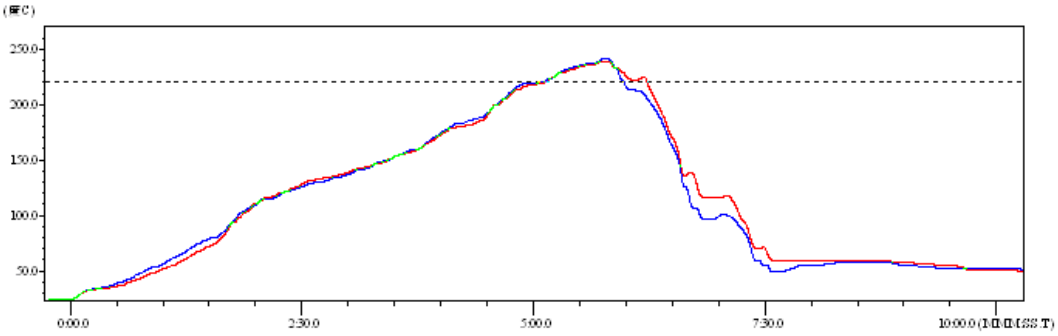


Figure 7. Reflow Soldering Profile

Table7. Reflow Soldering Parameter

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

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

2.2. Device Handling Instruction (Module IC SMT Preparation)

1. Shelf life in sealed bag: 12 months, at <30℃ and <60% relative humidity
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. 0℃ 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.

2.3. HF-LPD100 Shipping Information

TAPE

Size: 340*340*50 mm

BOX

Size: 370*370*370 mm

Figure 8. HF-LPD100 Shipping Information

Note:

1 tape = 900pcs

1 box = 5 tapes = 5 * 900 pcs = 4500pcs

OEM Guidance

1. Applicable FCC rules

   This module is granted by Single Modular Approval. It complies to

   the requirements of FCC part 15.247 and 15.407

2. The specific operational use conditions

   This module can be used in IoT devices. The input voltage to the module is nominally 2.1~3.46V DC. The operational ambient temperature of the module is –40 °C ~ 65 °C. Only the embedded PCB antenna is allowed. Any other external antenna is prohibited.

3. Limited module procedures

   N/A

4. Trace antenna design

   N/A

5. RF exposure considerations

   The equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator and your body. If the equipment built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by 2.1093.

6. Antenna

   Antenna type: PCB antenna Peak gain: 0dBi

7. Label and compliance information

   An exterior label on OEM's end product can use wording such as the following:
   "Contains Transmitter Module FCC ID: 2ACSVHF-LPD100" or
   "Contains FCC ID: 2ACSVHF-LPD100."

8. Information on test modes and additional testing requirements

a)The modular transmitter has been fully tested by the module grantee on the required number of channels,modulation types, and modes, it should not be necessary for the host installer to re-test all the available transmitter modes or settings. It is recommended that the host product manufacturer, installing the modular transmitter,perform some investigative measurements to confirm that the resulting composite system does not exceed the spurious emissions limits or band edge limits (e.g., where a different antenna may be causing additional emissions).

b)The testing should check for emissions that may occur due to the intermixing of emissions with the other transmitters, digital circuitry, or due to physical properties of the host product (enclosure). This investigation is especially important when integrating multiple modular transmitters where the certification is based on testing each of them in a stand-alone configuration. It is important to note that host product manufacturers should not assume that because the modular transmitter is certified that they do not have any responsibility for final product compliance.

c)If the investigation indicates a compliance concern the host product manufacturer is obligated to mitigate the issue. Host products using a modular transmitter are subject to all the applicable individual technical rules as well as to the general conditions of operation in Sections 15.5, 15.15, and 15.29 to not cause interference. The operator of the host product will be obligated to stop operating the device until the interference have been corrected .

9. Additional testing, Part 15 Sub part B disclaimer The final host / module combination need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.

The host integrator installing this module into their product must ensure that the final composite product complies with the FCC requirements by a technical assessment or evaluation to the FCC rules, including the transmitter operation and should refer to guidance in KDB 996369. For host products with certified modular transmitter, the frequency range of investigation of the composite system is specified by rule in Sections 15.33(a)(1) through (a)(3), or the range applicable to the digital device, as shown in Section 15.33(b)(1), whichever is the higher frequency range of investigation When testing the host product, all the transmitters must be operating.The transmitters can be enabled by using publicly-available drivers and turned on, so the transmitters are active. In certain conditions it might be appropriate to use a technology-specific call box (test set) where accessory 50 devices or drivers are not available. When testing for emissions from the unintentional radiator, the transmitter shall be placed in the receive mode or idle mode, if possible. If receive mode only is not possible then, the radio shall be passive (preferred) and/or active scanning. In these cases, this would need to enable activity on the communication BUS (i.e., PCIe, SDIO, USB) to ensure the unintentional radiator circuitry is enabled. Testing laboratories may need to add attenuation or filters depending on the signal strength of any active beacons (if applicable) from the enabled radio(s). See ANSI C63.4, ANSI C63.10 and ANSI C63.26 for further general testing details.

The product under test is set into a link/association with a partnering device, as per the normal intended use of the product. To ease testing, the product under test is set to transmit at a high duty cycle, such as by sending a file or streaming some media content.

FCC Warning:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment. This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation