

HF-LPT6200

Low Power 2.4GWi-Fi6 + BLE Module

User Manual V1.0

Overview of Characteristic

- ✧ **Support 2.4G Wi-Fi6 IEEE802.11b/g/n/ax and BLE5.1 Wireless Standards**
- ✧ **Based on Andes RISC SOC, 240MHz CPU, 512KB RAM, 2MB Flash**
- ✧ **Support UART Data Communication with Wi-Fi or BLE**
- ✧ **Support Wi-Fi STA/AP/AP+STA Mode**
- ✧ **Support BLE SmartBLELink Config**
- ✧ **Support Wi-Fi AP SmartAPLink**
- ✧ **Support Wireless and Remote Firmware Upgrade Function**
- ✧ **Support Software SDK for Develop**
- ✧ **Support Different Antenna Option**
 - **HF-LPT6200: Internal PCB or External 1st IPEX or Antenna Pad Out**
- ✧ **Single +3.3V Power Supply**
- ✧ **Size:**
 - **HF-LPT6200: 22.5±0.2mm x 13.5±0.2mm x 3.5±0.2mm, SMT18 package**

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HISTORY

Ed. V1.0 2022-10-25 First Version.

1. PRODUCT OVERVIEW

1.1. General Description

The HF-LPT6200 series module is a fully self-contained small form-factor, single stream, 802.11b/g/n Wi-Fi + BLE module, which provide a wireless interface to any equipment with a Serial interface for data transfer. This module integrate MAC, baseband processor, RF transceiver with power amplifier in hardware and all Wi-Fi protocol and configuration functionality and networking stack, in embedded firmware to make a fully self-contained 802.11b/g/n Wi-Fi and BLE solution for a variety of applications.

The HF-LPT6200 series module employs the world's lowest power consumption embedded architecture. It has been optimized for all kinds of client applications in the home automation, smart grid, handheld device, personal medical application and industrial control that have lower data rates, and transmit or receive data on an infrequent basis.

1.1.1 Key Application

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

1.1.2 Device Parameters

Table1. HF-LPT6200 Series Module Technical Specifications

Class	Item	Parameters
Wi-Fi Parameters	Wireless standard	802.11 b/g/n/ax
	Frequency range	2.412GHz-2.472GHz (CH1~CH13)
	Transmit Power	802.11b: +17dBm $\pm$ 1.5dBm (@11Mbps)
		802.11g: +15dBm $\pm$ 1.5dBm (@54Mbps)
		802.11n: +14dBm $\pm$ 1.5dBm (@HT20, MCS7)
	Receiver Sensitivity	802.11b: -96dBm (@1Mbps)
		802.11b: -89dBm (@11Mbps)
		802.11g: -91dBm (@6Mbps)
		802.11g: -76dBm (@54Mbps)
		802.11n: -91dBm (@MCS0)
		802.11n: -73dBm (@MCS7)
BLE Parameters	Wireless standard	BLE5.1
	Frequency range	2.402GHz-2.480GHz
	Transmit Power	Max 10dBm
	Receiver Sensitivity	-97dBm

Hardware Parameters	Antenna Option	HF-LPT6200: Internal: PCB antenna External: 1 st IPEX antenna or PAD out HF-LPT6210: Internal: PCB antenna External: 1 st IPEX antenna HF-LPT6220: Internal: PCB antenna External: 1 st IPEX antenna
	Data Interface	UART
		GPIO, SPI, PWMx3, ADCx1, I2Cx1
	GPIO Driver Ability	Source and Sink Current: 3mA (GND+0.3V/VCC-0.3V)
	Operating Voltage	3~3.6V
	Operating Current	Peak (1ms for every 100ms): <350mA Average (STA, No data, light sleep, DTIM1): 9mA Average (STA, No data, light sleep, DTIM10): 540uA Average (STA, No data, modem sleep, DTIM1): 17mA Average (STA, 1K/s data, modem sleep, DTIM1): 29mA Average (AP): 143mA
	Operating Temp.	-40℃ - 85℃
	Storage Temp.	-40℃ - 125℃
	Humidity	<85%
	MSL	Level 3
Software Parameters	Dimensions and Size	HF-LPT6200: 22.5±0.2mm x 13.5±0.2mm x 3.5±0.2mm
	Network Type	STA/AP/APSTA
	Security Mechanisms	WEP/WPA-PSK/WPA2-PSK/WPA3-SAE
	Encryption	WEP64/WEP128/TKIP/AES
	Update Firmware	Local Wireless, Remote OTA
	Customization	Support SDK for application develop
	Network Protocol	IPv4, TCP/UDP/HTTP/TLS 1.2
	User Configuration	AT+instruction set. SmartBLELink BLE Config SmartAPLink AP Config

1.2. Hardware Introduction

HF-LPT6200 series Wi-Fi module appearance is as following.

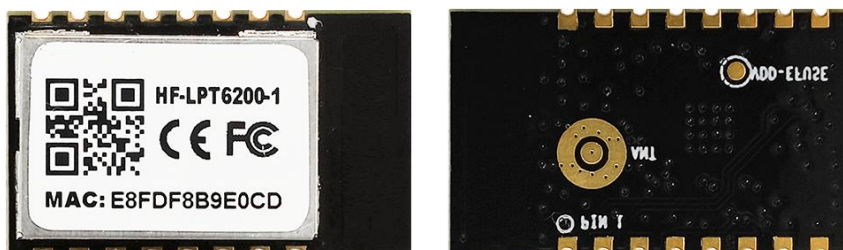


Figure 1. HF-LPT6200-1 Appearance

1.2.1. HF-LPT6200 Pins Definition

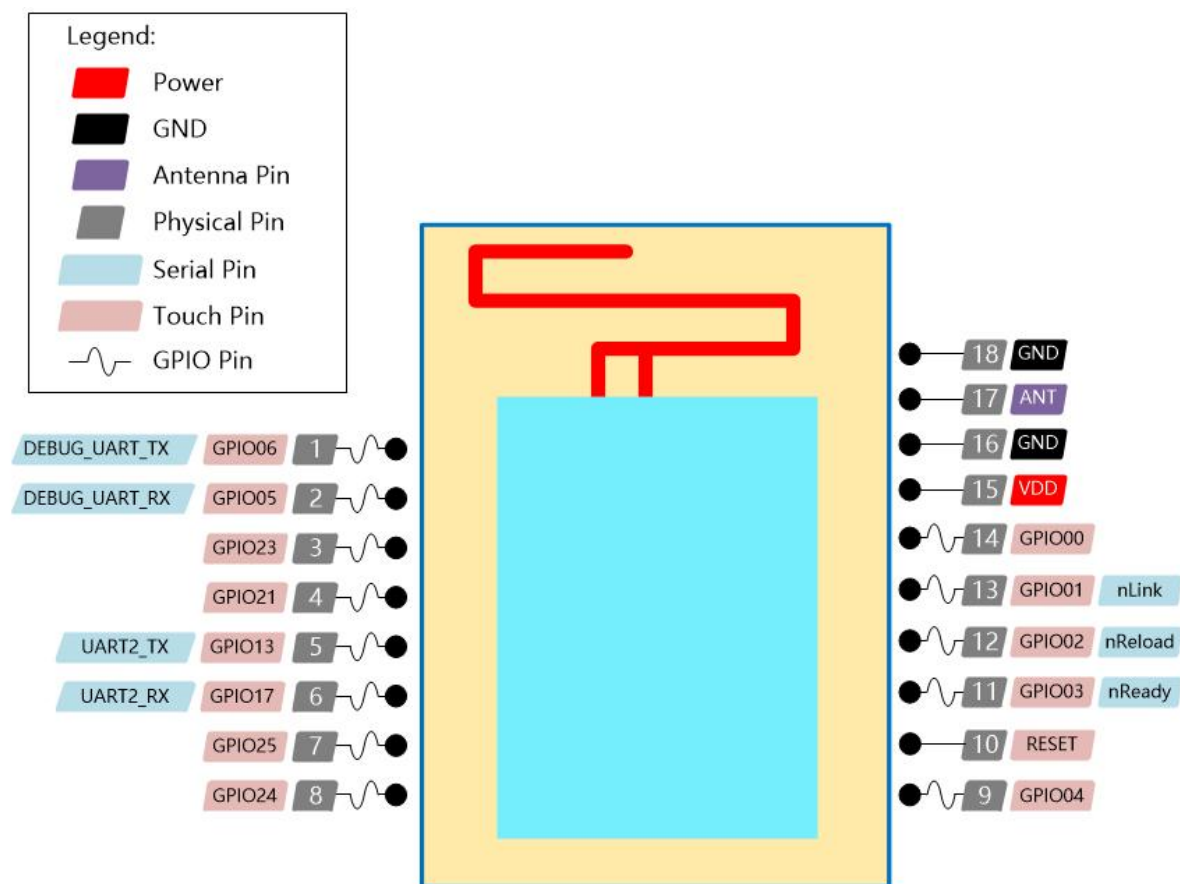


Figure 2. HF-LPT6200 Pins Map

Table2. HF-LPT6200 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1	UART_TX	DEBUG_UART_TX	O	3.3V TTL UART Debug Output GPIO06
2	UART_RX	DEBUG_UART_RX	I	3.3V TTL UART Debug Input GPIO05
3	UART2_RTS	GPIO23	O	used as RTS when enable flow control GPIO23
4	UART2_CTS	GPIO21	I	used as CTS when enable flow control GPIO21
5	UART2_TX	UART2_TX	O	3.3V TTL UART2 Communication Output GPIO13
6	UART2_RX	UART2_RX	I	3.3V TTL UART2 Communication Input GPIO17
7		GPIO25	IO	
8		GPIO24	IO	
9		GPIO04	IO	
10	Module Reset	RESET	I,PU	“Low” effective reset input. There is RC

Pin	Description	Net Name	Signal Type	Comments
				reset circuit internally. No need of external RC reset circuit.
11	Module Boot Up Indicator	nReady	O	"0" – Boot-up OK; "1" – Boot-up Fail; GPIO03
12	Multi-Function	nReload	I,PU	Internal 10K pull-up. Detailed functions see <Notes> GPIO02
13	Wi-Fi Status	nLink	O	"0" – Wi-Fi connect to router "1" – Wi-Fi unconnected; Detailed functions see <Notes> GPIO01
14		GPIO00	IO	
15	+3.3V Power	VDD	Power	
16	Ground	GND	Power	
17		ANT	Signal	Only -0 and -2 have these two pins Antenna Pad Out. See following for detailed.
18	Ground	GND	Power	

- -0 use external IPEX antenna, PIN17 is useless.
- -2 use PIN17 antenna PAD out

<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 SmartBLELink and SmartAPLink config mode, waiting for APP to set router SSID and password, config module connect to router. **Recommend to use SmartBleLink BLE method config.**
See Appendix to download SmartBLELink 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 SmartAPLink and SmartBLELink 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 or firmware program, baud rate 115200.

1.2.2. Electrical Characteristics

Table3. 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			4	KV
ESD (CDM)	TAMB=25°C			0.5	KV

1.2.3. HF-LPT6200 Mechanical Size

HF-LPT6200 modules physical size (Unit: mm) as follows:

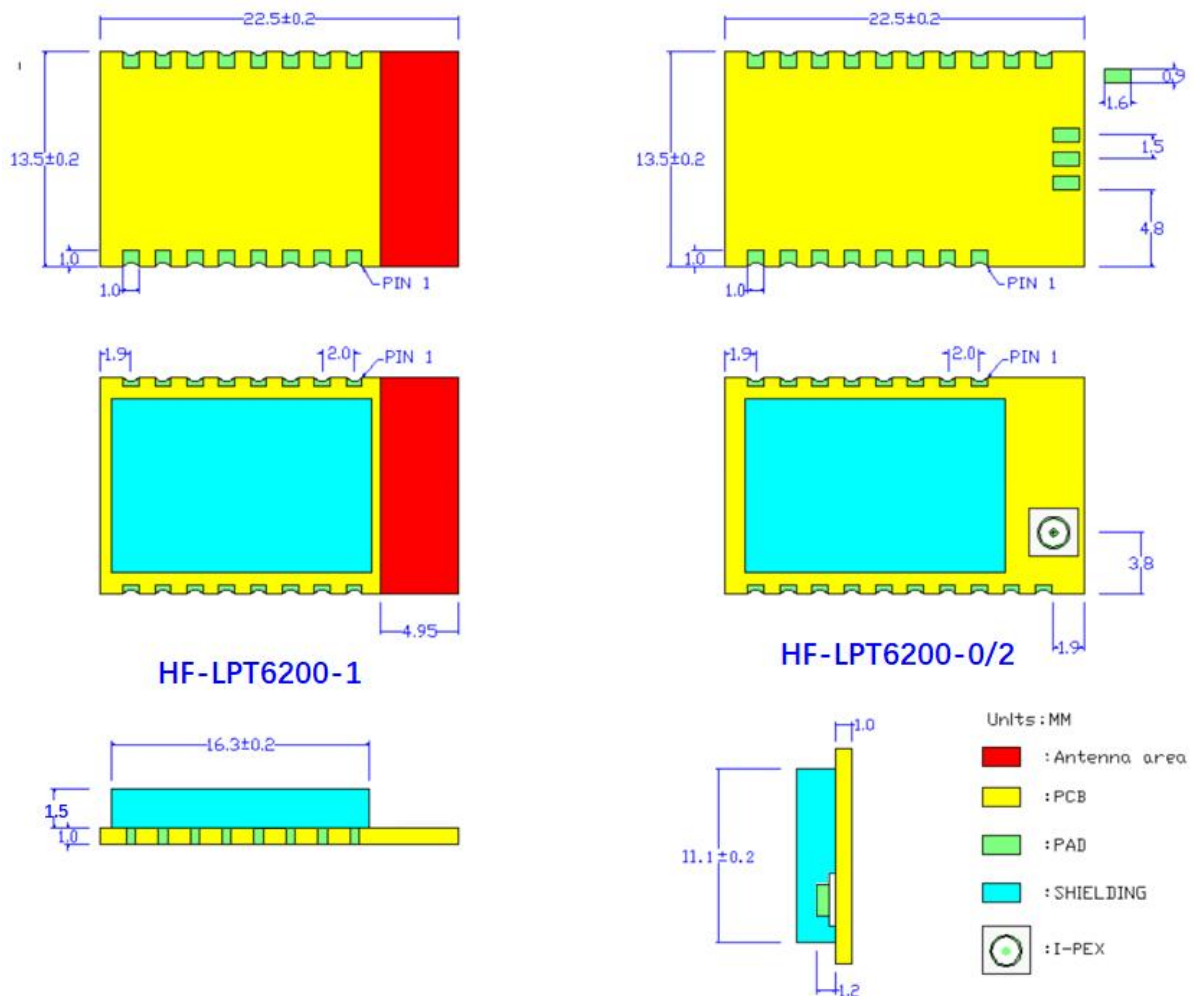


Figure 3. HF-LPT6200 Mechanical Dimension

1.2.4. 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 shielded by 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.

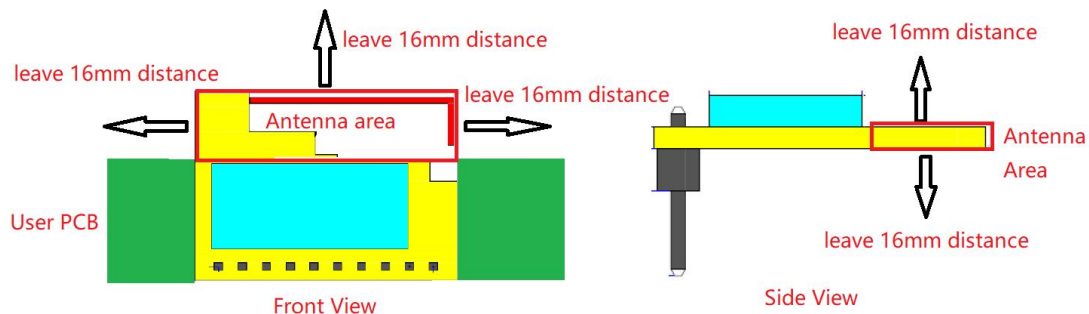


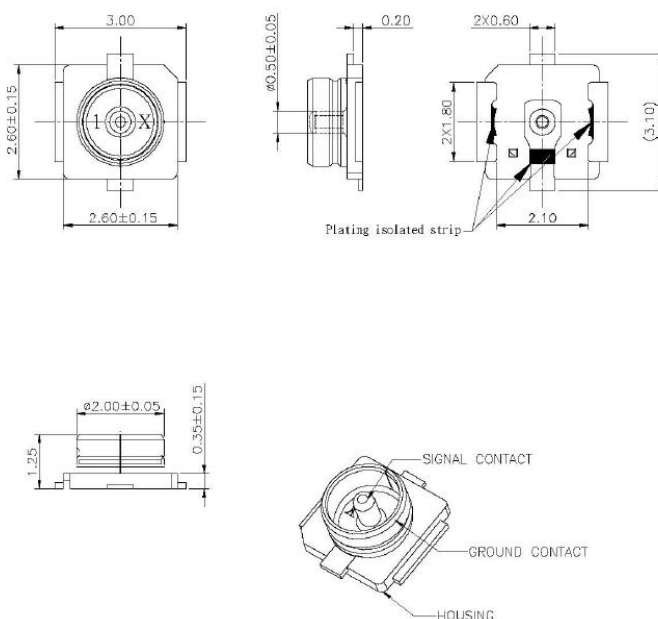
Figure 4. Suggested Module Placement Region

1.2.5. External Antenna

HF-LPT6200 series module supports external antenna(I-PEX) option for user dedicated application.

If user select external antenna, HF-LPT6200 series Wi-Fi modules must be connected to the 2.4G antenna according to IEEE 802.11b/g/n standards. We can provide external antenna if needed.

Contact with our salesman.



NOTES:

1. MATERIAL SPECIFICATION:
 - 1-1. HOUSING: LCP UL94V-0 COLOR: BEIGE.
 - 1-2. SIGNAL CONTACT: BRASS C2680;
 - 1-3. GROUND CONTACT: PHOSPHOR-COPPER C5191;
2. PLATING SPECIFICATION:
 - 2-1. SIGNAL CONTACT:
 - 50 μ m MIN. Ni PLATING OVER ALL.
 - 4 μ Au PLATED OVER MATING AREA.
 - 1 μ Au PLATED OVER SOLDER AREA.
 - 2-2. GROUND CONTACT:
 - 50 μ m MIN. Ni PLATING OVER ALL.
 - 2 μ Au PLATED OVER MATING AREA.
 - 1 μ Au PLATED OVER SOLDER AREA.
3. I.R. REFLOW:

THE PEAK TEMPERATURE ON THE BOARD SHALL BE MAINTAINED FOR 10 SECONDS MAX AT 260°C.
4. ELECTRICAL:
 - 4-1. IMPEDANCE: 50 Ω (NOMINAL)
 - 4-2. FREQUENCY RANGE: 0~6GHz
 - 4-3. RATED VOLTAGE: AC 60V.
 - 4-4. I.LCR: FOR SIGNAL AND GROUND CONTACT: INITIAL: 20m Ω MAX AFTER TESTING: 20m Ω MAX.
 - 4-5. INSULATION RESISTANCE: MATED: 100V DC INITIAL: 500M Ω MIN. AFTER TESTING: 100M Ω MIN.
 - 4-6. DIELECTRIC WITHSTAND VOLTAGE: MATED: APPLY 200V RMS, FOR 1 MINUTE NO BREAKDOWN.
5. MECHANICAL:
 - 5-1. DURABILITY: 30 CYCLES.
 - 5-2. CONNECTOR UNMATING FORCE: INITIAL: 4N MIN. AFTER DURABILITY 30 CYCLES: 2N MIN.
6. OPERATING TEMPERATURE

OPERATING TEMPERATURE: -40°C~+90°C

Figure 5. 1st IPEX Connector

The antenna parameters required as follows:

Table4. External Antenna Parameters

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

1.2.6. Evaluation Kit

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

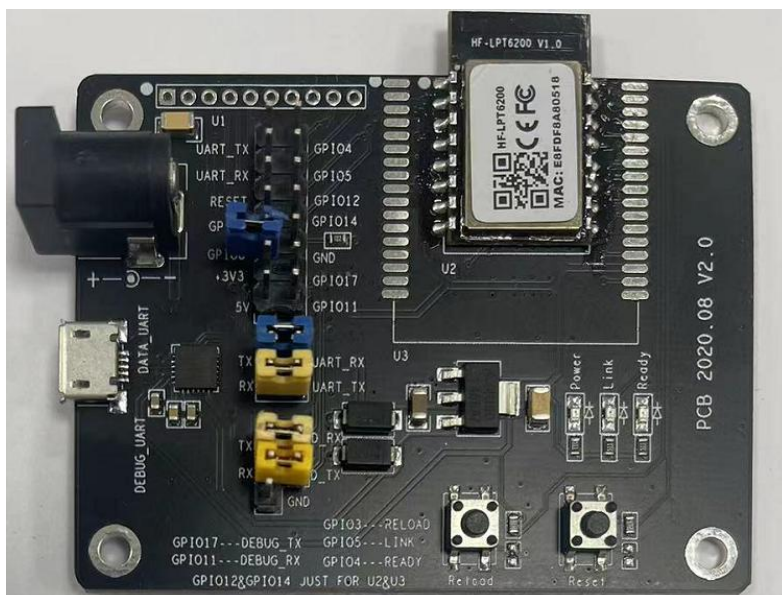


Figure 6. HF-LPT6200 EVK

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:

Table5. Evaluation Kit Interface Description

Function	Name	Description
External Interface	DATA_UART	Power In and communication UART2 port.
	DEBUG_UART	Power In and debug UART port, baud rate 115200
	DC	DC jack for power in, 5V input. When USB power

		supply is not enough, may use external adapter.
LED	Power	Power LED
	Ready	nReady LED
	Link	nLink LED
Button	Reload	Smart Config and Restore factory default configuration.
	Reset	Reboot module

1.2.7. Hardware Typical Application

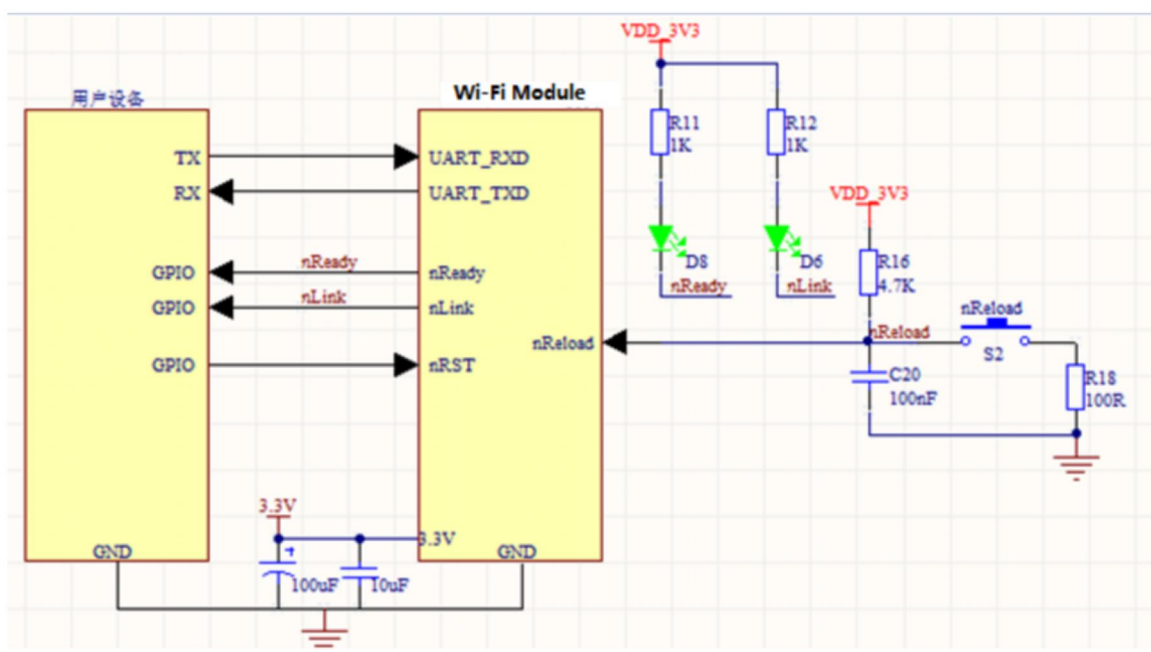


Figure 7. HF-LPT6200 Hardware Typical Application

Notes:

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

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

nLink- Module WIFI connection status indication. Output.

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

When module connects to AP (AP associated), this pin will output “0”. This signal used to judge if module already at WiFi connection status. 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

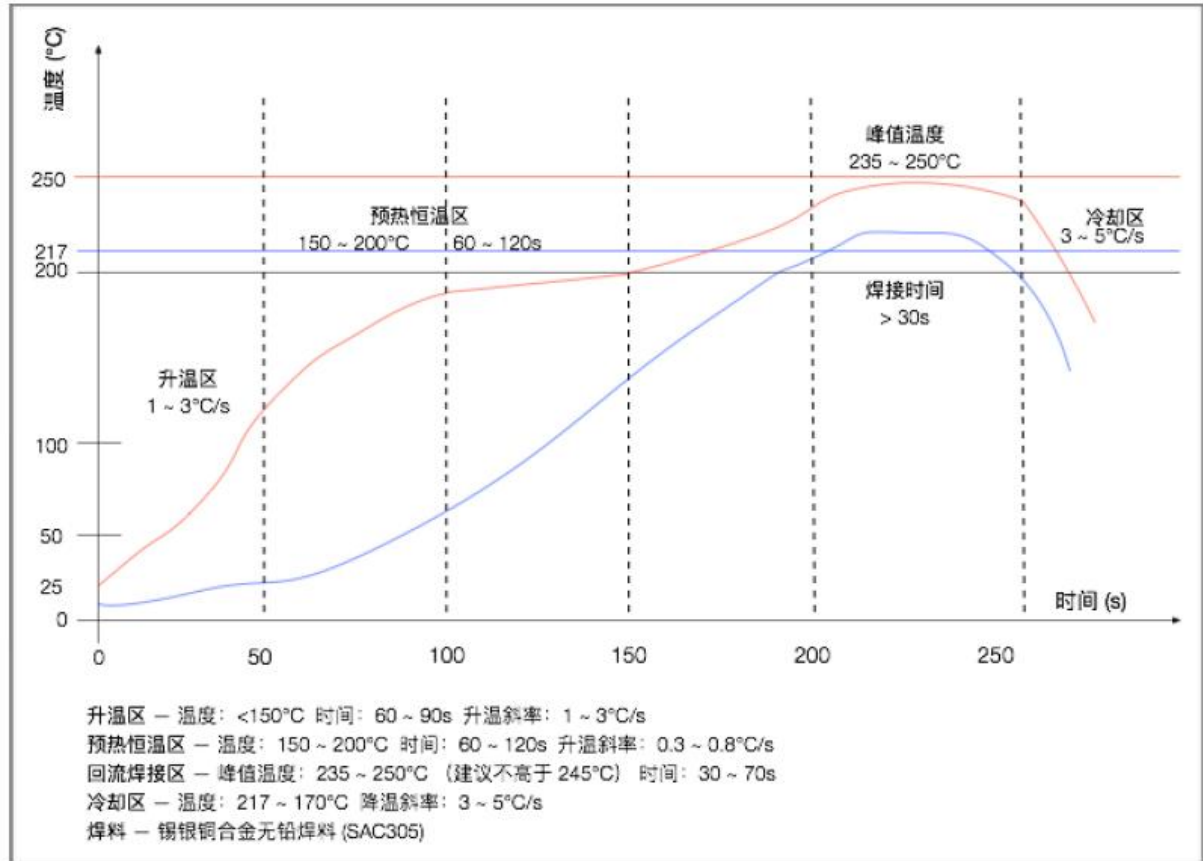


Figure 8. Reflow Soldering Profile

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.

FCC Statement

U.S. FCC Statement

FCC ID: 2ACSVHF-LPT6200

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual.

This device is intended only for OEM integrators under the following conditions: (For module device use)

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) The transmitter module may not be co-located with any other transmitter or antenna. As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment.

his equipment should be installed and operated with minimum distance 20 cm between the radiator & your body.

According to the definition of mobile and fixed device is described in Part 2.1091(b), this device is a mobile device.

And the following conditions must be met:

1. This Modular Approval is limited to OEM installation for mobile and fixed applications only. The antenna installation and operating configurations of this transmitter, including any applicable source-based time- averaging duty factor, antenna gain and cable loss must satisfy MPE categorical Exclusion Requirements of 2.1091.
2. The EUT is a mobile device; maintain at least a 20 cm separation between the EUT and the user's body and must not transmit simultaneously with any other antenna or transmitter.
3. A label with the following statements must be attached to the host end product: This device contains **FCC ID: 2ACSVHF-LPT6200**.
4. To comply with FCC regulations limiting both maximum RF output power and human exposure to RF radiation, maximum antenna gain (including cable loss) must not exceed:

❑ Bluetooth LE: $\leq 0.75\text{dBi}$

❑ Wi-Fi 2.4G: $\leq 0.75\text{dBi}$

5. This module must not transmit simultaneously with any other antenna or transmitter
6. The host end product must include a user manual that clearly defines operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.

For portable devices, in addition to the conditions 3 through 6 described above, a separate approval is required to satisfy the SAR requirements of FCC Part 2.1093

If the device is used for other equipment that separate approval is required for all other operating configurations, including portable configurations with respect to 2.1093 and different antenna configurations.

For this device, OEM integrators must be provided with labeling instructions of finished products. Please refer to KDB784748 D01 v07, section 8. Page 6/7 last two paragraphs:

A certified modular has the option to use a permanently affixed label, or an electronic label. For a permanently affixed label, the module must be labeled with an FCC ID - Section 2.926 (see 2.2 Certification (labeling requirements) above). The OEM manual must provide clear instructions explaining to the OEM the labeling requirements, options and OEM user manual instructions that are required (see next paragraph).

For a host using a certified modular with a standard fixed label, if (1) the module's FCC ID is not visible when installed in the host, or (2) if the host is marketed so that end users do not have straightforward commonly used methods for access to remove the module so that the FCC ID of the module is visible; then an additional permanent label referring to the enclosed module: "Contains Transmitter Module FCC ID: **2ACSVHF-LPT6200**" or "Contains FCC ID: **2ACSVHF-LPT6200**" must be used. The host OEM user manual must also contain clear instructions on how end users can find and/or access the module and the FCC ID.

The final host / module combination may also 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 user's manual or instruction manual for an intentional or unintentional radiator shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. In cases where the manual is provided only in a form other than paper, such as on a computer disk or over the Internet, the information required by this section may be included in the manual in that alternative form, provided the user can reasonably be expected to have the capability to access information in that form.

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.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.

APPENDIX A: 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
<http://www.hi-flying.com/en/>

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