

HF-LPB170

Low Power Wi-Fi+BLE Module

User Manual

V1.4

Overview of Characteristic

- ◇ **Support Wi-Fi IEEE 802.11b/g/n and BLE5.0 Wireless Standards**
- ◇ **Based on RISC SOC, 160MHz CPU, 276KB RAM,2MB Flash**
- ◇ **Support UART Data Communication with Wi-Fi or BLE**
- ◇ **Support Wi-Fi STA/AP Mode**
- ◇ **Support BLE Smart BLE Link Config**
- ◇ **Support Wi-Fi AP Smart AP Link and Sniffer Smart Link V8 Config**
- ◇ **Support Wireless and Remote Firmware Upgrade Function**
- ◇ **Support Software SDK for Develop**
- ◇ **Support Different Antenna Option**
 - **HF-LPB170: Internal PCB**
- ◇ **Single +3.3V Power Supply for HF-LPB170**
- ◇ **Size:**
 - **HF-LPB170: 23.1mm x 32.8mm x 3.5mm,SMT34 package**

TABLE OF CONTENTS

| | |
|--|-----------|
| LIST OF FIGURES | 3 |
| LIST OF TABLES | 4 |
| HISTORY | 5 |
| 1. PRODUCT OVERVIEW | 6 |
| 1.1. General Description | 6 |
| 1.1.1 Key Application | 7 |
| 1.1.2 Device Parameters | 7 |
| 1.2. Hardware Introduction | 8 |
| 1.2.1. HF-LPB170 Pins Definition | 9 |
| 1.2.2. Electrical Characteristics | 11 |
| 1.2.3. HF-LPB170 Mechanical Size..... | 12 |
| 1.2.4. On-board PCB Antenna | 13 |
| 1.2.5. Evaluation Kit | 13 |
| 1.2.6. Order Information | 15 |
| 1.2.7. Hardware Typical Application | 16 |
| APPENDIX D: CONTACT INFORMATION | 17 |
| OEM/Integrators Installation Manual | 18 |

LIST OF FIGURES

| | |
|--|----|
| Figure 1. Block Diagram | 6 |
| Figure 2. HF-LPB170 Appearance | 8 |
| Figure 3. HF-LPB170 Pins Map..... | 9 |
| Figure 4. HF-LPB170 Mechanical Dimension | 12 |
| Figure 5. Suggested Module Placement Region | 13 |
| Figure 6. HF-LPB170 Order Information | 15 |
| Figure 7. HF-LPB170 Hardware Typical Application | 16 |

LIST OF TABLES

| | | |
|---------|---|----|
| Table1. | HF-LPB170 Module Technical Specifications | 7 |
| Table2. | HF-LPB170 Pins Definition..... | 9 |
| Table3. | Absolute Maximum Ratings:..... | 11 |
| Table4. | Evaluation Kit Interface Description..... | 14 |

HISTORY

Ed.V1.0 06-09-2020 First Version.

Ed.V1.1 06-10-2020 Update some error description

Ed.V1.2 07-16-2020 Update 1MB and 2MB software difference.

Ed.V1.3 08-24-2020 Add HF-LPT170, HF-LPB170, HF-LPB175 type.

Ed.V1.4 09-16-2020 Delete 1MB version, and Add HF-LPT270, HF-LPT271 type.

1. PRODUCT OVERVIEW

1.1. General Description

The HF-LPB170 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-LPB170 module employs the world's lowest power consumption embedded architecture. It has been optimized for all kinds of client applications in the home automation, smart grid, handheld device, personal medical application and industrial control that have lower data rates, and transmit or receive data on an infrequent basis.

Figure 1. BlockDiagram

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-LPB170 Module Technical Specifications

| Class | Item | Parameters |
|----------------------------|---------------------|--|
| Wi-Fi Parameters | Wireless standard | 802.11 b/g/n |
| | Frequency range | 2.412GHz-2.462GHz |
| | Transmit Power | 802.11b: +18dBm \pm 2dBm (@1Mbps) |
| | | 802.11g: +22dBm \pm 2dBm (@6Mbps) |
| | | 802.11n: +22dBm \pm 2dBm (@HT20, MCS0) |
| | ReceiverSensitivity | 802.11b: -98dBm (@1Mbps) |
| | | 802.11b: -91dBm (@11Mbps) |
| | | 802.11g: -93dBm (@6Mbps) |
| 802.11g: -77dBm (@54Mbps) | | |
| 802.11n: -93dBm (@MCS0) | | |
| 802.11n: -73dBm (@MCS7) | | |
| BLE Parameters | Wireless standard | BLE5.0 |
| | Frequency range | 2.402GHz-2.480GHz |
| | Transmit Power | Max 8.6dBm |
| | ReceiverSensitivity | -90dBm |
| Hardware Parameters | Antenna Option | HF-LPT270: Internal: PCB antenna External: 1 st IPEX antenna or PAD out HF-LPT170: Internal:PCB antenna HF-LPT271: Internal:PCB antenna HF-LPB170: Internal: PCB antenna HF-LPB175: Internal: PCB antenna External: 1 st IPEX antenna |
| | Data Interface | UART GPIO,SPI,PWM, ADC |
| | Operating Voltage | 3.3V |
| | Operating Current | Peak (1msforevery100ms): <350mA Average(STA, No data): 45mA Average(STA, Continuous TX): 60mA Average(AP): 70mA Standby:200uA(Reset Pin set to low) |
| | Operating Temp. | -40°C- 85°C |

| | | |
|----------------------------|---------------------|--|
| | StorageTemp. | -40°C - 125°C |
| | Humidity | <85% |
| | MSL | Level 3 |
| | Dimensions and Size | HF-LPT270: 22.5mm x 13.5mm x 3mm HF-LPT170: 22mmx15.6mmx8mm HF-LPT271: 24mmx16mmx 3mm HF-LPB170: 23.1mm x 32.8mm x 3.5mm HF-LPB175: 41.3mm x 24.1mm x 6mm |
| Software Parameters | Network Type | STA/AP |
| | 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. Smart BLE Link BLE Config Smart AP Link AP Config Smart Link Config |

1.2. Hardware Introduction

HF-LPB170 Wi-Fi module appearance is as following.

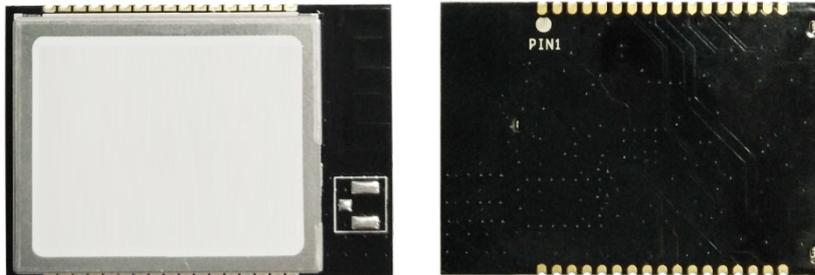


Figure 2. HF-LPB170Appearance

1.2.1. HF-LPB170 Pins Definition

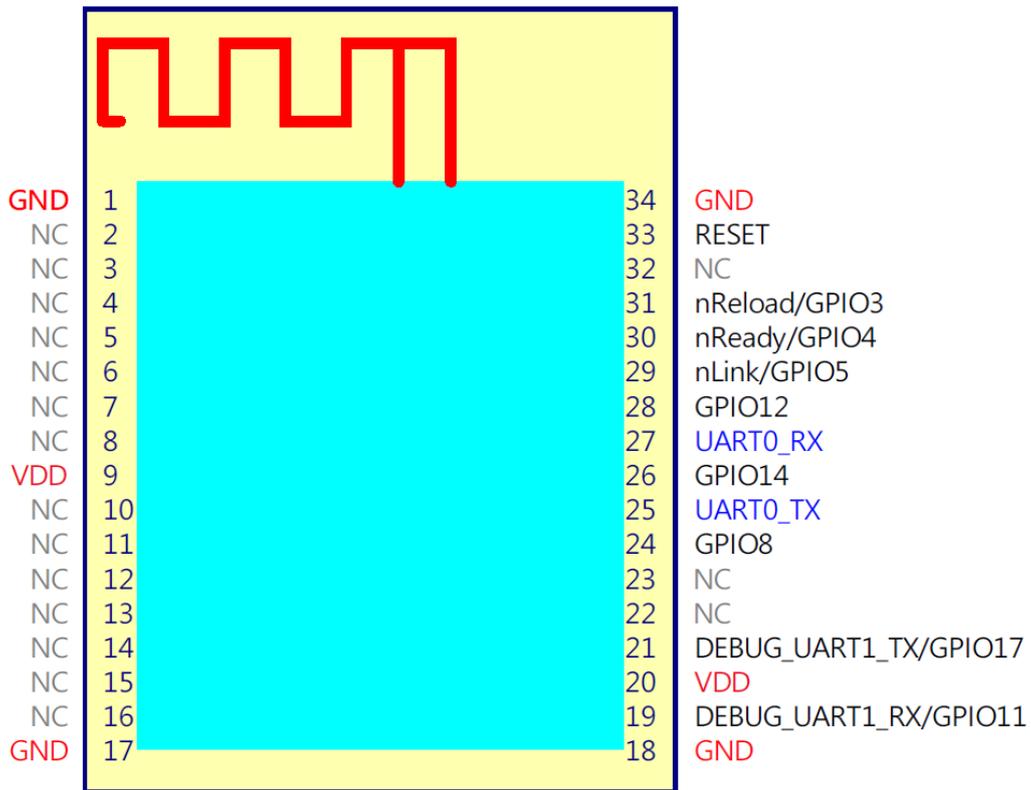


Figure 3. HF-LPB170 Pins Map

Table2. HF-LPB170 Pins Definition

| Pin | Description | Net Name | Signal Type | Comments |
|-------------------------------|-------------|----------------|-------------|--|
| 1,17,18,34 | Ground | GND | Power | |
| 2, 3, 4, 5, 6, 7, 8 | | N.C | | NoConnection |
| 9,20 | +3.3V Power | VDD | Power | |
| 10, 11, 12, 13, 14, 15, 16 | | N.C | | |
| 19 | UART1_RX | DEBUG_UART1_RX | I | 3.3V TTL UART1 Debug Input GPIO11 |
| 21 | UART1_TX | DEBUG_UART1_TX | O | 3.3V TTL UART1 Debug Output GPIO17 |
| 22, 23 | | N.C | | |
| 24 | | GPIO8 | I/O | Boot Select, default low,leave it unconnected. Low: boot from flash. High: boot from UART. |
| 25 | UART0 | UART0_TX | O,PU | 3.3V TTL UART0 Communication Output GPIO16 |

| Pin | Description | Net Name | Signal Type | Comments |
|-----|--------------------------|----------|-------------|---|
| 26 | GPIO14 | GPIO14 | I/O | GPIO14 |
| 27 | UART0 | UART0_RX | I | 3.3V TTL UART0 Communication Input GPIO7 |
| 28 | GPIO12 | GPIO12 | I/O | GPIO12 |
| 29 | Wi-Fi Status | nLink | O | “0” – Wi-Fi connect to router “1” – Wi-Fi unconnected; Detailed functions see <Notes> GPIO5 |
| 30 | Module Boot Up Indicator | nReady | O | “0” – Boot-up OK; “1” – Boot-up Fail; GPIO4, PWM2 |
| 31 | Multi-Function | nReload | I,PU | Detailed functions see <Notes> GPIO3, PWM3 |
| 32 | | N.C | | |
| 33 | Module Reset | RESET | I,PU | “Low” effective reset input. There is RC reset circuit internally. No need of external RC reset circuit. |

<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 Smart BLE Link config mode, waiting for APP to set router SSID and password, config module connect to router. **Recommend to use Smart Ble Link BLE method config, may use AT+SMART CONFIG to choose other config mode(Smart Link V8 and Smart AP Link).**
See Appendix to download Smart BLE Link, Smart Link V8 and Smart AP Link 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 “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 “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 or firmware program, baud rate 921600.

1.2.2. Electrical Characteristics

Table3. Absolute Maximum Ratings:

| Parameter | Condition | Min. | Typ. | Max. | Unit |
|-------------------------------|---------------------|------|------|------|------|
| Work temperature range | | -40 | | 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 |

1.2.3. HF-LPB170 Mechanical Size

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

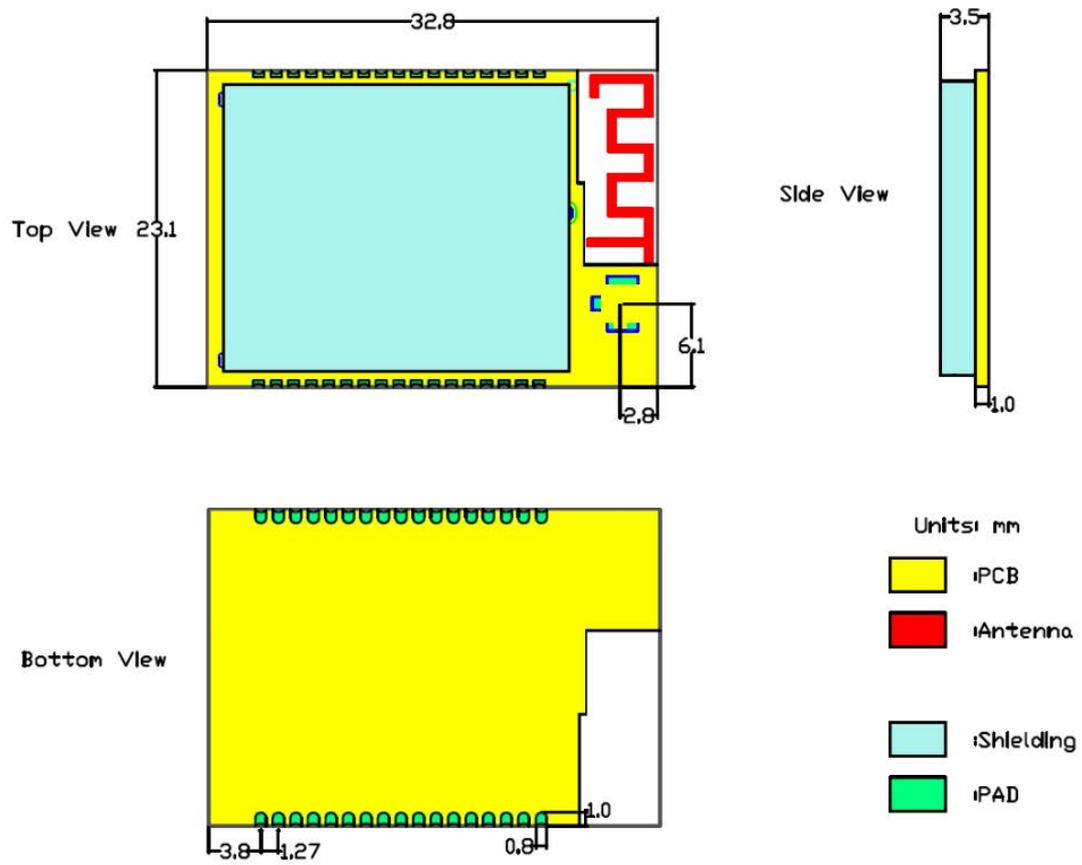


Figure 4. HF-LPB170 Mechanical Dimension

1.2.4. On-board PCB Antenna

HF modules 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, 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 10mm;
- Antenna can't be shieldedby any meal enclosure; All cover, include plastic, shall away from antenna at least 10mm;

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.

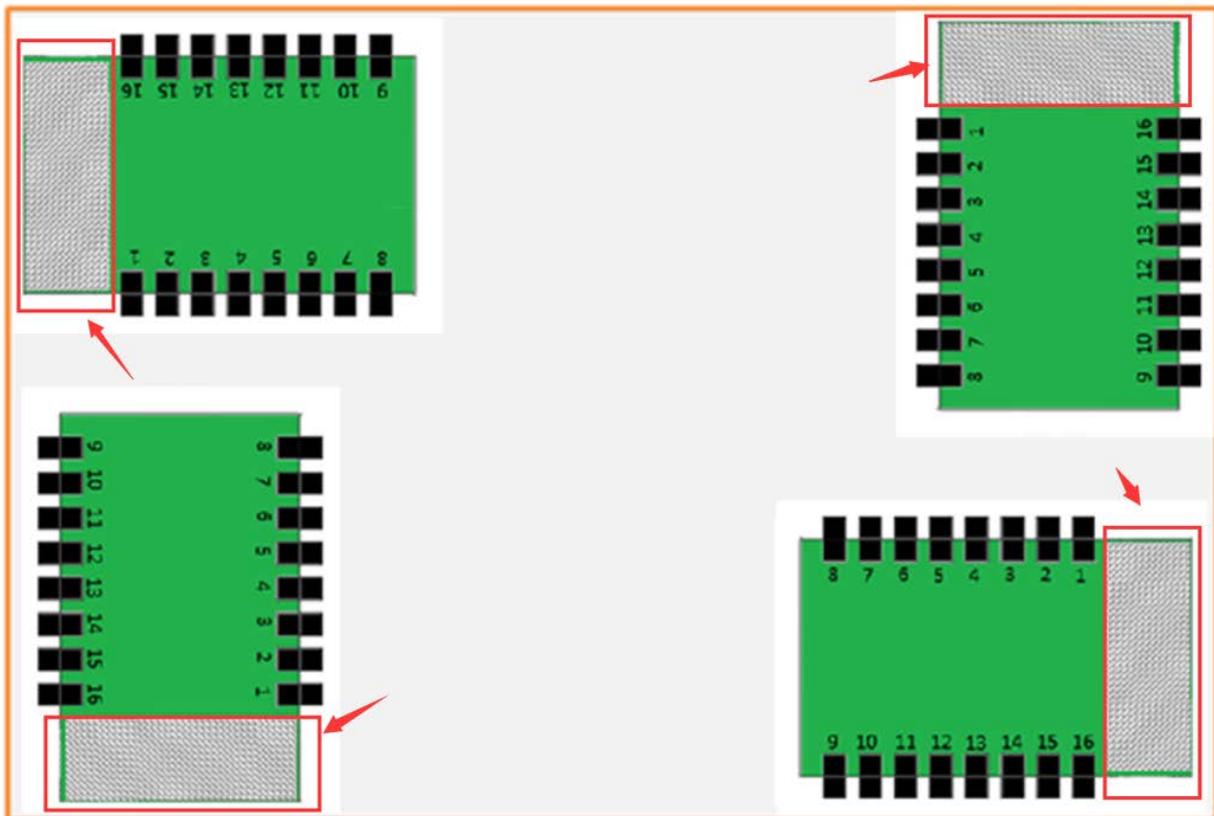


Figure 5. Suggested Module Placement Region

1.2.5. 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 UARTconvetor) or Wireless interface to configure the parameters, manage the module or do the some functional tests.

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:

Table4. Evaluation Kit Interface Description

| Function | Name | Description |
|----------|------|--------------------------|
| Extern | RS23 | Main data/command RS-232 |

| | | |
|---------------------|---------|--|
| al Interfa ce | 2 | interface, this interface maximum baud rate is 460800.Cannot be used for debug UART log(It need 921600) |
| | 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 | Smart link and Restore factory default configuration. See more for PIN Definition |

1.2.6. Order Information

Base on customer detailed requirement, HF-LPB170 modules provide different variants and physical type for detailed application.

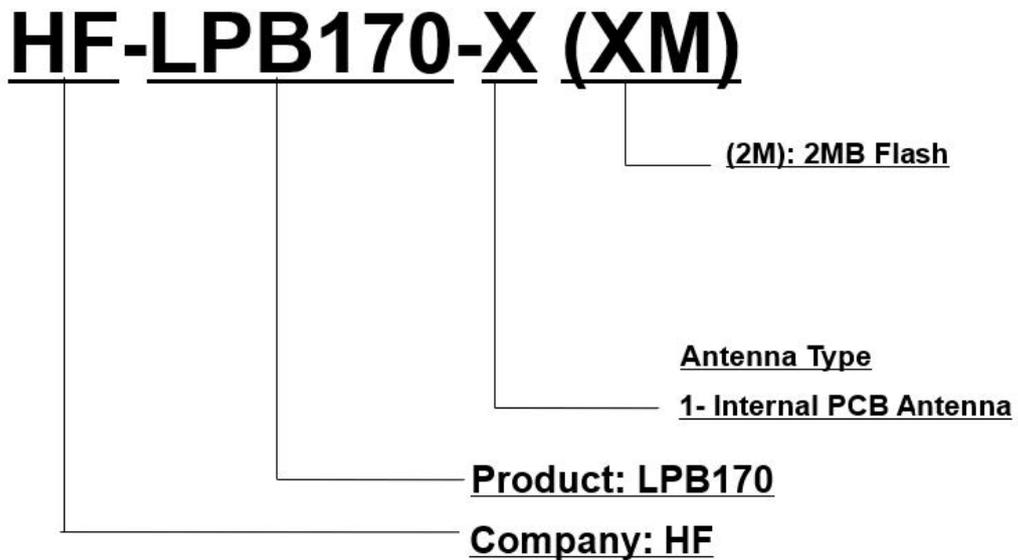


Figure 6. HF-LPB170 Order Information

1.2.8. Hardware Typical Application

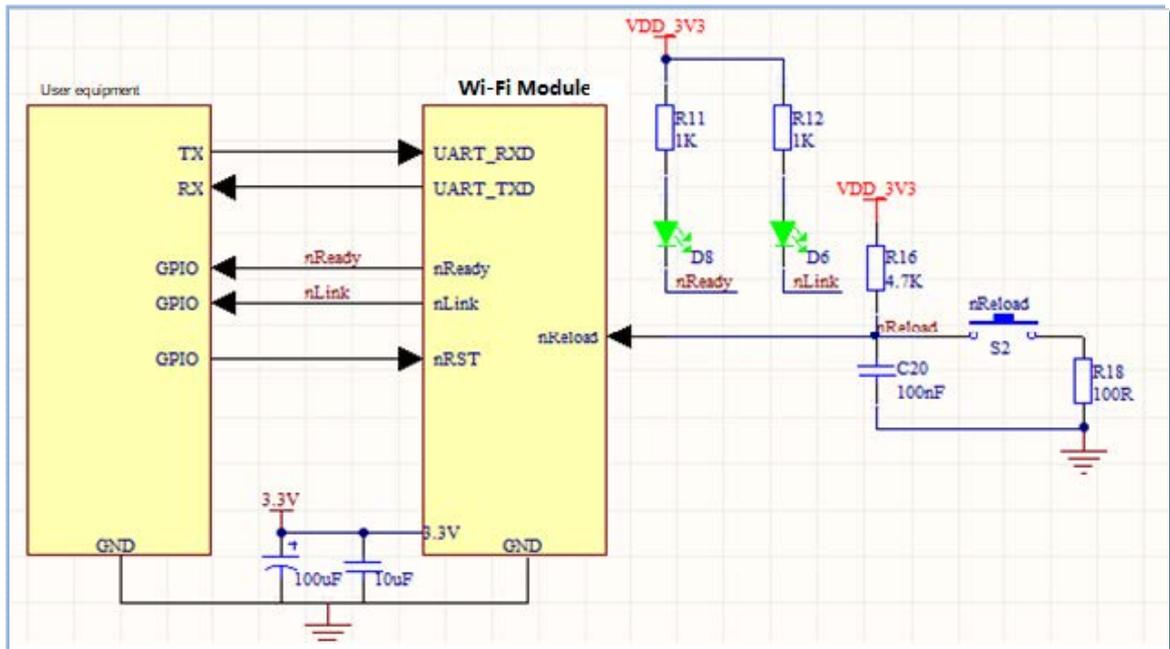


Figure 7. HF-LPB170 Hardware Typical Application

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.

APPENDIX D: CONTACT INFORMATION

Address: [Room 1002, Building 1, No.3000, Longdong Avenue, Pudong New Area, Shanghai, China, 201203](#)

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/>

© Copyright High-Flying, May, 2011

The information disclosed herein is proprietary to High-Flying and is not to be used by or disclosed to unauthorized persons without the written consent of High-Flying. The recipient of this document shall respect the security status of the information.

The master of this document is stored on an electronic database and is "write-protected" and may be altered only by authorized persons at High-Flying. Viewing of the master document electronically on electronic database ensures access to the current issue. Any other copies must be regarded as uncontrolled copies.

OEM/Integrators Installation Manual

1. List of applicable FCC rules

This module has been tested and found to comply with part 15.247 requirements for Modular Approval.

2. Summarize the specific operational use conditions

This module can be used in IoT devices. The input voltage to the module should be nominally 3.3VDC and the ambient temperature of the module should not exceed 85°C. HF-LPB170 has one PCB antenna with max antenna gain 2.0dBi. If the antenna needs to be changed, the certification should be re-applied.

3. Limited module procedures

NA

4. Trace antenna designs

NA

5. RF exposure considerations

This 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 & your body. If the device built into a host as a portable usage, the additional RF exposure evaluation may be required as specified by § 2.1093.

6. Antennas

| | |
|------------------------------|-------------------------------------|
| Antenna type: PCB antenna | 2.4GHz band Peak Gain: 2.0dBi |
|------------------------------|-------------------------------------|

7. Label and compliance information

When the module is installed in the host device, the FCC ID label must be visible through a window on the final device or it must be visible when an access panel, door or cover is easily re-moved. If not, a second label must be placed on the outside of the final device that contains the following text: "Contains FCC ID: 2ACSV-HFLPB170" The FCC ID can be used only when all FCC ID compliance requirements are met.

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, WIFI and Bluetooth testing using QRCT in FTM mode.

9. Additional testing, Part 15 Subpart 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 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 WLAN 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 Statement:

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,
- (2) This device must accept any interference received, including interference that may cause undesired operati

<END OF DOCUMENT>