HF-LPS170
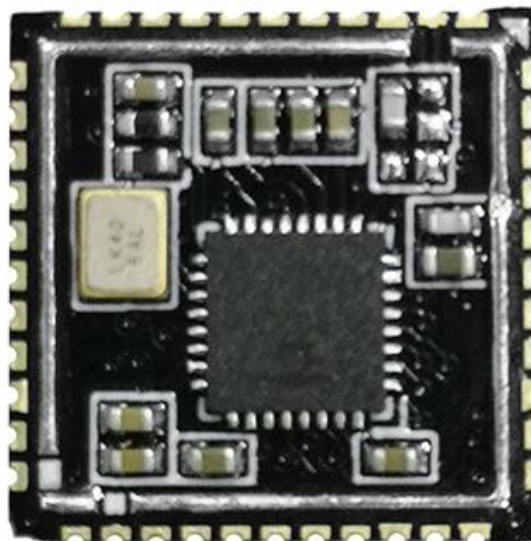
Low Power SDIO Wi-Fi + BLE Module

User Manual

V 1.3

Overview of Characteristic

✧ **Support Wi-Fi IEEE802.11b/g/n and BLE5.0 Wireless Standards**

✧ **Based on RISC SOC, 160MHz CPU, 276KB RAM, 2MB Flash**

✧ **Support SDIO Interface, Provide Linux Driver(Kernel Require 3.10 Above)**

✧ **Single +3.3V Power Supply，Selective 1.8V or 3.3V SDIO Voltage**

✧ **Size: 12mm x 12mm, SMT44**

✧ **FCC ID:2ACSVHF-LPS170**

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HISTORY

Ed. V1.0 07-21-2020   First Version.

Ed. V1.1 07-27-2020   Update IO voltage.

Ed. V1.2 11-03-2020   Update Kernel requirement, update GPIO_8 description.

Ed. V1.3 01-04-2021   Update GPIO8 description

1. PRODUCT OVERVIEW

1.1. General Description

The HF-LPS170 module is a Wi-Fi and BLE combo module for ultra-low-power application
Wireless subsystem contains 2.4G radio, Wi-Fi 802.11bgn and BLE5.0 baseband/MAC designs.
Microcontroller subsystem contains a low-power 32-bit RISC CPU, high-speed cache and memories.
Power Management Unit controls low-power modes. Moreover, variety of security features are
supported.
Peripheral interfaces include SDIO, SPI, UART I2C, IR remote, PWM, ADC and GPIOs.
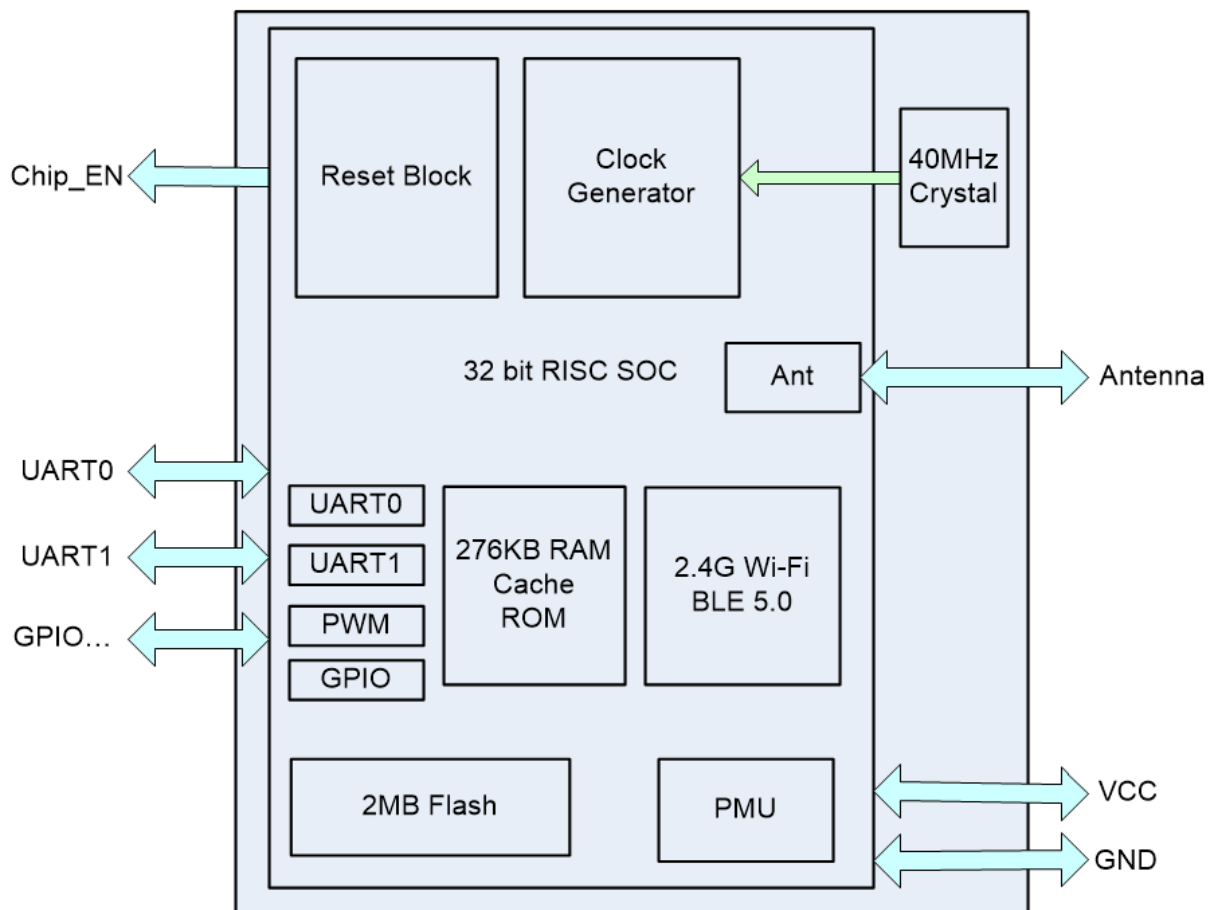Provice Linux driver for external MCU integrate using SDIO interface.

Figure 1.   HF-LPS170 Block Diagram

1.1.1 Wireless

➢   2.4G RF transceiver
➢   Wi-Fi 802.11bgn

- ➢ BLE 5.0, Channel Selection#2 is supported, 2M PHY / Coded PHY / ADC extension is not supported.
- ➢ Wi-Fi 20MHz bandwidth
- ➢ Wi-Fi Security WEP / WPA / WPA2 Personal / WPA2 Enterprise / WPS
- ➢ STA, softAP and Sniffer modes
- ➢ Multi-cloud connectivity
- ➢ Wi-Fi and BLE coexistence
- ➢ Integrated balun, PA/LNA

1.1.2 MCU Subsystem

- ➢ 32-bit RISC CPU with FPU
- ➢ Level-1 Cache
- ➢ One RT timer up to one year
- ➢ Two 32b general purpose timers
- ➢ Four DMA channels
- ➢ DFS from 1MHz to 192MHz
- ➢ The HF-LPS170 module is a Wi-Fi and BLE combo module for ultra-low-power application
- ➢ Wireless subsystem contains 2.4G radio, Wi-Fi 802.11bgn and BLE5.0 baseband/MAC designs.

1.1.3 Memory

- ➢ 276KB SRAM
- ➢ 128KB ROM
- ➢ 1Kb eFuse
- ➢ 2MB Flash

1.1.4 Security

- ➢ Secure boot
- ➢ Secure debug ports
- ➢ AES 128/192/256 bits
- ➢ SHA01/224/256
- ➢ TRNG
- ➢ PKA

1.1.5 Peripheral

- ➢ One SDIO 2.0 slave
- ➢ One SPI master/slave
- ➢ Two UART
- ➢ One I2CC master/slave
- ➢ Five PWM
- ➢ 10-bit DAC
- ➢ 12-bit ADC
- ➢ Two general analog comparators

> PIR detection
> IR remote HW accelerator
> 16 GPIOs

1.1.6 Power MSecurity

> Off
> Hibernate
> Power Down Sleep
> Active

1.1.7 Clock

> Support XTAL 40MHz
> Internal RC 32KHz oscillator
> Internal System PLL
> Hibernate
> Power Down Sleep
> Active

1.1.8 Device Paremeters

Table1.   HF-LPS170 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: +16 +/-2dBm (@11Mbps)
		802.11g: +14 +/-2dBm (@54Mbps)
		802.11n: +13 +/-2dBm (@HT20, MCS7)
	Receiver Sensitivity	802.11b: -87 dBm (@11Mbps ,CCK)
		802.11g: -73 dBm (@54Mbps, OFDM)
		802.11n: -71 dBm (@HT20, MCS7)
BLE Parameters	Wireless standard	BLE5.0
	Frequency range	2.402GHz-2.480GHz
	Transmit Power	Max 9dBm
	Receiver Sensitivity	-90dBm
Hardware Parameters	Antenna Option	antenna Pad
	Data Interface	UART
		GPIO, SPI, PWM
	Operating Voltage(TBD)	2.6~3.6V
	Operating Current(TBD)	Peak (Continuous TX): 350mA Average(STA, No data): 30mA Average(STA, Continuous TX): 85mA Average(AP): 110mA Standby: 300uA(Reset Pin set to low)
	Operating Temp.	-40℃- 85℃
	Storage Temp.	-40℃- 125℃

	Humidity	<85%
	Dimensions and Size	12mm x 12mm
Software Parameters	Driver	Linux

1.2. Hardware Introduction

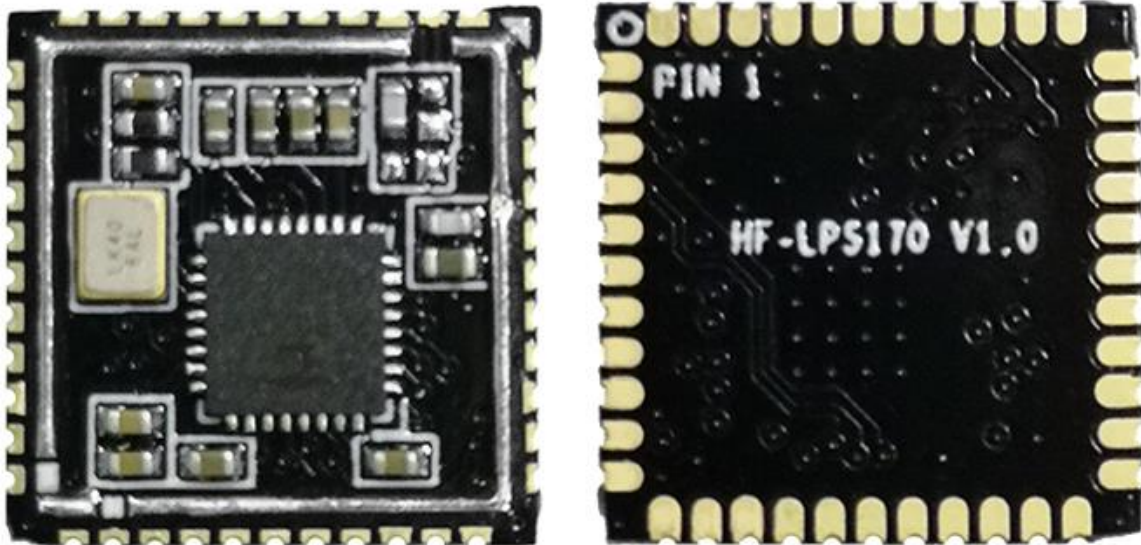HF-LPS170 Wi-Fi module appearance is as following.

Figure 2.   HF-LPS170 Appearance

1.2.1. HF-LPS170 Pins Definition
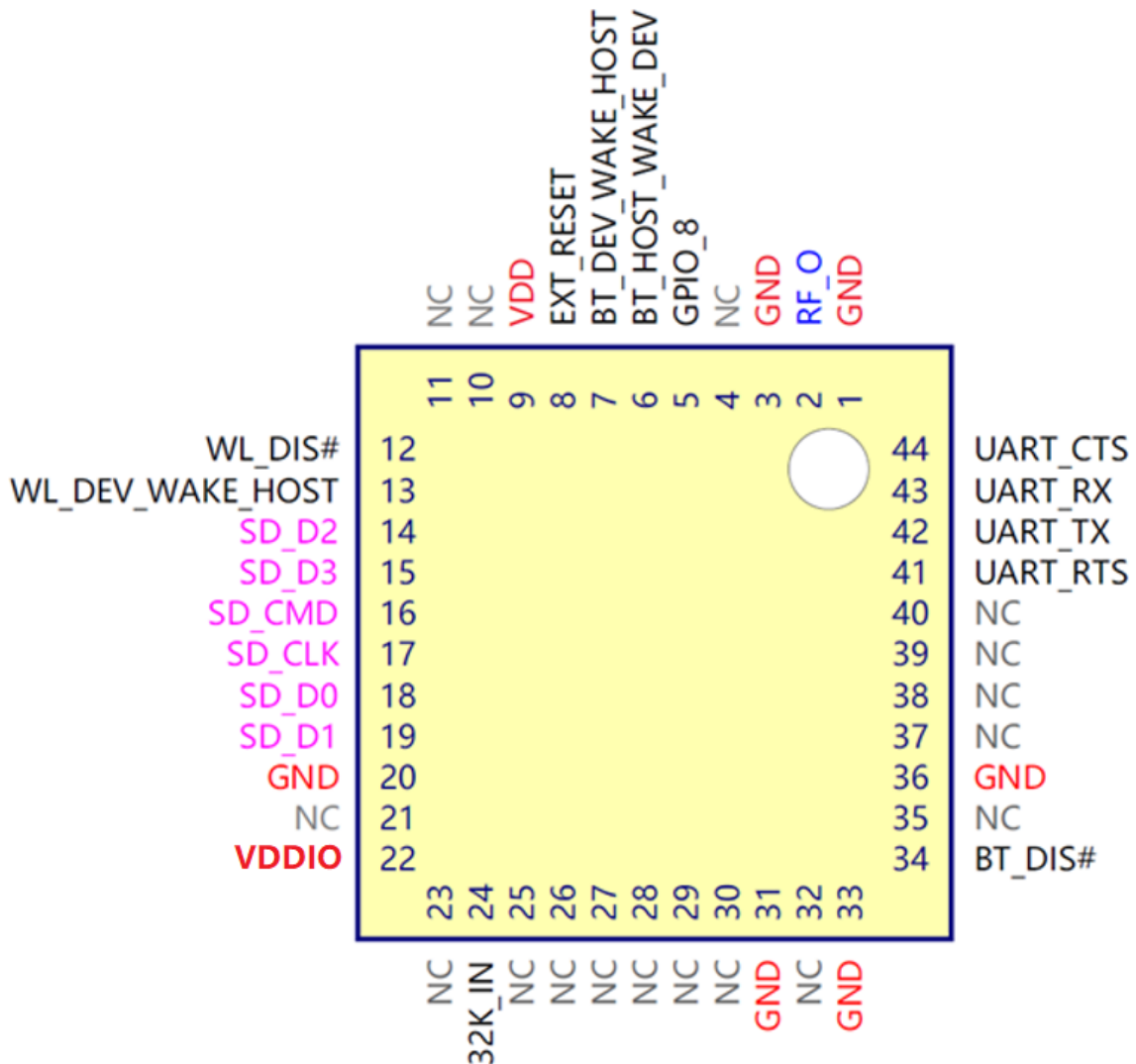
Figure 3.　　HF-LPS170 Pins Map

Table2.　　HF-LPS170 Pins Definition

Pin	Description	Net Name	Signal Type	Comments
1, 3, 20, 31, 33, 36	Ground	GND	Power	
2		RF_O	Analog	Antenna Signal
5		GPIO_8	IPD	3.3V Voltage default 10K pull-down, Boot Select: Low: boot from internal flash. High: boot from external UART or SDIO, firmware can be programmed into internal flash via UART. Due to internal 10K pull-down, add 1K pull-up resistor if need set to High.

Pin	Description	Net Name	Signal Type	Comments
6		BT_HOST_WAKE_DEV	I/O	3.3V Voltage GPIO12 SPI, I2C, PWM, ADC
7		BT_DEV_WAKE_HOST	I/O	3.3V Voltage GPIO11 SPI, I2C, PWM, ADC
8	Module Reset	EXT_RESET	I,PU	3.3V Voltage "Low" effective reset input. There is RC reset circuit internally. No need of external RC reset circuit.
9	**+3.3V Power**	**VDD**	**Power**	
12		WL_DIS#	I/O	VDDIO Voltage (1.8V/3.3V) GPIO21 SPI, I2C, PWM
13		WL_DEV_WAKE_HOST	I/O	VDDIO Voltage (1.8V/3.3V) GPIO20 SPI, I2C, PWM
14		SD_D2	I/O	VDDIO Voltage (1.8V/3.3V) SDIO DATA2, GPIO4
15		SD_D3	I/O	VDDIO Voltage (1.8V/3.3V) SDIO DATA3, GPIO5
16		SD_CMD	I/O	VDDIO Voltage (1.8V/3.3V) SDIO CMD, GPIO1
17		SD_CLK	I/O	VDDIO Voltage (1.8V/3.3V) SDIO CLK, GPIO0
18		SD_D0	I/O	VDDIO Voltage (1.8V/3.3V) SDIO DATA0, GPIO2
19		SD_D1	I/O	VDDIO Voltage (1.8V/3.3V) SDIO DATA1, GPIO3
22	**IO Power**	**VDDIO**	**Power**	**3.3V or 1.8V Power Input**
24		32L_IN	Analog	32.768K clock in, leave it open if not use
34		BT_DIS#	I/O	VDDIO Voltage (1.8V/3.3V) GPIO22 SPI, I2C, PWM
41	UART_RTS	UART_RTS	I/O	VDDIO Voltage (1.8V/3.3V) GPIO17 SPI, I2C, PWM
42	UART_TX	UART_TX	I/O	VDDDIO Voltage (1.8V/3.3V) UART Communication Output GPIO16
43	UART_RX	UART_RX	I/O	3.3V UART Communication Input GPIO7
44	UART_CTS	UART_CTS	I/O	3.3V Voltage GPIO14 SPI, I2C, PWM, ADC, DAC

Note:

VDDIO：Some IO use this IO voltage, if input 1.8V, then these IO all use 1.8V voltage.

NC：means no connection. it is unconnected and useless.

UART_TX, UART_RX and GPIO_8 is also used for firmware download, must connect these three pins out. If VDDIO is 1.8V input, then UART_TX is 1.8V TTL, UART_RX is 3.3V TTL, GPIO8 is 3.3V TTL. If GPIO_8 default low, module boot from internal Flash, VDDIO must input 3.3V, otherwise, module will fail to bootup. Wi-Fi and BLE driver firmware need to programmed into module, see driver for more detail.

If GPIO_8 set to High(3.3V), module boot from external, module only support Wi-Fi function and no power save function.

1.2.2. Electrical Characteristics

Table3.　　Electrical Characteristics

Parameter	Condition	Min.	Typ.	Max.	Unit
Work temperature range		-40		85	°C
VDD		2.6	3.3	3.6	V
VDDIO		2.6/1.62	3.3/1.8	3.6/1.98	V
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-LPS170 Mechanical Size

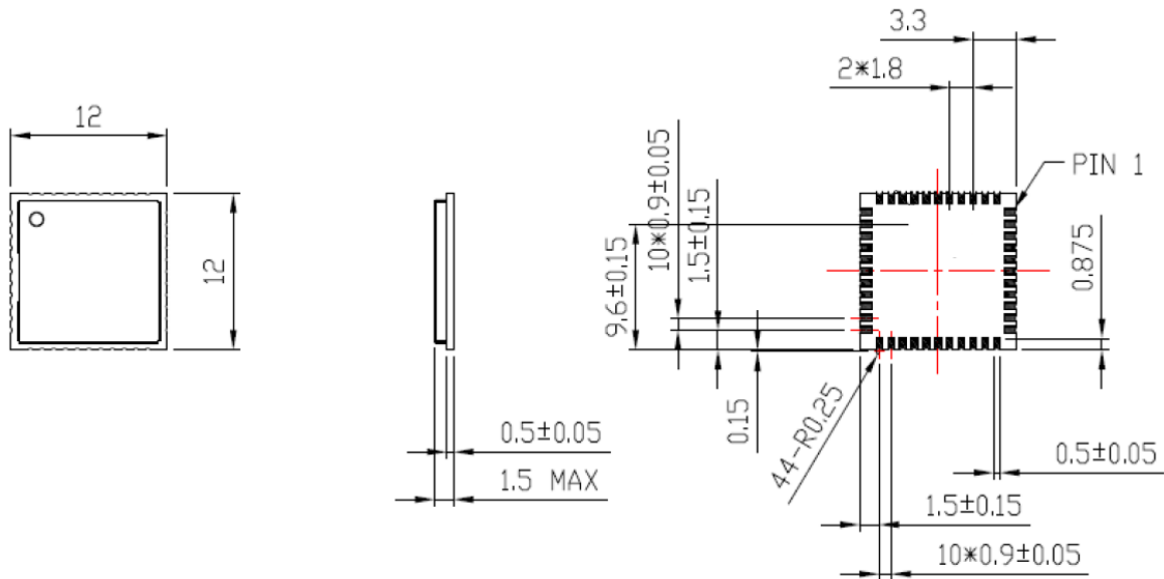HF-LPS170 modules physical size （Unit: mm） as follows:

Figure 4.   HF-LPS170 Mechanical Dimension

1.2.4. External Antenna

HF-LPS170 module supports external antenna(PAD) option for user dedicated application.

If user select external antenna, HF-LPS170 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.

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)
Antenna Type	Dipole antenna
Maximum Gain	3.0dBi

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

MODULE HINT :

1.The module is limited to OEM installation only.

2.The module is limited to installation in mobile or fixed application.

FCC Caution:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this 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.

FCC Radiation Exposure Statement:

This device complies with FCC radiation exposure limits set forth for an uncontrolled environment and it also complies with Part 15 of the FCC RF Rules.

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20cm is maintained between the antenna and users, and

2) The transmitter module may not be co-located with any other transmitter or antenna,

3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4Gband by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

As long as 3 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.

IMPORTANT NOTE:

In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labelling

The final end product must be labelled in a visible area with the following:

"Contains FCC ID: 2ACSVHF-LPS170".

Manual Information to the End User

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.

APPENDIX A: CONTACT INFORMATION

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Web: www.hi-flying.com
Service Online: 400-189-3108/18616078755
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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/

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