3161H-I

Wi-Fi Single-band 1X1 802.11b/g/n

IoT Module Datasheet

3161H-I Serial

Module Datasheet

Office: 6 Floor, Building U6, Junxiang U8 Park,
Hangcheng Avenue, Bao'an District,
Shenzhen City, CHINA
Factory: No.8, Litong Road, Liuyang Economic & Technical
Development Zone, Changsha, Hunan, CHINA
TEL: +86-755-2955-8186
Website: www.fn-link.com

Customer Approval : _____ Company

_____ Title

_____ Signature

_____ Date

_____ Fn-Link

Revision History

Version	Date	Revision Content	Draft	Approved
1.0	2020/02/24	Initial release	Lgp	Szs
2.0	2020/02/27	Update module picture Update carrier tape info	Lgp	Szs
3.0	2020/04/23	Update RF power spec Update ordering information Update module picture Update layout footprint Add RF connector info Add 3161-IL info	Lgp	Szs
4.0	2020/06/01	Add UART default configure info Add PCB antenna clearance area requirement Update Key Material List	Lgp	Szs

CONTENTS

1 Overview

1.1 Introduction

*3161H-I is a series of highly integrated IoT modules with low power 802.11b/g/n Wireless LAN (WLAN) communication controller. It combines a high-performance 32-bit MCU, WLAN (802.11 b/g/n) MAC, a 1T1R capable WLAN baseband, RF. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

3161H-I integrates internal memories for complete Wi-Fi protocol functions. The embedded memory configuration also provides simple application developments.

3161H-I is suitable for the field of low-power intelligent products of the Internet of things, such as smart home appliances, smart door locks, button, etc.

***Note: The series including 3161H-I and 3161H-IL, both have on board PCB version and external antenna version.**

1.2 Features

Wi-Fi General

- 802.11b/g/n compatible WLAN
- 72.2Mbps transmit and receive PHY rate using 20MHz bandwidth
- Compatible with 802.11n specification
- MAC support IEEE802.11 d/e/h/i/k/v/w
- Support STA and AP, support 6 clients when used as SAP

Wi-Fi Standards Supported

- 802.11b/g/n compatible WLAN
- 802.11e QoS Enhancement (WMM)
- Support WFA WPA/WPA2, WPS2.0

WLAN PHY Features

- 802.11n OFDM
- One Transmit and one Receive path(1T1R)
- Support standard 20MHz bandwidth and 5M/10M narrow band
- DSSS with DBPSK and DQPSK, CCK modulation with long and short preamble

MCU Features

- 32-bit MCU, max 160MHz
- SRAM 352KB
- ROM 288KB
- Flash 2MB

- Build-In 32.768KHz RTC (3161H-IL only)

Host Interface

- SDIO 2.0 1x
- SPI 1x
- I2C 1x
- UART 3x
- I2S 1x
- PWM 6x
- ADC 7x
- GPIO 13x

Note: Please refer to chapter 4.3 pin function table for detail host interface configures

The general block diagram of the module is shown as below

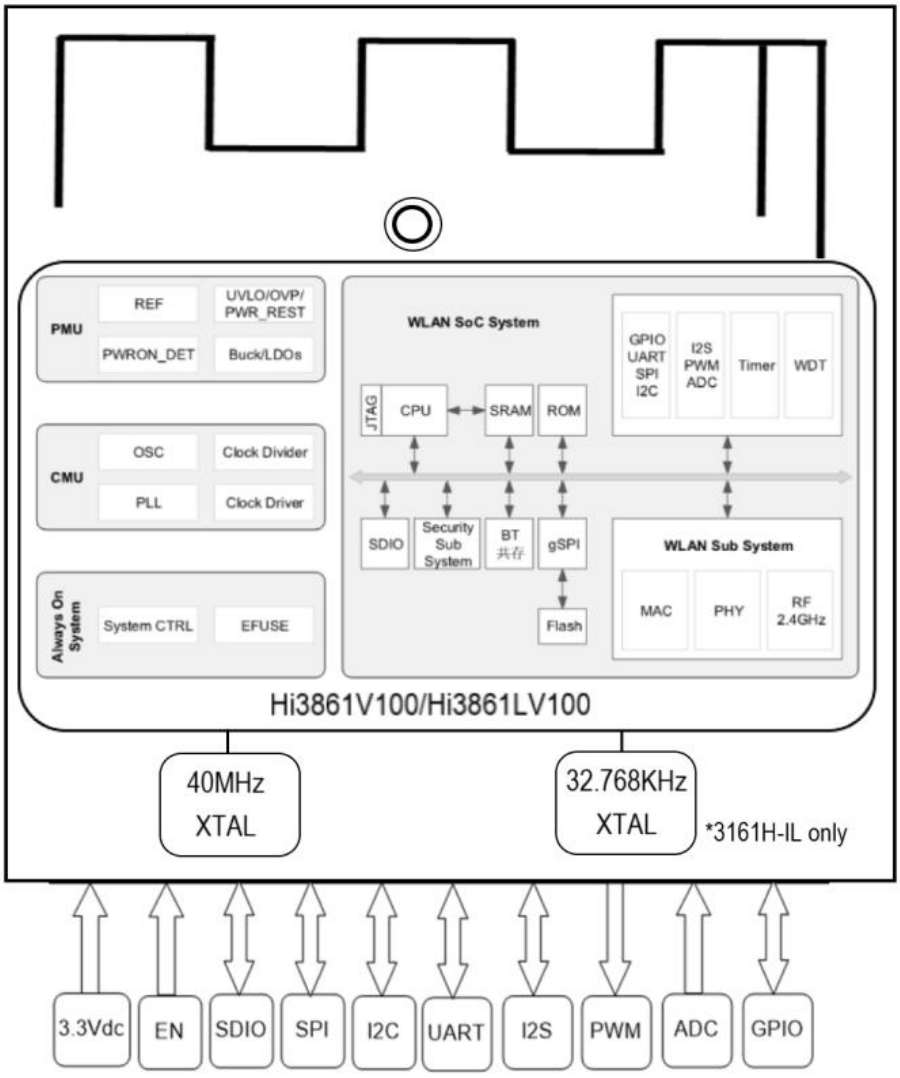


Figure 1-1 Block Diagram

1.3 General Specification

Model Name	3161H-I
Main Chipset	Hisilicon Hi3861V100(3161H-I) /Hi3861LV100(3161H-IL)
Host Interface	SDIO, SPI, I2C, UART, I2S, PWM, ADC, GPIO
Wi-Fi Standards	802.11b/g/n
Dimension	L x W x H: 18.00mm*20.00mm*2.45mm
RoHS	All hardware components are fully compliant with EU RoHS directive

1.4 Operating Conditions

Operating Voltage	3.3±10% Vdc
Operating Temperature	-40°C to +85°C
Storage Temperature	-40°C to +125°C

2 Wi-Fi RF Specification

2.1 2.4GHz RF Specification

Feature	**Description**			
WLAN Standard	IEEE 802.11 b/g/n Wi-Fi compliant			
Frequency Range	2.412～2.472GHz			
Number of Channels	**Wi-Fi:** USA/Canada: channel 1~11; Europe/China/Australia: channel 1~13			
Spectrum Mask	Min. b/g/n	Typ. b/g/n	Max. b/g/n	Unit b/g/n
1st side lobes(to fc ± 11MHZ)	-	-43/-30/-40	-	dBr
2st side lobes(to fc ± 22MHZ)	-	-52/-33/-58	-	dBr
Freq. Tolerance	-20/-20/-20	-	20/20/20	ppm

Test Items	**Typical Value**	**EVM**
Output Power	802.11b /11Mbps : 16dBm ± 1.5 dB	EVM ≤ -10dB
	802.11g /54Mbps : 16dBm ± 1.5 dB	EVM ≤ -25dB
	802.11n /MCS7 : 15dBm ± 1.5 dB	EVM ≤ -28dB

Test Items	**Test Value**	**Standard Value**
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -94 dBm	≤-83 dBm
	- 2Mbps PER @ -92 dBm	≤-80 dBm
	- 5.5Mbps PER @ -89 dBm	≤-79 dBm
	- 11Mbps PER @ -87 dBm	≤-76 dBm
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -89 dBm	≤-85 dBm
	- 9Mbps PER @ -88 dBm	≤-84 dBm
	- 12Mbps PER @ -87 dBm	≤-82 dBm
	- 18Mbps PER @ -86 dBm	≤-80 dBm
	- 24Mbps PER @ -84 dBm	≤-77 dBm
	- 36Mbps PER @ -80 dBm	≤-73 dBm
	- 48Mbps PER @ -77 dBm	≤-69 dBm
	- 54Mbps PER @ -75 dBm	≤-68 dBm
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -89 dBm	≤-85 dBm
	- MCS=1 PER @ -86 dBm	≤-82 dBm
	- MCS=2 PER @ -84 dBm	≤-80 dBm
	- MCS=3 PER @ -82 dBm	≤-77 dBm
	- MCS=4 PER @ -79 dBm	≤-73 dBm

	- MCS=5 PER @ -76 dBm	≤-69 dBm
	- MCS=6 PER @ -74 dBm	≤-68 dBm
	- MCS=7 PER @ -72 dBm	≤-67 dBm
Maximum Input Level	802.11b: -10 dBm	
	802.11g/n: -20 dBm	
Antenna Reference	PCB antenna with 0~2 dBi peak gain; External	

3 Power Consumption

Test mode	Current Value @3.3Vdc
TX	1M@20dBm 365mA
	11M@18dBm 321mA
	6M@19dBm 336mA
	54M@16dBm 260mA
	65M@15dBm 251mA
RX	47mA @3.3V
Power Up Idle	23.05mA
Start STA	48.1mA
Scan SSID	58.6mA
Throughput RX	78mA
Throughput TX	205mA
Deep Sleep	52uA
Ultra-Deep Sleep	3.5uA

4 Pin Assignments

4.1 Pin outline

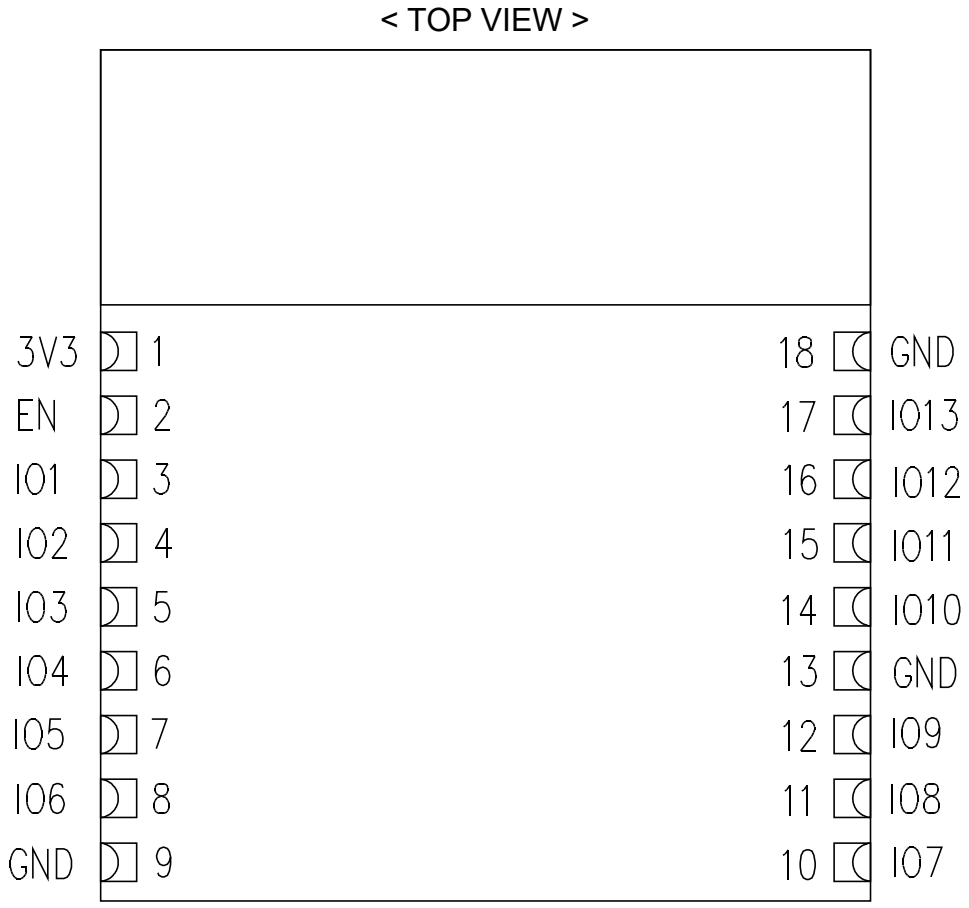


Figure 4-1 Pin Outline

4.2 Pin Definition

Pin#	Name	Type	Description	Voltage
1	3V3	P	3.3Vdc Power input	3.3V
2	EN	I	Enable chip. 1: Enable Chip, 0: Shut Down Chip. Default pull high	3.3V
3	IO1		GPIO Pin. The MUX Function can be referred to Pin Function Table	
4	IO2		GPIO Pin. The MUX Function can be referred to Pin Function Table	
5	IO3		GPIO Pin. The MUX Function can be referred to Pin Function Table	
6	IO4		GPIO Pin. The MUX Function can be referred to Pin Function Table	
7	IO5		GPIO Pin. The MUX Function can be referred to Pin Function Table	
8	IO6		GPIO Pin. The MUX Function can be referred to Pin Function Table	
9	GND		Ground connections	
10	IO7		GPIO Pin. The MUX Function can be referred to Pin Function Table	
11	IO8		GPIO Pin. The MUX Function can be referred to Pin Function Table	
12	IO9		GPIO Pin. The MUX Function can be referred to Pin Function Table	
13	GND		Ground connections	
14	IO10		GPIO Pin. The MUX Function can be referred to Pin Function Table	
15	IO11		GPIO Pin. The MUX Function can be referred to Pin Function Table	
16	IO12		GPIO Pin. The MUX Function can be referred to Pin Function Table	
17	IO13		GPIO Pin. The MUX Function can be referred to Pin Function Table	
18	GND		Ground connections	

P: POWER I:INPUT O: OUTPUT

4.3 Pin Function Group Table

Pin#	Name	Digital	UART0	UART1/2	SPI0	SDIO	ADC	PWM	I2S	I2C
3	IO1	GPIO_07		UART1_CTS	SPI0_RXD		ADC3	PWM0_OUT	I2S0_CLK	
4	IO2	GPIO_08		UART1_RTS	SPI0_TXD			PWM1_OUT	I2S0_WS	
5	IO3	GPIO_10		UART2_CTS	SPI0_CLK	SDIO_D3		PWM1_OUT	I2S0_TX	I2C0_SDA
6	IO4	GPIO_09		UART2_RTS	SPI0_TXD	SDIO_D2	ADC4	PWM0_OUT	I2S0_MCK	I2C0_SCL
7	IO5	GPIO_03	UART0_LOG_TXD							
8	IO6	GPIO_04	UART0_LOG_RXD				ADC1			
10	IO7	GPIO_13	UART0_LOG_TXD	UART2_RTS		SDIO_D0	ADC6	PWM4_OUT	I2S0_WS	I2C0_SDA
11	IO8	GPIO_12		UART2_RXD	SPI0_CS1	SDIO_CLK	ADC0	PWM3_OUT	I2S0_CLK	
12	IO9	GPIO_11		UART2_TXD	SPI0_RXD	SDIO_CMD	ADC5	PWM2_OUT	I2S0_RX	
14	IO10	GPIO_14	UART0_LOG_RXD	UART2_CTS		SDIO_D1		PWM5_OUT		I2C0_SCL
15	IO11	GPIO_06		UART1_TXD	SPI0_CLK			PWM3_OUT	I2S0_TX	
16	IO12	GPIO_05		UART1_RXD	SPI0_CS1		ADC2	PWM2_OUT	I2S0_MCK	
17	IO13	GPIO_02						PWM2_OUT		

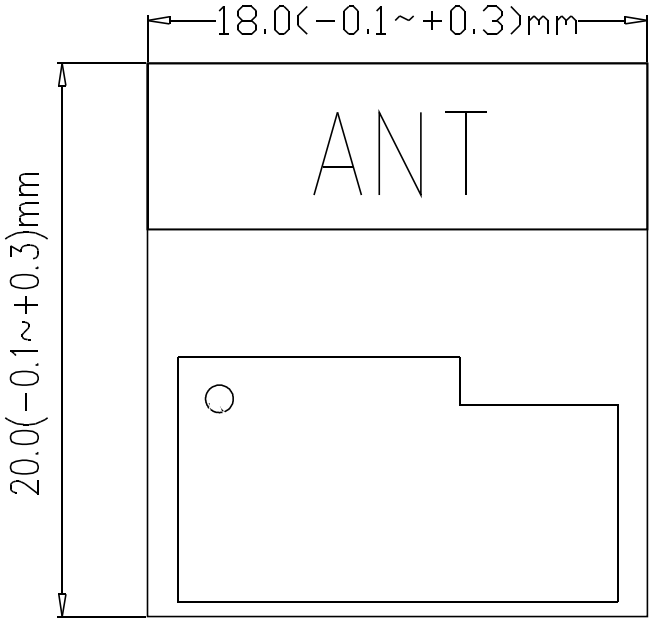
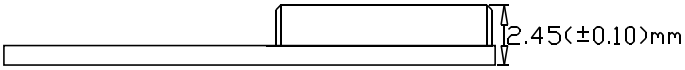
Note:

1, Pin7 is default configured as UART0_LOG_TXD, Pin8 is default configured as UART0_LOG_RXD, UART0 is used for firmware burning and print the booting log.

2, Pin11 is default configured as UART2_RXD, Pin12 is default configured as UART2_TXD, UART2 is used for AT communication, default baud rate is 115200.

5 Dimensions

5.1 Module Picture

<table>
<tr>
<td>L x W: 18 x 20 (+0.3/-0.1) mm
On board PCB antenna:
FG3161HIXX-00 FG3161HILX-00
 
 
External antenna IPEX connector:
FG3161HIXX-01 FG3161HILX-01
 
  </td>
<td>  </td>
</tr>
<tr>
<td>H: 2.45 (±0.10) mm</td>
<td>  </td>
</tr>
<tr>
<td>Weight</td>
<td>1.0(±0.1) g</td>
</tr>
</table>

5.2 Physical Dimensions

(unit: mm)

< TOP VIEW >

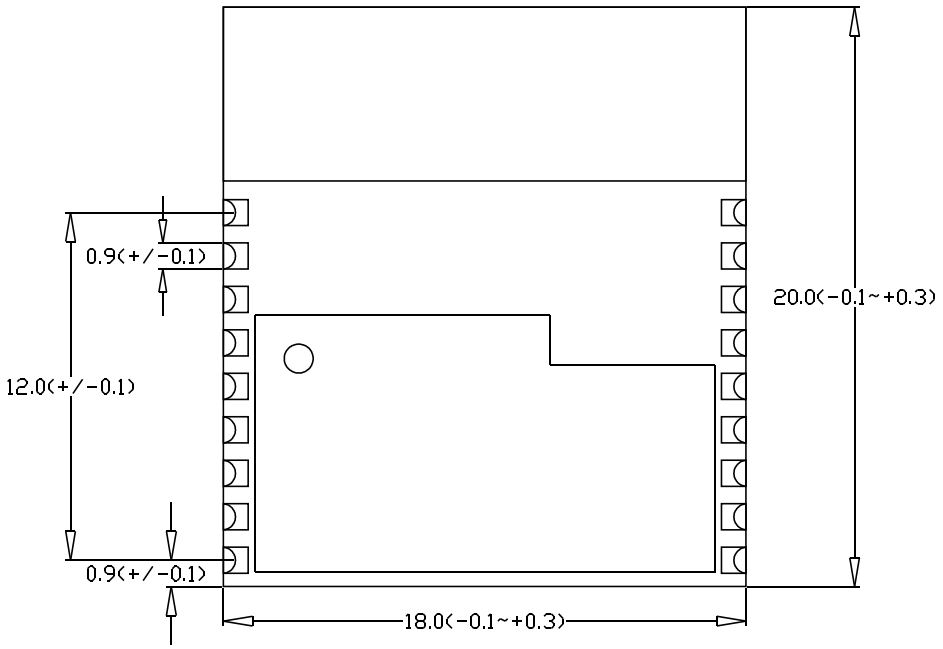


Figure 5-1 Physical Dimensions

5.3 Layout Recommendation

(unit: mm)

< TOP VIEW >

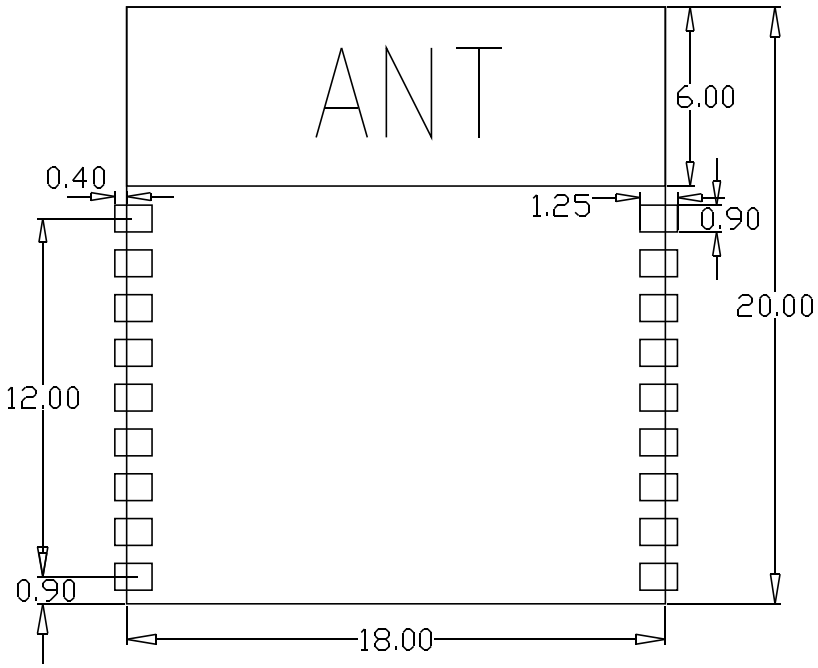


Figure 5-2 Layout recommendation

5.4 RF connector for external antenna

Unite:mm

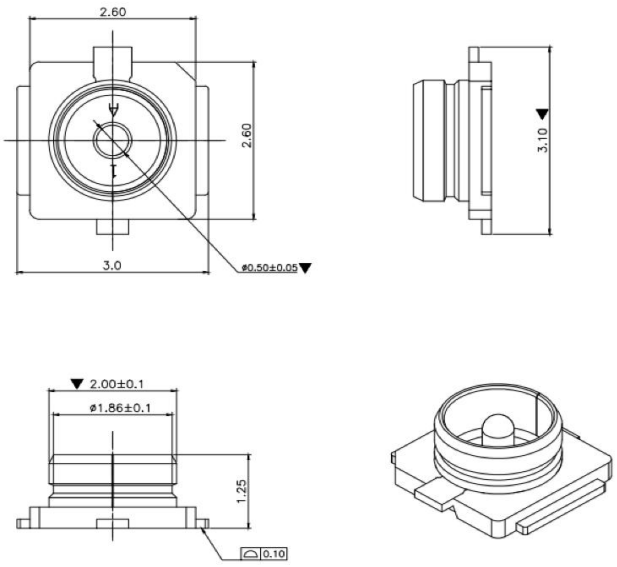


Figure 5-3 RF connector for external antenna

6 Reference Design

6.1 Schematic reference design

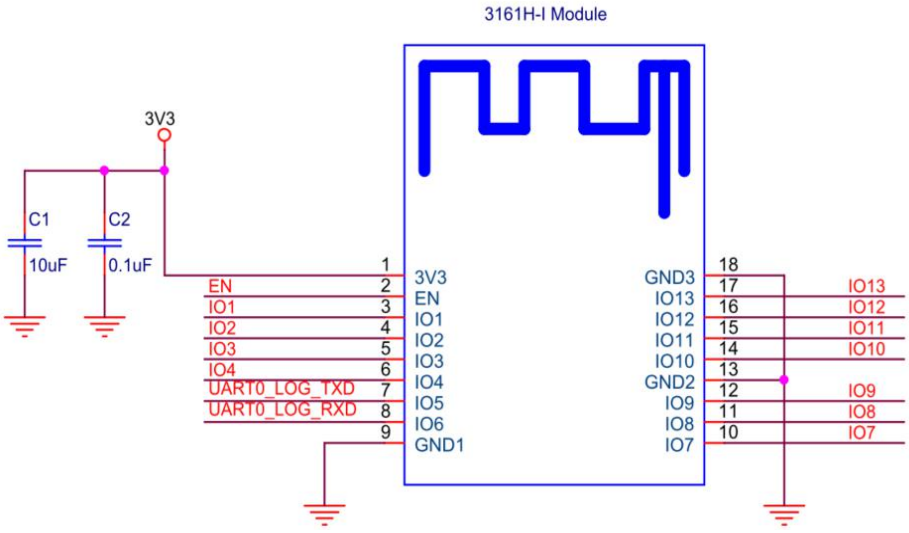


Figure 6-1 Reference Schematic

Note:

Please place C1,C2 close to PIN 1.

It is recommended have power supply current greater than 500mA for the module.

6.2 Antenna clearance area requirements

When using PCB antenna on Wi-Fi module, make sure the distance between PCB on motherboard and other metal devices is at least 16mm.The shaded areas in the figure below need to be marked away from metal devices, sensors, interference sources, and other materials that may interfere with the signal.

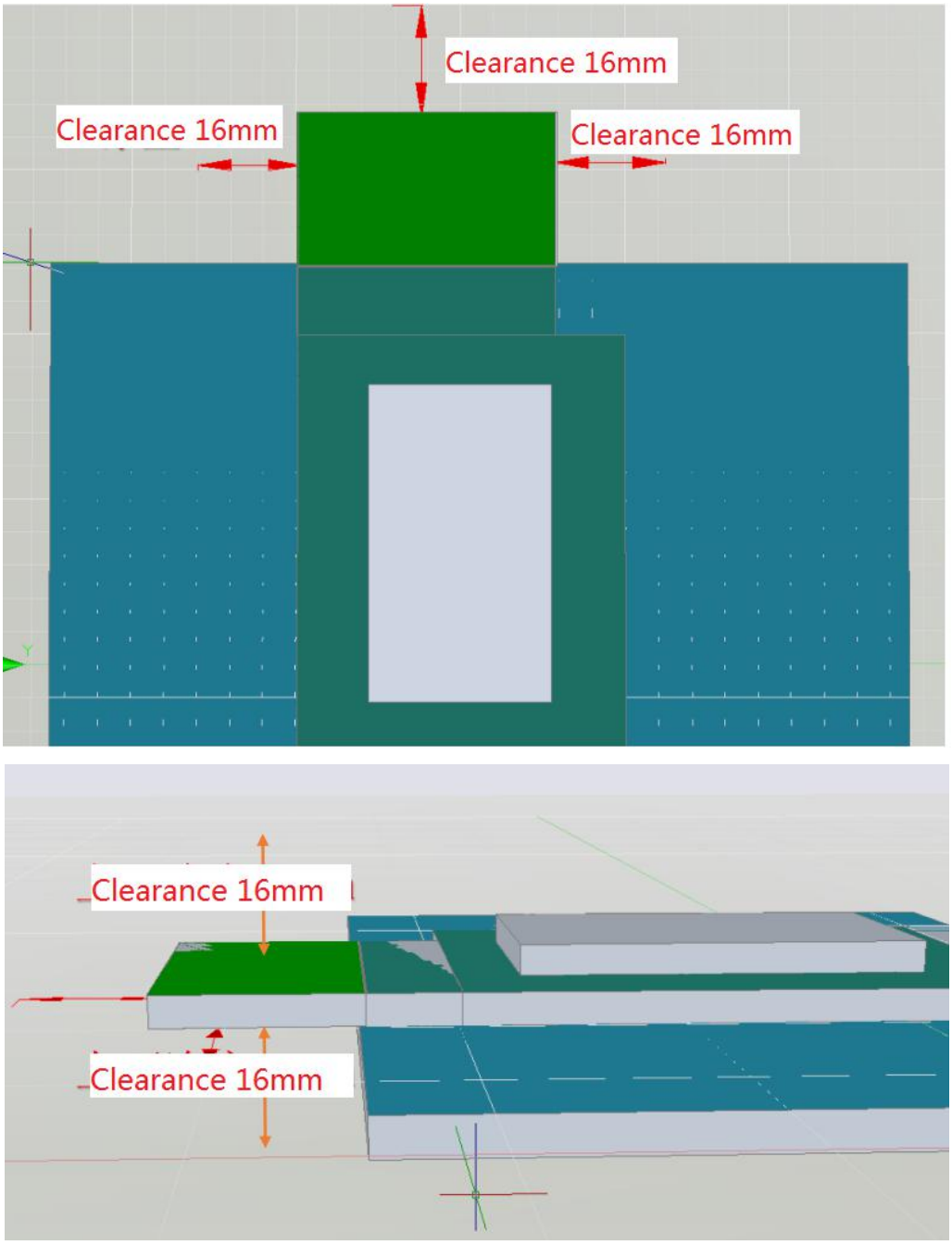


Figure 6-2 Antenna clearance reference

7 Ordering Information

Part NO.	Description
FG3161HIXX-00	Hi3861V100, 802.11b/g/n, 1T1R, UART/GPIO/I2C/PWM/SPI/SDIO/I2S, PCB ANT, 18*20mm, PCB V2.0
FG3161HIXX-01	Hi3861V100, 802.11b/g/n, 1T1R, UART/GPIO/I2C/PWM/SPI/SDIO/I2S, IPEX RF CONNECTOR, 18*20mm, PCB V2.0
FG3161HILX-00	Hi3861LV100, 802.11b/g/n, 1T1R, LOW POWER, UART/GPIO/I2C/PWM/SPI/SDIO/I2S, PCB ANT, 18*20mm, PCB V2.0
FG3161HILX-01	Hi3861LV100, 802.11b/g/n, 1T1R, LOW POWER, UART/GPIO/I2C/PWM/SPI/SDIO/I2S, IPEX RF CONNECTOR, 18*20mm, PCB V2.0

8 The Key Material List

Item	Part Name	Description	Manufacturer
1	Crystal	3225 40MHz 10ppm	ECEC, TKD, Hosonic, JWT, TXC
*2	Chipset	Hi3861RNIV100 or Hi3861LRNIV100	Hisilicon
3	PCB	FR4, 2 LAYER, GREEN	XY-PCB, GDKX, Sunlord, SLPCB

***Note: For 3161H-I, the chipset is Hi3861RNIV100**

For 3161H-IL, the chipset is Hi3861LRNIV100

9 Recommended Reflow Profile

Refer to IPC/JEDEC standard.

Peak Temperature: <250°C

Number of Times: ≤2 times

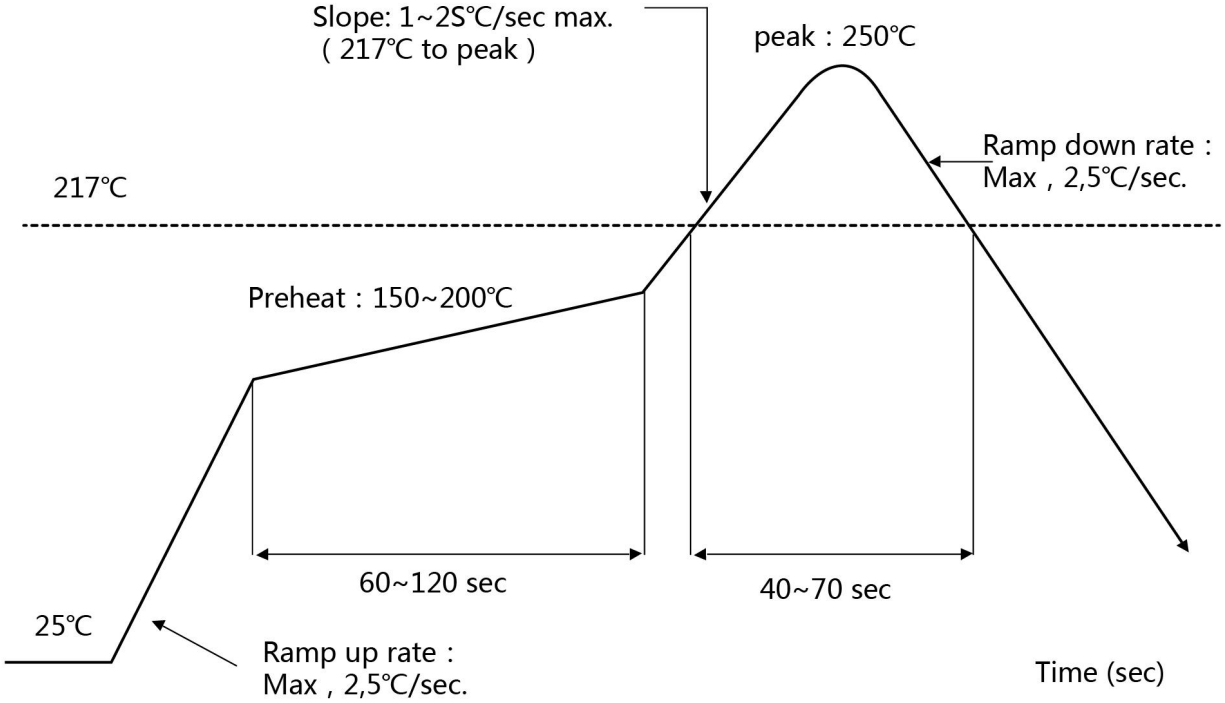


Figure 9-1 Reference reflow profile

10 Package Information

10.1 Reel

A roll of 800pcs

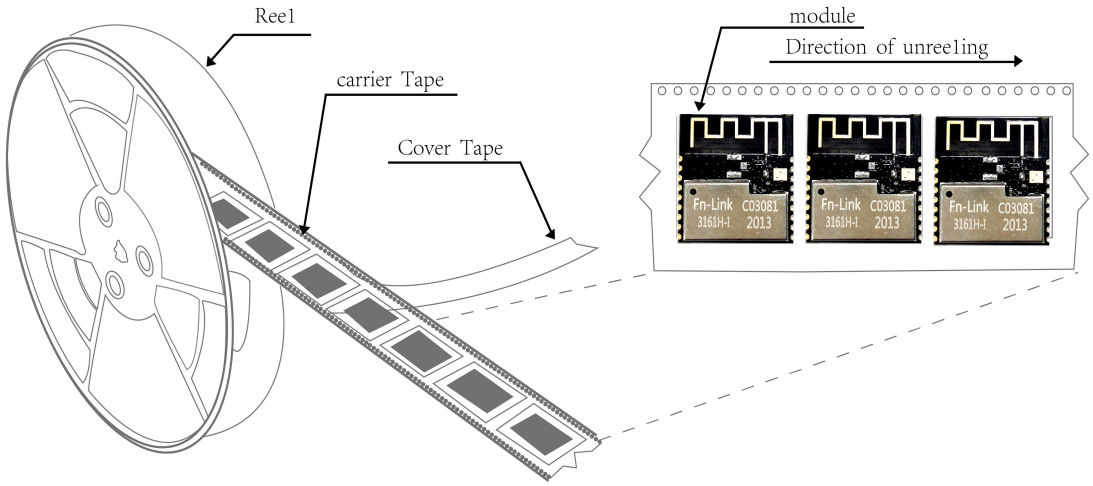


Figure 10-1 Package reel Reference

10.2 Carrier Tape Detail

ITEM	W	A0	B0	D	E	F	F1	K0	P0	P2	P	T
DIM	32	18.40	20.30	1.5	1.75	14.20	28.4	3.50	4.0	2.0	24.0	0.30
TOLE	+0.3 -0.3	±0.15	±0.15	+0.1 -0.0	±0.1	±0.15	±0.10	±0.10	±0.1	±0.15	±0.1	±0.05

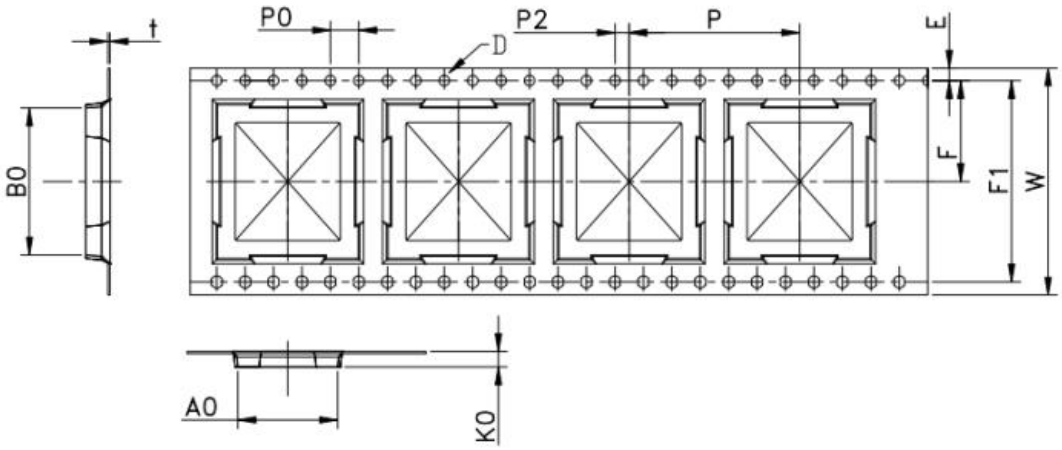


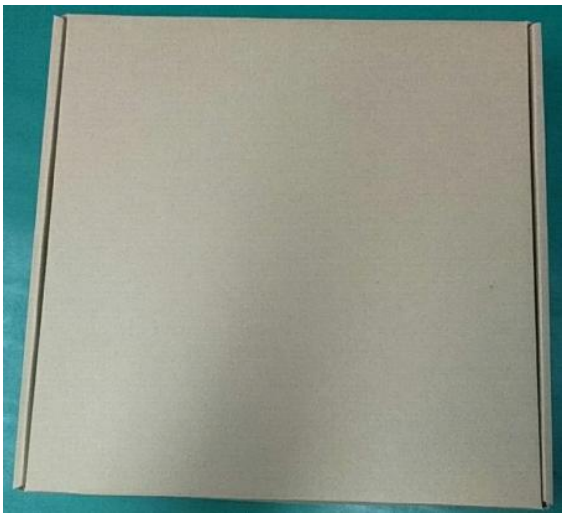
Figure 10-2 Carrier tape detail

10.3 Packaging Detail

the take-up package

Using self-adhesive tape
Size of black tape:44mm*20.2m　　the cover tape :37.5mm*20.2m
Color of plastic disc: blue
A roll of 800pcs

NY bag size:415mm*450mm



size ： 350X350X35mm

The packing case size: 360X210X370mm

10.4 Moisture Sensitivity

The Modules is a Moisture Sensitive Device level 3, in according with standard IPC/JEDEC J-STD-020, take care all the relatives requirements for using this kind of components.

Moreover, the customer has to take care of the following conditions:

a) Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)

b) Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5

c) The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition

d) “IPC/JEDEC J-STD-033A paragraph 5.2” is respected

e) Baking is required if conditions b) or c) are not respected

f) Baking is required if the humidity indicator inside the bag indicates 10% RH or more