

**PRODUCT SPECIFICATION**

**6131E-U**

**Wi-Fi Dual-band 1x1 802.11a/b/g/n**

**Module Datasheet**

Version:v5.2



## 6131E-U Module Datasheet

Ordering Information	Part NO.	Description
	FG6131EUXX-00	RTL8731BU/802.11a/b/g/n/1T1R, 12mm*13mm/USB (Rf is IPEX)
	FG6131EUXX-01	RTL8731BU/802.11a/b/g/n/1T1R, 12mm*13mm/USB (RF is stamp hole)

Customer: \_\_\_\_\_

Customer P/N: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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## 1. General Description

### 1.1 Introduction

FN-Link Technology would like to announce a low-cost and low-power consumption module which has all of the Wi-Fi functionalities. The highly integrated module makes the possibilities of web browsing, VoIP, video stream applications.

With seamless roaming capabilities and advanced security, also could interact with different vendors' 802.11a/b/g/n 1x1 Access Points in the wireless LAN.

The wireless module complies with IEEE 802.11 a/b/g/n standard and it can achieve up to a speed of 150Mbps when using 40MHz bandwidth. The integrated module provides USB2.0 interface for Wi-Fi.

### 1.2 Description

Model Name	6131E-U
Product Description	Support Wi-Fi functionalities
Dimension	L x W x H: 12.2 x 13.0 x 2.35 mm
Wi-Fi Interface	USB 2.0
OS supported	Android /Linux/ Win CE /iOS /XP/WIN7/WIN10
Operating temperature	-20°C to 70°C
Storage temperature	-40°C to 85°C

## 2. Features

### General

- Highly integrated wireless local area network (WLAN) system-on-chip (SOC) for 2.4G(802.11b/g/n)/5G (802.11a/n) WLAN applications
- Supports 20/40MHz at 2.4GHz and 5GHz
- OFDM with BPSK, QPSK, 16QAM, 64QAM modulation, Coding Rate: 1/2, 2/3, 3/4, and 5/6
- Maximum data rate 54Mbps in 802.11a and 802.11g, and 150Mbps in 802.11n
- Small SMT package
- 802.11i (WPA, WPA2, WPA3). Open, shared key, and pair-wise key authentication services

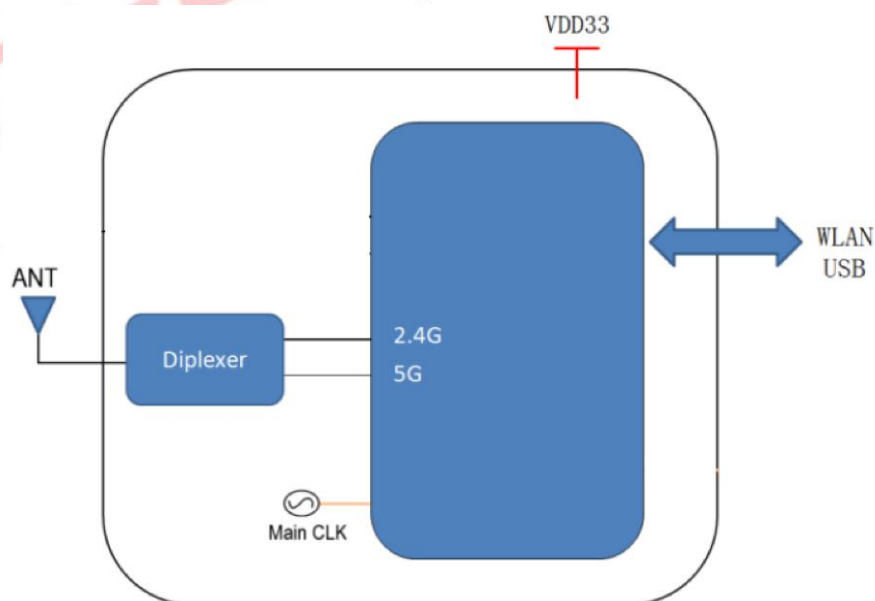
### PHY Features

- Max 72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth
- Max 150Mbps receive PHY rate and 150Mbps transmit PHY rate using 40MHz bandwidth

### Host Interface

- Supports USB interface for WLAN

## 3. Block Diagram



## 4. General Specification

### 4.1 WI-FI 2.4GHz Specification

Feature	Description		
WLAN Standard	IEEE 802.11 b/g/n 1x1 Wi-Fi compliant		
Frequency Range	2.400 GHz ~ 2.4835 GHz (2.4 GHz ISM Band)		
Number of Channels	2.4GHz: Ch1 ~ Ch14		
Test Items	Typical Value		EVM
Output Power	802.11b /11Mbps	: 21dBm ± 2 dB	EVM ≤ -9dB
	802.11g /54Mbps	: 19dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7	: 18dBm ± 2 dB	EVM ≤ -28dB
Spectrum Mask	Meet with IEEE standard		
Freq. Tolerance	± 20ppm		
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps	PER @ -92 dBm	≤-85
	- 11Mbps	PER @ -82 dBm	≤-76
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps	PER @ -89 dBm	≤-82
	- 54Mbps	PER @ -71 dBm	≤-65
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0	PER @ -89 dBm	≤-82
	- MCS=7	PER @ -67 dBm	≤-64
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0,	PER @ -87 dBm	≤-79
	- MCS=7,	PER @ -65 dBm	≤-61
Maximum Input Level	802.11b : -10 dBm		
	802.11g/n : -20 dBm		
Antenna Reference	Small antennas with 0~2 dBi peak gain		

Note: Other data rates transmit power are controlled by Power-by-Rate function of the driver.

### 4.2 Wi-Fi 5GHz RF Specification

Feature	Description		
WLAN Standard	IEEE 802.11a/n 1x1, Wi-Fi compliant		
Frequency Range	5.150 GHz ~ 5.850 GHz (5.0 GHz Band)		
Number of Channels	5.0GHz: Please see the table1		
Test Items	Typical Value		EVM
Output Power	802.11a /54Mbps:	17 dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7:	16 dBm ± 2 dB	EVM ≤ -28dB
Test Items	Test Value		Standard Value

Receive Sensitivity (11a, 20MHz) @10% PER	- 6Mbps	≤ -89 dBm	≤ -82 dBm
	- 54Mbps	≤ -71 dBm	≤ -65 dBm
Receive Sensitivity (11n, 20MHz) @10% PER	- MCS=0	≤ -89 dBm	≤ -82 dBm
	- MCS=7	≤ -67 dBm	≤ -64 dBm
Receive Sensitivity (11n, 40MHz) @10% PER	- MCS=0	≤ -87 dBm	≤ -79 dBm
	- MCS=7	≤ -65 dBm	≤ -61 dBm
Maximum Input Level	802.11a/n: -30 dBm		
Antenna Reference	Small antennas with 0~2 dBi peak gain		

Note: Other data rates transmit power are controlled by Power-by-Rate function of the driver.

**15GHz Channel table**

Band (GHz)	Operating Channel Number	Channel Center Frequency (MHz)
5.15GHz~5.25GHz	36	5180
	40	5200
	44	5220
	48	5240
5.25GHz~5.35GHz	52	5260
	56	5280
	60	5300
	64	5320
5.5GHz~5.7GHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
5.725GHz~5.825GHz	140	5700
	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

**5. ID setting information**

WI-FI

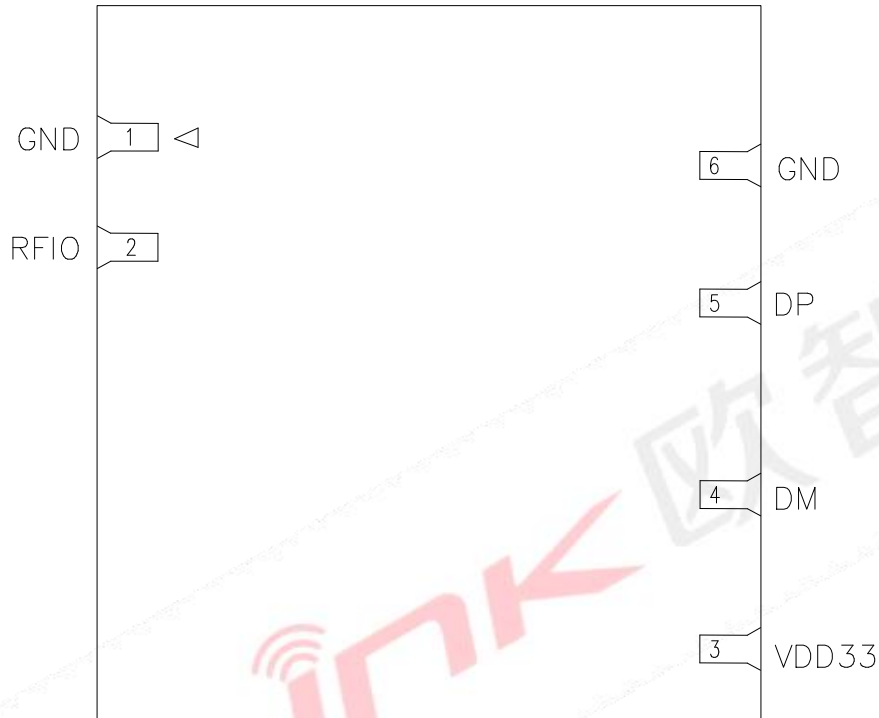
Vendor ID	TBD
Product ID	TBD



## 6. Pin Definition

### 6.1 Pin Outline

< TOP VIEW >



### 6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	GND	—	Ground connections	
2	RFIO	I/O	RF I/O, dual band Wi-Fi	
3	VDD33	P	Main power input 3.3V	3.3V
4	USB_DM	I/O	USB2.0 differential pair D-	
5	USB_DP	I/O	USB2.0 differential pair D+	
6	GND	—	Ground connections	

P:POWER I:INPUT O:OUTPUT

## 7. Electrical Specifications

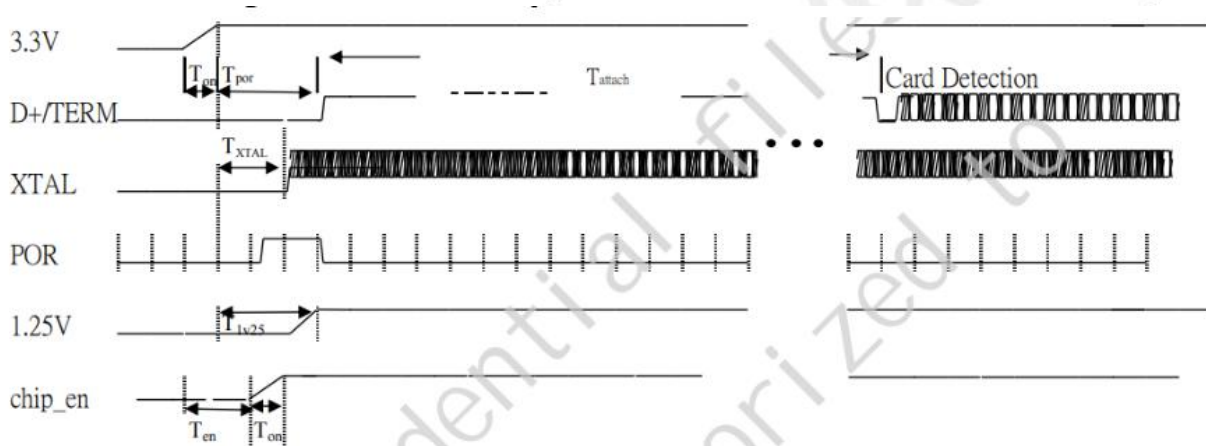
### 7.1 Power Supply DC Characteristics

The digital IO supports VDD33 or VDD18 application.

	MIN	TYP	MAX	Unit
Operating Temperature	-20	25	70	deg.C
VCC33	3.0	3.3	3.6	V

### 7.2 Interface Circuit time series

#### 7.2.1 USB Bus Timing during Power On Sequence



**Ton:** The main power ramp up duration

**Ten:** Interval between the rising point of 3.3V and chip\_en

**Tgate:** Interval of 3.3V to be gated when chip\_en voltage level < 2V

**Tattach:** USB attach state. The duration from resistor attached to USB host starting card detection procedure

**Txtal:** XTAL starts

#### The power on flow Description:

The power on flow description : After main 3.3V ramp up, the internal power on reset is released by power ready detection circuit and the power management unit will be enabled. The power management unit enables the internal regulator and clock circuits. The power management unit also enables the USB circuits.

USB analog circuits attach resistors to indicate the insertion of the USB device.

The typical timing range:

	Unit	Min	Typical	Max
T <sub>on</sub>	ms	0.2	1.5	5
T <sub>por</sub>	ms	--	2	10
T <sub>xtal</sub>	ms	--	1.5	8
T <sub>attach</sub>	ms	100	250	-
T <sub>lv25</sub>	ms	0	0	5

### 7.2.2 Power off by 3.3V power sequence

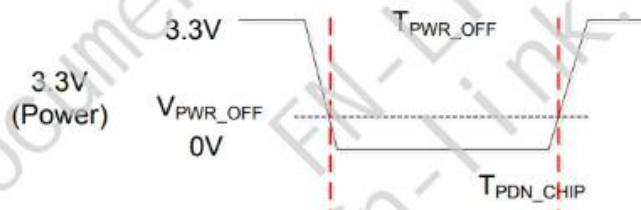


Figure 6. RTL8731BU-CG Power Off by 3.3V power Sequence

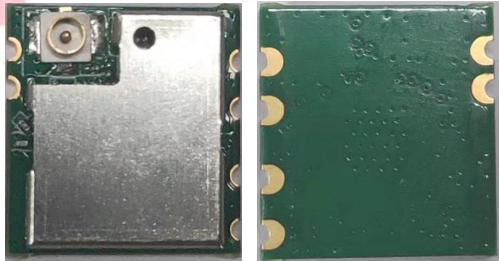
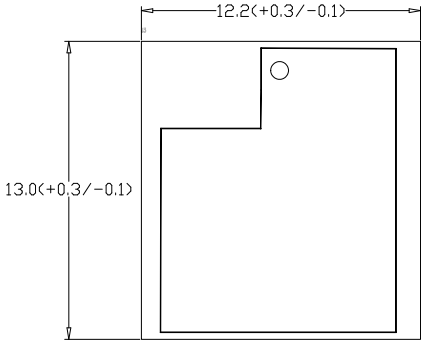
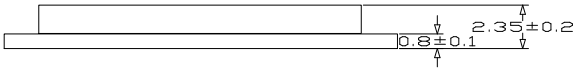
Table 14. RTL8731BU-CG Power Off by 3.3V power Timing Parameters

	Min	Typical	Max	Unit	Description
T <sub>PWR_OFF</sub>	100	200	--	ms	3.3V power off time
V <sub>PWR_OFF</sub>	--	--	0.7	V	3.3V power off voltage

When 3.3V power off and on afterward, the voltage of 3.3V power must keep lower than V<sub>PWR\_OFF</sub>, and the 3.3V power keeping off duration must be more than T<sub>PWR\_OFF</sub>

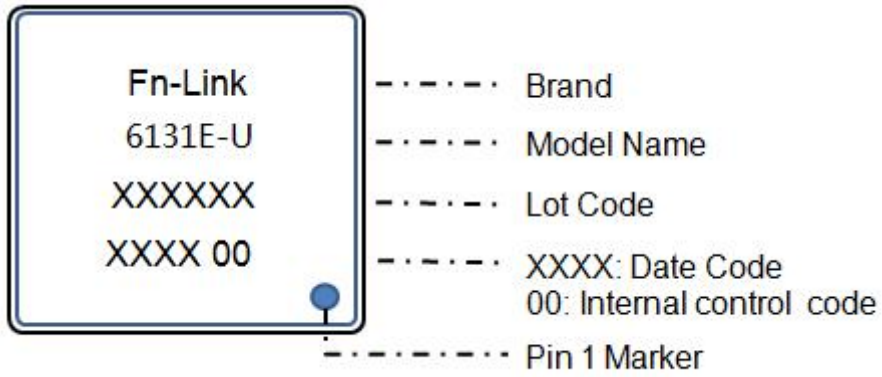
## 8. Size reference

### 8.1 Module Picture

<p><b>L x W : 12.2 x 13.0 (+0.3/-0.1) mm</b></p> 	
<p>H: 2.35 (±0.2) mm</p>	
<p><b>Weight</b></p>	<p><b>0.65g</b></p>

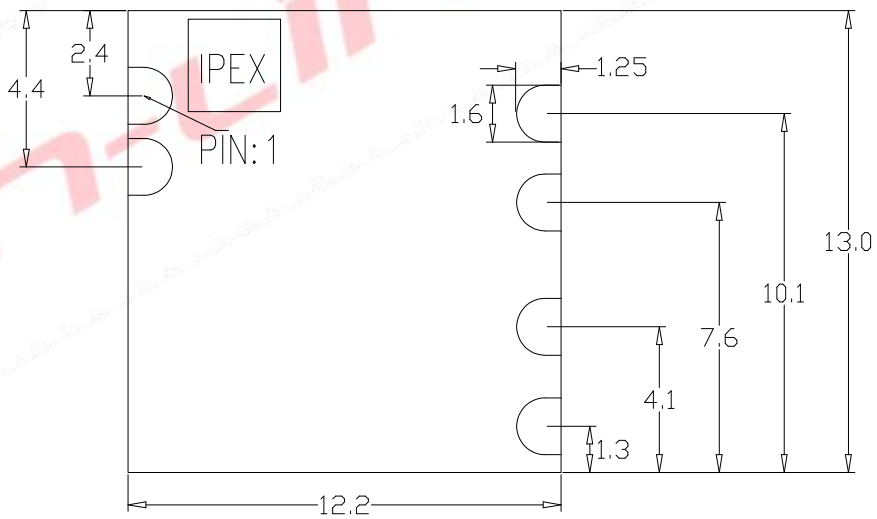
### 8.2 Marking Description

< TOP VIEW >

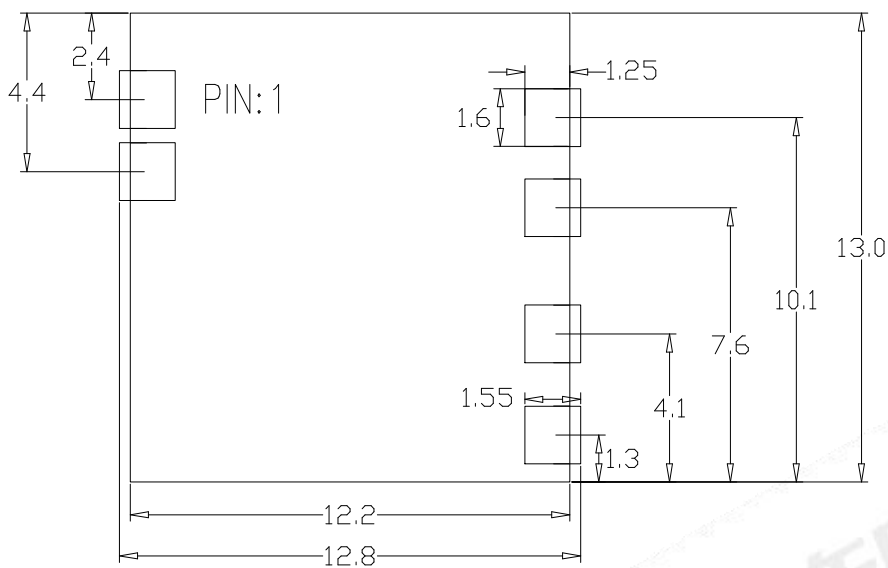


### 8.3 Physical Dimensions

<TOP View>



### 8.4 Layout Recommendation



### 9. The Key Material List

Item	Part Name	Description	Manufacturer
1	Inductor	2016,2.2uH,2x1.6x1mm	Cenker, Sunlord, Ceaiya
2	Crystal	2016, 40MHz,12pF	Murata, ECEC,TKD, Hosonic, JWT, TXC
3	Chipset	RTL8731BU	Realtek
4	PCB	FR4, 4 LAYER, GREEN	XY-PCB, GDKX, Sunlord, SLPCB

## 10. Reference Design

### 10.1 Reference Design

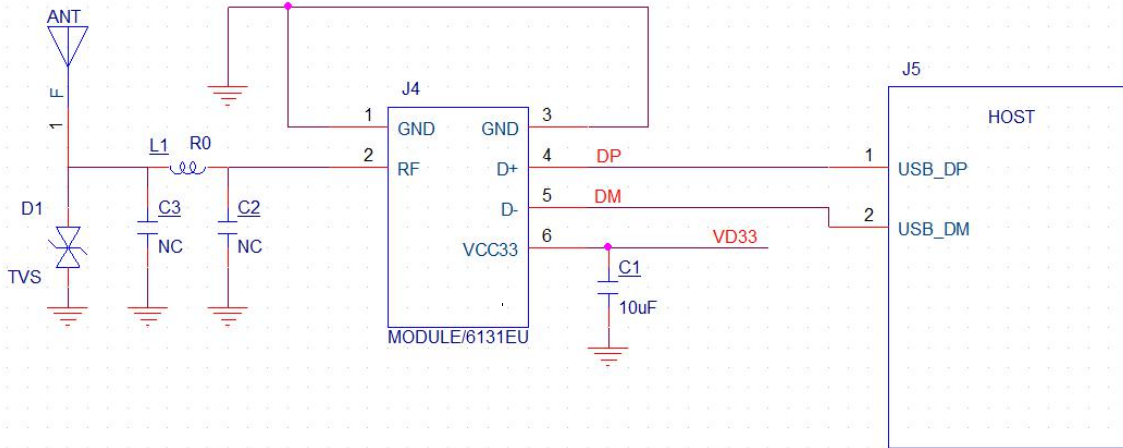
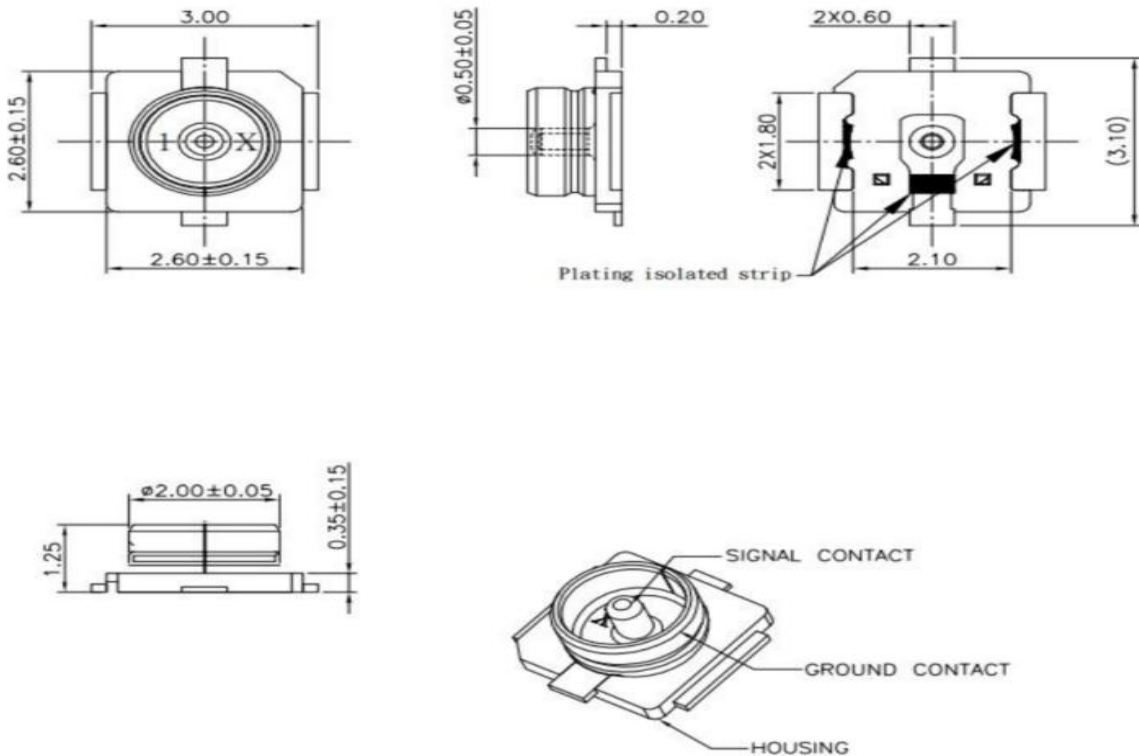


Figure 6-1 Reference Schematic

Note: Module requires independent power supply , supply capacity  $\geq 1200\text{mA}$  and ripple less than  $100\text{mV}$ ; Do not share power with amplifier, infrared device, camera, etc.

USB differential trace, please keep  $90\ \Omega$ .

### 10.2 RF Connector



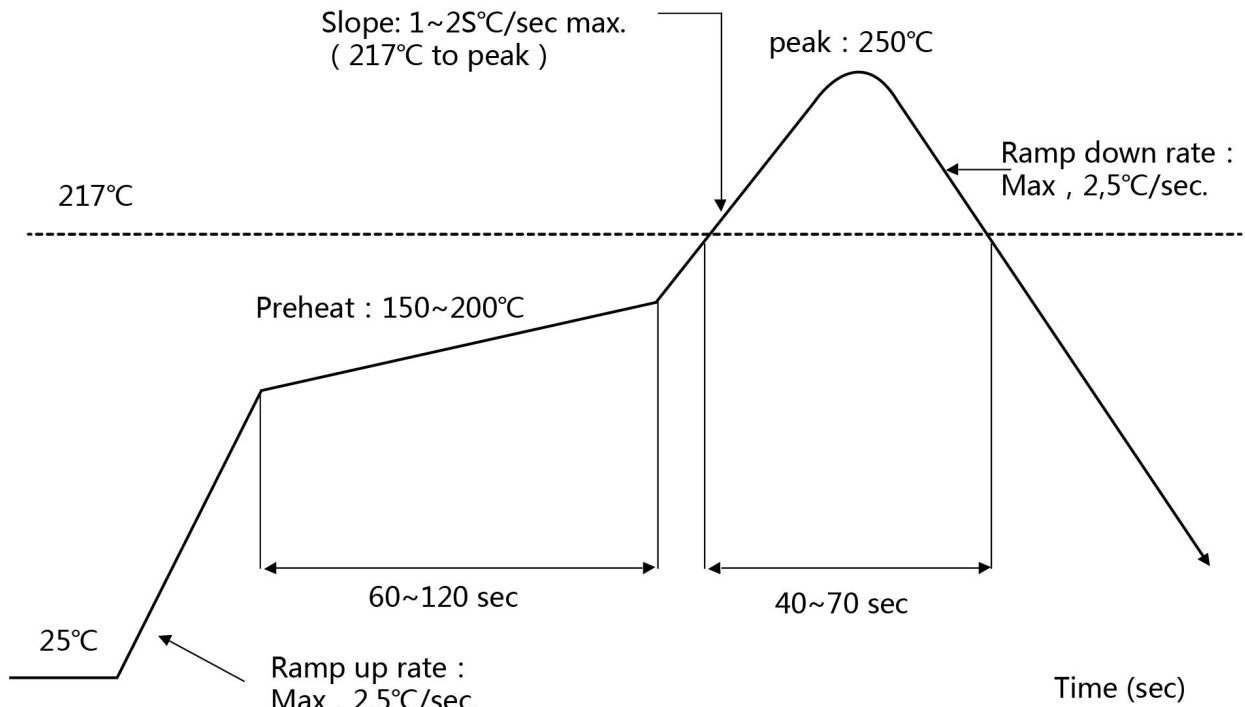
Note: The RF connector is an IPEX I connector.

### 11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times



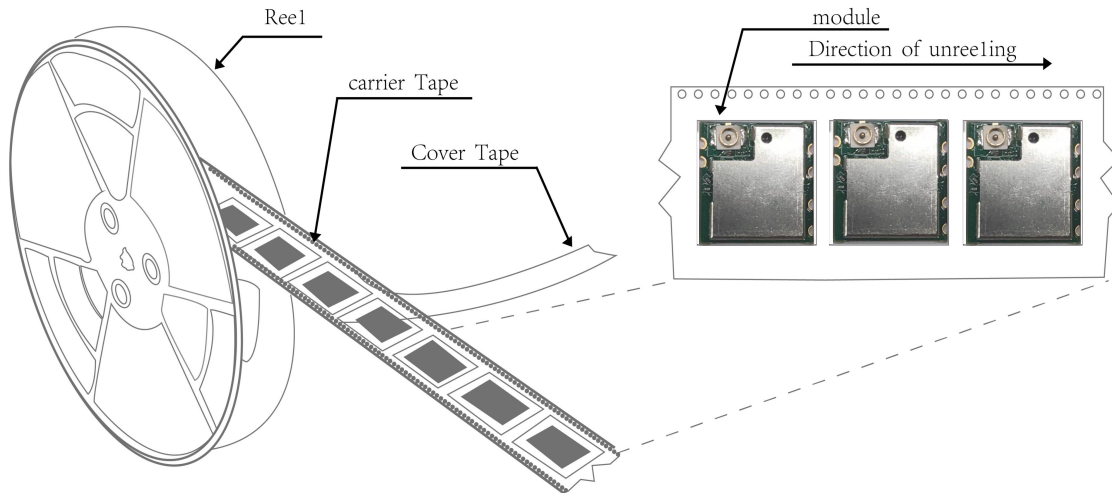
### 12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

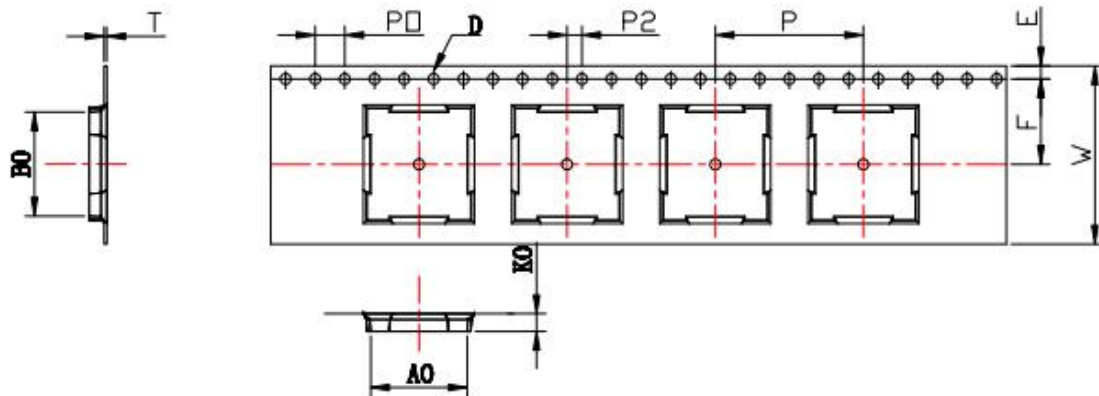
### 13. Package

#### 13.1 Reel

A roll of 1500pcs



ITEM	W	A0	B0	D	F	E	K0	P0	P2	P	T
DIM	24	12.50	13.50	1.50	11.5	1.75	2.40	4.0	2.0	20.0	0.30
TOLE	$\begin{matrix} +0.3 \\ -0.3 \end{matrix}$	$\pm 0.15$	$\pm 0.15$	$\begin{matrix} +0.1 \\ -0.0 \end{matrix}$	$\begin{matrix} +0.1 \\ -0.1 \end{matrix}$	$\pm 0.1$	$\pm 0.10$	$\pm 0.1$	$\pm 0.1$	$\pm 0.1$	$\pm 0.05$



#### 13.2 Packaging Detail

the take-up package





Using self-adhesive tape  
Color of plastic disc: blue



NY bag size:TBD



size : 350\*350\*35mm



The packing case size:360\*370\*210

## 14. 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 <math><40^{\circ}\text{C}</math> and <math><90\%</math> relative humidity (RH)
- b) Environmental condition during the production: - 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
- d) Baking is required if conditions b) or c) are not respected
- e) Baking is required if the humidity indicator inside the bag indicates 10% RH or more

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