

PRODUCT SPECIFICATION

6131E-U

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

USB Module Datasheet

Version:v1.5

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

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6131E-U Module Datasheet

Ordering Information	Part NO.	Description
	FG6131EUX-02	RTL8731BU-CG/802.11a/b/g/n/ 1T1R, /12.3x13mm/ USB,(Rf is IPEX)
	FG6131EUX-03	RTL8731BU-CG/802.11a/b/g/n/ 1T1R, /12.3x13mm/ USB,(no IPEX)

Target power:

2.4G: 20/19/18

5G: 17/16



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Revision History

[illegible]

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, 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	0°C to 70°C
Storage temperature	-55°C to 125°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
- Complete 802.11n solution for both 2.4GHz and 5GHz band
- 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
- Backward compatible with 802.11b/g devices while operating in 802.11n mode
- 72.2Mbps receive PHY rate and 72.2Mbps transmit PHY rate using 20MHz bandwidth
- 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services

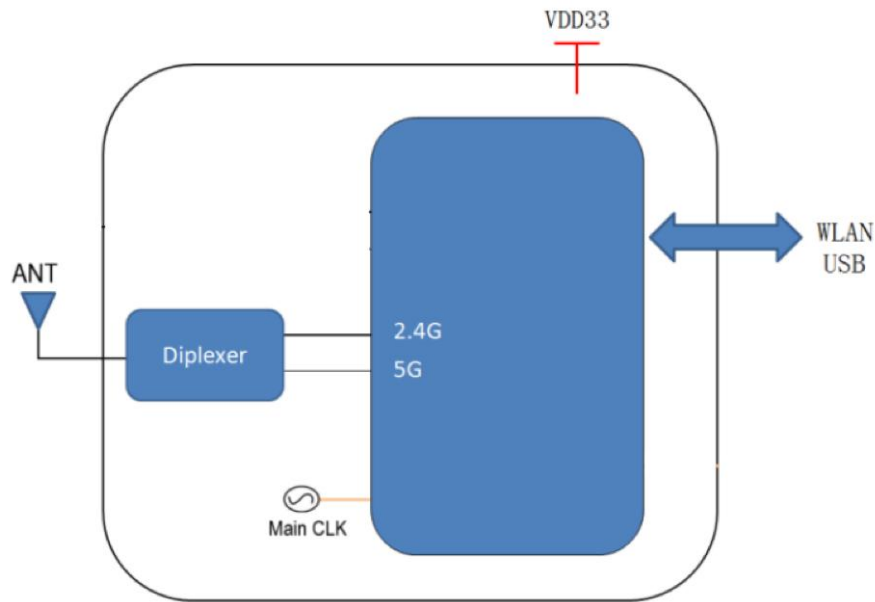
PHY Features

- 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	20dBm ± 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
Maximum Input Level	802.11b : -10 dBm		
	802.11g/n : -20 dBm		

Antenna Reference	Small antennas with 0~2 dBi peak gain
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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 $\pm$ 2 dB	EVM $\leq$ -25dB
	802.11n /MCS7: 16 dBm $\pm$ 2 dB	EVM $\leq$ -28dB
Test Items	Test Value	Standard Value
Receive Sensitivity (11a, 20MHz) @10% PER	- 6Mbps $\leq$ -89 dBm	$\leq$ -82 dBm
	- 54Mbps $\leq$ -71 dBm	$\leq$ -65 dBm
Receive Sensitivity (11n, 20MHz) @10% PER	- MCS=0 $\leq$ -89 dBm	$\leq$ -82 dBm
	- MCS=7 $\leq$ -67 dBm	$\leq$ -64 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.

5GHz Channel table

Band (GHz)	Operating Channel Number	Channel Center Frequency (MHz)
5150MHz~5250MHz	36	5180
	40	5200
	44	5220
	48	5240
5250MHz~5350MHz	52	5260
	56	5280
	60	5300
	64	5320
5470MHz~5725MHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660

5725MHz~5850MHz	136	5680
	140	5700
	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

5. ID setting information

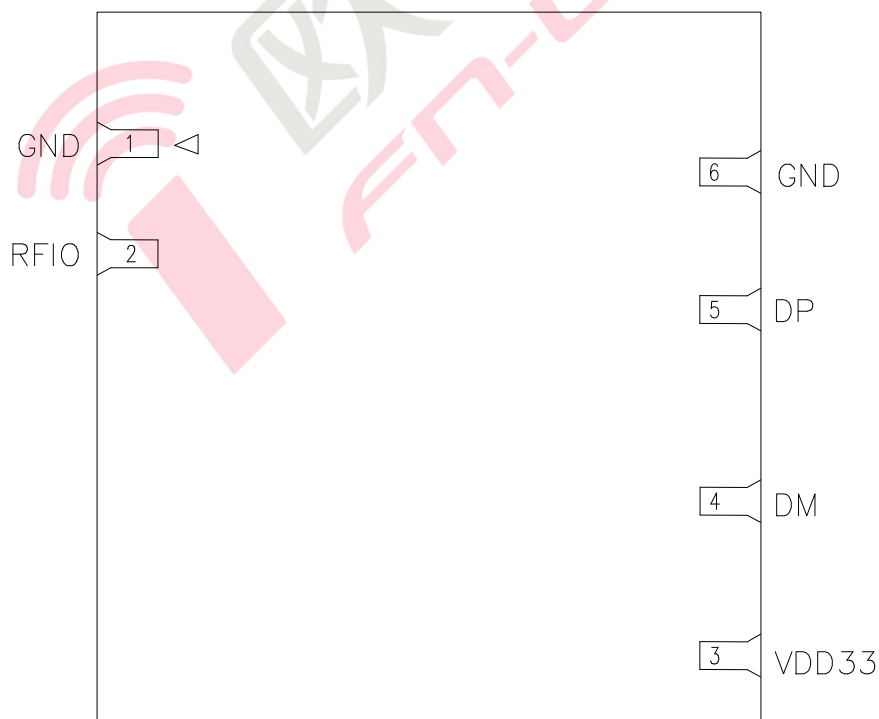
WI-FI

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

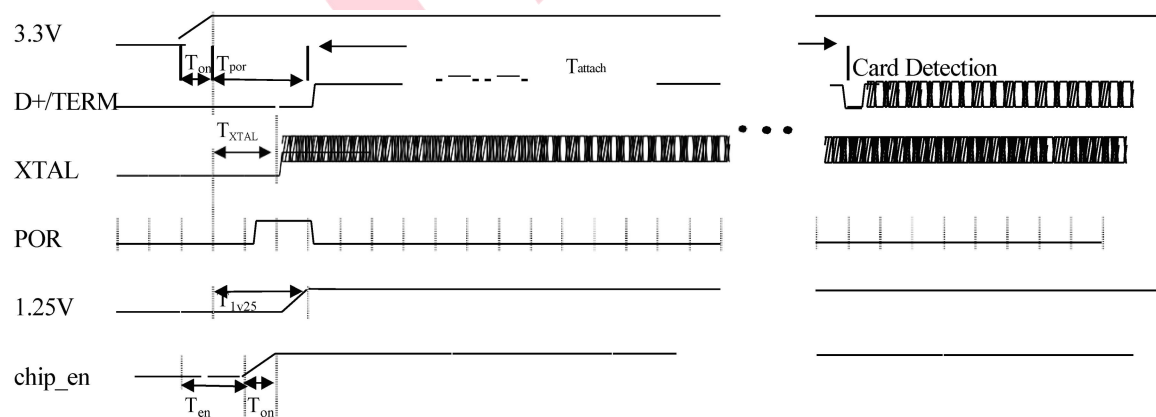
7. Electrical Specifications

7.1 Power Supply DC Characteristics

	MIN	TYP	MAX	Unit
Operating Temperature	0	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

Tpor: The power on reset releases and power management unit executes power on tasks

Tattach: USB attach state

Tk-state: the duration from resistor attached to USB host starting card detection procedure

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.

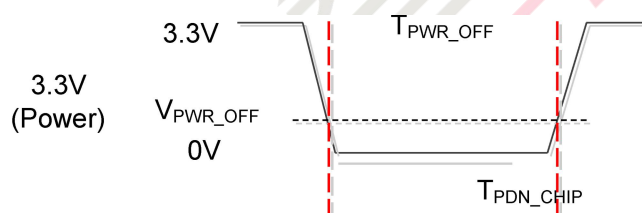
The power management unit also enables the USB circuits.

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

The typical timing range:

	Unit	Min	Typical	Max
T_{on}	ms	0.2	1.5	5
T_{por}	ms	--	2	10
T_{xtal}	ms	--	1.5	8
T_{attach}	ms	100	250	-
T_{1v25}	ms	0	2	5
T_{en}	ms	0	0	5

7.2.2 Power off by 3.3V power sequence



RTL8731BU Power Off by 3.3V power Sequence

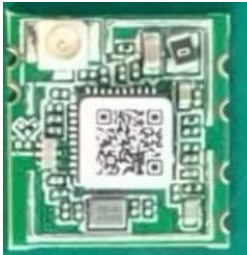
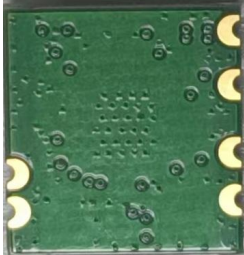
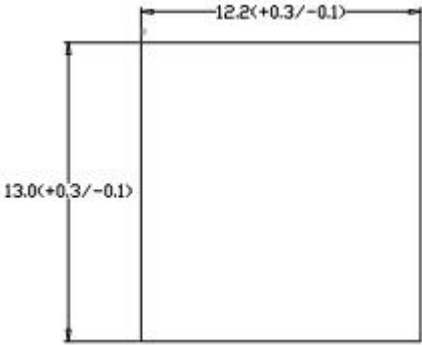
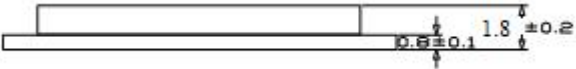
RTL8731BU Power Off by 3.3V power Timing Parameters

	Min	Typical	Max	Unit	Description
T_{PWR_OFF}	100	200	--	ms	3.3V power off time
V_{PWR_OFF}	--	--	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_{PWR_OFF} , and the 3.3V power keeping off duration must be more than T_{PWR_OFF}

8. Size reference

8.1 Module Picture

L x W : 12.2 x 13.0 (+0.3/-0.1) mm -02   -03 	
H: 1.8 (±0.2) mm	
Weight	0.43g

8.2 Marking Description

< TOP VIEW >



备注:

二维码内容: 112233445566;6131E-U;240200;Fn-Link

1. 二维码: 编码规则为 “wifi mac 地址;机型名称;datecode+成品料号后缀”

例如: 112233445566;6131E-U;240200;Fn-Link (MAC 地址以实际为准, 成品料号后缀 00 代表 FG6131EUX-00, FG6131EUX-02 则更新为 02, FG6131EUX-03 则更新为 03... 依此类推)

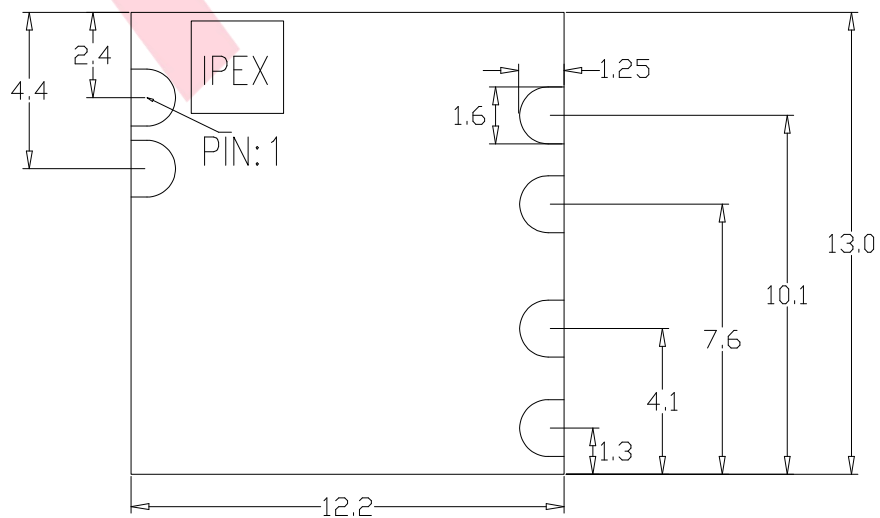
-----此机型无 BT MAC

8.3 List of certified information

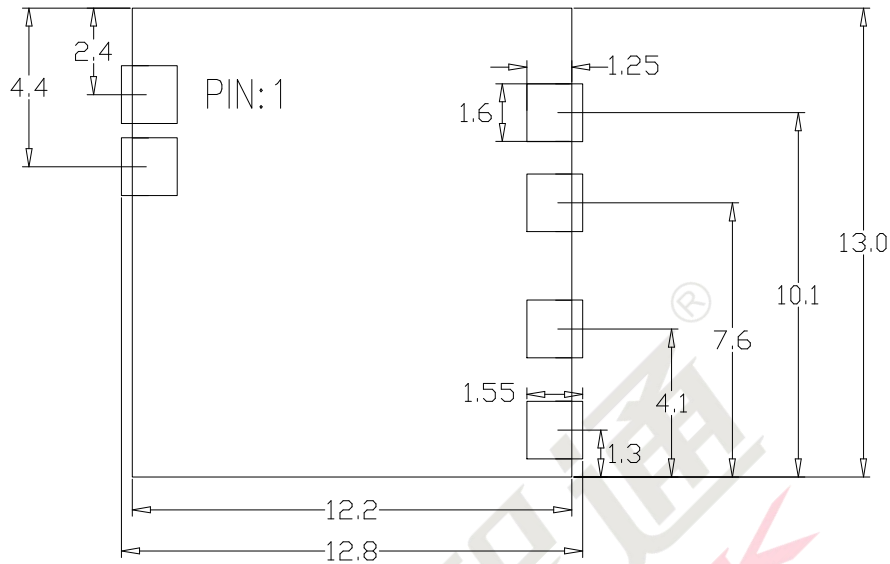
Certification project	Certificate number
SRRC	CMIIT ID:2022AP4202(M)
FCC	TBD
CE	TBD
IC	TBD
NCC	TBD
KCC	TBD
TELEC	TBD
Brazil	TBD
Argentina	TBD
Japan	TBD

8.4 Physical Dimensions

<TOP View>



8.5 Layout Recommendation



9. The Key Material List

Item	Part Name	Description	Manufacturer
1	Inductor	2016 ,SPH201610H2R2MT,2.2uH	Cenker, Sunlord, Ceaiya
2	Crystal	2016 40MHz,10pF,±10ppm,±15ppm	Murata, ECEC,TKD, Hosonic, JWT, TXC
3	Chipset	RTL8731BU-VQ-CG,QFN40	Realtek
4	PCB	6131E-U ,4L12.2X13X0.8mm	XY-PCB, GDKX, Sunlord, SLPCB, Truly
5	IPEX	1代 UFLR-MINIPCL,MRF IRECEPTACLE	佳沃,启明盛

10. Reference Design

10.1 Reference Design

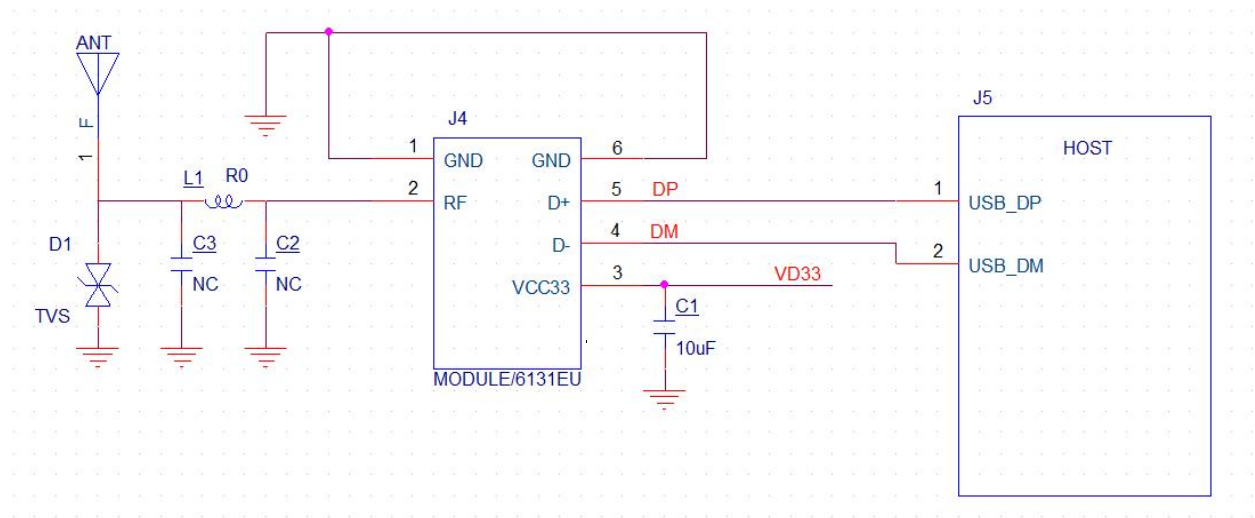
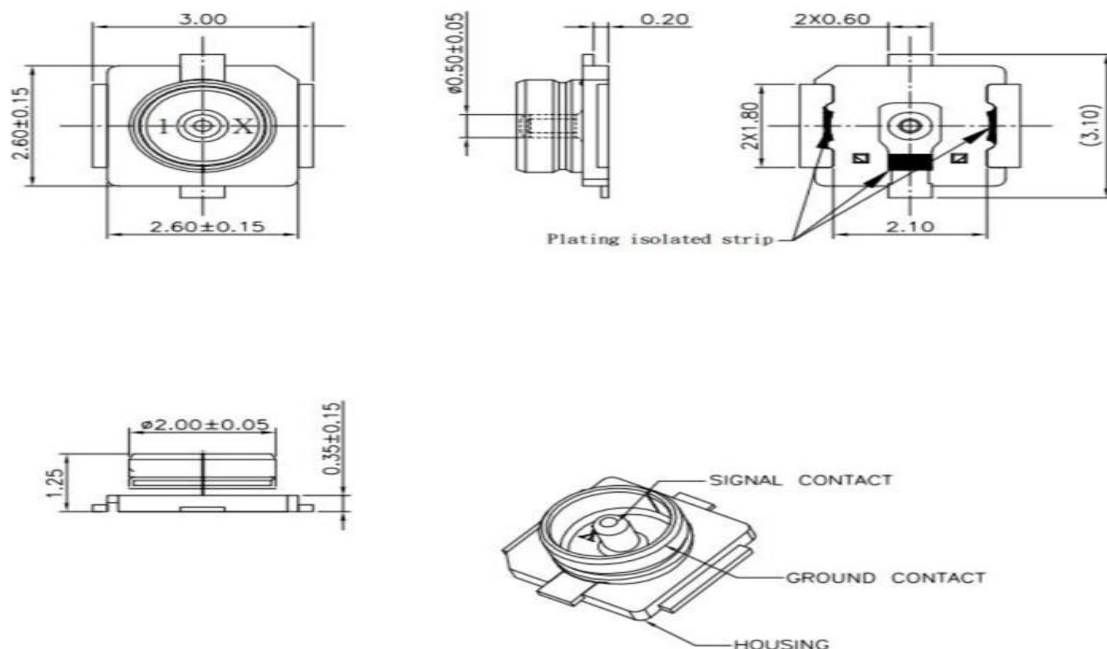


Figure 6-1 Reference Schematic

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

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

10.2 RF Connector



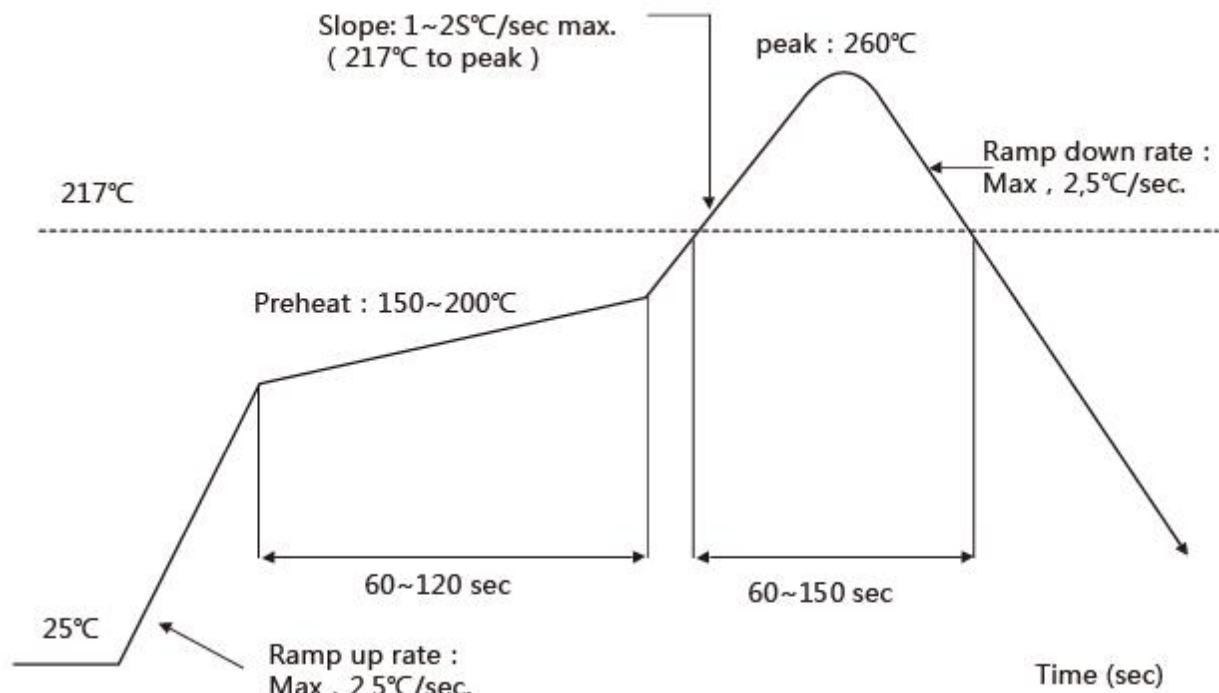
Note: The RF connector is an IPEX I connector.

11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : $<260^{\circ}\text{C}$

Number of Times : ≤ 2 times



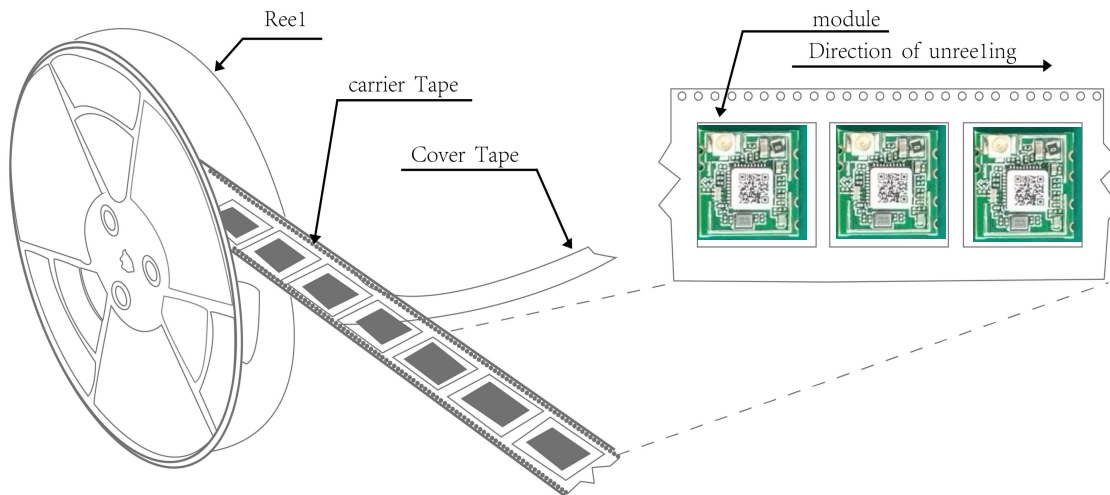
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

13. Package

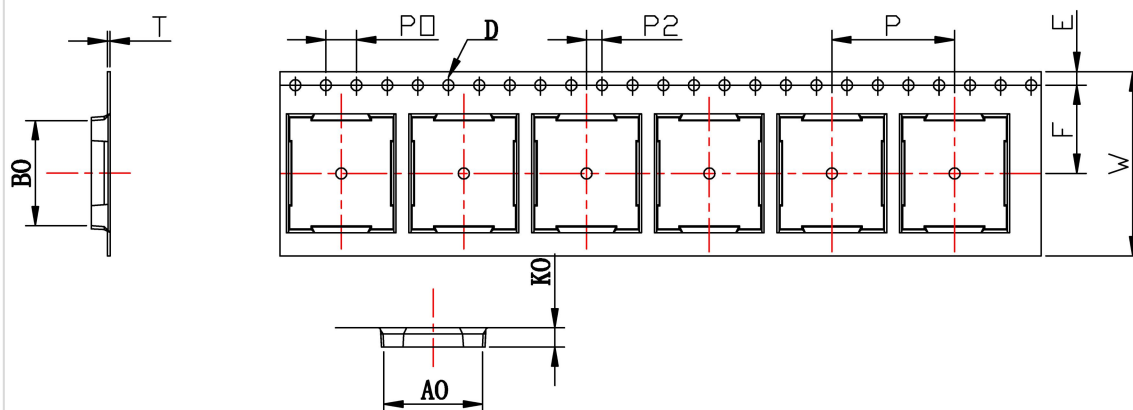
13.1 Reel

A roll of 1500pcs



13.2 Carrier Tape Detail

ITEM	W	A0	B0	D	F	E	K0	P0	P2	P	T
DIM	24	12.50	13.35	1.50	11.5	1.75	2.5	4.0	2.0	16.0	0.30
TOLE	$\begin{smallmatrix} +0.3 \\ -0.3 \end{smallmatrix}$	± 0.15	± 0.15	$\begin{smallmatrix} +0.1 \\ -0.0 \end{smallmatrix}$	$\begin{smallmatrix} +0.1 \\ -0.1 \end{smallmatrix}$	± 0.1	± 0.10	± 0.1	± 0.1	± 0.1	± 0.05



13.3 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape: 24mm*32.6m the cover tape :21.3mm*32.6m

Color of plastic disc: blue



NY bag size:450*415mm



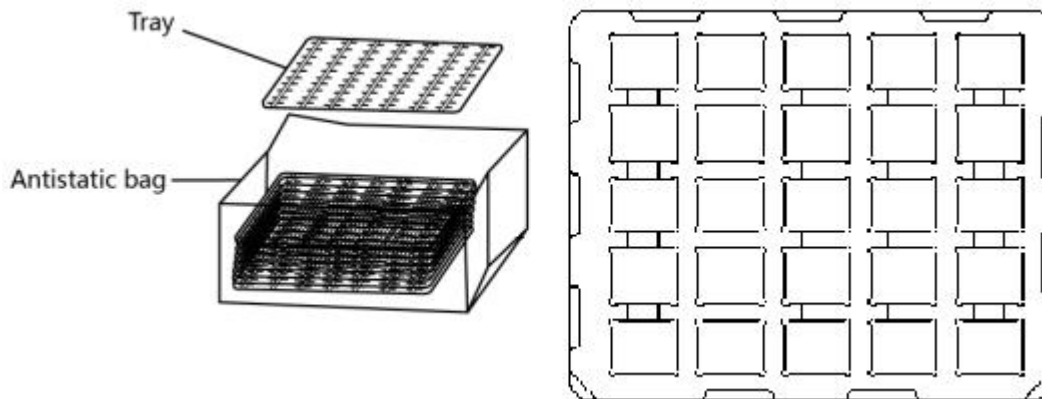
size : 350*350*35mm



The packing case size:360*210*370mm

13.4 Tray

Use pallet packaging for less than 300 pieces



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:

- Calculated shelf life in sealed bag: 12 months at $<40^{\circ}\text{C}$ and $<90\%$ relative humidity (RH)
- Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition b) "IPC/JEDEC J-STD-033A paragraph 5.2" is respected
- Baking is required if conditions b) or c) are not respected
- Baking is required if the humidity indicator inside the bag indicates 10% RH or more