

# 6111E-UC

**Wi-Fi Dual-band 1X1 11ac**

**Module Datasheet**



## 6111E-UC Module Datasheet

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	_____	Signature
	_____	Date
	_____	Fn-Link

## Revision History

Version	Date	Revision Content	Draft	Approved
1.0	2021/05/26	New version	Lxy	Szs

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# 1 Overview

## 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. It is a highly-integrated IEEE 802.11 a/b/g/n/ac MAC/Baseband/RF WLAN single chip. For Wireless LAN(WLAN)operation. The integrated module provides USB interface for Wi-Fi . The module provides simple legacy and 20MHz/40MHz/80MHz co-existence mechanism to ensure backward and network compatibility.

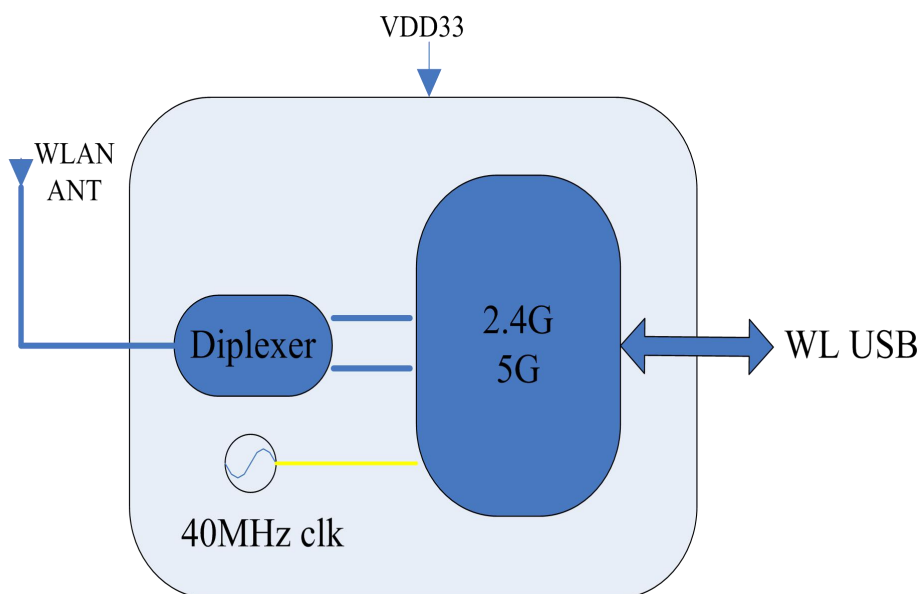
The wireless module complies with IEEE 802.11 a/b/g/n/ac standard and it can achieve up to a speed of 433.3Mbps with single stream in 802.11ac draft to connect to the wireless LAN. The integrated module provides USB interface for Wi-Fi .

This compact module is a total solution for a combination of Wi-Fi technologies. The module is specifically developed for Smart phones and Portable devices.

## 1.2 Features

- Support 802.11ac 1x1, Wave-2 compliant with MU-MIMO STA mode
- Complete 802.11n MIMO solution for 2.4GHz and 5GHz band
- Complies with USB2.0 for WLAN controller
- USB LPM/Selective Suspend supported

### Block Diagram:



### 1.3 General Specification

Model Name	6111E-UC
Product Description	Support Wi-Fi functionalities
Dimension	L *W *H: 12.2* 13*1.7 mm
Wi-Fi Interface	USB 2.0
Operating temperature	0°C to 70°C
Storage temperature	-55°C to 85°C

### 1.4 Recommended Operating Rating

		Min.	Typ.	Max.	Unit
Operating Temperature		0	25	70	deg.C
VCC33		3.0	3.3	3.6	V
Power Consumption (mA)	Transmit@MCS7 HT40,11n	190			
	Receive@MCS7 HT40,11n	80			
	Transmit@MCS7 HT20,11n	188			
	Receive@MCS7 HT20,11n	78			

### ※1.5 EEPROM Information

Wi-Fi

Vendor ID	0BDAh
Product ID	C811h

## 2 Wi-Fi RF Specification

### 2.1 2.4GHz RF Specification

Feature	Description			
WLAN Standard	IEEE 802.11b/g/n, Wi-Fi compliant			
Frequency Range	2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)			
Number of Channels	2.4GHz : Ch1 ~ Ch14			
Spectrum Mask	Min. b/g/n	Typ. b/g/n	Max. b/g/n	Unit b/g/n
1st side lobes(to fc ± 11MHZ)	-	-41/-32/-42	-	dBr
2st side lobes(to fc ± 22MHZ)	-	-51/-32/-57	-	dBr
Freq. Tolerance	-20/-20/-20	-	20/20/20	ppm
Output Power <sup>1</sup>	802.11b /11M: 16 dBm ± 1.5 dB @ EVM ≤ -9dB			
	802.11g /54M: 15 dBm ± 1.5 dB @ EVM ≤ -25dB			
	802.11n /MCS7: 14 dBm ± 1.5 dB @ EVM ≤ -28dB			
Receive Sensitivity (11b) @8% PER	- 1Mbps	PER @ -88 dBm, typical	≤-82	
	- 2Mbps	PER @ -82 dBm, typical	≤-80	
	- 5.5Mbps	PER @ -81 dBm, typical	≤-78	
	- 11Mbps	PER @ -80 dBm, typical	≤-76	
Receive Sensitivity (11g) @10% PER	- 6Mbps	PER @ -82 dBm, typical	≤-82	
	- 9Mbps	PER @ -81 dBm, typical	≤-81	
	- 12Mbps	PER @ -79 dBm, typical	≤-79	
	- 18Mbps	PER @ -77 dBm, typical	≤-77	
	- 24Mbps	PER @ -74 dBm, typical	≤-74	
	- 36Mbps	PER @ -71 dBm, typical	≤-70	
	- 48Mbps	PER @ -69 dBm, typical	≤-69	
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0	PER @ -84 dBm, typical	≤-82	
	- MCS=1	PER @ -80 dBm, typical	≤-79	
	- MCS=2	PER @ -79 dBm, typical	≤-77	
	- MCS=3	PER @ -75 dBm, typical	≤-74	
	- MCS=4	PER @ -72 dBm, typical	≤-70	
	- MCS=5	PER @ -70 dBm, typical	≤-68	
	- MCS=6	PER @ -67 dBm, typical	≤-66	
	- MCS=7	PER @ -66 dBm, typical	≤-65	

Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER @ -84 dBm, typical	≤-82
	- MCS=1	PER @ -80 dBm, typical	≤-79
	- MCS=2	PER @ -79 dBm, typical	≤-77
	- MCS=3	PER @ -75 dBm, typical	≤-74
	- MCS=4	PER @ -71 dBm, typical	≤-70
	- MCS=5	PER @ -67 dBm, typical	≤-66
	- MCS=6	PER @ -65 dBm, typical	≤-65
	- MCS=7	PER @ -64 dBm, typical	≤-64

## 2.2 5GHz RF Specification

Feature	Description
WLAN Standard	IEEE 802.11a/n/ac, Wi-Fi compliant
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)
Number of Channels	5.0GHz : Please see the table <sup>1</sup>
Modulation	802.11a/n : 64-QAM, 16-QAM, QPSK, BPSK 802.11ac : 256-QAM, 64-QAM, 16-QAM, QPSK, BPSK
Output Power <sup>2</sup>	802.11a /54M: 12 dBm ± 1.5 dB @ EVM ≤ -25dB
	802.11n /MCS7: 11 dBm ± 1.5 dB @ EVM ≤ -28dB
	802.11ac/MCS7: 10 dBm ± 1.5 dB @ EVM ≤ -28dB
	802.11ac/MCS9: 10 dBm ± 1.5 dB @ EVM ≤ -32dB
Receive Sensitivity (11a, 20MHz) @10% PER	- 6Mbps PER @ -85 dBm, typical ≤-85
	- 9Mbps PER @ -83 dBm, typical ≤-83
	- 12Mbps PER @ -82 dBm, typical ≤-82
	- 18Mbps PER @ -80 dBm, typical ≤-80
	- 24Mbps PER @ -76 dBm, typical ≤-76
	- 36Mbps PER @ -73 dBm, typical ≤-73
	- 48Mbps PER @ -68 dBm, typical ≤-68
	- 54Mbps PER @ -67 dBm, typical ≤-67
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -85 dBm, typical ≤-85
	- MCS=1 PER @ -83 dBm, typical ≤-82
	- MCS=2 PER @ -80 dBm, typical ≤-80
	- MCS=3 PER @ -77 dBm, typical ≤-77
	- MCS=4 PER @ -73 dBm, typical ≤-73
	- MCS=5 PER @ -69 dBm, typical ≤-69
	- MCS=6 PER @ -67 dBm, typical ≤-67
	- MCS=7 PER @ -66 dBm, typical ≤-66



Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER @ -83 dBm, typical	≤-82
	- MCS=1	PER @ -80 dBm, typical	≤-79
	- MCS=2	PER @ -78 dBm, typical	≤-77
	- MCS=3	PER @ -75 dBm, typical	≤-74
	- MCS=4	PER @ -72 dBm, typical	≤-70
	- MCS=5	PER @ -67 dBm, typical	≤-66
	- MCS=6	PER @ -66 dBm, typical	≤-65
	- MCS=7	PER @ -64 dBm, typical	≤-64
Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=0	PER @ -86 dBm, typical	≤-84
	- MCS=1	PER @ -84 dBm, typical	≤-81
	- MCS=2	PER @ -81 dBm, typical	≤-79
	- MCS=3	PER @ -77 dBm, typical	≤-76
	- MCS=4	PER @ -74 dBm, typical	≤-72
	- MCS=5	PER @ -70 dBm, typical	≤-68
	- MCS=6	PER @ -68 dBm, typical	≤-67
	- MCS=7	PER @ -67 dBm, typical	≤-66
Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=0	PER @ -83 dBm, typical	≤-81
	- MCS=1	PER @ -79 dBm, typical	≤-78
	- MCS=2	PER @ -77 dBm, typical	≤-76
	- MCS=3	PER @ -74 dBm, typical	≤-73
	- MCS=4	PER @ -71 dBm, typical	≤-69
	- MCS=5	PER @ -66 dBm, typical	≤-65
	- MCS=6	PER @ -64 dBm, typical	≤-64
	- MCS=7	PER @ -62 dBm, typical	≤-63
	- MCS=8	PER @ -60 dBm, typical	≤-58
	- MCS=9	PER @ -59 dBm, typical	≤-56
Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=0	PER @ -80 dBm, typical	≤-78
	- MCS=1	PER @ -77 dBm, typical	≤-75
	- MCS=2	PER @ -75 dBm, typical	≤-73
	- MCS=3	PER @ -71 dBm, typical	≤-70
	- MCS=4	PER @ -68 dBm, typical	≤-66
	- MCS=5	PER @ -66 dBm, typical	≤-62
	- MCS=6	PER @ -62 dBm, typical	≤-61
	- MCS=7	PER @ -60 dBm, typical	≤-60
- MCS=8	PER @ -57 dBm, typical	≤-55	

	- MCS=9 PER @ -56 dBm, typical	≤-53
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1.2.4G 11M / MCS7 HT40 mode power was calibrated, other rate power control by driver;

2.5G MCS7 HT40 mode power was calibrated, other rate power control by driver;

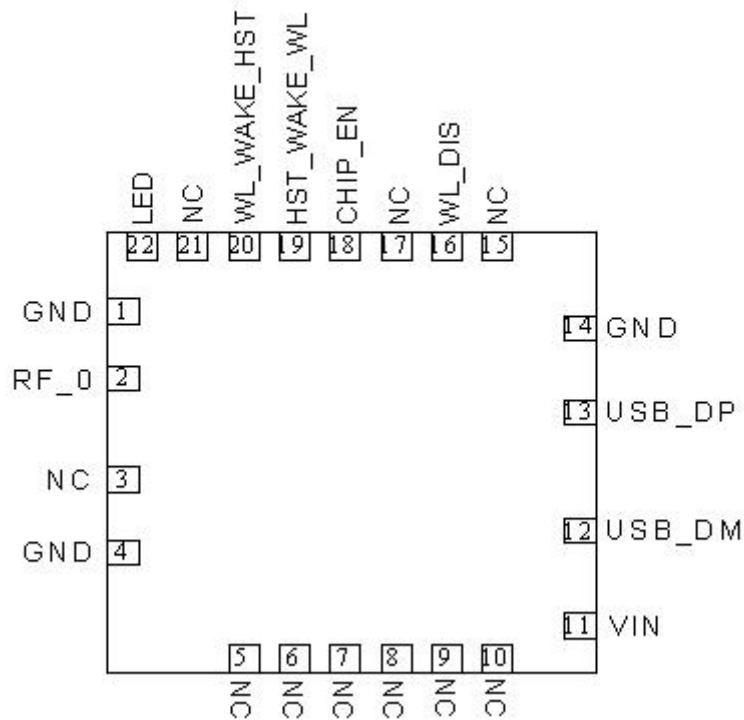
### 15GHz Channel table

Band (GHz)	Operating Channel Numbers	Channel center frequencies(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

## 3 Pin Assignments

### 3.1 Pin Outline

< TOP VIEW >



### 3.2 Pin Definition

The section describes the pin functionality of 6111E-UC chip.

NO	Name	Type	Description	Voltage
1	GND		Ground connections	
2	RF_0	I/O	WLAN 2G S1 RF Differential	
3	NC		Floating (Don't connected to ground)	
4	GND		Ground connections	
5	NC		Floating (Don't connected to ground)	
6	NC		Floating (Don't connected to ground)	
7	NC		Floating (Don't connected to ground)	
8	NC		Floating (Don't connected to ground)	
9	NC		Floating (Don't connected to ground)	
10	NC		Floating (Don't connected to ground)	
11	VIN		3.3V POWER INPUT	3.3V
12	USB_DM	I/O	USB DATA DM	
13	USB_DP	I/O	USB DATA DP	
14	GND		Ground connections	
15	NC	I/O	Floating (Don't connected to ground)	3.3V
16	WL_DIS	I/O	Wi-Fi DISABLE	3.3V

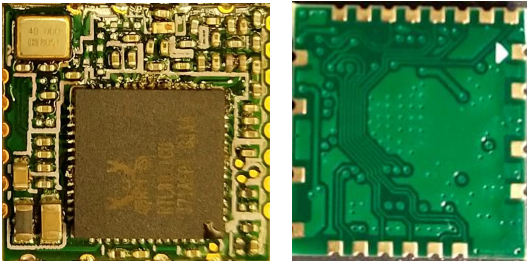
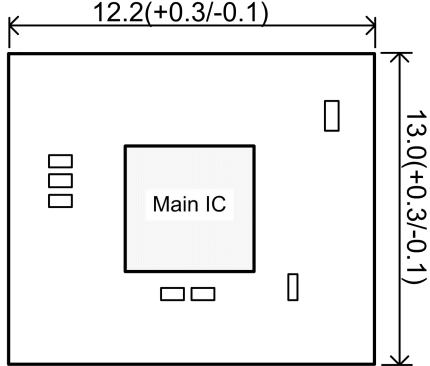
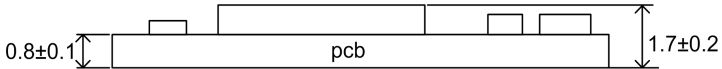
17	NC		Floating (Don't connected to ground)	
18	CHIP_EN	I	CHIP ENABLE	
19	HST_WAKE_WL	I/O	HOST to wake-up Wi-Fi device	3.3V
20	WL_WAKE_HST	I/O	Wi-Fi device to wake-up HOST	3.3V
21	NC	I/O	Floating (Don't connected to ground)	3.3V
22	LED	I/O	LED GPIO8	

P:POWER I:INPUT O:OUTPUT

## 4 Dimensions

### 4.1 Physical Dimensions and Module Photo

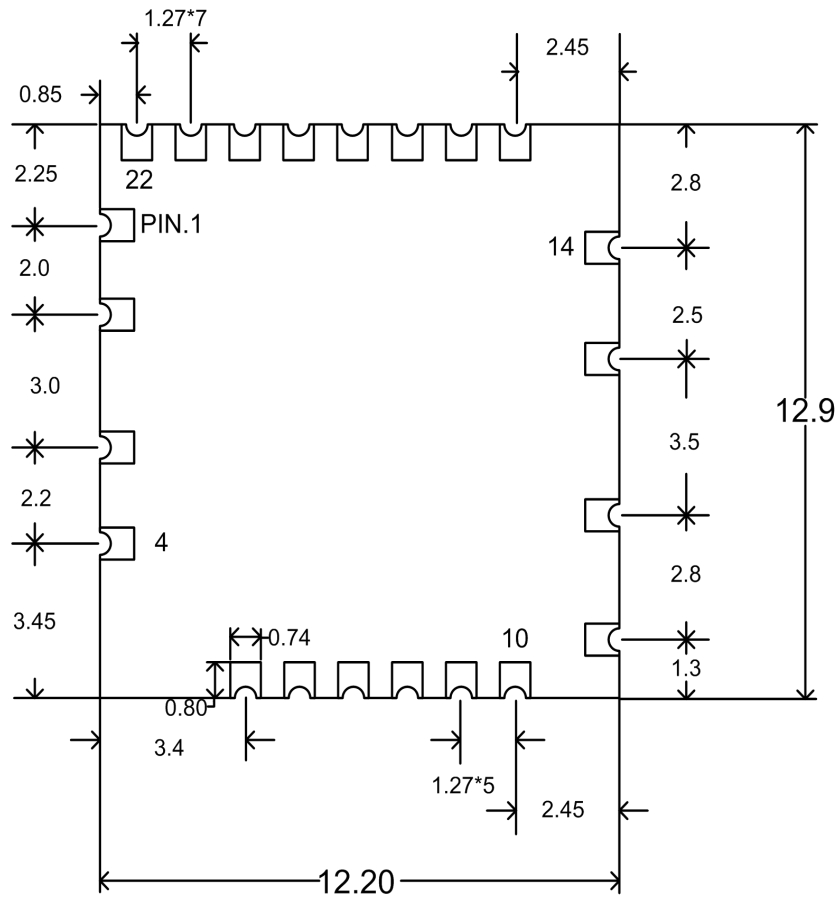
(Unit: mm)

<p>L x W : 12.2 x 13 mm</p> 	<p>&lt; TOP VIEW &gt;</p> 
<p>H: 1.7 mm</p>	<p>&lt; Side View &gt;</p> 
<p><b>Weight</b></p>	<p>0.45g</p>

### 4.2 Module Physical Dimensions

(Unit: mm)

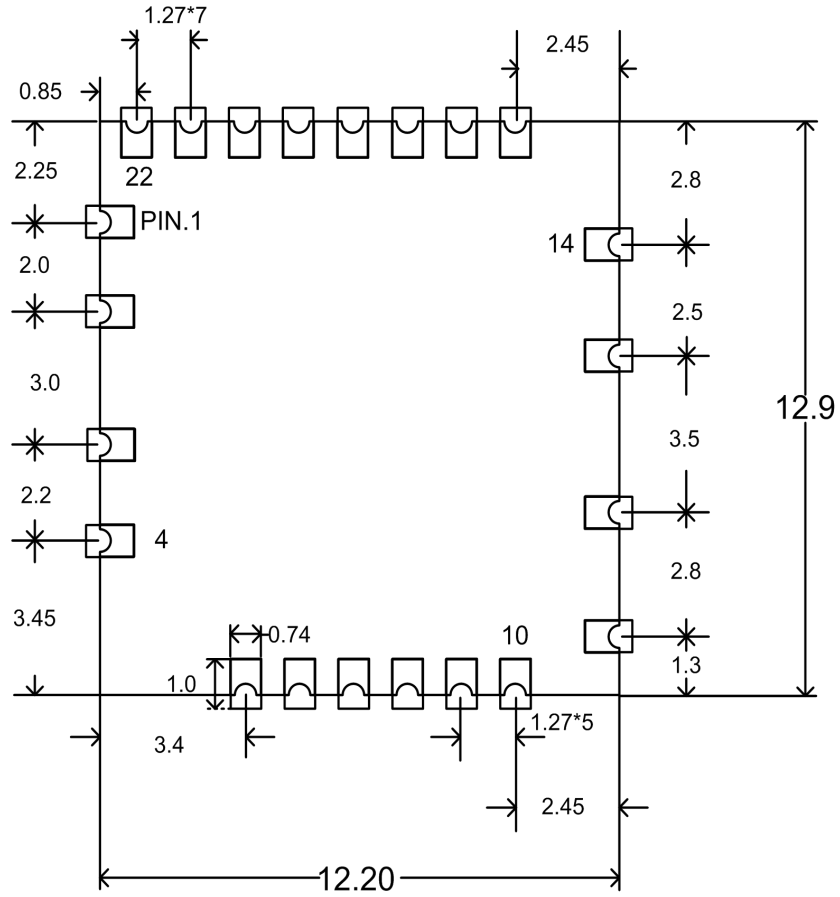
< TOP VIEW >



### 4.3 Layout Recommendation

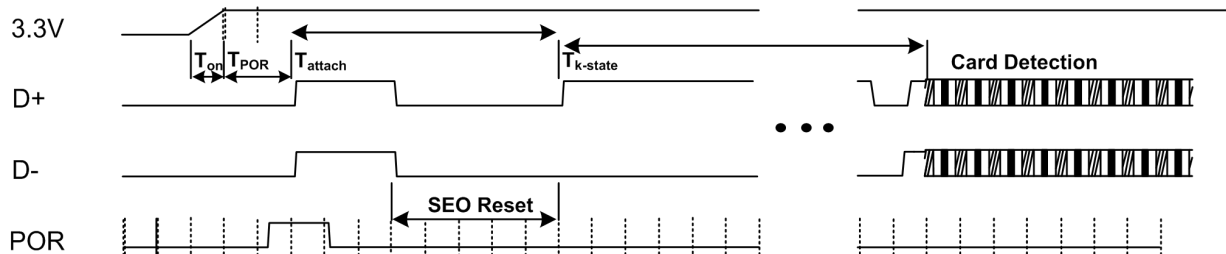
(Unit: mm)

< TOP VIEW >



## 5 Interface Timing Specification

### 5.1 USB Bus during Power On Sequence



$T_{on}$ :The main power ramp up duration

$T_{por}$ :The power on reset releases and power management unit executes power on tasks

$T_{attach}$ :USB attach state

$T_{k-state}$ :the duration from resister attached to USB host starting card detection procedure

#### The power on flow description:

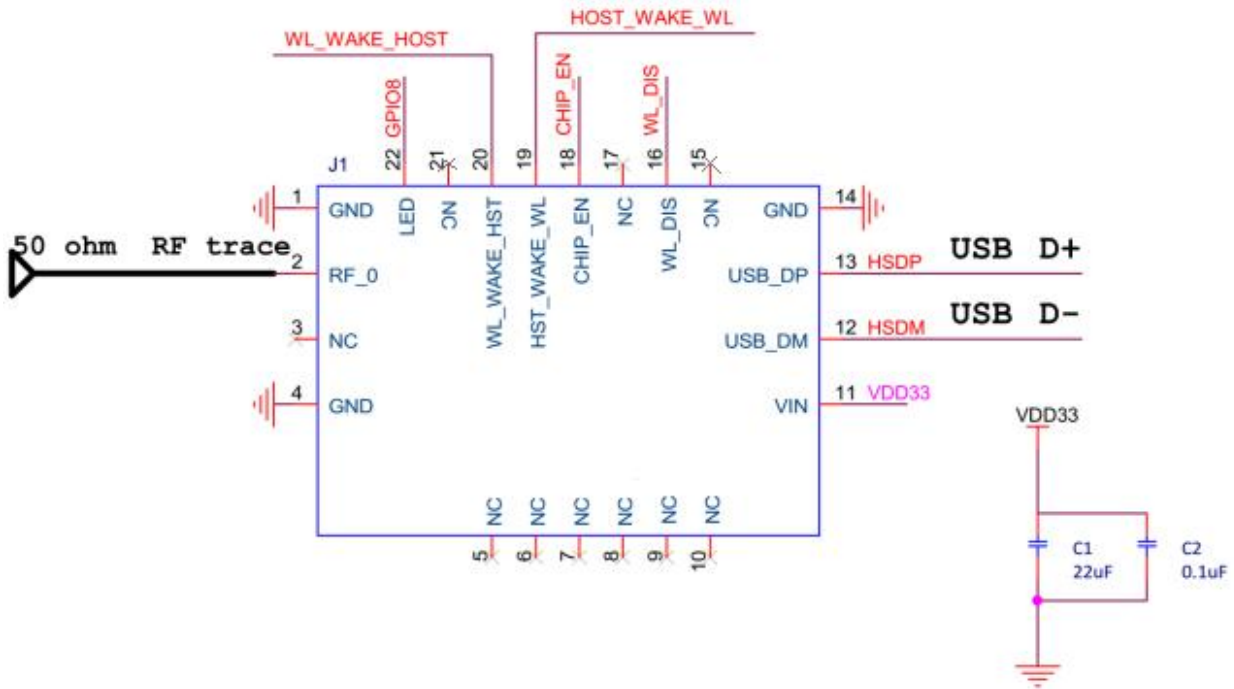
After main 3.3V ramp up,the internal power on reset is released by power ready detection circuit and the power management unit will be enabled.The power management unit enables the internal regulator and clock circuits.

The power management unit also enables the USB circuits.

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

	Unit	Min	Typical	Max
$T_{on}$	ms	--	1.5	5
$T_{por}$	ms	--	2	10
$T_{attach}$	ms	2	7	15
$T_{k-state}$	ms	50	250	--

## 6 Reference Design





## 7 Ordering Information

Part No.	Description
FG6111EUCX-01	RTL8811CU, a/b/g/n/ac, Wi-Fi, 1T1R, 12.2X13mm, USB, PCB version V5.0

## 8 The Key Material List

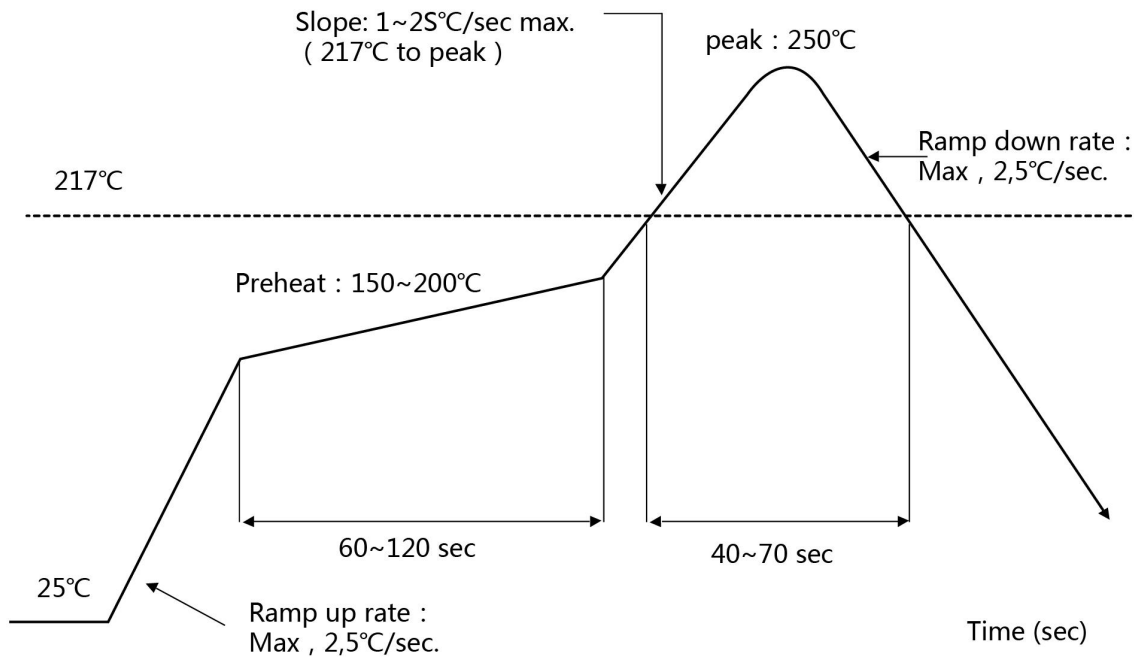
Inductor	0603 2.2UH,±20% >700mA	Sunlord, Microgate, cenke, ceaiya
Diplexer	Diplexer 2G&5GHz 50 OHM , DPX1005	Murata, ACX, walsin, Glead, TDK
Crystal	2520 40MHZ 15PF, 10ppm	TKD, TST, HOSONIC, TXC, ECEC
Chipset	RTL8811CU-CG MQFN56	Realtek
TVS	0201 4V 0.05pF 15KV TVS	Murata, Sunlord, WAYON
PCB	6221E-UUC V5.0, 4L, green, 12.2 x 13 x 0.8mm	XY-PCB, KX-PCB, SL-PCB, Sunlord

## 9 Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

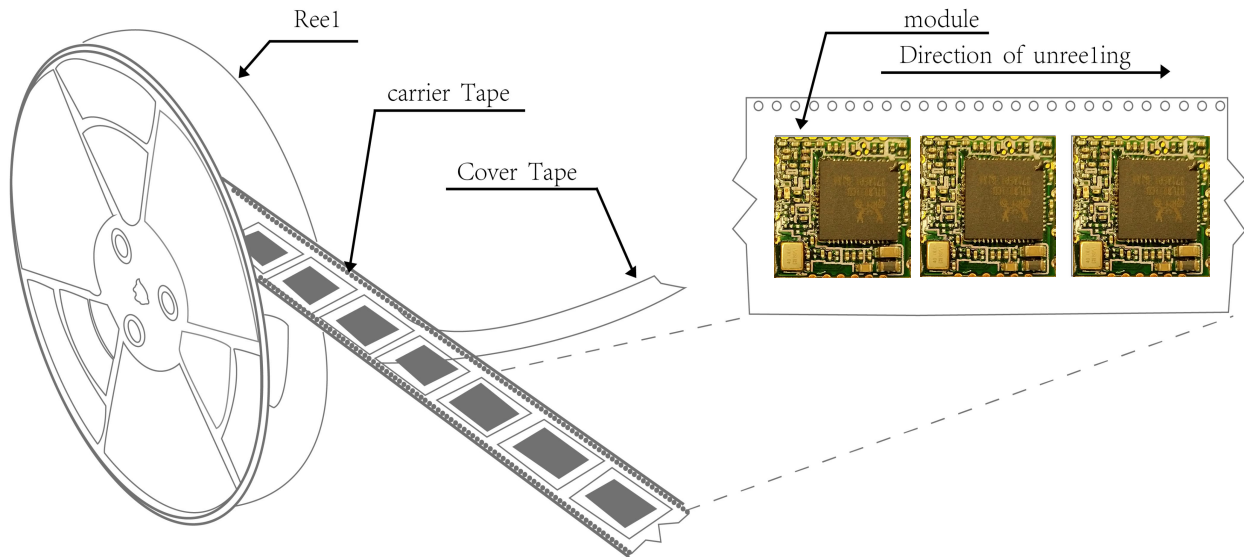
Number of Times :  $\leq 2$  times



## 10 Package Information

### 10.1 Reel

A roll of 2000pcs



### 10.2 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape:24mm\*32.6m the cover tape :2.13mmm\*32.6m

Color of plastic disc:blue

A roll of 2000pcs



NY bag size:460mm\*385mm



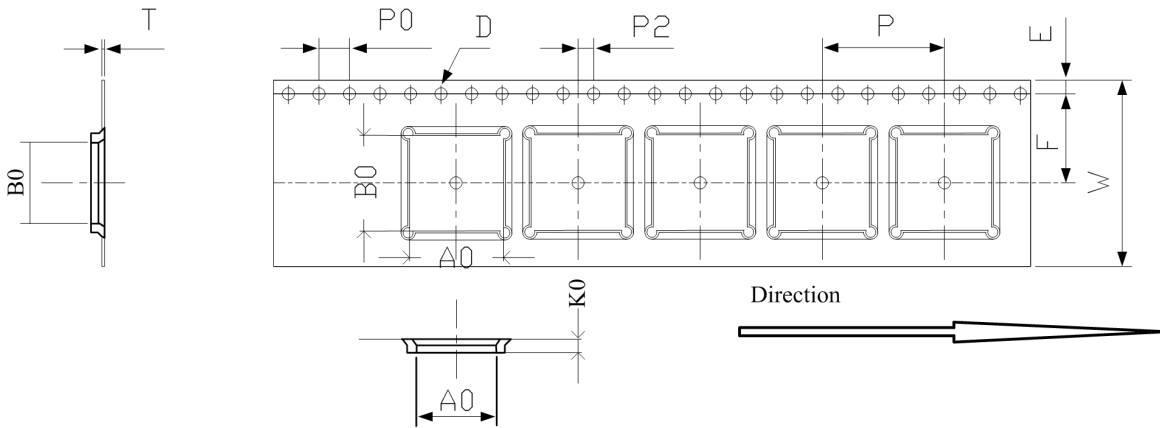
size : 350\*350\*35mm



The packing case size:350\*210\*370mm

### 10.3 Carrier Tape Detail

ITEM	W	A0	B0	D	F	E	K0	P0	P2	P	T
DIM	24	12.61	13.62	1.50	11.5	1.75	1.70	4.0	2.0	16.0	0.30
TOLE	+0.3 -0.3	±0.15	±0.15	+0.1 -0.0	+0.1 -0.1	±0.1	±0.10	±0.1	±0.1	±0.1	±0.05



### 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
- b) "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