

PRODUCT SPECIFICATION

6111E-UC

Wi-Fi Dual-band 1x1 11ac Module Datasheet

Version:v1.4

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

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6111E-UC Module Datasheet

Ordering Information	Part NO.	Description
	FG6111EUCX-01	RTL8811CU-CG,802.11a/b/g/n/ac ,1T1R,12.2*12.9 ,USB2.0, 单天线,PCB V5.0
	FG6111EUCX-K1	RTL8811CU-CG,802.11a/b/g/n/ac ,1T1R,12.2*12.9 ,USB2.0, 单天线,PCB V5.0

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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. 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 Description

Model Name	6111E-UC
Product Description	Support Wi-Fi functionalities
Dimension	L x W x H: 12.9* 12.2*1.7 mm
Wi-Fi Interface	Support USB 2.0
Operating temperature	0°C to 70°C
Storage temperature	-55°C to 85°C

2. Features

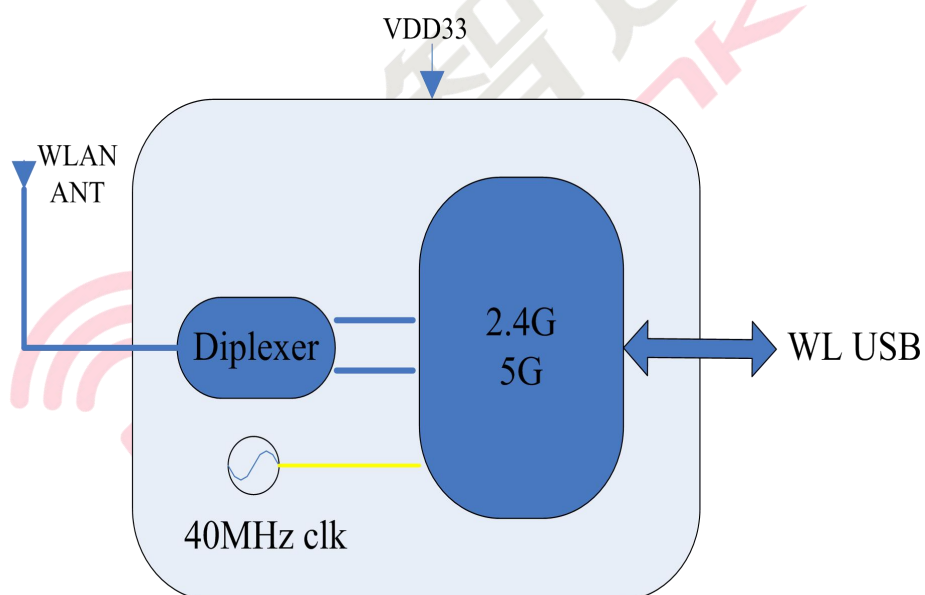
General Features

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

WLAN Interface

- Complies with USB2.0 for WLAN controller

3. Block Diagram



4. General Specification

4.1 2.4GHz RF Specification

Feature	Description	
WLAN Standard	IEEE 802.11 b/g/n 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 : 16dBm $\pm$ 2 dB	EVM $\leq$ -9dB
	802.11g /54Mbps : 15dBm $\pm$ 2 dB	EVM $\leq$ -25dB
	802.11n /MCS7 : 14dBm $\pm$ 2 dB	EVM $\leq$ -28dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	$\pm$ 20ppm	
Test Items	TYP Test Value	Standard Value
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -88 dBm, typical	$\leq$ -82
	- 2Mbps PER @ -82 dBm, typical	$\leq$ -80
	- 5.5Mbps PER @ -81 dBm, typical	$\leq$ -78
	- 11Mbps PER @ -80 dBm, typical	$\leq$ -76
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -82 dBm, typical	$\leq$ -82
	- 9Mbps PER @ -81 dBm, typical	$\leq$ -81
	- 12Mbps PER @ -79 dBm, typical	$\leq$ -79
	- 18Mbps PER @ -77 dBm, typical	$\leq$ -77
	- 24Mbps PER @ -74 dBm, typical	$\leq$ -74
	- 36Mbps PER @ -71 dBm, typical	$\leq$ -70
	- 48Mbps PER @ -69 dBm, typical	$\leq$ -69
	- 54Mbps PER @ -67 dBm, typical	$\leq$ -67
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -84 dBm, typical	$\leq$ -82
	- MCS=1 PER @ -80 dBm, typical	$\leq$ -79
	- MCS=2 PER @ -79 dBm, typical	$\leq$ -77
	- MCS=3 PER @ -75 dBm, typical	$\leq$ -74
	- MCS=4 PER @ -72 dBm, typical	$\leq$ -70
	- MCS=5 PER @ -70 dBm, typical	$\leq$ -68
	- MCS=6 PER @ -67 dBm, typical	$\leq$ -66
	- MCS=7 PER @ -66 dBm, typical	$\leq$ -65
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 PER @ -84 dBm, typical	$\leq$ -82
	- MCS=1 PER @ -80 dBm, typical	$\leq$ -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

4.2 5GHz RF Specification

Feature	Description	
WLAN Standard	IEEE 802.11a/n/ac, Wi-Fi compliant	
Frequency Range	5.150 GHz ~ 5.850 GHz (5.0 GHz ISM Band)	
Number of Channels	5.0GHz: Please see the table 1	
Modulation	802.11a/n : 64-QAM, 16-QAM, QPSK, BPSK 802.11ac : 256-QAM, 64-QAM, 16-QAM, QPSK, BPSK	
Test Items	Typical Value	EVM
Output Power	802.11a /54M: 12 dBm $\pm$ 2 dB	EVM $\leq$ -25dB
	802.11n /MCS7: 11 dBm $\pm$ 2 dB	EVM $\leq$ -28dB
	802.11ac/MCS8: 10 dBm $\pm$ 2 dB	EVM $\leq$ -28dB
	802.11ac/MCS9: 10 dBm $\pm$ 2 dB	EVM $\leq$ -32dB
Test Items	TYP Test Value	Standard Value
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=8	PER @ -63 dBm, typical	≤-61
	- 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
Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=7	PER @ -62 dBm, typical	≤-63
	- MCS=8	PER @ -60 dBm, typical	≤-58
	- MCS=9	PER @ -59 dBm, typical	≤-56
	- 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
Receive Sensitivity (11ac,80MHz) @10% PER	- 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

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

5. ID setting information

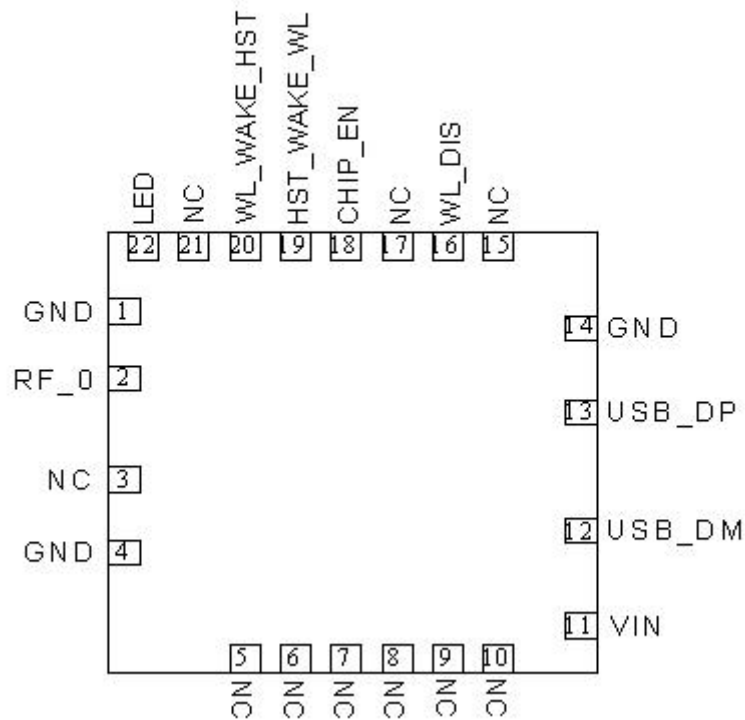
WI-FI

Vendor ID	0BDAh
Product ID	C811h

6. Pin Definition

6.1 Pin Outline

< TOP VIEW >



6.2 Pin Definition details

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

7. Electrical Specifications

7.1 Power Supply DC Characteristics

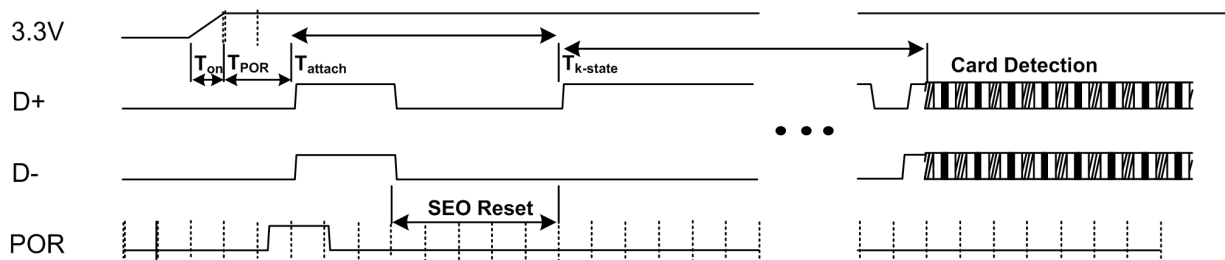
	MIN	TYP	MAX	Unit
Operating Temperature	0	25	70	deg.C
VCC33	3.0	3.3	3.6	V

7.2 Power Consumption

Power Consumption (mA)	Transmit@MCS7 HT40,11n	190
	Receive@MCS7 HT40,11n	80
	Transmit@MCS7 HT20,11n	188
	Receive@MCS7 HT20,11n	78

7.3 Interface Circuit time series

7.3.1 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 register 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.

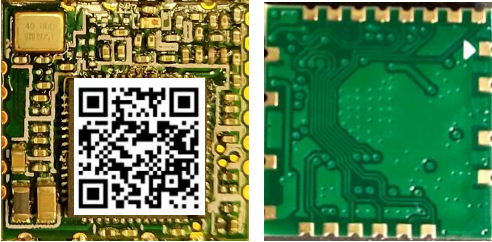
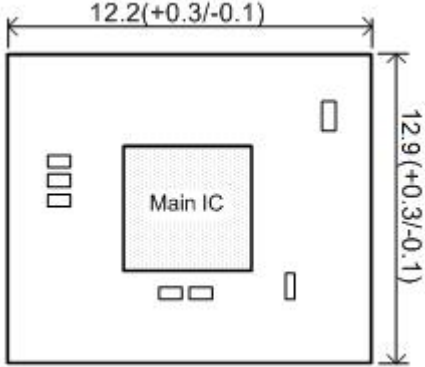
The power management unit also enables the USB circuits.

USB analog circuits attach registers 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	--

8. Size reference

8.1 Module Picture

L x W : 12.9 x 12.2 (+0.3/-0.1) mm 	
H: 1.7 (±0.2) mm	
Weight	0.45g

8.2 Marking Description



备注：

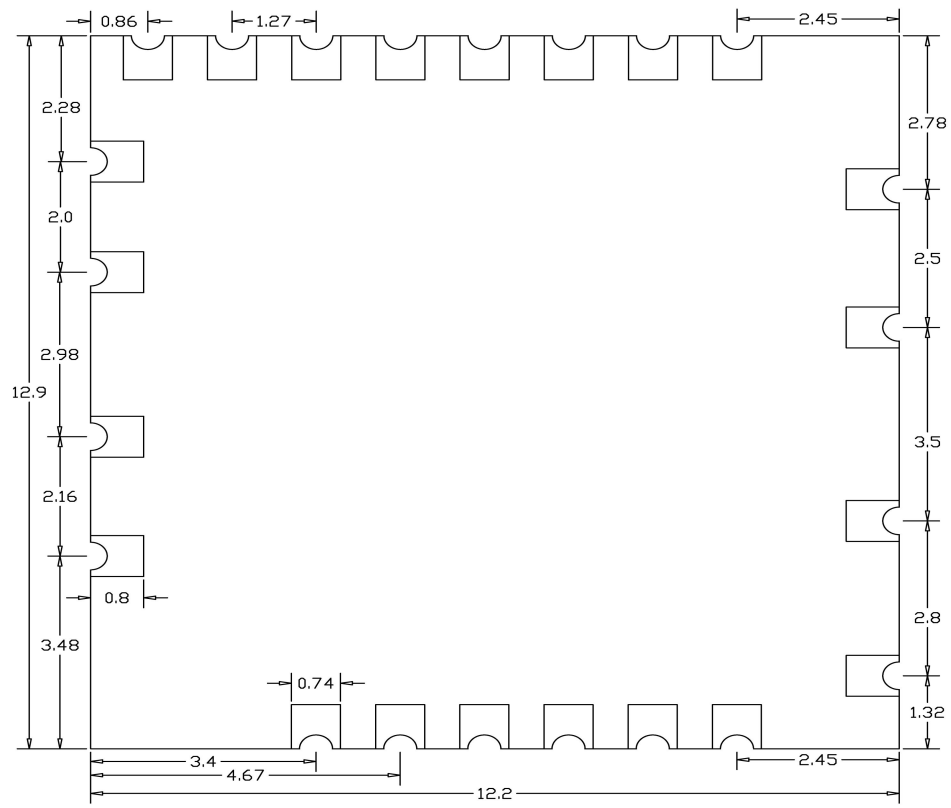
二维码内容：112233445566;FG6111EUCX-01

1. 二维码：编码规则为“wifi mac 地址;成品料号”

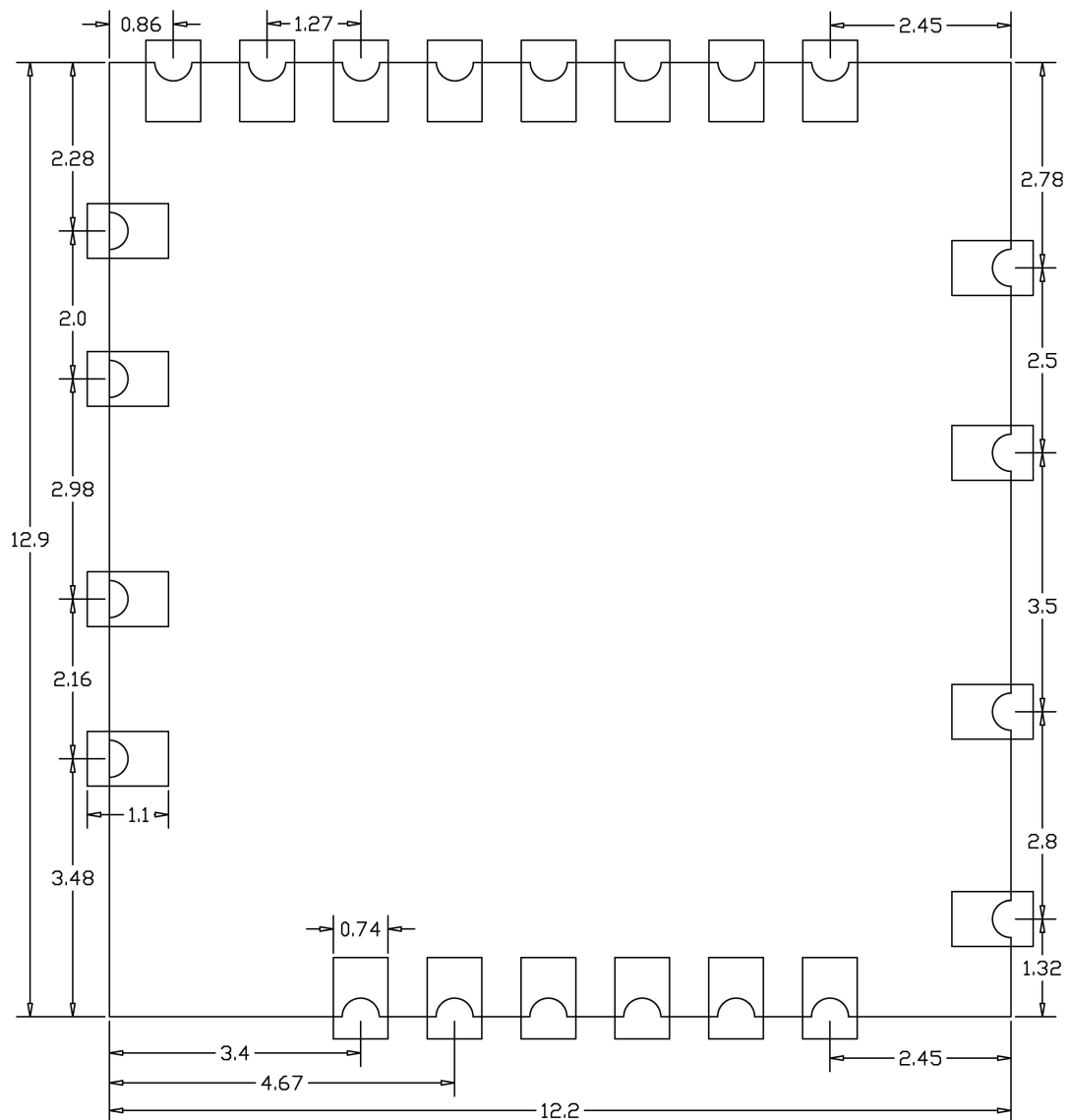
例如：112233445566;FG6111EUCX-01（MAC 地址以实际为准）

8.3 Physical Dimensions

<TOP View>



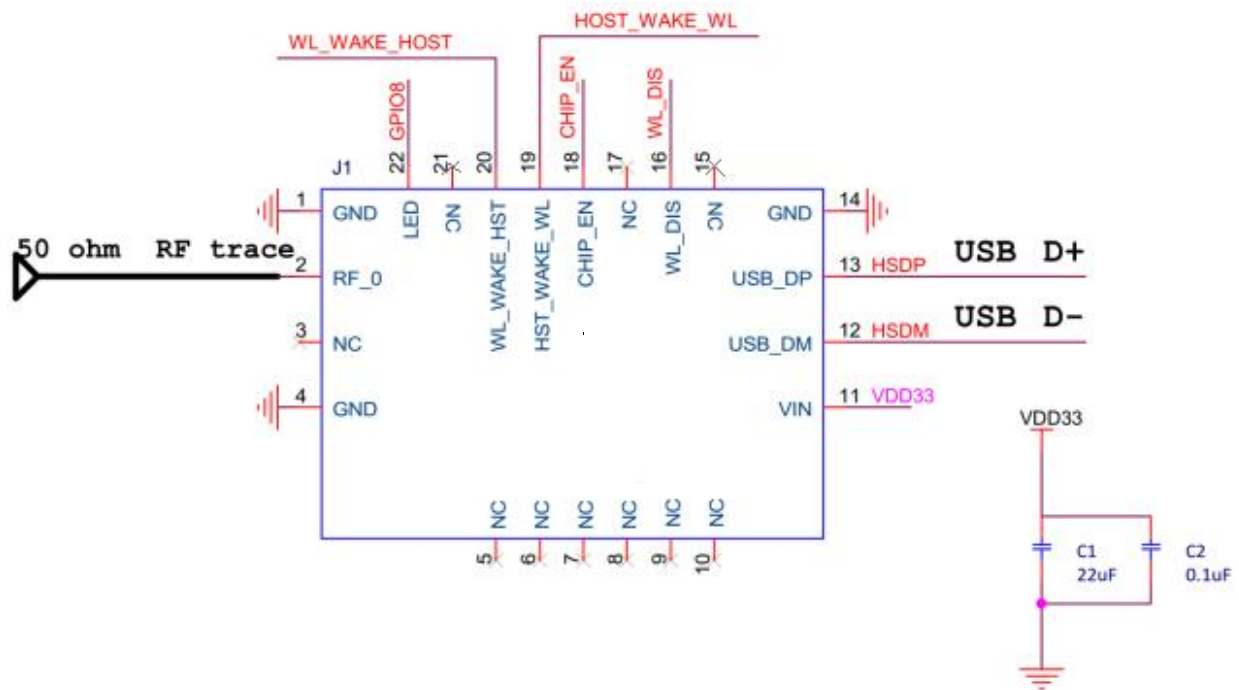
8.4 Layout Recommendation



9. The Key Material List

Item	Part Name	Description	Manufacturer
1	Inductor	0603 2.2UH, $\pm 20\%$ >700mA	Sunlord, Microgate, cenke, ceaiya
2	Crystal	2520 40MHZ 15PF, 10ppm	TKD, TST, HOSONIC, TXC, ECEC
3	Chipset	RTL8811CU-CG	Realtek
4	TVS	0201 4V 0.05pF 15KV TVS	Murata, Sunlord, WAYON
5	PCB	6221E-UUC, 4L, green, 12.2x12.9x0.8mm	XY-PCB, KX-PCB, SL-PCB, Sunlord

10. Reference Design

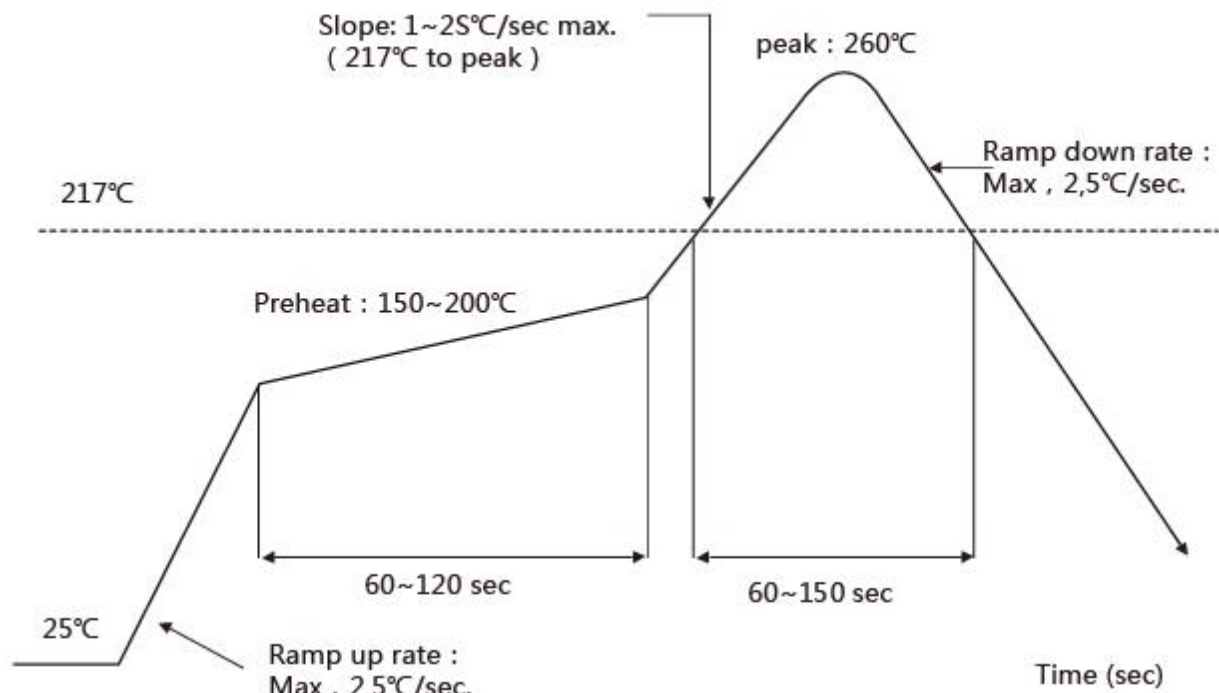


11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

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

Number of Times : ≤ 2 times



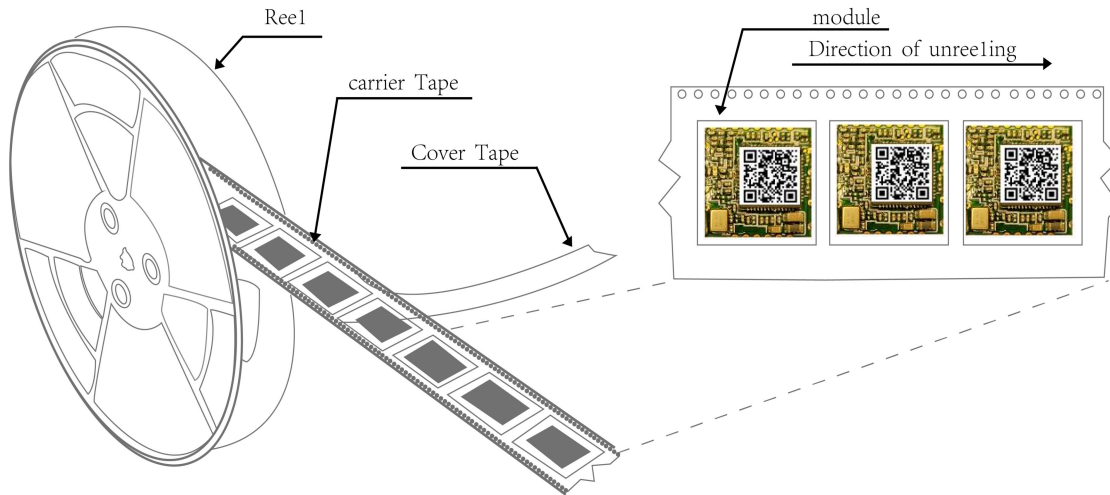
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

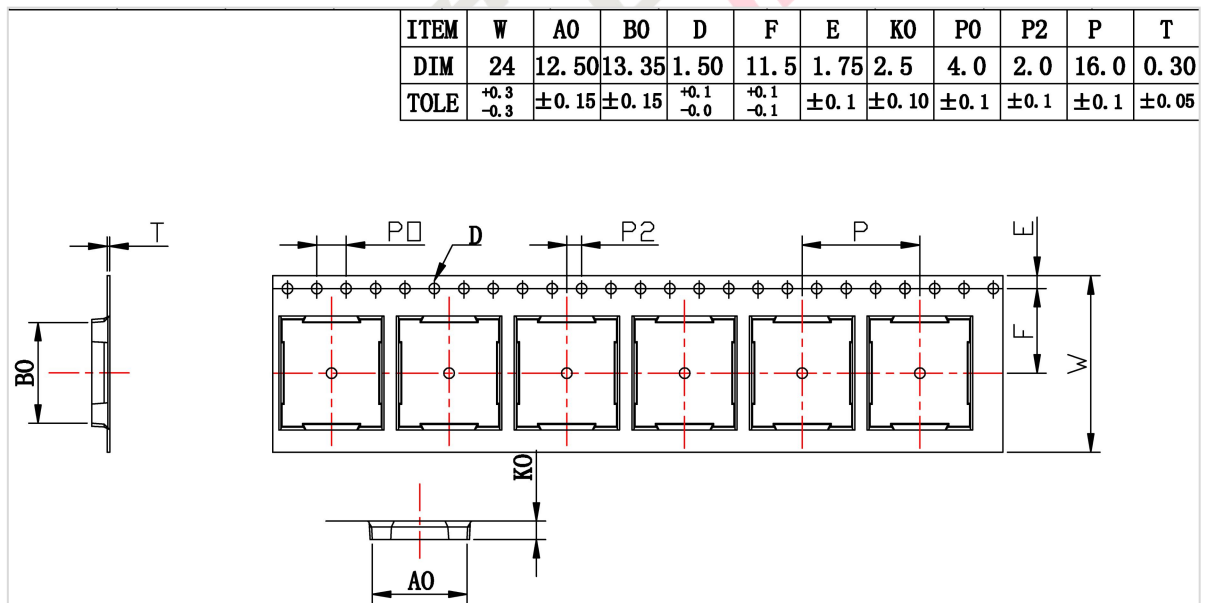
13. Package

13.1 Reel

A roll of 1500pcs



13.2 Carrier Tape Detail



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13.3 Packaging Detail

the take-up package



Using self-adhesive tape

Size of black tape: 24mm*24.4m the cover tape :21.3mm*32.6m

Color of plastic disc: blue



NY bag size:450mm*415mm



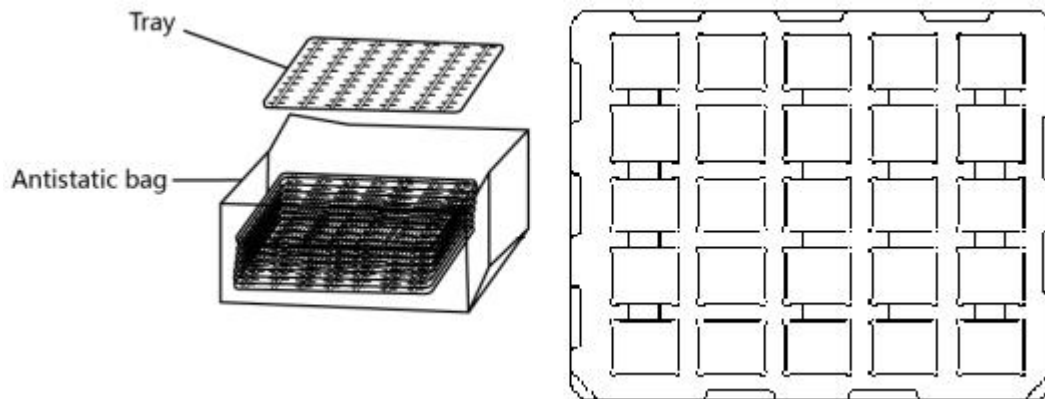
size : 350*350*35mm



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:

- a) Calculated shelf life in sealed bag: 12 months at $<40^{\circ}\text{C}$ 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