6221E-UUC

Wi-Fi Dual-band 1X1 11ac +Bluetooth 4.2

Combo Module Datasheet

6221E-UUC Module Datasheet

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Customer Approval :

_____	Company
_____	Title
_____	Signature
_____	Date
_____	Fn-Link

Revision History

Version	Date	Revision Content	Draft	Approved
1.0	2018/12/10	New version	Lzm	Jacky
1.1	2018/12/18	Modify the telephone number	Lzm	Lxy
1.2	2018/12/21	Modify layout recommendation	Lzm	Lxy
1.3	2018/12/24	Modify layout recommendation	Lzm	Lxy
1.4	2018/12/25	Modify the office and TEL	Lzm	Lxy
1.5	2019/01/08	Add Carrier Tape Detail	Lzm	Lxy
1.6	2019/04/17	Add certification information	Lxy	Szs
1.7	2019/05/28	Modify 2.4G & 5G Output Power	Wdd	Szs
1.8	2019/06/28	Update sensitivity criteria	Lxy	Szs
1.9	2019/08/05	Add 5G mcs7 criteria	Lxy	Szs
2.0	2019/08/27	update 5G tx criteria	Lxy	Szs

CONTENTS

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 mechanisms 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, USB interface for Bluetooth.

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

1.2 Features

- Highly integrated wireless local area network(WLAN) system-on-chip (SOC) for 5 GHZ 802.11ac, or 2.4G/5G 802.11n WLAN applications.
- Supports 20/40MHz at 2.4GHz and supports 20/40/80MHz at 5GHz
- Supports Bluetooth V4.2+HS, BLE and be backwards compatible with Bluetooth 1.2, 2.X+ enhance data rate.
- Supports WLAN-Bluetooth coexistence.
- Supports Bluetooth for class1、class2 and class 3 power level transmissions without requiring an external PA.

Block Diagram:
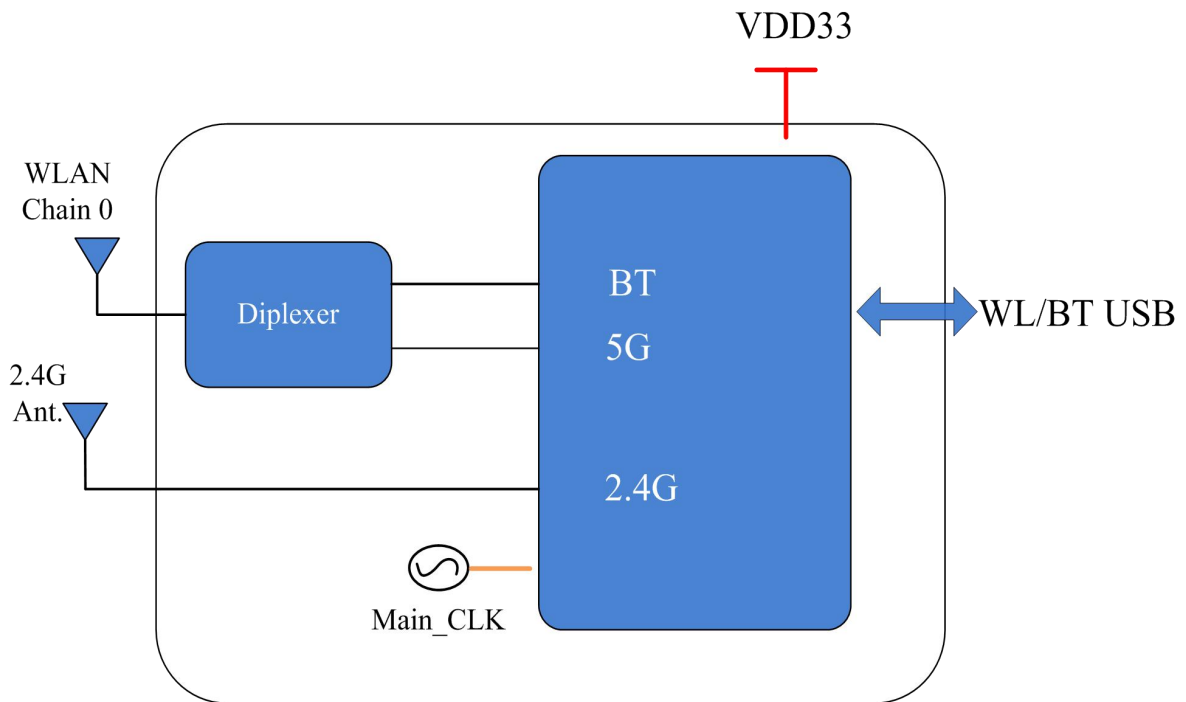
1.3 General Specification

Model Name	6221E-UUC
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 13 x 12.2 x1.6 mm
Wi-Fi Interface	USB 2.0
BT Interface	USB 2.0
Operating temperature	0°C to 70°C
Storage temperature	-55°C to 125°C
RoHS	All hardware components are fully compliant with EU RoHS directive

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		VCC33 = 3.3V(Unit:mA)			
	Wi-Fi on Mode	90			
	TX (2.4G HT40)	241			
	RX (2.4G HT40)	115			
	TX (5G HT80)	219			
	RX (5G HT80)	128			
	BT on	4			

※1.5 EEPROM Information

Wi-Fi

Vendor ID	0BDA
Product ID	C820

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			
Output Power	802.11b /11M : 16 dBm ± 1.5 dB @ EVM $\leq$ -9dB			
	802.11g /54M : 16 dBm ± 1.5 dB @ EVM $\leq$ -26dB			
	802.11n /MCS7 : 15 dBm ± 1.5 dB @ EVM $\leq$ -30dB			
	Other data rate TX power control by 'power by rate'			
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/-34/-42	-	dBr

2st side lobes(to fc ± 22MHZ)	-	-55/-41/-52	-	dBr
Freq. Tolerance	-20/-20/-20	-	20/20/20	ppm

Receive Sensitivity (11b) @8% PER	- 1Mbps	PER @ -92 dBm, typical	≤-85
	- 2Mbps	PER @ -90 dBm, typical	≤-83
	- 5.5Mbps	PER @ -87 dBm, typical	≤-81
	- 11Mbps	PER @ -85 dBm, typical	≤-79

Receive Sensitivity (11g) @10% PER	- 6Mbps	PER @ -89 dBm, typical	≤-85
	- 9Mbps	PER @ -88 dBm, typical	≤-84
	- 12Mbps	PER @ -87 dBm, typical	≤-82
	- 18Mbps	PER @ -84 dBm, typical	≤-80
	- 24Mbps	PER @ -81 dBm, typical	≤-77
	- 36Mbps	PER @ -78 dBm, typical	≤-73
	- 48Mbps	PER @ -73 dBm, typical	≤-69
	- 54Mbps	PER @ -71 dBm, typical	≤-68

Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0	PER @ -89 dBm, typical	≤-85
	- MCS=1	PER @ -86 dBm, typical	≤-82
	- MCS=2	PER @ -84 dBm, typical	≤-80
	- MCS=3	PER @ -80 dBm, typical	≤-77
	- MCS=4	PER @ -77 dBm, typical	≤-73
	- MCS=5	PER @ -72 dBm, typical	≤-69
	- MCS=6	PER @ -71 dBm, typical	≤-68
	- MCS=7	PER @ -69 dBm, typical	≤-67

Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER @ -87 dBm, typical	≤-82
	- MCS=1	PER @ -83 dBm, typical	≤-79
	- MCS=2	PER @ -82 dBm, typical	≤-77
	- MCS=3	PER @ -78 dBm, typical	≤-74
	- MCS=4	PER @ -74 dBm, typical	≤-70
	- MCS=5	PER @ -70 dBm, typical	≤-66
	- MCS=6	PER @ -68 dBm, typical	≤-65
	- MCS=7	PER @ -67 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[1]

Modulation	802.11a/n: 64-QAM,16-QAM, QPSK, BPSK	
	802.11ac : 256-QAM, 64-QAM,16-QAM, QPSK, BPSK	
Output Power	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	
	Other rate Tx power control by 'power by rate'	
Receive Sensitivity (11a, 20MHz) @10% PER	- 6Mbps PER @ -86 dBm, typical	≤-85
	- 9Mbps PER @ -86 dBm, typical	≤-84
	- 12Mbps PER @ -85 dBm, typical	≤-82
	- 18Mbps PER @ -83 dBm, typical	≤-80
	- 24Mbps PER @ -79 dBm, typical	≤-77
	- 36Mbps PER @ -76 dBm, typical	≤-73
	- 48Mbps PER @ -71 dBm, typical	≤-69
	- 54Mbps PER @ -70 dBm, typical	≤-68
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 @ -68 dBm, typical	≤-68
	- MCS=7 PER @ -67 dBm, typical	≤-67
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
	- MCS=8	PER @ -63 dBm, typical	≤-61
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 @ -63 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

[1]5GHz 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
	140	5700
5.725GHz~5.825GHz	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

3 Bluetooth Specification

3.1 Bluetooth Specification

Feature	Description
General Specification	
Bluetooth Standard	Bluetooth V4.2 of 1, 2 and 3 Mbps.
Host Interface	USB
Antenna Reference	Small antennas with 0~2 dBi peak gain
Frequency Band	2402 MHz ~ 2480 MHz
Number of Channels	79 channels
Modulation	GFSK, π/4-DQPSK, 8DPSK
RF Specification	

	Min.	Typical.	Max.
Output Power (Class 1.5)	4 dBm	8 dBm	12 dBm
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-88 dBm	
Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps)		-88 dBm	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-81 dBm	

Maximum Input Level	GFSK (1Mbps):-20dBm
	π/4-DQPSK (2Mbps) :-20dBm
	8DPSK (3Mbps) :-20dBm

4 Pin Assignments

4.1 Pin Outline

< TOP VIEW >
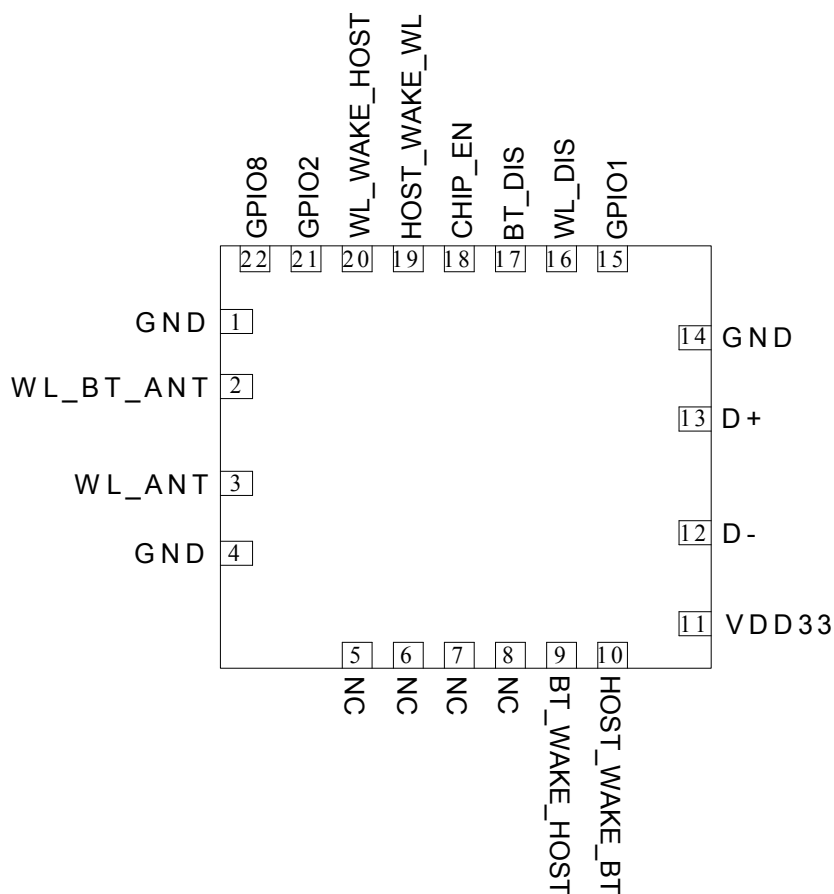
4.2 Pin Definition

| NO	Name	Type	Description	Voltage
1	GND	-	Ground connections	
2	WL_BT_ANT	I/O	5G Wi-Fi AND BT ANT	
3	WL_ANT	I/O	2.4G Wi-Fi ANT	
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	BT_WAKE_HOST	O	Bluetooth device to wake-up HOST Default low,High active.	3.3V
10	HOST_WAKE_BT	I	HOST to wake-up Bluetooth device Can keep this pin NC, using USB interface wake BT	3.3V
11	VDD33	P	3.3V POWER INPUT	3.3V
12	D-	I/O	USB DATA DM	

13	D+	I/O	USB DATA DP	
14	GND	-	Ground connections	
15	GPIO1	I/O	3DD_SYNC GPIO Can using for LTE coexistence control	3.3V
16	WL_DIS	I	Wi-Fi DISABLE, WL ON: pull high ; WL OFF: pull low External pull low to disable WLAN	3.3V
17	BT_DIS	I	Bluetooth DISABLE , BT ON: pull high ; BT OFF: pull low External pull low to disable BT	3.3V
18	CHIP_EN	I	CHIP ENABLE, Default ON: pull high ; OFF: pull low Module default pull high	3.3V
19	HOST_WAKE_WL	I	HOST to wake-up Wi-Fi device Default high, input Low wake up module	3.3V
20	WL_WAKE_HOST	O	Wi-Fi device to wake-up HOST Default low, output high to wake up host	3.3V
21	GPIO2	I/O	If not used, keep NC	3.3V
22	GPIO8	I/O	LED GPIO Conntect to LED cathode	3.3V
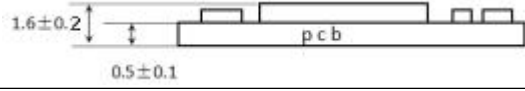
P:POWER   I:INPUT   O:OUTPUT

5 Dimensions

5.1 Physical Dimensions and Module Photo

(Unit: mm)

L x W : 13 x 12.2 mm	< TOP VIEW >
	12.2(+0.3/-0.1) 13.0(+0.3/-0.1) Main IC
H: 1.6 mm	< Side View >
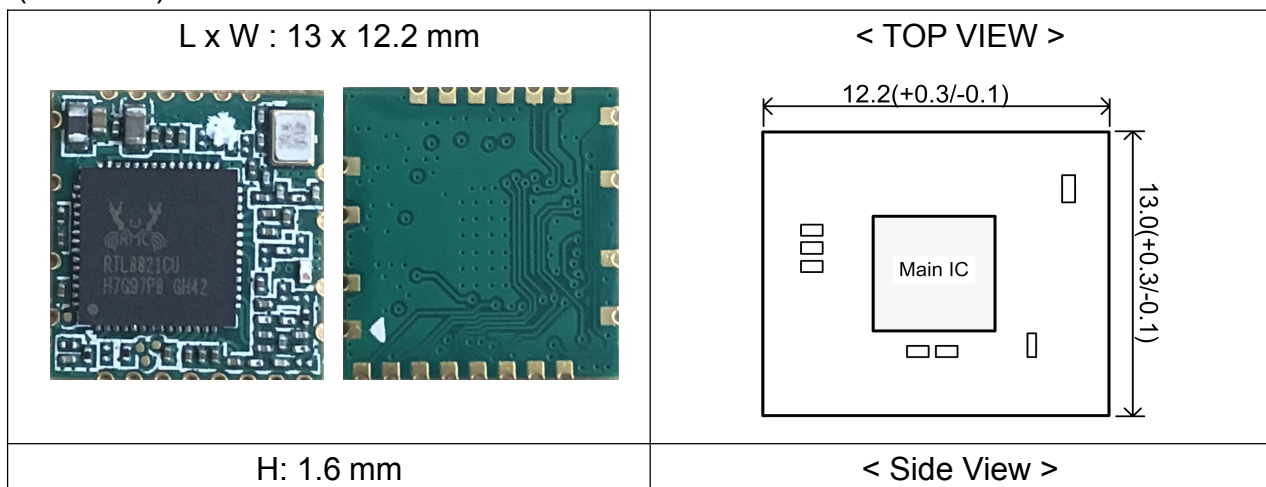
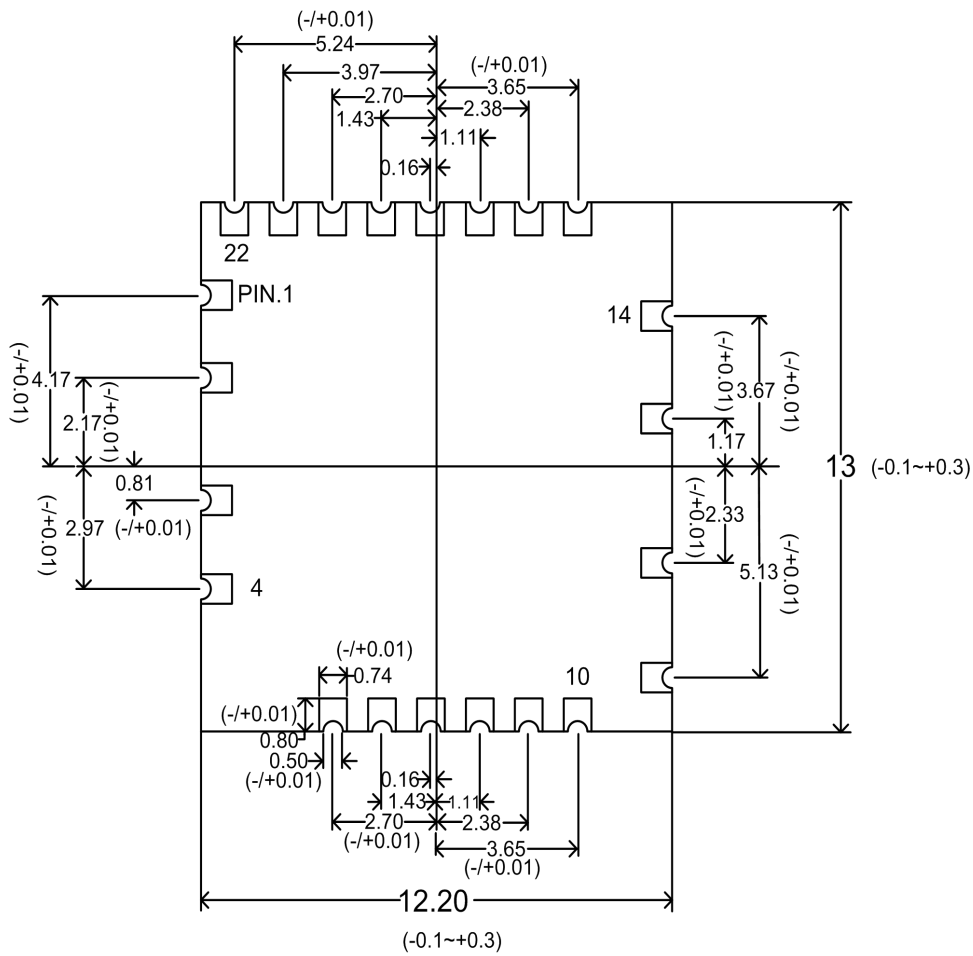|	
	1.6±0.2 pcb 0.5±0.1
Weight	0.45g

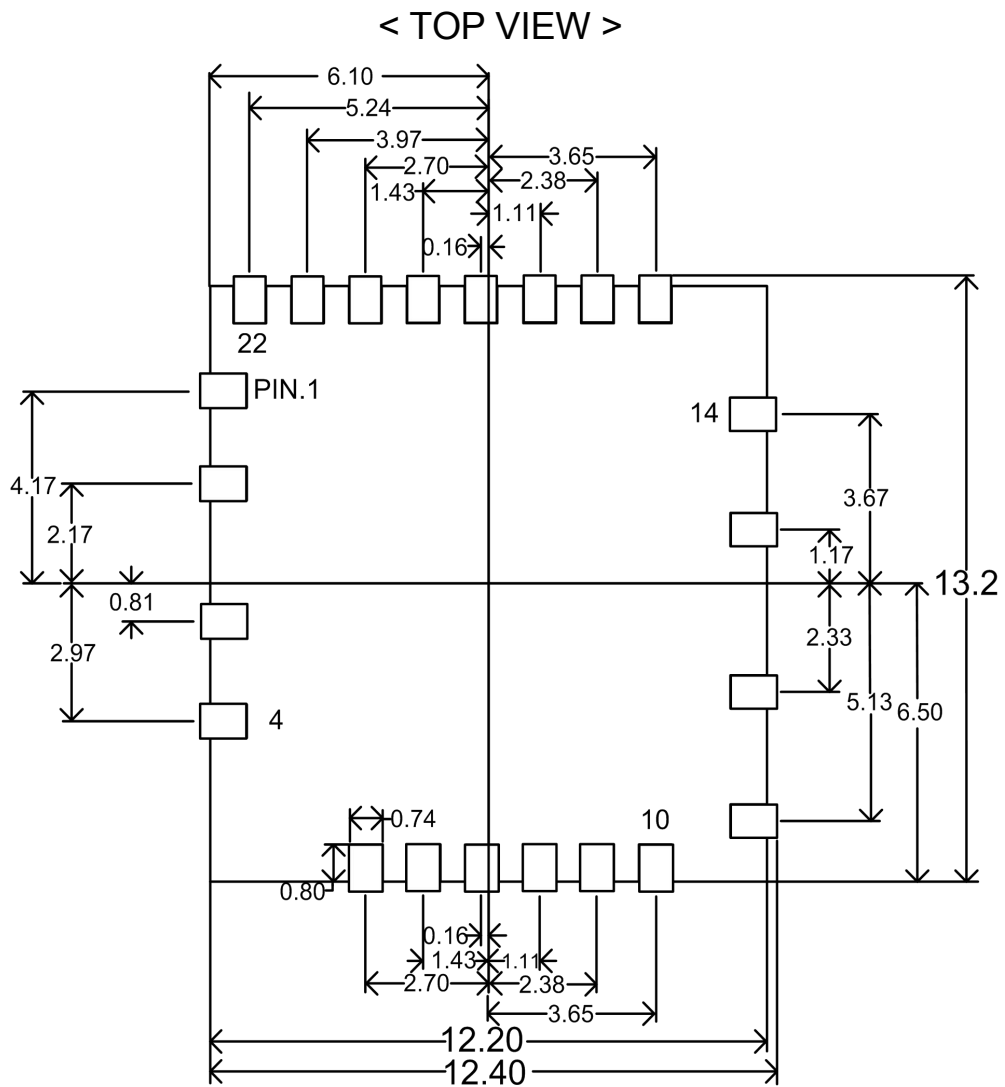## 5.2 Module Physical Dimensions

(Unit: mm)

< TOP VIEW >

5.3 Layout Recommendation

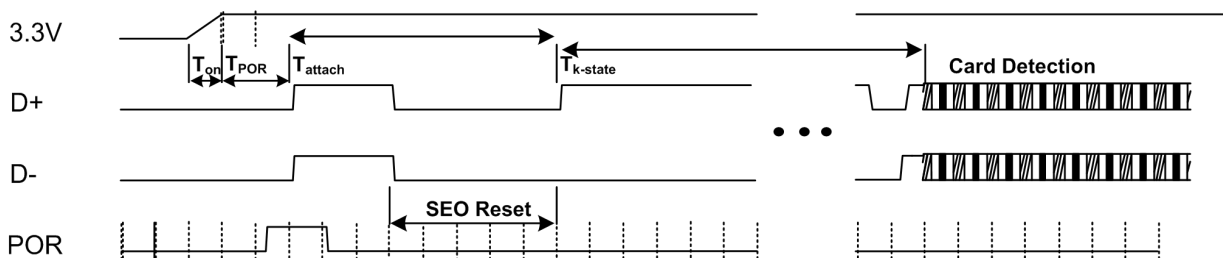(Unit: mm)

< TOP VIEW >

6 Interface Timing Specification

6.1 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 staring 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	--

7 Reference Design
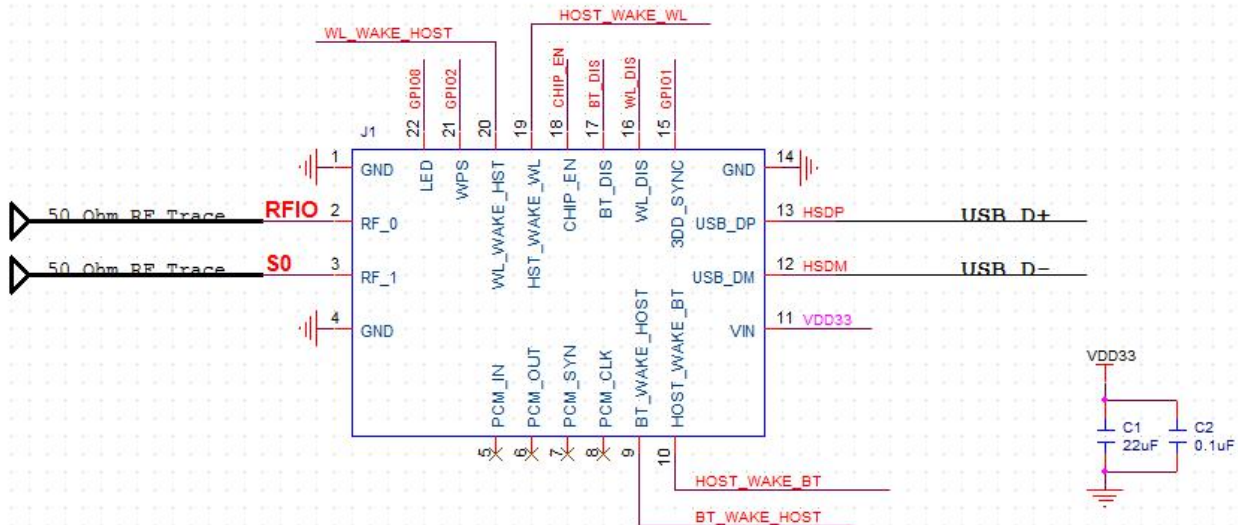
Note:

- Module requires independent power supply , supply capacity greater than 600mA and ripple less than 100mv;

- Attention to power up timing;

- Do not share power with amplifier, infrared device, camera, etc.

8 Ordering Information

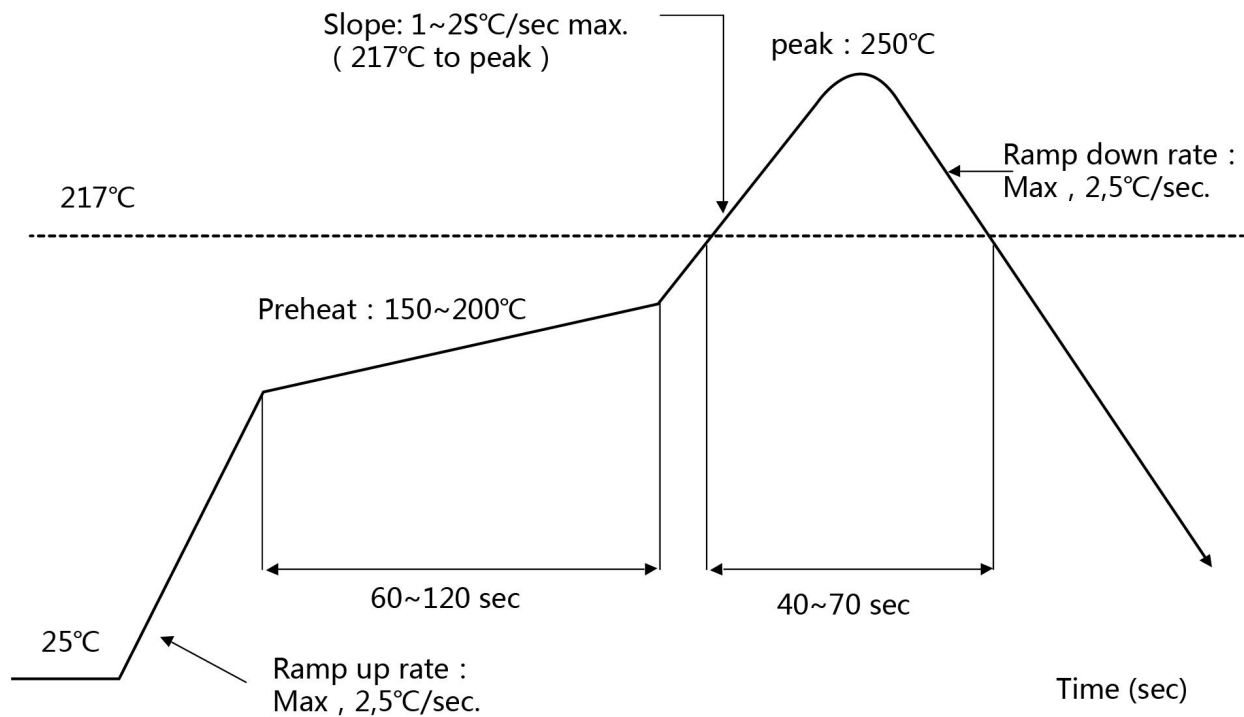| Part No.	Description
FG6221EUUC-00	6221E-UUC 802.11a/b/g/n/ac 1T1R+BT4.2, Diversity dual antenna, No PCM interface

9 The Key Material List

Main	Inductor	0603 2.2UH,±20% 850mA MPH160809S2R2MT (Sunlord)
Alternative	Inductor	0603 2.2UH,20% 850mA MGFL1608F2R2MT-LF（Microgate）
Main	Diplexer	Diplexer 2G&5GHz 50 OHM，DPX1005 /LFD152G45MU7E010 (Murata)
Alternative	Diplexer	DP1005-E2455FBT/LF (ACX)
Main	Crystal	2520 40MHZ 15PF, 10ppm SX25Y040000BF1T-C(TKD)
Alternative	Crystal	2520 40MHZ 15PF, 10ppm (TST)
Alternative	Crystal	2520 40MHZ 15PF, 10ppm -30+85℃ E2SB40E00001AE (HOSONIC)
Alternative	Crystal	2520 40MHZ 15PF, 10ppm 8Z40000022 (TXC)
Main	Chipset	RTL8821CU-CG MQFN56

10 Recommended Reflow Profile

Referred to IPC/JEDEC standard.
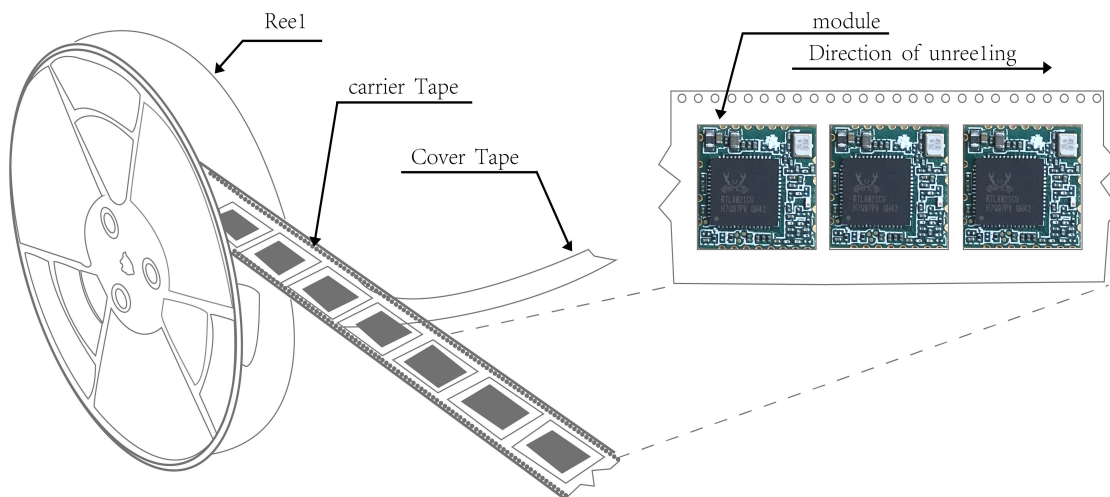
Peak Temperature : <250°C

Number of Times : ≤2 times

Slope: 1~2S°C/sec max.
(217°C to peak)

peak : 250°C

Ramp down rate :
Max , 2,5°C/sec.

217°C

Preheat : 150~200°C

60~120 sec

40~70 sec

25°C

Ramp up rate :
Max , 2,5°C/sec.

Time (sec)

11 Package Information

11.1 Reel

A roll of 2000pcs

11.2 Packaging Detail

the take-up package

Using self-adhesive tape
Size of black tape:24mm*32.6m   the cover tape   :2.13mm*32.6m
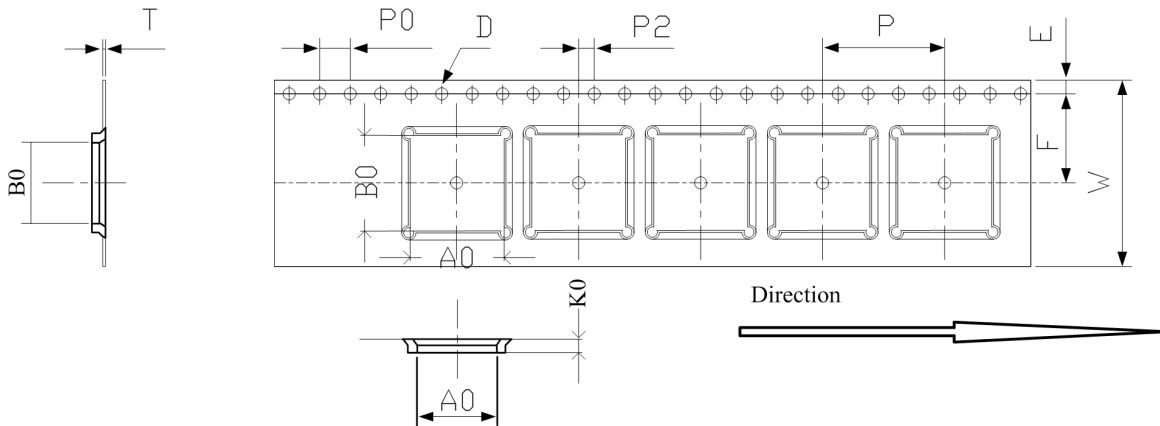Color of plastic disc:blue

A roll of 2000pcs

NY bag size:460mm*385mm

size ： 350*350*35mm

The packing case size:350*210*370mm

11.3 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

11.4 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

12 Certification Information

12.1 CE

RF Power(EIRP):

17.38dBm (2412MHz-2472MHz)   2.4G WiFi

9.72dBm   (2402MHz-2480MHz)   BT4.2+EDR

9.66dBm   (2402MHz-2480MHz)   BLE

12.85dBm   (5150MHz-5250MHz & 5725MHz-5850MHz)   5G WiFi

Caution:

1.The max operating of the EUT is 70°C. and shouldn't be lower than 0°C.

2.The module complies with RF specifications when the device used at 20cm form your body.

3.Declaration of Conformity

We,   HUNAN FN-LINK TECHNOLOGY LIMITED hereby, declare that the essential requirements compliance with the Directive 2014/53/EU.have been fully fulfilled on our product with indication below:

Product Name: Wi-Fi Dual-band 1X1 11ac +Bluetooth 4.2 Combo Module

Brand Name :   Fn-Link

Model :   6221E-UUC

This product can be used across EU member states.

12.2 FCC

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:(1) This device may not cause harmful interference, and(2) This device must accept any interference received, including interference that may cause undesired operation.