FN-LINK欧智通

PRODUCT SPECIFICATION

6222M-PUC

Wi-Fi Dual-band 2T2R 11ac + Bluetooth 5.0

Combo Module

Version:v2.3

6222M-PUC Module Datasheet

	Part NO.	Description
Ordering Information	FG6222MPUC-00	RTL8822CE-CG, a/b/g/n/ac, Wi-Fi+BT5.0, 2T2R, 22X30mm, PCIE+USB,M.2 port, PCB Version V1.0
	FG6222MPUC-01	RTL8822CE-CG,2.4G+5G/802.11b/g/n/ac,2T2R+BT5.0,PCIE+USB,22*30,M.2 port,PCB V2.0

Customer: _____

Customer P/N:_____

Signature:_____

Date:_____

Office: 14th floor, Block B, phoenix zhigu, Xixiang Street, Baoan District, Shenzhen

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Revision History

Version	Date	Contents of Revision Change	Draft	Checked	Approved
V1.0	2021/07/14	Initial Release	TZQ	TZQ	QJP
V2.0	2021/09/18	Update pictures and Marking Description	TZQ	TZQ	QJP
V2.1	2022/01/18	Update the specification format Add appearance diagram Added version -01	FC	TZQ	QJP
V2.2	2022/06/01	Update packaging information Change RF power tolerance to±2dBm	FC	TZQ	QJP
V2.3	2022/06/13	Update Power On Sequence	FC	TZQ	QJP

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 PCIe 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 2x2 MIMO standard and it can achieve up to a speed of 866.7Mbps to connect the wireless LAN. The integrated module provides PCIe interface for Wi-Fi, USB interface for Bluetooth.

This compact module is a total solution for a combination of Wi-Fi and Bluetooth v5.0 technologies. The module is specifically developed for all portable devices.

1.2 Description

Model Name	6222M-PUC
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 22 x 30 x 2.2 (typical) mm
Wi-Fi Interface	Support PCIe
BT Interface	USB
OS supported	Android /Linux/ Win CE /iOS /XP/WIN7/WIN10
Operating temperature	0° C to70° C
Storage temperature	-55° C to 85° C

2. Features

General

- IEEE 802.11a/b/g/n/ac compatible WLAN
- Supports 20/40MHz at 2.4GHz and supports 20/40/80MHz at 5GHz
- Supports 802.11ac 2x2, Wave-2 compliant with MU-MIMO
- Complete 802.11n MIMO solution for 2.4GHz and 5GHz band
- Enhanced BT/Wi-Fi Coexistence Control to improve transmission quality in different profiles
- Integrated 32K oscillator for power management

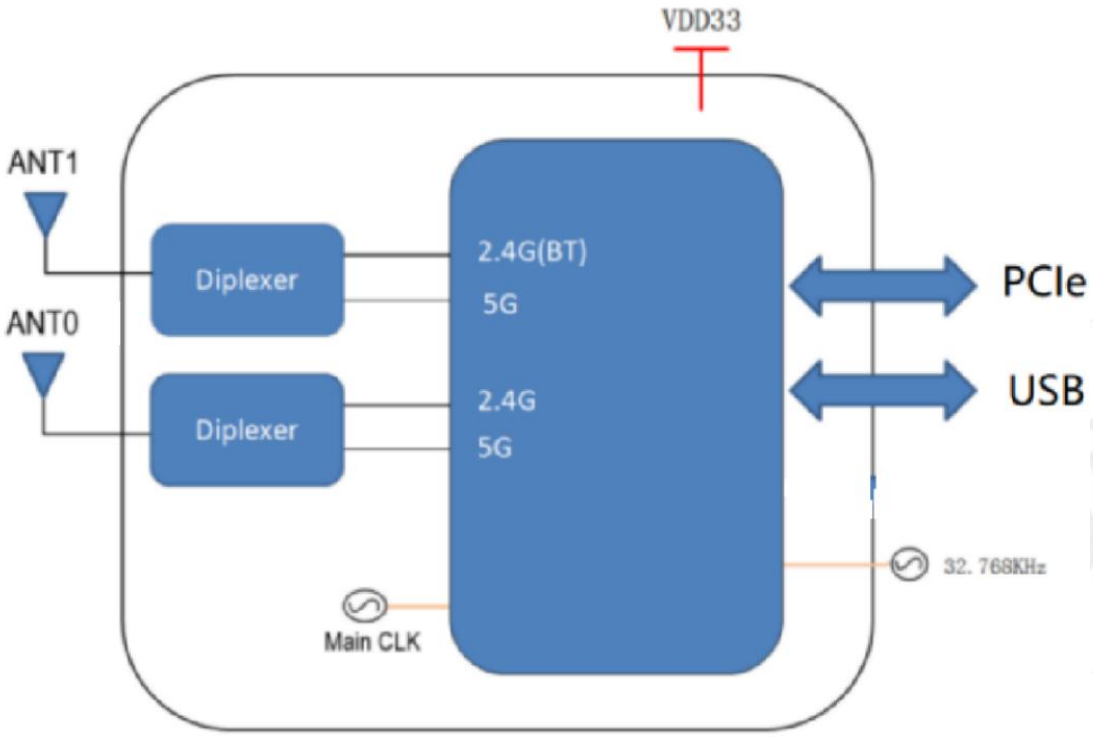
Host Interface

- Supports low power PCIe(Base Specification Revision 1.1) interface for WLAN and USB(2.0 FS-mode)

Bluetooth Features

- Supports Bluetooth 5.0 system
- Compatible with Bluetooth v2.1+EDR
- Dual Mode support: Simultaneous LE and BR/EDR
- Supports Bluetooth for class1, class2 and class3 power level transmissions without requiring an external PA

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	2.412 GHz ~ 2.484 GHz (2.4 GHz ISM Band)	
Number of Channels	2.4GHz：Ch1 ~ Ch14	
Test Items	**Typical Value**	**EVM**
Output Power	802.11b /11Mbps : 17dBm ± 2 dB	EVM ≤ -9dB
	802.11g /54Mbps : 16dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7 : 15dBm ± 2 dB	EVM ≤ -28dB
	Other data rates output power are defined by driver's power by rates mechanism	

Spectrum Mask	Meet with IEEE standard		
Freq. Tolerance	±20ppm		
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps	PER ≤ -92dBm	≤-83dBm
	- 11Mbps	PER ≤ -84dBm	≤-76dBm
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps	PER ≤ -89dBm	≤-85dBm
	- 54Mbps	PER ≤ -70dBm	≤-68dBm
Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0	PER ≤ -88dBm	≤-85dBm
	- MCS=7	PER ≤ -68dBm	≤-67dBm
Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER ≤ -85dBm	≤-82dBm
	- MCS=7	PER ≤ -65dBm	≤-64dBm
Maximum Input Level	802.11b : -10 dBm		
	802.11g/n : -20 dBm		
Antenna Reference	Small antennas with 0~2 dBi peak gain		

4.2 5GHz RF Specification

Conditions : VBAT=3.3V ; VDDIO=3.3V ; Temp:25°C

Feature	**Description**	
WLAN Standard	IEEE 802.11a/n/ac, Wi-Fi compliant	
Frequency Range	4.900 GHz ~ 5.850 GHz (5.0 GHz ISM Band)	
Number of Channels	5.0GHz：Please see the table1	
Output Power	802.11a /54Mbps : 16 dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7 : 15 dBm ± 2 dB	EVM ≤ -28dB
	802.11ac /MCS9 : 13 dBm ± 2 dB	EVM ≤ -32dB
	Other data rates output power are defined by driver's power by rates mechanism	
Test Items	**Test Value**	**Standard Value**
Receive Sensitivity (11a, 20MHz)@10% PER	- 6Mbps PER ≤ -89dBm	≤-85dBm
	- 54Mbps PER ≤ -70dBm	≤-68dBm
Receive Sensitivity (11n,20MHz)@10% PER	- MCS=0 PER ≤ -88dBm	≤-85dBm
	- MCS=7 PER ≤ -68dBm	≤-67dBm
Receive Sensitivity (11n,40MHz)@10% PER	- MCS=0 PER ≤ -85dBm	≤-85dBm
	- MCS=7 PER ≤ -65dBm	≤-65dBm
Receive Sensitivity (11ac,20MHz)@10% PER	- MCS=0 PER ≤ -86dBm	≤-83dBm
	- MCS=8 PER ≤ -63dBm	≤-60dBm
Receive Sensitivity	- MCS=0 PER ≤ -83dBm	≤-80dBm

(11ac,40MHz)@10% PER	- MCS=9 PER ≤ -59dBm	≤-55dBm
Receive Sensitivity (11ac,80MHz)@10% PER	- MCS=0 PER ≤ -82dBm	≤-79dBm
	- MCS=9 PER ≤ -56dBm	≤-54dBm
Maximum Input Level	802.11a/n : -30 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

[1]5GHz(20MHz) Channel table

Band range	Operating Channel Numbers	Channel center frequencies(MHz)
5180MHz~5240MHz	36	5180
	40	5200
	44	5220
	48	5240
5260MHz~5320MHz	52	5260
	56	5280
	60	5300
	64	5320
5550MHz~5700MHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
	140	5700
5745MHz~5825MHz	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

4.3 Bluetooth Specification

Feature	Description
General Specification	
Bluetooth Standard	Bluetooth V5.0 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, 8-DPSK		
RF Specification			
	Min(dBm)	**Typical**(dBm)	**Max**(dBm)
Output Power (Class 1)		5	
Sensitivity @ BER=0.1% for GFSK (1Mbps)			-70
Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps)			-70
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)			-70
Maximum Input Level	GFSK (1Mbps):-20dBm		
	π/4-DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

5. ID setting information

WI-FI

Vendor ID	10EC
Product ID	C822

BT

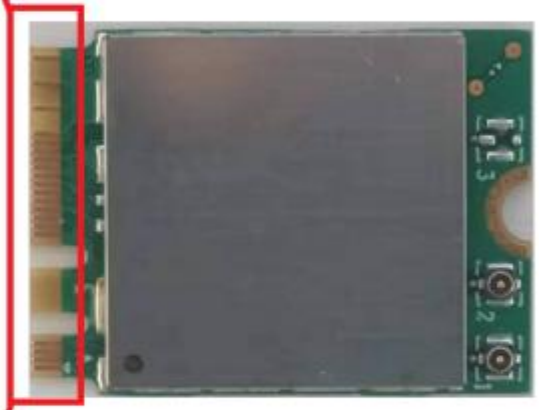
Vendor ID	0BDA
Product ID	C81D

6. Pin Definition

6.1 Pin Outline

< TOP VIEW >

PIN	Signal	Signal	PIN
74	NC	GND10	75
72	NC	NC	73
70	NC	NC	71
68	NC	GND9	69
66	NC	NC	67
64	NC	NC	65
62	NC	GND	63
60	NC	NC	61
58	NC	NC	59
56	WL_DIS_N	GND	57
54	BT_DIS_N	PEWAKE0	55
52	PERST0	CLKREQ0	53
50	SUSCLK	GND	51
48	COEX_RXD	REFCLKN0	49
46	COEX_TXD	REFCLKP0	47
44	COEX3	GND	45
42	NC	PETN0	43
40	NC	PETP0	41
38	VENDOR DEFINED	GND	39
36	NC	PERN0	37
34	NC	PERP0	35
32	NC	GND	33
30	NC	NC	31
28	NC	NC	29
26	NC	NC	27
24	NC	NC	25
22	NC	NC	23
20	NC	NC	21
18	GND	NC	19
16	LED_2#	NC	17
14	NC	NC	15
12	NC	NC	13
10	NC	NC	11
8	NC	NC	9
6	LED_1#	GND	7
4	3_3V	USB_D-	5
2	3_3V	USB_D+	3
		GND	1



6.2 Pin Definition details

NO	Name	Type	Description	Voltage
1	GND	-	Ground	
3	USB_D+	I/O	USB differential line for BT	
5	USB_D-	I/O		
7	GND	-	Ground	

9	NC	-	Floating (NC)	
11	NC		Floating (NC)	
13	NC		Floating (NC)	
15	NC		Floating (NC)	
17	NC	-	Floating (NC)	
19	NC	-	Floating (NC)	
21	NC	-	Floating (NC)	
23	NC	-	Floating (NC)	
25	NC		Floating (NC)	
27	NC		Floating (NC)	
29	NC		Floating (NC)	
31	NC		Floating (NC)	
33	GND	-	Ground	
35	PERP0	I	PCIe RX differential signals	
37	PERN0	I		
39	GND	-	Ground	
41	PETP0	O	PCIe TX differential signals	
43	PETN0	O		
45	GND	-	Ground	
47	REFCLKP0	I	PCIe clock differential input signal	
49	REFCLKN0	I		
51	GND		Ground	
53	CLKREQ0	O	PCIe reference clock request signal, open drain, active low	3.3V
55	PEWAKE0	O	PCIe wake up host, open drain, active low	3.3V
57	GND	-	Ground	
59	NC	-	Floating (NC)	
61	NC	-	Floating (NC)	
63	GND	-	Ground	
65	NC	-	Floating (NC)	
67	NC	-	Floating (NC)	
69	GND9	-	Ground	
71	NC	-	Floating (NC)	
73	NC	-	Floating (NC)	
75	GND10	-	Ground	

Bottom side

NO	Name	Type	Description	Voltage
2	3_3V	P	Power supply	3.3V
4	3_3V	P	Power supply	3.3V
6	LED_1#	O	WLAN LED signal	3.3V
8	NC	-	Floating (NC)	
10	NC	-	Floating (NC)	
12	NC	-	Floating (NC)	
14	NC	-	Floating (NC)	
16	LED_2#	O	BT LED signal	3.3V
18	GND	-	Ground	
20	NC	-	Floating (NC)	
22	NC	-	Floating (NC)	
24	NC		Floating (NC)	
26	NC		Floating (NC)	
28	NC		Floating (NC)	
30	NC		Floating (NC)	
32	NC		Floating (NC)	
34	NC	-	Floating (NC)	
36	NC	-	Floating (NC)	
38	VENDOR DEFINED	-	Host wake BT. No function, please don't connect to this pin.	
40	NC	-	Floating (NC)	
42	NC	-	Floating (NC)	
44	COEX3	I/O	LTE coexistence signal	3.3V
46	COEX_TXD	O	LTE coexistence signal	3.3V
48	COEX_RXD	I	LTE coexistence signal	3.3V
50	SUSCLK	I	Sleep clock input	3.3V
52	PERST0	I	PCIe reset signal, active low	3.3V
54	BT_DIS_N	I	Bluetooth disable signal, pull low to disable BT function	3.3V
56	WL_DIS_N	I	WLAN disable signal, pull low to WLAN Radio-off	3.3V
58	NC	-	Floating (NC)	
60	NC	-	Floating (NC)	

62	NC	-	Floating (NC)	
64	NC	-	Floating (NC)	
66	NC	-	Floating (NC)	
68	NC	-	Floating (NC)	
70	NC	-	Floating (NC)	
72	NC	-	Floating (NC)	
74	NC	-	Floating (NC)	

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
VDD33	3.0	3.3	3.6	V

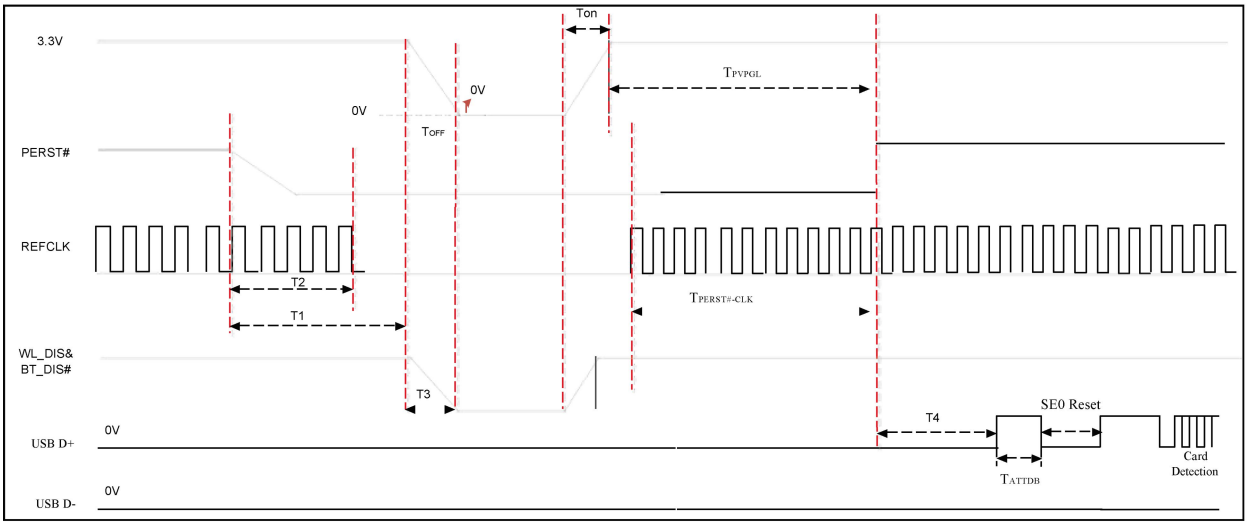
7.2 Power Consumption

Power Consumption	Wi-Fi only: TBD

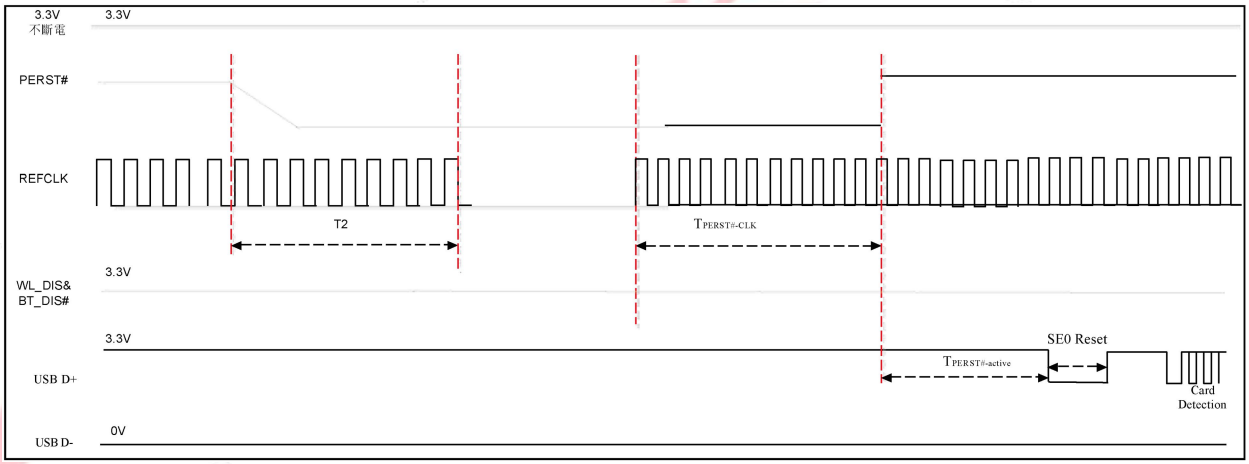
7.3 Interface Circuit time series

7.3.1 PCIe Bus during Power On Sequence

a. When WLAN is power off



b. When WLAN is NOT power off



RTL8822CE-CG PCIe and USB Bus Power On/Off Sequence

Ton: The main power ramp up duration

Toff: The main power off duration

TPVPGL: Power valid to PERST# input inactive

TPERST#-CLK: Reference clock stable before PERST# inactive

TATTDB: the debounce interval with a minimal duration of 100ms that provided by the USB system Software

TSE0 Reset: USB host send SE0 Reset duration

TPERST#-active: PCI-e initial duration after PERST# inactive

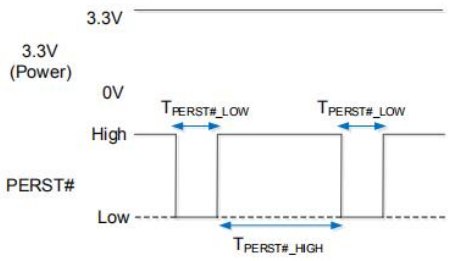
Note:

1. T1: PERST# goes active before the power on the connector is removed.
2. T2: Clock to inactive after PERST# goes active.
3. T3: WL_DIS# and BT_DIS# goes asserted when the power on the connector is removed.
4. T4: USB D+ go active after PERST# goes inactive.
5. T1/T2/T3/T4 timing value should large than 0.

Symbol	Unit	Min	Typic	Max
T_{on}	ms	0.5	1.5	5
T_{off}	ms	1.5		
T_{PVPGL}	ms	Implementation specific;recommended 50ms	--	--
$T_{PERST\#-CLK}$	us	100	--	--
T_{ATTDB}	ms	100	--	--
$T_{SE0\ Reset}$	ms	10	--	--
$T_{PERST\#-active}$	ms	10	--	--

The typical timing range

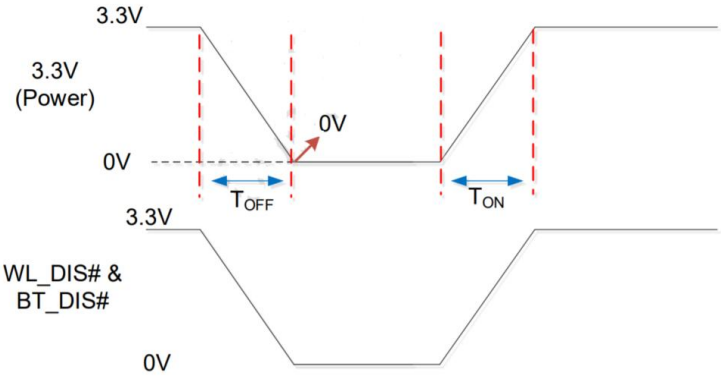
7.3.2 PCIe PERST# Timing Sequence



RTL8821CE-CG PCIE PERST# Timing Parameters

	Min	Typical	Max	Unit	Description
$T_{PERST\#\_LOW}$	6	10	X	ms	PERST# low duration
$T_{PERST\#\_HIGH}$	400	500	X	ms	PERST# high duration

7.3.3 Power Off Sequence

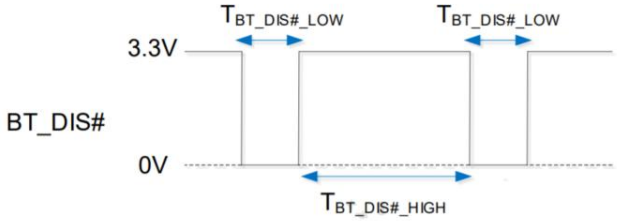


RTL8822CE-CG Power Off Timing Parameters

Symbol	Min	Typical	Max	Unit	Description
T_{OFF}	1.5ms	--	--	ms	Measure point start on 100% Measure point end on 0% (must be 0V)
T_{ON}	0.5	1.5	5	ms	Measure point start on 0% (must be 0V) Measure point end on 100%

Note: If BT_DIS# can't connect to the same power source with 3.3V, it need to be de-asserted before PERST# with 100ms in power on sequence.

7.3.4 BT_DIS Timing Sequence



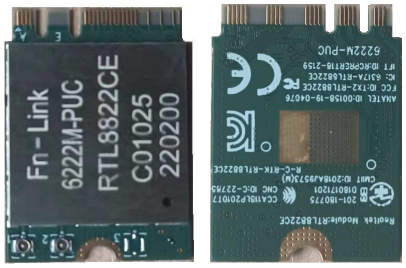
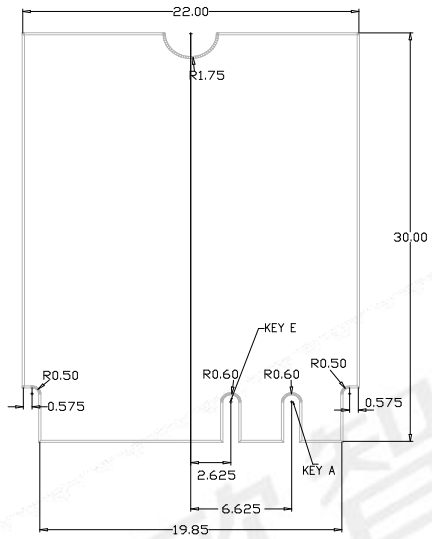
	Min	Typical	Max	Unit	Description
BT_DIS#_LOW	200	--	--	ms	BT_DIS# low duration
BT_DIS#_HIGH	500	--	--	ms	BT_DIS# high duration

7.3.5 Platform state transitions

3.3V Power range	3.3V Ripple	3.3V Noise	Rise time	
			Min	Max
+/-0.165V	300mVpp @ switching frequency > 100KHz		0.5ms	5ms

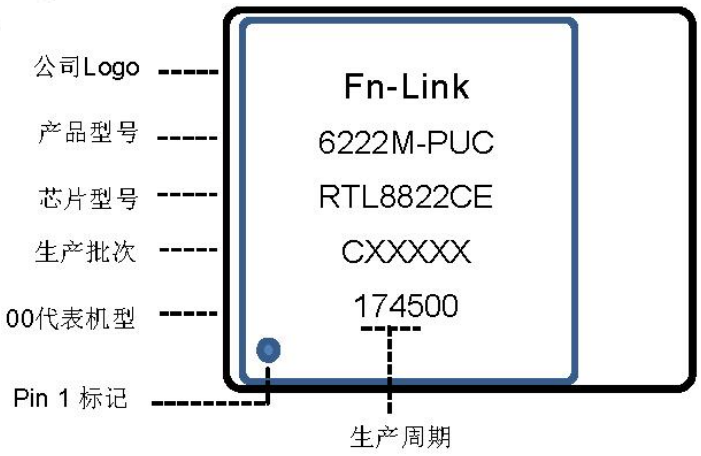
8. Size reference

8.1 Module Picture

L x W : 22 x 30 (+0.3/-0.1) mm 	
H: 2.2 (±0.2) mm	
Weight	2.6g

8.2 Marking Description

< TOP VIEW >

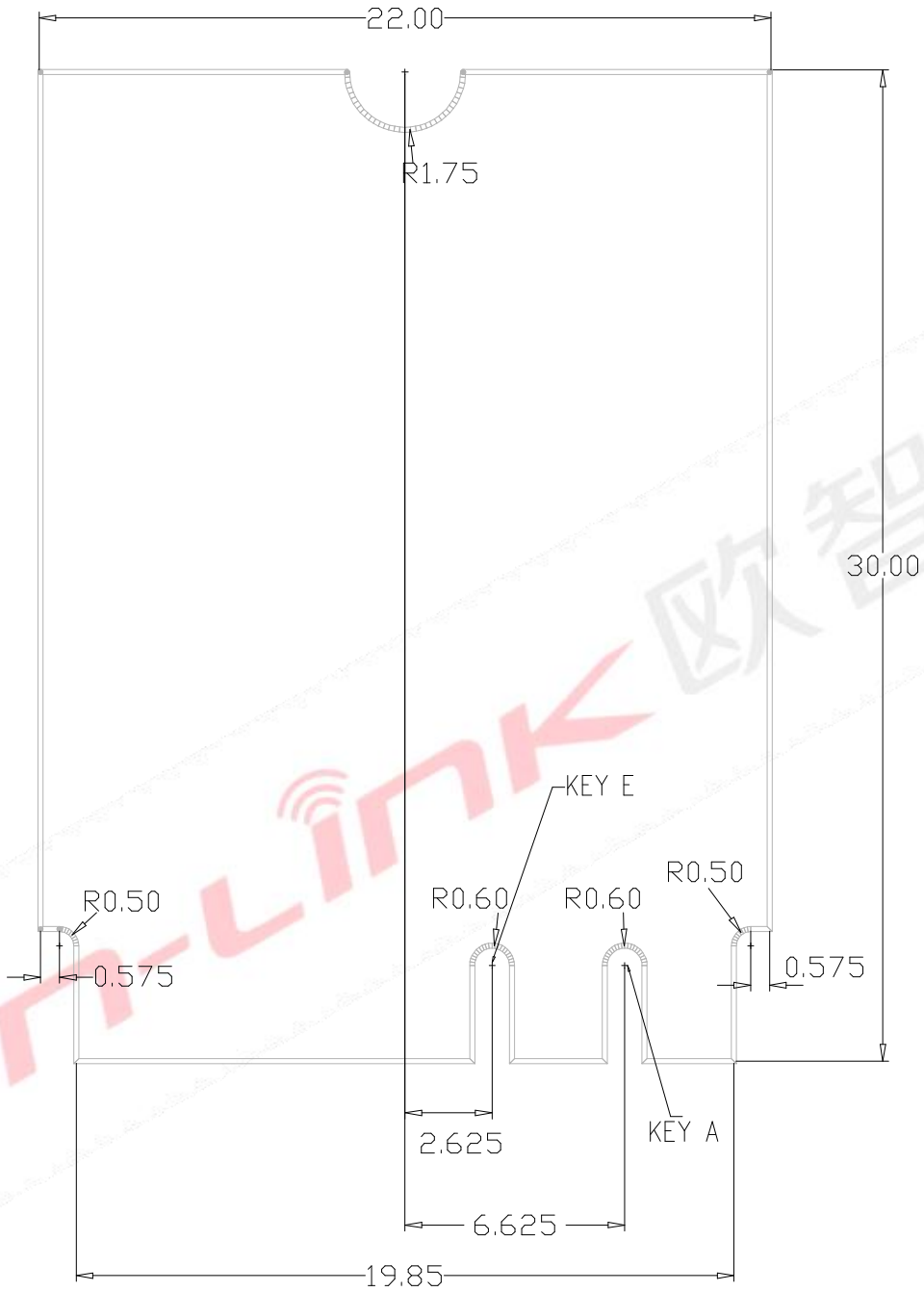


note：FG6222MPUC-00-----174500

FG6222MPUC-01-----174501

8.3 Physical Dimensions

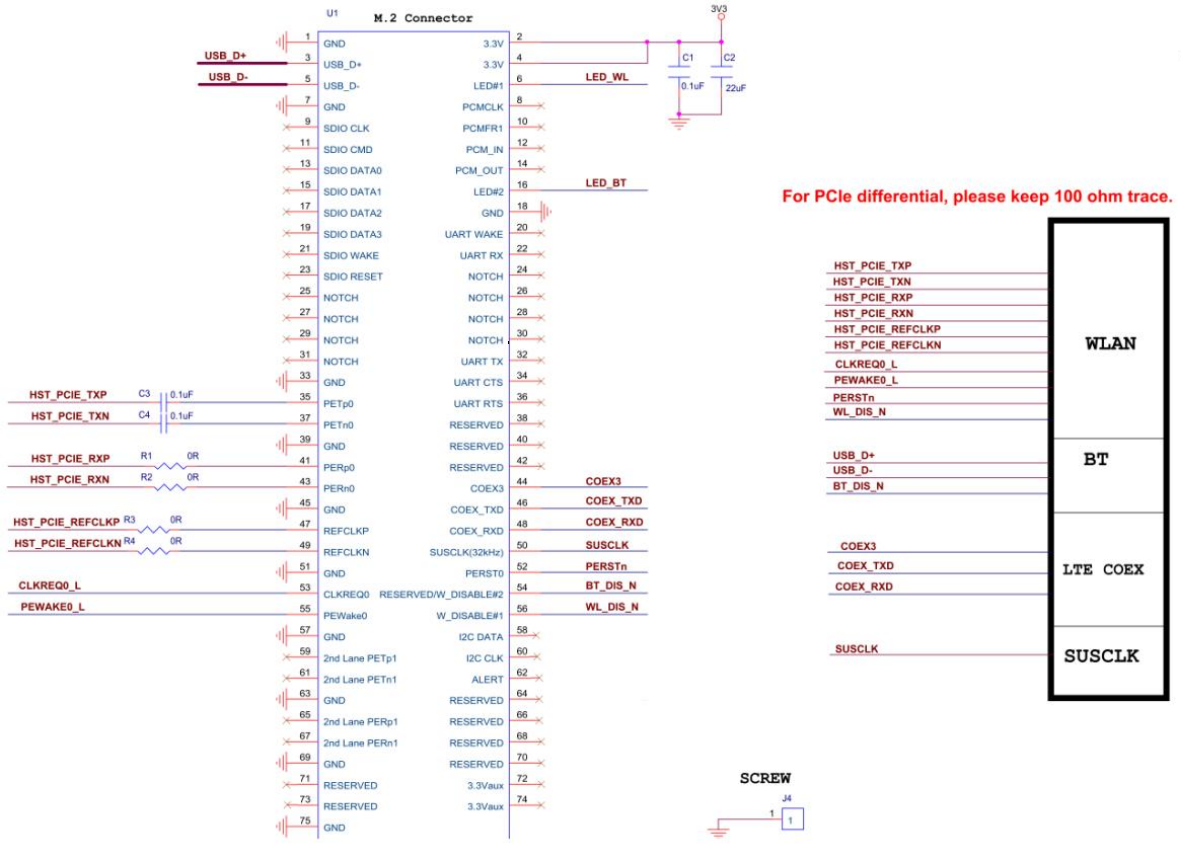
<TOP View>



9. The Key Material List

Item	Part Name	Description	Manufacturer
1	Inductor	2520 2.2UH ±20%,	Sunlord, Ceaiya, Cenker
2	Diplexer	1608 Dual-band, dual-mode 2.4GHz/5GHz WLAN	Glead, Walsin, ACX, Murata, MAG.LAYERS,ftrgroup
3	Crystal	3225 40MHz 15pF ±10ppm	ECEC, TKD, Hosonic, JWT, TXC
4	Chipset	RTL8822CE-CG	Realtek
5	PCB	6222M-PUC 22X30X0.8mm TG180	Brain-power, KX-pc，Sunlord, Piotek
6	Shielding	6222M-PUC Shielding cover	Suntech, JLitong

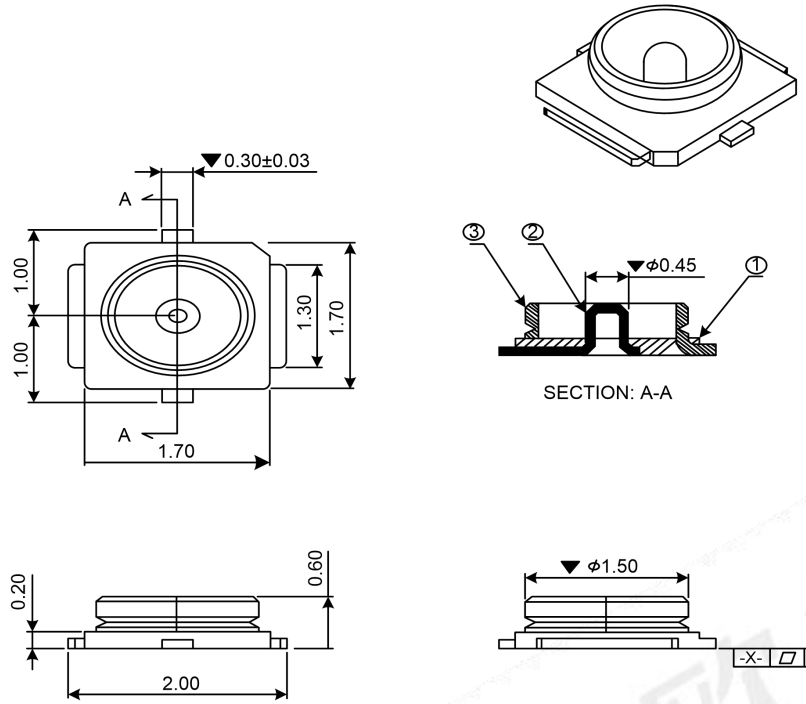
10. Reference Design



Note:

1. Both of the 2 ANTs are all support 2.4G/5G/BT function.
2. 6222M-PUC antenna port is control by driver if diversity function is enabled.
3. C1, C2 placed close to module side.
4. PCIe differential keep 100 ohm trace.
5. USB differential keep 90 ohm trace.

Connector Specification

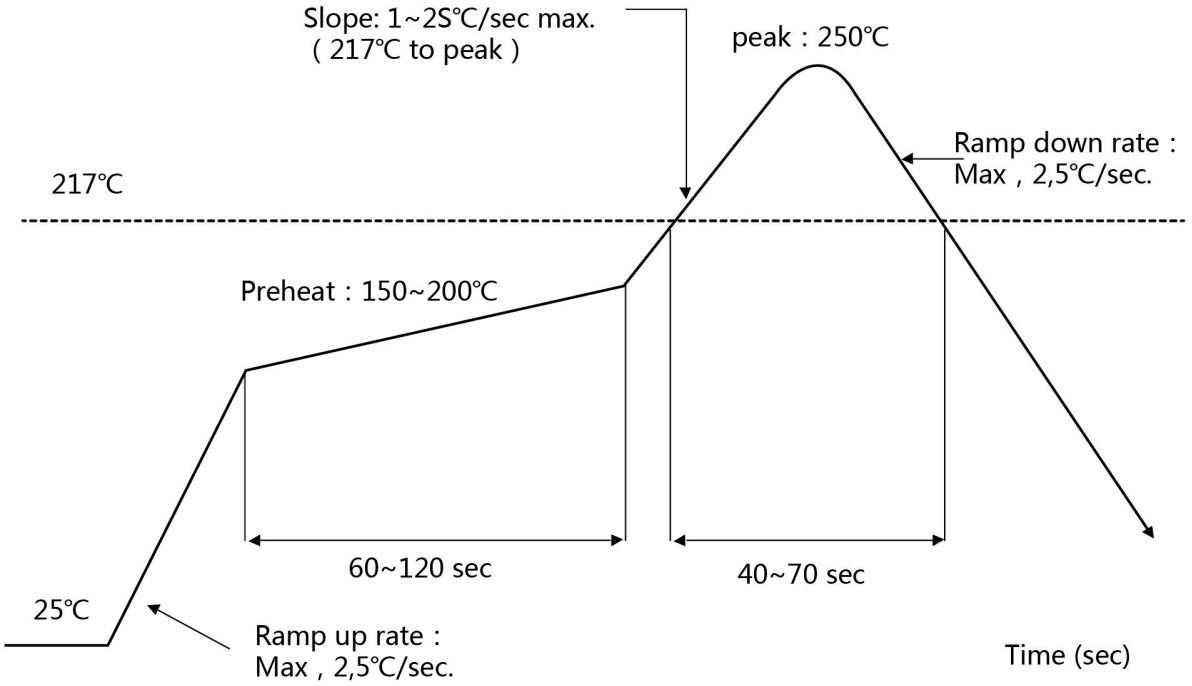


11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times



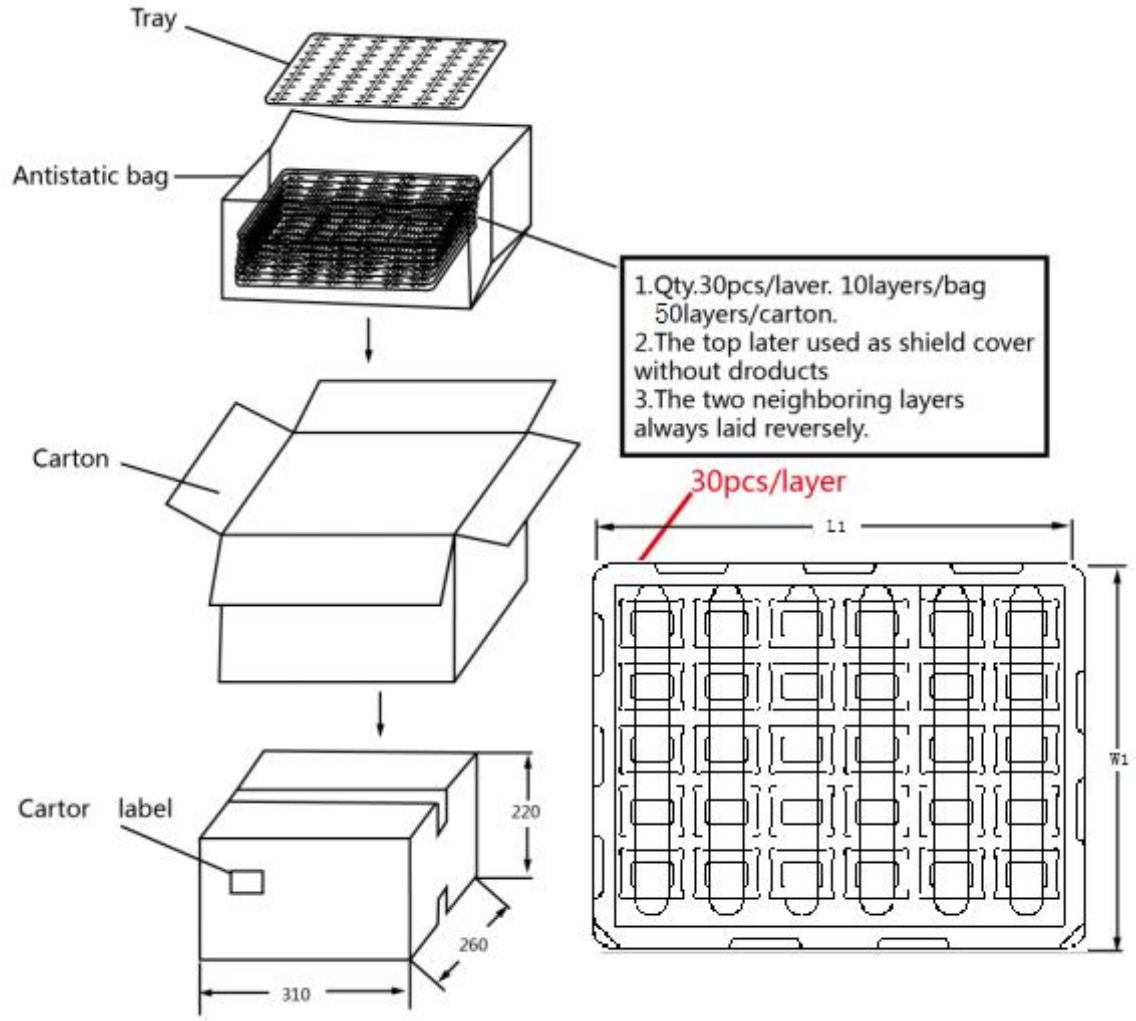
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

13. Package

13.1 Tray

Layer size: L250.0*W190.0 mm
Layer material: PVC
Carton size: L310.0*W260.0*H220.0 mm
Carton material: A=A



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°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

d) “IPC/JEDEC J-STD-033A paragraph 5.2” is respected

e) Baking is required if conditions b) or c) are not respected

f) Baking is required if the humidity indicator inside the bag indicates 10% RH or more