FN-LINK 欧智通

PRODUCT SPECIFICATION

6222N-IMA

Wi-Fi Dual-band 1x1 802.11a/b/g/n +BLE5.0

IOT Combo Module

Version:v1.4

6222N-IMA Module Datasheet

	Part NO.	Description
Ordering Information	FG6222NIMA-00	RTL8722DM,b/g/n/a,Wi-Fi+BLE5.0,1T1R,27X37mm,Uart+USB,with shielding,PCB antenna ,PCB 6V1
	FG6222NIMA-K0	RTL8722DM,b/g/n/a,Wi-Fi+BLE5.0,1T1R,27X37mm,Uart+USB,with shielding,PCB antenna ,PCB 6V1,客供 IC

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	2020/07/25	Initial release	Lxy	Lxy	Lgp
V1.1	2020/12/21	Update tx power limit	Lxy	Lxy	SZS
V1.2	2021/03/12	Update PCB to 0.8mm	Lxy	Lxy	SZS
V1.3	2021/07/08	Update BLE tx power	Lxy	Lxy	QJP
V1.4	2022/06/24	Update packaging details Update Features Change RF power tolerance to ±2dBm	Fc	Zzq	QJP

1. General Description

1.1 Introduction

6222N-IMA is a highly integrated IoT module with low power 802.11a/b/g/n Wireless LAN (WLAN) and Bluetooth Low Energy communication controller. It combines a high-performance KM4 MCU, a low power KM0 MCU, WLAN (802.11 a/b/g/n) MAC, a 1T1R capable WLAN baseband, RF, Bluetooth.

High speed connectivity interfaces, SDIO and USB are provided. Also audio codec, key-scan and touch keys integrated. Flexible design configures GPIO to different functions.

6222N-IMA integrates internal memories for complete Wi-Fi protocol functions.

1.2 Description

Model Name	6222N-IMA
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 27mm*37mm*3.15mm
Host Interface	SD,SDIO,USB,UART, SPI,I2C, GPIO...
Operating temperature	-20 ℃ to 85 ℃
Storage temperature	-40 ℃ to 125 ℃

2. Features

27*37mm with PCB antenna version

System and memory

- Dual processor core
- KM4: Armv8-M with cortex-m33
- KM0: Armv8-M with cortex-m23
- 512kB SRAM@200MHz
- 4MB PSRAM
- 4MB external flash
- 64 GPIO pins
- IPC: inter-processor communication

Wireless

- 802.11a/b/g/n 1x1 2.4G&5GHz
- 20MHz/40MHz up to MCS7
- Very low power suspends mode(DLPS)
- BLE5.0

Security

- Hardware engine: AES/DES/SHA hardware engine.
- Secure boot supported
- Debug port access protection and prohibition modes
- Secure efuse
- Flash decryption on the fly

Communication internaces

- SD/SDIO2.0 SDR25
- USB2.0
- SPI
- UART
- IR
- SGPIO
- I2C
- USI

Audio

- Sampling frequency:8/16/32/44.1/48/88.2/9KHz
- Integrates earphone driver 40mW on 16Ω load/ 20mW on 32Ω load
- Gain step: 0.375dB/step ,gain range: -64.5dB~0dB
- Audio output mode Line-out cap-less mode /differential mode/ single-ended mode
- I2S

Timer

- PWM
- RTC

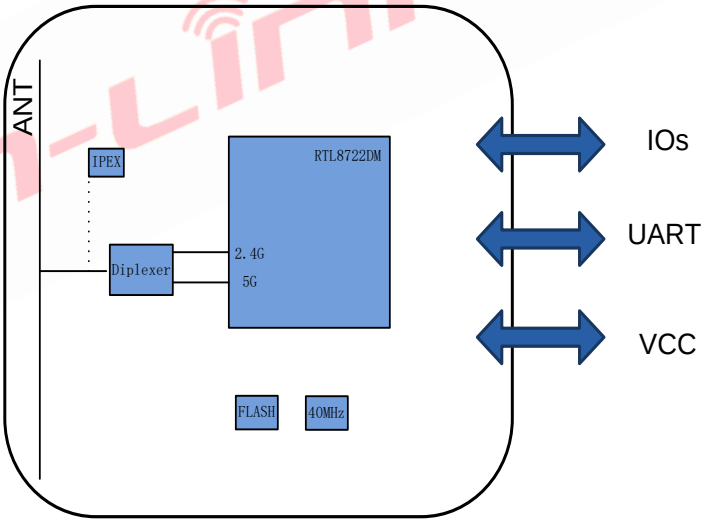
Human machine interaction

- Key-matrix
- Cap-touch
- LCD

Analog

- ADC

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	**Wi-Fi:** USA/Canada: channel 1~11; Europe/China/Australia: channel 1~13; Japan: channel 1~14	
Test Items	**Typical Value**	**EVM**
Output Power	802.11b /11Mbps : 18dBm ±2 dB	EVM ≤ -10dB
	802.11g /54Mbps : 17dBm ±2 dB	EVM ≤ -25dB
	802.11n /MCS7 : 16dBm ±2 dB	EVM ≤ -28dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	±20ppm	
Test Items	**TYP Test Value**	**Standard Value**
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps PER @ -94 dBm	≤-83 dBm
	- 2Mbps PER @ -92 dBm	≤-80 dBm
	- 5.5Mbps PER @ -89 dBm	≤-79 dBm
	- 11Mbps PER @ -87 dBm	≤-76 dBm
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps PER @ -89 dBm	≤-85 dBm
	- 9Mbps PER @ -88 dBm	≤-84 dBm
	- 12Mbps PER @ -87 dBm	≤-82 dBm
	- 18Mbps PER @ -86 dBm	≤-80 dBm
	- 24Mbps PER @ -84 dBm	≤-77 dBm
	- 36Mbps PER @ -80 dBm	≤-73 dBm
	- 48Mbps PER @ -77 dBm	≤-69 dBm
	- 54Mbps PER @ -75 dBm	≤-68 dBm
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -89 dBm	≤-85 dBm
	- MCS=1 PER @ -86 dBm	≤-82 dBm
	- MCS=2 PER @ -84 dBm	≤-80 dBm
	- MCS=3 PER @ -82 dBm	≤-77 dBm
	- MCS=4 PER @ -79 dBm	≤-73 dBm
	- MCS=5 PER @ -76 dBm	≤-69 dBm
	- MCS=6 PER @ -74 dBm	≤-68 dBm
	- MCS=7 PER @ -72 dBm	≤-67 dBm

SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0	PER @ -89 dBm	≤-82 dBm
	- MCS=1	PER @ -86 dBm	≤-79 dBm
	- MCS=2	PER @ -83 dBm	≤-77 dBm
	- MCS=3	PER @ -80 dBm	≤-74 dBm
	- MCS=4	PER @ -77 dBm	≤-70 dBm
	- MCS=5	PER @ -74 dBm	≤-66 dBm
	- MCS=6	PER @ -72 dBm	≤-65 dBm
	- MCS=7	PER @ -70 dBm	≤-64 dBm
Maximum Input Level	802.11b : -10 dBm		
	802.11g/n : -20 dBm		
Antenna Reference	PCB antenna with 0~2 dBi peak gain		

Note:1.MCS7 HT40 is calibrated,other rate power all control by firmware driver.

4.2 5GHz RF Specification

Feature	**Description**	
WLAN Standard	IEEE 802.11 a/n Wi-Fi compliant	
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz Band)	
Test Items	**Typical Value**	**EVM**
Output Power[1]	802.11a /54Mbps : 14dBm ± 2 dB	EVM ≤ -25dB
	802.11n HT20 /MCS7 : 13dBm ± 2 dB	EVM ≤ -28dB
	802.11n HT40 /MCS7 : 13dBm ± 2 dB	EVM ≤ -28dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	±20ppm	
Test Items	**Test Value**	**Standard Value**
SISO Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps PER @ -87 dBm	≤-85 dBm
	- 9Mbps PER @ -86 dBm	≤-84 dBm
	- 12Mbps PER @ -85 dBm	≤-82 dBm
	- 18Mbps PER @ -84 dBm	≤-80 dBm
	- 24Mbps PER @ -82 dBm	≤-77 dBm
	- 36Mbps PER @ -78 dBm	≤-73 dBm
	- 48Mbps PER @ -75 dBm	≤-69 dBm
	- 54Mbps PER @ -73 dBm	≤-68 dBm
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 PER @ -87 dBm	≤-85 dBm
	- MCS=1 PER @ -84 dBm	≤-82 dBm

	- MCS=2	PER @ -82 dBm	≤-80 dBm
	- MCS=3	PER @ -80 dBm	≤-77 dBm
	- MCS=4	PER @ -77 dBm	≤-73 dBm
	- MCS=5	PER @ -74 dBm	≤-69 dBm
	- MCS=6	PER @ -72 dBm	≤-68 dBm
	- MCS=7	PER @ -70 dBm	≤-67 dBm
SISO Receive Sensitivity (11n ,40MHz) @10% PER	- MCS=0	PER @ -87 dBm	≤-82 dBm
	- MCS=1	PER @ -84 dBm	≤-79 dBm
	- MCS=2	PER @ -81 dBm	≤-77 dBm
	- MCS=3	PER @ -78 dBm	≤-74 dBm
	- MCS=4	PER @ -75 dBm	≤-70 dBm
	- MCS=5	PER @ -72 dBm	≤-66 dBm
	- MCS=6	PER @ -70 dBm	≤-65 dBm
	- MCS=7	PER @ -68 dBm	≤-64 dBm
Maximum Input Level	802.11a/n: -20 dBm		
Antenna Reference	PCB antenna with 0~2 dBi peak gain		

Note:1.MCS7 HT40 is calibrated,other rate power all control by firmware driver.

2. all measurement is base on 3.3V power supply.

[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	BLE 5.0		
Host Interface	UART		
Frequency Band	2402 MHz ~ 2480 MHz		
Number of Channels	40 channels for BLE		
Modulation	GFSK, π/4-DQPSK		
RF Specification			
	Min(dBm)	**Typical**(dBm)	**Max**(dBm)
Output Power (Class 1)		8±1.5	
Sensitive @PER=30.8%			-70
Maximum Input Level	-10dBm		

5. ID setting information

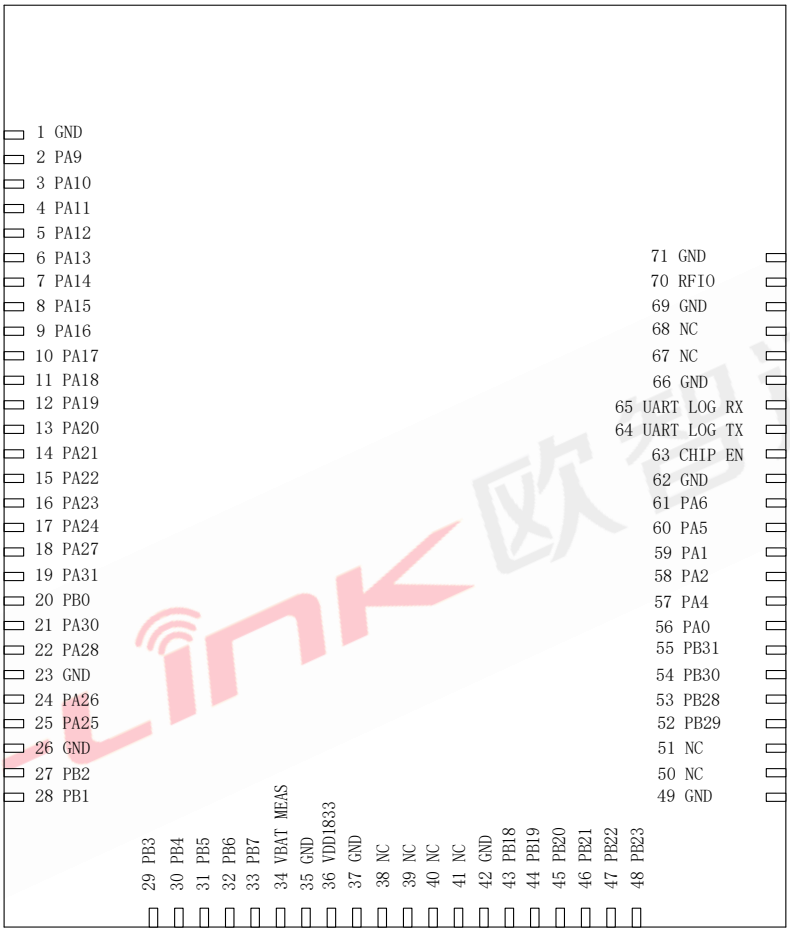
WI-FI

Vendor ID	-
Product ID	-

6. Pin Definition

6.1 Pin Outline

< TOP VIEW >



6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	GND	-	Ground connection	
2	PA9	I/O	Muti function IO	
3	PA10	I/O	Muti function IO	
4	PA11	I/O	Muti function IO	
5	PA12	I/O	Muti function IO	

6	PA13	I/O	Muti function IO	
7	PA14	I/O	Muti function IO	
8	PA15	I/O	Muti function IO	
9	PA16	I/O	Muti function IO	
10	PA17	I/O	Muti function IO	
11	PA18	I/O	Muti function IO	
12	PA19	I/O	Muti function IO	
13	PA20	I/O	Muti function IO	
14	PA21	I/O	Muti function IO	
15	PA22	I/O	Muti function IO	
16	PA23	I/O	Muti function IO	
17	PA24	I/O	Muti function IO	
18	PA27	I/O	Muti function IO Normal mode sel: normal operation, enter into test mode. Not allowed to pull down when power on.	
19	PA31	I/O	Muti function IO	
20	PB0	I/O	Muti function IO	
21	PA30	I/O	Muti function IO SPS SEL: SWR mode,(module pulled high) 0-LDO mode.	
22	PA28	I/O	Muti function IO	
23	GND	-	Ground connection	
24	PA26	I/O	Muti function IO, USB DP	
25	PA25	I/O	Muti function IO, USB DM	
26	GND	-	Ground connection	
27	PB2	I/O	Muti function IO	
28	PB1	I/O	Muti function IO	
29	PB3	I/O	Muti function IO	
30	PB4	I/O	Muti function IO	
31	PB5	I/O	Muti function IO	
32	PB6	I/O	Muti function IO	
33	PB7	I/O	Muti function IO	

34	VBAT MEAS	I	ADC IN	
35	GND	-	Ground connection	
36	VDD1833	P	POWER IN	1.8v or 3.3v
37	GND	-	Ground connection	
38	NC	-	No connection	
39	NC	-	No connection	
40	NC	-	No connection	
41	NC	-	No connection	
42	GND	-	Ground connection	
43	PB18	I/O	Muti function IO	
44	PB19	I/O	Muti function IO	
45	PB20	I/O	Muti function IO	
46	PB21	I/O	Muti function IO	
47	PB22	I/O	Muti function IO	
48	PB23	I/O	Muti function IO	
49	GND	-	Ground connection	
50	NC	-	No connection	
51	NC	-	No connection	
52	PB29	I/O	Muti function IO	
53	PB28	I/O	Muti function IO	
54	PB30	I/O	Muti function IO	
55	PB31	I/O	Muti function IO	
56	PA0	I/O	Muti function IO	
57	PA4	I/O	Muti function IO	
58	PA2	I/O	Muti function IO	
59	PA1	I/O	Muti function IO	
60	PA5	I/O	Muti function IO	
61	PA6	I/O	Muti function IO	
62	GND	-	Ground connection	
63	CHIP EN	I	Default high, Low shut down chip	
64	UART LOG TX	O	PA7, UART LOG OUT Uart download control: boot from flash, 0-download image from UART.	
65	UART LOG RX	I	PA8, UART LOG IN	
66	GND	-	Ground connection	
67	NC	-	No connection	

68	NC	-	No connection	
69	GND	-	Ground connection	
70	RFIO	I/O	RF port, is not used	
71	GND	-	Ground connection	

P:POWER I:INPUT O:OUTPUT

7. Electrical Specifications

7.1 Power Supply DC Characteristics

	MIN	TYP	MAX	Unit
Operating Temperature	-20	25	85	deg.C
VCC33	3.0	3.3	3.6	V

7.2 Power Consumption

Operation Mode		Condition	Current		Unit
Power Mode	Scenario		3.3V	1.8V	
Deepsleep	Deepsleep	RTC timer 1KB retention RAM	7~8	7 8	uA
	Deepsleep with Key-Scan	RTC timer 1KB retention RAM Key-Scan	12~13	12~13	uA
	Deepsleep with Cap-Touch	RTC timer	20	16	uA
	(average current)	1KB retention RAM Cap-Touch			
Sleep	WoWLAN sleep power	KM4 power gate KM0 clock gate All RAM retained Wi-Fi retained	30~50	30~50	uA
Active	Wi-Fi Tx	CCK 18dBm @3.3V， and 15dBm @1.8V KM4 in active mode	257	224	mA
		OFDM 19dBm @3.3V， and 13dBm @1.8V KM4 in active mode	262	214	mA
	Wi-Fi Rx Idle	HT20 MCS0~7 normal mode KM4 in active mode Rx idle	50	81	mA
		HT20 MCS0~7 ultra-low power mode KM4 in active mode Rx idle	35	60	mA
	Wi-Fi Rx UDP	HT20 MCS0~7 ultra-low power mode KM4 in active mode UDP Rx @ 8Mbps	39	67	mA
WoWLAN	WoWLAN Rx Beacon	Rx beacon mode @ normal mode KM4 in sleep mode	28	45	mA
		Rx beacon mode @ ultra-low power mode KM4 in sleep mode	23	39	mA
	WoWLAN DTIM=1 (Average)	KM4 in sleep mode All SRAM retained Wi-Fi retained Shielding room	700~800	1100~1200	uA
		KM4 in sleep mode All SRAM retained Wi-Fi retained Open space	1~2	1.1~2	mA

Note: Ultra-low power mode side effect:
- OFDM: Rx Sensitivity Degree 2~4dBm
- CCK: Rx Sensitivity Degree 1~2dBm

7.3 Interface Circuit time series

7.3.1 Timing Information

Power on or Resuming from Deepsleep Sequence

The timing sequence of power on or resuming from deepsleep is given in Fig 7-1.

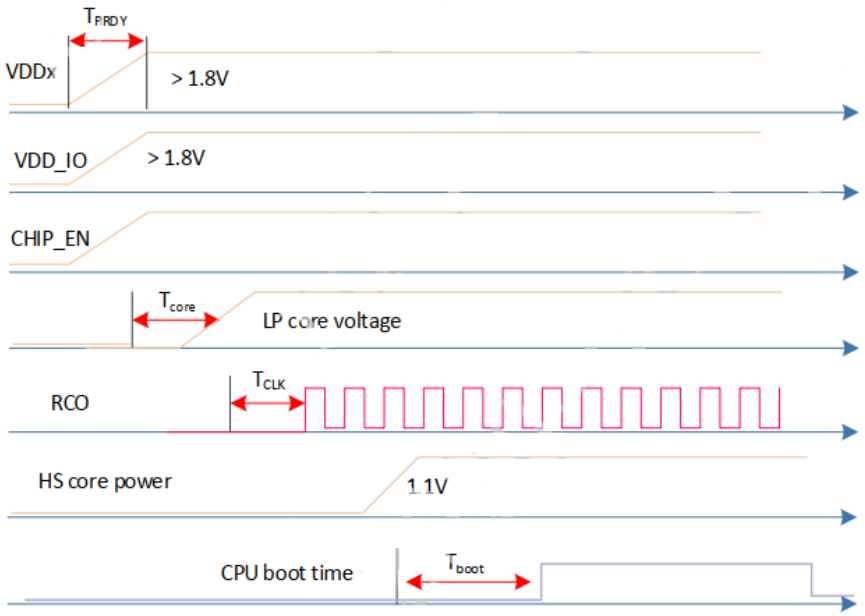


Fig 7-1 Timing sequence of power on or resuming from deepsleep

Shutdown Sequence

The timing sequence of shutdown is illustrated in Fig 7-2.

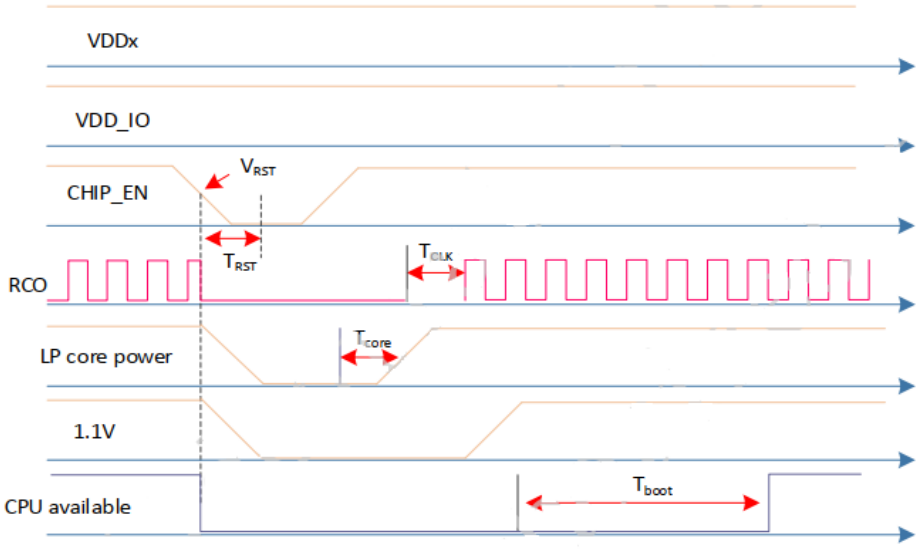
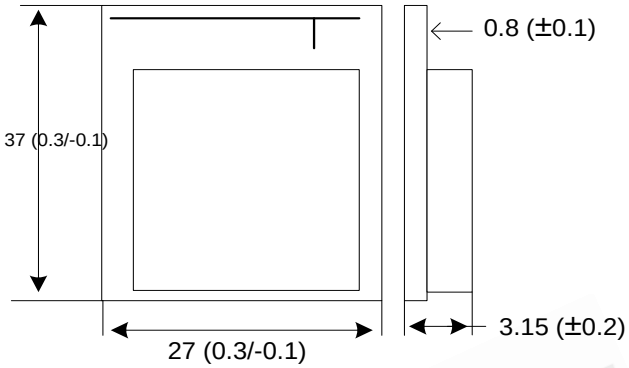


Fig 7-2 Timing sequence of shutdown

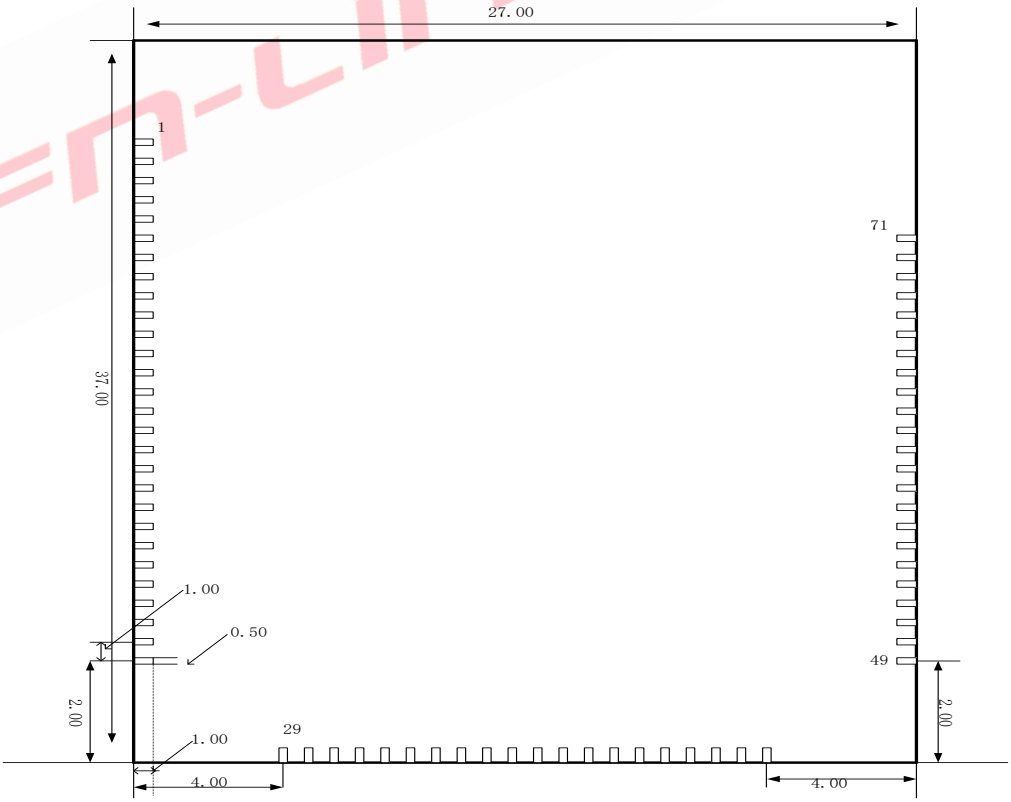
8. Size reference

8.1 Module Picture

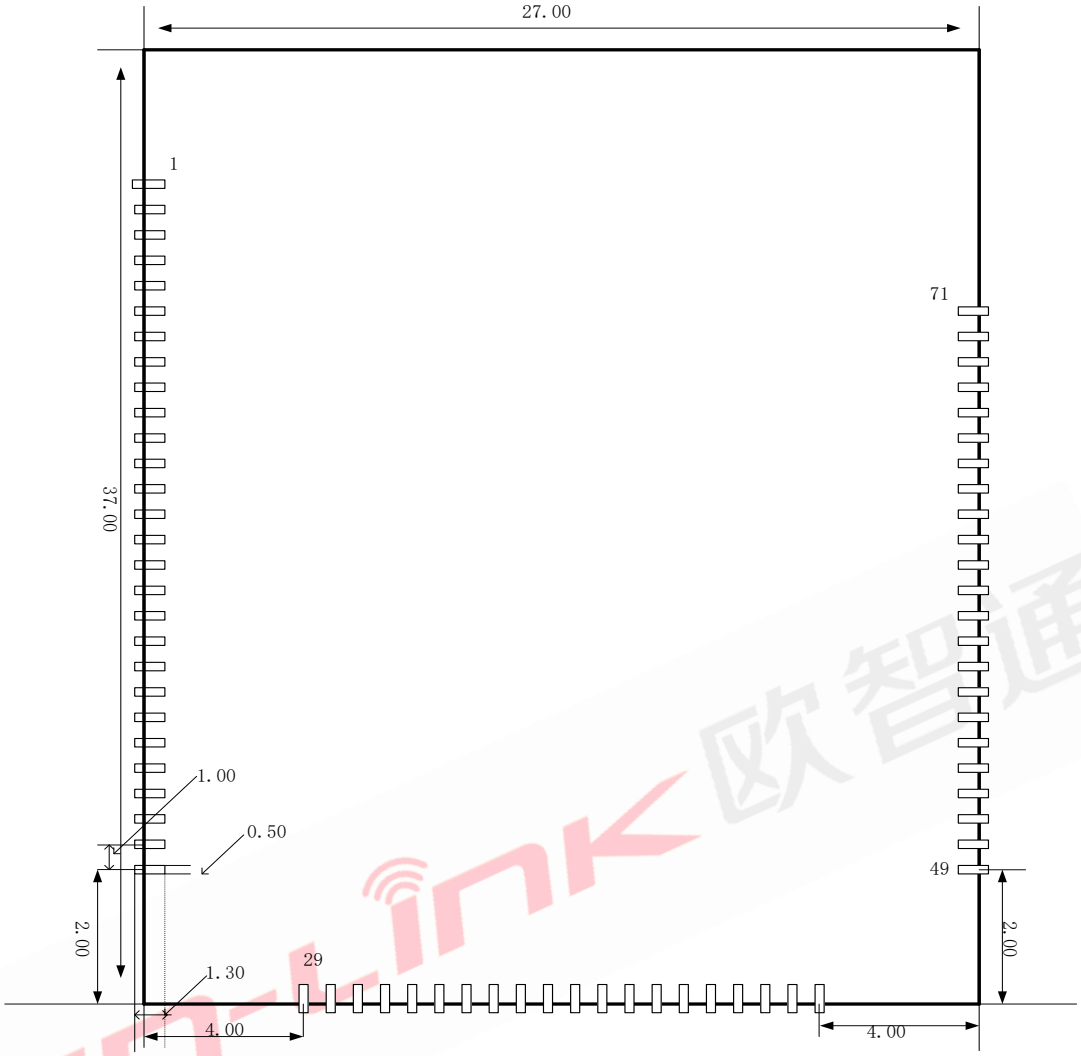
L x W : 27 x 37 (+0.3/-0.1) mm 	
H: 3.15 (±0.2) mm	
Weight	3.45g

8.2 Physical Dimensions

<TOP View>



8.3 Layout Recommendation

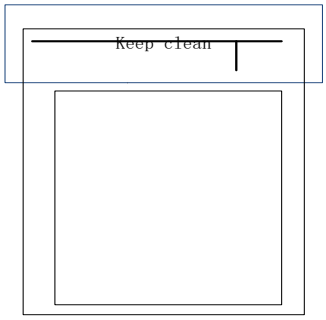


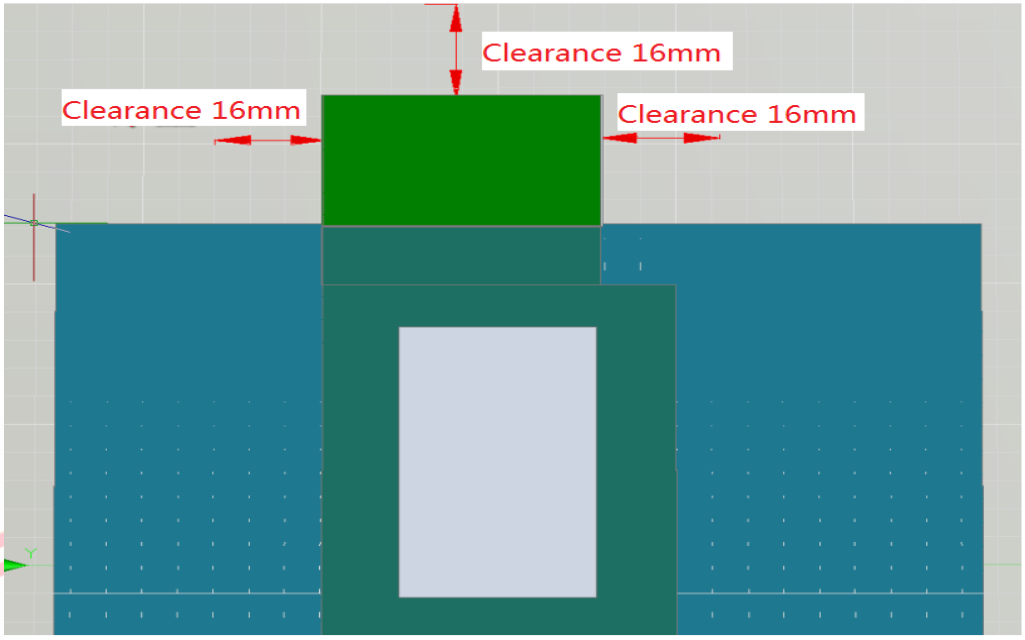
9. The Key Material List

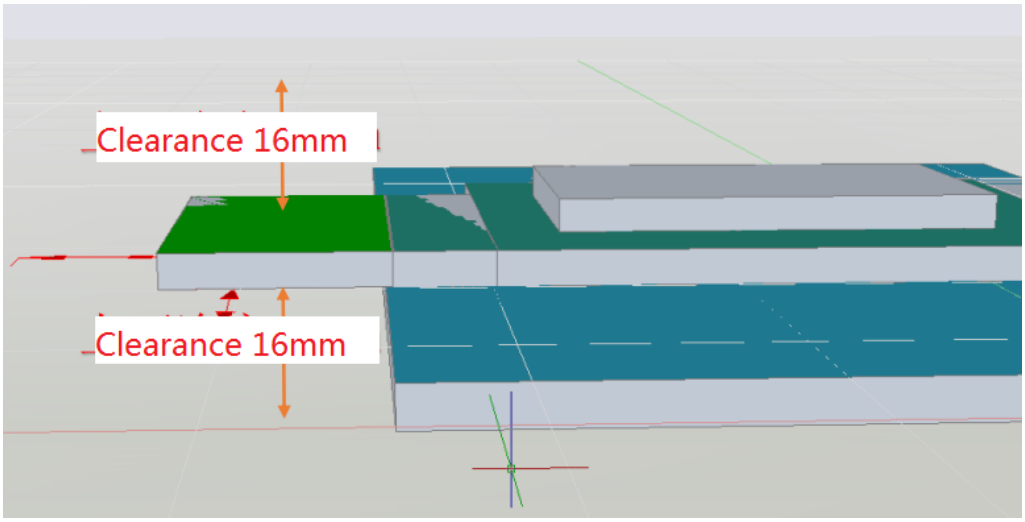
Item	Part Name	Description	Manufacturer
1	PCB	6222N-IMA 6V1 2L FR4 27X37X0.8mm	XY-PCB, GDKX, Sunlord, SLPCB
2	Crystal	2016 40MHz 15pF 10ppm	ECEC, Hosonic, TKD, JWT
3	Chipset	RTL8722DM-VA1-CG QFN88	Realtek
4	Shielding	6222N-IMA/B Shielding	信太，精力通
5	Diplexer	1.6*0.8 RFDIP1606L248D1T	Glead, Walsin, ACX, Murata, MAG.LAYERS,ftrgroup
6	Inductor	0805,2.2UH,±20%,>800mA	MURATA,microgate,cenke,ceaiya

10. Reference Design

1. Pin mux detail list in other file named：RTL872xD-pinmux.xlsx
2. Details see chip datasheet file.
3. 6222N-IMA model antenna area please keep clean space,no metal no other material cover on it.





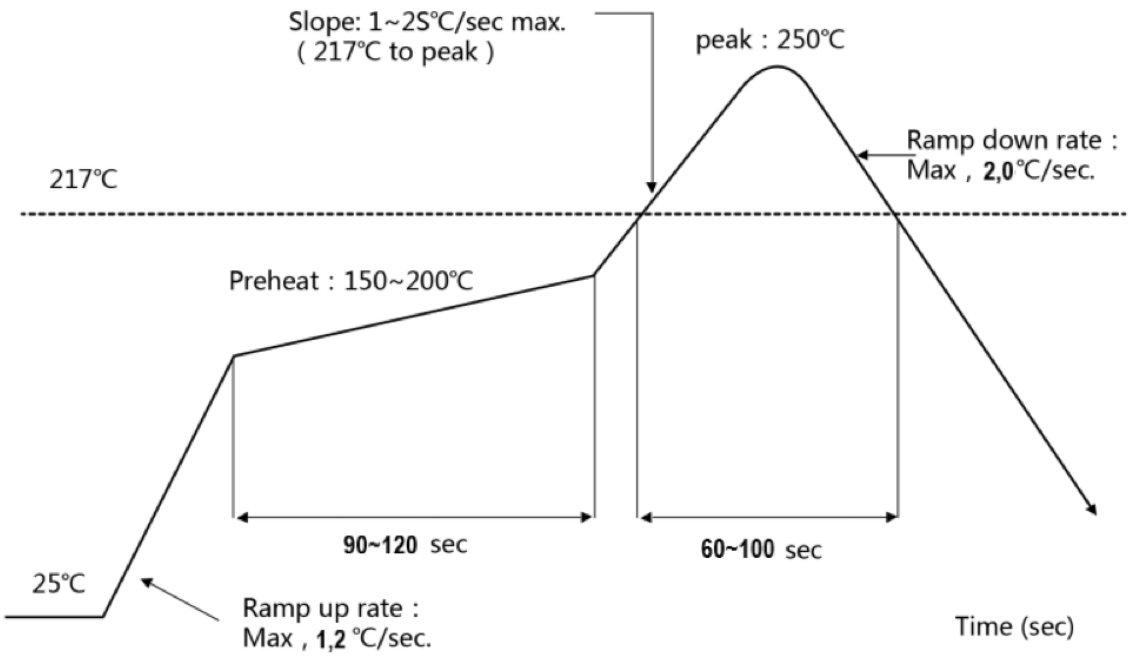


11. Recommended Reflow Profile

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

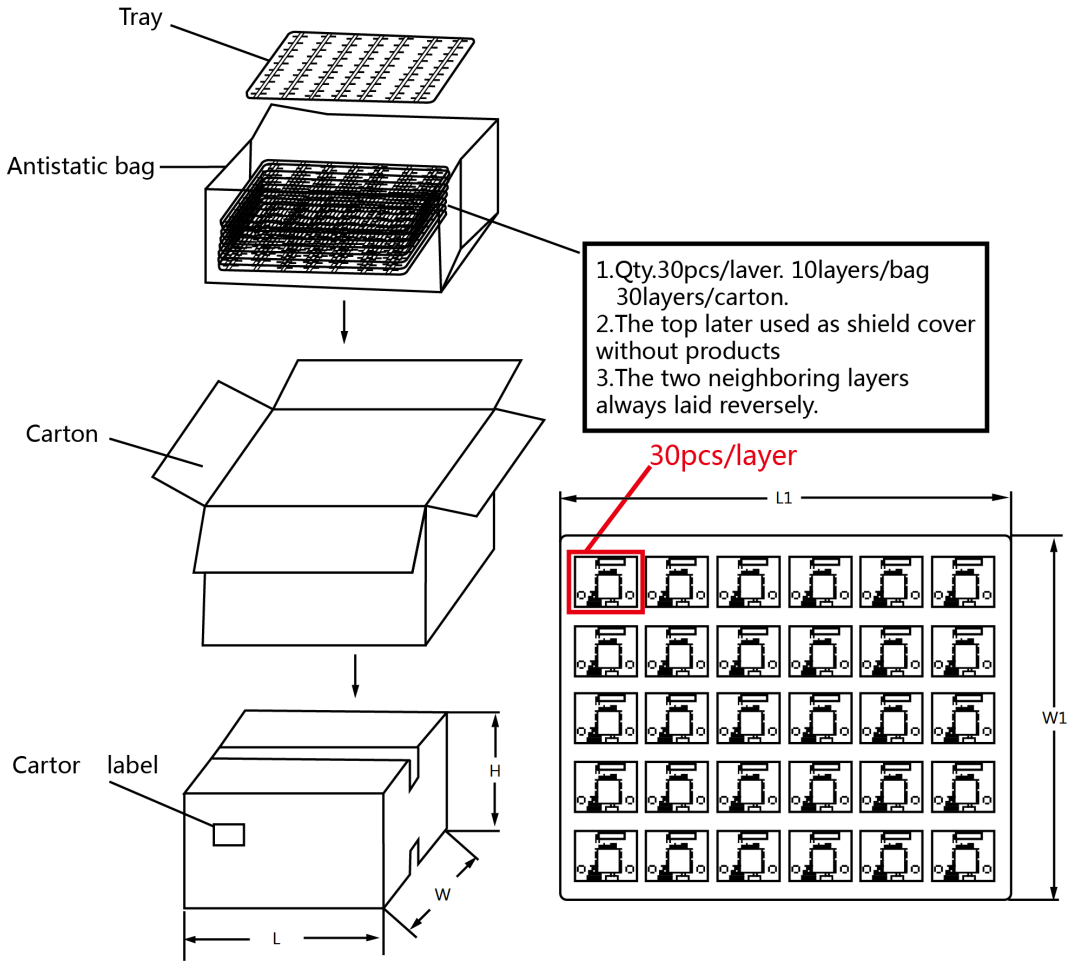
13. Package

Layer size: L1=300mm, W1=240mm

Layer material: PVC

Carton size: L=310mm, W=260mm, H=220mm

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 ℃ and <90% relative humidity (RH)

b) Environmental condition during the production: 30 ℃ / 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