

**PRODUCT SPECIFICATION**

**6220N-IN**

**Wi-Fi Single-band 1x1 802.11b/g/n + BLE v4.2**

**IOT Combo Module**

**Version:v1.7**



## 6220N-IN Module Datasheet

Ordering Information	Part NO.	Description
	FG6220NINX-04	RTL8720CM-VA2, 802.11b/g/n+BLE4.2,1T1R,22.0*30.0, AWS版,SPI/Uart/GPIO/I2C/PWM,Onboard ANT,PCB 版本 V2.0

Customer: \_\_\_\_\_

Customer P/N: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

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### Revision History

Version	Date	Contents of Revision Change	Draft	Checked	Approved
V1.0	2019/05/22	Initial release	Wesley	Wesley	Stone
V1.1	2019/06/12	Correct BLE from 4.0 to 4.2	Wesley	Wesley	Stone
V1.2	2019/07/16	Modify some typos	Wesley	Wesley	Stone
V1.3	2019/07/24	Refine section 1, 6, 7.	Wesley	Wesley	Stone
V1.4	2019/09/10	Refine section 3,4,5 and 9	Wesley	Wesley	Stone
V1.5	2019/12/06	Refine section 4 and 7	Wesley	Wesley	Stone
V1.6	2020/03/12	Refine section 5	Wesley	Wesley	Stone
V1.7	2022/05/21	Update Specification Format Chip changed to RTL8720CM-VA2 Add electrical specifications information	Fc	Zzq	Qjp

# 1. General Description

## 1.1 Introduction

6220N-IN combo module is a highly integrated IoT module with low power 802.11b/g/n Wireless LAN (WLAN) network controller. It combines a KM4 MCU, WLAN MAC, a 1T1R capable WLAN baseband, RF, and Bluetooth. It also provides a bunch of configurable GPIOs which are configured as digital peripherals for different applications and control usage.

6220N-IN integrates internal memories for complete Wi-Fi protocol functions. The embedded memory configuration also provides simple application developments.

## 1.2 Description

Model Name	6220N-IN
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 30mm*22mm*3.1mm
Interface	UART, GPIO, SDIO device, SPI, PWM, I2C
BT Interface	UART
OS supported	Android /Linux/ Win CE /iOS /XP/WIN7/WIN10
Operating temperature	-20°C to +85°C
Storage temperature	-40°C to +125°C
Operating Voltage	3.3±10% Vdc

## 2. Features

### General Features

- 802.11b/g/n compatible WLAN
- 65Mbps transmit and receive PHY rate using 20MHz bandwidth
- 802.11e QoS Enhancement (WMM)
- 802.11i (WPA, WPA2). Open, shared key, and pair-wise key authentication services
- Wi-Fi Direct support
- Internal 4MB pSRAM

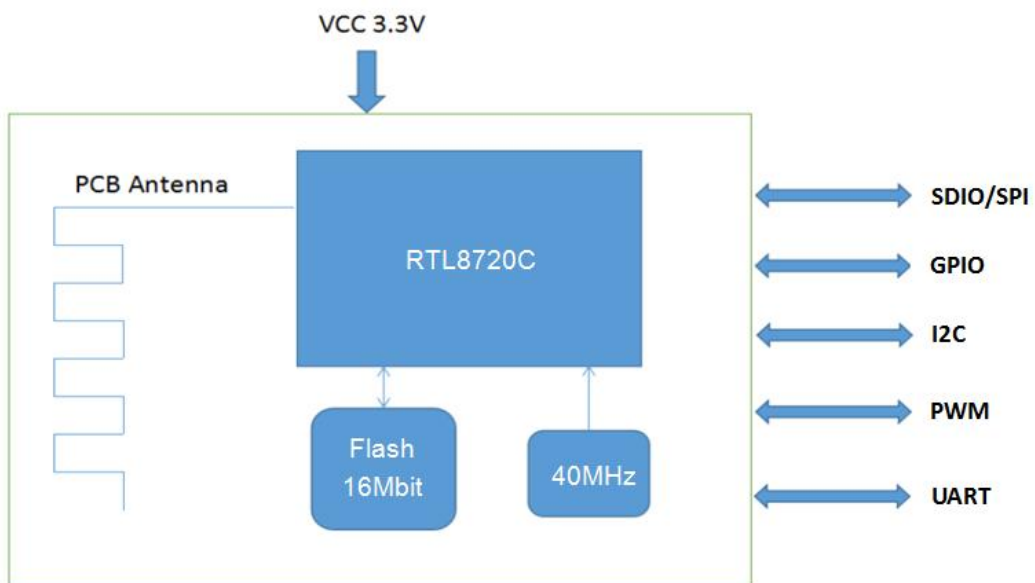
### Interface

- UART
- SPI
- I2C
- GPIO
- PWM
- SDIO2.0 device

### Bluetooth Features

- Bluetooth 4.2 Low Energy (BLE)

## 3. Block Diagram



## 4. General Specification

### 4.1 WI-FI 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 : 17dBm ± 2 dB		EVM ≤ -10dB
	802.11g /54Mbps : 15dBm ± 2 dB		EVM ≤ -25dB
	802.11n /MCS7 : 14dBm ± 2 dB		EVM ≤ -28dB
Spectrum Mask	Meet with IEEE standard		
Freq. Tolerance	± 20ppm		
Test Items	TYP Test Value		Standard Value
Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps	PER @ -92 dBm	≤-83
	- 11Mbps	PER @ -84 dBm	≤-76
Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps	PER @ -88 dBm	≤-85
	- 54Mbps	PER @ -71 dBm	≤-68
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0	PER @ -87 dBm	≤-85
	- MCS=7	PER @ -68 dBm	≤-67
Maximum Input Level	802.11b : -10 dBm		
	802.11g/n : -20 dBm		
Antenna Reference	Small antenna with 0~2 dBi peak gain		

### 4.2 Bluetooth Specification

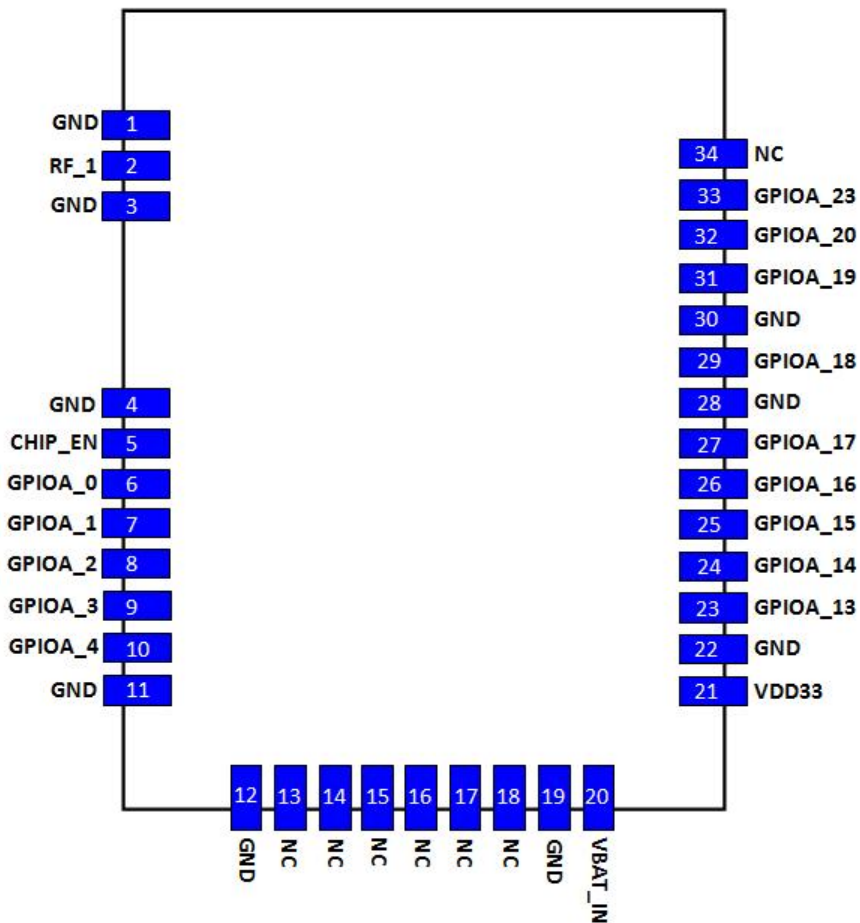
Feature	Description
<b>General Specification</b>	
Bluetooth Standard	BLE V4.2.
Host Interface	UART
Antenna Reference	Small antennas with 0~2 dBi peak gain
Frequency Band	2400 MHz ~ 2483.5 MHz
Number of Channels	40 channels

Modulation	GFSK		
<b>RF Specification</b>			
	<b>Min(dBm)</b>	<b>Typical(dBm)</b>	<b>Max(dBm)</b>
Output Power	2.5	4.5	6.5
Sensitivity @ BER=0.1%		-90	
Maximum Input Level	GFSK (1Mbps):-20dBm		

## 5. Pin Definition

### 5.1 Pin Outline

< TOP VIEW >





### 5.2 Pin Definition details

NO.	Name	Type <sup>Note1</sup>	Description	Voltage
1	GND		Ground connections	
2	RF_1	I/O	WL RF signal; NC by default (use printing antenna on module)	
3	GND		Ground connections	
4	GND		Ground connections	
5	CHIP_EN	I	Enable Chip (1: enable; 0: shutdown)	3.3V
6	GPIOA_0 <sup>Note2,3</sup>	I/O	GPIO pin, refer to Pin Function Table	3.3V
7	GPIOA_1 <sup>Note3</sup>	I/O	GPIO pin, refer to Pin Function Table	3.3V
8	GPIOA_2	I/O	GPIO pin, can be used as UART1 input. refer to Pin Function Table	3.3V
9	GPIOA_3	I/O	GPIO pin, can be used as UART1 output. refer to Pin Function Table	3.3V
10	GPIOA_4	I/O	GPIO pin, refer to Pin Function Table	3.3V
11	GND		Ground connections	
12	GND		Ground connections	
13~18	NC		No connected	
19	GND		Ground connections	
20	VBAT_IN	P	3.3V ± 10% power supply	3.3V
21	VD33	P	NC, internally connected to VBAT_IN for 3.3V power supply	3.3V
22	GND		Ground connections	
23	GPIOA_13 <sup>Note2</sup>	I/O	GPIO pin, refer to Pin Function Table	3.3V
24	GPIOA_14	I/O	GPIO pin, refer to Pin Function Table	3.3V
25	GPIOA_15	I/O	GPIO pin, refer to Pin Function Table	
26	GPIOA_16	I/O	GPIO pin, refer to Pin Function Table	
27	GPIOA_17	I/O	GPIO pin, refer to Pin Function Table	
28	GND		Ground connections	
29	GPIOA_18	I/O	GPIO pin, refer to Pin Function Table	
30	GND		Ground connections	
31	GPIOA_19	I/O	GPIO pin, refer to Pin Function Table	
32	GPIOA_20	I/O	GPIO pin, refer to Pin Function Table	
33	GPIOA_23 <sup>Note3</sup>	I/O	GPIO pin, refer to Pin Function Table	3.3V
34	NC		No connected	

Note1: P for POWER, I for INPUT, O for OUTPUT

Note2: Make sure GPIOA\_0 and GPIOA\_13 won't be both pulled up when power-on.

Note3: GPIOA\_0, GPIOA\_1 and GPIOA\_23 are power on trap pins with internal 10Kohm pull-low. We suggest keep them not connected, please contact us for support if customer really have to use them.

### 5.3 Pin Function Table

Module Pin#	IC Pin Name	SDIO	JTAG	UART	SPI/WL_LED /EXT_32K	I2C	PWM
6	GPIOA_0		JTAG_CLK	UART1_IN	EXT_32K		PWM[0]
7	GPIOA_1		JTAG_TMS	UART1_OUT	BT_LED		PWM[1]
8	GPIOA_2		JTAG_TDO	UART1_IN	SPI_CS <sub>n</sub>	I2C_SCL	PWM[2]
9	GPIOA_3		JTAG_TDI	UART1_OUT	SPI_SCL	I2C_SDA	PWM[3]
10	GPIOA_4		JTAG_TRST	UART1_CTS	SPI_MOSI		PWM[4]
23	GPIOA_13			UART0_IN			PWM[7]
24	GPIOA_14			UART0_OUT			PWM[2]
25	GPIOA_15	SD_D2		UART2_IN	SPI_CS <sub>n</sub>	I2C_SCL	PWM[3]
26	GPIOA_16	SD_D3		UART2_OUT	SPI_SCL	I2C_SDA	PWM[4]
27	GPIOA_17	SD_CMD					PWM[5]
29	GPIOA_18	SD_CLK					PWM[6]
31	GPIOA_19	SD_D0		UART2_CTS	SPI_MOSI	I2C_SCL	PWM[7]
32	GPIOA_20	SD_D1		UART2_RTS	SPI_MISO	I2C_SDA	PWM[0]
33	GPIOA_23				LED_0		PWM[7]

Note: Please contact Fn-Link for SW feasibility once you confirm GPIO configuration.

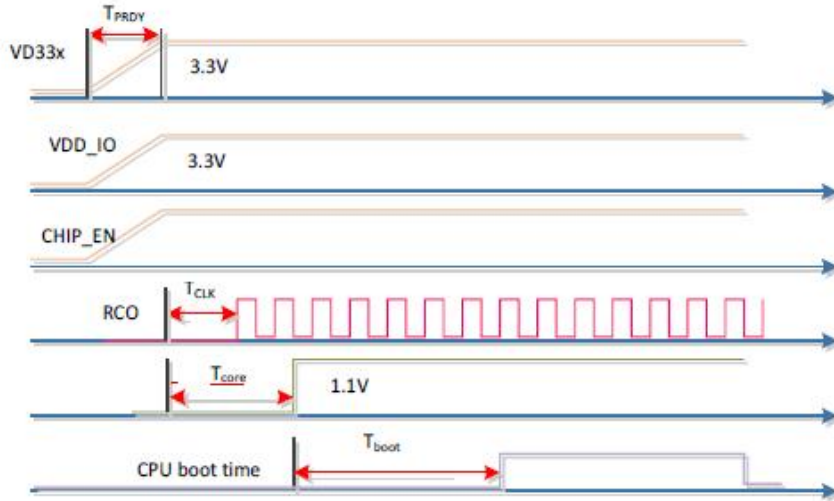
## 6. Electrical Specifications

### 6.1 Power Supply DC Characteristics

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

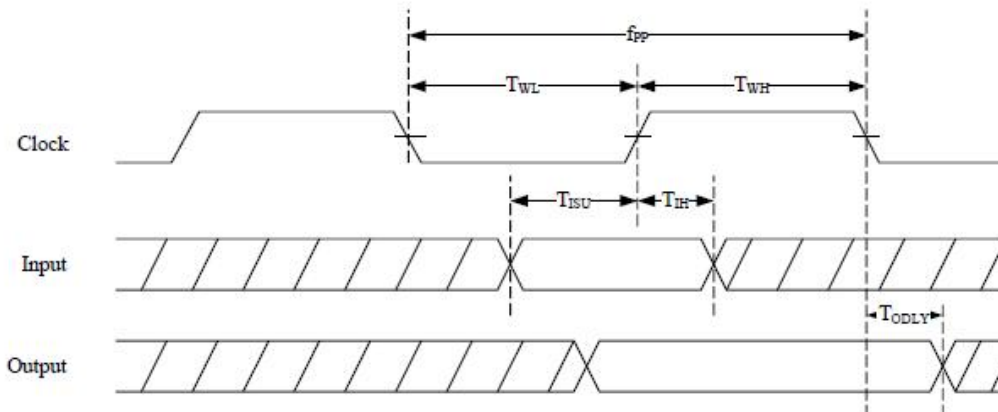
## 6.2 Interface Circuit time series

### 6.2.1 Power On Sequence



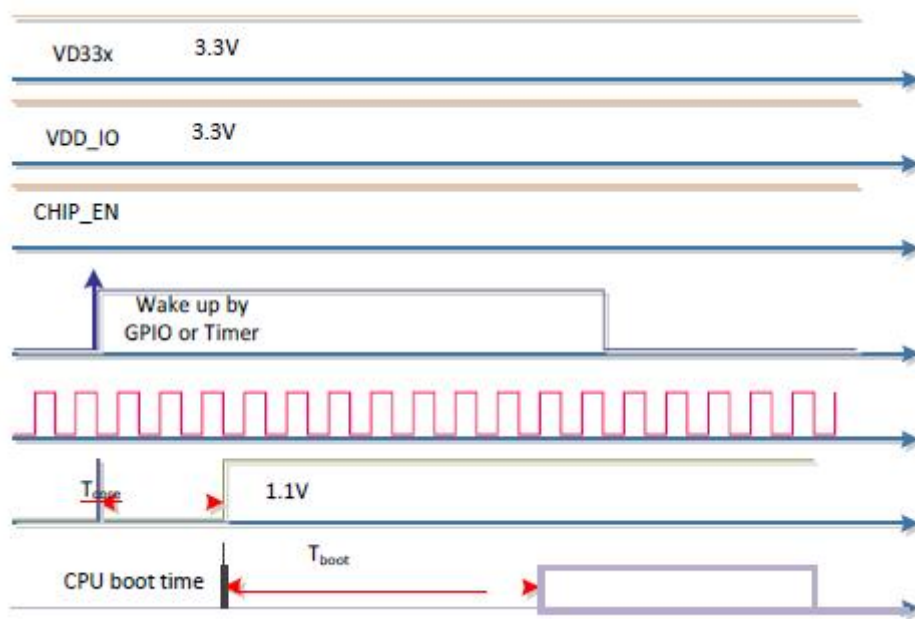
Symbol	Parameter	Minimu	Typica	Maxi	Unit
$T_{PRDY}$	3.3V ready time	0.6	0.6	1	ms
$T_{CLK}$	Internal ring clock stable time after 3.3V ready	1			ms
$T_{core}$	Core power ready time	1.5	1.5		ms
$T_{boot}$	Application ready time				ms
$V_{RST}$	Shutdown occurs after CHIP_EN lower than this voltage	0	0	1.65	V
$T_{RST}$	The require time that CHIP_EN lower than $V_{RST}$	--	10	--	us

### 6.2.2 Bus Timing Specification

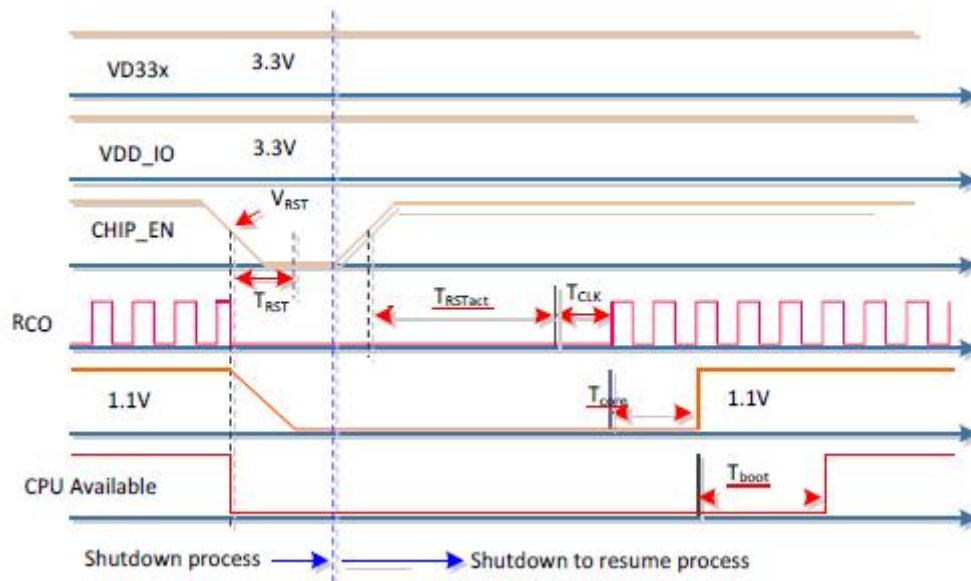


NO	Parameter	Mode	MIN	MAX	Unit
f <sub>PP</sub>	Clock Frequency	Default	0	25	MHz
		HS	0	50	MHz
T <sub>WL</sub>	Clock Low Time	DEF	10	-	ns
		HS	7	-	ns
T <sub>WH</sub>	Clock High Time	DEF	10	-	ns
		HS	7	-	ns
T <sub>ISU</sub>	Input Setup Time	DEF	5	-	ns
		HS	6	-	ns
T <sub>IH</sub>	Input Hold Time	DEF	5	-	ns
		HS	2	-	ns
T <sub>ODLY</sub>	Output Delay Time	DEF	-	14	ns
		HS	-	14	ns

### 6.2.3 Resume from Standby


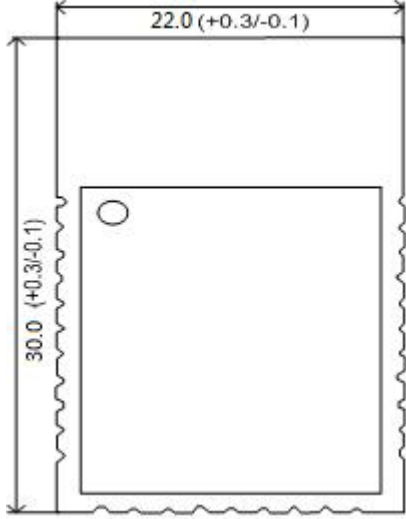
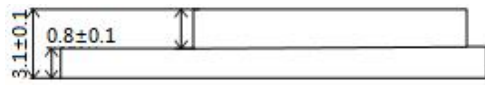


### 6.2.4 Shutdown Sequence



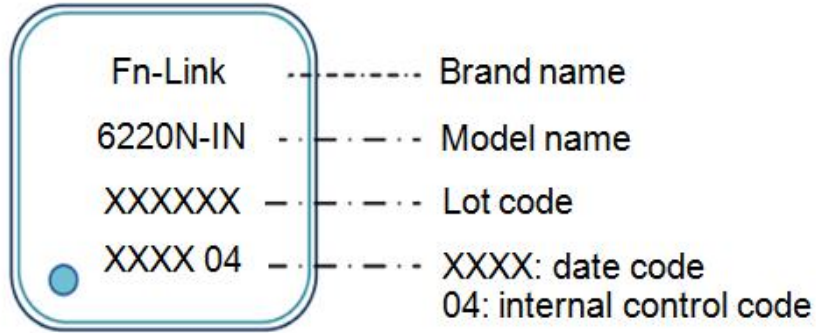
## 7. Size reference

### 7.1 Module Picture

<p><b>L x W : 30 x 22 (+0.3/-0.1) mm</b></p>  <p>Refer to section 4.2 for detailed marking info.</p>	
<p><b>H: 3.1 (±0.1) mm</b></p>	
<p><b>Weight</b></p>	<p><b>2.56g</b></p>

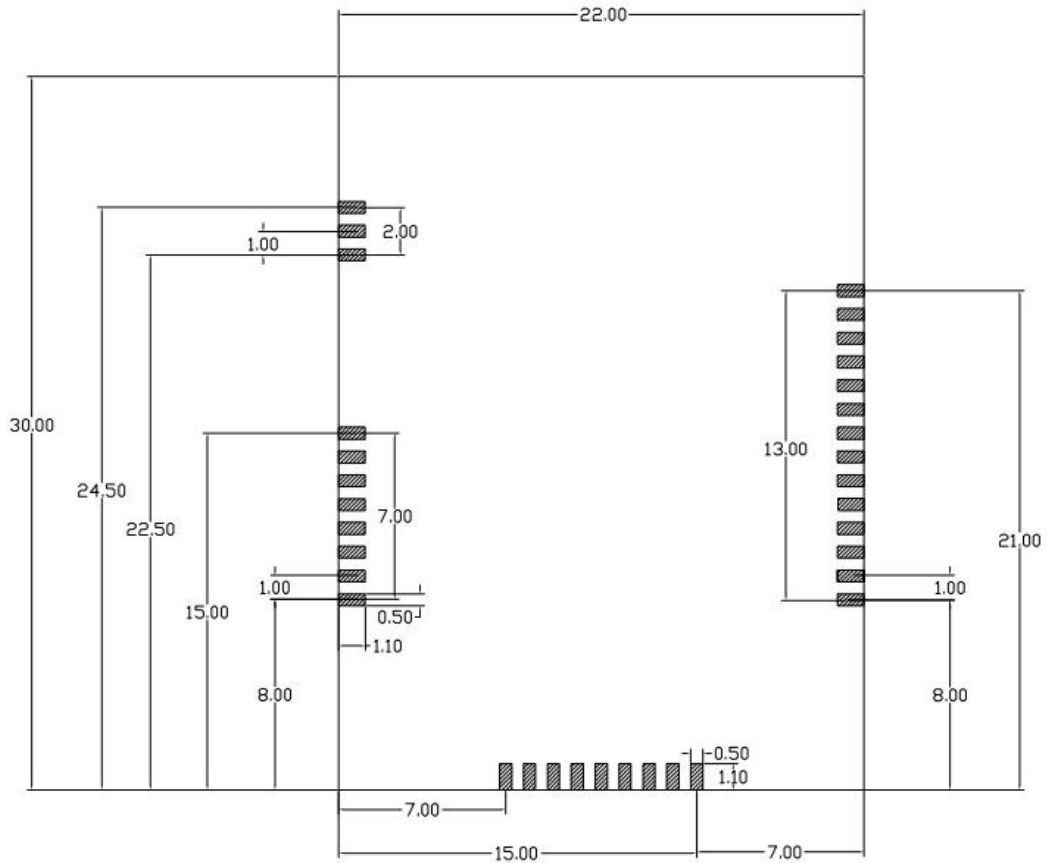
### 7.2 Marking Description

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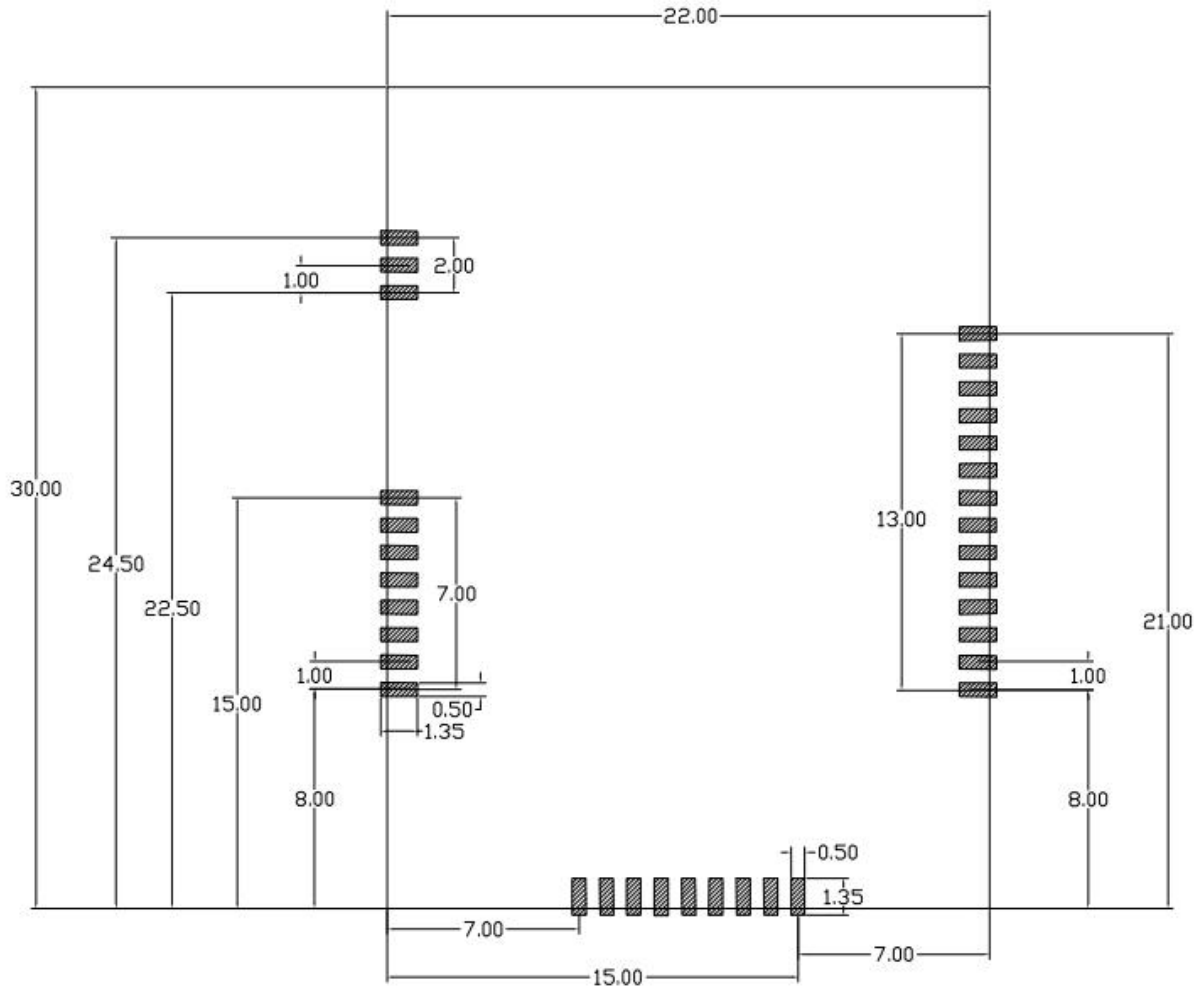


### 7.3 Physical Dimensions

<TOP View>



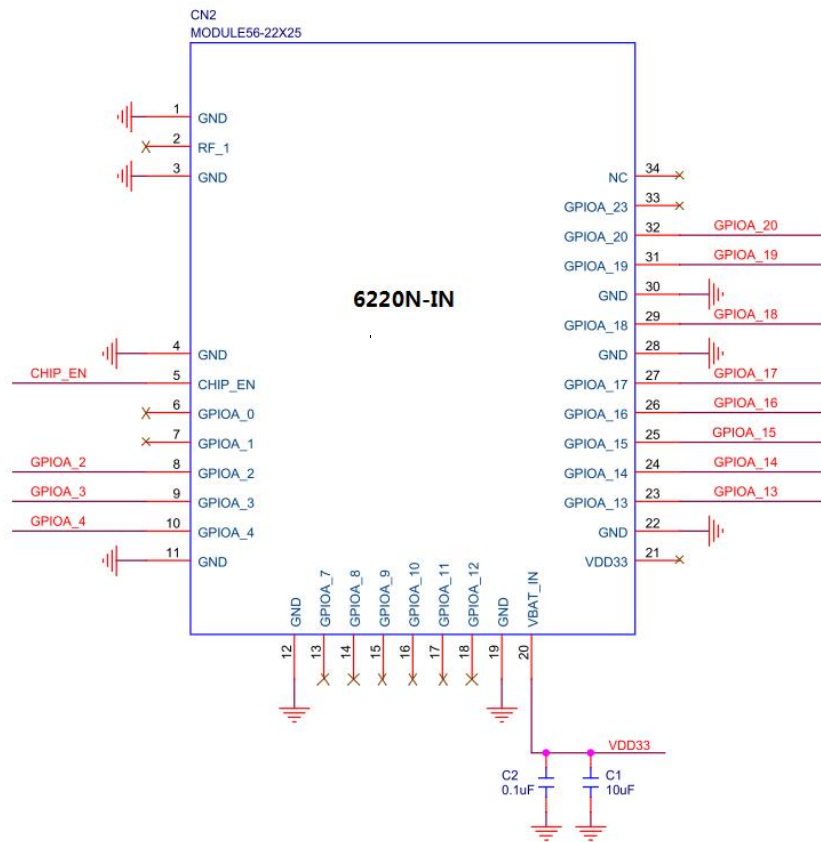
### 7.4 Layout Recommendation



### 8. The Key Material List

Item	Part Name	Description	Manufacturer
1	PCB	6220N-IN,深绿色,无卤,2L 30x22x0.8mm	XY-PCB, GDKX, Sunlord, SLPCB
2	Crystal	3225 40MHz, ±10ppm, 12pF	ECEC, Hosonic, TKD, JWT
3	Chipset	RTL8720CM-VA2, QFN40	Realtek
4	Shielding	6220N-IN Shielding	信太, 精力通
5	Flash	MX25L1606EM1I-12G SOP8-150MIL	MXIC,GigaDevice

## 9. Reference Design



Note 1: Use on-board printing antenna by default. Contact Fn-Link for technical support if you want to use reserved pin2 or U.FL connector for external antenna design.

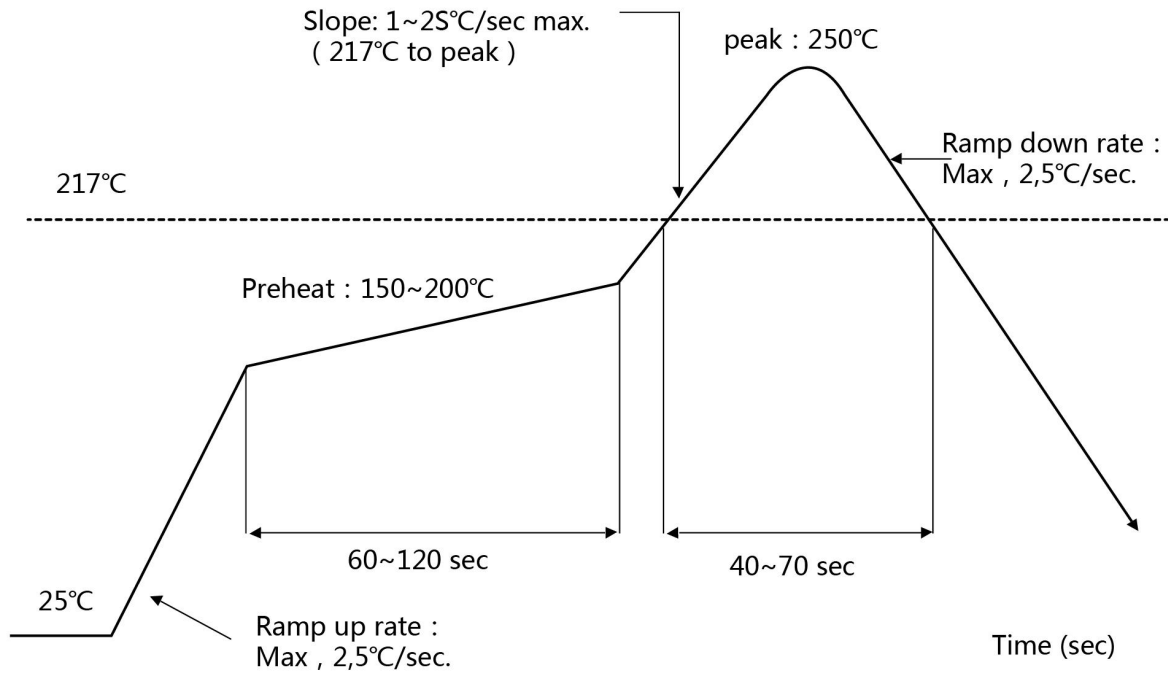


## 10. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C

Number of Times : ≤2 times



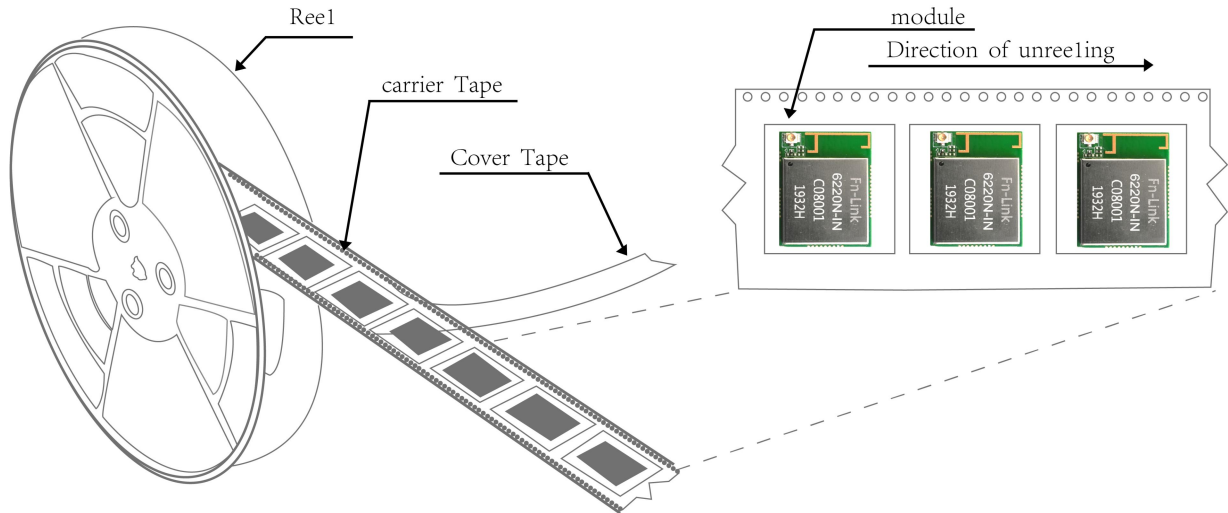
## 11. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

## 12. Package

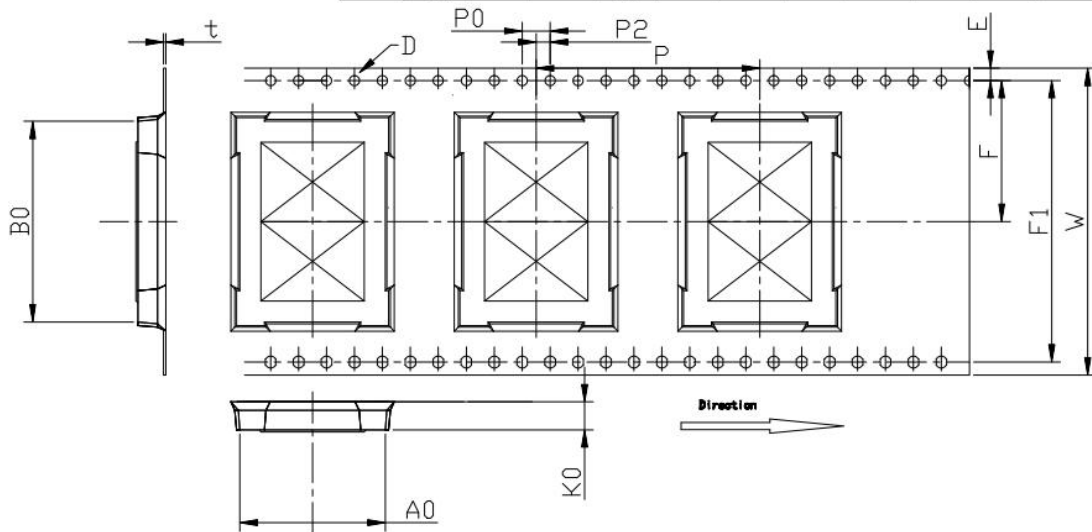
### 12.1 Reel

A roll of 500pcs



### 12.2 Carrier Tape Detail

ITEM	W	A0	B0	D	E	F	F1	K0	P0	P2	P	T
DIM	44	22.45	30.40	1.5	1.75	20.2	40.4	3.15	4.0	2.0	32.0	0.30
TOLE	+0.3 -0.3	±0.15	±0.15	+0.1 -0.0	±0.1	±0.15	±0.10	±0.10	±0.1	±0.15	±0.1	±0.05



### 12.3 Packaging Detail

the take-up package



Using self-adhesive tape  
Size of black tape: 44mm  
Color of plastic disc: blue

the cover tape :37.5mm



NY bag size:500mm\*420mm



size : 335\*335\*55mm



The packing case size:360\*210\*370mmg

### 13. 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 <math><40^{\circ}\text{C}</math> and <math><90\%</math> relative humidity (RH)
- b) Environmental condition during the production: - 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