



## PRODUCT SPECIFICATION

# K265B-PR

**Wi-Fi Dual-band 2x2 11ax + Bluetooth 5.2**

**Combo Module**

Version:v1.2

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

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

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

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

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# K265B-PR Module Datasheet

	Part NO.	Description
<b>Ordering Information</b>	FGK265BPRX-00	W265P1,a/b/g/n/ac/ax,Wi-Fi+BT5.2,2T2R,PCIE+UART,13*15mm, 3 Antenna ,with shielding



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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/ax MAC/Baseband/RF WLAN single chip. For Wireless LAN operation. The integrated module provides PCIE 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/ax 2x2 MIMO standard and the speed can achieve up to 1201Mbps with dual stream in 802.11ax. The integrated module provides PCIE interface for Wi-Fi, UART/ PCM interface for Bluetooth.

This combo module is a total solution for a combination of Wi-Fi and Bluetooth V5.2 technologies. The module is specifically developed for all portable devices.

### 1.2 Description

Model Name	K265B-PR
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 13 x 15 mm x 2.5 mm
Wi-Fi Interface	Support PCIE
BT Interface	UART / PCM
OS supported	Android /Linux
Operating temperature	0°C to 70°C
Storage temperature	-40°C to 125°C

## 2. Features

### General

- Support IEEE802.11a/b/g/n/ac/ax
- Complies with PCI express base specification revision 1.1
- Dual-stream spatial multiplexing up to 1201 Mbps data rate.
- Supports 20/40MHz at 2.4GHz and supports 20/40/80MHz at 5GHz
- Supports Transmit Beamformee

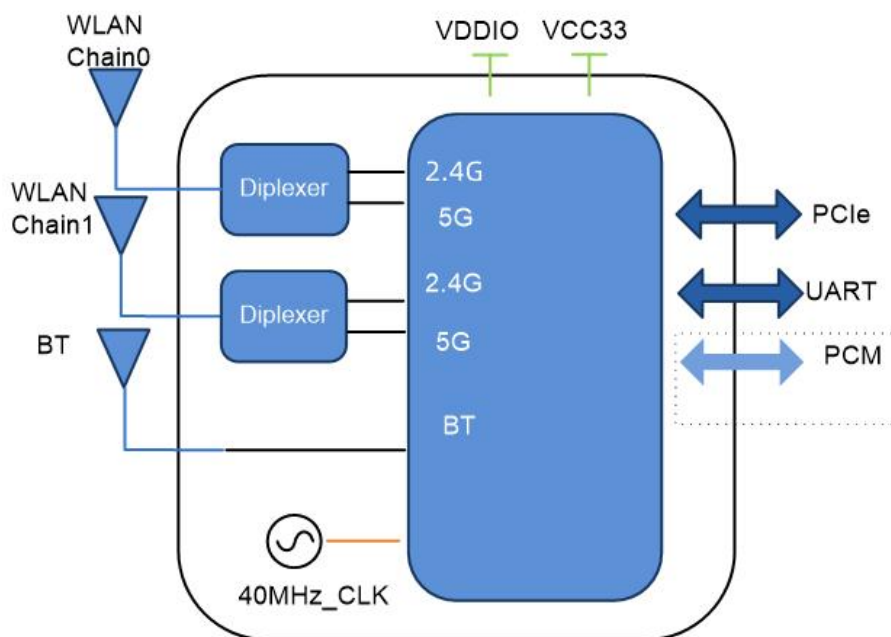
### Host Interface

- Supports PCIE interface for WLAN and UART/PCM interface for Bluetooth.

### Bluetooth Features

- Supports Bluetooth system (BT5.2 Logo Compliant)
- Supports WLAN/Bluetooth coexistence
- Compatible with Bluetooth v2.1+EDR.
- Dual Mode support: Simultaneous LE and BR/EDR
- BT host digital interface:
  - UART
  - PCM for audio data

## 3. Block Diagram



## 4. General Specification

### 4.1 WI-FI 2.4GHz Specification

Feature	Description	
WLAN Standard	IEEE 802.11 b/g/n/ac/ax Wi-Fi compliant	
Frequency Range	2.400 GHz ~ 2.4835GHz (2.4 GHz ISM Band)	
Number of Channels	2.4GHz: Ch1 ~ Ch13	
Test Items	Typical Value	EVM
Output Power <sup>1</sup>	802.11b /11Mbps : 13 dBm ± 2 dB	EVM ≤ -10dB
	802.11g /54Mbps : 13 dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7 : 13 dBm ± 2 dB	EVM ≤ -28dB
	802.11ax HE20/MCS11: 12 dBm ± 2 dB	EVM ≤ -35dB
	802.11ax HE40/MCS11: 12 dBm ± 2 dB	EVM ≤ -35dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	± 20ppm	
Test Items	Test Value	Standard Value
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 11Mbps PER @ -86 dBm	≤-84
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 54Mbps PER @ -73 dBm	≤-71
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=7 PER @ -71 dBm	≤-69
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=7 PER @ -68 dBm	≤-66
SISO Receive Sensitivity (11ax,20MHz) @10% PER	- MCS=11 PER @ -57 dBm	≤-55
SISO Receive Sensitivity (11ax ,40MHz) @10% PER	- MCS=11 PER @ -56 dBm	≤-54
Maximum Input Level	802.11b : -10 dBm	
	802.11g/n : -20 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

## 4.2 WI-FI 5GHz Specification

Feature	Description	
WLAN Standard	IEEE 802.11a/n/ac/ax, Wi-Fi compliant	
Frequency Range	5.15 GHz ~ 5.850 GHz(5.0 GHz ISM Band)	
Number of Channels	5.0GHz: Please see the table <sup>1</sup>	
Test Items	Typical Value	EVM
Output Power <sup>1</sup>	802.11a /54Mbps: 11 dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7: 11 dBm ± 2 dB	EVM ≤ -28dB
	802.11ac vHT20 MCS8: 10 dBm ± 2 dB	EVM ≤ -30dB
	802.11ac vHT40 MCS9: 10 dBm ± 2 dB	EVM ≤ -32dB
	802.11ac vHT80 MCS9: 10 dBm ± 2 dB	EVM ≤ -32dB
	802.11ax HE20 MCS11: 9 dBm ± 2 dB	EVM ≤ -35dB
	802.11ax HE40 MCS11: 9 dBm ± 2 dB	EVM ≤ -35dB
802.11ax HE80 MCS11: 9 dBm ± 2 dB	EVM ≤ -35dB	
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	± 20ppm	
Test Items	Test Value	Standard Value
SISO Receive Sensitivity (11a,20MHz) @10% PER	- 54Mbps PER @ -70dBm	≤-68
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=7 PER @ -68 dBm	≤-66
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=7 PER @ -66 dBm	≤-64
SISO Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=8, NSS1 PER @ -64 dBm	≤ -62
SISO Receive Sensitivity (11ac ,40MHz) @10% PER	- MCS=9, NSS1 PER @ -60 dBm	≤ -58
SISO Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=9, NSS1 PER @ -56 dBm	≤-54
SISO Receive Sensitivity (11ax,20MHz) @10% PER	- MCS=11 PER @ -58 dBm	≤-56
SISO Receive Sensitivity (11ax ,40MHz) @10% PER	- MCS=11 PER @ -56 dBm	≤-54
SISO Receive Sensitivity (11ax,80MHz) @10% PER	- MCS=11 PER @ -52 dBm	≤-50
Maximum Input Level	802.11a/n: -30 dBm	



Antenna Reference

Small antennas with 0~2 dBi peak gain

2. 2.4G,5G output power control by firmware power by rate table, the table value must same with module target power

**15GHz(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
5500MHz~5700MHz	100	5500
	104	5520
	108	5540
	112	5560
	116	5580
	120	5600
	124	5620
	128	5640
	132	5660
	136	5680
5745MHz~5825MHz	149	5745
	153	5765
	157	5785
	161	5805
	165	5825

Note: The Wi-Fi RF specification data will be updated in future version.

### 4.3 Bluetooth Specification

Feature	Description
<b>General Specification</b>	
Bluetooth Standard	BDR,EDR(1Mbps & 2Mbps & 3Mbps),LE(1Mbps),2LE(2Mbps)
Host Interface	USB
Frequency Band	2402 MHz ~ 2480 MHz
Number of Channels	79 channels for classic,40 channels for BLE
Modulation	GFSK, $\pi/4$ -DQPSK,8DPSK
<b>RF Specification</b>	
<b>Output Power , tolerance <math>\pm 3</math> dB</b>	
	<b>CL1(dBm)</b>
BDR Output Power	9
EDR Output Power	9
BLE Output Power	13
<b>Sensitivity, tolerance : /</b>	
Sensitivity @ BER=0.1% for GFSK (1Mbps)	-75
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)	-75
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)	-75
Sensitivity @ BLE=30.8% for LE (1Mbps)	-75
Sensitivity @ BLE=30.8% for 2LE (2Mbps)	-75
Maximum Input Level	GFSK (1Mbps):-20dBm
	$\pi/4$ -DQPSK (2Mbps) :-20dBm
	8DPSK (3Mbps) :-20dBm

Note: The Bluetooth Specification will be updated in future version.

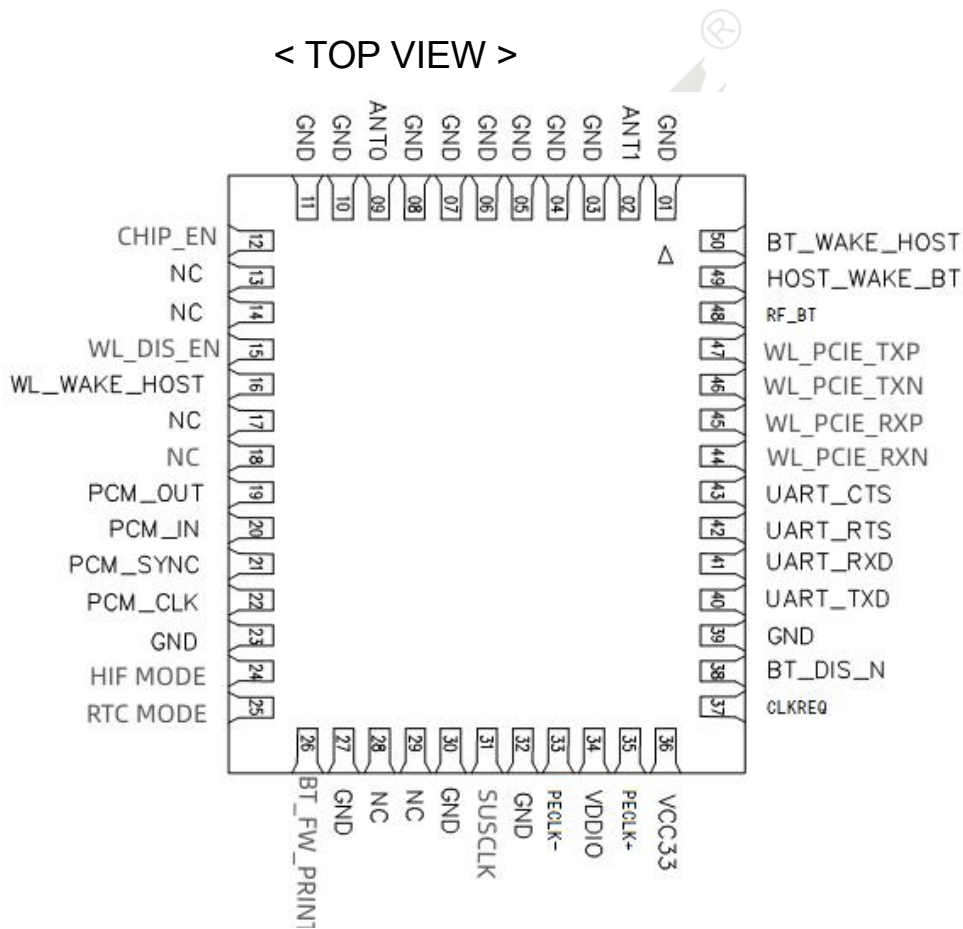
## 5. ID setting information

WI-FI

Vendor ID	-
Product ID	-

## 6. Pin Definition

### 6.1 Pin Outline



### 6.2 Pin Definition details

NO.	Name	Type	Description	Voltage
1	GND	—	Ground connections	
2	ANT1	I/O	RF I/O port chain1, Dual band Wi-Fi and BT(2 ant	

			type)	
3	GND	—	Ground connections	
4	GND	—	Ground connections	
5	GND	—	Ground connections	
6	GND	—	Ground connections	
7	GND	—	Ground connections	
8	GND	—	Ground connections	
9	ANT0	I/O	RF I/O port chain0, dual band Wi-Fi	
10	GND	—	Ground connections	
11	GND	—	Ground connections	
12	CHIP_EN	I/O	active high	3.3V
13	NC	—	No connect	
14	NC	—	No connect	
15	WL_DIS_EN	I	Enable pin for WLAN device Default ON: pull high; OFF: pull low	VDDIO
16	WL_WAKE_HOST	O	WAKE#, WLAN wake-up HOST, active low	3.3V
17	NC	—	No connect	
18	NC	—	No connect	VDDIO
19	PCM_OUT	O	PCM Data output Not supported please NC	VDDIO
20	PCM_IN	I	PCM data input Not supported please NC	VDDIO
21	PCM_SYNC	I/O	PCM sync signal Not supported please NC	VDDIO
22	PCM_CLK	I/O	PCM clock Not supported please NC	VDDIO
23	GND	—	Ground connections	
24	HIF MODE	DI	MUX UART WT print out	
25	RTC MODE	DI	CHIP Interface select for ext rtc/inner rtc, 0: ext; 1 ,inner	
26	BT_FW_PRINT	DO	External Grant	
27	GND	—	Ground connections	
28	NC	—	No connect	
29	NC	—	No connect	
30	GND	—	Ground connections	
31	NC	—	No connect	

32	GND	—	Ground connections	
33	PECLK-	I/O	PCIE CLK-	
34	VDDIO	P	I/O Voltage supply input 1.8V or 3.3V	1.8V or 3.3V
35	PECLK+	I/O	PCIE CLK+	
36	VCC33	P	Main power voltage source input 3.3V	3.3V
37	CLK REQ	I/O	PCIE clk request	3.3V
38	BT_DIS_N	I	Enable pin for Bluetooth device Default ON: pull high; OFF: pull low	VDDIO
39	GND	—	Ground connections	
40	UART_TXD	O	Bluetooth UART interface	VDDIO
41	UART_RXD	I	Bluetooth UART interface	VDDIO
42	UART_RTS	O	Bluetooth UART interface	VDDIO
43	UART_CTS	I	Bluetooth UART interface	VDDIO
44	WL_PCIE_RXN	I	PCIE RX-	
45	WL_PCIE_RXP	I	PCIE RX+	
46	WL_PCIE_TXN	O	PCIE TX-	
47	WL_PCIE_TXP	O	PCIE TX+	
48	RF_BT	I/O	BT antenna (opional if 3 ant type) 2 ant type NC this pin	
49	HOST_WAKE_BT	I	HOST wake-up Bluetooth device	VDDIO
50	BT_WAKE_HOST	O	Bluetooth device to wake-up HOST	VDDIO

P:POWER I:INPUT O:OUTPUT VDDIO:3.3V

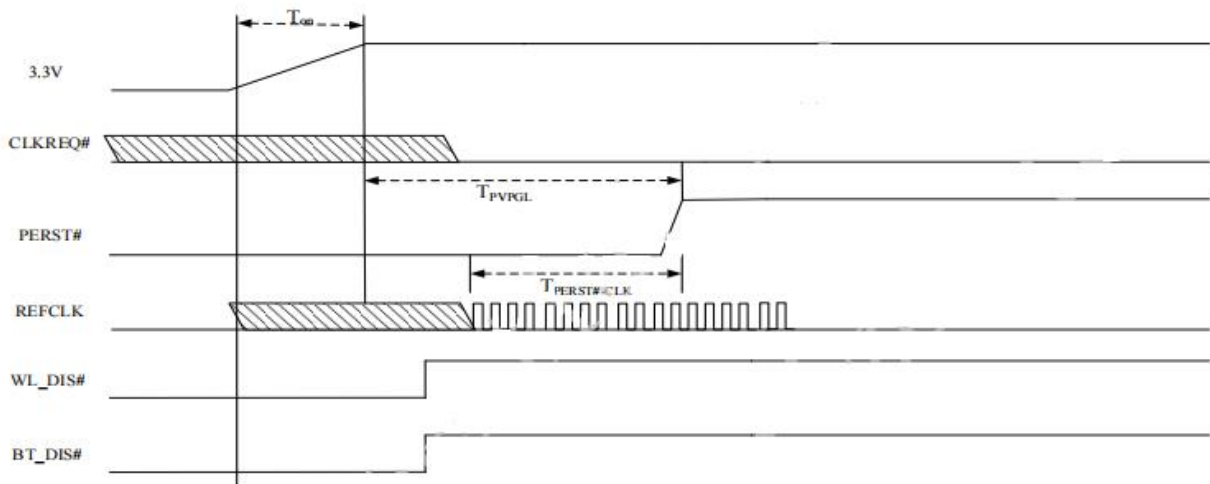
## 7. Electrical Specifications

### 7.1 Power Supply DC Characteristics

	Min.	Typ.	Max.	Unit
Operating Temperature	0	25	70	deg.C
VDD	2.97	3.3	3.63	V

## 7.2 Interface Circuit time series

### 7.2.1 PCIe bus during power on sequence



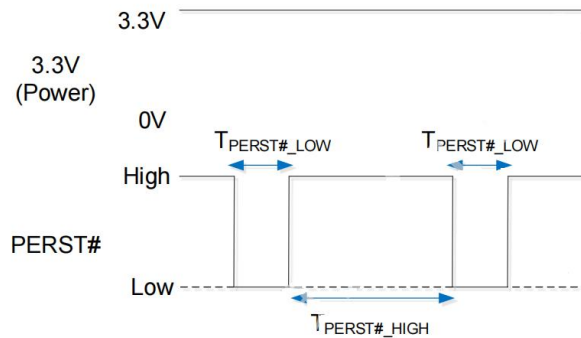
$T_{on}$ : the main power ramp up duration

$T_{PVPG_L}$ : power valid to PERST# input inactive

$T_{PERST\#-CLK}$ : reference clock stable before PERST# inactive

Symbol	Unit	Min.	Typical	Max
$T_{on}$	ms	0.5	1.5	5
$T_{PVPG_L}$	ms	Implementation specific; recommended 50ms		--
$T_{PERST\#-CLK}$	us	100	--	--

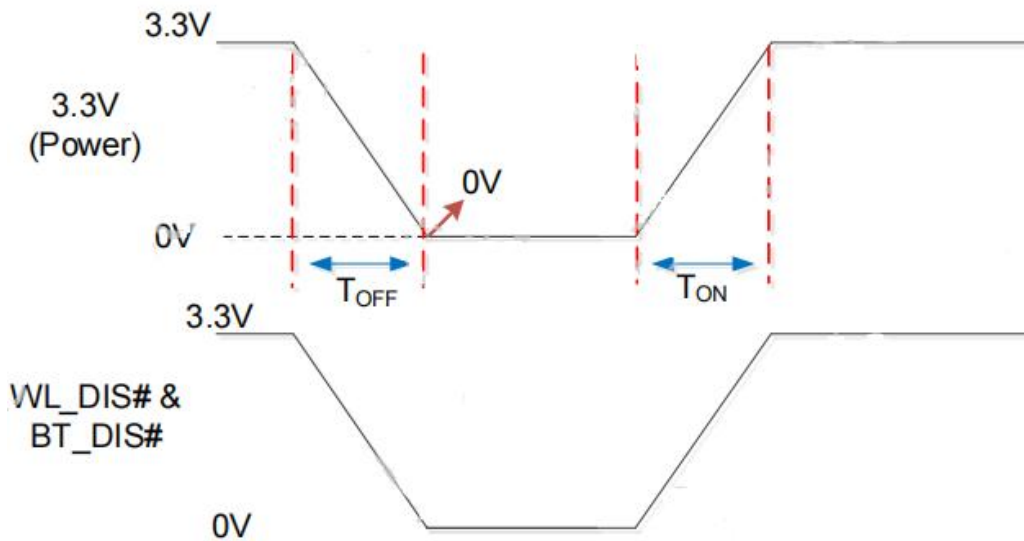
### 7.2.2 PCIe PERST# Timing sequence



PCIE PERST# Timing Parameters

	Min	Typical	Max	Unit	Description
T <sub>PERST#_LOW</sub>	6	10	X	ms	PERST# low duration
T <sub>PERST#_HIGH</sub>	400	500	X	ms	PERST# high duration

### 7.2.3 power off sequence

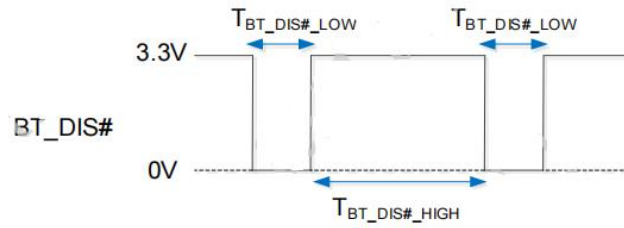


Power Off Timing Parameters

Symbol	Min.	Typical	Max.	Unit	Description
T <sub>OFF</sub>	1.5	--	--	ms	Measure point start on 100% Measure point end on 0% (must be 0V)
T <sub>ON</sub>	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.

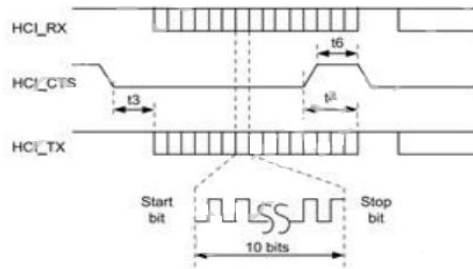
### 7.2.4 BT\_DIS Timing sequence



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

### 7.2.5 UART interface timing

The interface includes four signals, TXD/RXD/CTS. Flow control between the host and the device is byte-wise by hardware. When the UART\_CTS signal is set high, the device stops transmitting on the interface. If HCI\_CTS is set high in the middle of transmitting a byte, the device finishes transmitting the byte and stops the transmission.



**UART Timing Diagram**  
**UART Timing Characteristics**

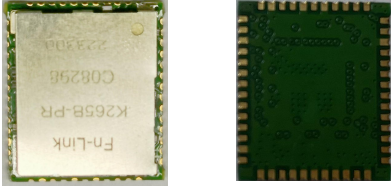
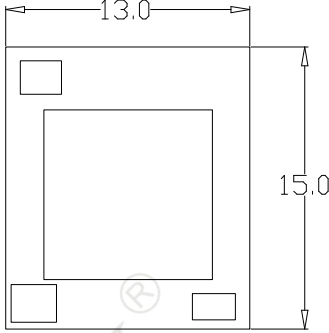
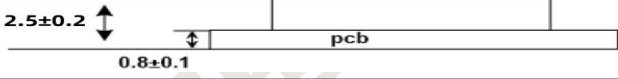
Parameter	Condition	Symbol	Min.	Typ	Max.	Unit
Baud rate			115.2		3000	Kbps
Baud rate accuracy per	Receive/Transmit		-3		3	%
CTS low to TX_DATA on		T3	0	2		ns
CTS high to TX_DATA off	Hardware flow	T4			1	byte
CTS High Pulse Width		T6	1			bit

\* Note : HCI packet means HCI command(256 bytes), HCI event(256 bytes), ACL(1024 bytes), SCO(256 bytes)

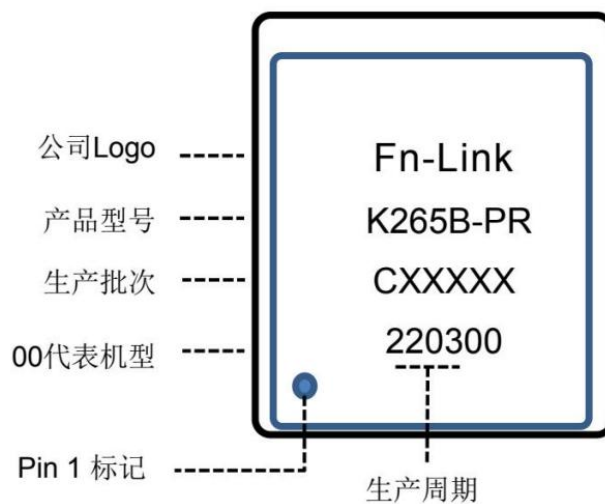


## 8. Size reference

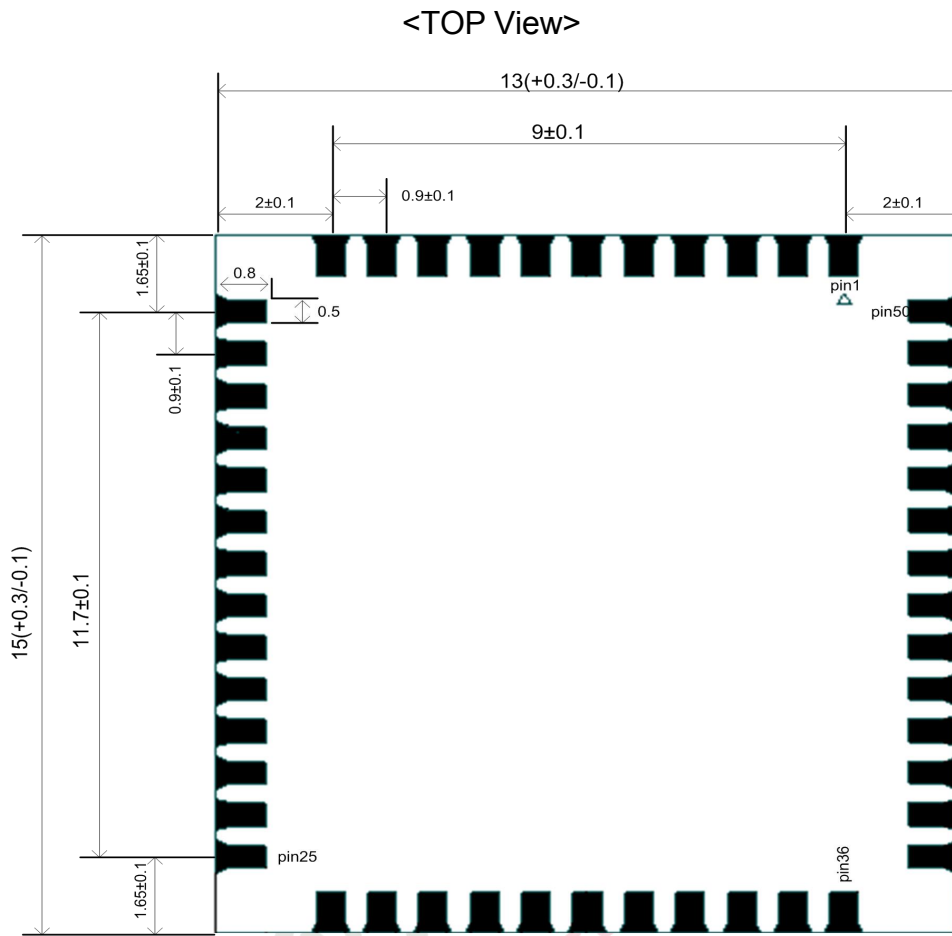
### 8.1 Module Picture

<p><b>L x W : 15 x 13 (+0.3/-0.1) mm</b></p> <p>Pin1 mark ▲</p> 	
<p><b>H: 2.5 (±0.2) mm</b></p>	
<p><b>Weight</b></p>	<p>0.8g</p>

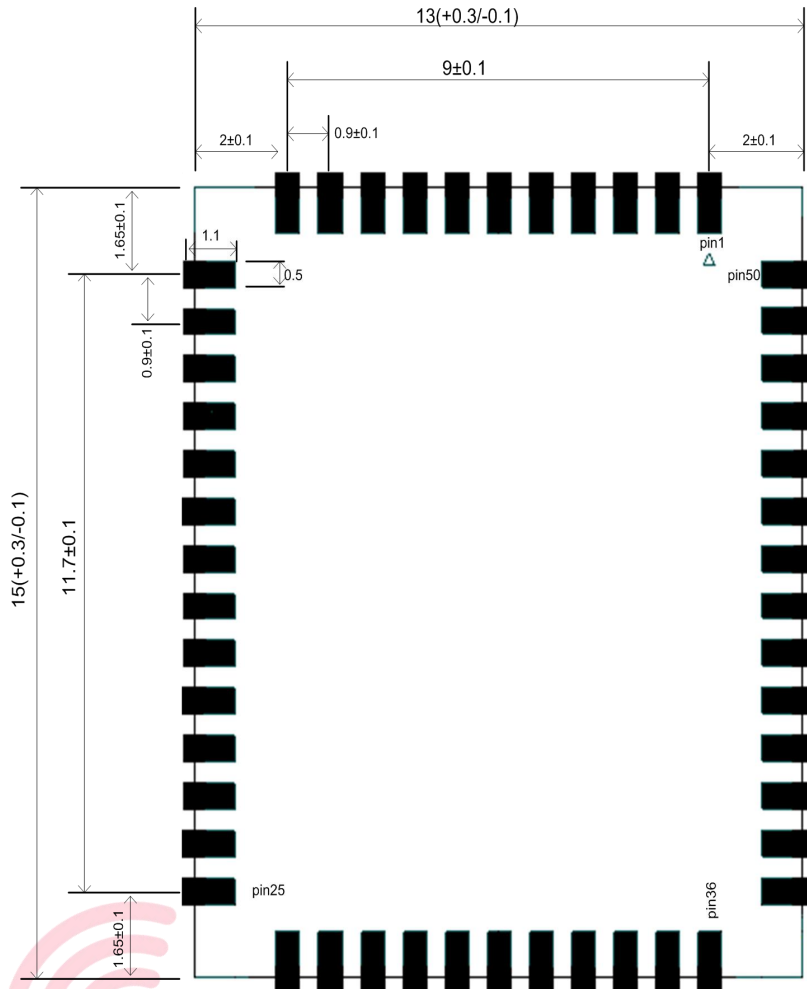
### 8.2 Marking Description



### 8.3 Physical Dimensions



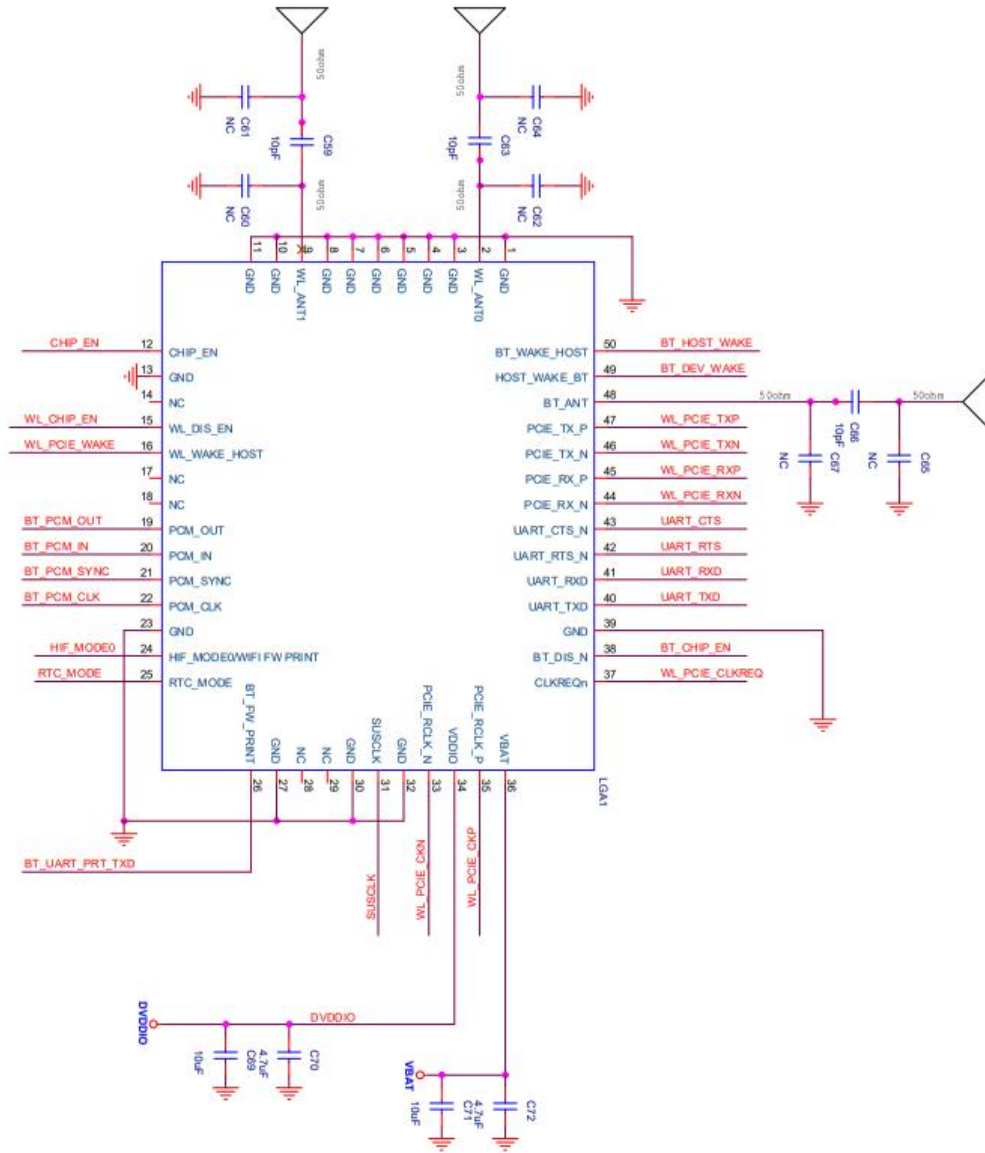
### 8.4 Layout Recommendation

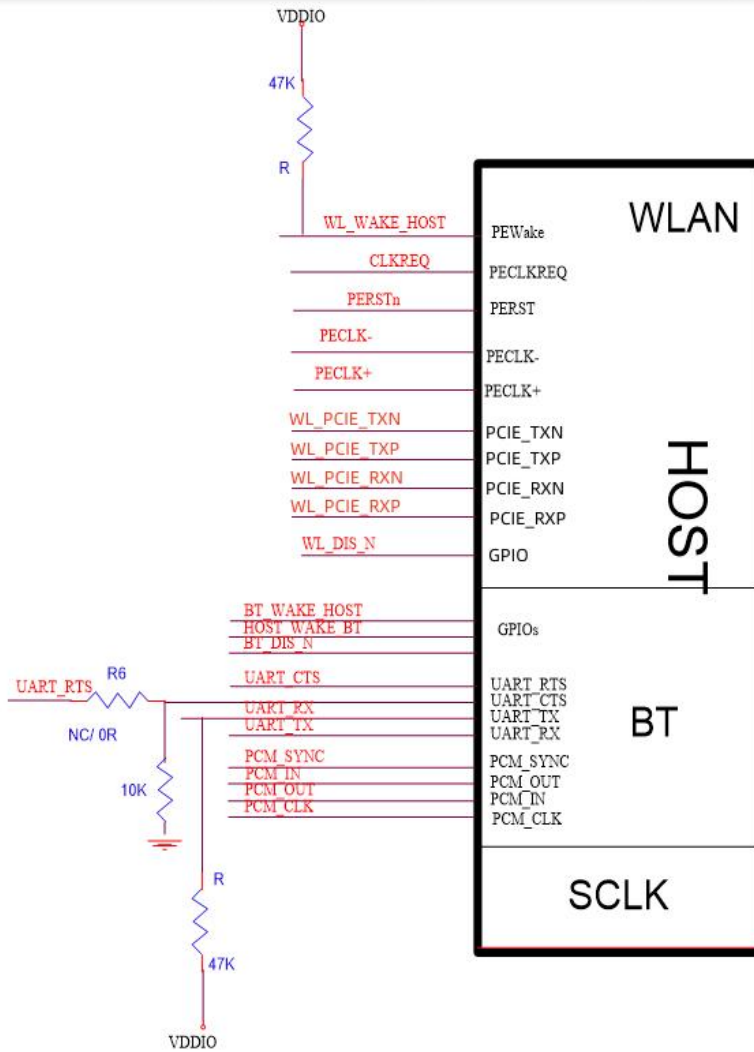


### 9. The Key Material List

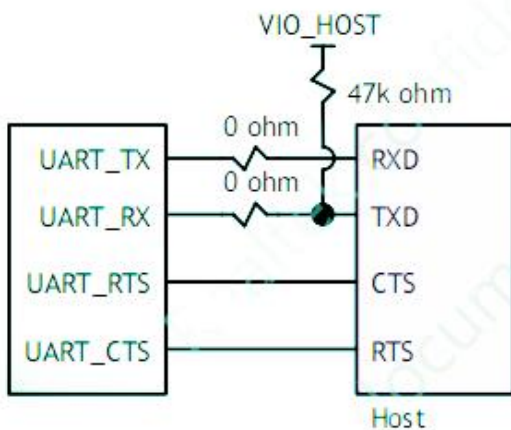
Item	Part Name	Description	Manufacturer
1	Chipset	W265P1	AMLOGIC
2	PCB	K265B-PR 深绿色,FR4,6 层通孔,有卤 TG150, 沉金,金厚 1 μ ,30 连片,13X15X0.8mm	XY-PCB, GDKX, Sunlord, SLPCB,TRULY
3	Crystal	2016 40MHz ±10ppm	ECEC, TKD, Hosonic, JWT, TXC
4	Inductor	2012 2.2UH,±20%	Sunlord, Ceaiya, Cener
5	Diplexer	1608 Dual-band, dual-mode 2.4GHz/5GHz WLAN	Glead, Walsin, ACX, Murata, MAG.LAYERS,TDK

# 10. Reference Design

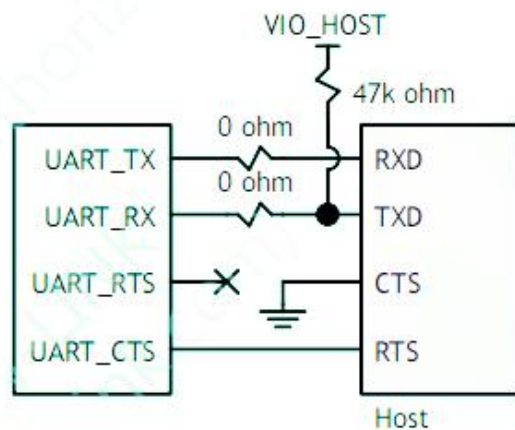




HCI Connection for H4 protocol



HCI Connection for H5 protocol



Note: There must be 0 ohm jumper-resistors on TX/RX paths, for BQB certification test

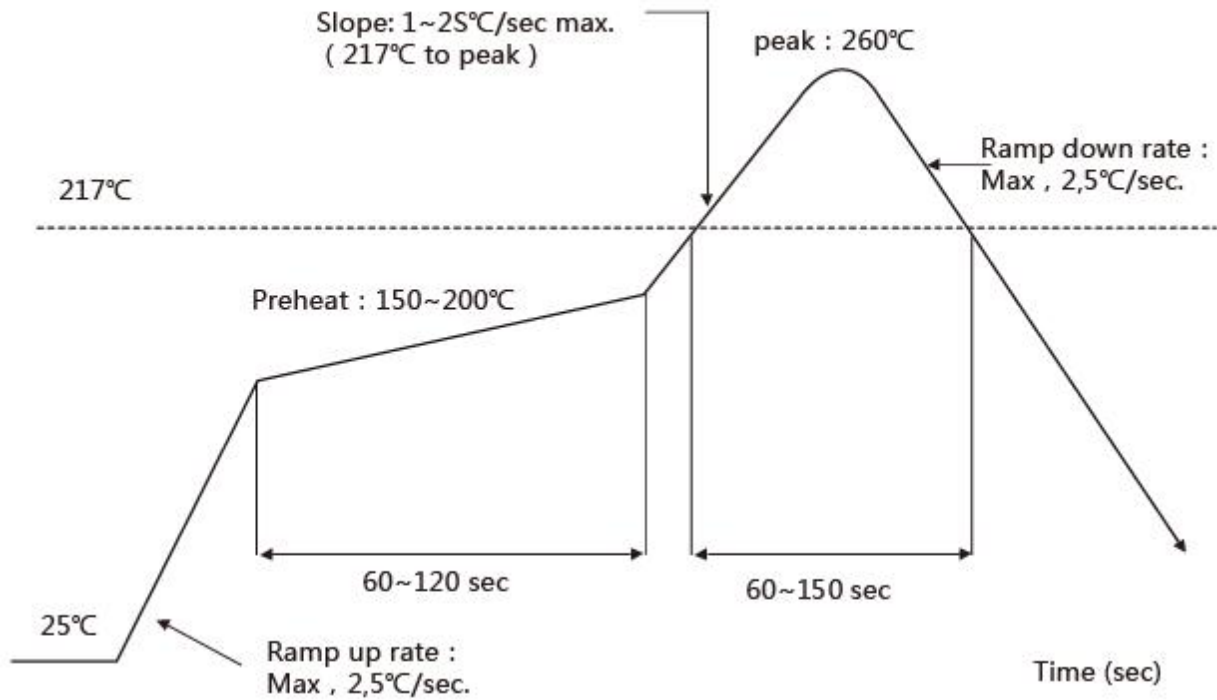
## 11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <math><260^{\circ}\text{C}</math>

Time within  $5^{\circ}\text{C}$  of peak temperature:  $\geq 10\text{s}$

Number of Times :  $\leq 2$  times



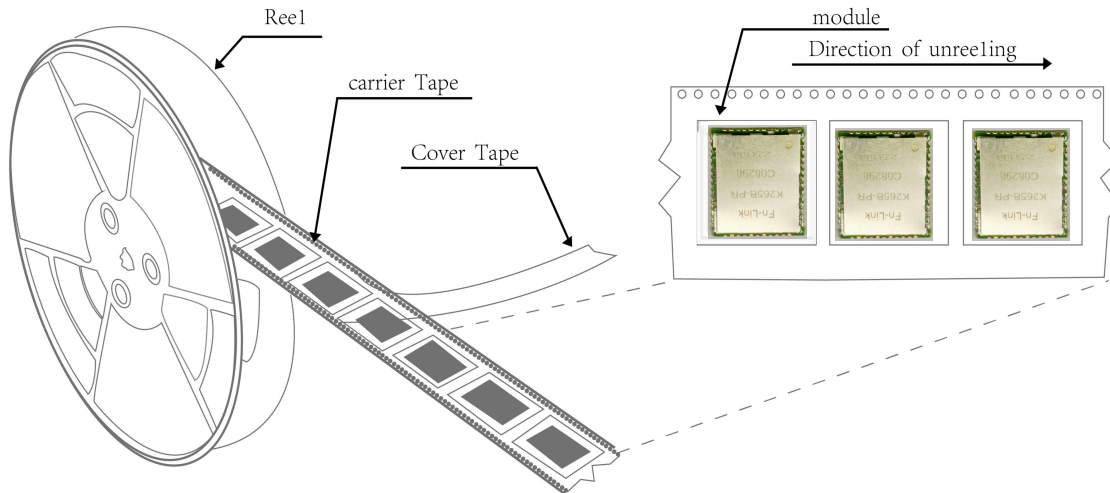
## 12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

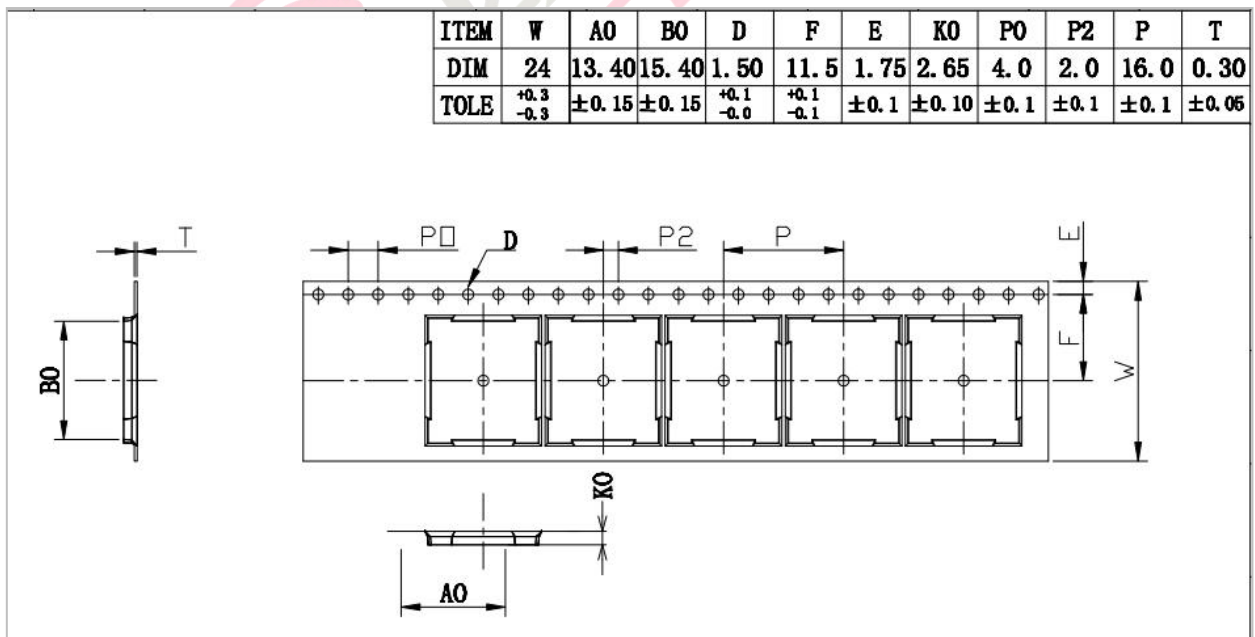
### 13. Package

#### 13.1 Reel

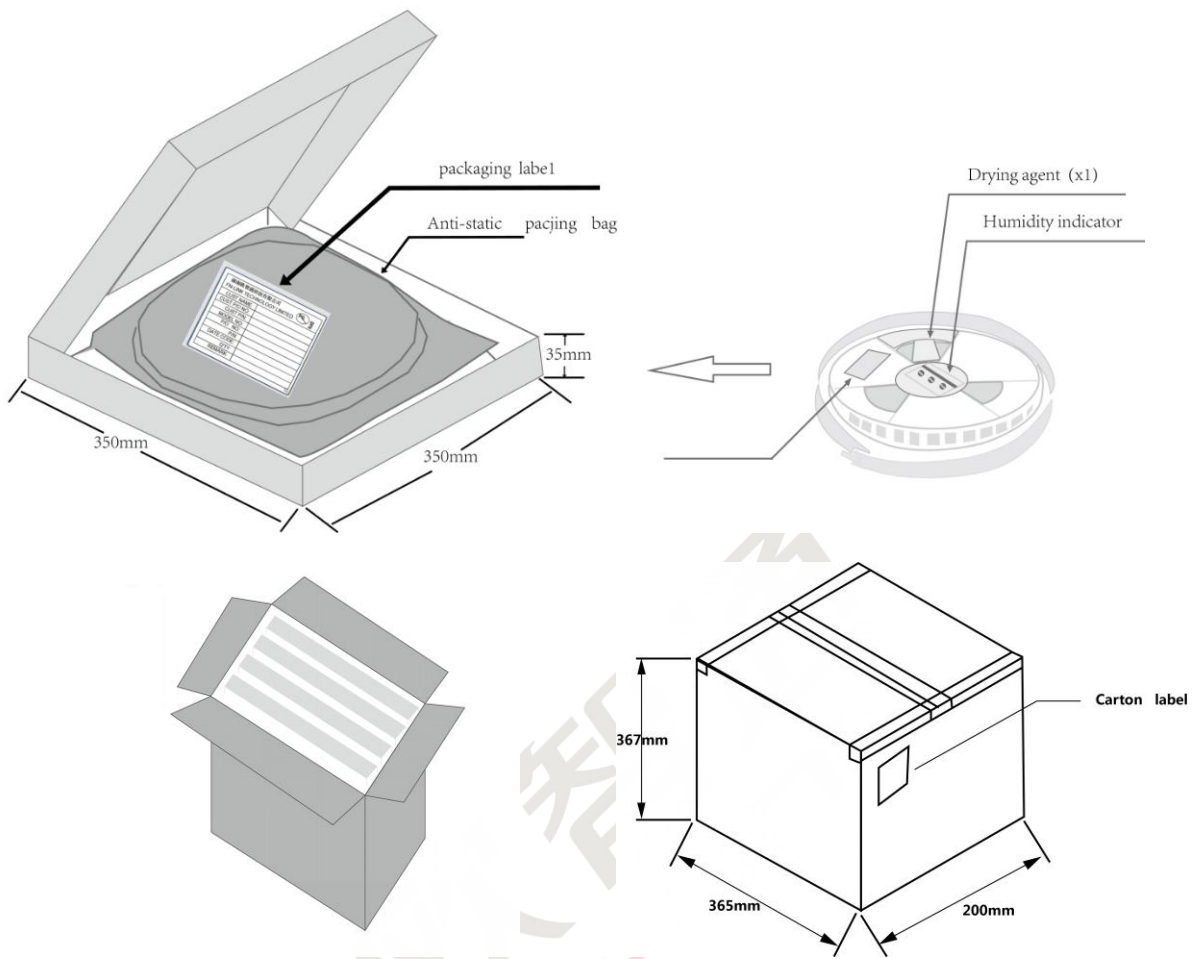
A roll of 1500pcs



#### 13.2 Carrier Tape Detail

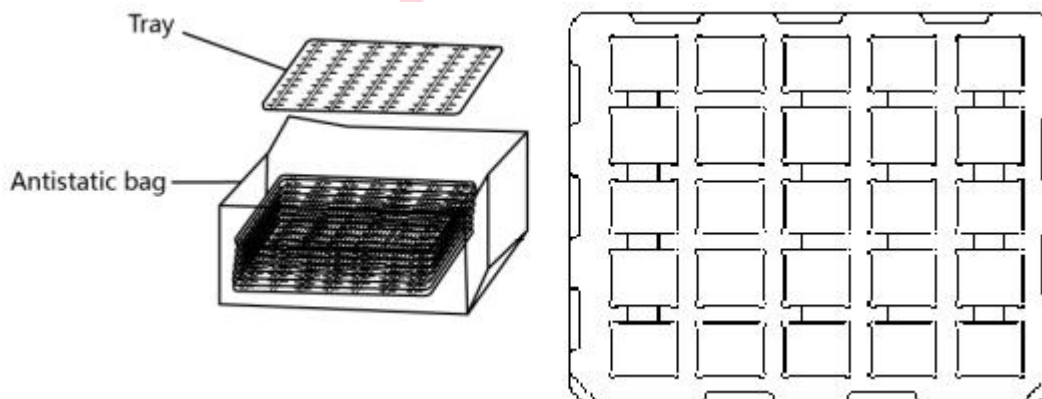


### 13.3 Packaging Detail



### 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 <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