

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

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



CONTENTS

1. General Description	5
1.1 Introduction	5
1.2 Description	5
2. Features	6
3. Block Diagram	6
4. General Specification	7
4.1 WI-FI 2.4GHz Specification	7
4.2 WI-FI 5GHz Specification	8
4.3 Bluetooth Specification	10
5. ID setting information	11
6. Pin Definition	11
6.1 Pin Outline	11
6.2 Pin Definition details	11
7. Electrical Specifications	13
7.1 Power Supply DC Characteristics	13
7.2 Interface Circuit time series	14
7.2.1 PCIe bus during power on sequence	14
7.2.2 PCIe PERST# Timing sequence	15
7.2.3 power off sequence	15
7.2.4 BT_DIS Timing sequence	16
7.2.5 UART interface timing	16
8. Size reference	17
8.1 Module Picture	17
8.2 Marking Description	17
8.3 Physical Dimensions	18
8.4 Layout Recommendation	19
9. The Key Material List	19
10. Reference Design	20
11. Recommended Reflow Profile	22
12. RoHS compliance	22
13. Package	23
13.1 Reel	23
13.2 Carrier Tape Detail	23
13.3 Packaging Detail	24
13.4 Tray	24
14. Moisture sensitivity	25

Revision History

[illegible]

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

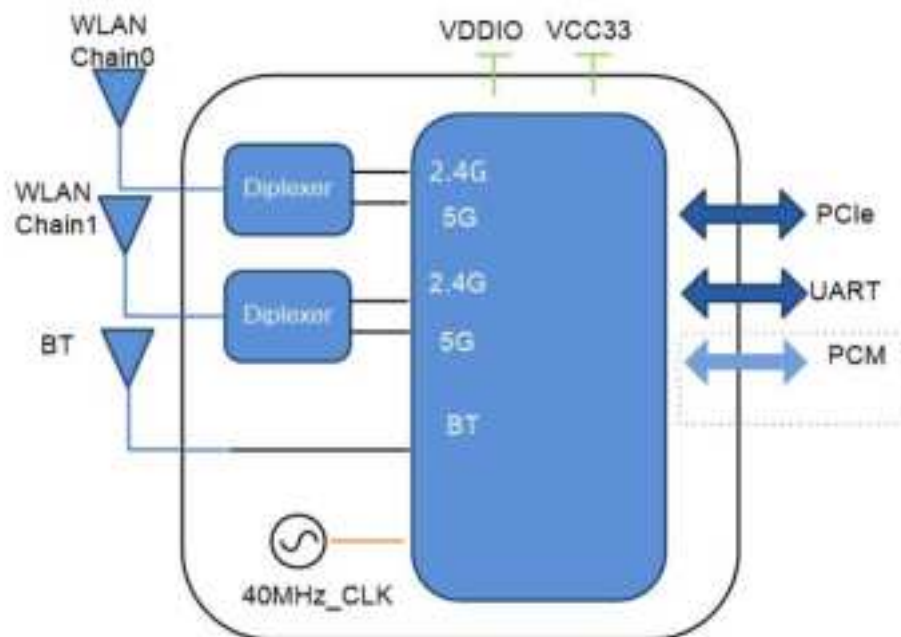
Host Interface

- 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 ¹	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 ¹	
Test Items	Typical Value	EVM
Output Power ¹	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
	140	5700
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
General Specification	
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
RF Specification	
Output Power , tolerance ± 3 dB	
	CL1(dBm)
BDR Output Power	9
EDR Output Power	9
BLE Output Power	13
Sensitivity, tolerance : /	
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.

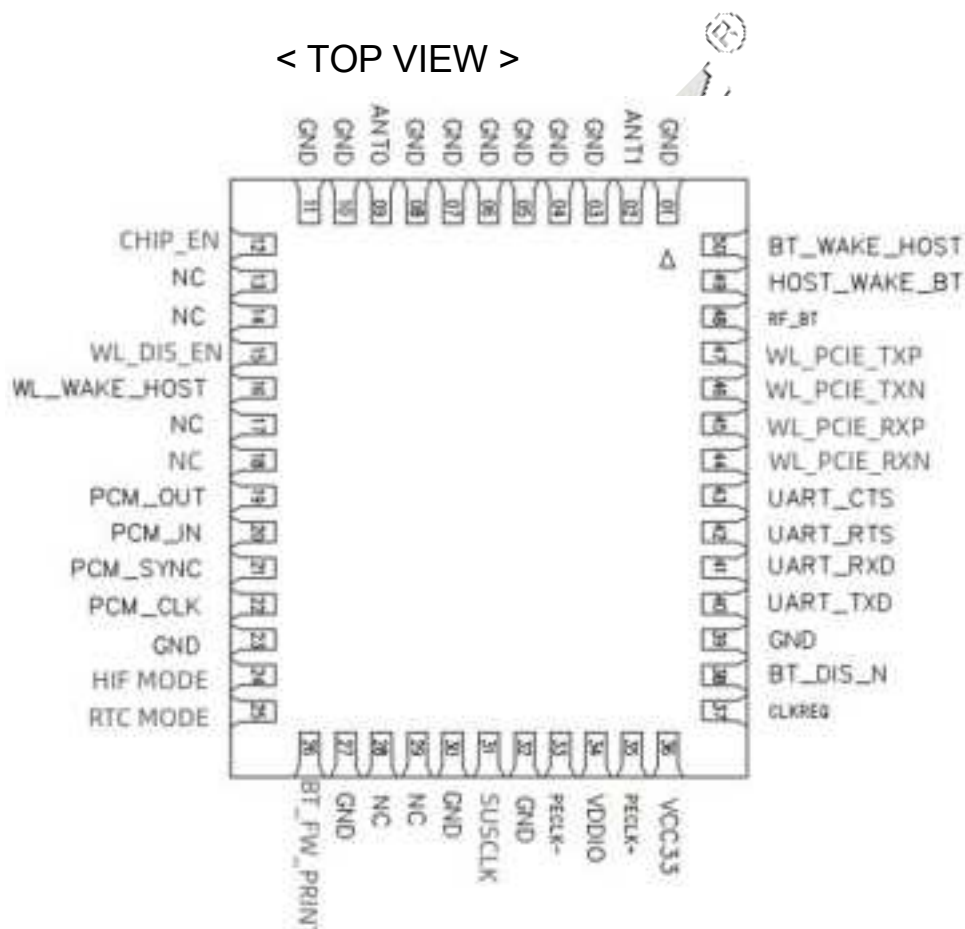
5. ID setting information

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 (optional 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

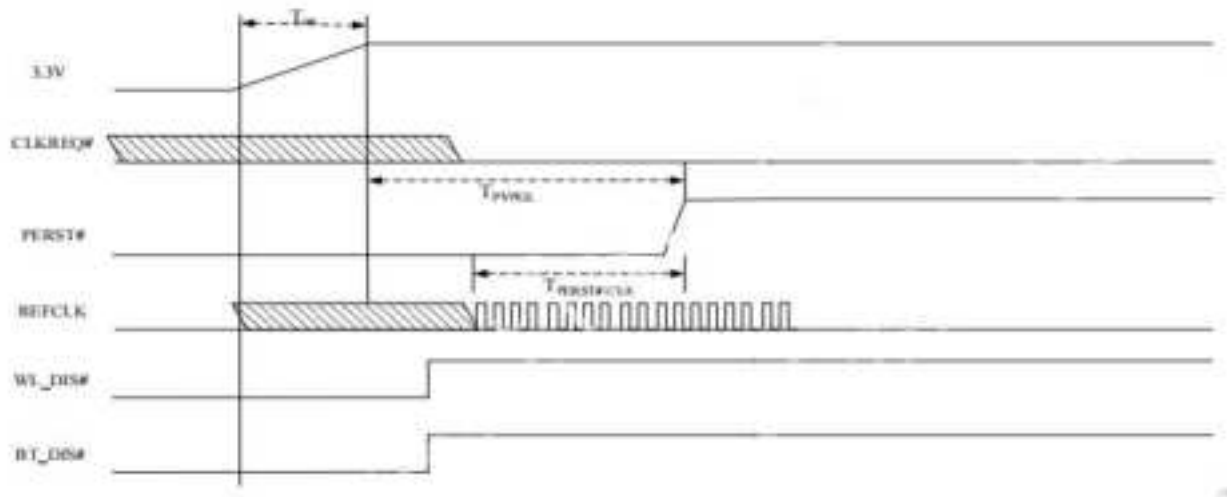
7. Electrical Specifications

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



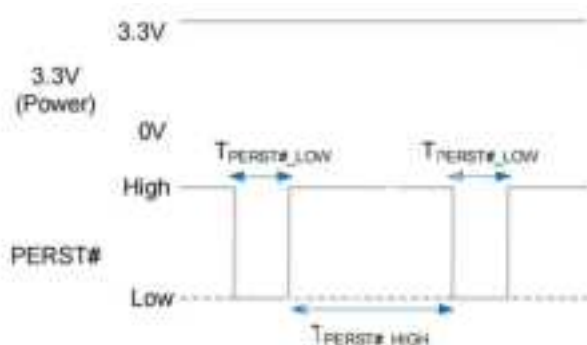
T_{on} : the main power ramp up duration

T_{PVGL} : 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_{PVGL}	ms	Implementation specific; recommended 50ms		
$T_{PERST\#-CLK}$	us	100	--	--

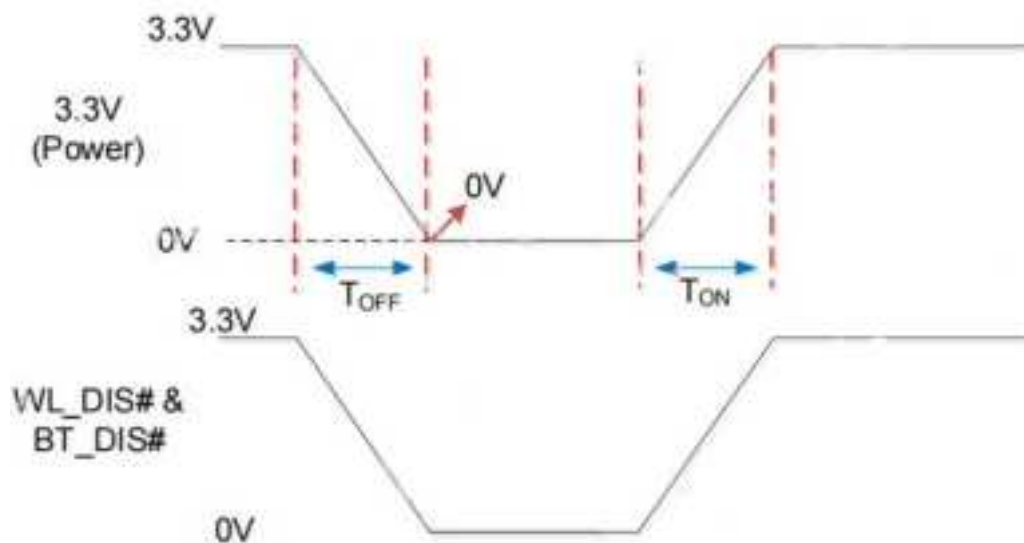
7.2.2 PCIe PERST# Timing sequence



PCIE PERST# Timing Parameters

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

7.2.3 power off sequence

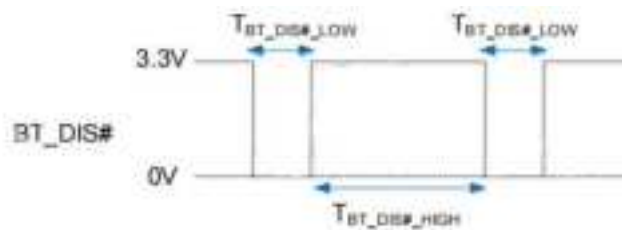


Power Off Timing Parameters

Symbol	Min.	Typical	Max.	Unit	Description
T _{OFF}	1.5	--	--	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.

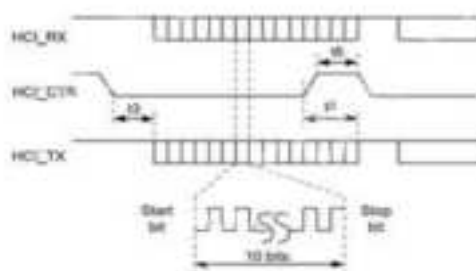
7.2.4 BT_DIS Timing sequence



	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.



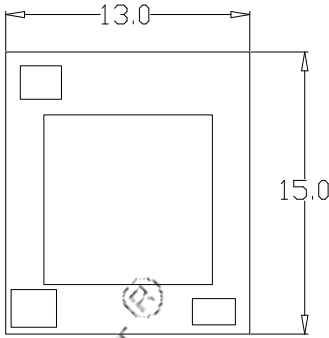
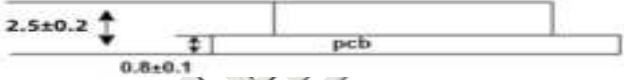
UART Timing Diagram
UART Timing Characteristics

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

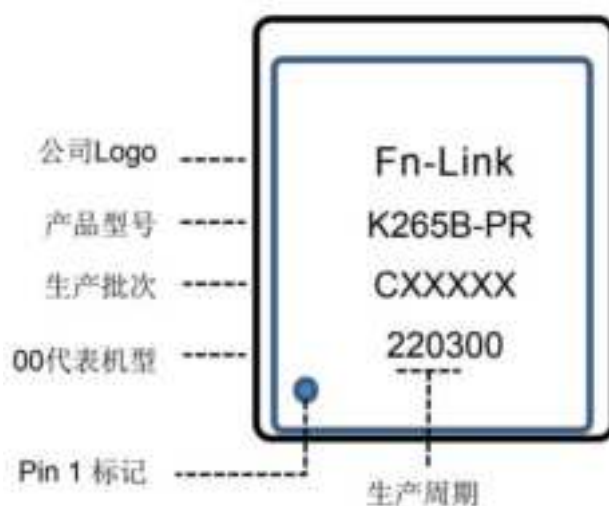
* Note : HCI packet means HCI command(256 bytes), HCI event(256 bytes), ACL(1024 bytes), SCO(256 bytes)

8. Size reference

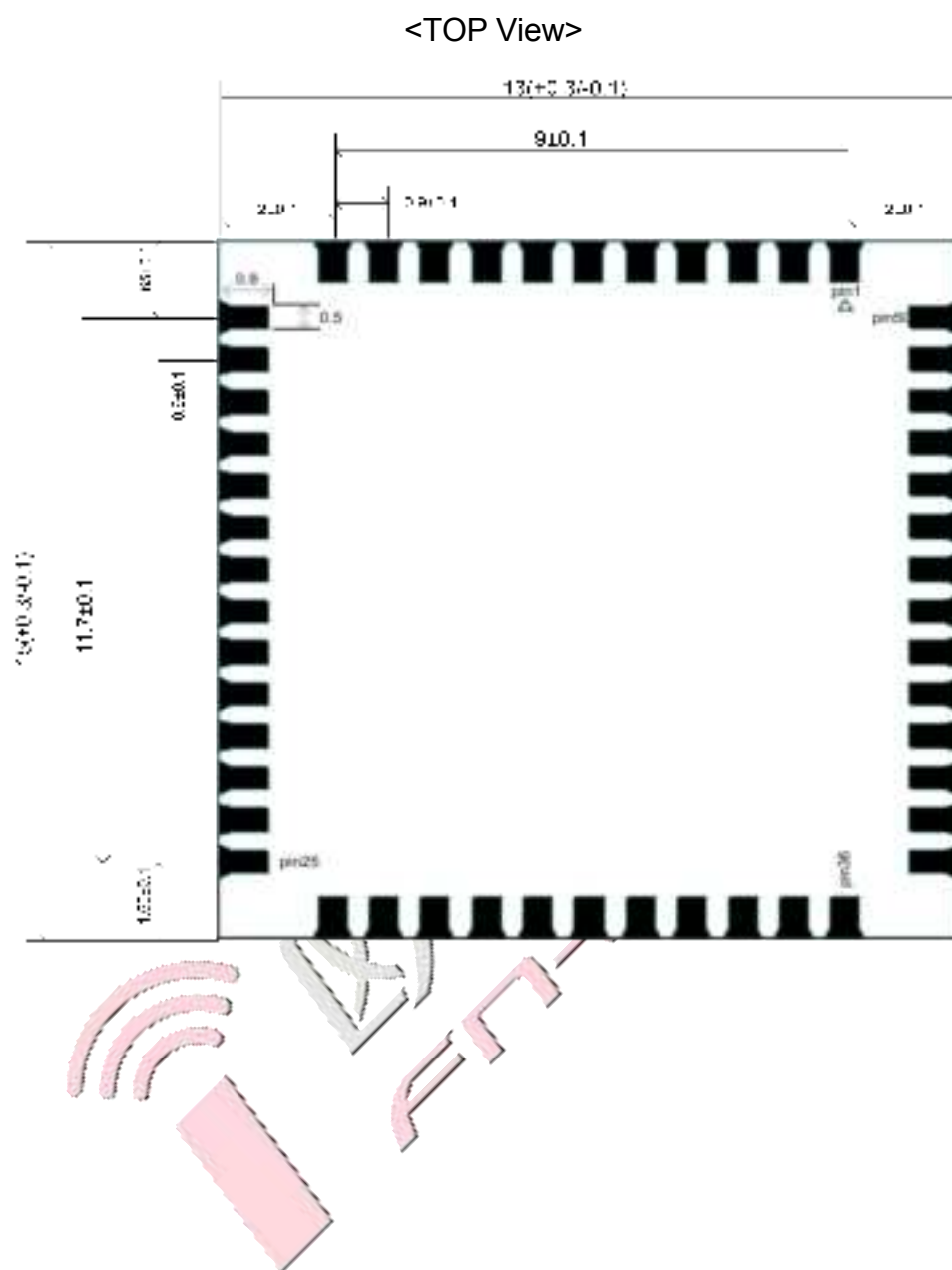
8.1 Module Picture

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

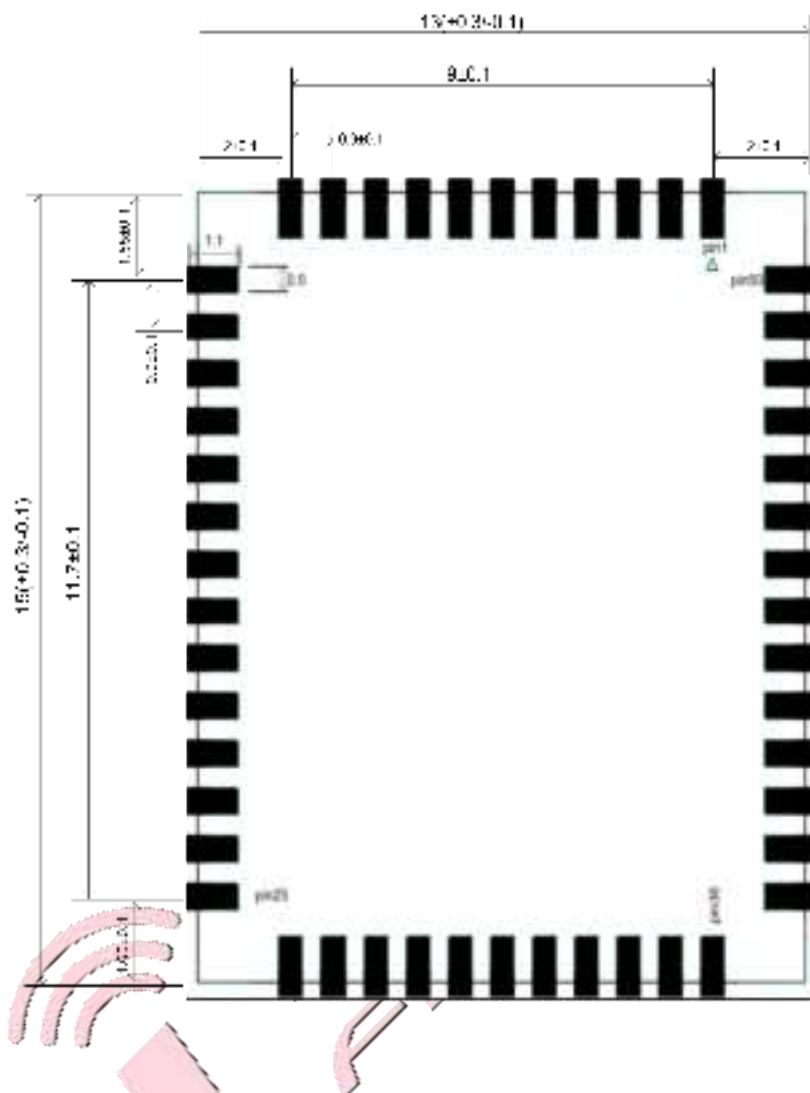
8.2 Marking Description



8.3 Physical Dimensions



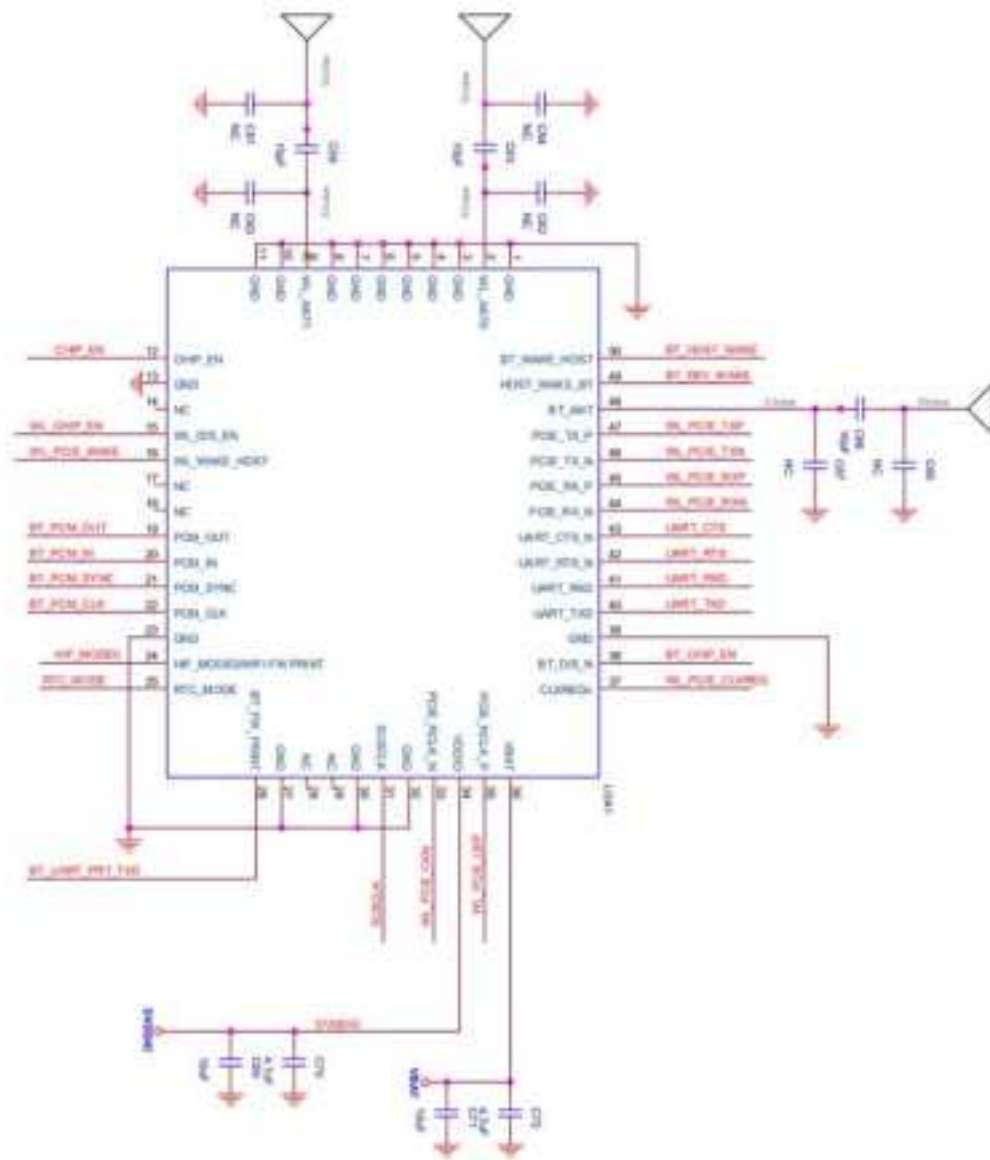
8.4 Layout Recommendation

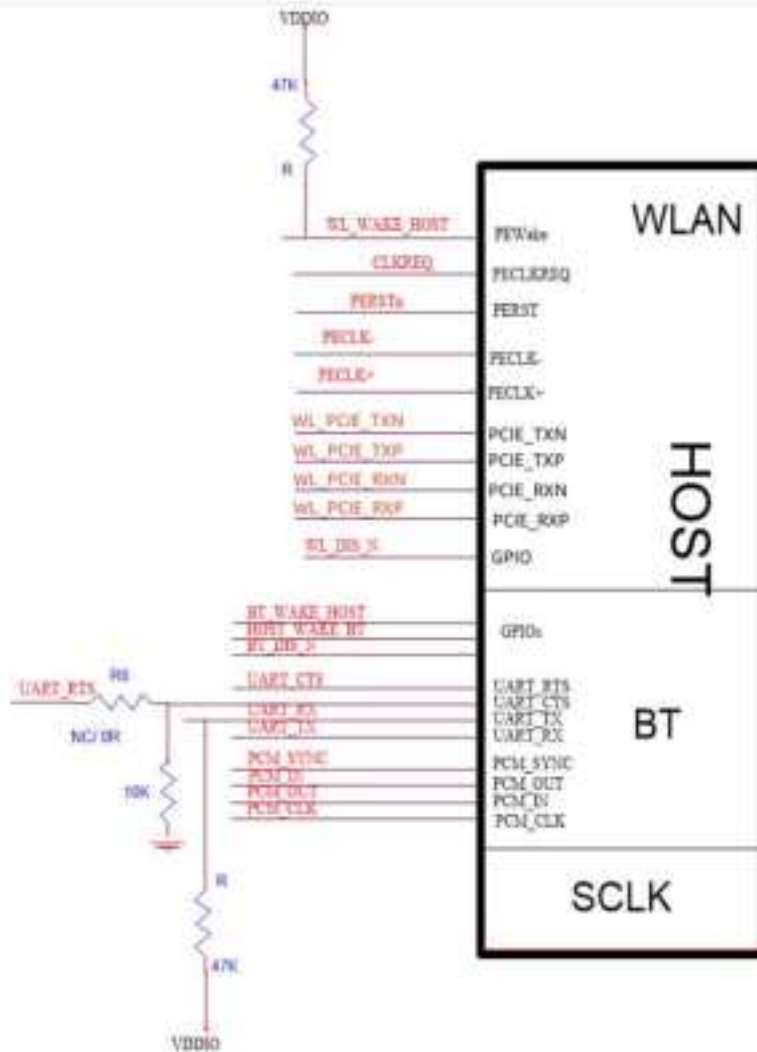


9. The Key Material List

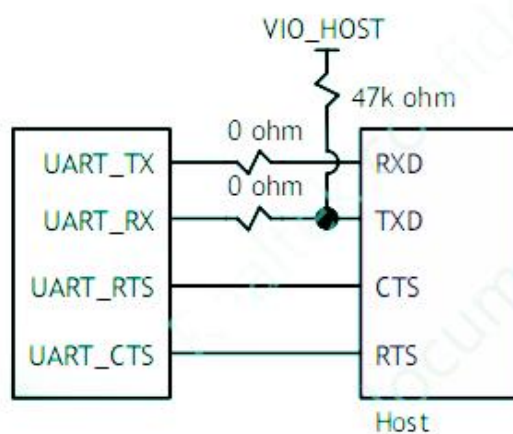
Item	Part Name	Description	Manufacturer
1	Chipset	W265P1	AMLOGIC
2	PCB	K265B-PR 深绿色,FR4,6 层通孔,有卤 TG150, 沉金,金厚 1 μ,30 连片,13X15X0.8mm	XY-PCB, GDKX, Sunlord, SLPCB,TRULY
3	Crystal	2016 40MHz ±10ppm	ECEC, TKD, Hosonic, JWT, TXC
4	Inductor	2012 2.2UH,±20%	Sunlord, Ceaiya, Cenker
5	Diplexer	1608 Dual-band,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

10. Reference Design

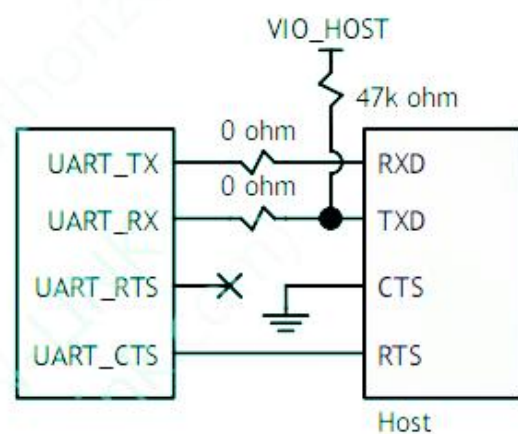




HCI Connection for H4 protocol



HCI Connection for H5 protocol



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

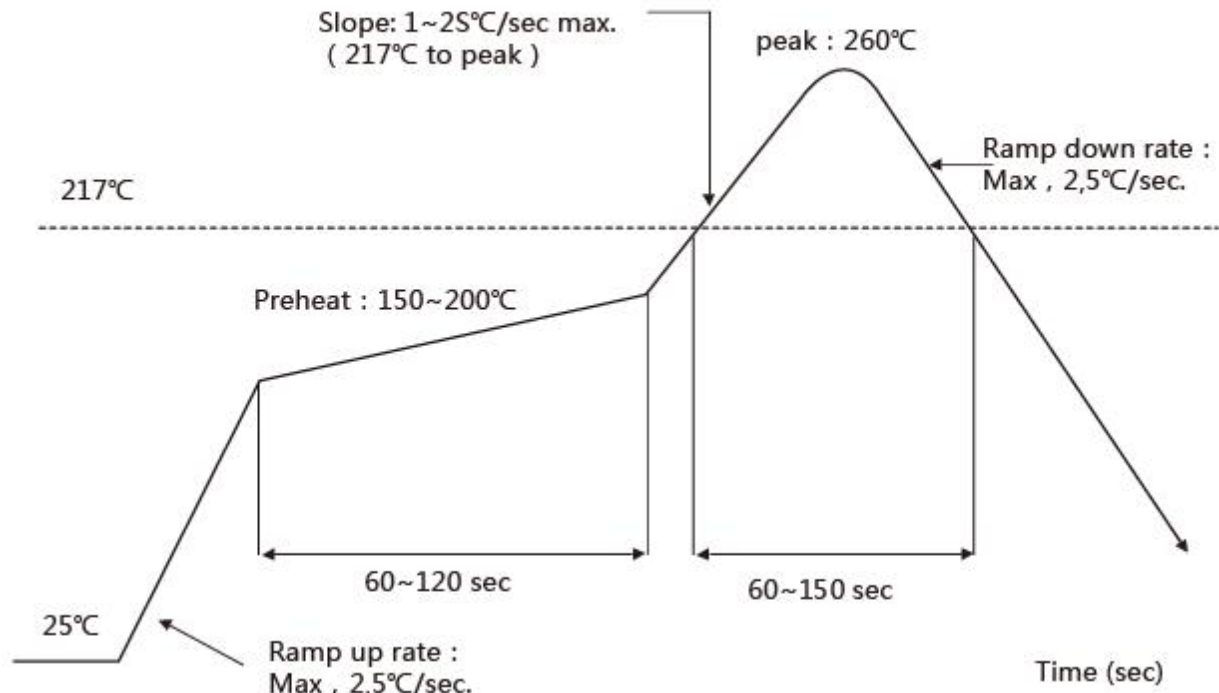
11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : $<260^{\circ}\text{C}$

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

Number of Times : ≤ 2 times



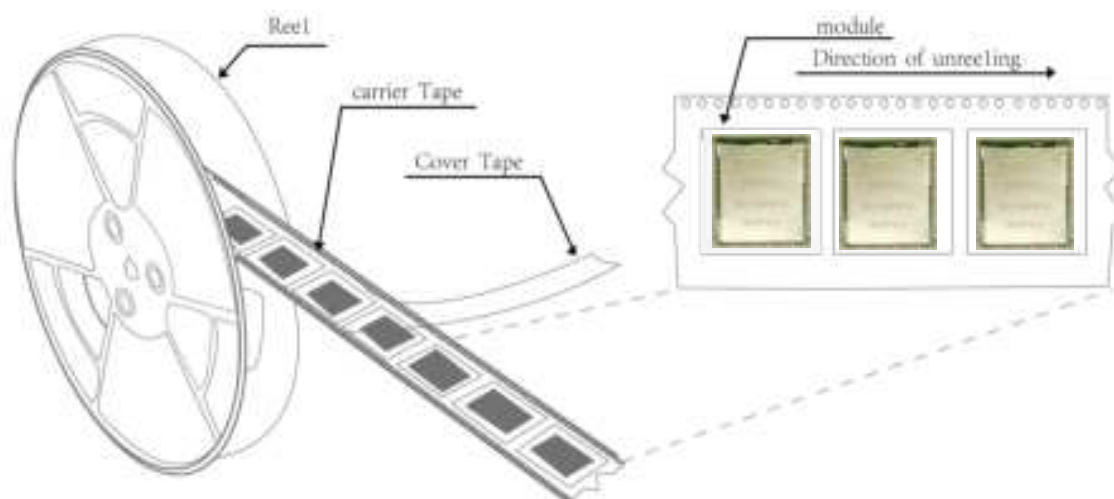
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

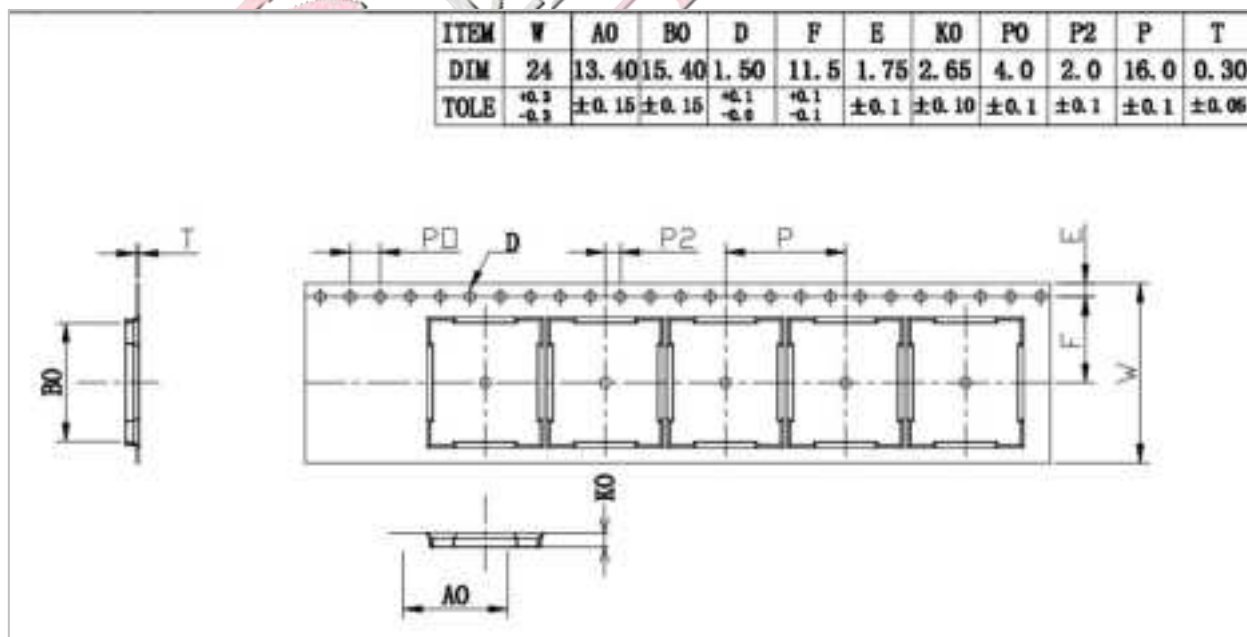
13. Package

13.1 Reel

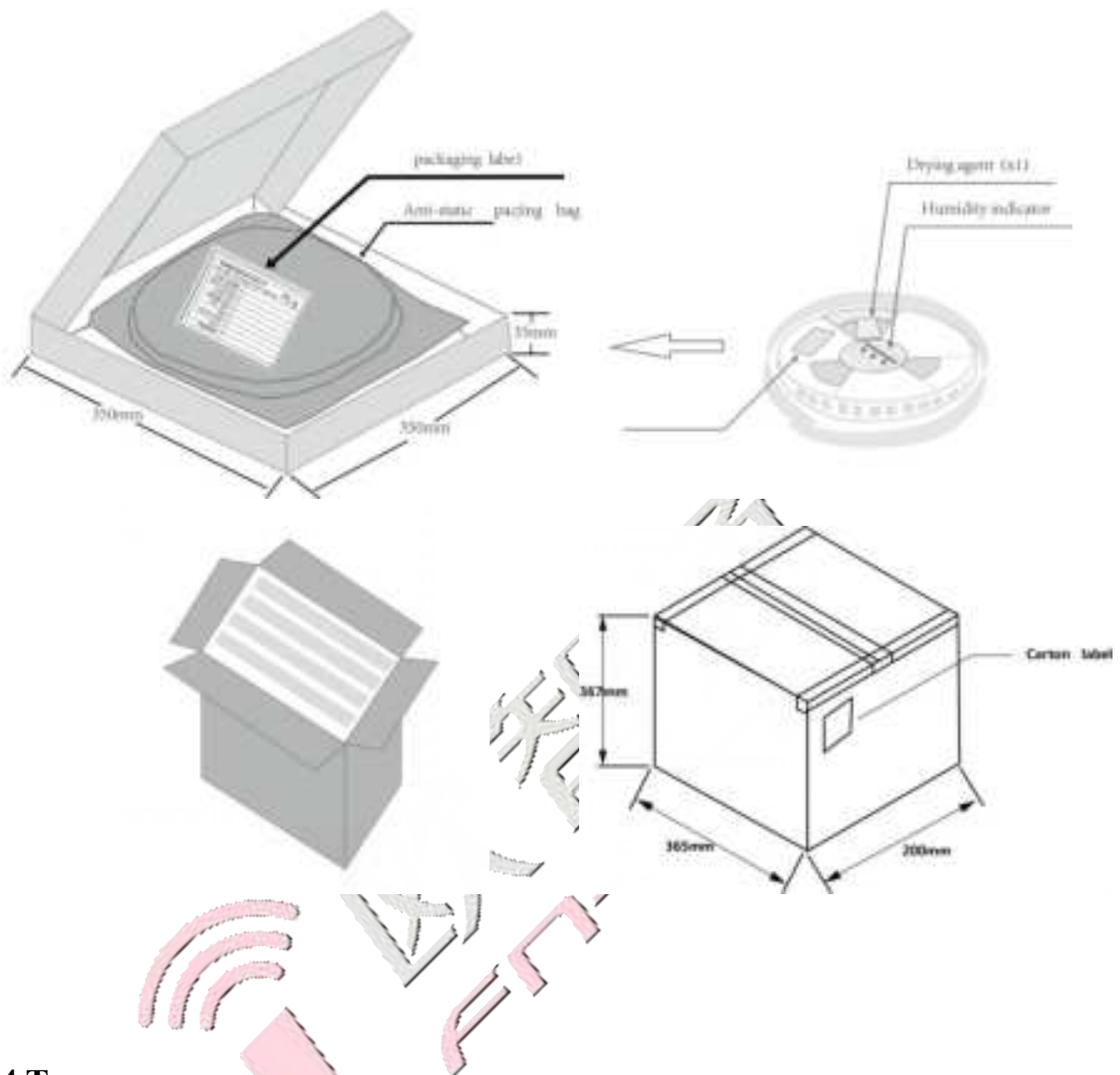
A roll of 1500pcs



13.2 Carrier Tape Detail

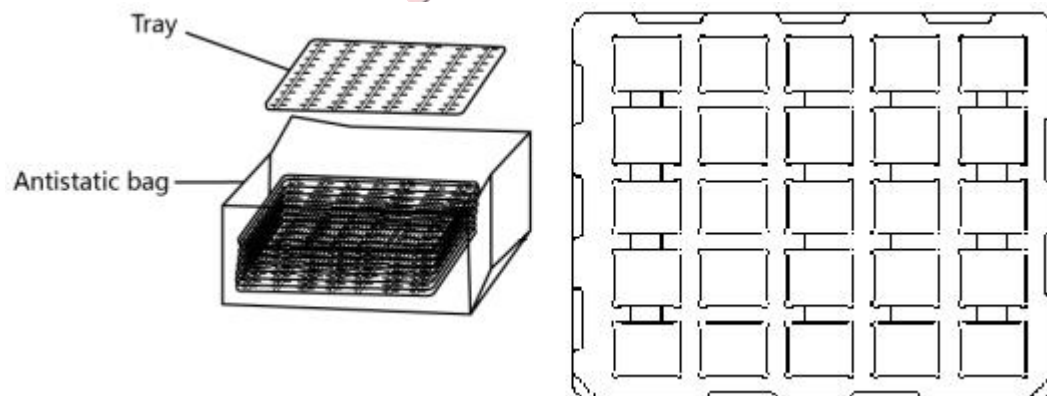


13.3 Packaging Detail



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 <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

