

PRODUCT SPECIFICATION

6252B-PRB

Wi-Fi Dual-band 2x2 11ax + BT 5.2

PCIe Combo Module

Version:v1.2



6252B-PRB Module Datasheet

Ordering Information	Part NO.	Description
	FG6252BPRB-00	RTL8852BE-VR-CG,a/b/g/n/ac/ax WiFi,2T2R+BT5.2, 13*15mm, PCIE+UART,2ant version
	FG6252BPRB-K0	RTL8852BE-VR-CG,a/b/g/n/ac/ax WiFi,2T2R+BT5.2, 13*15mm, PCIE+UART,2ant version(客供)
	FG6252BPRB-01	RTL8852BE-VR-CG,a/b/g/n/ac/ax WiFi,2T2R+BT5.2, 13*15mm,PCIE+UART,3ant version
	FG6252BPRB-K1	RTL8852BE-VR-CG,a/b/g/n/ac/ax WiFi,2T2R+BT5.2, 13*15mm,PCIE+UART,3ant version(客供)

Customer: _____

Customer P/N: _____

Signature: _____

Date: _____

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Revision History

[illegible]

1. General Description

1.1 Introduction

6252B-PRB is a highly integrated single module that support 2-stream 802.11ax solution with multi-user MIMO with WLAN PCI Express network interface controller and HS-UART mixed interface. It combines a WLAN MAC, a 2T2R capable WLAN baseband, and RF Support 802.11 a/b/g/n/ac/ax and provide up to 1201Mbps for 11ax MIMO OFDM.

1.2 Description

Model Name	6252B-PRB
Product Description	Support Wi-Fi/Bluetooth functionalities
Dimension	L x W x H: 15 x 13 x 1.8 mm
Wi-Fi Interface	Support PCIe
BT Interface	UART / PCM
OS supported	Android /Linux/ Win CE /iOS /XP/WIN7/WIN10
Operating temperature	0°C to 70°C
Storage temperature	-40°C to 85°C

2. Features

General

- Support IEEE802.11a/b/g/n/ac/ax
- Dual-stream spatial multiplexing up to 1201 Mbps data rate
- Supports 20/40MHz bandwidth at 2.4GHz and 20/40/80MHz 5GHz band channels
- Complies with PCI express base specification revision 1.1
- Support 802.11e,i,h,k. WAPI

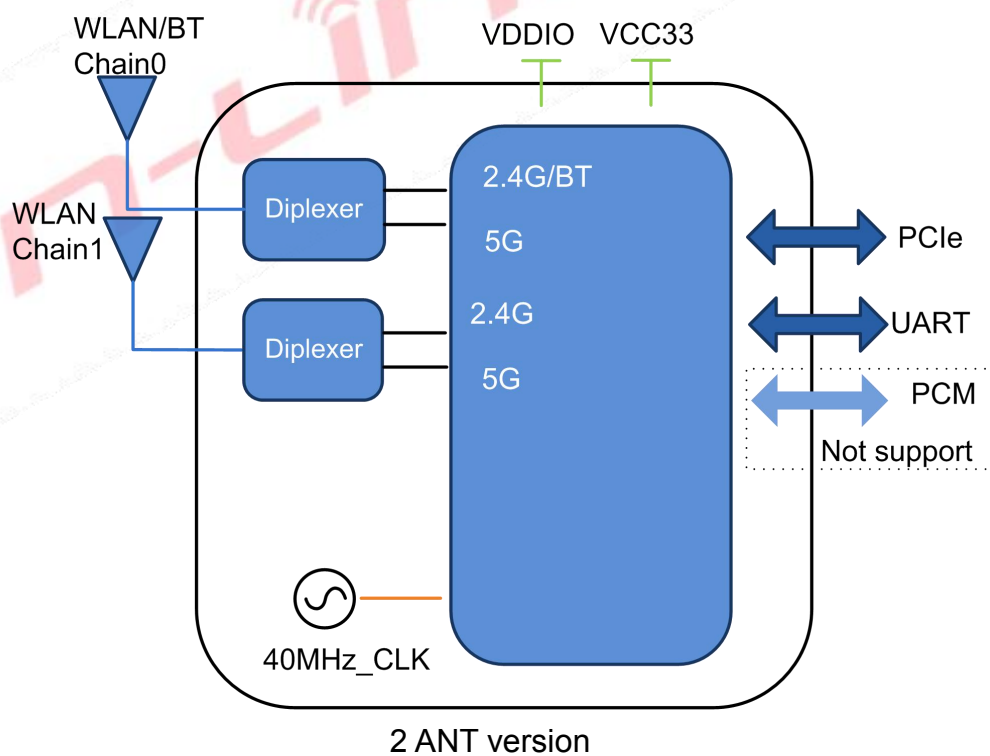
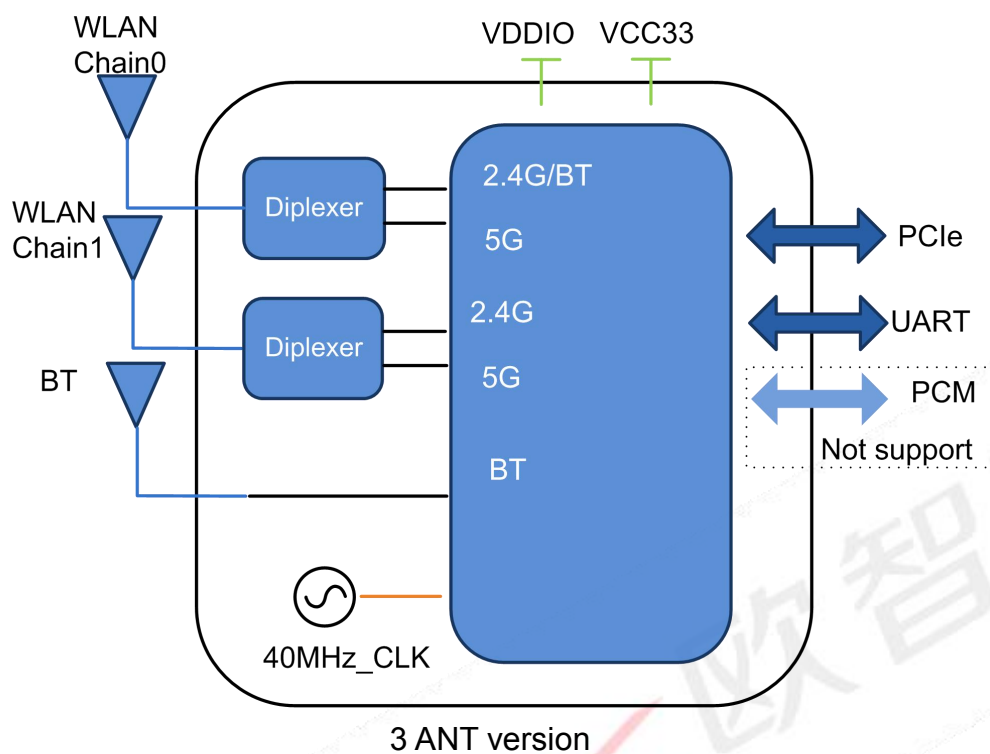
Host Interface

- PCIe LTR/L1.Off state supported
- Supports WLAN/Bluetooth coexistence

Bluetooth Features

- Complies with HS-UART with configurable baud rate for BT
- Supports Bluetooth 5 system (BT5.2 Logo Compliant)
- Compatible with Bluetooth v2.1+EDR
- Dual Mode support: Simultaneous LE and BR/EDR
- BT host digital interface:
 - HCI UART

3. Block Diagram



4. General Specification

4.1 2.4G RF Specification

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

Feature	Description	
WLAN Standard	IEEE 802.11 b/g/n/ac/ax Wi-Fi compliant	
Frequency Range	2.400 GHz ~ 2.497 GHz (2.4 GHz ISM Band)	
Number of Channels	2.4GHz: Ch1 ~ Ch14	
Test Items	Typical Value	EVM
Output Power ¹	802.11b /11Mbps : 19dBm ± 2 dB	EVM ≤ -9dB
	802.11g /54Mbps : 18dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7 : 17dBm ± 2 dB	EVM ≤ -28dB
	802.11ac VHT20/MCS8: 16dBm ± 2 dB	EVM ≤ -30dB
	802.11ac VHT40/MCS9: 15dBm ± 2 dB	EVM ≤ -32dB
	802.11ax HE20/MCS11: 13dBm ± 2 dB	EVM ≤ -35dB
	802.11ax HE40/MCS11: 13dBm ± 2 dB	EVM ≤ -35dB
Spectrum Mask	Meet with IEEE standard	
Freq. Tolerance	± 20ppm	
SISO Receive Sensitivity (11b,20MHz) @8% PER	- 1Mbps @ -94 dBm	≤ -83 dBm
	- 11Mbps @ -85 dBm	≤ -76 dBm
SISO Receive Sensitivity (11g,20MHz) @10% PER	- 6Mbps @ -90 dBm	≤ -85 dBm
	- 54Mbps @ -71 dBm	≤ -68 dBm
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 @ -90 dBm	≤ -85 dBm
	- MCS=7 @ -69 dBm	≤ -67 dBm
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 @ -87 dBm	≤ -82 dBm
	- MCS=7 @ -66 dBm	≤ -64 dBm
SISO Receive Sensitivity (11ac,20MHz) @10% PER	- MCS=0 @ -90 dBm	≤ -82 dBm
	- MCS=8 @ -64 dBm	≤ -60 dBm
SISO Receive Sensitivity (11ac ,40MHz) @10% PER	- MCS=0 @ -87 dBm	≤ -79 dBm
	- MCS=9 @ -59 dBm	≤ -55 dBm
SISO Receive Sensitivity (11ax,20MHz) @10% PER	- MCS=0 @ -90 dBm	≤ -74 dBm
	- MCS=11 @ -60 dBm	≤ -52 dBm
SISO Receive Sensitivity (11ax ,40MHz) @10% PER	- MCS=0 @ -87 dBm	≤ -71 dBm
	- MCS=11 @ -57 dBm	≤ -49 dBm
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/ax, Wi-Fi compliant	
Frequency Range	4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band)	
Number of Channels	5.0GHz: Please see the table ¹	
Test Items	Typical Value	EVM
Output Power ²	802.11a /54Mbps: 18 dBm ± 2 dB	EVM ≤ -25dB
	802.11n /MCS7: 17 dBm ± 2 dB	EVM ≤ -28dB
	802.11ac VHT20/MCS8: 16 dBm ± 2 dB	EVM ≤ -30dB
	802.11ac VHT40/MCS9: 15 dBm ± 2 dB	EVM ≤ -32dB
	802.11ac VHT80/MCS9: 15 dBm ± 2 dB	EVM ≤ -32dB
	802.11ax HE20/MCS11: 13 dBm ± 2 dB	EVM ≤ -35dB
	802.11ax HE40/MCS11: 13 dBm ± 2 dB	EVM ≤ -35dB
	802.11ax HE80/MCS11: 13 dBm ± 2 dB	EVM ≤ -35dB
Test Items	Test Value	Standard Value
SISO Receive Sensitivity (11a,20MHz) @10% PER	- 6Mbps @ -90 dBm	≤ -85 dBm
	- 54Mbps @ -71 dBm	≤ -68 dBm
SISO Receive Sensitivity (11n,20MHz) @10% PER	- MCS=0 @ -90 dBm	≤ -85 dBm
	- MCS=7 @ -69 dBm	≤ -67 dBm
SISO Receive Sensitivity (11n,40MHz) @10% PER	- MCS=0 @ -87 dBm	≤ -82 dBm
	- MCS=7 @ -66 dBm	≤ -64 dBm
SISO Receive Sensitivity (11ac,20MHz)@10% PER	- MCS=0, NSS1 @ 90 dBm	≤ -82 dBm
	- MCS=8, NSS1 @ -64 dBm	≤ -60 dBm
SISO Receive Sensitivity (11ac,40MHz) @10% PER	- MCS=0, NSS1 @ -87 dBm	≤ -79 dBm
	- MCS=9, NSS1 @ -59 dBm	≤ -55 dBm
SISO Receive Sensitivity (11ac,80MHz) @10% PER	- MCS=0, NSS1 @ -84 dBm	≤ -79 dBm
	- MCS=9, NSS1 @ -56 dBm	≤ -54 dBm
SISO Receive Sensitivity (11ax,20MHz) @10% PER	- MCS=0 @ -90 dBm	≤ -74 dBm
	- MCS=11 @ -60 dBm	≤ -52 dBm
SISO Receive Sensitivity (11ax,40MHz) @10% PER	- MCS=0 @ -87 dBm	≤ -71 dBm
	- MCS=11 @ -57 dBm	≤ -49 dBm
SISO Receive Sensitivity (11ax,80MHz) @10% PER	- MCS=0 @ -84 dBm	≤ -68 dBm
	- MCS=11 @ -54 dBm	≤ -46 dBm
Maximum Input Level	802.11a/n: -30 dBm	
Antenna Reference	Small antennas with 0~2 dBi peak gain	

1. 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
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

Note: The Wi-Fi RF specification may update by customer requirement.

4.3 Bluetooth Specification

Feature	Description		
General Specification			
Bluetooth Standard	Bluetooth V5.2		
Host Interface	UART		
Antenna Reference	Small antennas with 0~2 dBi peak gain		
Frequency Band	2402 MHz ~ 2480 MHz		
Number of Channels	79 channels		
Modulation	GFSK, $\pi/4$ -DQPSK, 8-DPSK		
RF Specification			
	Min(dBm)	Typical(dBm)	Max(dBm)
Output Power (Class 1)	2	5	8
Sensitivity @ BER=0.1% for GFSK (1Mbps)		-89	
Sensitivity @ BER=0.01% for $\pi/4$ -DQPSK (2Mbps)		-86	
Sensitivity @ BER=0.01% for 8DPSK (3Mbps)		-85	
Maximum Input Level	GFSK (1Mbps):-20dBm		
	$\pi/4$ -DQPSK (2Mbps) :-20dBm		
	8DPSK (3Mbps) :-20dBm		

Note: The Wi-Fi RF specification may update by customer requirement.

5. ID setting information

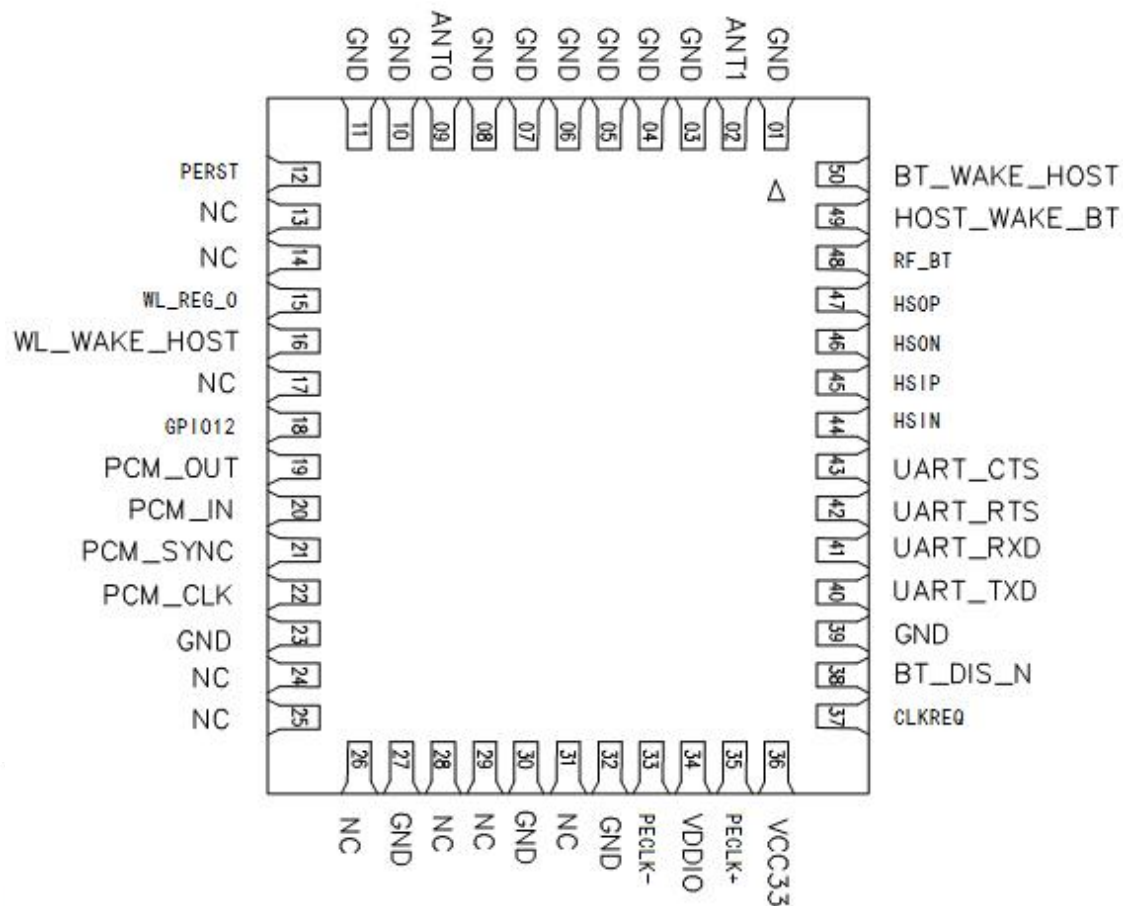
WI-FI

Vendor ID	10EC
Product ID	B852

6. Pin Definition

6.1 Pin Outline

< TOP VIEW >



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	PERST	I/O	PCIE reset, active low	3.3V
13	NC	—	No connect	
14	NC	—	No connect	
15	WL_REG_O	I	GPIO9,WL RESET, 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	GPIO12	I/O	IO pin, if not used please NC	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	NC	—	No connect	
25	NC	—	No connect	
26	NC	—	No connect	
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	HSIN	I	PCIE RX-	
45	HSIP	I	PCIE RX+	
46	HS0N	O	PCIE TX-	
47	HS0P	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:1.8V or 3.3V

7. Electrical Specifications

7.1 Power Supply DC Characteristics

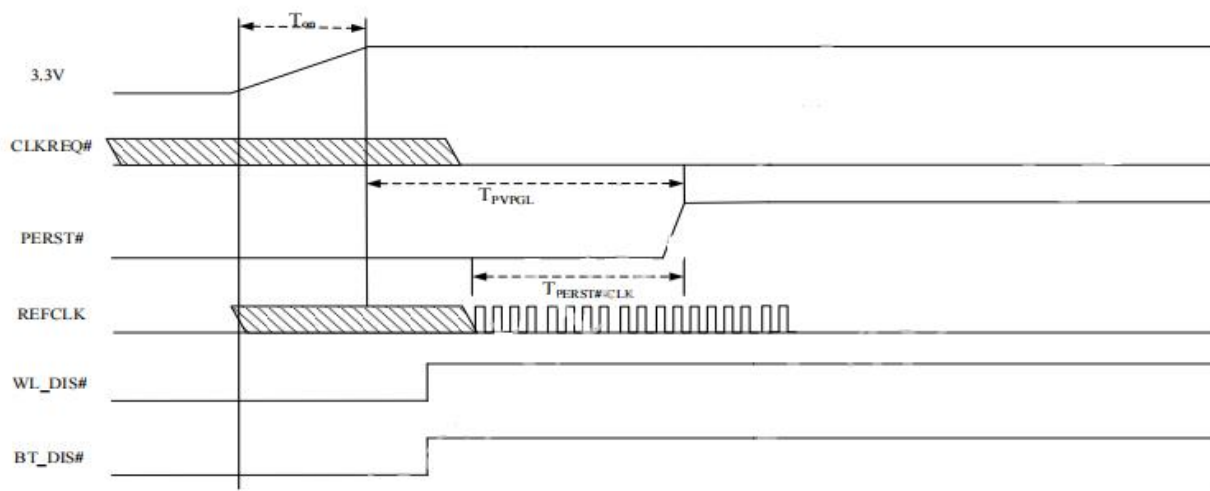
	MIN	TYP	MAX	Unit
Operating Temperature	0	25	70	deg.C
VCC33	3.0	3.3	3.6	V
VDDIO (3.3V)	3.0	3.3	3.6	V
VDDIO (1.8V)	1.7	1.8	3.6	V

7.2 Power Consumption

Power Consumption		VCC33 = 3.3V(Unit:mA)
	TX (2.4G 11B)	478
	RX (2.4G 11B)	290
	TX (2.4G 11G)	342
	RX (2.4G 11G)	290
	TX (2.4G 11N)	324
	RX (2.4G 11N)	290
	TX (2.4G 11AC)	318
	RX (2.4G 11AC)	292
	TX (2.4G 11AX)	310
	RX (2.4G 11AX)	290
	TX (5G 11G)	320
	RX (5G 11G)	290
	TX (5G 11N)	324
	RX (5G 11N)	290
	TX (5G 11AC)	326
	RX (5G 11AC)	290
	TX (5G 11AX)	326
	RX (5G 11AX)	290

7.3 Interface Circuit time series

7.3.1 PCIe bus during power on sequence



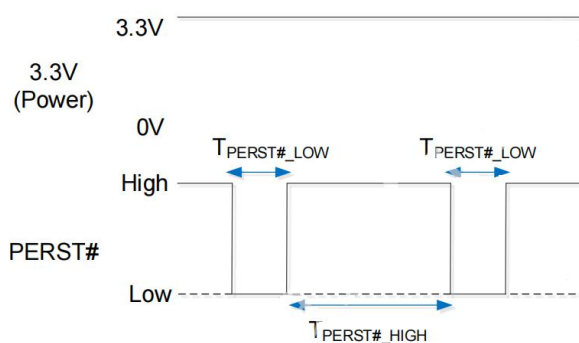
T_{on} : the main power ramp up duration

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	--	--

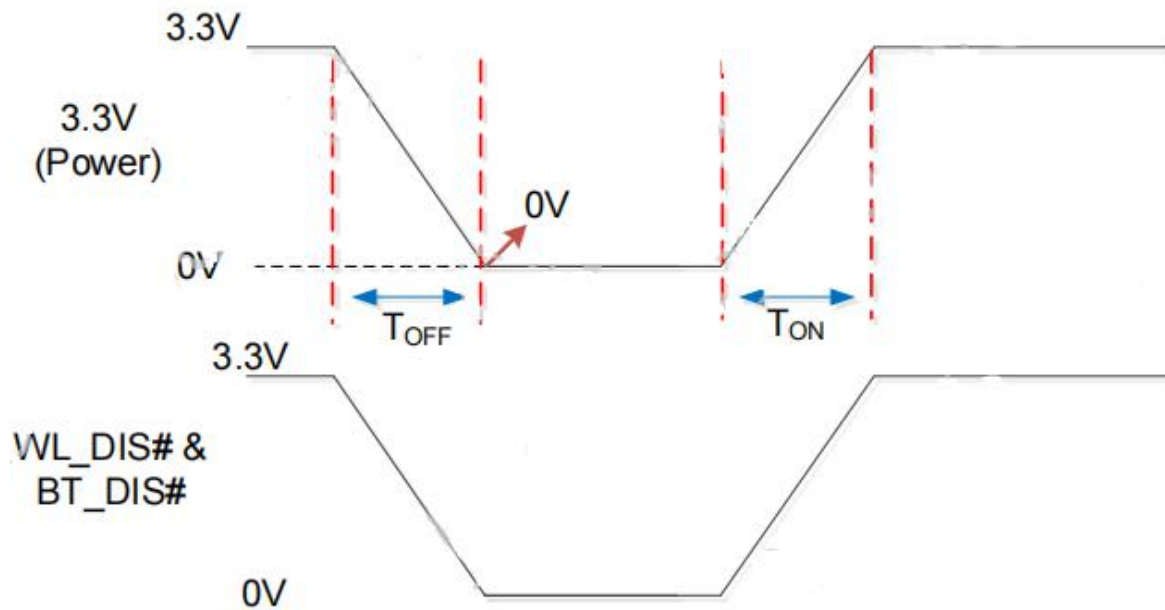
7.3.2 PCIe PERST# Timing sequence



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

7.3.3 power off sequence

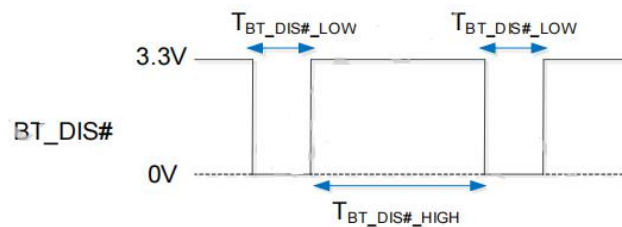


Power Off Timing Parameters

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.

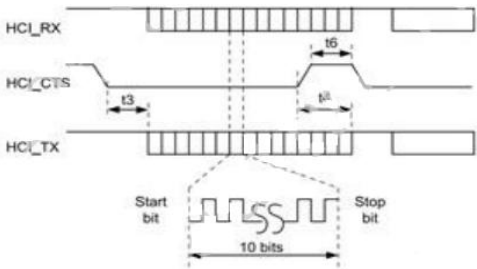
7.3.4 BT_DIS Timing sequence



	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 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

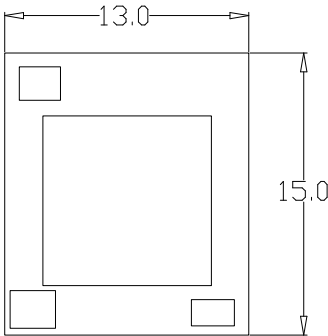
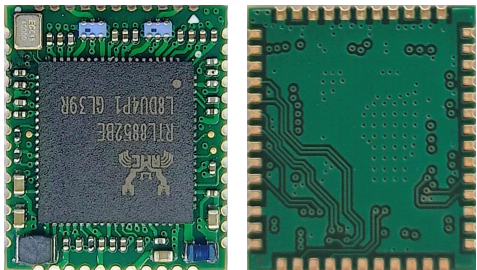
* Note : HCI packet means HCI command(256 bytes), HCI event(256 bytes), ACL(1024 bytes), SCO(256 bytes)

8. Size reference

8.1 Module Picture

L x W : 15 x 13 (+0.3/-0.1) mm

Pin1 mark ▲



H: 1.8 (±0.2) mm



Weight

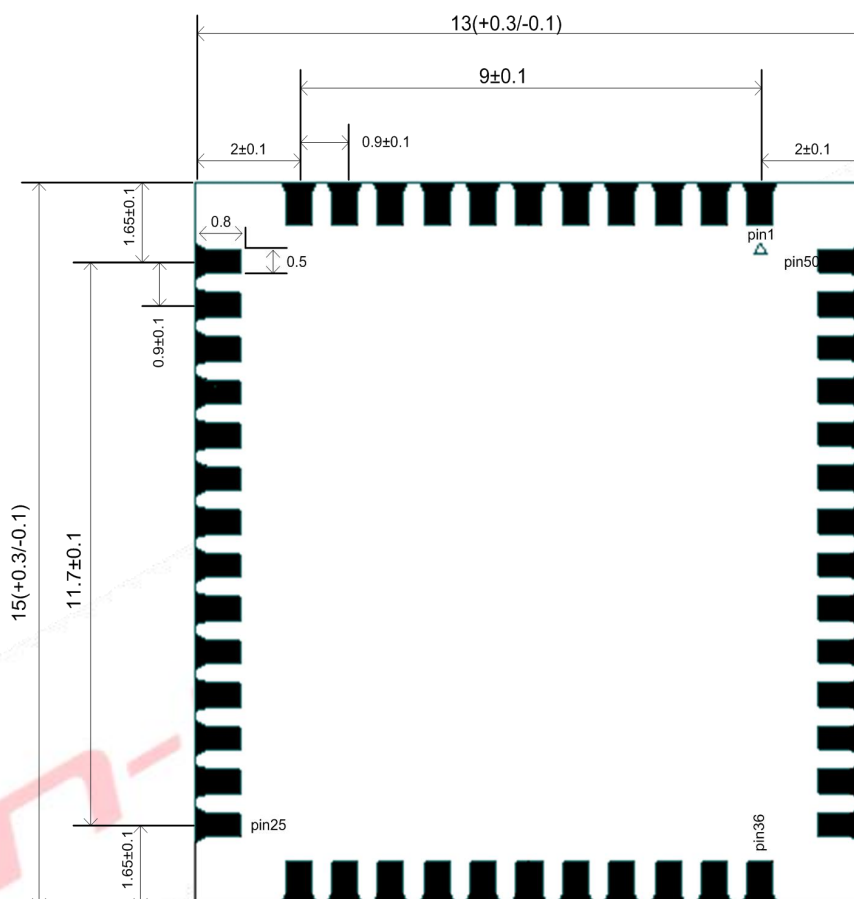
0.71g

8.2 Marking Description

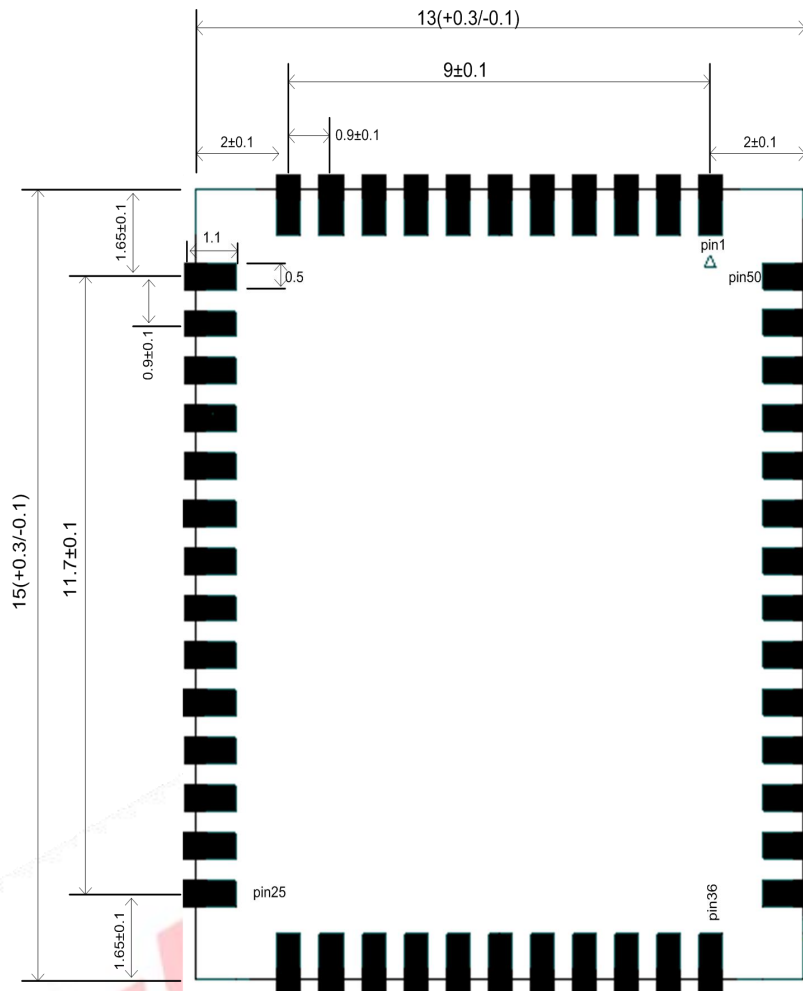
NA

8.3 Physical Dimensions

<TOP View>



8.4 Layout Recommendation

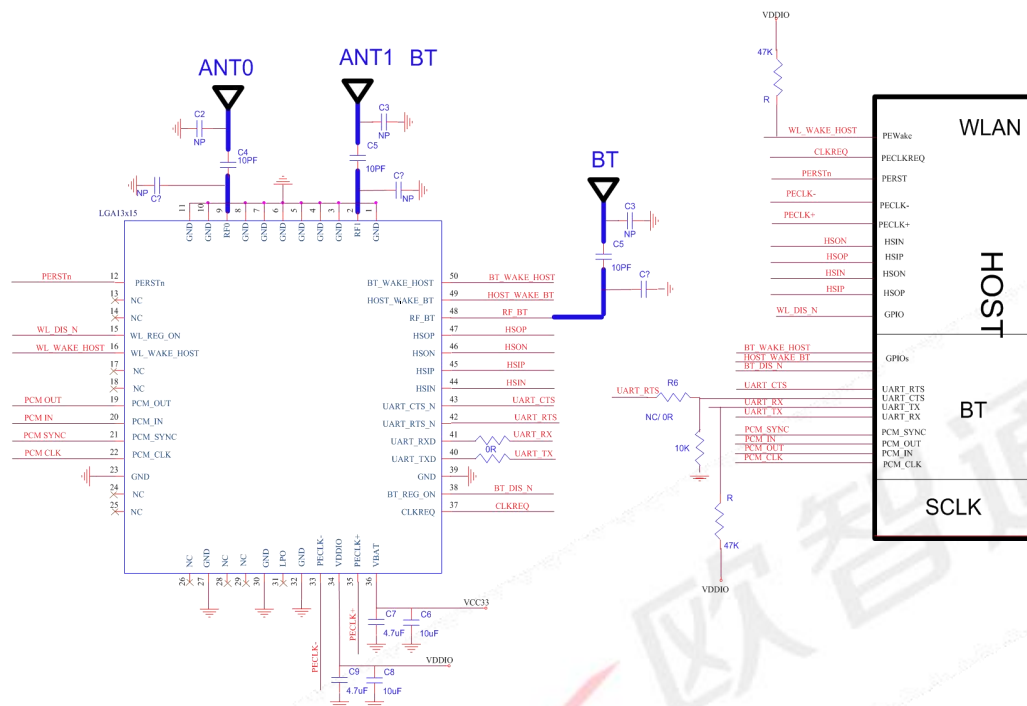


9. The Key Material List

Item	Part Name	Description	Manufacturer
1	Inductor	0603 2.2UH,±10%,DCR:0.56Ω,560mA	Sunlord,Ceaiya,cenker,TAIYO
2	Inductor	2016,1.0uH,±20%,DCR 0.095Ω,耐流 1.45A	Sunlord,Ceaiya,cenker,TAIYO
3	Diplexer	1608 Dual-band, dual-mode 2.4GHz/5GHz WLAN	Glead, Walsin, ACX, Murata, MAG.LAYERS,TDK
4	Crystal	2016 40MHz ±10ppm	ECEC, TKD, Hosonic, JWT, TXC
5	Chipset	RTL8852BS-VR-CG	Realtek
6	PCB	FR4, 6 LAYER, GREEN	XY-PCB,GDKX,Sunlord, SL-PCB

10. Reference Design

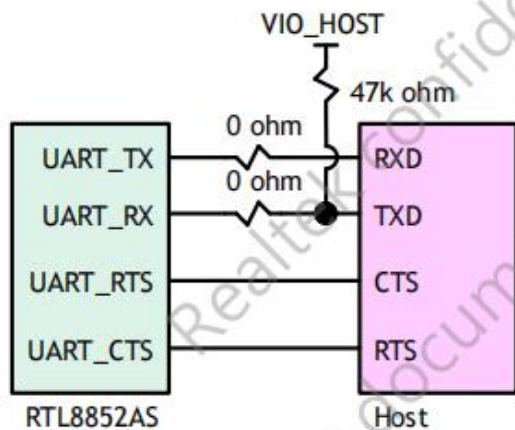
50 ohm RF trace



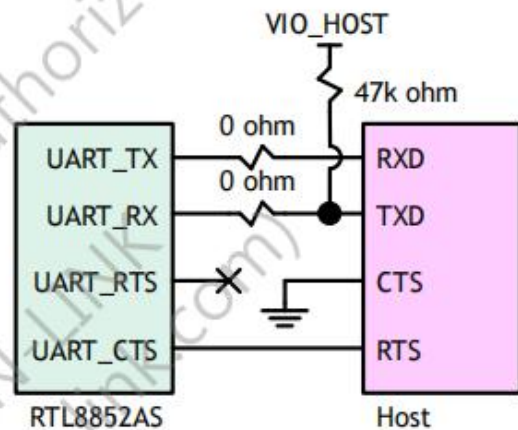
C6, C7 caps should be closed to pin36 of the module

C8, C9 caps should be closed to pin34 of the module

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

Note:

RF_BT is optional for 3 ANT version. 2 ANT type NC this pin;

PCIe TX /RX trace please put in PCB inner layer;

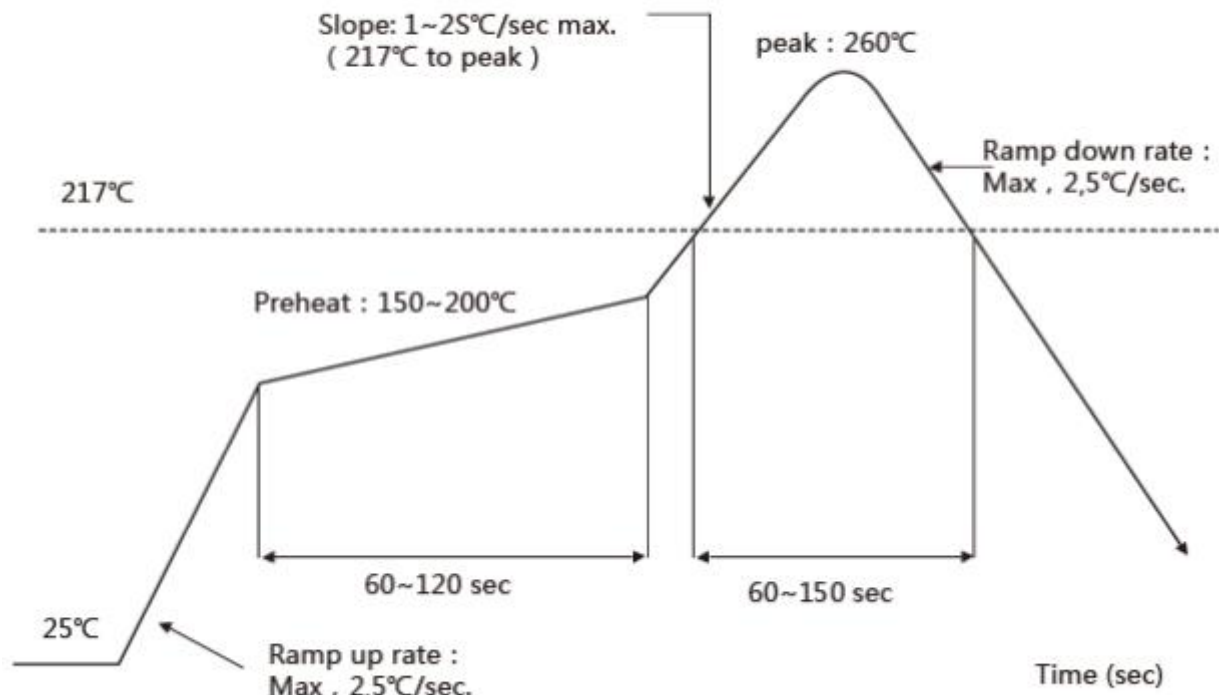
11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature: $260 \pm 5^{\circ}\text{C}$

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

Number of Times: 2 times



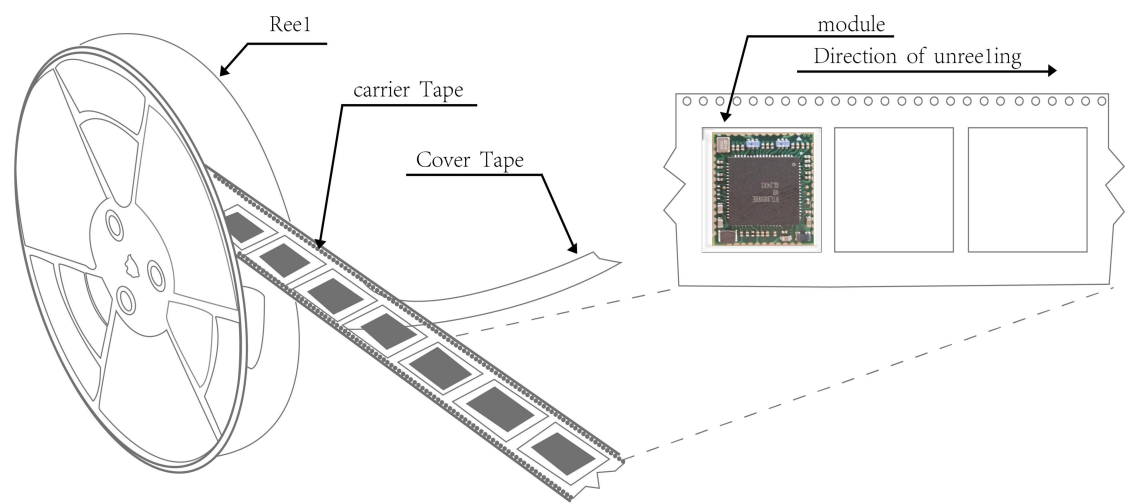
12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

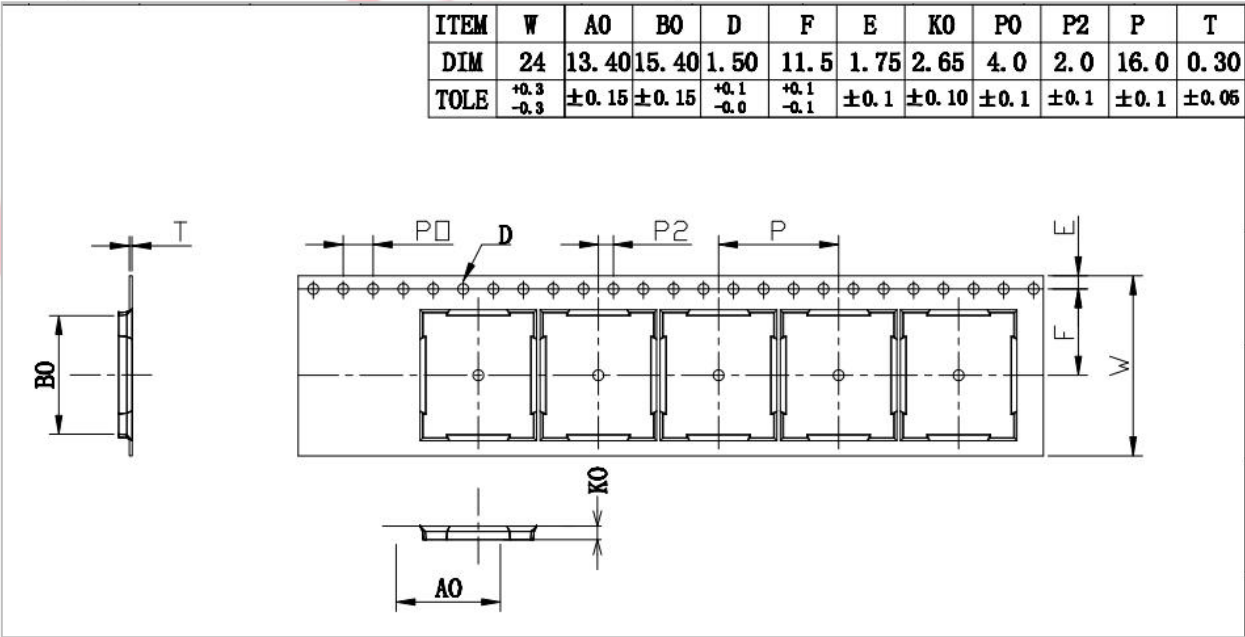
13. Package

13.1 Reel

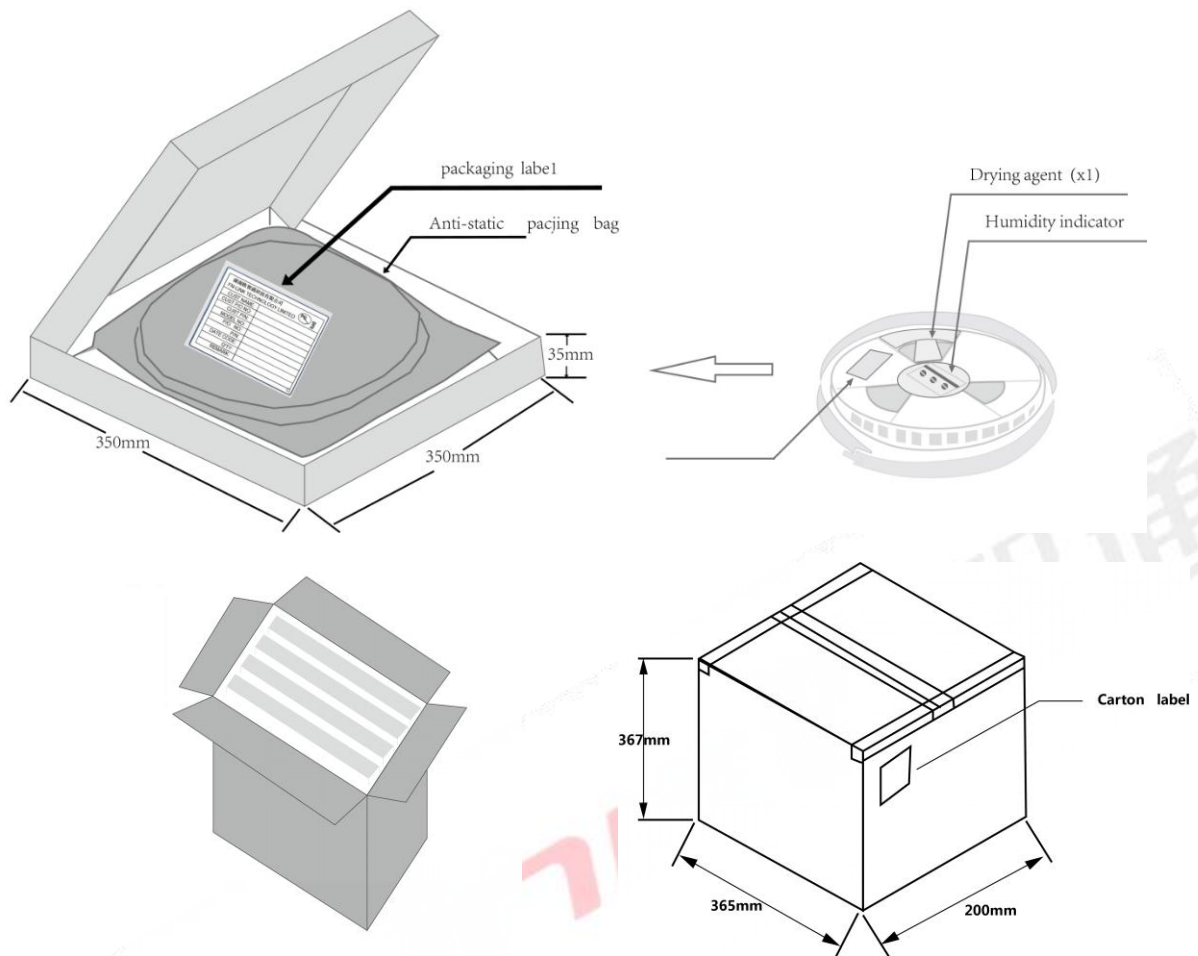
A roll of 1500pcs



13.2 Carrier Tape Detail



13.3 Packaging Detail



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:

- Calculated shelf life in sealed bag: 12 months at $<40^{\circ}\text{C}$ and $<90\%$ relative humidity (RH)
- Environmental condition during the production: 30°C / 60% RH according to IPC/JEDEC J-STD-033A paragraph 5
- The maximum time between the opening of the sealed bag and the reflow process must be 168 hours if condition
- “IPC/JEDEC J-STD-033A paragraph 5.2” is respected
- Baking is required if conditions b) or c) are not respected
- Baking is required if the humidity indicator inside the bag indicates 10% RH or more