# PRODUCT SPECIFICATION

# 6252C-PUB

## Wi-Fi Dual-band 2T2R 11ax + Bluetooth 5.2

## Combo Module

### Version:v1.0

# 6252C-PUB Module Datasheet

| Ordering Information | Part NO. | Description |
|---|---|---|
| | FG6252CPUB-00 | RTL8852BE-CG/wifi6/2T2R+BT,802.11a/b/g/n/ac/ax+BLE5.2,2T2R,PCIE+USB,12*16,PCIE port |

**Customer:** _____

**Customer P/N:** _____

**Signature:** _____

**Date:** _____

Office: 14th floor, Block B, phoenix zhigu, Xixiang Street, Baoan District, Shenzhen

Factory: NO.8, Litong RD., Liuyang Economic & Technical Development Zone, Changsha, CHINA

TEL:+86-755-2955-8186                    Website:www.fn-link.com

# CONTENTS

# Revision History

| Version | Date | Contents of Revision Change | Draft | Checked | Approved |
|---------|------|------------------------------|-------|---------|----------|
| V1.0 | 2021/12/31 | New version | FC | TZQ | QJP |
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# 1. General Description

## 1.1 Introduction

The fn-link6252C-PUB is a highly integrated single-chip that support 2-stream 802. 11ax solutions with Multi-user MIMO (Multiple-Input, Multiple-Output)with Wireless LAN (WLAN) PCI Express network interface controller with integrated Bluetooth 5 USB interface controller.It combines a WLAN MAC, a2T2R capable WLAN baseband, and RF in a single chip. The RTL8852BE provides a complete solution fora high-performance integrated wireless and Bluetooth device

## 1.2 Description

| | |
|---|---|
| Model Name | 6252C-PUB |
| Product Description | Support Wi-Fi/Bluetooth functionalities |
| Dimension | L x W x H: 16x 12x 1.7 (typical) mm |
| Wi-Fi Interface | Support PCIe |
| BT Interface | USB |
| OS supported | Android /Linux/ Win CE /iOS /XP/WIN7/WIN10 |
| Operating temperature | 0°C to 70°C |
| Storage temperature | -55°C to 85°C |

# 2. Features

## General

- IEEE 802.11a/b/g/n/ac/ax compatible WLAN

- Supports 20/40MHz at 2.4GHz and supports 20/40/80MHz at 5GHz

- Supports 802.11ac 2x2, Wave-2 compliant with RX MU-MIMO

- Complete 802.11n MIMO solution for 2.4GHz and 5GHz band

- Enhanced BT/Wi-Fi Coexistence Control to improve transmission quality in different profiles

- Integrated 32K oscillator for power management

## Host Interface

- Supports low power PCIe(Base Specification Revision 1.1) interface for WLAN and USB(2.0FS-mode)

## Bluetooth Features

- Supports Bluetooth 5.2 system

- Compatible with Bluetooth v2.1+EDR

- Dual Mode support: Simultaneous LE and BR/EDR

- Supports Bluetooth for class1, class2 and class3 power level transmissions without requiring an external PA

# 3. Block Diagram
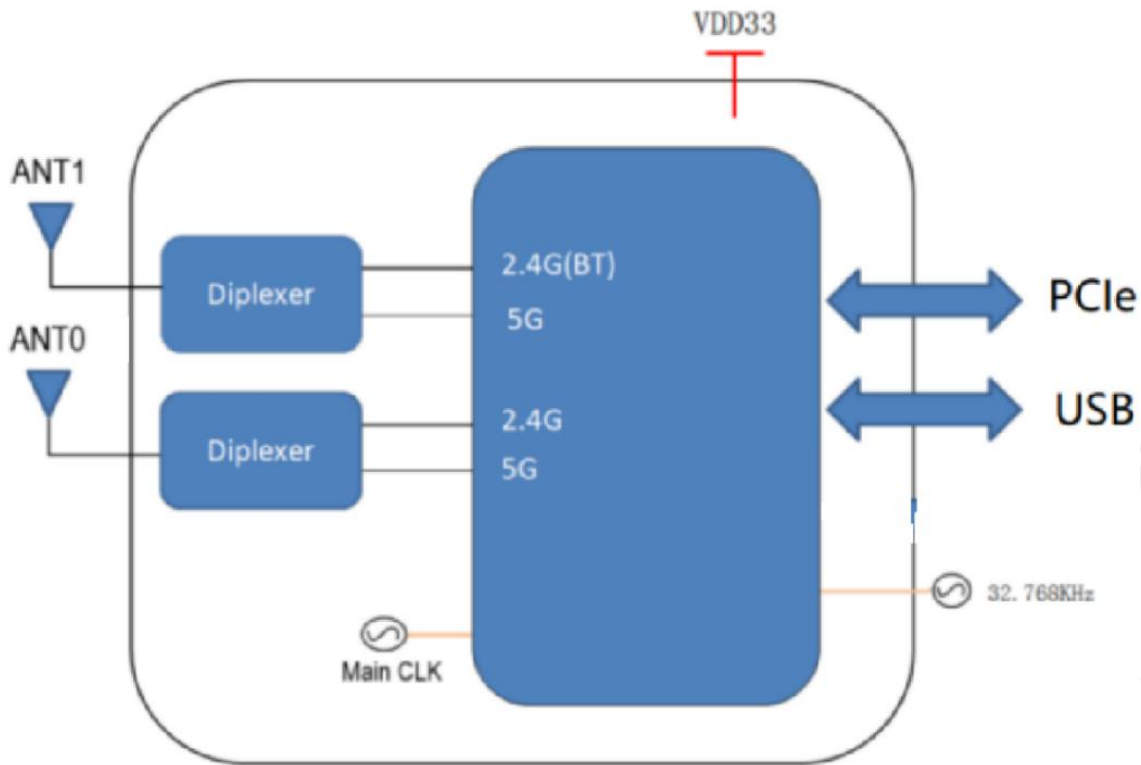


# 4. General Specification

## 4.1 2.4GHz RF Specification

| 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 | 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 |
| Receive Sensitivity (11g,20MHz) @10% PER | -   6Mbps | @ -90 dBm | ≤-85 dBm |
| | -   54Mbps | @ -71 dBm | ≤-68 dBm |
| Receive Sensitivity (11n,20MHz) @10% PER | -   MCS=0 | @ -90 dBm | ≤-85 dBm |
| | -   MCS=7 | @ -69 dBm | ≤-67 dBm |
| Receive Sensitivity (11n,40MHz) @10% PER | -   MCS=0 | @ -87 dBm | ≤-82 dBm |
| | -   MCS=7 | @ -66 dBm | ≤-64 dBm |
| Receive Sensitivity (11ac,20MHz) @10% PER | -   MCS=0 | @ -90 dBm | ≤ -82 dBm |
| | -   MCS=8 | @ -64 dBm | ≤ -60 dBm |
| Receive Sensitivity (11ac ,40MHz) @10% PER | -   MCS=0 | @ -87 dBm | ≤ -79 dBm |
| | -   MCS=9 | @ -59 dBm | ≤ -55 dBm |
| Receive Sensitivity (11ax,20MHz) @10% PER | -   MCS=0 | @ -90 dBm | ≤-74 dBm |
| | -   MCS=11 | @ -60 dBm | ≤-52 dBm |
| 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 2x2, Wi-Fi compliant | |
| Frequency Range | 4.900 GHz ~ 5.845 GHz (5.0 GHz ISM Band) | |
| Number of Channels | 5.0GHz：Please see the table1 | |
| **Test Items** | **Typical Value** | **EVM** |
| Output Power | 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 |
|---|---|---|---|
| Receive Sensitivity (11a,20MHz) @10% PER | - 6Mbps | @ -90 dBm | ≤-85 |
| | - 54Mbps | @ -71 dBm | ≤-68 |
| Receive Sensitivity (11n,20MHz) @10% PER | - MCS=0 | @ -90 dBm | ≤-85 |
| | - MCS=7 | @ -69 dBm | ≤-67 |
| Receive Sensitivity (11n,40MHz) @10% PER | - MCS=0 | @ -87 dBm | ≤-82 |
| | - MCS=7 | @ -66 dBm | ≤-64 |
| Receive Sensitivity (11ac,20MHz)@10% PER | - MCS=0, NSS1 | @ 90 dBm | ≤-82 |
| | - MCS=8, NSS1 | @ -64 dBm | ≤-60 |
| Receive Sensitivity (11ac,40MHz) @10% PER | - MCS=0, NSS1 | @ -87 dBm | ≤-79 |
| | - MCS=9, NSS1 | @ -59 dBm | ≤-55 |
| Receive Sensitivity (11ac,80MHz) @10% PER | - MCS=0, NSS1 | @ -84 dBm | ≤-79 |
| | - MCS=9, NSS1 | @ -56 dBm | ≤-54 |
| Receive Sensitivity (11ax,20MHz) @10% PER | - MCS=0 | @ -90 dBm | ≤-74 |
| | - MCS=11 | @ -60 dBm | ≤-52 |
| Receive Sensitivity (11ax,40MHz) @10% PER | - MCS=0 | @ -87 dBm | ≤-71 |
| | - MCS=11 | @ -57 dBm | ≤-49 |
| Receive Sensitivity (11ax,80MHz) @10% PER | - MCS=0 | @ -84 dBm | ≤-68 |
| | - MCS=11 | @ -54 dBm | ≤-46 |
| Maximum Input Level | 802.11a/n: -30 dBm | | |
| Antenna Reference | Small antennas with 0~2 dBi peak gain | | |

**[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 |
| | 149 | 5745 |
| | 153 | 5765 |
| 5745MHz~5825MHz | 157 | 5785 |
| | 161 | 5805 |
| | 165 | 5825 |

## 4.3 Bluetooth Specification

| Feature | Description |
|---|---|
| **General Specification** | |
| Bluetooth Standard | Bluetooth V5.2 of 1, 2 and 3 Mbps. |
| Host Interface | USB |
| Antenna Reference | Small antennas with 0~2 dBi peak gain |
| Frequency Band | 2402 MHz ~ 2480 MHz |
| Number of Channels | 79 channels |
| Modulation | GFSK, π/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) | | | -70 |
| Sensitivity @ BER=0.01% for π/4-DQPSK (2Mbps) | | | -70 |
| Sensitivity @ BER=0.01% for 8DPSK (3Mbps) | | | -70 |
| Maximum Input Level | GFSK (1Mbps):-20dBm | | |
| | π/4-DQPSK (2Mbps) :-20dBm | | |
| | 8DPSK (3Mbps) :-20dBm | | |

# 5. ID setting information

WI-FI

| Vendor ID | TBD |
|---|---|
| Product ID | TBD |

# 6. Pin Definition

## 6.1 Pin Outline



< TOP VIEW>
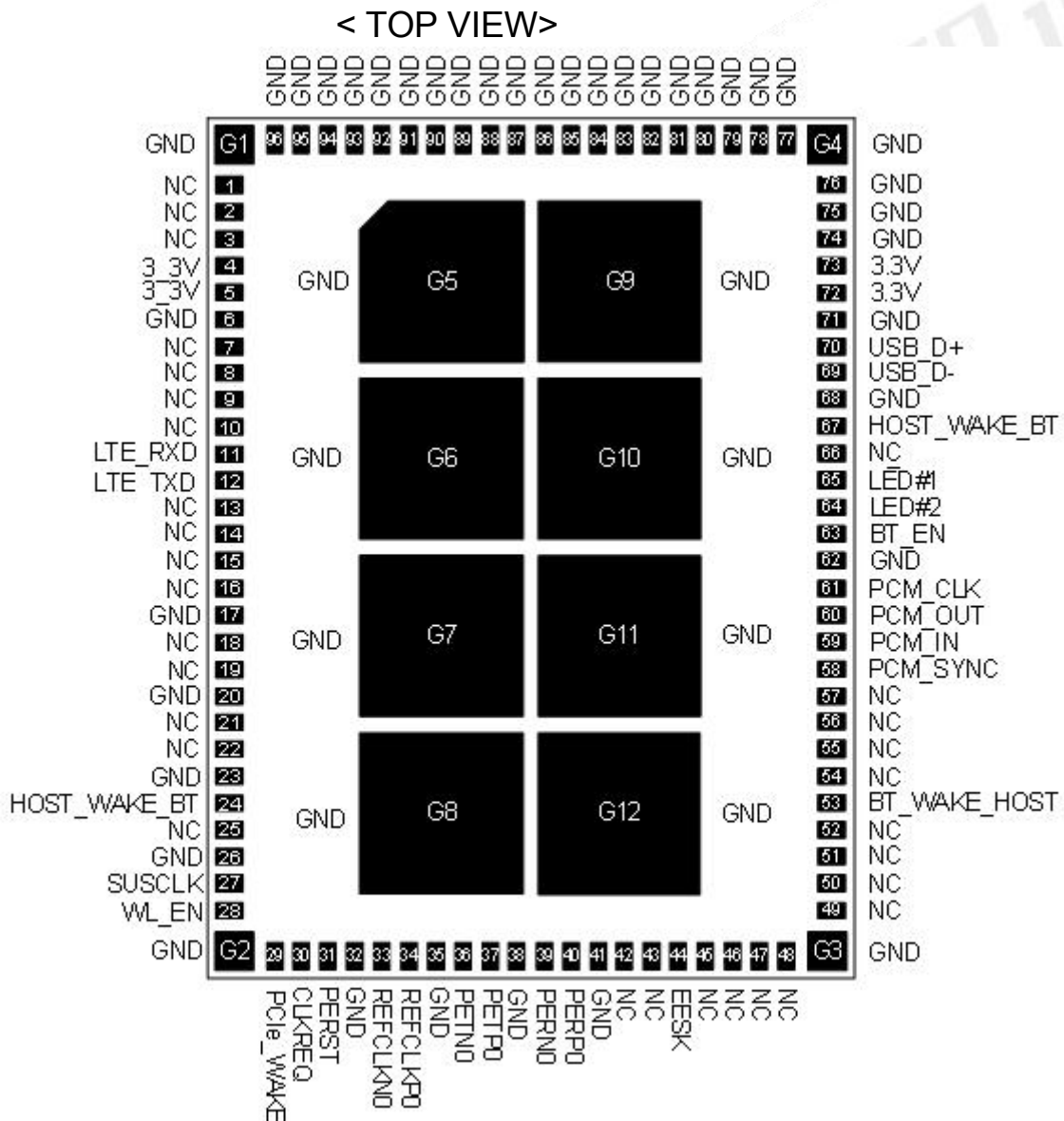
## 6.2 Pin Definition details

| NO. | Name | Type | Description | Voltage |
|-----|------|------|-------------|---------|
| 1 | NC | — | No connect | |
| 2 | NC | — | No connect | |
| 3 | NC | — | No connect | |
| 4 | 3_3V | P | Main power voltage source input 3.3V | 3.3V |
| 5 | 3_3V | P | Main power voltage source input 3.3V | 3.3V |
| 6 | GND | — | Ground connections | |
| 7 | NC | — | No connect | |
| 8 | NC | — | No connect | |
| 9 | NC | — | No connect | |
| 10 | NC | — | No connect | |
| 11 | LTE_RXD | I | LTE coexist signal | 3.3V |
| 12 | LTE_TXD | O | LTE coexist signal | 3.3V |
| 13 | NC | — | No connect | |
| 14 | NC | — | No connect | |
| 15 | NC | — | No connect | |
| 16 | NC | — | No connect | |
| 17 | GND | — | Ground connections | |
| 18 | NC | — | No connect | |
| 19 | NC | — | No connect | |
| 20 | GND | — | Ground connections | |
| 21 | NC | — | No connect | |
| 22 | NC | — | No connect | |
| 23 | GND | — | Ground connections | |
| 24 | HOST_WAKE_BT | I | Host wake up BT | 3.3V |
| 25 | NC | — | No connect | |
| 26 | GND | — | Ground connections | |
| 27 | SUSCLK | I | External sleep clock input(32.768KHz) | 3.3V |
| 28 | WL_EN | — | WLAN enable pin, High: enable,Low:disable | 3.3V |
| 29 | PCIe_WAKE | OD | PCIe wake up host | 3.3V |
| 30 | CLKREQ | OD | PCIe reference clock request signal | 3.3V |
| 31 | PERST | PD | PCIe reset module | 3.3V |
| 32 | GND | — | Ground connections | |
| 33 | REFCLKN0 | I | PCIe CLK Difference - | |
| 34 | REFCLKP0 | I | PCIe CLK Difference + | |
| 35 | GND | — | Ground connections | |

| 36 | PETN0 | O | PCIe Data Out Difference - | |
| 37 | PETP0 | O | PCIe Data Out Difference + | |
| 38 | GND | — | Ground connections | |
| 39 | PERN0 | I | PCIe Data IN Difference - | |
| 40 | PERP0 | I | PCIe Data IN Difference + | |
| 41 | GND | — | Ground connections | |
| 42 | NC | — | No connect | |
| 43 | NC | — | No connect | |
| 44 | EESK/NC | — | EESK or No connect, NC if not use, do not connect to GND | |
| 45 | NC | — | No connect | |
| 46 | NC | — | No connect | |
| 47 | NC | — | No connect | |
| 48 | NC | — | No connect | |
| 49 | NC | — | No connect | |
| 50 | NC | — | No connect | |
| 51 | NC | — | No connect | |
| 52 | NC | — | No connect | |
| 53 | BT_WAKE_HOST | O | Bluetooth wake up host | 3.3V |
| 54 | NC | — | No connect | |
| 55 | NC | — | No connect | |
| 56 | NC | — | No connect | |
| 57 | NC | — | No connect | |
| 58 | PCM_SYNC | I/O | PCM sync signal | 3.3V |
| 59 | PCM_IN | I | PCM data input | 3.3V |
| 60 | PCM_OUT | O | PCM Data output | 3.3V |
| 61 | PCM_CLK | I/O | PCM clock | 3.3V |
| 62 | GND | — | Ground connections | |
| 63 | BT_EN | I | This pin can externally shut down the module BT function when BT_EN is pulled Low. When this pin is pulled low, USB interface will be also disabled. | 3.3V |
| 64 | LED#2 | O | BT link LED, active low. | 3.3V |
| 65 | LED#1 | O | WLAN link LED, active low. | 3.3V |
| 66 | NC | — | No connect | |
| 67 | HOST_WAKE_BT | I | Host wake up BT, active high | 3.3V |
| 68 | GND | — | Ground connections | |
| 69 | USB_D- | I/O | USB difference line for BT | |

| 70 | USB_D+ | I/O | USB difference line for BT | |
| 71 | GND | — | Ground connections | |
| 72 | 3.3V | P | Main power voltage source input 3.3V | 3.3V |
| 73 | 3.3V | P | Main power voltage source input 3.3V | 3.3V |
| 74-96 | GND | — | Ground connections | |
| G1-G12 | GND | — | Ground connections | |

P:POWER   I:INPUT   O:OUTPUT

# 7. Electrical Specifications
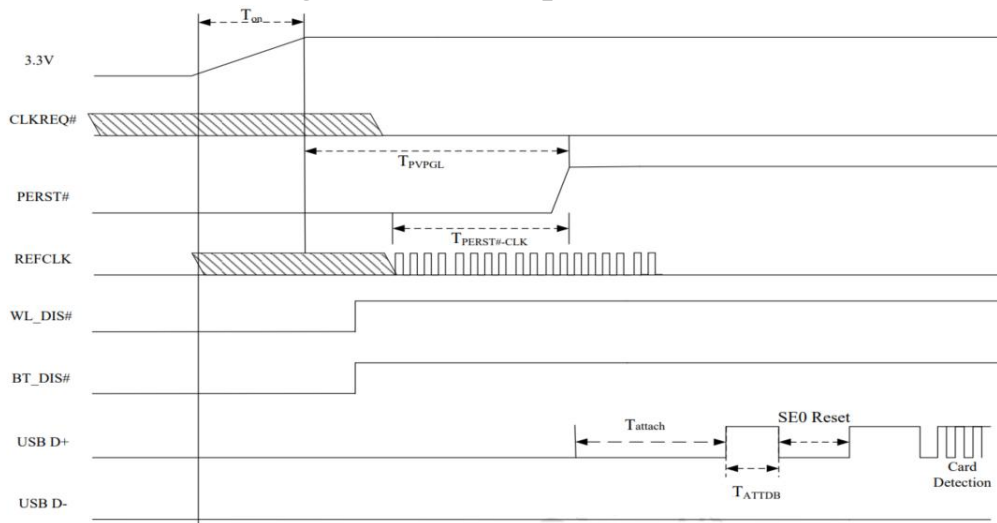
## 7.1 Power Supply DC Characteristics

The digital IO supports VDD33 or VDD18 application.

| | MIN | TYP | MAX | Unit |
|---|---|---|---|---|
| Operating Temperature | 0 | 25 | 70 | deg.C |
| VDD33 | 3.0 | 3.3 | 3.6 | V |

## 7.2 Power Consumption

| | | VDD33 = 3.3V(Unit:mA) |
|---|---|---|
| Power Consumption | Wi-Fi on Mode | |
| | TX (2.4G 1M) | |
| | TX (2.4G HT40) | |
| | RX (2.4G HT40) | |
| | TX (5G 6M) | |
| | TX (5G vHT80) | |
| | RX (5G vHT80) | |
| | BT on | |
| | BT Hopping | |
| | BT TX | |
| | BT RX | |

## 7.3 PCIe Bus during Power On Sequence



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

$T_{PVPGL}$: Power valid to PERST# input inactive

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

$T_{attach}$: The interval to turn on BT after PERST# de-asserted

$T_{ATTDB}$: the debounce interval with a minimal duration of 100ms that provided by the USB system Software

$T_{SE0\ Reset}$: USB host send SE0 Reset duration

| Symbol | Unit | Min | Typical | Max |
|---|---|---|---|---|
| $T_{on}$ | ms | 0.5 | 1.5 | 5 |
| $T_{PVPGL}$ | ms | Implementation specific;recommended 50ms | -- | -- |
| $T_{PERST\#-CLK}$ | us | 100 | -- | -- |
| $T_{attach}$ | ms | 0.5 | 2 | 5 |
| $T_{ATTDB}$ | ms | 100 | -- | -- |
| $T_{SE0\ Reset}$ | ms | 10 | -- | -- |

## 7.4 Interface Circuit time series

### 7.4.1 PCIe PERST# Timing Sequence
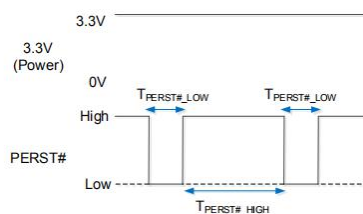


**RTL8821CE-CG PCIE PERST# Timing Parameters**

|  | 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 |

## 7.4.2 Power Off Sequence
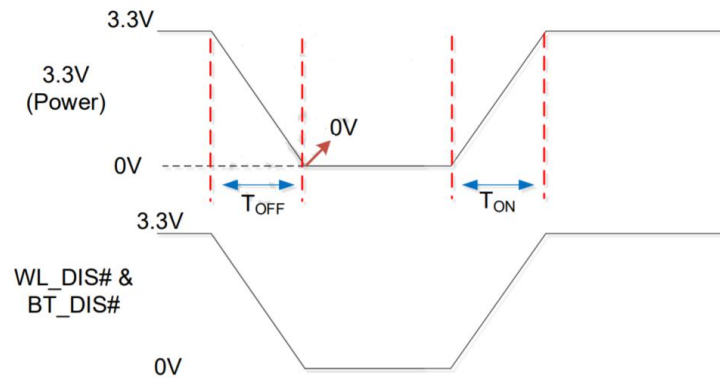


**RTL8822CE-CG Power Off Timing Parameters**

| Symbol | Min | Typical | Max | Unit | Description |
|--------|-----|---------|-----|------|-------------|
| $T_{OFF}$ | 1.5ms | -- | -- | 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.

## 7.4.3 BT_DIS Timing Sequence
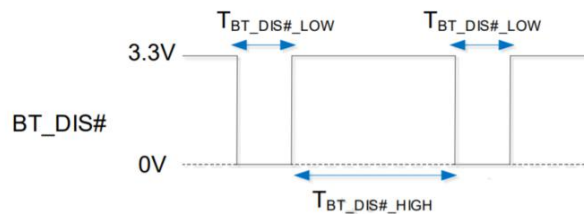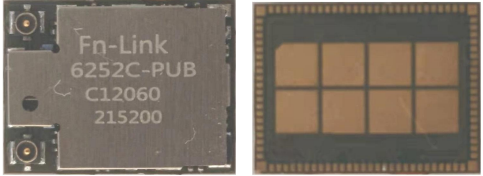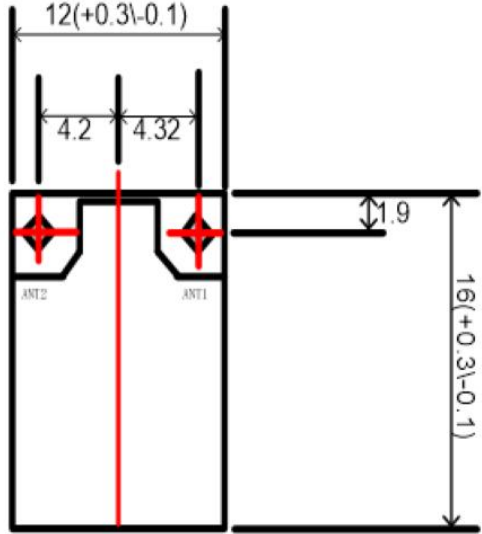


| | Min | Typical | Max | Unit | Description |
|--|-----|---------|-----|------|-------------|
| BT_DIS#_LOW | 200 | -- | -- | ms | BT_DIS# low duration |
| BT_DIS#_HIGH | 500 | -- | -- | ms | BT_DIS# high duration |

## 7.4.4 Platform state transitions

| 3.3V Power range | 3.3V Ripple | 3.3V Noise | Rise time | |
|------------------|-------------|------------|-----------|------|
| | | | Min | Max |
| +/-0.165V | 300mVpp @ switching frequency > 100KHz | | 0.5ms | 5ms |

# 8. Size reference

## 8.1 Module Picture

| **L x W : 16 x 12 (+0.3/-0.1) mm** |  |
|---|---|
| H: 1.7 (±0.2) mm |  |
| **Weight** | 0.75(±0.1)g |

## 8.2 Marking Description

< TOP VIEW >



Brand name ------ Fn-Link

Model name ------ 6252C-PUB

Lot code ------ CXXXXX

Date code ------ 174500
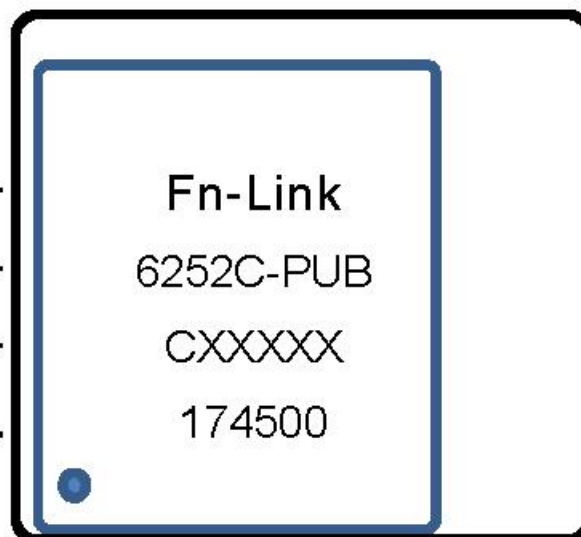
## 8.3 Physical Dimensions

<TOP View>
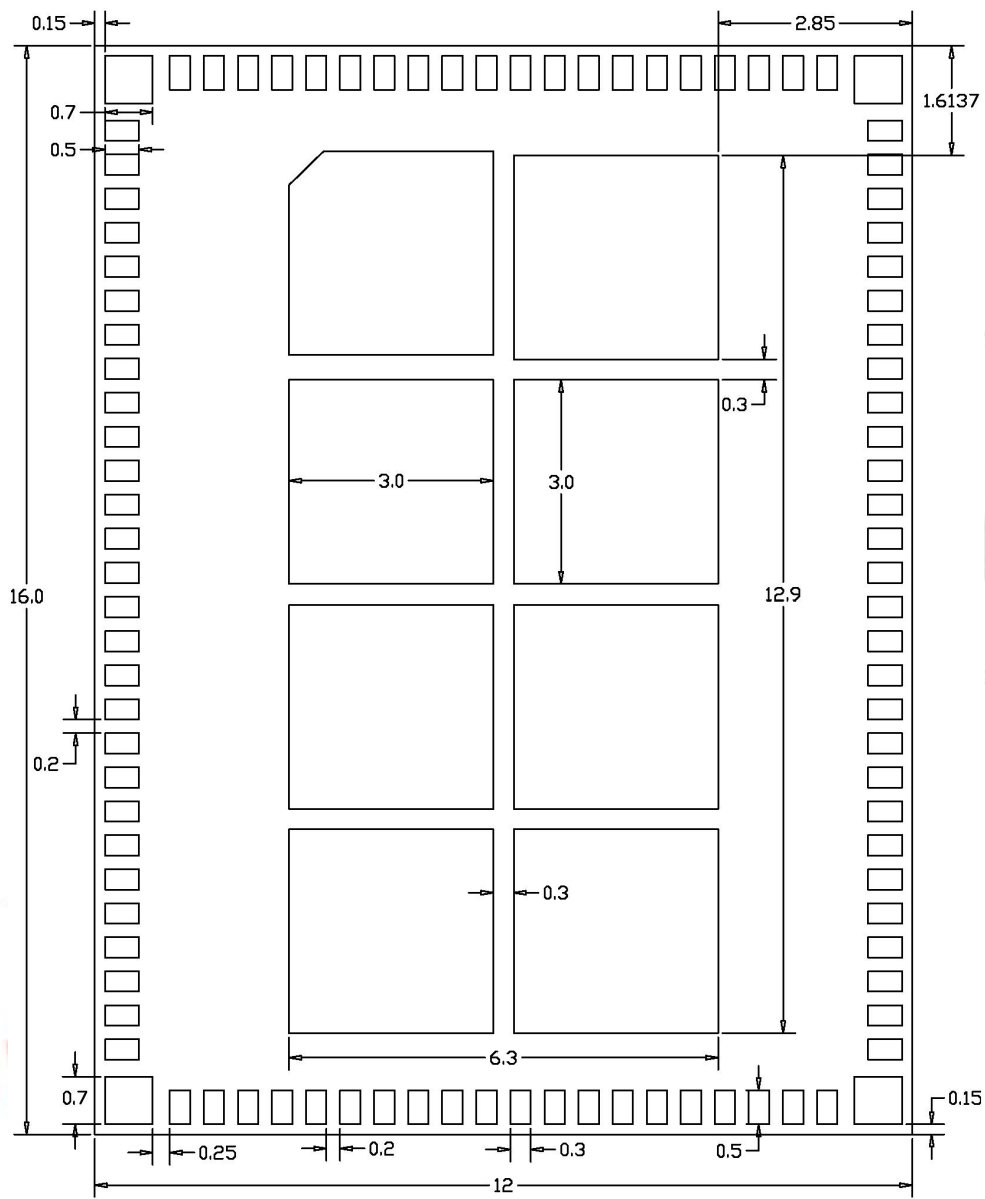
## 8.4 Layout Recommendation
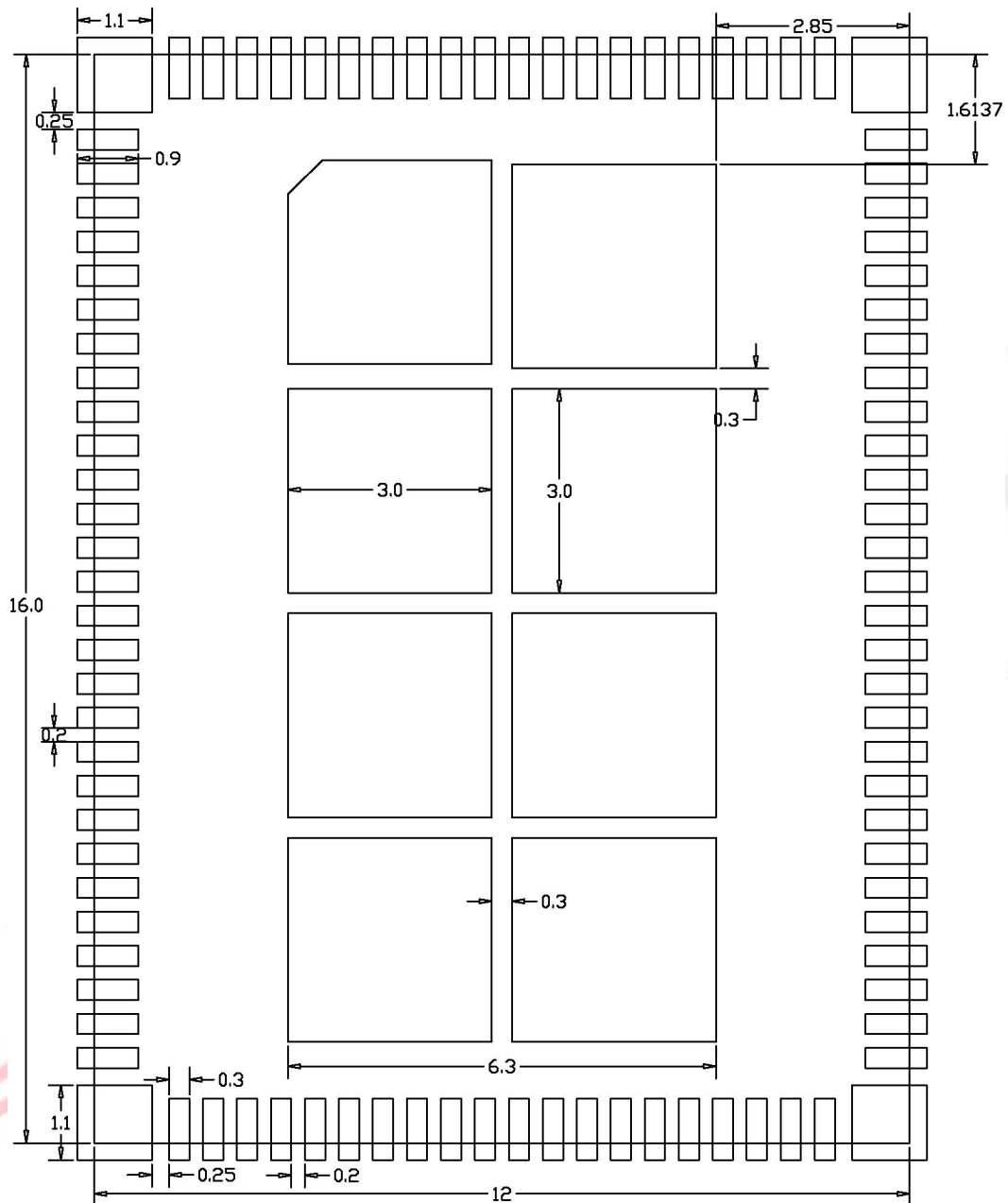


# 9. The Key Material List

| Item | Part Name | Description | Manufacturer |
|------|-----------|-------------|--------------|
| 1 | PCB | 6252C-PUB 4L,12X16X0.4mm | 欣强,XY-PCB, GDKX, Sunlord |
| 2 | Crystal | 2016 40MHZ,±10ppm,12pF | ECEC, Hosonic, TKD, JWT,Murata |
| 3 | Chipset | RTL8852BE-CG | Realtek |
| 4 | Shielding | 6252C-PUB-V2.0 Shielding | 信太，精力通 |

# 10. Reference Design
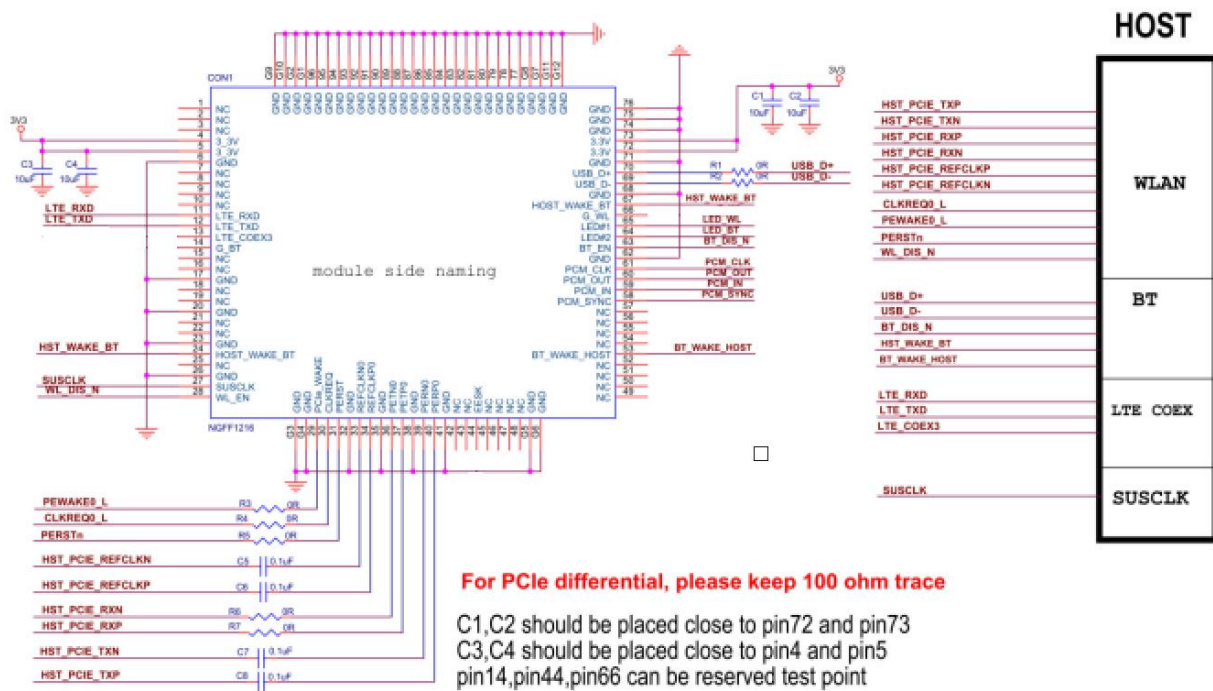


Note:

1. ANT_A, ANT_B are all support 2.4G/5G function, ANT_B is support Bluetooth also;

2. The module requires independent power supply, supply capacity ≥ 1000mA and ripple less than 150mV;

3. Do not share power with amplifier, camera, etc.
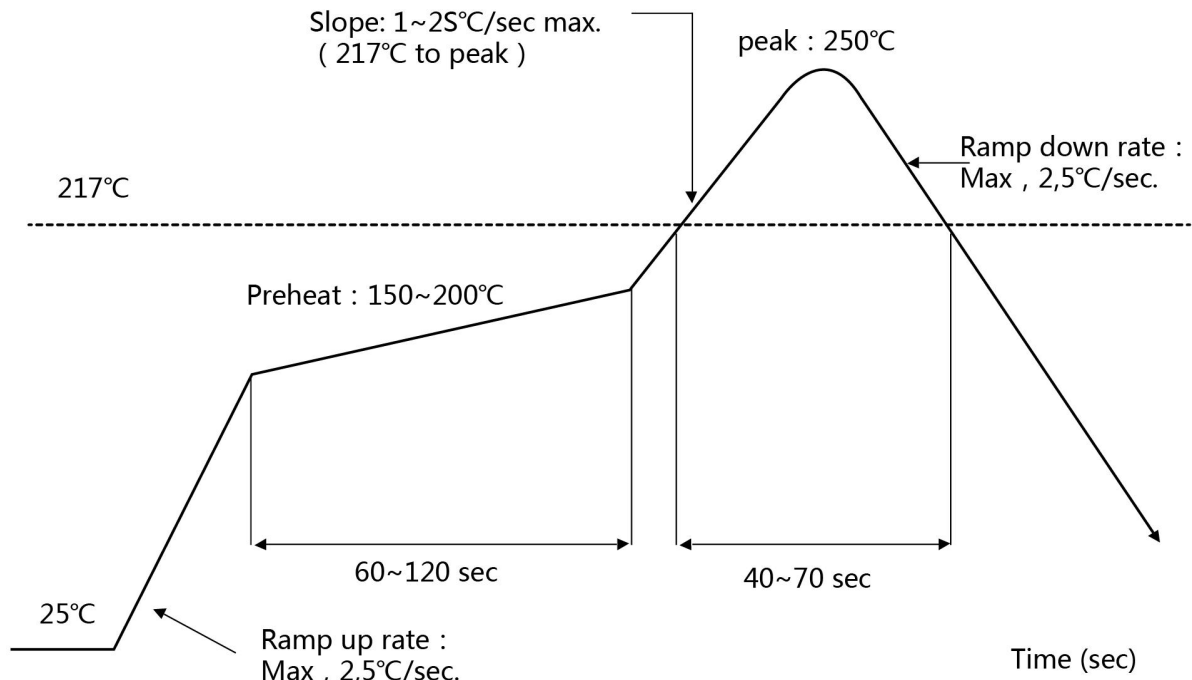
Connector Specification
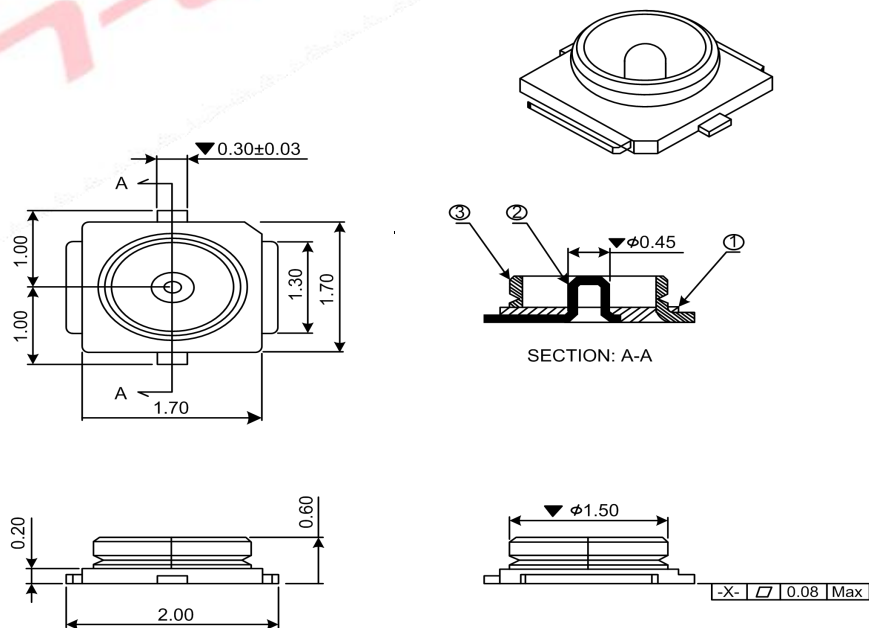
# 11. Recommended Reflow Profile

Referred to IPC/JEDEC standard.

Peak Temperature : <250°C
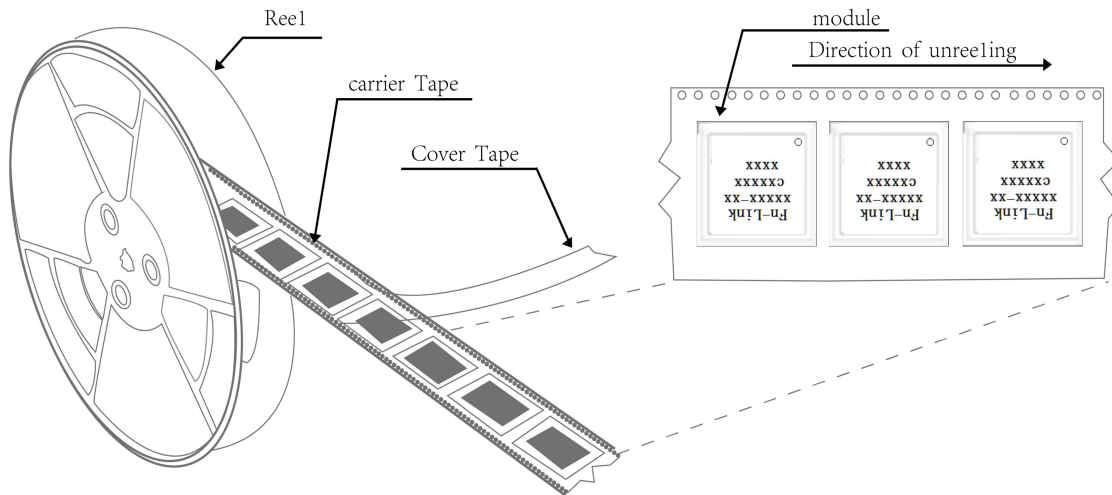
Number of Times : ≤2 times

Slope: 1~2S℃/sec max.
( 217℃ to peak )

peak : 250℃

Ramp down rate :
Max，2,5℃/sec.

217℃

Preheat : 150~200℃

60~120 sec

40~70 sec

25℃

Ramp up rate :
Max，2,5℃/sec.

Time (sec)

# 12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

# 13. Package

## 13.1 Reel

A roll of 2000pcs
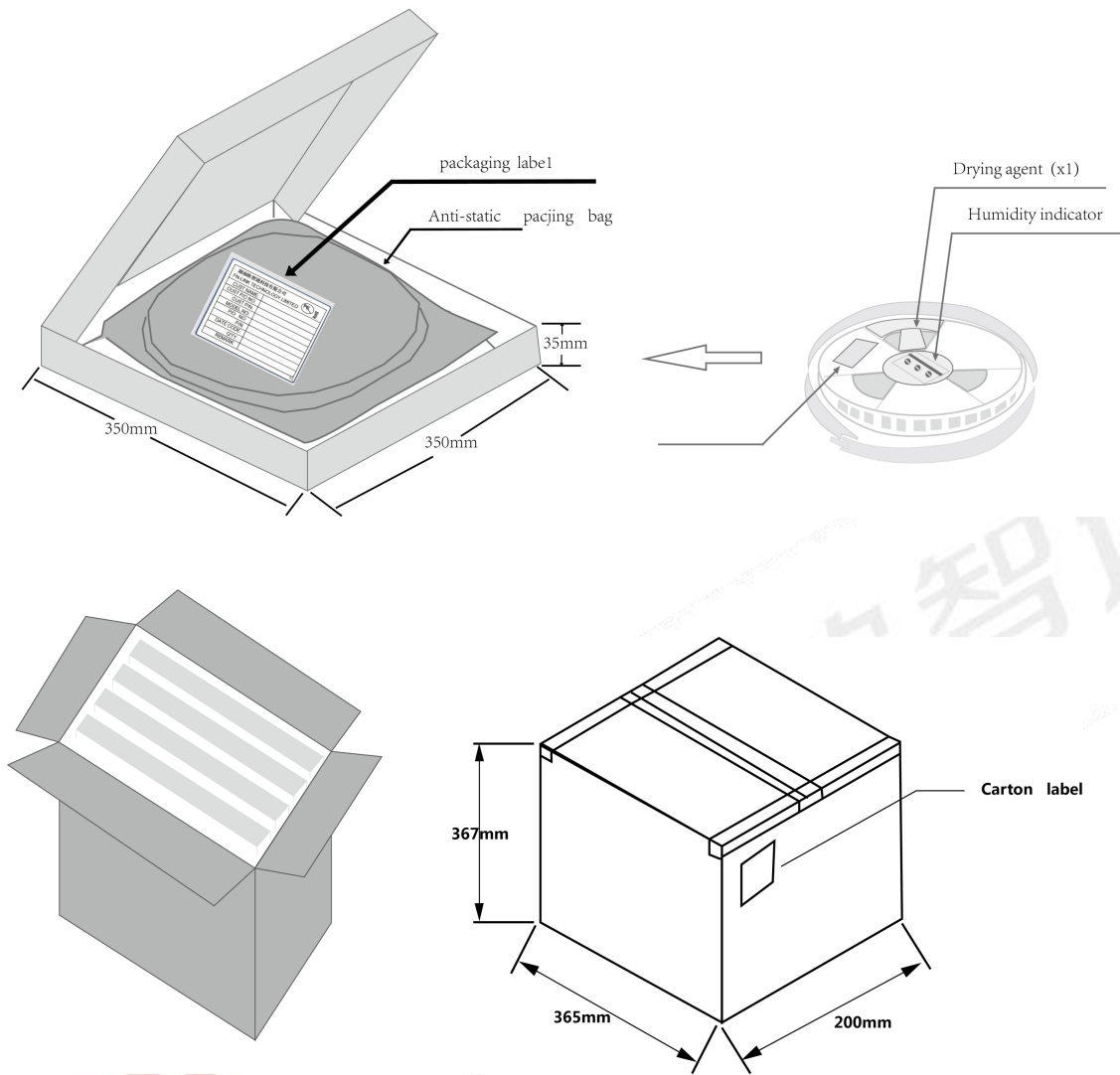


## 13.2 Carrier Tape Detail

| ITEM | W | A0 | B0 | D | E | F | F1 | K0 | P0 | P2 | P | T |
|------|---|----|----|---|---|---|----|----|----|----|---|---|
| DIM | 32 | 12.50 | 16.60 | 1.5 | 1.75 | 14.20 | 28.4 | 2.15 | 4.0 | 2.0 | 20.0 | 0.30 |
| TOLE | +0.3 -0.3 | ±0.18 | ±0.18 | +0.1 -0.0 | ±0.1 | ±0.15 | ±0.10 | ±0.10 | ±0.1 | ±0.15 | ±0.1 | ±0.05 |
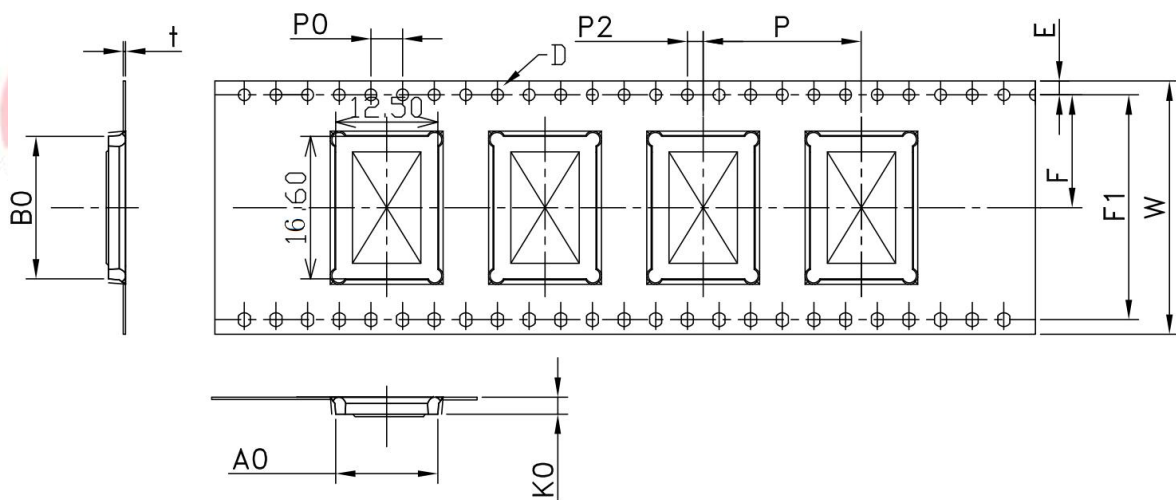
## 13.3 Packaging Detail



# 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:

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

b) "IPC/JEDEC J-STD-033A paragraph 5.2" is respected

d) Baking is required if conditions b) or c) are not respected

e) Baking is required if the humidity indicator inside the bag indicates 10% RH or more