# PRODUCT SPECIFICATION

# 8276M-PU

## Wi-Fi7 Tri-band 2T2R DBS +Bluetooth 5.3

## PCIe Combo Module

**Version:v1.0**

**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

# 8276M-PU Module Datasheet

| Ordering Information | Part NO. | Description |
|---|---|---|
| | FG8276MPUX-00 | QCA2076,WiFi7,DBS 802.11a/b/g/n/ac/ax/be +BT5.3,2T2R, PCIe/USB,22*30mm M.2 interface |

Target power

2.4G:

5G:

6G:

# CONTENTS

# Revision History

| Version | Date | Contents of Revision Change | Draft | Checked | Approved |
|---|---|---|---|---|---|
| V1.0 | 2023/06/02 | Draft Release | FC | LXY | QJP |
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# 1. General Description

## 1.1 Introduction

8276M-PU is a highly integrated System-On-Chip (SoC) supporting Wi-Fi 7 and Bluetooth (BT) 5.3. supports simultaneous operation on 2.4 GHz +5 GHz, 2.4 GHz + 6 GHz and 5 GHz + 6 GHz.

## 1.2 Description

| | |
|---|---|
| Model Name | 8276M-PU |
| Product Description | Support Wi-Fi/Bluetooth functionalities |
| Dimension | L x W x H: 22x 30x 2.4 (typical) mm |
| Wi-Fi Interface | Support PCIe |
| BT Interface | USB |
| OS supported | Android /Linux/ Win CE /iOS /XP/WIN7/WIN10 |
| Operating temperature | -30°C to 85°C |
| Storage temperature | -40°C to 85°C |

# 2. Features

## General Features

- Support IEEE802.11a/b/g/n/ac/ax/be.
- Support Multi-link Operation (MLO)
- Supports 2x2 Multi-User Multiple-Input Multiple-Output (MU-MIMO).
- Support tri-band 2.4 GHz/5 GHz/6 GHz
- Support up to 4096 QAM modulation at each band
- Channel bandwidth up to 40 MHz at 2.4 GHz, up to 160 MHz at 5GHz and 6 GHz
- Dual Band Simultaneous (DBS) up to 2.4 GHz + 5 GHz / 6 GHz .
- Up to 5.3 Gbps data rate (2x2 5 GHz 160 MHz + 2x2 6 GHz 160MHz with 4K QAM modulation)
- Dynamic Frequency Selection (DFS) radar detection

## WLAN Interface

- Low-power PCIe (with L1 substate) interface.

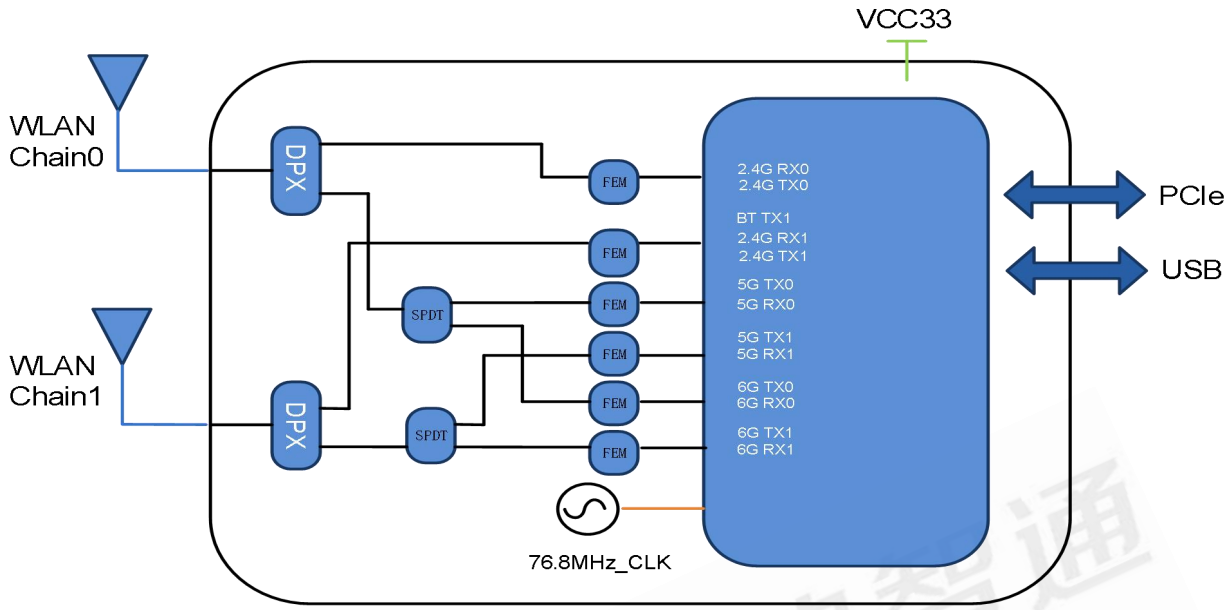
## Bluetooth Features

- Compliant with Bluetooth 5.3 and ANT+
- Support dual Bluetooth,Simultaneous Bluetooth connection and Bluetooth scan/

Discovery;MRC receiver and implicit beamforming transmitter.

- Support LE audio
- Support 2 Mbps Bluetooth Low Energy (BLE), BLE Long Range
- BT host digital interface: USB

# 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 ~ 2.4835 GHz (2.4 GHz ISM Band) | |
| Number of Channels | 2.4GHz：Ch1 ~ Ch14 | |
| **Test Items** | **Typical Value** | **EVM** |
| Output Power[1] | 802.11b /11Mbps : 23dBm ± 3 dB | EVM ≤ -9dB |
| | 802.11g /54Mbps : 21dBm ± 3dB | EVM ≤ -25dB |
| | 802.11n MCS7 : 20dBm ± 3 dB | EVM ≤ -28dB |
| | 802.11ax MCS11: 17dBm ± 3 dB | EVM ≤ -35dB |
| | 802.11be MCS13: 15.5dBm ± 3 dB | EVM ≤ -35dB |
| Spectrum Mask | Meet with IEEE standard | |
| Freq. Tolerance | ±20ppm | |
| **Test Items** | **TYP Test Value** | **Standard Value** |

| | | |
|---|---|---|
| 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 @ -57 dBm | ≤-52 dBm |
| SISO Receive Sensitivity (11ax ,40MHz) @10% PER | - MCS=0 @ -87 dBm | ≤-71 dBm |
| | - MCS=11 @ -54 dBm | ≤-49 dBm |
| SISO Receive Sensitivity (11be ,40MHz) @10% PER | - MCS=13 @ -54 dBm | ≤-47 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 ; Temp:25°C

| **Feature** | **Description** | |
|---|---|---|
| WLAN Standard | IEEE 802.11a/n/ac/ax, Wi-Fi compliant | |
| Frequency Range | 5.1500 GHz ~ 5.850 GHz (5.0 GHz ISM Band) | |
| Number of Channels | full band supported | |
| **Test Items** | **Typical Value** | **EVM** |
| Output Power[1] | 802.11a 54Mbps: 19 dBm ± 3 dB | EVM ≤ -25dB |
| | 802.11n MCS7: 19dBm ± 3 dB | EVM ≤ -28dB |
| | 802.11ac MCS9: 17.5 dBm ± 3 dB | EVM ≤ -32dB |
| | 802.11ax MCS11: 17.5 dBm ± 3 dB | EVM ≤ -35dB |
| | 802.11be MCS13: 16.5 dBm ± 3 dB | EVM ≤ -35dB |

| | | |
|---|---|---|
| | 802.11ax HE160/MCS11: 16 dBm ± 3 dB | EVM ≤ -35dB |
| | 802.11be HE160/MCS13: 15 dBm ± 3 dB | EVM ≤ -35dB |
| **Test Items** | **Test Value** | **Standard Value** |
| SISO Receive Sensitivity (11a,20MHz) @10% PER | - 6Mbps @ -90 dBm | ≤-85 |
| | - 54Mbps @ -71 dBm | ≤-68 |
| SISO Receive Sensitivity (11n,20MHz) @10% PER | - MCS=0 @ -90 dBm | ≤-85 |
| | - MCS=7 @ -69 dBm | ≤-67 |
| SISO Receive Sensitivity (11n,40MHz) @10% PER | - MCS=0 @ -87 dBm | ≤-82 |
| | - MCS=7 @ -66 dBm | ≤-64 |
| SISO Receive Sensitivity (11ac,20MHz)@10% PER | - MCS=0 @ 90 dBm | ≤-82 |
| | - MCS=8 @ -64 dBm | ≤-60 |
| SISO Receive Sensitivity (11ac,40MHz) @10% PER | - MCS=0 @ -87 dBm | ≤-79 |
| | - MCS=9 @ -59 dBm | ≤-55 |
| SISO Receive Sensitivity (11ac,80MHz) @10% PER | - MCS=0 @ -84 dBm | ≤-79 |
| | - MCS=9 @ -56 dBm | ≤-54 |
| SISO Receive Sensitivity (11ax,20MHz) @10% PER | - MCS=0 @ -90 dBm | ≤-74 |
| | - MCS=11 @ -58 dBm | ≤-52 |
| SISO Receive Sensitivity (11ax,40MHz) @10% PER | - MCS=0 @ -87 dBm | ≤-71 |
| | - MCS=11 @ -54 dBm | ≤-49 |
| SISO Receive Sensitivity (11ax,80MHz) @10% PER | - MCS=0 @ -84 dBm | ≤-68 |
| | - MCS=11 @ -48 dBm | ≤-46 |
| SISO Receive Sensitivity (11be,160MHz) @10% PER | - MCS=13 @ -47 dBm | ≤-44 |
| Maximum Input Level | 802.11a/n: -30 dBm | |
| Antenna Reference | Small antennas with 0~2 dBi peak gain | |

## 4.3 6GHz RF Specification

| **Feature** | **Description** | |
|---|---|---|
| WLAN Standard | IEEE 802.11a/n/ac/ax, Wi-Fi compliant | |
| Frequency Range | 5.925 GHz ~ 7.125 GHz | |
| Number of Channels | Full band supported | |
| **Test Items** | **Typical Value** | **EVM** |
| Output Power[1] | 802.11a 54Mbps: 19 dBm ± 3 dB | EVM ≤ -25dB |
| | 802.11n MCS7: 19dBm ± 3 dB | EVM ≤ -28dB |
| | 802.11ax MCS11: 17.5 dBm ± 3 dB | EVM ≤ -35dB |
| | 802.11ax MCS13: 16 dBm ± 3 dB | EVM ≤ -35dB |
| | 802.11be HE160/MCS13: 15 dBm ± 3 dB | EVM ≤ -35dB |

| Test Items | Test Value | Standard Value |
|---|---|---|
| SISO Receive Sensitivity (11a,20MHz) @10% PER | - 6Mbps @ -90 dBm | ≤-85 |
| | - 54Mbps @ -71 dBm | ≤-68 |
| SISO Receive Sensitivity (11ax,20MHz) @10% PER | - MCS=0 @ -90 dBm | ≤-74 |
| | - MCS=11 @ -58 dBm | ≤-52 |
| SISO Receive Sensitivity (11ax,40MHz) @10% PER | - MCS=0 @ -87 dBm | ≤-71 |
| | - MCS=11 @ -54 dBm | ≤-49 |
| SISO Receive Sensitivity (11ax,80MHz) @10% PER | - MCS=0 @ -84 dBm | ≤-68 |
| | - MCS=11 @ -48 dBm | ≤-46 |
| SISO Receive Sensitivity (11be,160MHz) @10% PER | - MCS=13 @ -47 dBm | ≤-44 |
| Maximum Input Level | 802.11a/n: -30 dBm | |
| Antenna Reference | Small antennas with 0~2 dBi peak gain | |

## 4.2 Bluetooth Specification

| Feature | Description |
|---|---|
| **General Specification** | |
| Bluetooth Standard | BDR,EDR(1Mbps & 2Mbps & 3Mbps),LE(1Mbps),2LE(2Mbps) |
| Host Interface | UART |
| Frequency Band | 2400 MHz ~ 2483.5 MHz |
| Number of Channels | 79 channels for classic,40 channels for BLE |
| Modulation | GFSK, π/4-DQPSK,8DPSK |
| **RF Specification** | |
| **Output Power [1], tolerance ±3 dB** | |
| | **CL1**(dBm) |
| BDR Output Power | 21 |
| EDR Output Power | 18 |

| | |
|---|---|
| BLE Output Power | 21 |
| **Sensitivity, tolerance : /** | |
| Sensitivity @ BER=0.1%<br>for GFSK (1Mbps) | -92 |
| Sensitivity @ BER=0.01%<br>for π/4-DQPSK (2Mbps) | -86 |
| Sensitivity @ BER=0.01%<br>for 8DPSK (3Mbps) | -85 |
| Sensitivity @ BLE=30.8%<br>for LE (1Mbps) | -90 |
| Sensitivity @ BLE=30.8%<br>for 2LE (2Mbps) | -90 |
| Maximum Input Level | GFSK (1Mbps):-20dBm |
| | π/4-DQPSK (2Mbps) :-20dBm |
| | 8DPSK (3Mbps) :-20dBm |

**1.2.4G/5G/6G/BT output power may update by future version.**

# 5. ID setting information

WI-FI

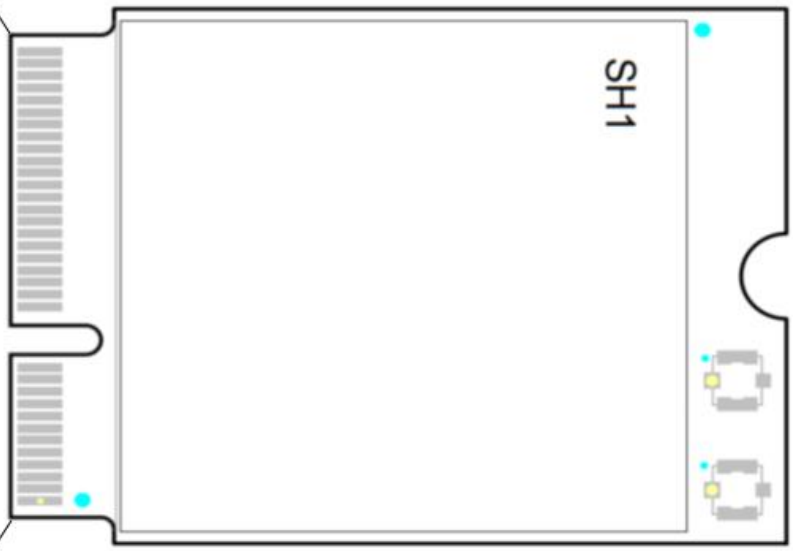
| | |
|---|---|
| Vendor ID | - |
| Product ID | - |

# 6. Pin Definition

## 6.1 Pin Outline

< TOP VIEW >

| BOT | | TOP | |
|---|---|---|---|
| Signal | PIN | Signal | PIN |
| 3V3 | 74 | GND | 75 |
| 3V3 | 72 | NC | 73 |
| NC | 70 | NC | 71 |
| NC | 68 | GND | 69 |
| NC | 66 | PCIE_TXN1 | 67 |
| NC/ VIO | 64 | PCIE_TXP1 | 65 |
| NC/SENS_TXD | 62 | GND | 63 |
| NC/WL_DBGUART_RX | 60 | PCIE_RXN1 | 61 |
| NC/WL_DBGUART_TX | 58 | PCIE_RXP1 | 59 |
| WL_RF_KILL | 56 | GND | 57 |
| BT_RF_KILL | 54 | PCIE_WAKE | 55 |
| PCIE_RST | 52 | CLKREQ | 53 |
| SUSCLK | 50 | GND | 51 |
| NC/LTE_COEX_RXD | 48 | PCIE_CLKN | 49 |
| NC/LTE_COEX_TXD | 46 | PCIE_CLKP | 47 |
| NC | 44 | GND | 45 |
| NC | 42 | PCIE_TXN | 43 |
| NC | 40 | PCIE_TXP | 41 |
| NC | 38 | GND | 39 |
| NC | 36 | PCIE_RXN | 37 |
| NC | 34 | PCIE_RXP | 35 |
| NC | 32 | GND | 33 |
| KEY-E | 24-30 | KEY-E | 25-31 |
| NC | 22 | NC | 23 |
| NC/BT_WAKE_HOST | 20 | NC | 21 |
| GND | 18 | NC | 19 |
| NC/BT_LED | 16 | NC | 17 |
| BT_I2S_SDI | 14 | NC | 15 |
| BT_I2S_SDO | 12 | NC | 13 |
| BT_I2S_WS | 10 | NC | 11 |
| BT_I2S_SCK | 8 | NC | 9 |
| NC/WL_LED | 6 | GND | 7 |
| 3V3 | 4 | USB- | 5 |
| 3V3 | 2 | USB+ | 3 |
| | | GND | 1 |



## 6.2 Pin Definition details

| NO | Name | Type | Description | Voltage |
|---|---|---|---|---|
| 1 | GND | - | Ground connections | |
| 3 | USB_D+ | I/O | USB differential line for BT | |
| 5 | USB_D- | I/O | USB differential line for BT | |
| 7 | GND | - | Ground connections | |
| 9 | NC | - | Floating (NC) | |
| 11 | NC | | Floating (NC) | |
| 13 | NC | | Floating (NC) | |
| 15 | NC | | Floating (NC) | |
| 17 | NC | - | Floating (NC) | |
| 19 | NC | - | Floating (NC) | |
| 21 | NC | - | Floating (NC) | |
| 23 | NC | - | Floating (NC) | |
| 33 | GND | - | Ground connections | |
| 35 | PCIE_RXP | I | PCIe RX differential signals | |
| 37 | PCIE_RXN | I | | |
| 39 | GND | - | Ground connections | |
| 41 | PCIE_TXP | O | PCIe TX differential signals | |
| 43 | PCIE_TXN | O | | |
| 45 | GND | - | Ground connections | |
| 47 | PCIE_CLKP | I | PCIe clock differential input signal | |
| 49 | PCIE_CLKN | I | | |
| 51 | GND | | Ground connections | |
| 53 | CLKREQ | O | PCIe reference clock request signal, open drain, active low.must be driven to low or high by host. | 3.3V |
| 55 | PCIE_WAKE | O | PCIe wake up host, open drain, active low. must be driven to low or high by host. | 3.3V |
| 57 | GND | - | Ground connections | |
| 59 | PCIE_RXP1 | I | PCIe RX differential signals | |
| 61 | PCIE_RXN1 | I | PCIe RX differential signals | |
| 63 | GND | - | Ground connections | |
| 65 | PCIE_TXP1 | O | PCIe TX differential signals | |

| | | | | |
|---|---|---|---|---|
| 67 | PCIE_TXN1 | O | PCIe TX differential signals | |
| 69 | GND | - | Ground connections | |
| 71 | NC | - | Floating (NC) | |
| 73 | NC | - | Floating (NC) | |
| 75 | GND | - | Ground connections | |

Bottom side

| NO | Name | Type | Description | Voltage |
|---|---|---|---|---|
| 2 | 3V3 | P | Power supply | 3.3V |
| 4 | 3V3 | P | Power supply | 3.3V |
| 6 | NC/WL_LED | O | No function,Floating (NC) | 3.3V |
| 8 | BT_I2S_SCK | - | Or PCM CLK,If not used can Floating | 1.8V |
| 10 | BT_I2S_WS | - | Or PCM SYNC,If not used can Floating | 1.8V |
| 12 | BT_I2S_SDO | - | Or PCM OUT,If not used can Floating Reserve 10k pull up. | 1.8V |
| 14 | BT_I2S_SDI | - | Or PCM IN,If not used can Floating | 1.8V |
| 16 | NC/BT_LED | O | No function,Floating (NC) | 3.3V |
| 18 | GND | - | Ground connections | |
| 20 | NC/BT_WAKE_HOST | - | No function,Floating (NC) | 3.3V |
| 22 | NC | - | Floating (NC) | |
| 32 | NC | | Floating (NC) | |
| 34 | NC | - | Floating (NC) | |
| 36 | NC | - | Floating (NC) | |
| 38 | NC | - | Floating (NC) | |
| 40 | NC | - | Floating (NC) | |
| 42 | NC | - | Floating (NC) | |
| 44 | NC | - | Floating (NC) | |
| 46 | NC/LTE_COEX_TXD | O | No function,Floating (NC). | 1.8V |
| 48 | NC/LTE_COEX_RXD | I | No function,Floating (NC). | 1.8V |
| 50 | SUSCLK | I | No function,Floating (NC),External 32.768K clock input,when NC can use internal 32K. | 1.8V |
| 52 | PCIE__RST | I | PCIe reset signal, active low,must be driven to low or high by host. | 3.3V |

| | | | | |
|---|---|---|---|---|
| 54 | BT_RF_KILL | I | Bluetooth enable signal. It is an input, active high to enable Bluetooth operation.must be driven to low or high by host. | 3.3V |
| 56 | WL_RF_KILL | I | WLAN enable signal. It is an input, active high to enable WLAN operation. must be driven to low or high by host. | 3.3V |
| 58 | NC/WL_DBGUART_TX | - | Floating (NC) | 1.8V |
| 60 | NC/WL_DBGUART_RX | - | Floating (NC) | 1.8V |
| 62 | NC/SENS_TXD | - | Floating (NC) | 1.8V |
| 64 | NC/VIO | - | Floating (NC) | 1.8V |
| 66 | NC | - | Floating (NC) | 1.8V |
| 68 | NC | - | Floating (NC) | 1.8V |
| 70 | NC | - | Floating (NC) | 1.8V |
| 72 | 3V3 | P | Power supply | 3.3V |
| 74 | 3V3 | P | Power supply | 3.3V |

P:POWER I:INPUT O:OUTPUT

# 7. Electrical Specifications

## 7.1 Power Supply DC Characteristics

| | MIN | TYP | MAX | Unit |
|---|---|---|---|---|
| Operating Temperature | -30 | 25 | 85 | deg.C |
| VDD33 | 3.0 | 3.3 | 3.6 | V |

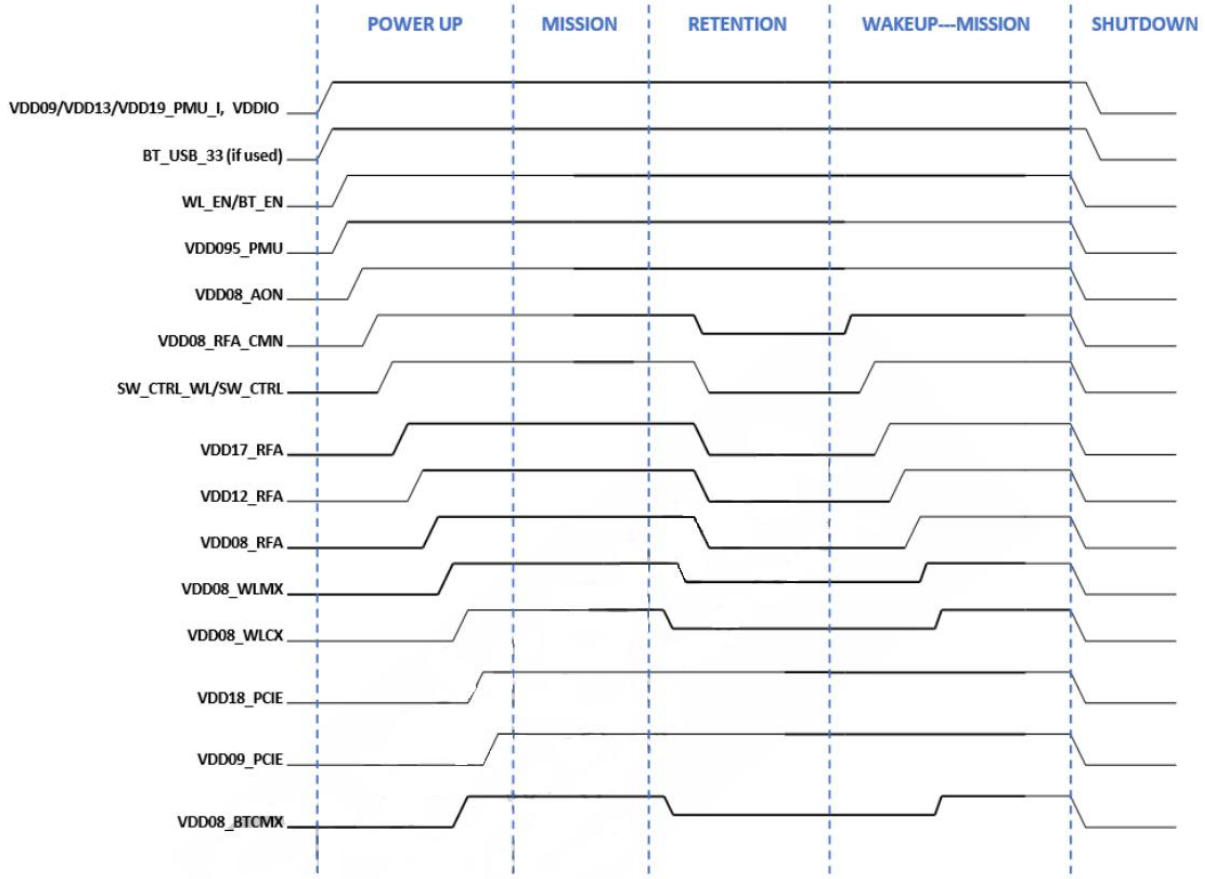
## 7.2 Power Consumption

This information will be included in future revisions.

## 7.3 Interface Circuit time series

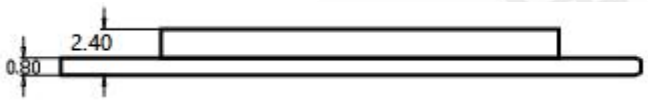
### 7.3.1 PCIe Bus during Power On Sequence

All input supplies must be ON and available before WLAN/BT_EN is asserted. There is no requirement on the order of input supply.



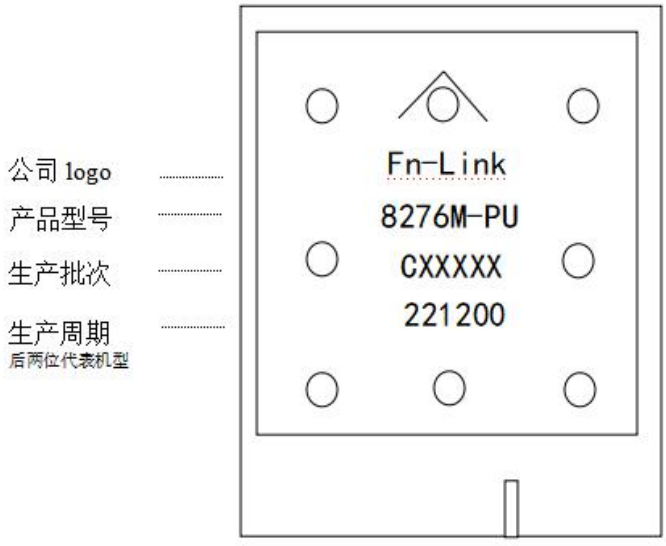
# 8. Size reference

## 8.1 Module Picture

| | |
|---|---|
| **L x W : 22 x 30 (+0.3/-0.1) mm**<br>NA |  |
| H: 2.4 (±0.2) mm |  |
| **Weight** | ? g |

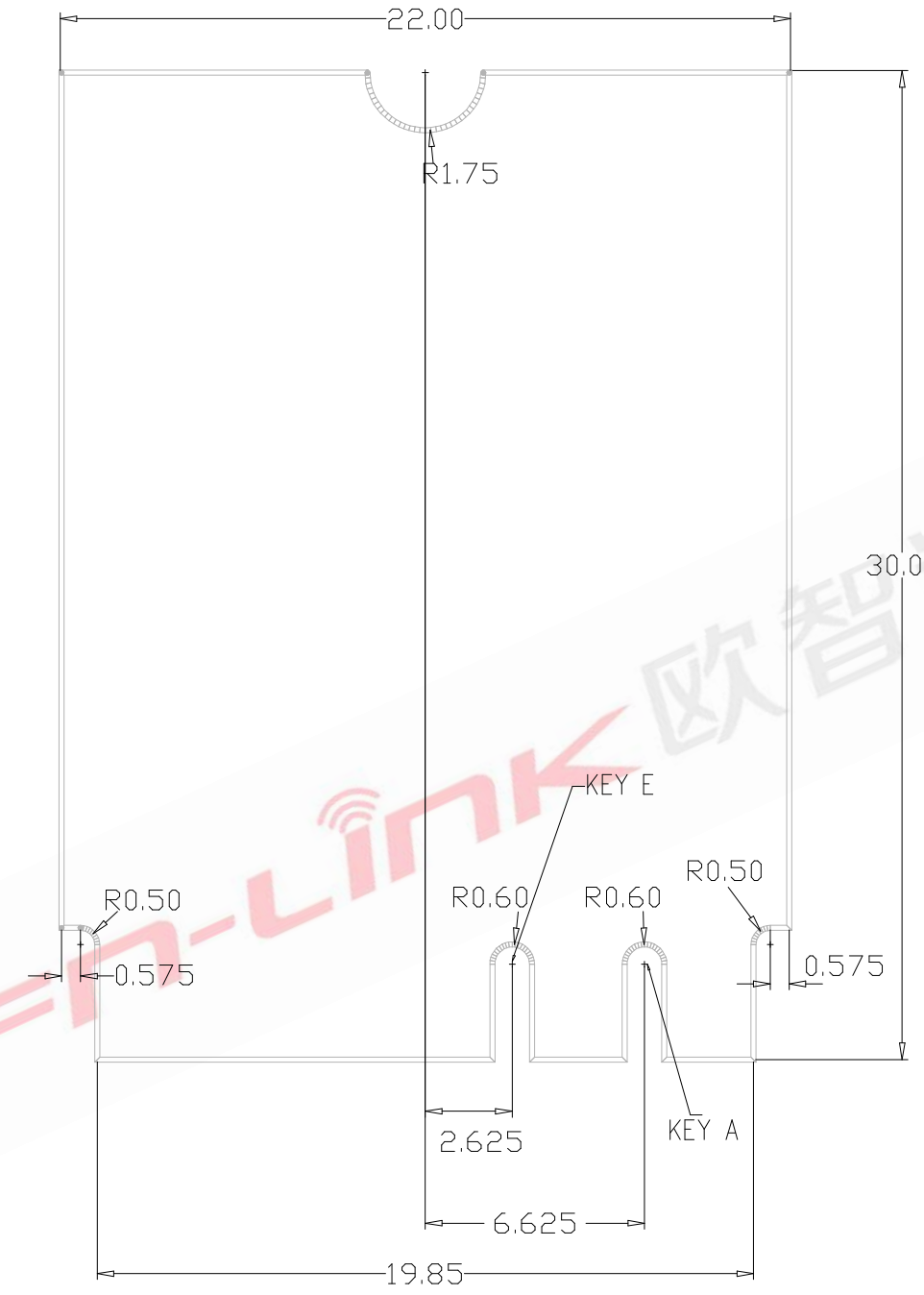
## 8.2 Marking Description

< TOP VIEW >



## 8.3 Physical Dimensions

<TOP View>




module is key-E type

# 9. The Key Material List

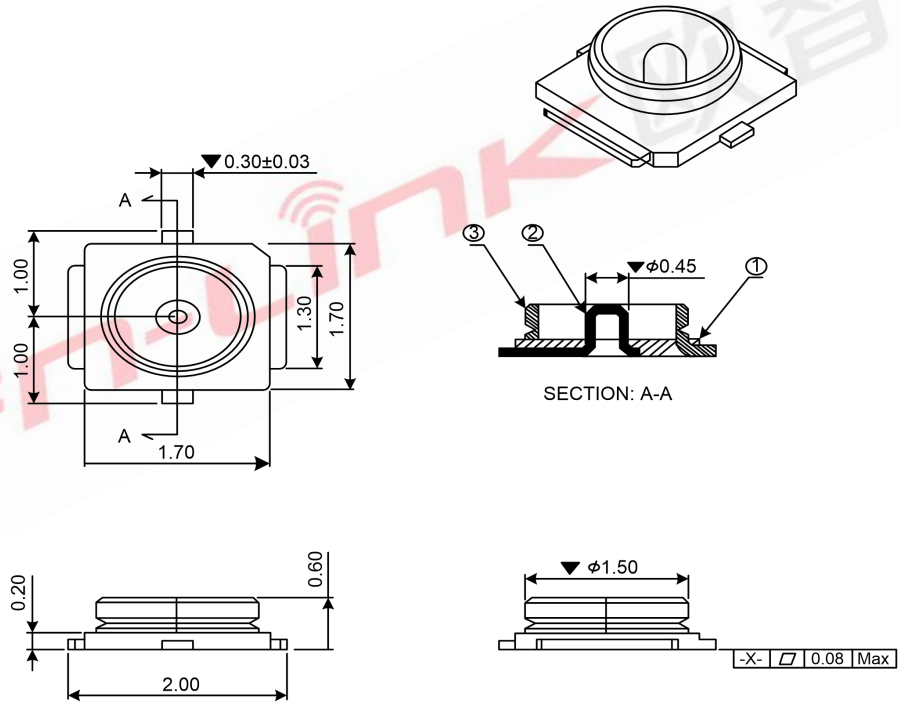
| Item | Part Name | Description | Manufacturer |
|---|---|---|---|
| 1 | PCB | 8276M-PU Green,HDI 6L,FR4,AU,22X30X0.8mm | Sunlord, GDKX, Truly, Brain-power |
| 2 | Inductor | 2012 1uH,±20%,Isat=2.8A Irms=2.1A | Sunlord, Ceaiya, CYNTEC,Cenker,Chilisin,Murata,INPAQ |
| 3 | Inductor | 2520 1uH 20% Isat4.3A /Irms3.9A | CYNTEC,Sunlord, Ceaiya,Cenker,Chilisin,Murata,INPAQ |
| 4 | Diplexer | BB76C; QXF2076 (000-0) | QCA |
| 5 | Crystal | 1210,76.8MHZ,±10PPM,10PF | ECEC, TKD, Hosonic, JWT, TXC |
| 6 | Chipset | QCC-2076-0-NSP334-TR-01-0,NSP334, WI-FI 7,6.8X8.5-0.65mm （Qualcomm） | Qualcomm |
| 7 | Shielding | 8276M-PU,Shielding cover,21.45X20.57X1.5mm,T=0.2mm | Suntech, JLitong,卓益 |
| 8 | Filter | BF1411-R6R1NGWT/LF,BPF 5150-7125 MHz<br>FILTER,BAW WLAN 2G 2442MHZ ,BF87A<br>RFBPF1005040K38Q1C ,BPF, 5150-7125MHZ | ACX,QCA, Walsin |
| 9 | SWITCH | SPDT Switch,MXD8723E | 卓胜微 |
| 10 | Diplexer | Diplexer,1608 | ACX,TDK,FTR,GLEAD,Walsin,Murata |
| 11 | FEM | QXM1086 (0J4-0) ,LGA17D,5-7GHZ FEM<br>QXM1083 (0H6-0) ,LGA19,2.4GHZ FEM | Qualcomm |
| 12 | DC-DC | MP1605GTF-Z,DC-DC,VIN2.3~5.5V,0.6V/2A,2.2MHz,SOT563 | MPS |
| 13 | DC-DC | MT3124NQER,DC-DC,VIN2.5~6V,0.6V/3.5A,1.2MHz,QFN2X2_12L | M3TEK |

# 10. Reference Design

## 10.1 Reference design

1. PCIe differential keep 100 ohm trace.
2. USB differential keep 90 ohm trace.

## 10.2 Connector Specification



# 11. Recommended Reflow Profile

No need to do SMT reflow process.

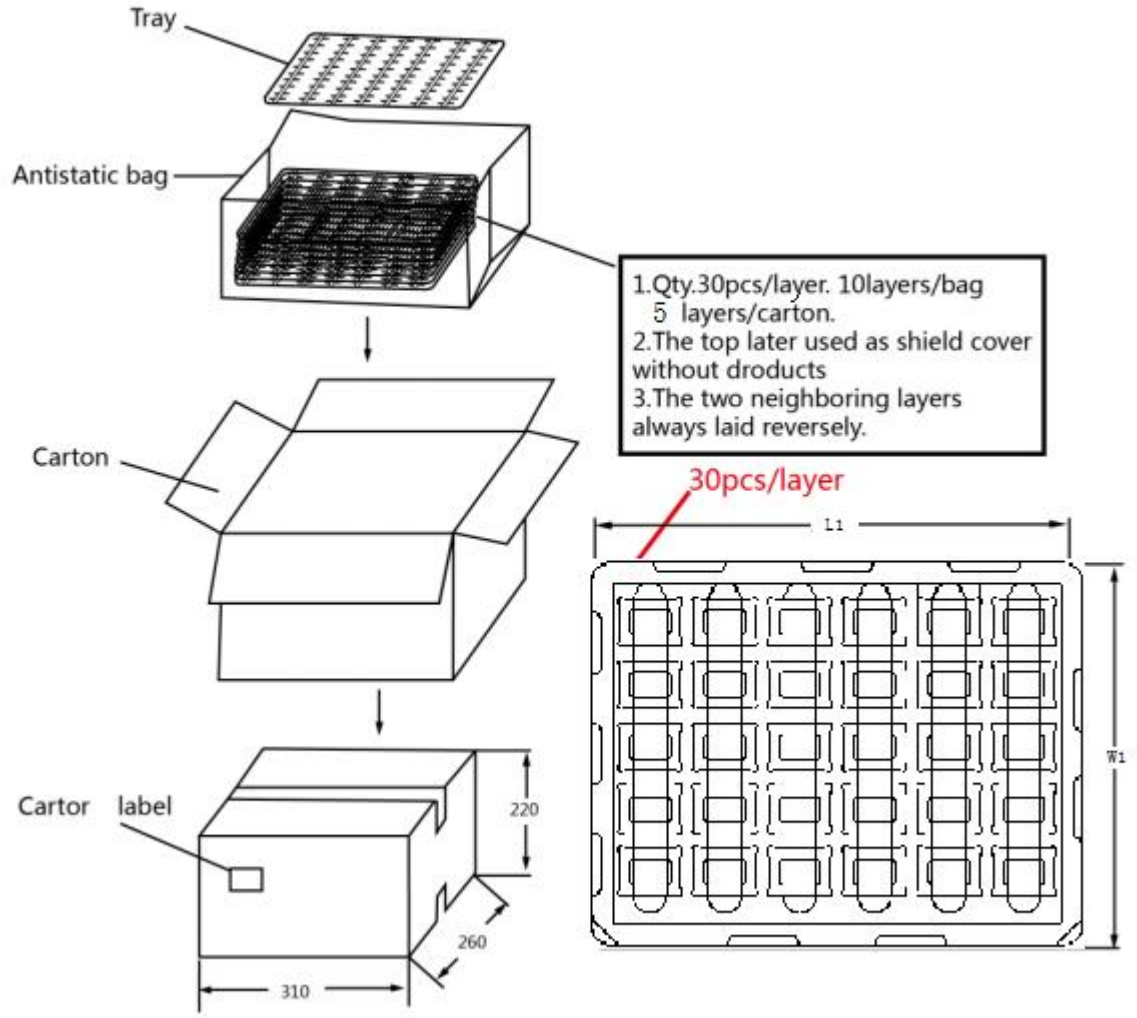
# 12. RoHS compliance

All hardware components are fully compliant with EU RoHS directive

# 13. Package

## 13.1 Tray

Layer size: L250.0*W190.0 mm
Layer material: PVC
Carton size: L310.0*W260.0*H220.0 mm
Carton material: A=A
Total=1500pcs
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