# SPECIFICATION

# 产品规格书

# SKI.WB921A.5

## IEEE 802.11b/g/n/a/ac/ax 2T2R USB WiFi Module

## Integrated BT 2.1+EDR/4.2/5.2

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# Content


1. Introduction（简介）.....1
2. Features（特性）.....1
3. Block Diagram（结构框图）.....2
4. Package Outline and Mounting（外形及安装尺寸）.....3
5. Product Pictures（实物图片）.....4
6. Key Materials（关键物料）.....4
7. General Requirements（一般要求）.....5
8. Electrical Characteristics（电气特性）.....5
   8.1 IEEE 802.11b Section(2.4GHz).....5
   8.2 IEEE 802.11g Section(2.4GHz).....6
   8.3 IEEE 802.11n HT20 Section(2.4GHz).....7
   8.4 IEEE 802.11n HT40 Section(2.4GHZ).....8
   8.5 IEEE 802.11ax Section(2.4GHz).....9
   8.6 IEEE 802.11a Section(5GHz).....10
   8.7 IEEE 802.11n HT20 Section(5GHz).....11
   8.8 IEEE 802.11n HT40 Section(5GHz).....12
   8.9 IEEE 802.11ac Section(5GHz).....13
   8.10 IEEE 802.11ax Section(5GHz).....14
   8.11 IEEE 802.11 Section(6GHz).....15
   8.12 Bluetooth Section.....15
9. Mechanical,Environmental and Reliability Tests（机械、环境和可靠性测试）17
10. Package（包装）.....19

# 1. Introduction（简介）

SKI.WB921A.5 module is based on MediaTek MT7921AU solution.

MT7921AU is a highly integrated single chip which features a low power 2x2 11a/b/g/n/ac/ax dual-band Wi-Fi subsystem and a Bluetooth v5.2 subsystem, offering feature-rich wireless connectivity at high standards,and delivering reliable,cost-effective throughput from an extended distance.

MT7921AU data rate up to 800Mbps with USB3.0.Optimized RF architecture and baseband algorithms provide superb performance and low power consumption. Intelligent MAC design deploys a high efficient offload engine,and hardware data processing accelerators which fully offloads Wi-Fi task of the host processor, MT7921AU is designed to support standard based features in the areas of security, quality of service and international regulations, giving end users the greatest performance any time and in any circumstance.This documentation describes the engineering requirements specification.

SKI.WB921A.5 模块基于联发科 MT7921AU 方案。MT7921AU 是一款高度集成的单芯片，符合 2x2 11a/b/g/n/ac/ax 标准，支持低功耗的双频 Wi-Fi 和蓝牙 v5.2 子系统，提供功能丰富的无线标准接口，以及可靠、高效的远距离吞吐量。

MT7921AU 使用 USB3.0 高速接口，数据速率高达 800Mbps，优化后的射频架构和基带算法提供了卓越的性能，并且功耗很低。MAC 部署了一个高效的卸载引擎和硬件数据处理加速器，可完全卸载主机处理器的 Wi-Fi 任务。MT7921AU 安全、优异的性能，并且符合国际法律法规标准，无论何时何地都为用户提供最好的应用体验。本文档描述了工程要求规范。

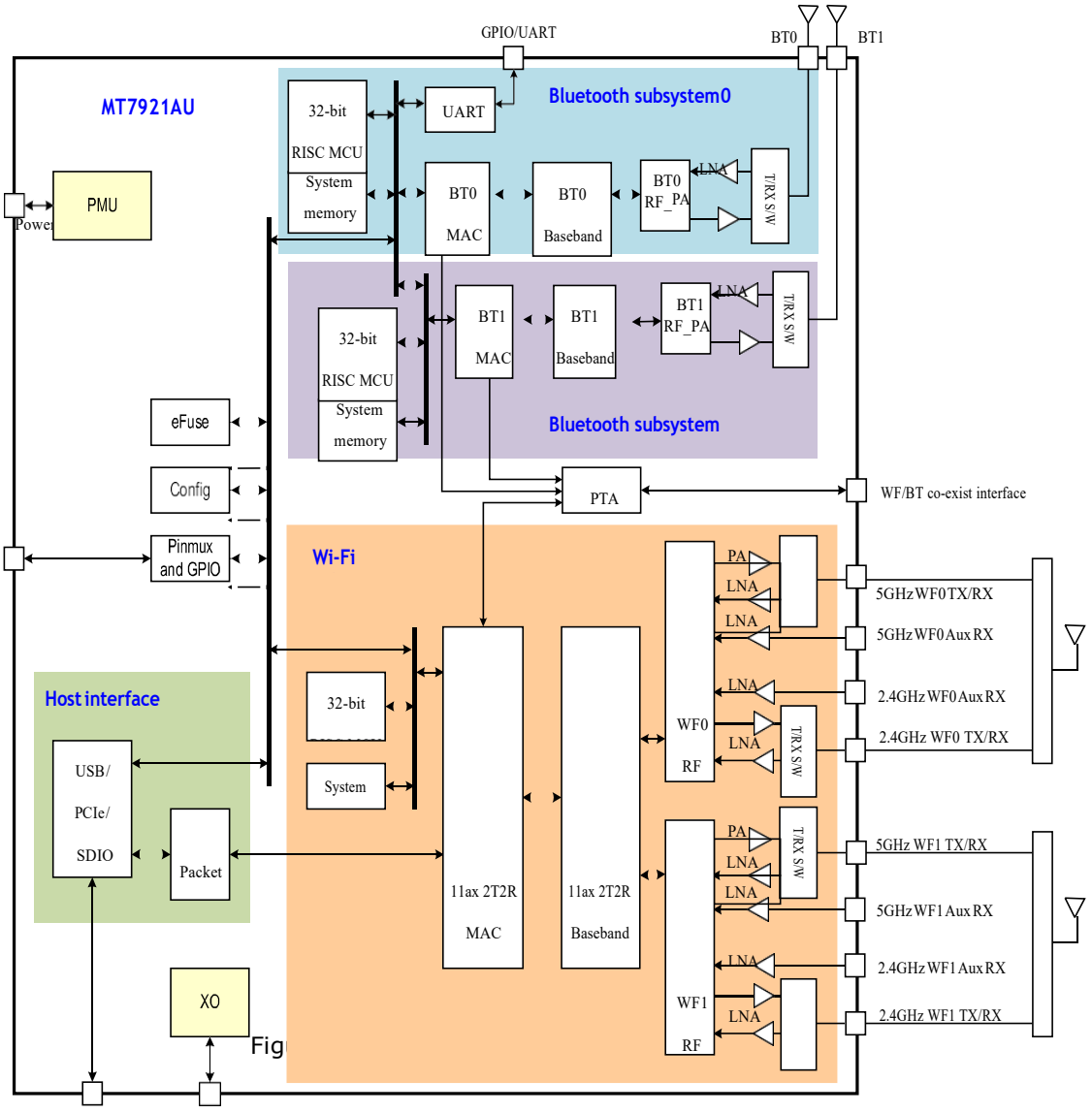
# 2. Features（特性）

| | |
|---|---|
| **Reserving System**<br>**接收制式** | IEEE Std. 802.11a |
| | IEEE Std. 802.11b |
| | IEEE Std. 802.11g |
| | IEEE Std. 802.11n |
| | IEEE Std. 802.11ac |
| | IEEE Std. 802.11ax |
| | BT 2.1+EDR |
| | BT 4.2 |
| | BT 5.2 with BLE (BT low energy) |

| | |
|---|---|
| **Chip Solution 芯片方案** | MT7921AU |
| **Band 波段** | 2.4~2.5GHz & 5.15~5.825GHz & 5.926~7.125GHz |
| **Dimensions 尺寸** | 25.6mm×23mm×2.4mm |

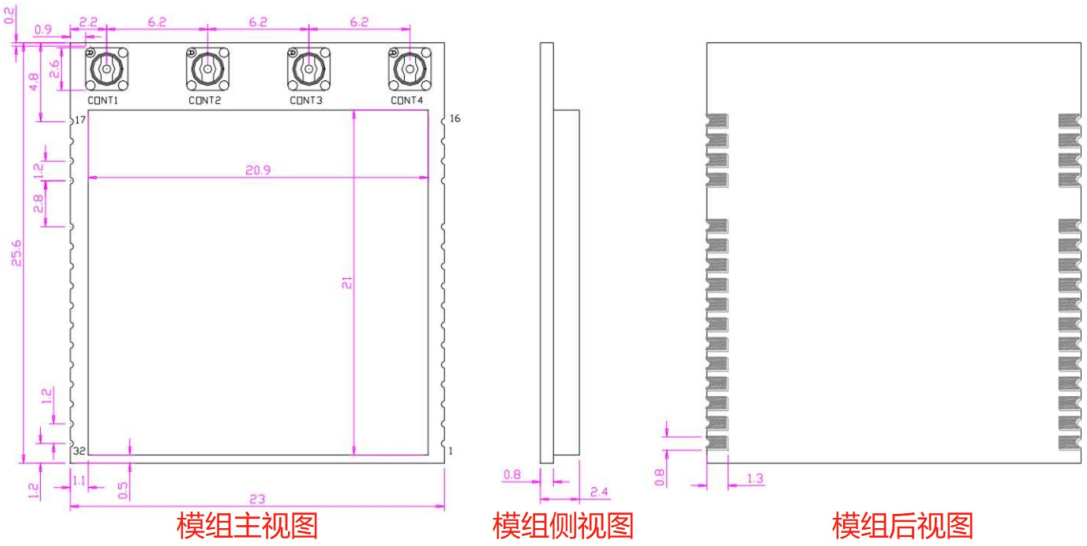
| Model<br>型号 | Installation Mode<br>安装方式 | Protocol l<br>支持标准 | Frequency<br>频段 | Antenna<br>天线 | Remark<br>备注 |
|---|---|---|---|---|---|
| SKI.WB921A.5 | SMD | IEEE 802.11a/b/g/n/ac/ax<br>BT 2.1+EDR/4.2/5.2 | 2.4GHz/5GHz<br>/6GHz | WiFi&BT：<br>一代 Ipex | 25.6mm×<br>23mm×2.4mm |

## 3. Block Diagram（结构框图）




Fig

# 4. Package Outline and Mounting（外形及安装尺寸）




CONT1: RF_BT0; CONT2: RF0; CONT3: RF1；CONT4: RF_BT1

**Pin Definition（引脚定义）**

| PIN | SYMBOL | DESCRIPTION |
|---|---|---|
| 1 | U3-TXN | USB3.0 TXN，连接主平台 RXN |
| 2 | U3-TXP | USB3.0 TXP，连接主平台 RXP |
| 3 | GND | Ground |
| 4 | U3-RXN | USB3.0 RXN，连接主平台 TXN |
| 5 | U3-RXP | USB3.0 RXP，连接主平台 TXP |
| 6 | GND | Ground |
| 7 | U2-DP | USB2.0 DP，连接主平台 DP |
| 8 | U2-DM | USB2.0 DM，连接主平台 DM |
| 9 | GND | Ground |
| 10 | WIFI_WAKE | WIFI 唤醒主机，内部 10K 上拉，低电平有效 |
| 11 | BT_WAKE | BT 唤醒主机，内部 10K 上拉，低电平有效 |
| 12 | NC | Not connect |
| 13 | BT1 | Not connect(默认使用板载 ipex) |
| 14 | GND | Ground |
| 15 | GND | Ground |
| 16 | WiFi1 | Not connect(默认使用板载 ipex) |
| 17 | WiFi0 | Not connect(默认使用板载 ipex) |
| 18 | GND | Ground |
| 19 | GND | Ground |
| 20 | BT0 | Not connect(默认使用板载 ipex) |
| 21 | GND | Ground |
| 22 | GND | Ground |

| | | |
|---|---|---|
| 23 | NC | Not connect |
| 24 | NC | Not connect |
| 25 | NC | Not connect |
| 26 | RESET | PMU RESET，内部 10K 上拉，低电平有效 |
| 27 | 3.3V | 3.3V (DCDC 单独供电，预留 2A，纹波小于 120mV) |
| 28 | 3.3V | 3.3V (DCDC 单独供电，预留 2A，纹波小于 120mV) |
| 29 | GND | Ground |
| 30 | NC | Not connect |
| 31 | GPIO1I | 选择 USB3.0 的比特率（2.5GHz or 5GHz），上拉为正常高速模式（5GHz bit rate），内部默认上拉 |
| 32 | GND | GND |

# 5. Product Pictures（实物图片）

暂无

**正视图（top view）**

暂无

**背视图（bottom view）**

暂无

**标签信息（information view）**

# 6. Key Materials（关键物料）

| 序号 | 关键件名称 | 型号 | 规格/材料 | 备注 |
|---|---|---|---|---|
| 1 | 集成电路 | MT7921AU | 109-DRQFN | |
| 2 | PCB | SKI.WB921A.5 | FR-4,4LAY | |
| 3 | 晶体振荡器 | CF4040M00006T2115218 | 40MHz | |

# 7. General Requirements（一般要求）

| No. | Feature | Description |
|---|---|---|
| **7-1** | Operation Voltage 工作电压范围 | 3.3V+/-0.3 |
| **7-2** | Current Consumption 最大电流 | 900mA（预留 2A） |
| **7-3** | Ripple 纹波 | ≤120mV |
| **7-4** | Operation Temperature 工作温度范围 | 0°C to +40°C |
| **7-5** | Antenna Type 天线类型 | External antenna |
| **7-6** | USB | High Speed USB 3.0 Interface<br>（兼容 High Speed USB 2.0 Interface） |
| **7-7** | Storage Temperature 存储温度 | -40°C to +125°C |

# 8. Electrical Characteristics（电气特性）

除非另有说明，电气规范试验都在下列条件下进行：

环境条件温度：25℃±5℃；

电源电压：模块输上入电压 3.3V+/-0.3；

The Test for electrical specification was performed under the following condition unless otherwise specified：

Ambient condition Temperature :25℃ ± 5℃;

Power supply voltages：3.3V+/-0.3 input power at the Module;

## 8.1 IEEE 802.11b Section(2.4GHz)

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11b | | | | |
| Mode | CCK | | | | |
| Channel | CH1 to CH13 | | | | |
| Data rate | 1, 2, 5.5, 11Mbps | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | Remark |
| 1. Power Levels(Calibrated) | | | | | |
| 1) For antenna port（CCK 11M） | 12 | 14 | 16 | dBm | |
| 2. Spectrum Mask @ target power | | | | | |
| 1) fc +/-11MHz to +/-22MHz | - | - | -30 | dBr | |
| 2) fc > +/-22MHz | - | - | -50 | dBr | |
| 3 Constellation Error(EVM)@ target power | | | | | |
| 1) 1Mbps | - | - | -10 | dB | |
| 2) 2Mbps | - | - | -10 | dB | |
| 3) 5.5Mbps | - | - | -10 | dB | |
| 4) 11Mbps | - | - | -10 | dB | |
| 4. Frequency Error | -20 | - | 20 | ppm | |

| RX Characteristics | Min. | Typ. | Max. | Unit | |
|---|---|---|---|---|---|
| 5 Minimum Input Level Sensitivity (each chain) | | | | | |
| 1) 1Mbps (FER ≦8%) | - | - | -83 | dBm | |
| 2) 2Mbps (FER ≦8%) | - | - | -80 | dBm | |
| 3) 5.5Mbps (FER ≦8%) | - | - | -79 | dBm | |
| 4) 11Mbps (FER ≦8%) | - | - | -76 | dBm | |
| 6 Maximum Input Level (FER ≦8%) | -10 | - | - | dBm | |

## 8.2 IEEE 802.11g Section(2.4GHz)

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11g | | | | |
| Mode | OFDM | | | | |
| Channel | CH1 to CH13 | | | | |
| Data rate | 6, 9, 12, 18, 24, 36, 48, 54Mbps | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | Remark |
| 1. Power Levels | | | | | |
| 1) For antenna port（54M） | 12 | 14 | 16 | dBm | |
| 2. Spectrum Mask @ target power | | | | | |
| 1) at fc +/-11MHz | - | - | -20 | dBr | |
| 2) at fc +/-20MHz | - | - | -28 | dBr | |
| 3) at fc > +/-30MHz | - | - | -40 | dBr | |
| 3 Constellation Error(EVM)@ target power | | | | | |
| 1) 6Mbps | - | - | -5 | dB | |
| 2) 9Mbps | - | - | -8 | dB | |
| 3) 12Mbps | - | - | -10 | dB | |
| 4) 18Mbps | - | - | -13 | dB | |
| 5) 24Mbps | - | - | -16 | dB | |
| 6) 36Mbps | - | - | -19 | dB | |
| 7) 48Mbps | - | - | -22 | dB | |
| 8) 54Mbps | - | - | -25 | dB | |
| 4 Frequency Error | -20 | - | 20 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 5 Minimum Input Level Sensitivity (each chain) | | | | | |
| 1) 6Mbps (PER ≦10%) | - | - | -85 | dBm | |
| 2) 9Mbps (PER ≦10%) | - | - | -84 | dBm | |
| 3) 12Mbps (PER ≦10%) | - | - | -82 | dBm | |
| 4) 18Mbps (PER ≦10%) | - | - | -80 | dBm | |
| 5) 24Mbps (PER ≦10%) | - | - | -77 | dBm | |
| 6) 36Mbps (PER ≦10%) | - | - | -73 | dBm | |

| | | | | | |
|---|---|---|---|---|---|
| 7) 48Mbps (PER ≦10%) | - | - | -69 | dBm | |
| 8) 54Mbps (PER ≦10%) | - | - | -65 | dBm | |
| 6 Maximum Input Level (PER ≦10%) | -20 | - | - | dBm | |

## 8.3 IEEE 802.11n HT20 Section(2.4GHz)

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11n HT20 @ 2.4GHz | | | | |
| Mode | OFDM | | | | |
| Channel | CH1 to CH13 | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7 | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | |
| 1. Power Levels | | | | | |
| 1) For antenna port（MCS7） | 12 | 14 | 16 | dBm | |
| 2. Spectrum Mask @ target power | | | | | |
| 1) at fc +/-11MHz | - | - | -20 | dBr | |
| 2) at fc +/-20MHz | - | - | -28 | dBr | |
| 3) at fc > +/-30MHz | - | - | -45 | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | |
| 1) MCS0 | - | - | -5 | dB | |
| 2) MCS1 | - | - | -10 | dB | |
| 3) MCS2 | - | - | -13 | dB | |
| 4) MCS3 | - | - | -16 | dB | |
| 5) MCS4 | - | - | -19 | dB | |
| 6) MCS5 | - | - | -22 | dB | |
| 7) MCS6 | - | - | -25 | dB | |
| 8) MCS7 | - | - | -28 | dB | |
| 4. Frequency Error | -20 | - | 20 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 5.Minimum Input Level Sensitivity (each chain) | | | | | |
| 1) MCS0 (PER ≦10%) | - | - | -82 | dBm | |
| 2) MCS1 (PER ≦10%) | - | - | -79 | dBm | |
| 3) MCS2 (PER ≦10%) | - | - | -77 | dBm | |
| 4) MCS3 (PER ≦10%) | - | - | -74 | dBm | |
| 5) MCS4 (PER ≦10%) | - | - | -70 | dBm | |
| 6) MCS5 (PER ≦10%) | - | - | -66 | dBm | |
| 7) MCS6 (PER ≦10%) | - | - | -65 | dBm | |
| 8) MCS7 (PER ≦10%) | - | - | -64 | dBm | |
| 7. Maximum Input Level (PER ≦10%) | -20 | - | - | dBm | |

# 8.4 IEEE 802.11n HT40 Section(2.4GHZ)

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11n HT40 @ 2.4GHz | | | | |
| Mode | OFDM | | | | |
| Channel | CH3 to CH11 | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7 | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | |
| 1. Power Levels (Calibrated) | | | | | |
| 1) For antenna port（MCS7） | 12 | 14 | 16 | dBm | |
| 2. Spectrum Mask @target power | | | | | |
| 1) at fc +/-22MHz | - | - | -20 | dBr | |
| 2) at fc +/-40MHz | - | - | -28 | dBr | |
| 3) at fc > +/-60MHz | - | - | -45 | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | |
| 1) MCS0 | - | - | -5 | dB | |
| 2) MCS1 | - | - | -10 | dB | |
| 3) MCS2 | - | - | -13 | dB | |
| 4) MCS3 | - | - | -16 | dB | |
| 5) MCS4 | - | - | -19 | dB | |
| 6) MCS5 | - | - | -22 | dB | |
| 7) MCS6 | - | - | -25 | dB | |
| 8) MCS7 | - | - | -28 | dB | |
| 4. Frequency Error | -20 | - | 20 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 5. Minimum Input Level Sensitivity (each chain) | | | | | |
| 1) MCS0 (PER ≦10%) | - | - | -79 | dBm | |
| 2) MCS1 (PER ≦10%) | - | - | -76 | dBm | |
| 3) MCS2 (PER ≦10%) | - | - | -74 | dBm | |
| 4) MCS3 (PER ≦10%) | - | - | -71 | dBm | |
| 5) MCS4 (PER ≦10%) | - | - | -67 | dBm | |
| 6) MCS5 (PER ≦10%) | - | - | -63 | dBm | |
| 7) MCS6 (PER ≦10%) | - | - | -62 | dBm | |
| 8) MCS7 (PER ≦10%) | - | - | -61 | dBm | |
| 6. Maximum Input Level (PER ≦10%) | -20 | - | - | dBm | |

# 8.5 IEEE 802.11ax Section(2.4GHz)

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11ax | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM,256QAM, 1024QAM and OFDMA | | | | |
| Channel | HE20：CH1 to CH13<br>HE40：CH3 to CH11 | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7/8/9/10/11 | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | |
| 1. Power Levels (Calibrated) | | | | | |
| 1) For antenna port（MCS11） | 10 | 12 | 14 | dBm | |
| 2. Spectrum Mask @VHT20/VHT40/VHT80 target power | | | | | |
| 1) at fc +/-11MHz/21MHz/41MHz | - | - | -20 | dBr | |
| 2) at fc +/-20MHz/40MHz/80MHz | - | - | -28 | dBr | |
| 3) at fc +/-30MHz/60MHz/120MHz | - | - | -40 | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | |
| 1) MCS0 | - | - | -5 | dB | |
| 2) MCS1 | - | - | -10 | dB | |
| 3) MCS2 | - | - | -13 | dB | |
| 4) MCS3 | - | - | -16 | dB | |
| 5) MCS4 | - | - | -19 | dB | |
| 6) MCS5 | - | - | -22 | dB | |
| 7) MCS6 | - | - | -25 | dB | |
| 8) MCS7 | - | - | -27 | dB | |
| 9) MCS8 | - | - | -30 | dB | |
| 10) MCS9 | - | - | -32 | dB | |
| 11) MCS10 | | | -34 | dB | |
| 12) MCS11 | | | -35 | dB | |
| 4. Frequency Error | -20 | - | 20 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | | Unit |
| 5.Minimum Input Level Sensitivity (each chain) | | | HE 20 | HE 40 | |
| 1) MCS0 (PER ≦10%) | - | - | -82 | -79 | dBm |
| 2) MCS1 (PER ≦10%) | - | - | -79 | -76 | dBm |
| 3) MCS2 (PER ≦10%) | - | - | -77 | -74 | dBm |
| 4) MCS3 (PER ≦10%) | - | - | -74 | -71 | dBm |
| 5) MCS4 (PER ≦10%) | - | - | -70 | -67 | dBm |
| 6) MCS5 (PER ≦10%) | - | - | -66 | -63 | dBm |
| 7) MCS6 (PER ≦10%) | - | - | -65 | -62 | dBm |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 8) MCS7 (PER ≦10%) | - | - | -64 | -61 | | dBm | |
| 9) MCS8(PER ≦10%) | - | - | -59 | -56 | | dBm | |
| 10) MCS9(PER ≦10%) | - | - | -57 | -54 | | dBm | |
| 11) MCS10(PER ≦10%) | - | - | -54 | -51 | | dBm | |
| 12) MCS11(PER ≦10%) | - | - | -52 | -49 | | dBm | |
| 6. Maximum Input Level (PER ≦10%) | -30 | - | - | | | dBm | |

## 8.6 IEEE 802.11a Section(5GHz)

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11a | | | | |
| Mode | OFDM | | | | |
| Channel | CH36 to CH165 | | | | |
| Data rate (MCS index) | 6, 9, 12, 18, 24, 36, 48, 54Mbps | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | |
| 1. Power Levels (Calibrated) | | | | | |
| 1) For antenna port（54M） | 12 | 14 | 16 | dBm | |
| 2. Spectrum Mask @target power | | | | | |
| 1) at fc +/-11MHz | - | - | -20 | dBr | |
| 2) at fc +/-20MHz | - | - | -28 | dBr | |
| 3) at fc > +/-30MHz | - | - | -40 | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | |
| 1) 6Mbps | - | - | -5 | dB | |
| 2) 9Mbps | - | - | -8 | dB | |
| 3) 12Mbps | - | - | -10 | dB | |
| 4) 18Mbps | - | - | -13 | dB | |
| 5) 24Mbps | - | - | -16 | dB | |
| 6) 36Mbps | - | - | -19 | dB | |
| 7) 48Mbps | - | - | -22 | dB | |
| 8) 54Mbps | - | - | -25 | dB | |
| 4 Frequency Error | -20 | - | 20 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 5 Minimum Input Level Sensitivity (each chain) | | | | | |
| 1) 6Mbps (PER ≦10%) | - | - | -82 | dBm | |
| 2) 9Mbps (PER ≦10%) | - | - | -81 | dBm | |
| 3) 12Mbps (PER ≦10%) | - | - | -79 | dBm | |
| 4) 18Mbps (PER ≦10%) | - | - | -77 | dBm | |
| 5) 24Mbps (PER ≦10%) | - | - | -74 | dBm | |
| 6) 36Mbps (PER ≦10%) | - | - | -70 | dBm | |
| 7) 48Mbps (PER ≦10%) | - | - | -66 | dBm | |
| 8) 54Mbps (PER ≦10%) | - | - | -65 | dBm | |

| | | | | | |
|---|---|---|---|---|---|
| 6. Maximum Input Level (PER ≦10%) | -30 | - | - | dBm | |

## 8.7 IEEE 802.11n HT20 Section(5GHz)

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11n HT20 @ 5GHz | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM and OFDM | | | | |
| Channel | CH36 to CH165 | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7 | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | |
| 1. Power Levels (Calibrated) | | | | | |
| 1) For antenna port（MCS7） | 12 | 14 | 16 | dBm | |
| 2. Spectrum Mask @target power | | | | | |
| 1) at fc +/-11MHz | - | - | -20 | dBr | |
| 2) at fc +/-20MHz | - | - | -28 | dBr | |
| 3) at fc > +/-30MHz | - | - | -45 | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | |
| 1) MCS0 | - | - | -5 | dB | |
| 2) MCS1 | - | - | -10 | dB | |
| 3) MCS2 | - | - | -13 | dB | |
| 4) MCS3 | - | - | -16 | dB | |
| 5) MCS4 | - | - | -19 | dB | |
| 6) MCS5 | - | - | -22 | dB | |
| 7) MCS6 | - | - | -25 | dB | |
| 8) MCS7 | - | - | -28 | dB | |
| 4. Frequency Error | -20 | - | 20 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 6. Minimum Input Level Sensitivity (each chain) | | | | | |
| 1) MCS0 (PER ≦10%) | - | - | -82 | dBm | |
| 2) MCS1 (PER ≦10%) | - | - | -79 | dBm | |
| 3) MCS2 (PER ≦10%) | - | - | -77 | dBm | |
| 4) MCS3 (PER ≦10%) | - | - | -74 | dBm | |
| 5) MCS4 (PER ≦10%) | - | - | -70 | dBm | |
| 6) MCS5 (PER ≦10%) | - | - | -66 | dBm | |
| 7) MCS6 (PER ≦10%) | - | - | -65 | dBm | |
| 8) MCS7 (PER ≦10%) | - | - | -64 | dBm | |
| 6. Maximum Input Level (PER ≦10%) | -30 | - | - | dBm | |

# 8.8 IEEE 802.11n HT40 Section(5GHz)

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | IEEE802.11n HT40 @ 5GHz | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM and OFDM | | | | |
| Channel | CH38 to CH163 | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7 | | | | |
| TX Characteristics | Min. | Typ. | Max. | Unit | |
| 1. Power Levels (Calibrated) | | | | | |
| 1) For antenna port（MCS7） | 12 | 14 | 16 | dBm | |
| 2. Spectrum Mask @target power | | | | | |
| 1) at fc +/-21MHz | - | - | -20 | dBr | |
| 2) at fc +/-40MHz | - | - | -28 | dBr | |
| 3) at fc > +/-60MHz | - | - | -45 | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | |
| 1) MCS0 | - | - | -5 | dB | |
| 2) MCS1 | - | - | -10 | dB | |
| 3) MCS2 | - | - | -13 | dB | |
| 4) MCS3 | - | - | -16 | dB | |
| 5) MCS4 | - | - | -19 | dB | |
| 6) MCS5 | - | - | -22 | dB | |
| 7) MCS6 | - | - | -25 | dB | |
| 8) MCS7 | - | - | -28 | dB | |
| 4. Frequency Error | -20 | - | 20 | ppm | |
| RX Characteristics | Min. | Typ. | Max. | Unit | |
| 7. Minimum Input Level Sensitivity (each chain) | | | | | |
| 1) MCS0 (PER ≦10%) | - | - | -79 | dBm | |
| 2) MCS1 (PER ≦10%) | - | - | -76 | dBm | |
| 3) MCS2 (PER ≦10%) | - | - | -74 | dBm | |
| 4) MCS3 (PER ≦10%) | - | - | -71 | dBm | |
| 5) MCS4 (PER ≦10%) | - | - | -67 | dBm | |
| 6) MCS5 (PER ≦10%) | - | - | -63 | dBm | |
| 7) MCS6 (PER ≦10%) | - | - | -62 | dBm | |
| 8) MCS7 (PER ≦10%) | - | - | -61 | dBm | |
| 6. Maximum Input Level (PER ≦10%) | -30 | - | - | dBm | |

# 8.9 IEEE 802.11ac Section(5GHz)

| Items | Contents | | | | | | |
|---|---|---|---|---|---|---|---|
| Specification | IEEE802.11ac | | | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM ,256QAM and OFDM | | | | | | |
| Channel | CH36 to CH165 VHT20<br>CH38 to CH163 VHT40<br>CH42 to CH157 VHT80 | | | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7/8/9 | | | | | | |
| TX Characteristics | Min. | Typ. | Max. | | | Unit | |
| 1. Power Levels (Calibrated) | | | | | | | |
| 1) For antenna port（MCS9） | 11 | 13 | 15 | | | dBm | |
| 2. Spectrum Mask @VHT20/VHT40/VHT80 target power | | | | | | | |
| 1) at fc +/-11MHz/21MHz/41MHz | - | - | -20 | | | dBr | |
| 2) at fc +/-20MHz/40MHz/80MHz | - | - | -28 | | | dBr | |
| 3) at fc +/-30MHz/60MHz/120MHz | - | - | -40 | | | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | | | |
| 1) MCS0 | - | - | -5 | | | dB | |
| 2) MCS1 | - | - | -10 | | | dB | |
| 3) MCS2 | - | - | -13 | | | dB | |
| 4) MCS3 | - | - | -16 | | | dB | |
| 5) MCS4 | - | - | -19 | | | dB | |
| 6) MCS5 | - | - | -22 | | | dB | |
| 7) MCS6 | - | - | -25 | | | dB | |
| 8) MCS7 | - | - | -27 | | | dB | |
| 9) MCS8 | - | - | -30 | | | dB | |
| 10) MCS9 | - | - | -32 | | | dB | |
| 4. Frequency Error | -20 | - | 20 | | | ppm | |
| RX Characteristics | Min. | Typ. | Max. | | | Unit | |
| 5.Minimum Input Level Sensitivity (each chain) | | | VHT 20 | VHT 40 | VHT 80 | | |
| 1) MCS0 (PER ≦10%) | - | - | -82 | -79 | -76 | dBm | |
| 2) MCS1 (PER ≦10%) | - | - | -79 | -76 | -73 | dBm | |
| 3) MCS2 (PER ≦10%) | - | - | -77 | -74 | -71 | dBm | |
| 4) MCS3 (PER ≦10%) | - | - | -74 | -71 | -68 | dBm | |
| 5) MCS4 (PER ≦10%) | - | - | -70 | -67 | -64 | dBm | |
| 6) MCS5 (PER ≦10%) | - | - | -66 | -63 | -60 | dBm | |
| 7) MCS6 (PER ≦10%) | - | - | -65 | -62 | -59 | dBm | |
| 8) MCS7 (PER ≦10%) | - | - | -64 | -61 | -58 | dBm | |
| 9) MCS8(PER ≦10%) | - | - | -59 | -56 | -53 | dBm | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 10) MCS9(PER ≦10%) | - | - | -57 | -54 | -51 | dBm | |
| 6. Maximum Input Level (PER ≦10%) | -30 | - | - | | | dBm | |

## 8.10 IEEE 802.11ax Section(5GHz)

| Items | Contents | | | | | | |
|---|---|---|---|---|---|---|---|
| Specification | IEEE802.11ax | | | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM,256QAM, 1024QAM and OFDMA | | | | | | |
| Channel | CH36 to CH165 HE20<br>CH38 to CH163 HE40<br>CH42 to CH157 HE80 | | | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7/8/9/10/11 | | | | | | |
| TX Characteristics | Min. | Typ. | Max. | | | Unit | |
| 1. Power Levels (Calibrated) | | | | | | | |
| 1) For antenna port（MCS11） | 10 | 12 | 14 | | | dBm | |
| 2. Spectrum Mask @VHT20/VHT40/VHT80 target power | | | | | | | |
| 1) at fc +/-11MHz/21MHz/41MHz | - | - | -20 | | | dBr | |
| 2) at fc +/-20MHz/40MHz/80MHz | - | - | -28 | | | dBr | |
| 3) at fc +/-30MHz/60MHz/120MHz | - | - | -40 | | | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | | | |
| 1) MCS0 | - | - | -5 | | | dB | |
| 2) MCS1 | - | - | -10 | | | dB | |
| 3) MCS2 | - | - | -13 | | | dB | |
| 4) MCS3 | - | - | -16 | | | dB | |
| 5) MCS4 | - | - | -19 | | | dB | |
| 6) MCS5 | - | - | -22 | | | dB | |
| 7) MCS6 | - | - | -25 | | | dB | |
| 8) MCS7 | - | - | -27 | | | dB | |
| 9) MCS8 | - | - | -30 | | | dB | |
| 10) MCS9 | - | - | -32 | | | dB | |
| 11) MCS10 | | | -34 | | | dB | |
| 12) MCS11 | | | -35 | | | dB | |
| 4. Frequency Error | -20 | - | 20 | | | ppm | |
| RX Characteristics | Min. | Typ. | Max. | | | Unit | |
| 5.Minimum Input Level Sensitivity (each chain) | | | HE 20 | HE 40 | HE 80 | | |
| 1) MCS0 (PER ≦10%) | - | - | -82 | -79 | -76 | dBm | |
| 2) MCS1 (PER ≦10%) | - | - | -79 | -76 | -73 | dBm | |
| 3) MCS2 (PER ≦10%) | - | - | -77 | -74 | -71 | dBm | |
| 4) MCS3 (PER ≦10%) | - | - | -74 | -71 | -68 | dBm | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5) MCS4 (PER ≦10%) | - | - | -70 | -67 | -64 | dBm | |
| 6) MCS5 (PER ≦10%) | - | - | -66 | -63 | -60 | dBm | |
| 7) MCS6 (PER ≦10%) | - | - | -65 | -62 | -59 | dBm | |
| 8) MCS7 (PER ≦10%) | - | - | -64 | -61 | -58 | dBm | |
| 9) MCS8(PER ≦10%) | - | - | -59 | -56 | -53 | dBm | |
| 10) MCS9(PER ≦10%) | - | - | -57 | -54 | -51 | dBm | |
| 11) MCS10(PER ≦10%) | - | - | -54 | -51 | -48 | dBm | |
| 12) MCS11(PER ≦10%) | - | - | -52 | -49 | -46 | dBm | |
| 6. Maximum Input Level (PER ≦10%) | -30 | - | - | | | dBm | |

## 8.11 IEEE 802.11 Section(6GHz)

| Items | Contents | | | | | | |
|---|---|---|---|---|---|---|---|
| Specification | IEEE802.11ax | | | | | | |
| Mode | BPSK, QPSK, 16QAM, 64QAM,256QAM, 1024QAM and OFDMA | | | | | | |
| Operating Frequency | 5926~7125MHz | | | | | | |
| Data rate (MCS index) | MCS0/1/2/3/4/5/6/7/8/9/10/11 | | | | | | |
| TX Characteristics | Min. | Typ. | Max. | | | Unit | |
| 1. Power Levels (Calibrated) | | | | | | | |
| 1) For antenna port（MCS11） | 10 | 12 | 14 | | | dBm | |
| 2. Spectrum Mask @VHT20/VHT40/VHT80 target power | | | | | | | |
| 1) at fc +/-11MHz/21MHz/41MHz | - | - | -20 | | | dBr | |
| 2) at fc +/-20MHz/40MHz/80MHz | - | - | -28 | | | dBr | |
| 3) at fc +/-30MHz/60MHz/120MHz | - | - | -40 | | | dBr | |
| 3. Constellation Error(EVM)@ target power | | | | | | | |
| 1) MCS0 | - | - | -5 | | | dB | |
| 2) MCS1 | - | - | -10 | | | dB | |
| 3) MCS2 | - | - | -13 | | | dB | |
| 4) MCS3 | - | - | -16 | | | dB | |
| 5) MCS4 | - | - | -19 | | | dB | |
| 6) MCS5 | - | - | -22 | | | dB | |
| 7) MCS6 | - | - | -25 | | | dB | |
| 8) MCS7 | - | - | -27 | | | dB | |
| 9) MCS8 | - | - | -30 | | | dB | |
| 10) MCS9 | - | - | -32 | | | dB | |
| 11) MCS10 | | | -34 | | | dB | |
| 12) MCS11 | | | -35 | | | dB | |
| 4. Frequency Error | -20 | - | 20 | | | ppm | |
| RX Characteristics | Min. | Typ. | Max. | | | Unit | |
| 5.Minimum Input Level Sensitivity | | | HE | HE | HE | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| (each chain) | | | 20 | 40 | 80 | | |
| 1) MCS0 (PER ≦10%) | - | - | -82 | -79 | -76 | dBm | |
| 2) MCS1 (PER ≦10%) | - | - | -79 | -76 | -73 | dBm | |
| 3) MCS2 (PER ≦10%) | - | - | -77 | -74 | -71 | dBm | |
| 4) MCS3 (PER ≦10%) | - | - | -74 | -71 | -68 | dBm | |
| 5) MCS4 (PER ≦10%) | - | - | -70 | -67 | -64 | dBm | |
| 6) MCS5 (PER ≦10%) | - | - | -66 | -63 | -60 | dBm | |
| 7) MCS6 (PER ≦10%) | - | - | -65 | -62 | -59 | dBm | |
| 8) MCS7 (PER ≦10%) | - | - | -64 | -61 | -58 | dBm | |
| 9) MCS8(PER ≦10%) | - | - | -59 | -56 | -53 | dBm | |
| 10) MCS9(PER ≦10%) | - | - | -57 | -54 | -51 | dBm | |
| 11) MCS10(PER ≦10%) | - | - | -54 | -51 | -48 | dBm | |
| 12) MCS11(PER ≦10%) | - | - | -52 | -49 | -46 | dBm | |
| 6. Maximum Input Level (PER ≦10%) | -30 | - | - | | | dBm | |

## 8.12 Bluetooth Section

| Items | Contents | | | | |
|---|---|---|---|---|---|
| Specification | BT2.1+EDR/4.2/5.2 with BLE | | | | |
| Mode | FHSS,GFSK,DPSK,DQPSK | | | | |
| Number of Channel | 79 Channels | | | | |
| Frequency Band | 2.402 GHz ~2.480GHz | | | | |
| | Min. | Typ. | Max. | Unit | Remark |
| 1. Output Power | - | 6 | - | dBm | |
| 2. Gain step | - | 1 | - | dB | |
| 3. Receiver sensitivity (BER ≦0.1%) | - | -93.5 | -80 | dBm | |
| 4. Maximum usable signal (BER ≦0.1%) | - | -5 | - | | |
| 5. C/I co-channel (BER<0.1%) | - | 4 | 11 | dB | |
| 6. C/I 1MHz (BER<0.1%) | - | -14 | 0 | dB | |
| 7. C/I 2MHz (BER<0.1%) | - | -42 | -30 | dB | |
| 8. C/I≥3MHz (BER<0.1%) | - | -49 | -40 | dB | |
| 9. C/I Image channel (BER<0.1%) | - | -25 | -9 | dB | |
| 10. C/I Image 1MHz (BER<0.1%) | - | -50 | -20 | dB | |
| 11. Inter-modulation | - | -13 | - | dB | |
| 12. Out-of-band blocking | | | | | |
| 1). 30MHz to 2000MHz | -10 | - | - | dBm | |
| 2). 2000MHz to 2399MHz | -27 | - | - | dBm | |
| 3). 2498MHz to 3000MHz | -27 | - | - | dBm | |
| 4). 3000MHz to 12.75GHz | -10 | - | - | dBm | |
| 13. Modulation characteristics | | | | | |
| 1). Δf1avg | 140 | 157 | 175 | KHz | |
| 2). Δf2max (For at least 99.9% of all Δf2max) | 115 | 140 | - | KHz | |

| | | | | | |
|---|---|---|---|---|---|
| 3). Δf1avg /Δf2avg | 0.8 | 0.98 | - | KHz | |
| 14. ICFT | -75 | ±20 | +75 | KHz | |
| 15. Carrier frequency drift | | | | | |
| 1). One slot packet (DH1) | -25 | ±15 | +25 | KHz | |
| 2). Two slot packet (DH3) | -40 | ±15 | +40 | KHz | |
| 3). Five slot packet (DH5) | -40 | ±15 | +40 | KHz | |
| 4). Max drift rate | - | 6 | 20 | KHz/50us | |
| 16. TX output spectrum(20dB bandwidth) | - | 922 | 1000 | KHz | |
| 17. In-Band spurious emission | | | | | |
| 1). ±2MHz offset | - | -45 | -20 | dBm | |
| 2). ±3MHz offset | - | -48 | -40 | dBm | |
| 3). >±3MHz offset | - | -48 | -40 | dBm | |

# 9. Mechanical,Environmental and Reliability Tests

## （机械、环境和可靠性测试）

| Test Items | | Test Conditions | Qty | Criteria Condition |
|---|---|---|---|---|
| **9-1** | **Drop test** | The packed samples was tested at below condition:<br>Drop height:<br>760mm(0.5~9.5kg）<br>610mm(9.5~18.5kg)<br>Drop time: 1x corner, 3x edge and 6x face. | 1xBox | After test, the outer box and inner box will not been broken by appearance visual inspection, and the products should be ok. |
| **9-2** | **Vibration test** | X-Y-Z direction, first Frequency changing from 10Hz to 30Hz to 10Hz,amplitude 2.0mm,<br>5 times vibrations, 5x times vibration. | 1xBox | After test, the outer box and inner box will not been broken by appearance visual inspection and the products should be ok. |
| **9-3** | **Soldering ability test (Only for SKI module)** | Soldering temperature:<br>245±5℃<br>Soldering duration:<br>3±0.5S | 3 | 1.After soldering, the soldered area must be covered by a smooth bright solder layer, some deficiencies such as a small amount of the pinhole, not wetting are allowed, but the deficiencies can not be in the same place;<br>2. At least 90% of soldered area shall be covered continuously by the soldering material. |
| **9-4** | **High Temperature** | Leave samples in 60℃, 90% RH @ 24 hours | 4 | After test, the products appearance, power, EVM and frequency error |

| | | | | |
|---|---|---|---|---|
| | **and Humidity Operation Test** | | | functional parameter shall be satisfied with the test specification. |
| **9-5** | **Low Temperature Operation Test** | Leave samples in -15℃ @24 hours | 4 | After test, the products appearance, power, EVM and frequency error functional parameter shall be satisfied with the test specification. |
| **9-6** | **High Temperature and Humidity Start Test** | Leave samples in 60℃, 90% RH for 4x hours | 4 | After test, power on and off the samples for 3x tiems, the samples should be able to start normally |
| **9-7** | **Low temperature start test** | Leave samples in -15℃ for 4x hours | 4 | After test, power on and off the samples for 3x tiems, the samples should be able to start normally |
| **9-8** | **High Temperature and Humidity Storage Test** | Leave samples in 85℃, 95% RH @ 48 hours | 4 | After test, the products appearance, power, EVM and frequency error functional parameter shall be satisfied with the test specification. |
| **9-9** | **Low Temperature Storage Test** | Leave samples in -40℃, @48 hours | 4 | After test, the products appearance, power, EVM and frequency error functional parameter shall be satisfied with the test specification. |
| **9-10** | **Thermal Shock Test** | -40~85℃，dwell time：30min，50cycles | 4 | After test, the products appearance, power, EVM and frequency error functional parameter shall be satisfied with the test specification. |
| **9-11** | **Aging Test** | 60℃，120Hrs | 10 | The products at high temperature for a long time can continuous work normally |
| **9-12** | **Salt spray test** | NSS,35C,PH:6.5~7.2，24H | 2 | The Sample shall has no minor or major defects, such as physical damage, crack, corrosion, deformation etc; |
| **9-13** | **ESD** | Discharge voltage:<br>1kV C: 50pF<br>Discharge resistance：330Ω<br>Positive10 times<br>1 time for each second | 3 | The products can recoverable smoothly after ESD test. |

# 10. Package（包装）

（1）编带尺寸

暂无

（2）编带方向：（箭头代表编带走向）

暂无

（3）包装示意图：

暂无