

**晶体管光耦**  
**Photo Transistor**

**AT4NXX**

**Product Data Sheet**

**AOTE DCC**  
**RELEASE**

**台湾奥特半导体科技有限公司**

TAIWAN AOTE SEMICONDUCTOR TECHNOLOGY CO.,LTD

[www.aotesemi.com](http://www.aotesemi.com)

## 概述 Description

AT4NXX是一款由发光二极管和一个光电晶体管组成的光电耦合器。六引脚封装 ( DIP6、SMD6 )。

The AT4NXX is a photoelectric coupler composed of light-emitting diode and phototransistor. It is packaged in a 6-pin package at DIP、SMD.

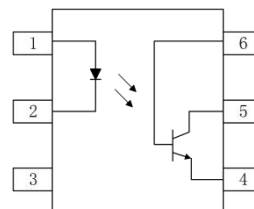
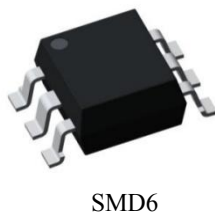
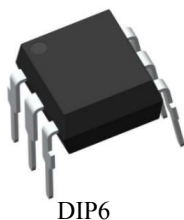
## 特性 Features

- 电流转换比(CTR)范围:  $\geq 20\%$  ( $I_F = 10\text{mA}$ ,  $V_{CE} = 10\text{V}$ ,  $T_a = 25^\circ\text{C}$ ) Current transfer ratio: $\geq 20\%$  ( $I_F = 10\text{mA}$ ,  $V_{CE} = 10\text{V}$ ,  $T_a = 25^\circ\text{C}$ )
- 输入-输出隔离电压 ( $V_{ISO} = 5000 \text{Vrms}$ )  
High isolation voltage between input and output( $V_{ISO} = 5000 \text{Vrms}$ )
- 输入-输出隔离电阻 (典型值  $R_{iso} = 10^{11}\Omega$ )  
Input-output isolation voltage resistance ( $R_{iso} = 10^{11}\Omega$ )
- 工作温度:  $-55^\circ\text{C} \sim 100^\circ\text{C}$   
Operating Temperature:  $-55^\circ\text{C} \sim 100^\circ\text{C}$
- 符合加强绝缘标准  
Meet reinforced insulation standards
- 符合安规标准: UL 1577, VDE DIN EN60747-5-5 (VDE 0884-5), CQC11-471543-2022  
Meet safety standard approval: UL 1577, VDE DIN EN60747-5-5 (VDE 0884-5), CQC11-471543-2022

## 应用 Applications

- 电源调节器  
Power regulator
- 数字逻辑输入  
Digital logic input
- 微处理器输入  
Microprocessor input

## 封装和原理图 Package and Schematic Diagram



### Pin Configuration

1. Anode
2. Cathode
3. NC
4. Emitter
5. Collector
6. Base



## 产品型号命名规则 Order Code

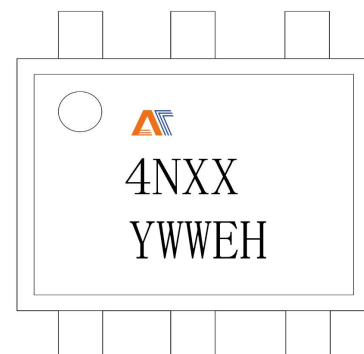
# AT 4NXX - UN Y - W (V) (ZZ)

①            ②            ③    ④            ⑤            ⑥            ⑦

- ① 公司代码 Company Code ( AT: 奥特AOTE )
- ② 产品系列 Product Series ( XX: 25, 26, 27,28,35,36,37,38 )
- ③ 框架类型 Lead Frame ( Cu: 铜框架 Copper )
- ④ 树脂类型 Epoxy ( H: 无卤 Halogen-free )
- ⑤ 封装形式 Package ( D: DIP ; S: SMD )
- ⑥ 器件工作温度范围 Device Operating Temperature Range ( 特殊范围需填或者空白 Special Range or None )
- ⑦ 内部补充代码 Internal Supplementary Code ( 数字或者空白 Number or None )

## 印字信息 Marking Information

- 印字中 “” 为奥特品牌 LOGO  
 “” denotes LOGO
- 印字中的 “XX” 代表产品分档 : 25, 26, 27,28,35,36,37,38  
 “XX” denotes the classification : 25, 26, 27,28,35,36,37,38
- 印字中 “Y” 代表年份 ; A(2018),B(2019),C(2020).....  
 “Y” denotes YEAR : A(2018), B(2019), C(2020).....
- 印字中 “WW” 代表周号  
 “WW” denotes Week’ s number
- 印字中 “E” 代表内部代码  
 “E” denotes Internal code
- 印字中的 “H” 代表无卤  
 “H” denotes Halogen-free



**绝缘和安规信息 Insulation and Safety related specifications**

| 项目<br>Item                            | 符号<br>Symbol | 数值<br>Value | 单位<br>Unit | 备注<br>Remark   |
|---------------------------------------|--------------|-------------|------------|--|
| 爬电距离<br>Creepage Distance             | L            | >7.0        | mm         | 从输入端到输出端，沿本体最短距离路径<br>Measured from input terminals to output terminals, shortest distance path along body |
| 电气间隙<br>Clearance Distance            | L            | >7.0        | mm         | 从输入端到输出端，通过空气的最短距离<br>Measured from input terminals to output terminals, shortest distance through air     |
| 绝缘距离<br>Insulation Thickness          | DTI          | > 0.4       | mm         | 发射器和探测器之间的绝缘厚度<br>Insulation thickness between emitter and detector  |
| 峰值隔离电压<br>Peak Isolation Voltage      | $V_{IORM}$   | 1500        | $V_{peak}$ | DIN/EN/IEC EN60747-5-5   |
| 瞬态隔离电压<br>Transient isolation voltage | $V_{IOTM}$   | 7000        | $V_{peak}$ | DIN/EN/IEC EN60747-5-5   |
| 隔离电压<br>Isolation Voltage             | Viso         | >5000       | Vrms       | For 1 min, RH < 60%  |

**极限参数 Absolute Maximum Ratings (Ta = 25°C)**

| 参数<br>Parameter                              |  | 符号<br>Symbol | 额定值<br>Rating | 单位<br>Unit |
|--|--|--------------|---------------|------------|
| 发射端<br>Input                                 | 正向电流<br>Forward Current                              | $I_F$        | 60            | mA         |
|  | 峰值正向电流(1us, 脉冲)<br>Peak forward current (1us, pulse) | $I_{FP}$     | 1000          | mA         |
|  | 反向电压<br>Reverse Voltage                              | $V_R$        | 6             | V          |
|  | 功耗<br>Power Dissipation                              | $P_D$        | 100           | mW         |
| 接收端<br>output                                | 集电极功耗<br>Collector Power Dissipation                 | $P_C$        | 300           | mW         |
|  | 集电极电流<br>Collector Current                           | $I_C$        | 100           | mA         |
|  | 集电极-基极电压<br>Collector-Base Voltage                   | $V_{CBO}$    | 70            | V          |
|  | 集电极-发射极电压<br>Collector-Emitter Voltage               | $V_{CEO}$    | 30            | V          |
|  | 发射极-集电极电压<br>Emitter - Collector Voltage             | $V_{ECO}$    | 7             | V          |
| 总功耗<br>Total Power Dissipation               | $P_{tot}$  | 350          | mW            |            |
| 输入输出瞬态耐受电压<br>Input-output isolation voltage | Viso   | 5000         | Vrms          |            |
| 工作温度<br>Operating Temperature                | $T_{opr}$  | -55 ~ +100   | °C            |            |
| 存储温度<br>Storage Temperature                  | $T_{stg}$  | -55 ~ +125   | °C            |            |
| 焊接温度<br>Soldering Temperature                | $T_{sol}$  | 260          | °C            |            |

**产品特性参数 Electro-optical Characteristics (Ta = 25°C)**

| 参数<br>Parameter                     |   | 符号<br>Symbol   | 条件<br>Condition  | 最小<br>Min.                               | 典型<br>Typ.         | 最大<br>Max.    | 单位<br>Unit    |   |
|-------------------------------------|---|----------------|--|--|--------------------|---------------|---------------|---|
| 发射端<br>Input                        | 正向电压<br>Forward Voltage                             | $V_F$          | $I_F = 10\text{mA}$                                      | -  | 1.2                | 1.5           | V             |   |
|                                     | 反向电流<br>Reverse Current                             | $I_R$          | $V_R = 3\text{V}$  | -  | -                  | 10            | $\mu\text{A}$ |   |
|                                     | 输入电容<br>Terminal Capacitance                        | $C_t$          | $V=0, F=1\text{KHz}$                                     | -  | 50                 | -             | pF            |   |
| 接收端<br>Output                       | 集电极暗电流<br>Collector Dark Current                    | $I_{CEO}$      | $V_{CE} = 10\text{V}$                                    | -  | -                  | 50            | nA            |   |
|                                     | 集电极-基极击穿电压<br>Collector-Base Breakdown Voltage      | $BV_{CBO}$     | $I_B = 0.1\text{mA}, I_F = 0$                            | 70                                       | -                  | -             | V             |   |
|                                     | 集电极-发射极击穿电压<br>Collector-Emitter Breakdown Voltage  | $BV_{CEO}$     | $I_C = 0.1\text{mA}, I_F = 0$                            | 30                                       | -                  | -             | V             |   |
|                                     | 发射极-集电极击穿电压<br>Emitter-Collector Breakdown Voltage  | $BV_{ECO}$     | $I_E = 0.01\text{mA}, I_F = 0$                           | 7  | -                  | -             | V             |   |
| 传输特性<br>Transfer<br>Characteristics | 电流传输比<br>Current<br>Transfer Ratio                  | 4N25、4N26、4N38 | $CTR^*$  | $I_F = 10\text{mA}, V_{CE} = 10\text{V}$ | 20                 | -             | -             | % |
|                                     |   | 4N27、4N28      |  |  | 10                 | -             | -             | % |
|                                     |   | 4N35、4N36、4N37 |  |  | 100                | -             | -             | % |
|                                     | 集电极-发射极饱和压降<br>Collector-Emitter Saturation Voltage | $V_{CE(sat)}$  | $I_F = 50\text{mA}, I_C = 2\text{mA}$                    | -  | -                  | 0.3           | V             |   |
|                                     | 隔离电阻<br>Isolation Resistance                        | $R_{ISO}$      | DC=500V<br>40~60%R.H.                                    | $5 \times 10^{10}$                       | $1 \times 10^{11}$ | -             | $\Omega$      |   |
|                                     | 隔离电容<br>Isolation capacitance                       | $C_{ISO}$      | $V=0, F=1\text{MHz}$                                     | -  | 1                  | 2.5           | pF            |   |
|                                     | 上升时间<br>Rise Time                                   | $T_r$          | $V_{CE} = 10\text{V}, I_C = 2\text{mA}, R_L = 100\Omega$ | -  | 4                  | -             | $\mu\text{s}$ |   |
| 下降时间<br>Fall Time                   | $T_f$   | -              |  | 3  | -                  | $\mu\text{s}$ |               |   |

注\*：电流传输比= $I_C/I_F \times 100\%$ 。

Note\*：CTR= $I_C/I_F \times 100\%$ 。

**典型光电特性曲线 Typical Electro-Optical Characteristics Curves**

Fig.1 Relative Current Transfer Ratio vs. Forward Current

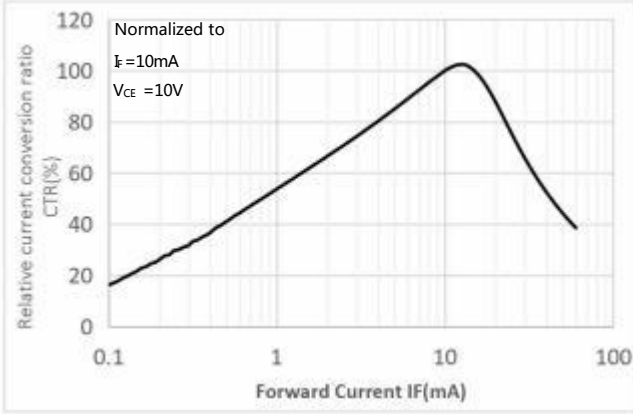


Fig.2 Forward Current vs. Forward Voltage

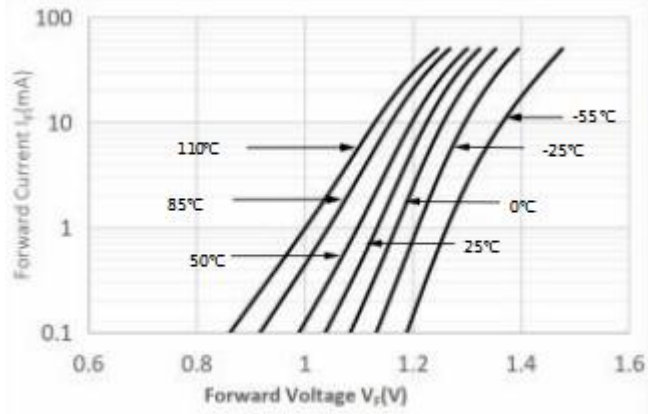


Fig.3 Collector Current vs. Collector-emitter Voltage

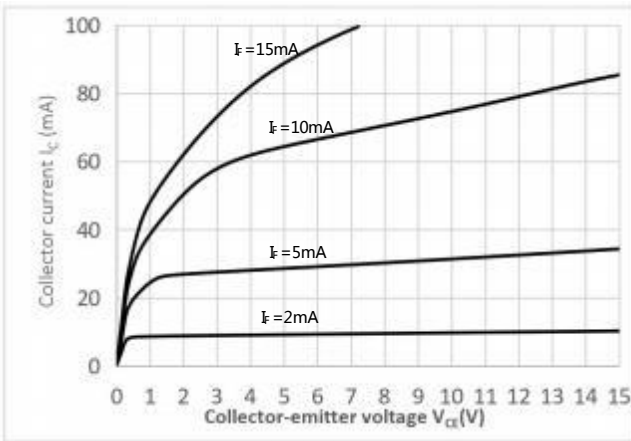


Fig.4 Relative Current Transfer Ratio vs. Ambient Temperature

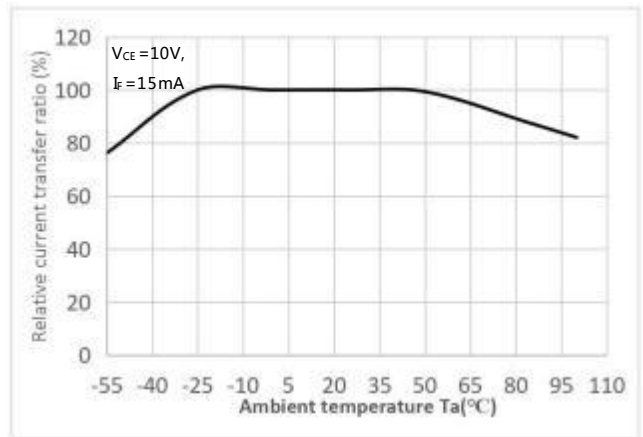


Fig.5 Collector Dark Current vs Ambient Temperature

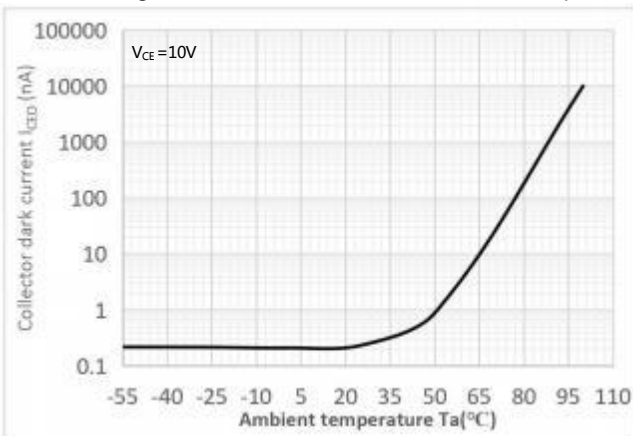


Fig.6 Response Time vs. Load Resistance

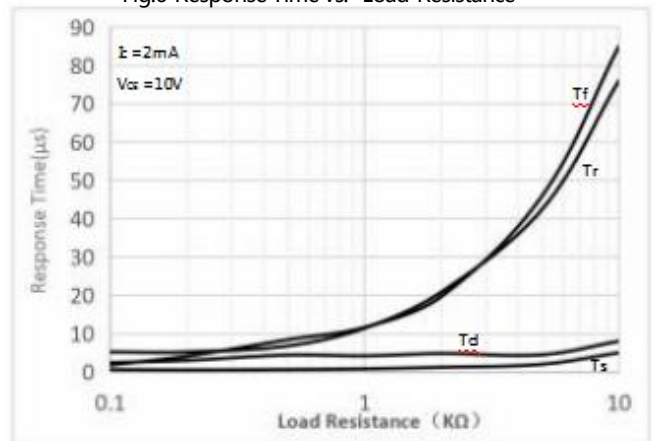


Fig.7 Frequency Response

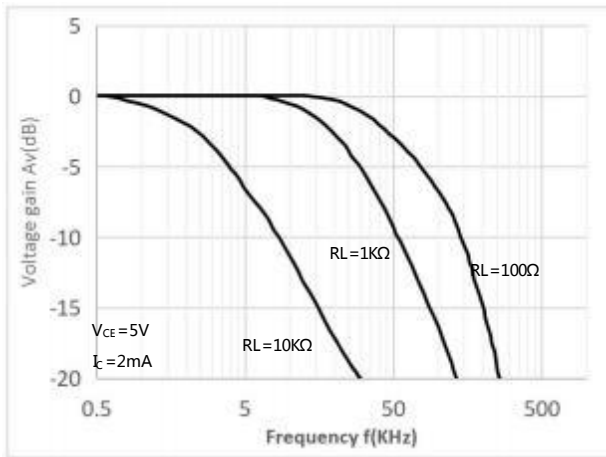


Fig.8 Collector-emitter Saturation Voltage vs Forward Current

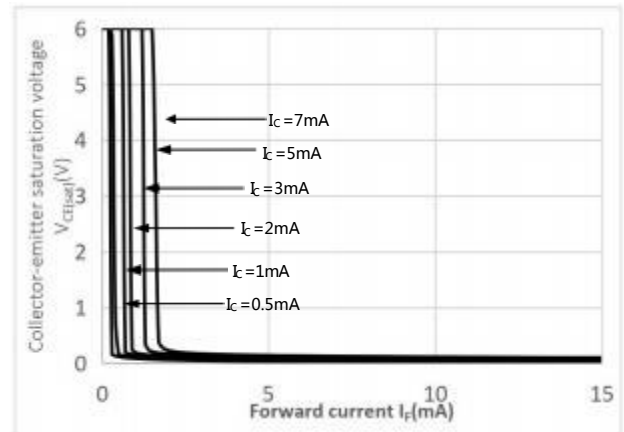
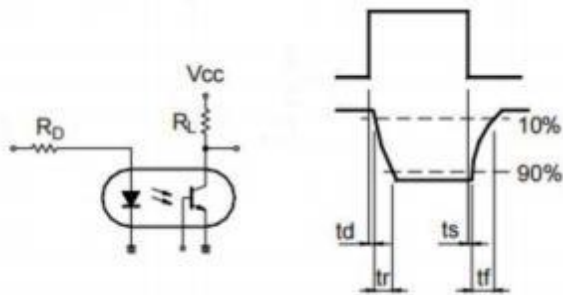
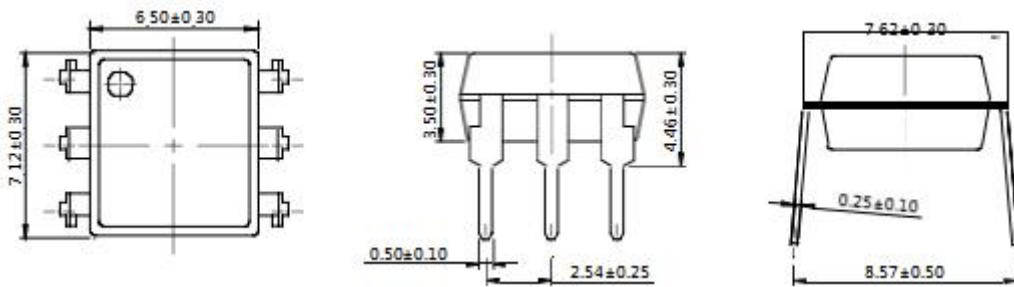


Fig.9 Switching Time Test Circuit & Waveforms

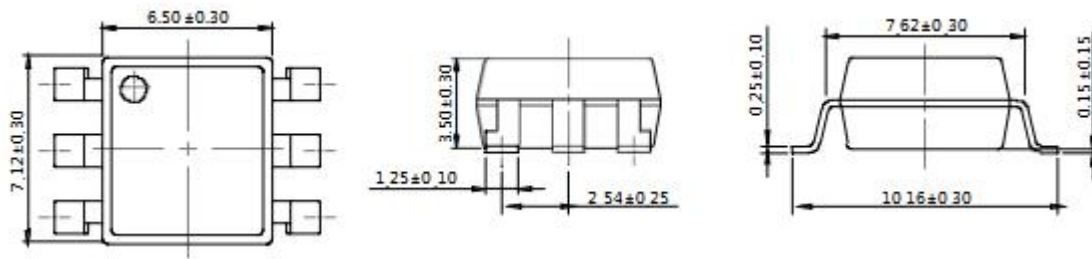


## 外形尺寸 Outline Dimensions

DIP6



SMD6



单位 Unit: mm



## 回流焊温度曲线图 Solder Reflow Profile



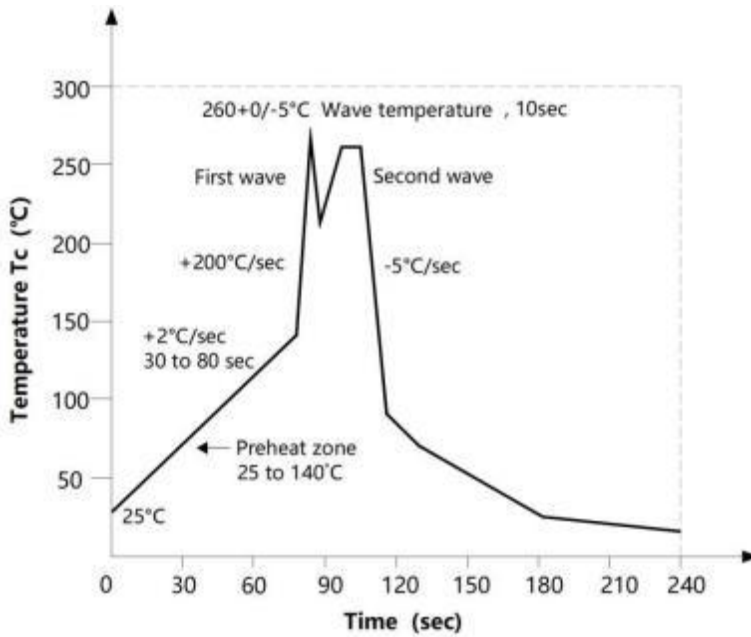
| 项目<br>Item  | 符号<br>Symbol | 最小值<br>Min. | 最大值<br>Max. | 单位<br>Unit         |
|---|--------------|-------------|-------------|--------------------|
| 预热温度<br>Preheat Temperature   | $T_s$        | 150         | 200         | $^\circ\text{C}$   |
| 预热时间<br>Preheat Time  | $t_s$        | 60          | 120         | s                  |
| 升温速率<br>Ramp-Up Rate ( $T_L$ to $T_P$ )   | -            | -           | 3           | $^\circ\text{C/s}$ |
| 液相线温度<br>Liquidus Temperature   | $T_L$        | 217         |             | $^\circ\text{C}$   |
| 时间高于 $T_L$<br>Time Above $T_L$  | $t_L$        | 60          | 150         | s                  |
| 峰值温度<br>Peak Temperature  | $T_P$        | -           | 260         | $^\circ\text{C}$   |
| $T_c$ 在 $(T_P - 5)$ 和 $T_P$ 之间的时间<br>Time During Which $T_c$ Is Between $(T_P - 5)$ and $T_P$ | $t_p$        | -           | 30          | s                  |
| 降温速率<br>Ramp-down Rate ( $T_P$ to $T_L$ )   | -            | -           | 6           | $^\circ\text{C/s}$ |

注 Note :

建议在所示的温度和时间条件下进行回流焊，最多不能超过三次；

Reflow soldering is recommended at the temperatures and times shown, no more than three times;

## 波峰焊温度曲线图 Wave Soldering Profile



## 手工烙铁焊接 Soldering with hand soldering iron

- A. 手工烙铁焊仅用于产品返修或样品测试；  
Hand soldering iron is only used for product rework or sample testing;
- B. 手工烙铁焊要求：温度  $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ，时间  $\leq 3\text{s}$ 。  
Manual soldering method Temperature:  $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , within 3s.

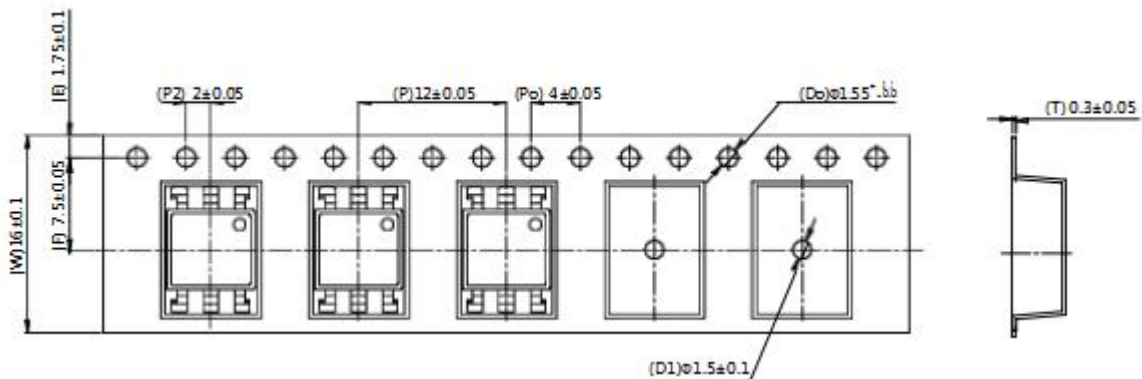
## 包装 Packing

### ■ 汇总表 Summary table

| 封装形式         | 包装方式                                | 盘数量               | 盒数量              | 箱数量                 | 静电袋规格                        | 盒规格               | 箱(双瓦楞)规格             | 备注  |
|--------------|-------------------------------------|-------------------|------------------|---------------------|------------------------------|-------------------|----------------------|---|
| Package Type | Packing Form                        | Quantity per Reel | Quantity per Box | Quantity per Carton | Antistatic Bag Specification | Box Specification | Carton Specification | Note  |
| SMD6         | 卷盘<br>( $\phi 330\text{mm}$ 蓝盘)     | 1000 只/盘          | 2 盘/盒            | 10 盒/箱              | 450*390*0.1mm                | 340*60*340mm      | 620*360*365mm        | 首尾端空至少 200mm  |
| DIP6         | 管装<br>(500*12*11mm)                 | 65 只/管            | 50 管/盒           | 10 盒/箱              | 不适用                          | 525*128*56mm      | 535*275*300mm        | 每管使用蓝白胶塞, 方向须一致                                       |
| SMD6         | Reel<br>( $\phi 330\text{mm}$ Blue) | 1000 pcs/reel     | 2 reels/box      | 10 boxes/ctn        | 450*390*0.1mm                | 340*60*340mm      | 620*360*365mm        | Guard band 200mm min.                                 |
| DIP6         | Tube<br>(500*12*11mm)               | 65 pcs/tube       | 50 tubes/box     | 10 boxes/ctn        | NA                           | 525*128*56mm      | 535*275*300mm        | Endplug (blue) and Endplug (white) keep the direction |

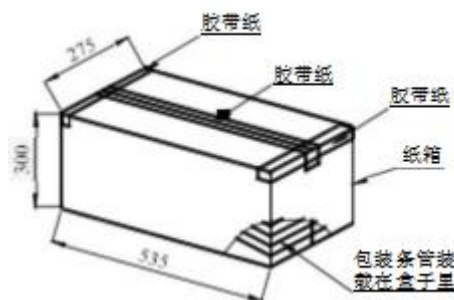
### ■ 编带包装 Tape & Reel

- 1) 每卷数量：1000 只。  
Qty/reel : 1000 pcs.
- 2) 每箱数量：20000 只。  
Qty/ctn : 20000 pcs.
- 3) 内包装：每盒 2 盘。  
Inner packing : 2 reels/box.
- 4) 示意图 Schematic :



### ■ 管条包装 Tape & Tube

- 1) 每管数量：65 只。  
Qty/Tube : 65 pcs.
- 2) 每箱数量：32500 只。  
Qty/ctn : 32500 pcs.
- 3) 内包装：每盒 50 管。  
Inner packing : 50 Tube/box.
- 4) 示意图 Schematic



单位/Unit : mm

## 注意 Attention

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