

**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.

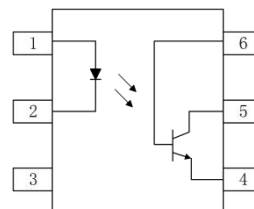
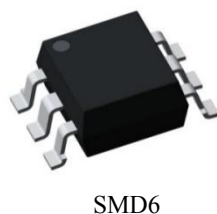
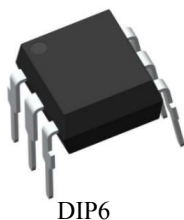
## 特性 Features

- 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

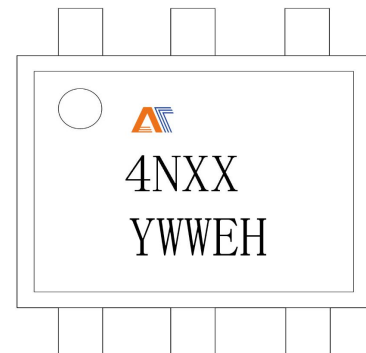
# AT 4NXX - UN Y - W (V) (ZZ)

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

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

参数 Parameter		符号 Symbol	额定值 Rating	单位 Unit
发射端 Input	正向电流 Forward Current	I <sub>F</sub>	60	mA
	峰值正向电流(1us, 脉冲) Peak forward current (1us, pulse)	I <sub>FP</sub>	1000	mA
	反向电压 Reverse Voltage	V <sub>R</sub>	6	V
	功耗 Power Dissipation	P <sub>D</sub>	100	mW
接收端 output	集电极功耗 Collector Power Dissipation	P <sub>C</sub>	300	mW
	集电极电流 Collector Current	I <sub>C</sub>	100	mA
	集电极-基极电压 Collector-Base Voltage	V <sub>CBO</sub>	70	V
	集电极-发射极电压 Collector-Emitter Voltage	V <sub>CEO</sub>	30	V
	发射极-集电极电压 Emitter - Collector Voltage	V <sub>ECO</sub>	7	V
总功耗 Total Power Dissipation	P <sub>tot</sub>	350	mW	
输入输出瞬态耐受电压 Input-output isolation voltage	V <sub>iso</sub>	5000	V <sub>rms</sub>	
工作温度 Operating Temperature	T <sub>opr</sub>	-55 ~ +100	°C	
存储温度 Storage Temperature	T <sub>stg</sub>	-55 ~ +125	°C	
焊接温度 Soldering Temperature	T <sub>sol</sub>	260	°C	

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

参数 Parameter		符号 Symbol	条件 Condition	最小 Min.	典型 Typ.	最大 Max.	单位 Unit	
发射端 Input	正向电压 Forward Voltage	$V_F$	$I_F = 10\text{mA}$	-	1.2	1.5	V	
	反向电流 Reverse Current	$I_R$	$V_R = 3\text{V}$	-	-	10	$\mu\text{A}$	
	输入电容 Terminal Capacitance	$C_t$	$V=0, F=1\text{KHz}$	-	50	-	pF	
接收端 Output	集电极暗电流 Collector Dark Current	$I_{CEO}$	$V_{CE} = 10\text{V}$	-	-	50	nA	
	集电极-基极击穿电压 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 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 Emitter-Collector Breakdown Voltage	$BV_{ECO}$	$I_E = 0.01\text{mA}, I_F = 0$	7	-	-	V	
传输特性 Transfer Characteristics	电流传输比 Current 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 Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_F = 50\text{mA}, I_C = 2\text{mA}$	-	-	0.3	V	
	隔离电阻 Isolation Resistance	$R_{ISO}$	DC=500V 40~60%R.H.	$5 \times 10^{10}$	$1 \times 10^{11}$	-	$\Omega$	
	隔离电容 Isolation capacitance	$C_{ISO}$	$V=0, F=1\text{MHz}$	-	1	2.5	pF	
	上升时间 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 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

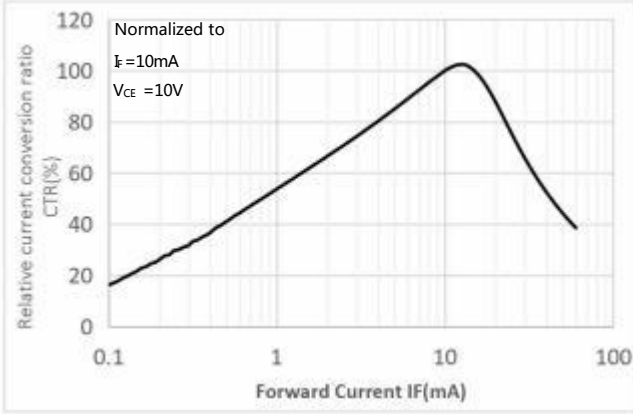


Fig.2 Forward Current vs. Forward Voltage

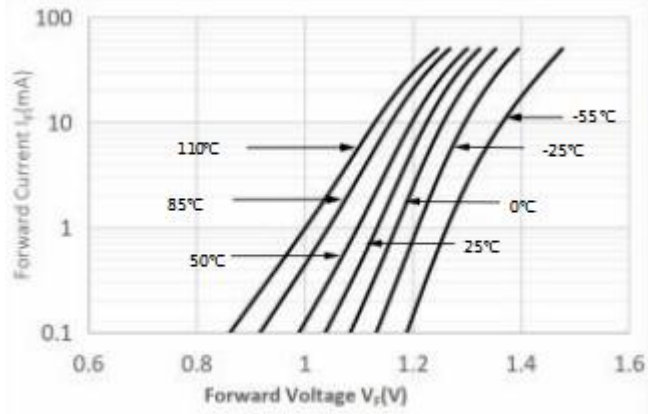


Fig.3 Collector Current vs. Collector-emitter Voltage

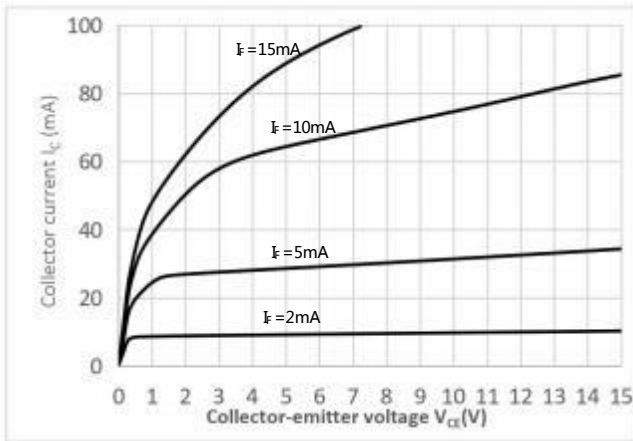


Fig.4 Relative Current Transfer Ratio vs. Ambient Temperature

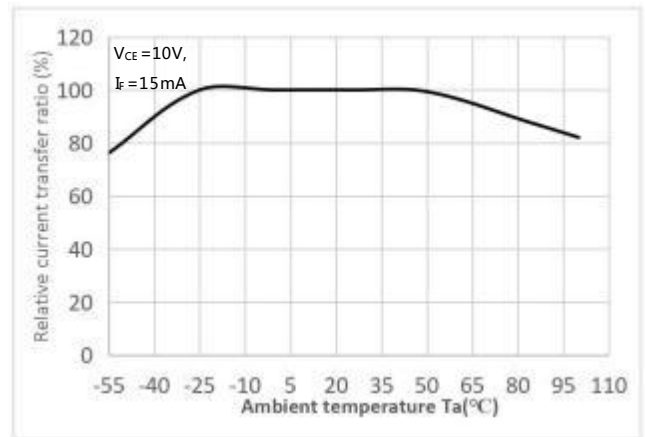


Fig.5 Collector Dark Current vs Ambient Temperature

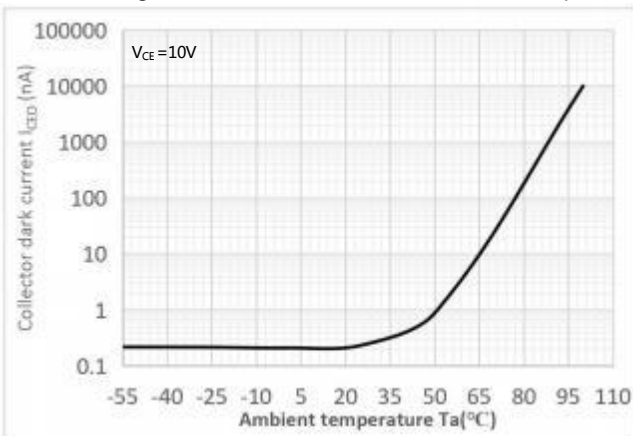


Fig.6 Response Time vs. Load Resistance

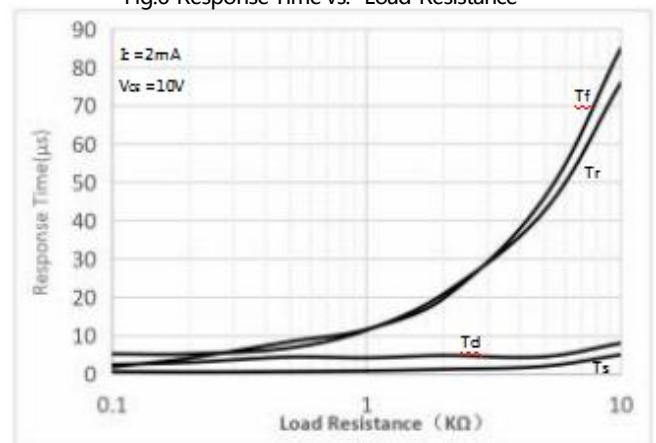


Fig.7 Frequency Response

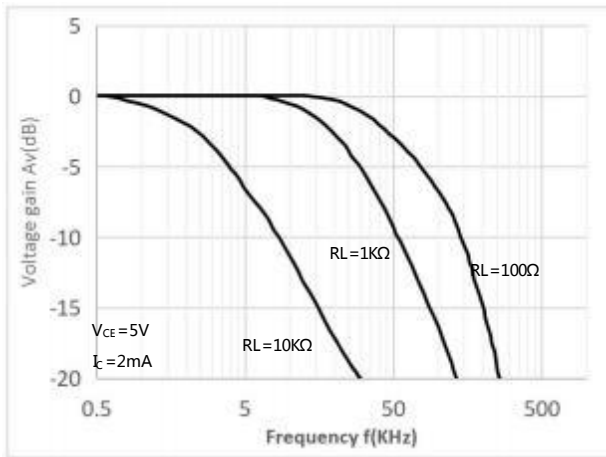


Fig.8 Collector-emitter Saturation Voltage vs Forward Current

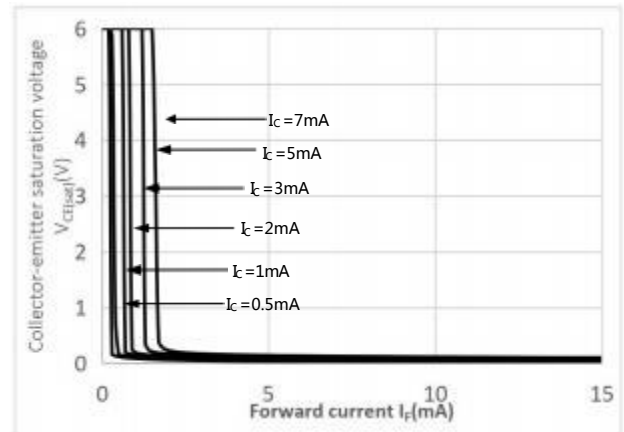
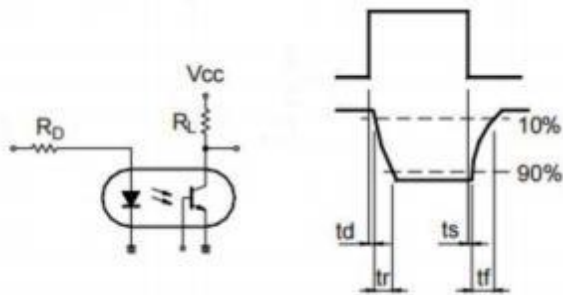
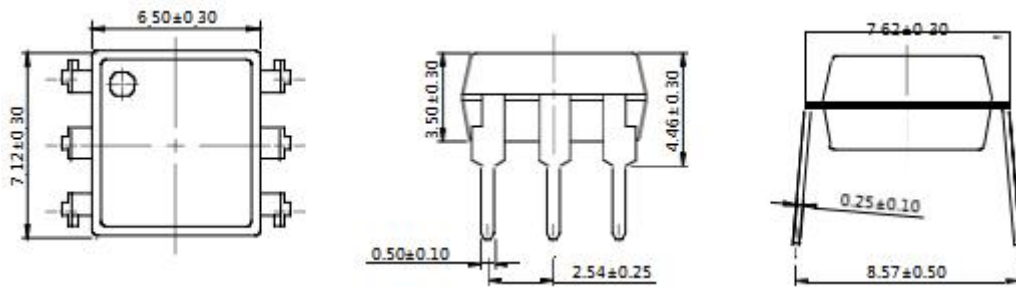


Fig.9 Switching Time Test Circuit & Waveforms

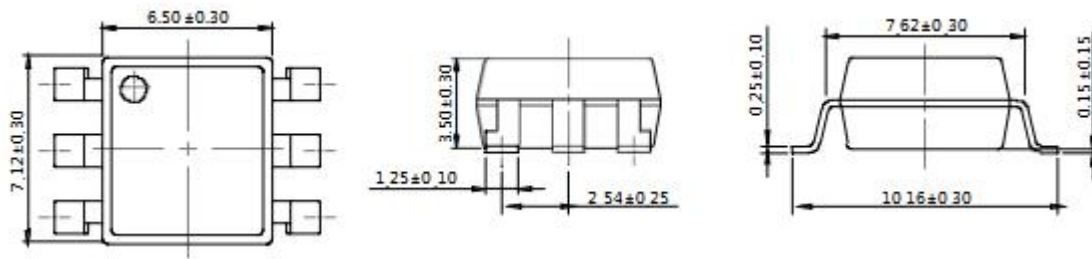


## 外形尺寸 Outline Dimensions

DIP6



SMD6



单位 Unit: mm



## 回流焊温度曲线图 Solder Reflow Profile



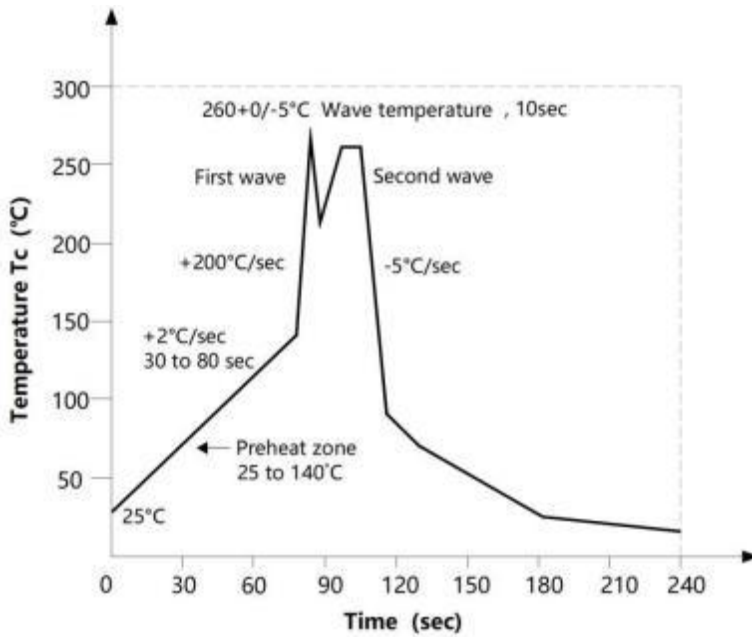
项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	$T_s$	150	200	$^\circ\text{C}$
预热时间 Preheat Time	$t_s$	60	120	s
升温速率 Ramp-Up Rate ( $T_L$ to $T_P$ )	-	-	3	$^\circ\text{C/s}$
液相线温度 Liquidus Temperature	$T_L$	217		$^\circ\text{C}$
时间高于 $T_L$ Time Above $T_L$	$t_L$	60	150	s
峰值温度 Peak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

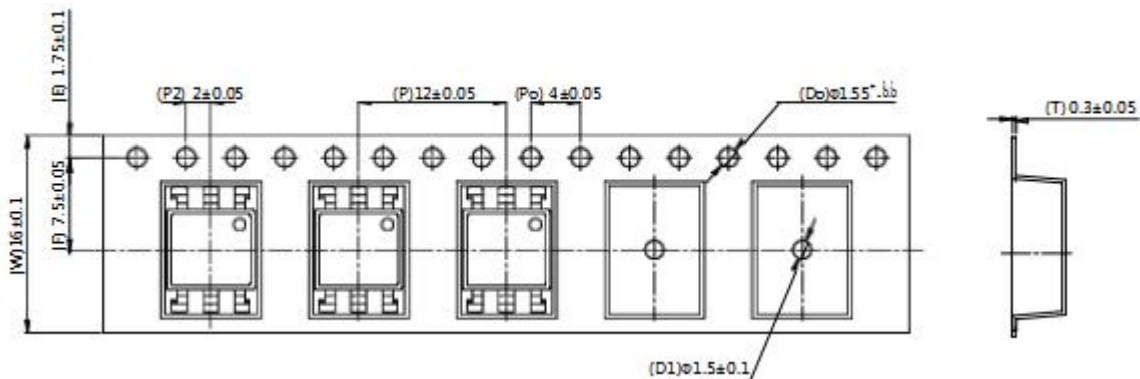
## 包装 Packing

### ■ 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
SMD6	卷盘 ( $\phi 330\text{mm}$ 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 (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
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SMD6	Reel ( $\phi 330\text{mm}$ 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 (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

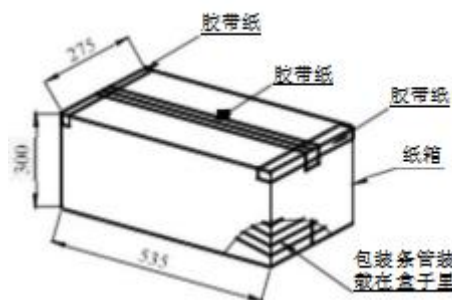
### ■ 编带包装 Tape & Reel

- 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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