



晶体管光耦

Photo Transistor

**QX851**

宁波群芯微电子股份有限公司

NINGBO QUNXIN MICROELECTRONICS CO., LTD.

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## 概述 Description

QX851是一款由发光二极管和光电晶体管组成的高耐压( $V_{CE0} \geq 350V$ )光电耦合器。四引脚封装, 三种形式(DIP, DIP-M, SMD)。

The QX851 is a photoelectric coupler composed of light-emitting diode and phototransistor. It is high voltage resistance( $V_{CE0} \geq 350V$ ). It is packaged in a 4-pin small outline SOP package of three forms such as DIP、DIP-M、SMD.

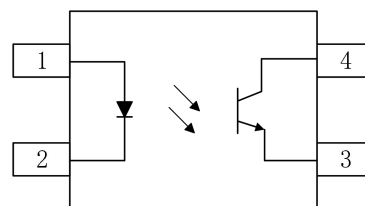
## 特性 Features

- 电流转换比(CTR)范围: 50%~600% ( $I_F=5mA, V_{CE}=5V$ )  
Current transfer ratio: 50%~600% ( $I_F=5mA, V_{CE}=5V$ )
- 输入-输出隔离电压 ( $V_{ISO}=5000 V_{rms}$ )  
High isolation voltage between input and output( $V_{ISO}=5000 V_{rms}$ )
- 集电极-发射极击穿电压  $BV_{CE0} \geq 350V$   
Collector - emitter breakdown voltage  $BV_{CE0} \geq 350V$
- 工作温度:  $-55^{\circ}C \sim +100^{\circ}C$   
Operating Temperature:  $-55^{\circ}C \sim +100^{\circ}C$
- 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

- 开关电源, 智能电表  
Switching power supply, intelligent meter
- 工业控制, 测量仪器  
Industrial control, measuring instruments
- 办公设备, 比如复印机  
Office equipment such as copiers
- 家用电器, 比如空调、风扇、热水器等  
Household appliances: such as air conditioners, fans, water heaters, etc.

## 封装和原理图 Package and Schematic Diagram



Pin Configuration

1. Anode
2. Cathode
3. Emitter
4. Collector



产品型号命名规则 Order Code

**QX 851 - UN Y - W (V) (ZZ)**

①      ②      ③      ④      ⑤      ⑥      ⑦

- ① 公司代码 Company Code (QX: 群芯 Qunxin)
- ② 产品系列 Product Series (851: 851)
- ③ 框架类型 Lead Frame (Cu: 铜框架 Copper)
- ④ 树脂类型 Epoxy Type (H: 无卤 Halogen-free)
- ⑤ 封装形式 Package (D:DIP, S:SMD, M:DIP-M)
- 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 need to be filled in or left blank)
- 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“”为群芯品牌 LOGO  
“”denotes LOGO
- 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“N”代表星期几  
“N”denotes day of the week
- 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	$V_{IORM}$	1500	$V_{peak}$	DIN/EN/IEC EN60747-5-5
瞬态隔离电压 Transient isolation voltage	$V_{IOTM}$	7000	$V_{peak}$	DIN/EN/IEC EN60747-5-5
隔离电压 Isolation Voltage	$V_{iso}$	> 5000	$V_{rms}$	For 1 min

### 极限参数 Absolute Maximum Ratings ( $T_a=25^{\circ}C$ )

参数 Parameter		符号 Symbol	额定值 Rating	单位 Unit
发射端 Input	正向电流 Forward Current	$I_F$	60	mA
	反向电压 Reverse Voltage	$V_R$	6	V
	功耗 Power Dissipation	$P_D$	100	mW
	额定值降低因子(在 $T_a = 100^{\circ}C$ 以上) Power dissipation Derating factor (above $T_a = 100^{\circ}C$ )	$P_{DD}$	2.9	mW/ $^{\circ}C$
接收端 output	集电极功耗 Collector Power Dissipation	$P_C$	150	mW
	集电极电流 Collector Current	$I_C$	50	mA
	集电极-发射极电压 Collector-Emitter Voltage	$V_{CEO}$	350	V
	发射极-集电极电压 Emitter-Collector Voltage	$V_{ECO}$	7	V
总功耗 Total Power Dissipation		$P_{tot}$	200	mW
隔离电压 Isolation Voltage		$V_{iso}$	5000	$V_{rms}$
工作温度 Operating Temperature		$T_{opr}$	-55~+100	$^{\circ}C$
存储温度 Storage Temperature		$T_{stg}$	-55~+125	$^{\circ}C$
焊接温度 Soldering Temperature		$T_{sol}$	260	$^{\circ}C$

**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	1.4	V
	反向电流 Reverse Current	$I_R$	$V_R=5\text{V}$	-	-	10	$\mu\text{A}$
	输入电容 Terminal Capacitance	$C_t$	$V=0, f=1\text{KHz}$	-	30	250	pF
接收端 Output	集电极暗电流 Collector Dark Current	$I_{CEO}$	$V_{CE}=200\text{V}$	-	-	100	nA
	集电极-发射极击穿电压 Collector-Emitter Breakdown Voltage	$BV_{CEO}$	$I_C=0.1\text{mA}, I_F=0\text{mA}$	350	-	-	V
	发射极-集电极击穿电压 Emitter-Collector Breakdown Voltage	$BV_{ECO}$	$I_C=0.1\text{mA}, I_F=0\text{mA}$	7	-	-	V
传输特性 Transfer Characteristics	电流传输比 Current Transfer Ratio	$CTR^*$	$I_F=5\text{mA}, V_{CE}=5\text{V}$	50	-	600	%
	集电极-发射极饱和压降 Collector-Emitter Saturation Voltage	$V_{CE(sat)}$	$I_F=20\text{mA}, I_C=1\text{mA}$	-	-	0.4	V
	隔离电阻 Isolation Resistance	$R_{ISO}$	DC500V, 40~60%R.H.	$1 \times 10^{12}$	-	-	$\Omega$
	隔离电容 Isolation capacitance	$C_{ISO}$	$V=0, f=1\text{MHz}$	-	0.6	-	pF
	截止频率 Cut-off Frequency	$F_c$	$V_{CE}=5\text{V}, I_C=2\text{mA}, R_L=100\Omega$	-	80	-	kHz
	上升时间 Rise Time	$T_r$	$V_{CE}=2\text{V}, I_C=2\text{mA}, R_L=100\Omega$	-	4	18	$\mu\text{s}$
	下降时间 Fall Time	$T_f$	$V_{CE}=2\text{V}, I_C=2\text{mA}, R_L=100\Omega$	-	5	18	$\mu\text{s}$

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

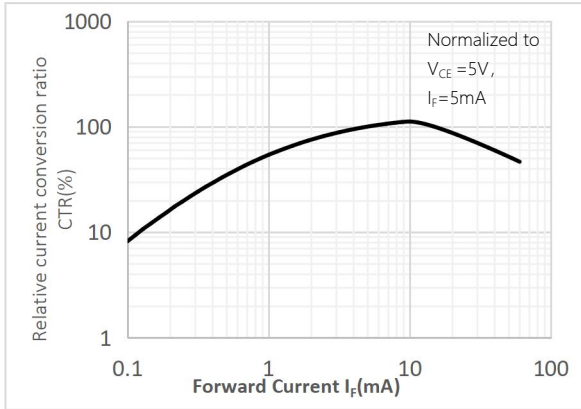


Fig.2 Forward Current vs. Forward Voltage

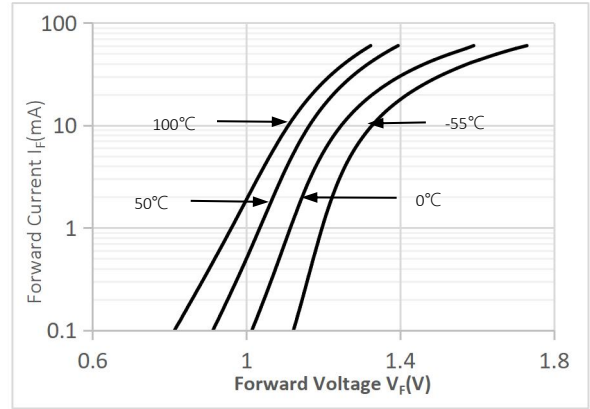


Fig.3 Collector Current vs. Collector-emitter Voltage

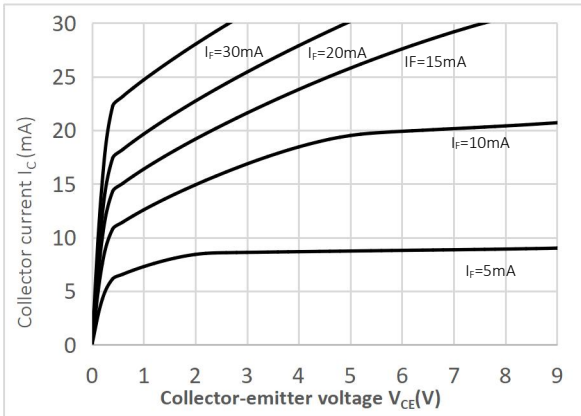


Fig.4 Relative Current Transfer Ratio vs. Ambient Temperature

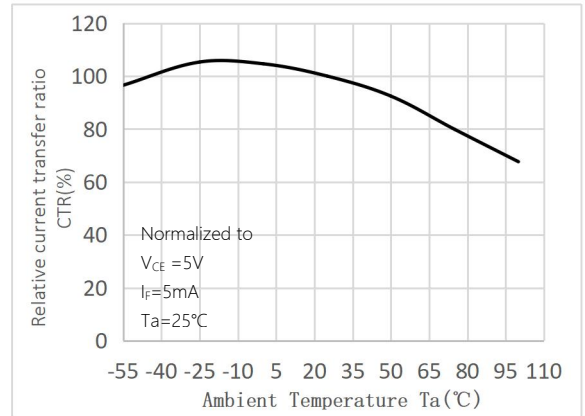


Fig.5 Collector-emitter Saturation Voltage vs. Ambient Temperature

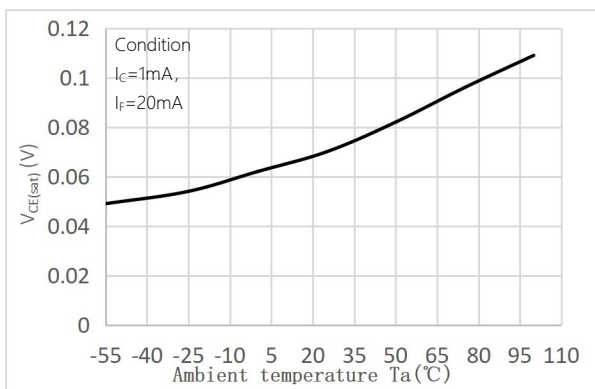


Fig.6 Collector Dark Current vs Ambient Temperature

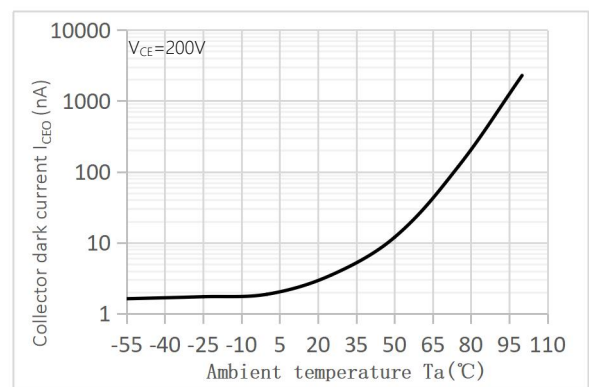


Fig.7 Response Time vs. Ambient Temperature

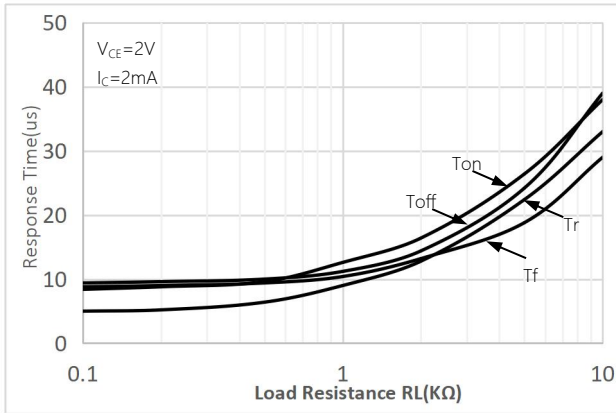


Fig.8 Collector-emitter Saturation Voltage vs Forward Current

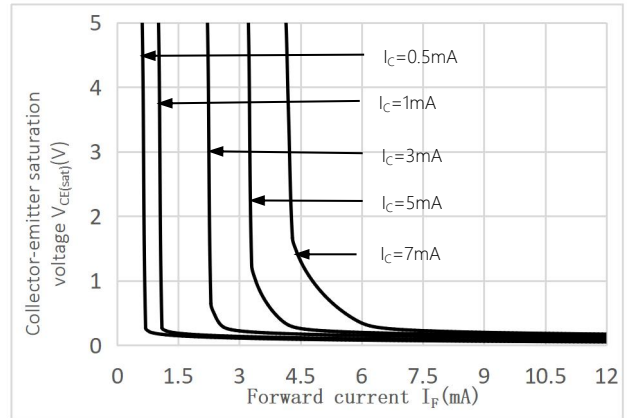
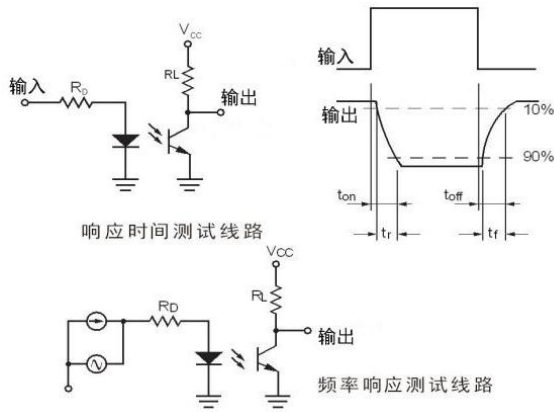
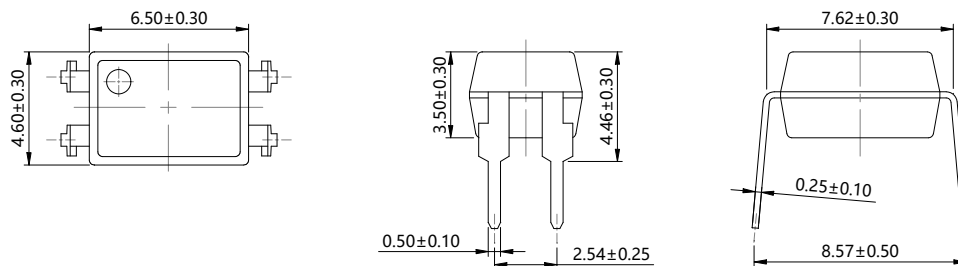


Fig.7 Switching Time Test Circuit & Wave forms

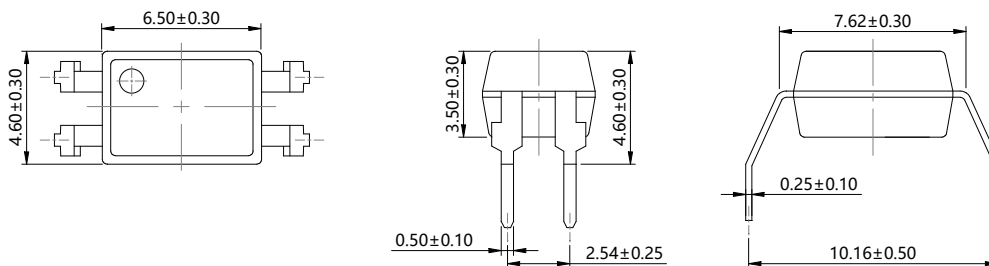


外形尺寸 Outline Dimensions

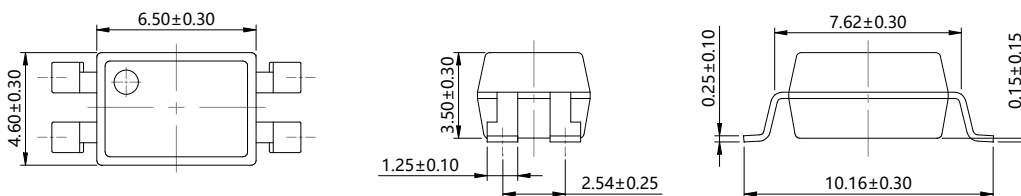
DIP4



DIP4-M



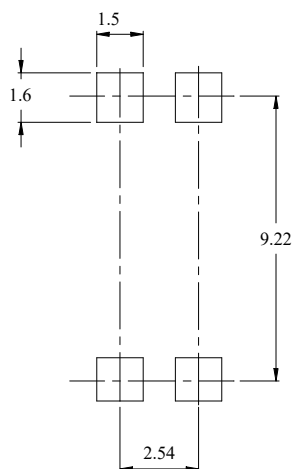
SMD4



单位 Unit: mm



建议焊盘布局 Recommended Pad Layout

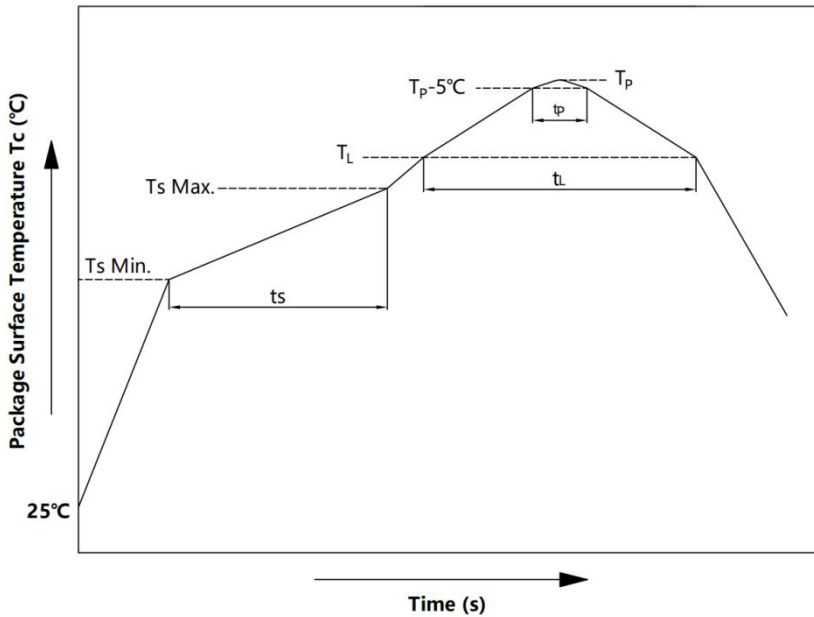


单位 Unit: mm

注：上图为产品正视图。

Note: The picture above is the front view of the product.

回流焊温度曲线图 Solder Reflow Profile



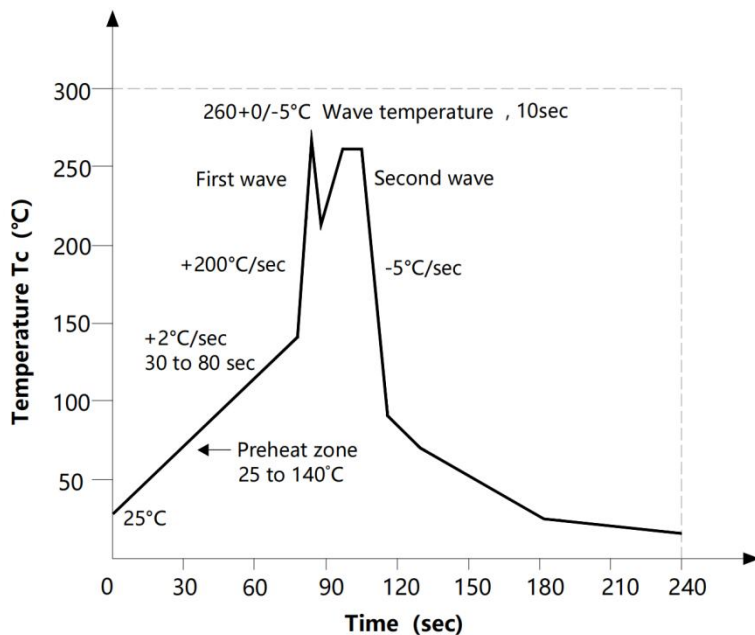
项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	$T_s$	150	200	$^\circ\text{C}$
预热时间 Preheat Time	$t_s$	60	120	s
升温速率 Ramp-Up Rate ( $T_L$ to $T_P$ )	-	-	3	$^\circ\text{C}/\text{s}$
液相线温度 Liquidus Temperature	$T_L$	217		$^\circ\text{C}$
时间高于 $T_L$ Time Above $T_L$	$t_L$	60	150	s
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	$^\circ\text{C}/\text{s}$

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  $\leq 3\text{s}$ 。  
Hand soldering iron requirements: Temperature:  $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , within 3s.

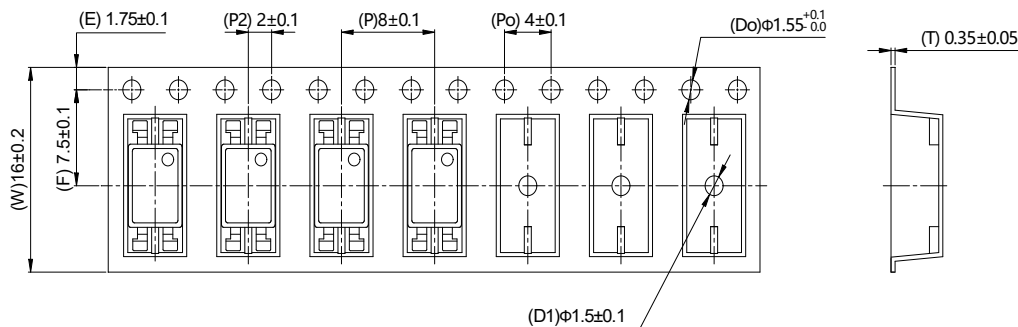
**包装 Packing**

■ 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
SMD4	卷盘 (φ330mm 蓝盘)	2000 只/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	340*60*34mm	620*360*365mm	首尾端空至少 200mm
DIP4	管装 (500*12*11mm)	100 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
DIP4-M	管装 (500*13*11mm)	100 只/管	45 管/盒	10 盒/箱	不适用	525*136*58mm	535*295*310mm	
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SMD4	Reel (φ330mm Blue)	2000 pcs/reel	2 reels/box	10 boxes/ctn	450*390*0.1mm	340*60*34mm	620*360*365mm	Guard band 200mm min.
DIP4	Tube (500*12*11mm)	100 pcs /tube	50 tubes/box	10 boxes/ctn	NA	525*128*56mm	535*275*300mm	Endplug (blue) and Endplug (white) keep the direction
DIP4-M	Tube (500*13*11mm)	100 pcs /tube	45 tubes/box	10 boxes/ctn	NA	525*136*58mm	535*295*310mm	

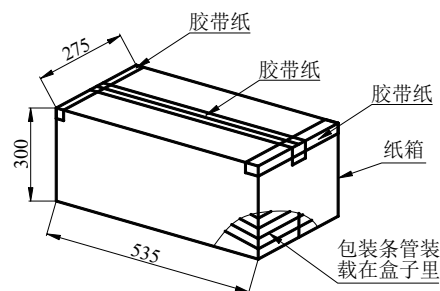
■ 编带包装 Tape & Reel

- 1) 每卷数量: 2000 只。  
Qty/reel: 2000 pcs.
- 2) 每箱数量: 40000 只。  
Qty/ctn: 40000 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: 100 只。  
Qty/Tube: 100 pcs.
- 2) 每箱数量 DIP4/DIP4-M: 50000/45000 只。  
Qty/ctn DIP4/DIP4-M: 50000/45000 pcs.
- 3) 内包装 DIP4/DIP4-M: 每盒 50/45 管。  
Inner packing DIP4/DIP4-M: 50/45 Tube/box.
- 4) 示意图 Schematic:



单位/Unit: mm

## 注意 Attention

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