可控硅光耦 HLM303X HLM304X HLM306X HLM308X

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概述 Description

- HLM303X、HLM304X、 HLM306X、HLM308X 系列器件是由一个 GaAs 红外发光二极管和一个单晶硅芯片的过零相位光电双向晶闸管组成的光电耦合器。

The HLM303X, HLM304X, HLM306X and HLM308X series devices are optical couplers composed of GaAs infrared light emitting diodes and zero-crossing phase photoelectric bidirectional thyristor of single crystal silicon chip.

特性 Features

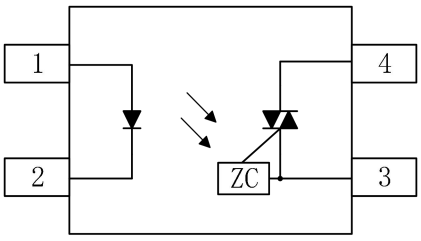
- 峰值击穿电压
  Peak breakdown voltage
  250V：HLM303X；
  400V：HLM304X；
  600V：HLM306X；
  800V：HLM308X；
- 输入-输出隔离电压 (V_{ISO}=3750 Vrms)
  High isolation voltage between input and output(V_{ISO}=3750 Vrms)
- 工作温度：-55℃~110℃
  Operating Temperature: -55℃~110℃
- 符合加强绝缘标准
  Meet reinforced insulation standards
- 符合安规标准：UL 1577，VDE DIN EN60747-5-5 (VDE 0884-5），CQC11-471543-2022
  Safety standards 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

SOP4



Pin Configuration
1. Anode
2. Cathode
3. GND
4. VCC

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产品型号命名规则 Order Code

HL M30VX - UN Y - W (V) (ZZ)

① ② ③ ④ ⑤ ⑥ ⑦

① 公司代码 Company Code（HL:鸿利鲲鹏HongliKunpeng）
② 产品系列 Product Series（M30VT: M303X, M304X, M306X, M308X）
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（ S: SOP）
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

- 印字中的"V"代表 V_{DRM} 分档：3、4、6、8
  "V"denotes the VDRM digissr：3、4、6、8
- 印字中的"X"代表 IFTdigissr：0、1、2、3
  "X"denotes the IFT：0、1、2、3
- 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 the 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	> 5.0	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	> 5.0	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}	600	V_{peak}	DIN/EN/IEC EN60747-5-5
瞬态隔离电压 Transient isolation voltage	V_{IOTM}	5000	V_{peak}	DIN/EN/IEC EN60747-5-5
隔离电压 Isolation Voltage	Viso	> 3750	Vrms	For 1 min

极限参数 Absolute Maximum Ratings (Ta=25℃)

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 Backward Voltage		V_R	6	V
	功耗 Power Dissipation		P_D	100	mW
	额定值降低因子(在 Ta = 85°C 以上) Power dissipation Derating factor (above Ta = 85°C)		P_{DD}	3.8	mW/°C
接收端 output	断态输出端电压 Off-state output terminal voltage	HLM303X	V_{DRM}	250	V
		HLM304X		400	
		HLM306X		600	
		HLM308X		800	
	峰值重复浪涌电流(pw=100μs,120pps) Peak repetitive surge current (pw=100μs,120pps)		I_{TSM}	1	A
	开启态电流（均方根值） On-state current (root mean square value)		$I_{T(RMS)}$	100	mA
	功耗 Power Dissipation		P_C	300	mW
	额定值降低因子(在 Ta = 90°C 以上) Power dissipation Derating factor (above Ta = 90°C)			7.6	mW/°C
总功耗 Total Power Dissipation			P_{tot}	330	mW
隔离电压 Isolation Voltage			Viso	3750	V

参数 Parameter	符号 Symbol	额定值 Rating	单位 Unit
工作温度 Operating Temperature	T_{opr}	-55—110	℃
存储温度 Storage Temperature	T_{stg}	-55—125	℃
焊接温度 Soldering Temperature	T_{sol}	260	℃

* 在相对湿度 40% ~ 60%下的进行交流电测试，此时 1、2 脚短接，3、4 脚短接。

* Conduct AC test at 40%~60% relative humidity. At this time, pins 1 and 2 are short-circuited, and pins 3 and 4 are short-circuited.

产品特性参数 Electro-optical Characteristics (Ta=25℃)

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=20mA	-	1.23	1.5	V
	反向电流 Back current		I_R	V_R=6V	-	-	10	uA
接收端 Output	断态峰值电流 Off-state peak current	HLM303X	I_{DRM1}	V_{DRM} =Rated V_{DRM} I_F = 0mA	-	-	100	nA
		HLM304X						
		HLM306X			-	-	500	
		HLM308X						
	通态峰值电压 On-state peak voltage		V_{TM}	I_{TM}=100mA peak I_F= Rated I_{FT}	-	-	3	V
	断态电压临界上升率 Critical rise rate of off-state voltage	HLM303X	dv/dt	V_{PEAK} =Rated V_{DRM}, I_F=0	1000	-	-	V/μs
		HLM304X						
		HLM306X						
		HLM308X			600	-	-	
	抑制电压（MT1-MT2 高于多少电压不会触发） Suppression voltage (MT1-MT2 will not be triggered if it is higher than this voltage)		V_{Inh}	I_F= Rated I_{FT}	-	-	20	V
	抑制状态的漏电流 Leakage current in suppression state		I_{DRM2}	I_F= Rated I_{FT}, V_{DRM}=Rated V_{DRM}, Off state	-	-	500	uA
传输特性 Transfer Characteristics	LED 触发电流 LED trigger current	HLM3031	I_{FT}	主端电压 Main terminal Voltage =3V	-	-	15	mA
		HLM3041						
		HLM3061						
		HLM3081						
		HLM3032			-	-	10	
		HLM3042						
		HLM3062						
		HLM3082						
		HLM3033			-	-	5	
		HLM3043						
		HLM3063						
		HLM3083						
	维持电流 Maintain current		I_H	-	-	280	-	uA

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

Fig.1 LED forward current vs Forward voltage

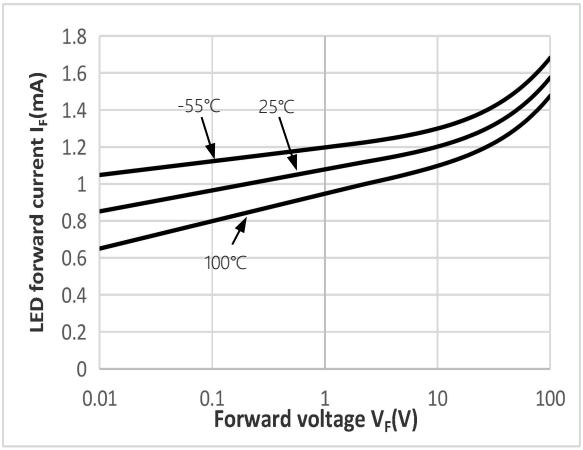


Fig.2 On-state characteristic diagram

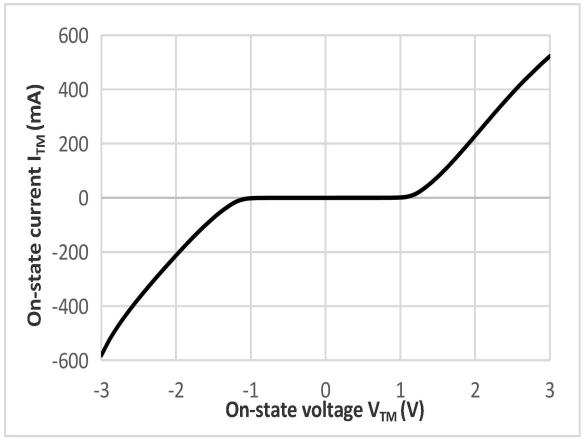


Fig.3 Trigger current vs Ambient temperature

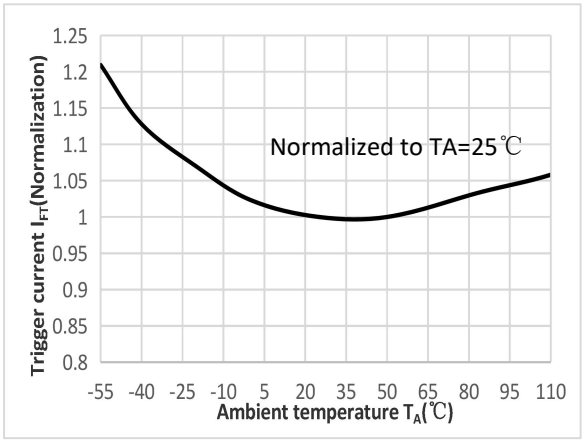


Fig.4 Trigger current vs LED pulse width

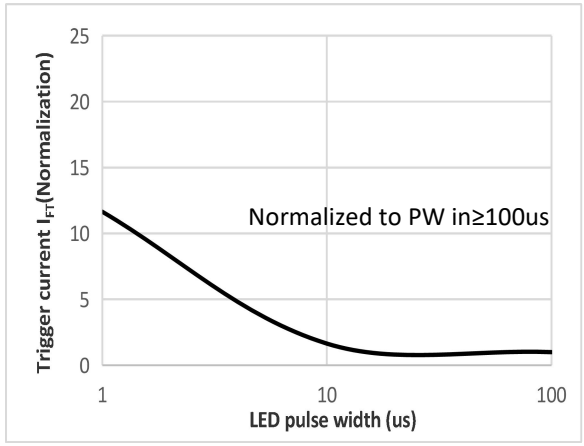


Fig.5 Maintenance current vs Ambient temperature

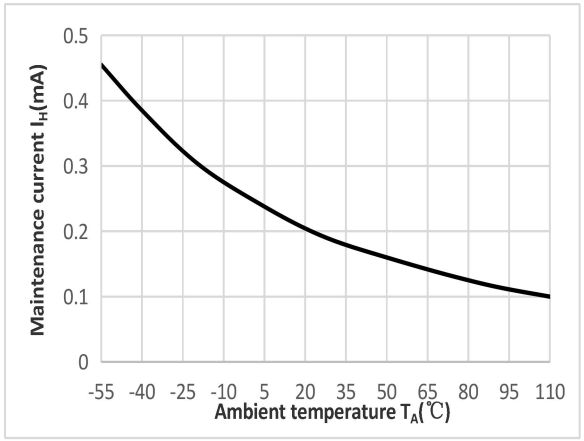


Fig.6 Leakage current vs Ambient temperature

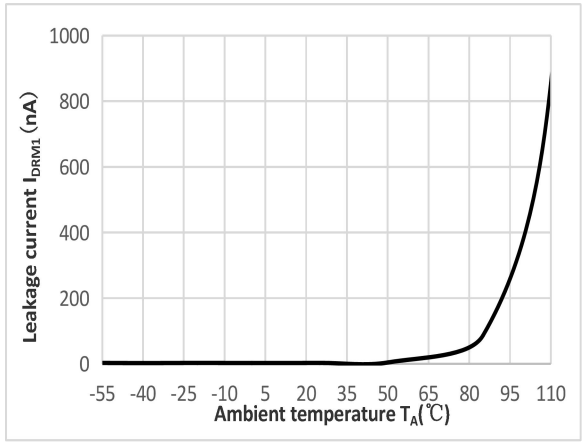


Fig.7 Suppressed state leakage current vs Ambient temperature

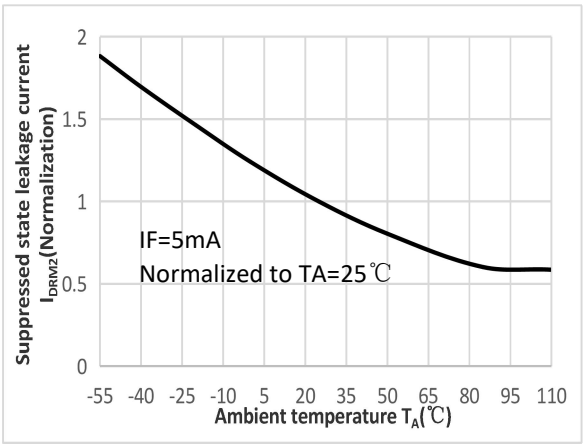


Fig.8 Suppression voltage vs Ambient temperature

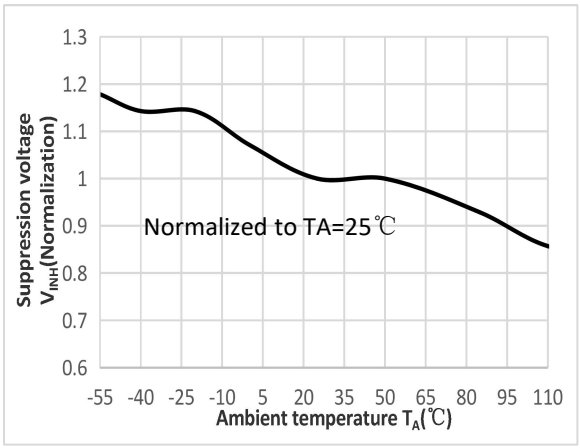
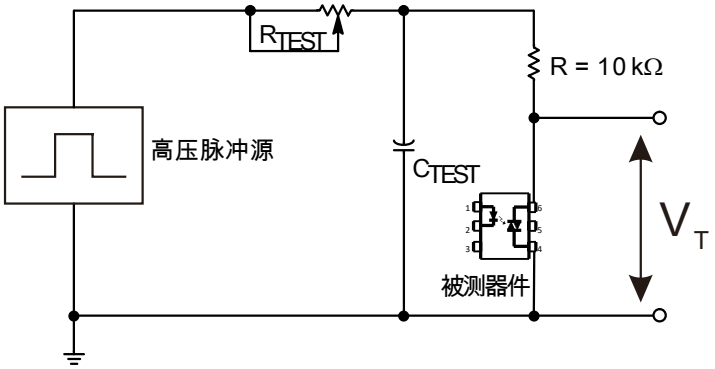
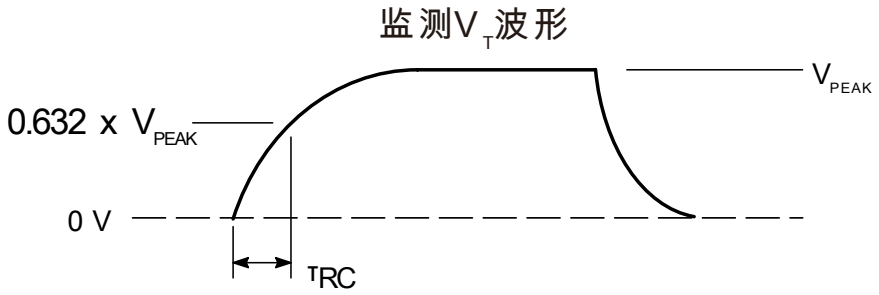


Fig.9 静态 dv/dt 测试电路和波形 Static dv/dt test circuit and waveform





通过 RC 电路施加于被测器件的输出端的高电压脉冲设置到所需的 V_{PEAK} 值上。LED 电流无需加上。波形 V_T 使用 X100 探头监测。通过调节 R_{TEST} 值，dv/dt（斜度）增加，直到被测器件观察到被触发（波形崩溃）。dv/dt 然后下降，直到被测器件停止被触发。此时，记录 τ_{RC} 值并可计算 dv/dt 了。

The high voltage pulse applied to the output end of the device under test through the RC circuit is set to the desired V_{PEAK} value. LED current does not need to be added. Waveform V_T is monitored with X100 probe. By adjusting the R_{TEST} value, dv/dt (slope) increases until the device under test is observed to be triggered (waveform collapse). Dv/dt then drops until the device under test stops being triggered. At this time, dv/dt can be calculated by recording the value of τRC.

$$dv/dt = \frac{0.632 \times 400}{\tau_{RC}} = \frac{252}{\tau_{RC}}$$

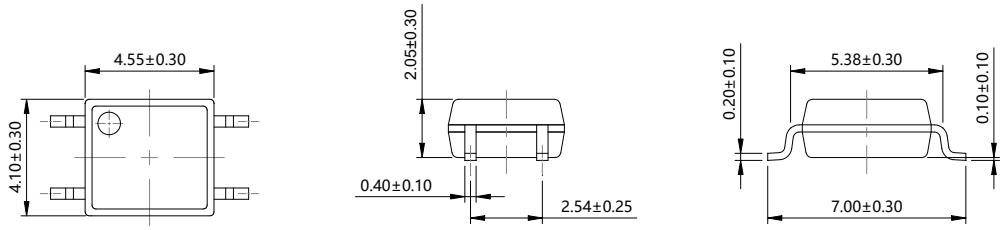
例如，HL304X 系列的电压峰值 V_{PEAK} = 400V。 dv/dt 值的计算方式如下：

For example, the voltage peak of HL304X series V_{PEAK}=400V. Then the dv/dt value can be calculated as follows:

$$dv/\mathrm{d}t = \frac{0.632 \times 400}{\tau_{RC}} = \frac{252}{\tau_{RC}}$$

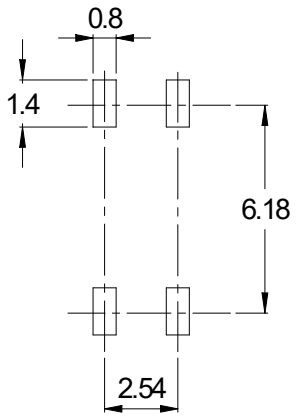
外形尺寸 Outline Dimensions

SOP4



单位 Unit: mm

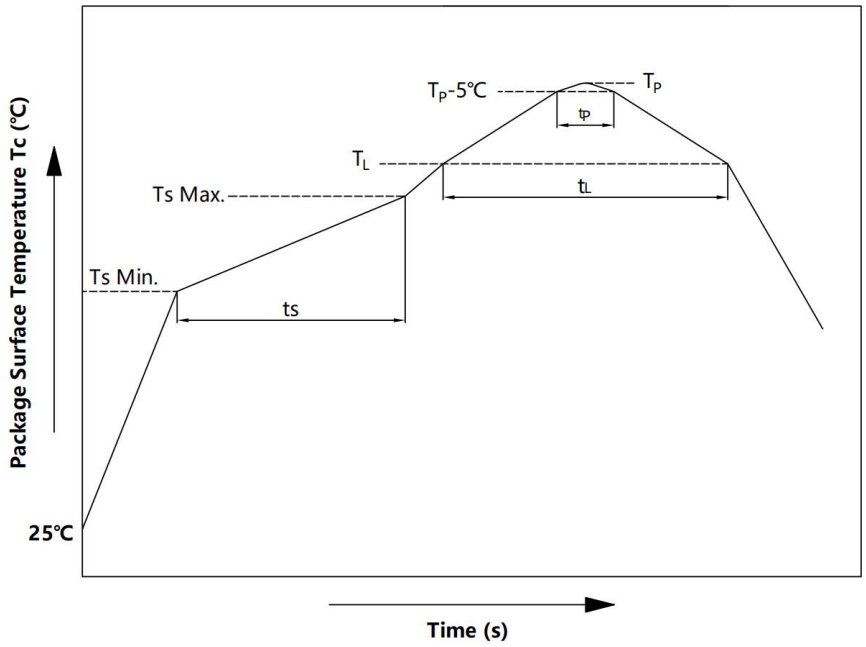
建议焊盘布局 Recommended Pad Layout



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



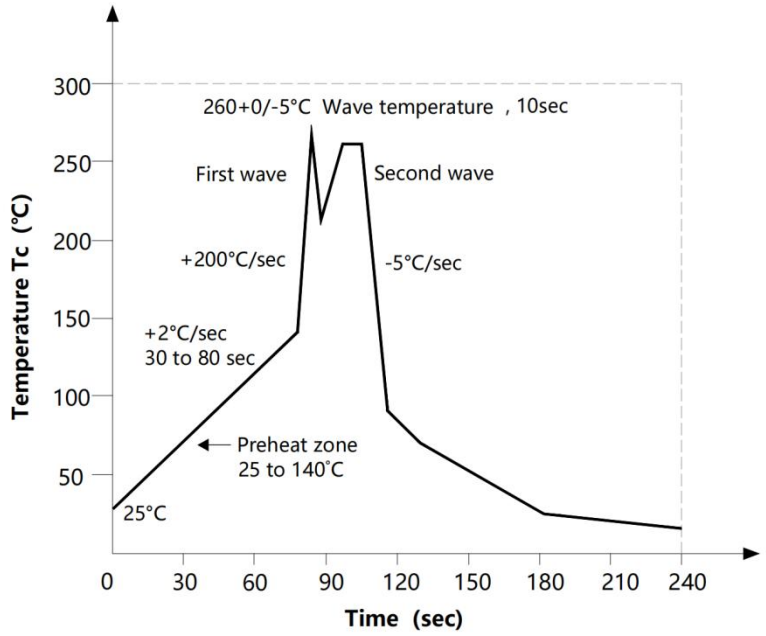
项目 Item	符号 Symbol	最小值 Min.	最大值 Max.	单位 Unit
预热温度 Preheat Temperature	Ts	150	200	℃
预热时间 Preheat Time	ts	60	120	s
升温速率 Ramp-Up Rate (T_L to T_P)	-	-	3	℃/s
液相线温度 Liquidus Temperature	T_L	217		℃
时间高于 T_L Time Above T_L	t_L	60	150	s
峰值温度 Peak Temperature	T_P	-	260	℃
Tc 在(T_P-5)和 T_P 之间的时间 Time During Which Tc 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	℃/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℃ ± 5℃，时间≤3s。

Hand soldering iron requirements：Temperature：360℃ ± 5℃, within 3s

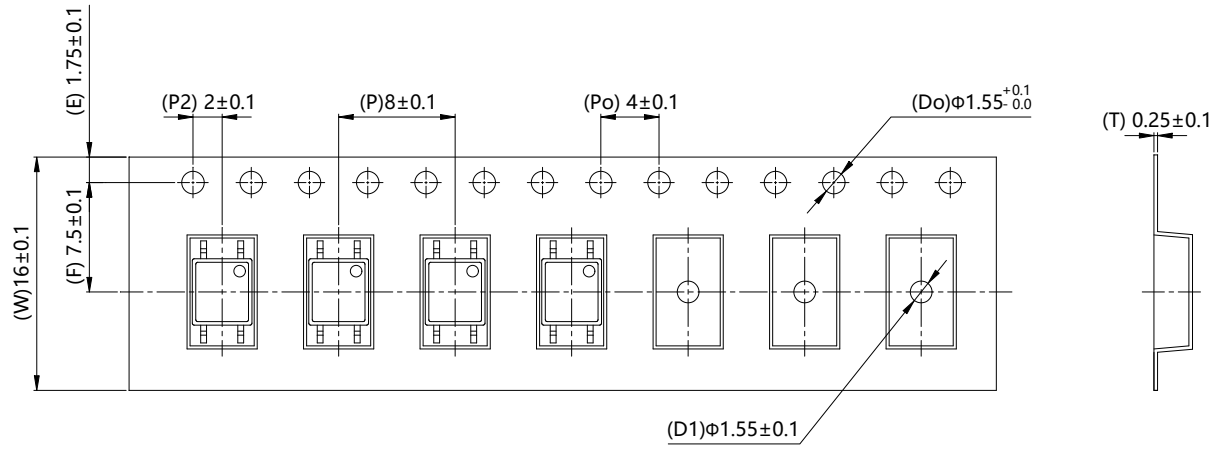
包装 Packing

■ 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
SOP4	卷盘 (ϕ330mm 蓝盘)	3000/盘	2 盘/盒	10 盒/箱	450*390*0.1mm	340*60*340mm	380*360*365mm	首尾端空至少 200mm
Package Type	Packing Form	Quantity per Reel	Quantity per Box	Quantity per Carton	Antistatic Bag Specification	Box Specification	Carton Specification	Note
SOP4	Reel (ϕ330mm Blue)	3k pcs/reel	2 reels /box	10 boxes /ctn	450*390*0.1mm	340*60*340mm	380*360*365mm	Leave at least 200mm of blank space at both ends

■ 编带包装 Tape & Reel

1) 每卷数量：3000 只。
   Qty/reel：3000 pcs.
2) 每箱数量：60000 只。
   Qty/ctn：60000 pcs.
3) 内包装：每盒 2 盘。
   Inner packing：2 reels/box.
4) 示意图 Schematic：



单位 Unit：mm

注意 Attention

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