



# 晶体管光耦 Photo Transistor

## LTV-357T

### Product Data Sheet

**AOTE DCC**  
**RELEASE**

**台湾奥特半导体科技有限公司**

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## 概述 Description

LTV-357T是一款由发光二极管和光电晶体管组成的光电耦合器。 四引脚封装（SOP）。

The LTV-357T is a photoelectric coupler composed of light-emitting diode and phototransistor. It is packaged in a 4-pin small outline SOP package.

## 特性 Features

- 电流转换比(CTR)范围: 80% ~600% ( $I_F=5\text{mA}$ ,  $V_{CE}=5\text{V}$ ,  $T_a=25^\circ\text{C}$ )  
Current transfer ratio: 80% ~600% ( $I_F=5\text{mA}$ ,  $V_{CE}=5\text{V}$ ,  $T_a=25^\circ\text{C}$ )
- 输入-输出隔离电压 ( $V_{ISO}=3750\text{ Vrms}$ )  
High isolation voltage between input and output( $V_{ISO}=3750\text{ Vrms}$ )
- 集电极-发射极击穿电压  $BV_{CEO}\geq 80\text{V}$   
Collector - emitter breakdown voltage  $BV_{CEO}\geq 80\text{V}$
- 工作温度:  $-55^\circ\text{C} \sim +110^\circ\text{C}$   
Operating Temperature:  $-55^\circ\text{C} \sim +110^\circ\text{C}$
- 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

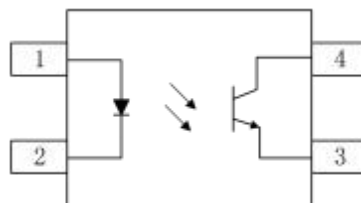
## 应用 Applications

- 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. Emitter
4. Collector

## 印字信息 Marking Information

- 印字中 “” 为奥特品牌 LOGO  
“” denotes LOGO
- 印字中的 “X” 代表产品分档：A、B、C、D、E、F 或无  
“X” denotes the classification：A、B、C、D、E、F or None
- 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            | >5.0        | 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            | >5.0        | 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      | $V_{IORM}$   | 600         | $V_{peak}$ | DIN/EN/IEC EN60747-5-5                                                                                     |
| 瞬态隔离电压<br>Transient isolation voltage | $V_{IOTM}$   | 5000        | $V_{peak}$ | DIN/EN/IEC EN60747-5-5                                                                                     |
| 隔离电压<br>Isolation Voltage             | $V_{iso}$    | > 3750      | $V_{rms}$  | For 1 min                                                                                                  |

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

| 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                                                                                           | $I_F$        | 50            | mA                     |
|                               | 反向电压<br>Reverse Voltage                                                                                           | $V_R$        | 6             | V                      |
|                               | 功耗<br>Power Dissipation                                                                                           | $P_D$        | 70            | mW                     |
|                               | 额定值降低因子(在 $T_a = 90^{\circ}\text{C}$ 以上)<br>Power dissipation Derating factor (above $T_a = 90^{\circ}\text{C}$ ) | $P_{DD}$     | 2.9           | mW/ $^{\circ}\text{C}$ |
| 接收端<br>output                 | 集电极功耗<br>Collector Power Dissipation                                                                              | $P_C$        | 150           | mW                     |
|                               | 集电极电流<br>Collector Current                                                                                        | $I_C$        | 50            | mA                     |
|                               | 集电极-发射极电压<br>Collector-Emitter Voltage                                                                            | $V_{CEO}$    | 80            | V                      |
|                               | 发射极-集电极电压<br>Emitter-Collector Voltage                                                                            | $V_{ECO}$    | 6             | V                      |
| 隔离电压<br>Isolation Voltage     |                                                                                                                   | $V_{iso}$    | 3750          | $V_{rms}$              |
| 工作温度<br>Operating Temperature |                                                                                                                   | $T_{opr}$    | -55 ~ +110    | $^{\circ}\text{C}$     |
| 存储温度<br>Storage Temperature   |                                                                                                                   | $T_{stg}$    | -55 ~ +125    | $^{\circ}\text{C}$     |
| 焊接温度<br>Soldering Temperature |                                                                                                                   | $T_{sol}$    | 260           | $^{\circ}\text{C}$     |

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

| 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                             | $V_F$         | $I_F = 20\text{mA}$                                                  | -                  | 1.2                | 1.4        | V             |
|                                     | 反向电流<br>Reverse Current                             | $I_R$         | $V_R = 4\text{V}$                                                    | -                  | -                  | 10         | $\mu\text{A}$ |
|                                     | 输入电容<br>Terminal Capacitance                        | $C_t$         | $V=0, f=1\text{KHz}$                                                 | -                  | 30                 | 250        | pF            |
| 接收端<br>Output                       | 集电极暗电流<br>Collector Dark Current                    | $I_{CEO}$     | $V_{CE} = 20\text{V}$                                                | -                  | -                  | 100        | nA            |
|                                     | 集电极-发射极击穿电压<br>Collector-Emitter Breakdown Voltage  | $BV_{CEO}$    | $I_C = 0.1\text{mA}, I_F = 0\text{mA}$                               | 80                 | -                  | -          | V             |
|                                     | 发射极-集电极击穿电压<br>Emitter-Collector Breakdown Voltage  | $BV_{ECO}$    | $I_E = 10\mu\text{A}, I_F = 0$                                       | 6                  | -                  | -          | V             |
| 传输特性<br>Transfer<br>Characteristics | 电流传输比<br>Current Transfer Ratio                     | CTR*          | $I_F = 5\text{mA}, V_{CE} = 5\text{V}$                               | 80                 | -                  | 600        | %             |
|                                     | 集电极-发射极饱和压降<br>Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_F = 20\text{mA}, I_C = 1\text{mA}$                                | -                  | 0.1                | 0.2        | V             |
|                                     | 隔离电阻<br>Isolation Resistance                        | $R_{ISO}$     | DC500V, 40 ~ 60% R.H.                                                | $5 \times 10^{10}$ | $1 \times 10^{11}$ | -          | $\Omega$      |
|                                     | 隔离电容<br>Isolation capacitance                       | $C_{ISO}$     | $V=0, f=1\text{MHz}$                                                 | -                  | 0.6                | 1.0        | pF            |
|                                     | 截止频率<br>Cut-off Frequency                           | $F_c$         | $V_{CE} = 5\text{V}, I_C = 2\text{mA}, R_L = 100\Omega, -3\text{dB}$ | -                  | 80                 | -          | kHz           |
|                                     | 上升时间<br>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<br>Fall Time                                   | $T_f$         | $V_{CE} = 2\text{V}, I_C = 2\text{mA}, R_L = 100\Omega$              | -                  | 3                  | 18         | $\mu\text{s}$ |

注\*：电流传输比 =  $I_C/I_F \times 100\%$ 。

Note\*：CTR =  $I_C/I_F \times 100\%$ 。

**电流传输比分档表 CTR Classification Table ( $I_F = 5\text{mA}, V_{CE} = 5\text{V}, T_a = 25^\circ\text{C}$ )**

| 代码 Code | 最小值 Min. | 最大值 Max. |
|---------|----------|----------|
| A       | 80       | 160      |
| B       | 130      | 260      |
| C       | 200      | 400      |
| D       | 300      | 600      |
| E       | 100      | 200      |
| F       | 150      | 300      |
| None    | 80       | 600      |

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

Fig.1 Current Transfer Ratio vs Forward Current

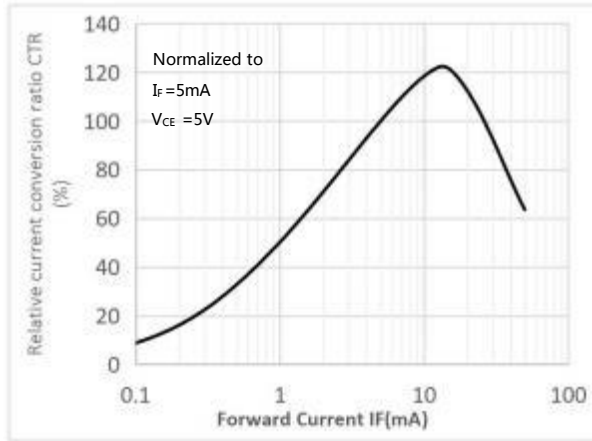


Fig.2 Forward Current vs. Forward Voltage

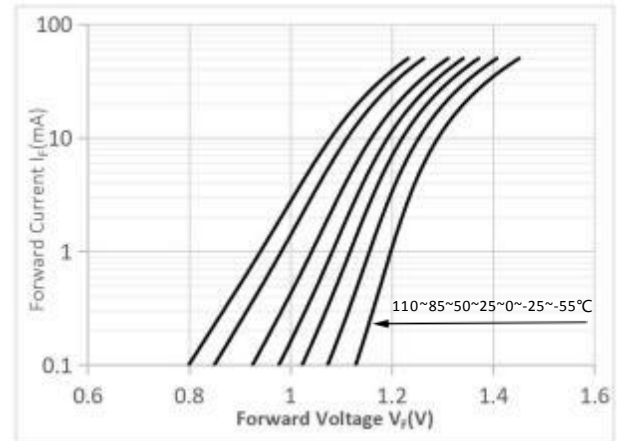


Fig.3 Collector Current vs. Collector-emitter Voltage

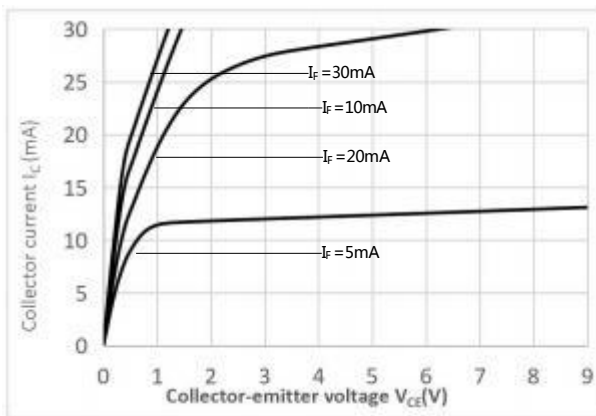


Fig.4 Relative Current Transfer Ratio vs. Ambient Temperature

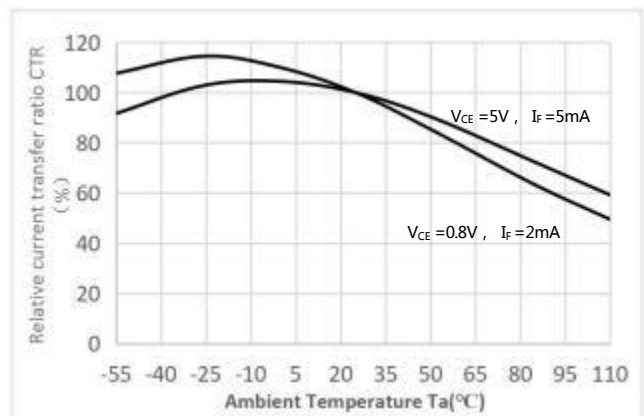


Fig.5 Collector-emitter Saturation Voltage vs. Ambient Temperature

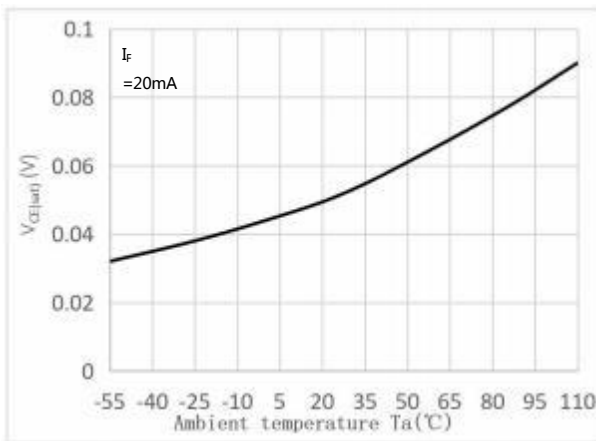


Fig.6 Collector Dark Current vs Ambient Temperature

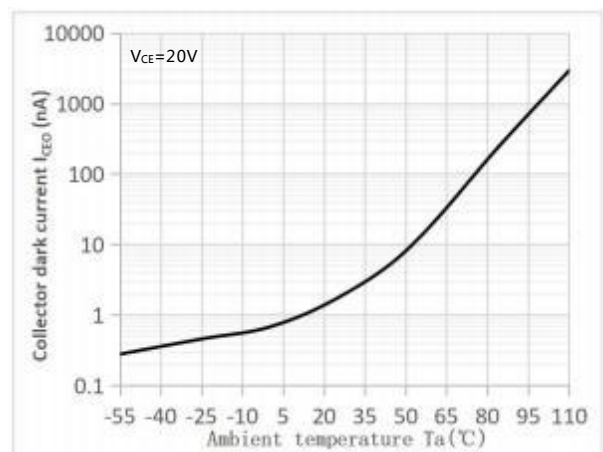


Fig.7 Response Time vs. Load Resistance

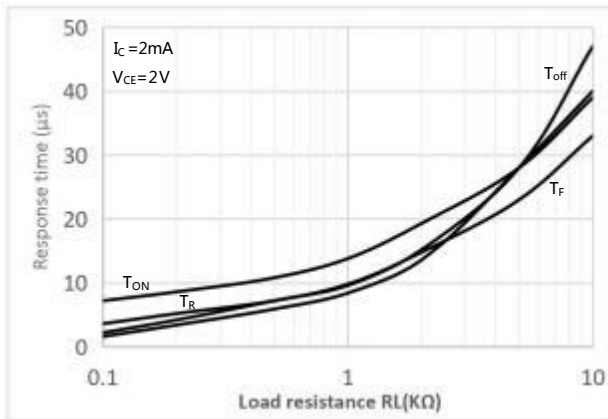


Fig.8 Frequency Response

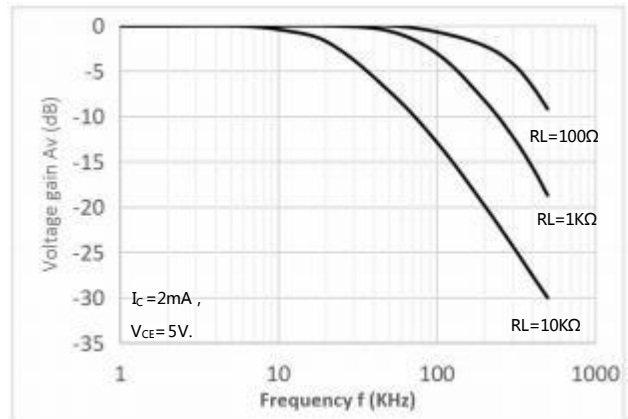


Fig.9 Collector-emitter Saturation Voltage vs Forward Current

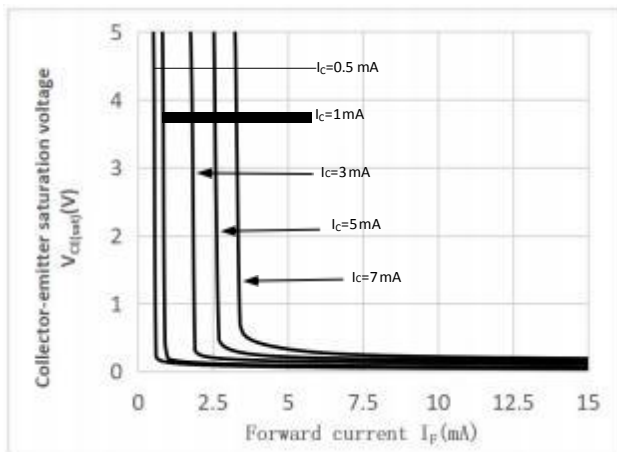
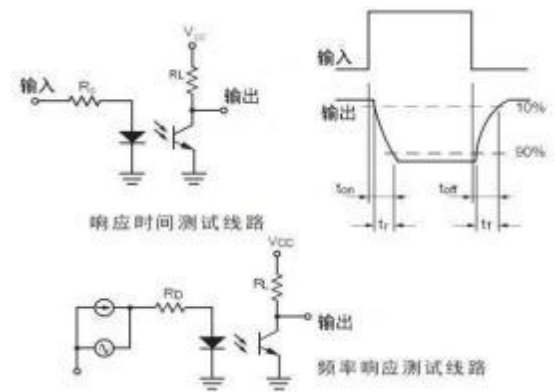
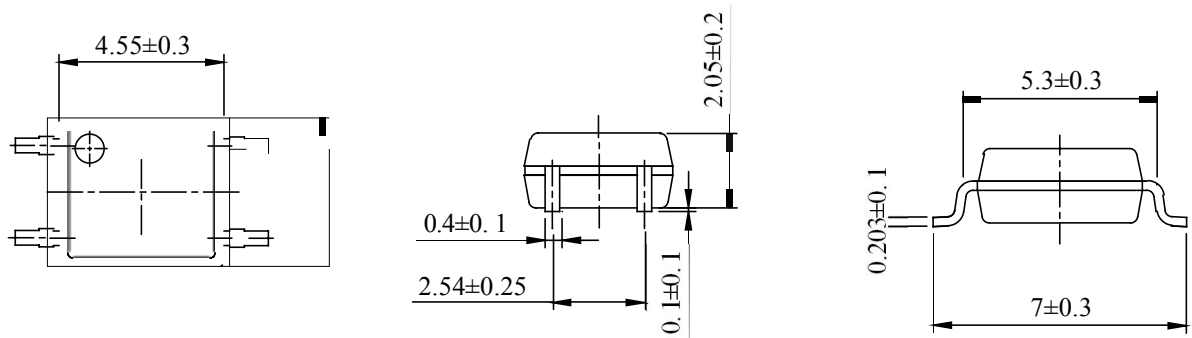


Fig.10 Switching Time Test Circuit & Waveforms



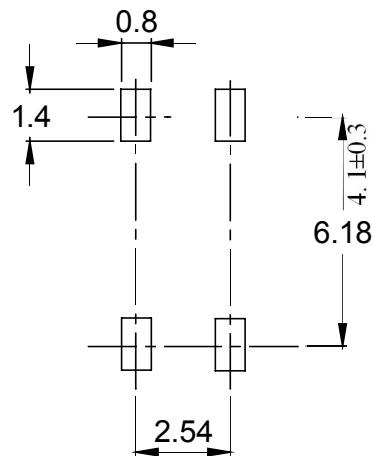
## 外形尺寸 Outline Dimensions

### SOP4



单位 Unit: mm

## 建议焊盘布局 Recommended Pad Layout

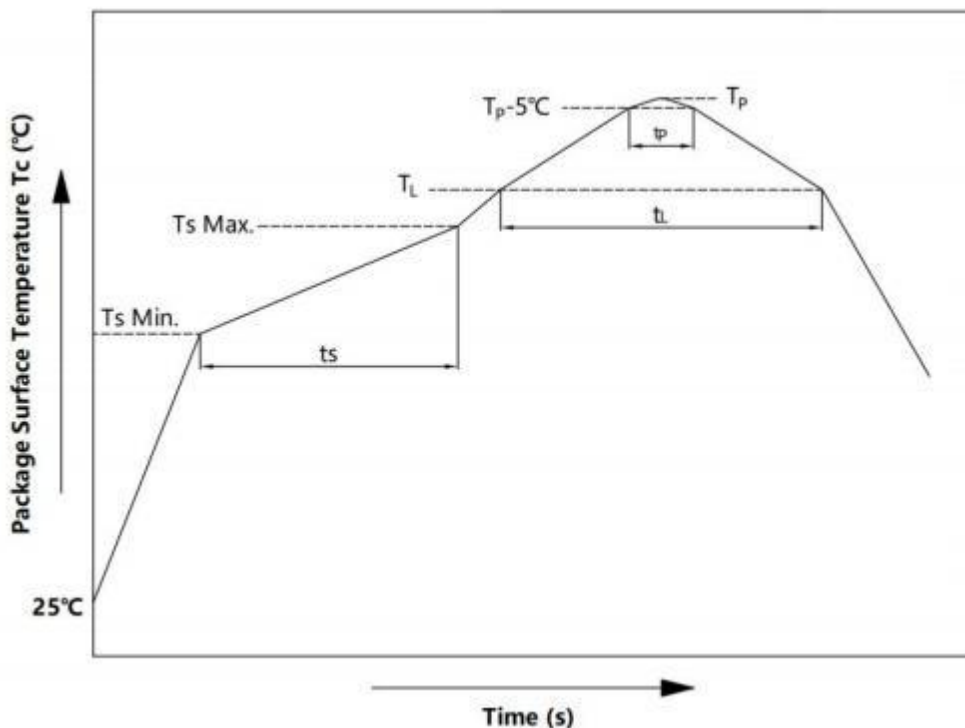


单位 Unit: mm

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<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        | °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          | °C/s       |
| 液相线温度<br>Liquidus Temperature                                                                     | $T_L$        | 217         |            | °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        | °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          | °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  $\leq 3\text{s}$ 。  
Hand soldering iron requirements：Temperature： $360^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , within 3s.

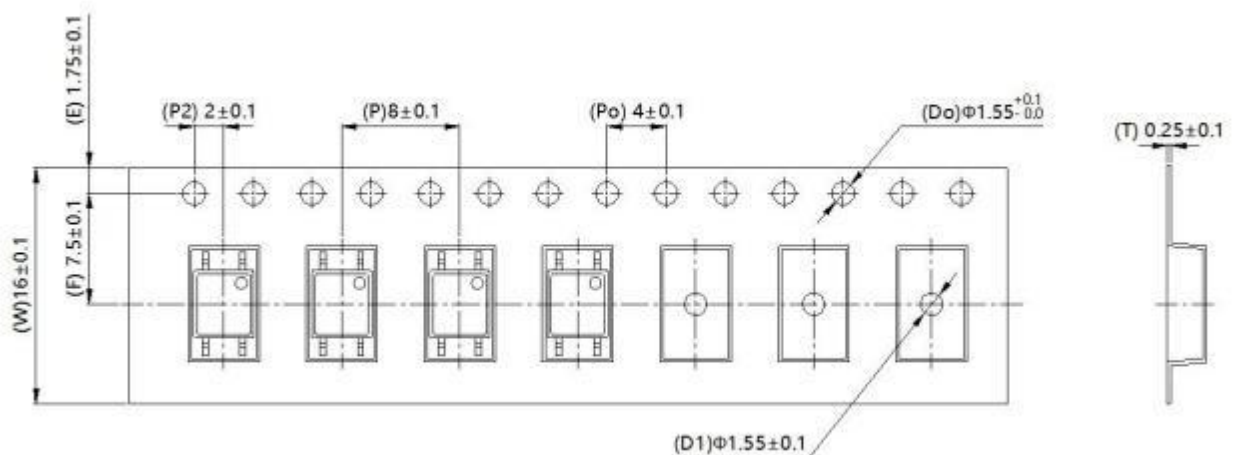
## 包装 Packing

### ■ 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                    |
|--------------|-------------------------------------|-------------------|------------------|---------------------|------------------------------|-------------------|----------------------|-----------------------|
| SOP4         | 卷盘<br>( $\phi 330\text{mm}$ 蓝盘)     | 3000 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          |
| Package Type | Packing Form                        | Quantity per Reel | Quantity per Box | Quantity per Carton | Antistatic Bag Specification | Box Specification | Carton Specification | Note                  |
| SOP4         | Reel<br>( $\phi 330\text{mm}$ Blue) | 3000 pcs /reel    | 2 reels /box     | 10 boxes /ctn       | 450*390*0.1mm                | 340*60*340mm      | 620*360*365mm        | Guard band 200mm min. |

### ■ 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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