



**晶体管光耦**  
**Photo Transistor**  
**AT814X**

**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 . aote se mi . co m](http://www.aotese mi .co m)

## 概述 Description

AT814X是一款由两个发光二极管和光电晶体管组成的光电耦合器。 四引脚封装， 三种形式（ DIP、 DIP-M、 SMD）。

The AT814X is a photoelectric coupler composed of two light-emitting diode and phototransistor. It is packaged in a 4-pin package of three forms such as DIP、 DIP-M、 SMD.

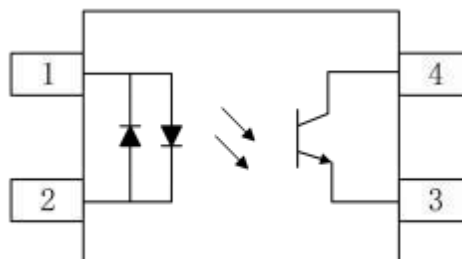
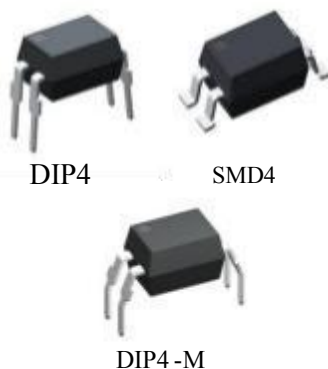
## 特性 Features

- 电流转换比(CTR)范围:  $\geq 20\%$  ( $I_F = \pm 1\text{mA}$ ,  $V_{CE} = 5\text{V}$ )  
Current transfer ratio:  $\geq 20\%$  ( $I_F = \pm 1\text{mA}$ ,  $V_{CE} = 5\text{V}$ )
- 输入-输出隔离电压 ( $V_{ISO} = 5000\text{ Vrms}$ )  
High isolation voltage between input and output ( $V_{ISO} = 5000\text{ Vrms}$ )
- 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 packageandschematic Diagram



Pin Configuration

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

## 产品型号命名规则 Order code

# AT 814 X-UN Y-W(V)(ZZ)

①      ②      ③      ④      ⑤      ⑥      ⑦      ⑧

① 公司代码 Company Code (AT: 奥特 Aote)

② 产品系列 Product Series ( 814: 814)

③ CTR 档位 Classification (代码 Code: A ,B or None)

④ 框架类型 Lead Frame ( Cu: 铜框架 Copper, Fe : 铁框架 Ferrum)

⑤ 树脂类型 Epoxy Type ( H: 无卤 Halogen-free )

⑥ 封装形式 Package ( D:DIP, S:SMD, M:DIP-M )

⑦ 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)

⑧ 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 “X” 代表产品分档：A、 B 或 空档  
“X” denotes the classification：A、 B 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                 | >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 <sub>IORM</sub> | 1500        | V <sub>peak</sub> | DIN/EN/IEC EN60747-5-5                                                                                     |
| 瞬态隔离电压<br>Transient isolation voltage | V <sub>IOTM</sub> | 7000        | V <sub>peak</sub> | DIN/EN/IEC EN60747-5-5                                                                                     |
| 隔离电压<br>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<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 <sub>F</sub>    | ±50           | mA               |
|                                | 功耗<br>Power Dissipation                                                          | P <sub>D</sub>    | 70            | mW               |
|                                | 额定值降低因子(在 Ta = 100°C 以上)<br>Power dissipation Derating factor (above Ta = 100°C) | P <sub>DD</sub>   | 2.9           | mW/°C            |
|                                | 热阻(结-环境)<br>Thermal Resistance Junction-Ambient                                  | R <sub>thJA</sub> | 325           | °C/W             |
|                                | 热阻(结-壳)<br>Thermal Resistance Junction-Case                                      | R <sub>thJC</sub> | 200           | °C/W             |
| 接收端<br>output                  | 集电极功耗<br>Collector Power Dissipation                                             | P <sub>C</sub>    | 150           | mW               |
|                                | 集电极电流<br>Collector Current                                                       | I <sub>C</sub>    | 50            | mA               |
|                                | 集电极-发射极电压<br>Collector-Emitter Voltage                                           | V <sub>CEO</sub>  | 80            | V                |
|                                | 发射极-集电极电压<br>Emitter - Collector Voltage                                         | V <sub>ECO</sub>  | 7             | V                |
| 总功耗<br>Total Power Dissipation |                                                                                  | P <sub>tot</sub>  | 200           | mW               |
| 隔离电压<br>Isolation Voltage      |                                                                                  | V <sub>iso</sub>  | 5000          | V <sub>rms</sub> |
| 工作温度<br>Operating Temperature  |                                                                                  | T <sub>opr</sub>  | -55 ~ +110    | °C               |
| 存储温度<br>Storage Temperature    |                                                                                  | T <sub>stg</sub>  | -55 ~ +125    | °C               |
| 焊接温度<br>Soldering Temperature  |                                                                                  | T <sub>sol</sub>  | 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                             | $V_F$         | $I_F = \pm 20\text{mA}$                                        | -                  | 1.2                | 1.4        | V             |
|                                     | 终端电容<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  | $BV_{CEO}$    | $I_C=0.1\text{mA}, I_F=0$                                      | 80                 | -                  | -          | V             |
|                                     | 发射极-集电极击穿电压<br>Emitter-Collector Breakdown Voltage  | $BV_{ECO}$    | $I_E=10\mu\text{A}, I_F=0$                                     | 7                  | -                  | -          | V             |
| 传输特性<br>Transfer<br>Characteristics | 电流传输比<br>Current Transfer Ratio                     | $CTR^*$       | $I_F = \pm 1\text{mA}, V_{CE}=5\text{V}$                       | 200                | -                  | 600        | %             |
|                                     | 集电极-发射极饱和压降<br>Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | $I_F = \pm 20\text{mA}, I_C=1\text{mA}$                        | -                  | 0.1                | 0.2        | V             |
|                                     | 隔离电阻<br>Isolation Resistance                        | $R_{SO}$      | 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            |
|                                     | 截至频率<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                                   | $T_r$         | $V_{CE}=2\text{V}, I_C=2\text{mA}, R_L=100\Omega$              | -                  | -                  | 18         | $\mu\text{s}$ |
|                                     | 下降时间<br>Fall Time                                   | $T_f$         | $V_{CE}=2\text{V}, I_C=2\text{mA}, R_L=100\Omega$              | -                  | -                  | 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 ( $I_F=1\text{mA}, V_{CE}=5\text{V}, T_a=25^\circ\text{C}$ )**

| 代码code                          | 分档classification | 最小值 Min | 最大值 Max |
|---------------------------------|------------------|---------|---------|
| 电流传输比<br>Current Transfer Ratio | A                | 50      | 150     |
|                                 | B                | 100     | 300     |
|                                 | None             | 20      | 300     |

## 典型光电特性曲线 Typical Electro-optical characteristics curves

Fig.1 Relative Current Transfer Ratio vs. Forward Current

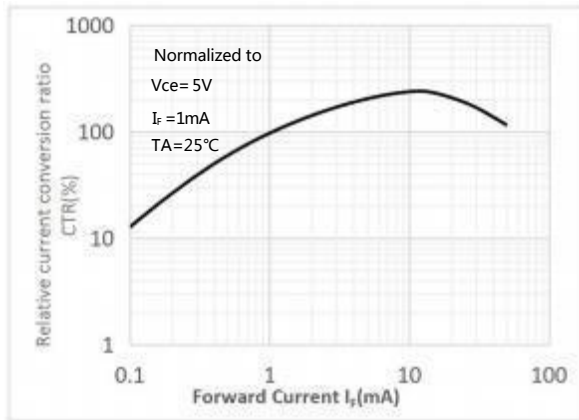


Fig.2 Forward Current vs Forward Voltage

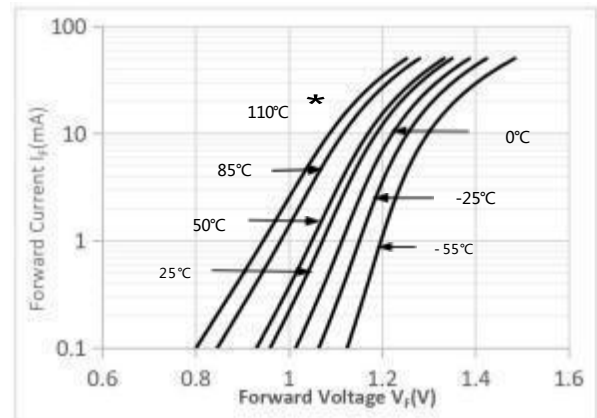


Fig.3 Collector Current vs. Collector-emitter Voltage

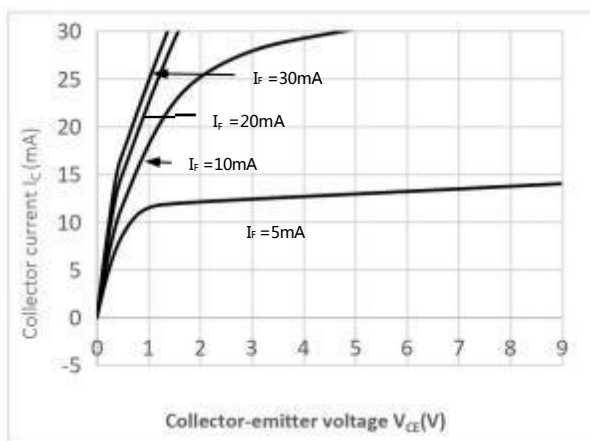


Fig.4 Relative Current Transfer Ratio vs. Ambient Temperature

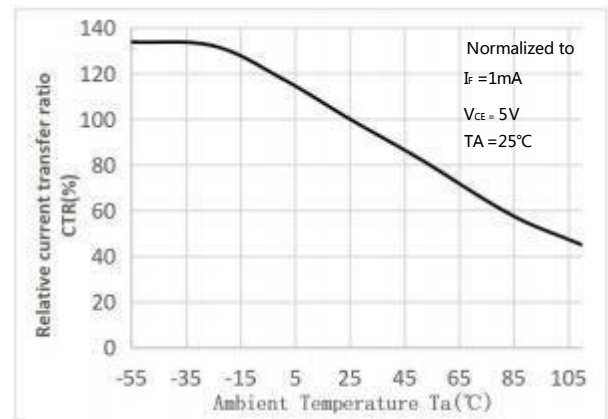


Fig.5 Collector-emitter Saturation Voltage vs. Ambient Temperature

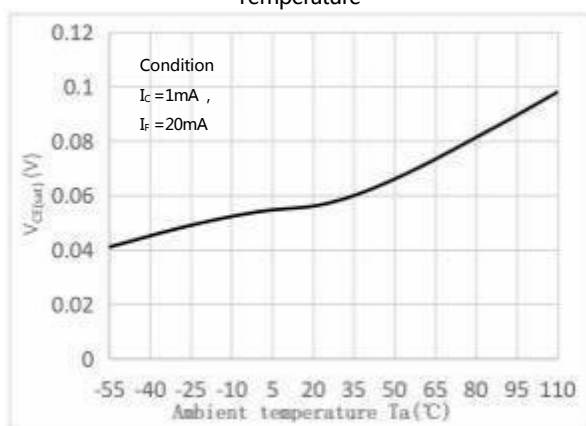


Fig.6 Collector Dark Current vs Ambient Temperature

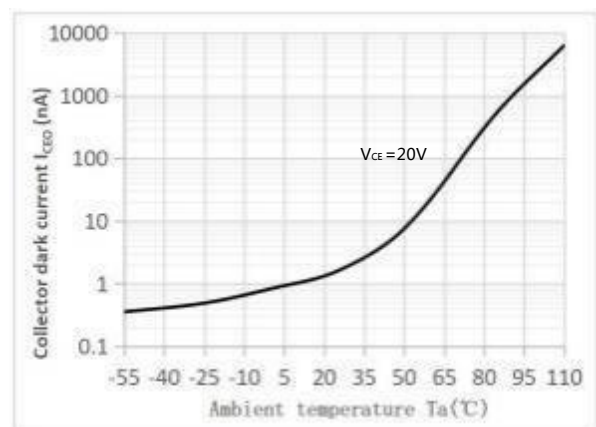


Fig.7 Response Time vs. Load Resistance

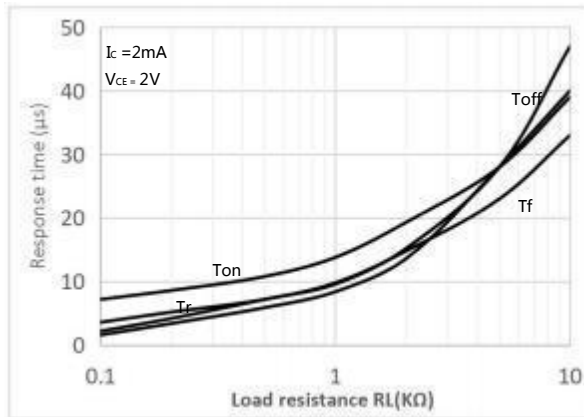


Fig.8 Frequency Response

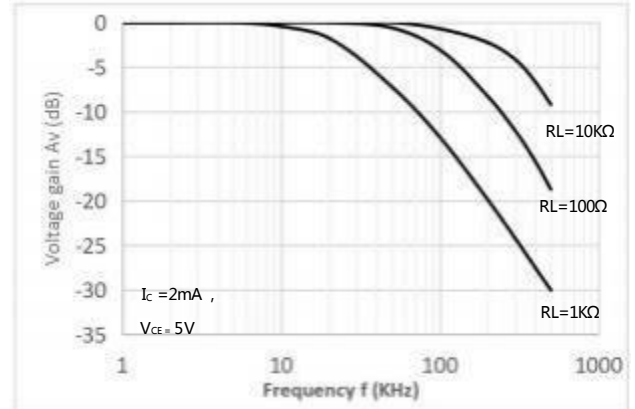


Fig.9 Collector-emitter Saturation Voltage vs. Forward Current

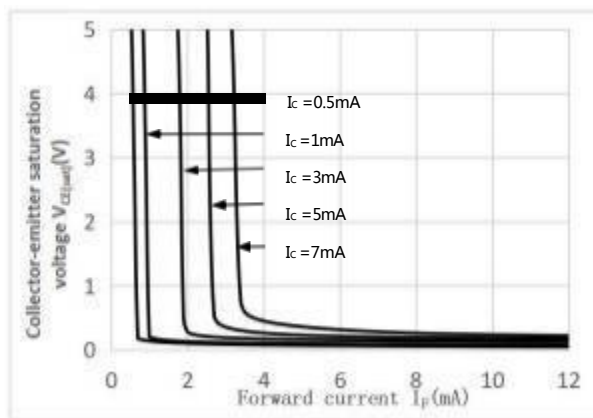
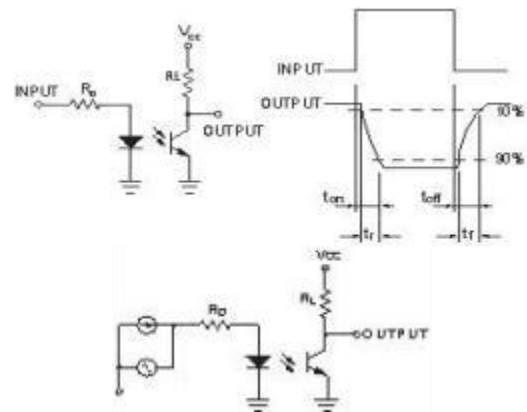
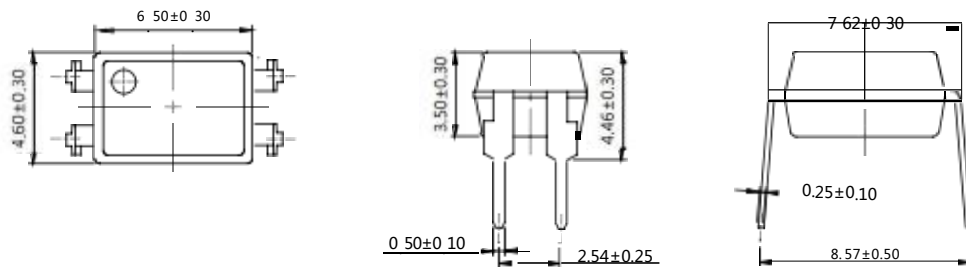


Fig.10 Test Circuits

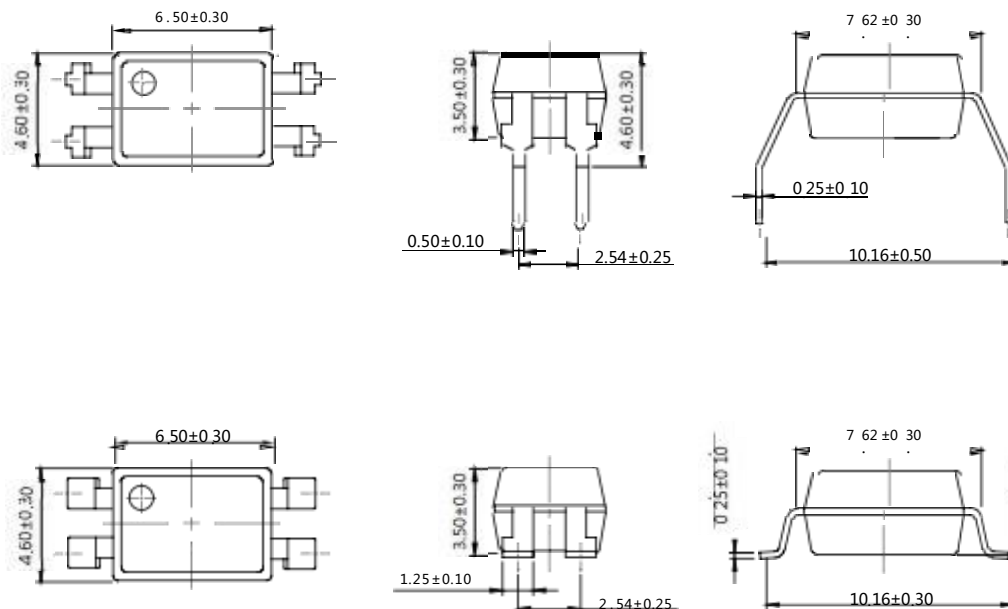


## 外形尺寸 Outline Dimensions

DIP4



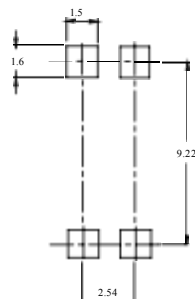
DIP4-M



SMD4

单位 Unit: mm

## 建议焊盘布局 Recommended pad Layout

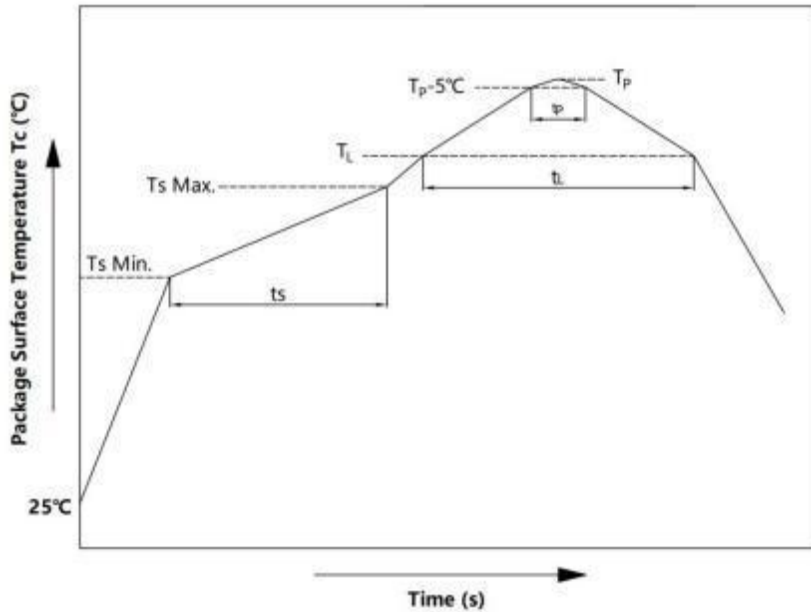


单位 Unit: mm

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



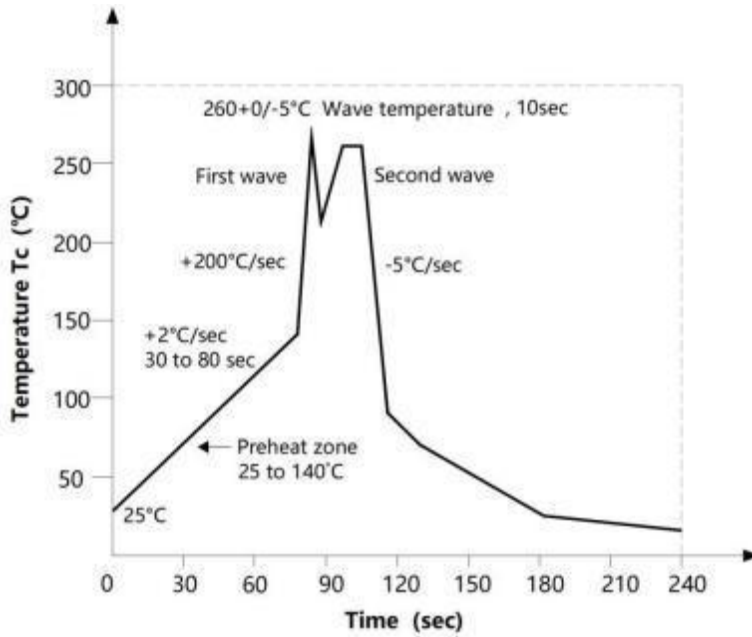
| 项目<br>Item                                                                                      | 符号<br>Symbol | 最小值<br>Min. | 最大值<br>Max. | 单位<br>Unit |
|-------------------------------------------------------------------------------------------------|--------------|-------------|-------------|------------|
| 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.

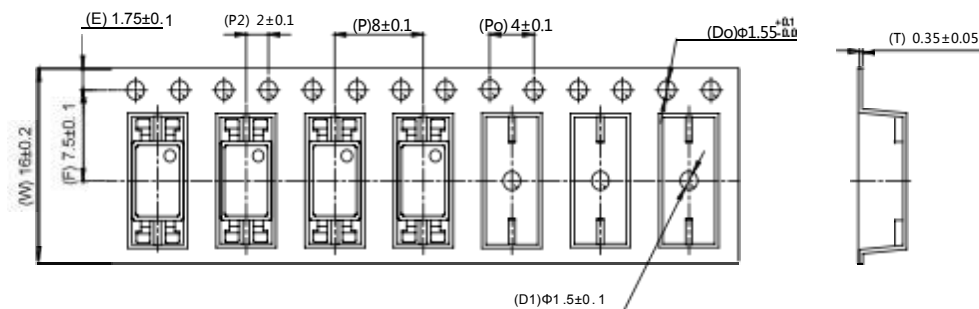
## 包装 packing

### ■ 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                                                                  |
|--------------|-------------------------------|-------------------|------------------|---------------------|------------------------------|-------------------|----------------------|---------------------------------------------------------------------|
| SMD4         | 卷盘<br>( $\phi 330$ mm蓝盘)      | 2000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                                                         |
| DIP4         | 管装<br>(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<br>(500*13*11mm)           | 100只/管            | 50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<br>( $\phi 330$ mm Blue) | 2000 pcs/reel     | 2 reels/box      | 10 boxes/ctn        | 450*390*0.1mm                | 340*60*340mm      | 620*360*365mm        | Leave at least 200mm of blank space at both ends                    |
| DIP4         | Tube<br>(500*12*11mm)         | 100 pcs/tube      | 50 tubes/box     | 10 boxes/ctn        | NA                           | 525*128*56mm      | 535*275*300mm        | Use blue and white rubber plugs for each tube in the same direction |
| DIP4-M       | Tube<br>(500*13*11mm)         | 100 pcs/tube      | 50 tubes/box     | 10 boxes/ctn        | NA                           | 525*136*58mm      | 535*295*310mm        |                                                                     |

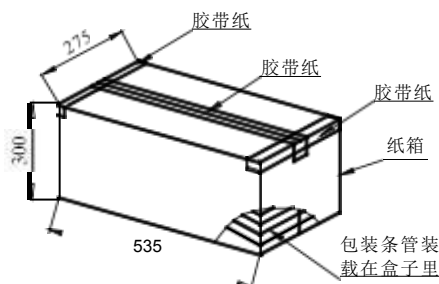
### ■ 编带包装Tape&Reel

- 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：50000只。  
Qty/ctn：50000 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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