



高速光耦

High Speed Photo
Coupler

AT075L

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

概述 Description

双通道 AT075L 由高速 LED 和 CMOS 检测芯片组成。最低数据传输速率达 15Mbit/s，具有卓越的高速性能和超低功耗。

Basic building blocks of AT075L (dual-channel) is high speed LEDs and CMOS detector ICs. It is 15Mbit/s CMOS opto-couplers. The optocouplers use the latest CMOS IC technology to achieve outstanding performance with very low power consumption.

特性 Features

- 高速响应 15 MBit/s
Very high speed – 15MBit/s
- 宽工作温度：-40°C ~105°C
-40°C to 105°C temperature range
- SOP8 封装
Packaging: SOP8
- 共模抑制能力至少达 10 kV/μs
10 kV/μs minimum common mode rejection
- 无短时脉冲电源启动功能
No short-time pulse power start function
- 符合安规标准：UL 1577，VDE DIN EN60747-5-5 (VDE 0884-5)，CQC11-471543-2022
Meet Safety standard：UL 1577, VDE DIN EN60747-5-5 (VDE 0884-5)，CQC11-471543-2022

应用 Applications

- 数字现场总线隔离
Digital field bus isolation
- 多路复用数据传输
Multiplexed data transmission
- 电脑外设接口
Computer peripheral interface
- 微处理器系统接口
Microprocessor system interface
- 直流/直流转换器
DC/DC converter

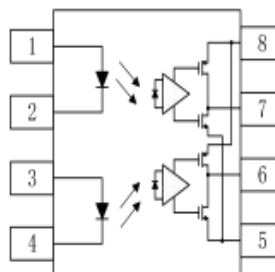
真值表 Truth table

| | |
|-----|----|
| LED | VO |
| OFF | H |
| ON | L |

封装和原理图 Package and Schematic Diagram



SOP8



Pin Configuration

- | | |
|--------------|--------|
| 1. Anode 1 | 8.VCC |
| 2. Cathode 1 | 7.VO 1 |
| 3. Cathode 2 | 6.VO 2 |
| 4. Anode 2 | 5.GND |

注：在引脚 5 和 8 之间必须连接一个 0.01 - 0.1uF 的旁路电容器。



Note: 0.01 - 0.1uF bypass capacitor must be connected between pins 5 and 8.

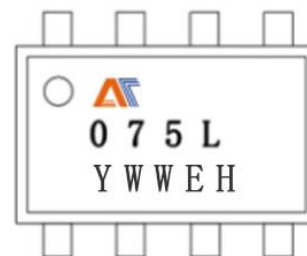
产品型号命名规则 Order Code
AT 075L - UN Y - W (V) (ZZ)

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 (075L)
- 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 “” 为奥特品牌 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 “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 | > 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 | V_{iso} | > 3750 | Vrms | For 1 min |

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

| 参数 Parameter | | 符号 Symbol | 最小值 Min. | 最大值 Max. | 单位 Unit |
|-------------------------------|-------------------------|--------------|-------------|-------------|------------|
| 输入 Input | 正向电流 Forward Current | I_F | - | 20 | mA |
| | 功耗 Power Dissipation | P_D | - | 35 | mW |
| 输出 Output | 电源电压 Supply Voltage | V_{DD} | - | 6 | V |
| | 输出电流 Output Current | I_O | - | 10 | mA |
| | 输出电压 Output Voltage | V_O | -0.5 | VDD+0.5 | V |
| | 功耗 Power Dissipation | P_O | - | 100 | mW |
| 隔离电压 Isolation voltage | | V_{iso} | - | 3750 | Vrms |
| 工作温度 Operating Temperature | | T_{opr} | -40 | +105 | °C |
| 存储温度 Storage Temperature | | T_{stg} | -55 | +125 | °C |
| 焊接温度 Soldering Temperature | | T_{sol} | - | +260 | °C |

推荐工作条件 Recommended Operating Conditions

| 参数 Parameter | 符号 Symbol | 最小值 Min. | 最大值 Max. | 单位 Unit |
|------------------------------------|--------------|-------------|-------------|------------|
| 电源电压 Supply Voltages | V_{DD} | 4.5 | 5.5 | V |
| | | 3 | 3.6 | V |
| 开启电流 Forward Input Current (ON) | $I_{F(ON)}$ | 9 | 18 | mA |
| 操作温度 Operating Temperature | T_A | -40 | 105 | °C |
| 电压转化速率 Supply Voltage Slew Rate | S_R | 0.5 | 500 | V/ms |

产品特性参数 Electro-optical Characteristics ($T_a = 25^\circ\text{C}$, $V_{DD} = 3.3\text{V}$)

| 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 | $I_F = 14\text{mA}$ | 1.3 | 1.46 | 1.8 | V |
| | 反向击穿电压 Reverse Breakdown Voltage | B_{VR} | $I_R = 10\mu\text{A}$ | 5 | 35 | - | V |
| 接收端 Output | 高电平输出电压 High Level Output Voltage | V_{OH} | $I_F = 0, I_O = -4\text{mA}, V_{DD} = 5\text{V}$ | $V_{DD}-1$ | 4.85 | - | V |
| | | | $I_F = 0, I_O = -4\text{mA}, V_{DD} = 3.3\text{V}$ | $V_{DD}-1$ | 3.1 | - | V |
| | 低电平输出电压 Low Level Output Voltage | V_{OL} | $I_F = 14\text{mA}, I_O = 4\text{mA}, V_{DD} = 5\text{V}$ | - | 0.07 | 0.8 | V |
| | | | $I_F = 14\text{mA}, I_O = 4\text{mA}, V_{DD} = 3.3\text{V}$ | - | 0.08 | 0.8 | V |
| | 输入阈值电流 Input Threshold Current | I_{TH} | $I_{OL} = 20\mu\text{A}$ | - | 3 | 5 | mA |
| | 高电平电源电流 High Output Supply Current | I_{DDH} | $I_F = 0$ | - | 9.4 | 12 | mA |
| | 低电平电源电流 Low Output Supply Current | I_{DDL} | $I_F = 14\text{mA}$ | - | 9.05 | 12 | mA |

开关特性 Switching Specification

| 参数 Parameter | 符号 Symbol | 条件 Condition | 最小 Min. | 典型 Typ. | 最大 Max. | 单位 Unit |
|---|---------------------|--|------------|------------|------------|------------|
| 逻辑高电平传播延迟 Propagation Delay Time to Logic High Output Level | T_{PLH} | $I_F=14mA, C_L=15\text{ pF}$ $V_{DD}=3.3V$ | - | 62 | 80 | ns |
| | | $I_F=14mA, C_L=15\text{ pF}$ $V_{DD}=5V$ | - | - | 80 | ns |
| 逻辑低电平传播延迟 Propagation Delay Time to Logic Low Output Level | T_{PHL} | $I_F=14mA, C_L=15\text{ pF}$ $V_{DD}=3.3V$ | - | 28 | 80 | ns |
| | | $I_F=14mA, C_L=15\text{ pF}$ $V_{DD}=5V$ | - | - | 80 | ns |
| 脉冲宽度 Pulse Width | T_{pw} | | 66.7 | - | - | ns |
| 脉宽失真 Pulse Width Distortion | $ T_{PLH}-T_{PHL} $ | $I_F=14mA, C_L=15\text{ pF}$ $V_{DD}=3.3V$ | - | 34 | 40 | ns |
| | | $I_F=14mA, C_L=15\text{ pF}$ $V_{DD}=5V$ | - | - | 40 | ns |
| 上升时间 (10%-90%) Rise Time (10%-90%) | T_r | $I_F=14mA, C_L=15\text{ pF}$ | - | 6 | - | ns |
| 下降时间 (90%-10%) Fall Time (90%-10%) | T_f | $I_F=14mA, C_L=15\text{ pF}$ | - | 4 | - | ns |
| 传输延迟差 $ T_{PLH}-T_{PHL} $ Propagation Delay Skew $ T_{PLH}-T_{PHL} $ | T_{PSK} | $I_F=14mA, C_L=15\text{ pF}$ | - | - | 30 | ns |
| 输出高电平共模抑制 Logic High Common Mode Transient Immunity | $ CM_H $ | $I_F=0mA$ $T_A=25^\circ C$, $ V_{CM} =1kV$ | 10 | 15 | - | kV/us |
| 输出低电平共模抑制 Logic Low Common Mode Transient Immunity | $ CM_L $ | $I_F=14mA$ $T_A=25^\circ C$, $ V_{CM} =1kV$ | 10 | 15 | - | kV/us |
| 隔离电阻 Isolation resistance | R_{i-o} | $V_{iH}=500V$, 40~60%R.H. | - | 1012 | - | Ω |
| 隔离电容 Isolation Capacitance | C_{i-o} | $V=0, F=1MHz$ | - | 0.6 | - | pF |

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

Fig.1 Forward current vs. Forward Voltage

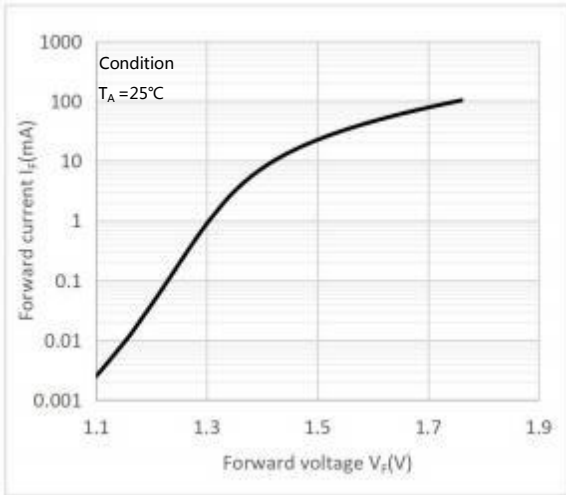


Fig.2 Input threshold current vs. Ambient temperature

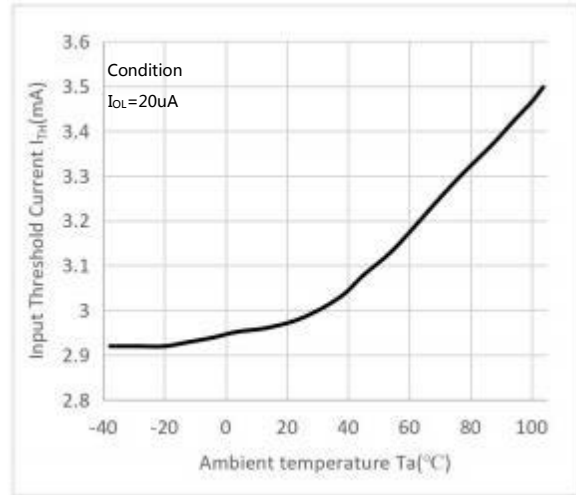


Fig.3 High output supply current vs. Ambient temperature

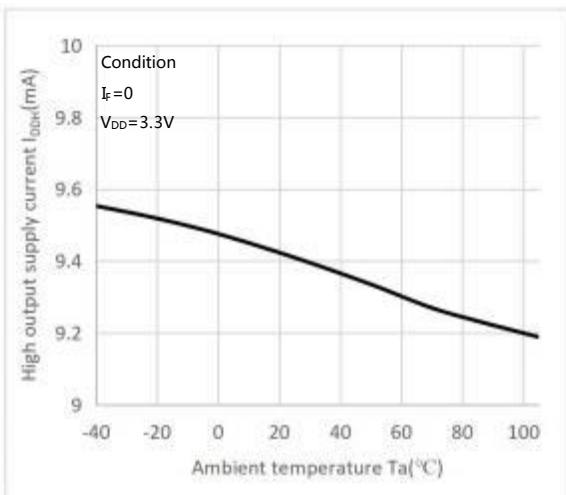


Fig.4 Low output supply current vs. Ambient temperature

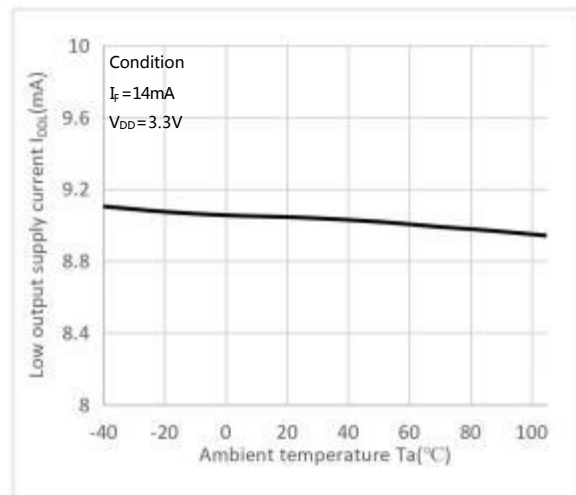


Fig.5 Propagation delay vs. Pulse input current

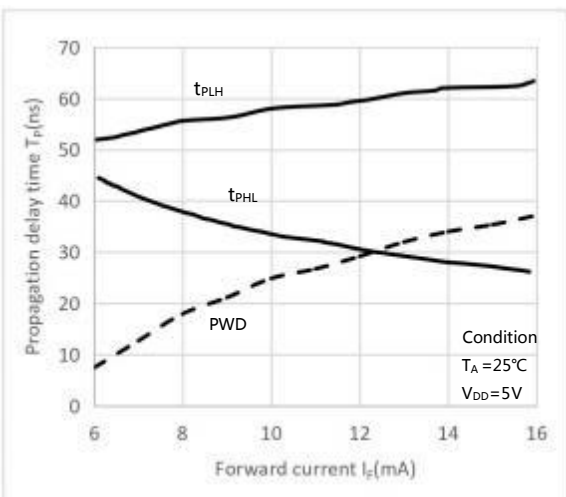


Fig.6 Propagation delay vs. Pulse input current

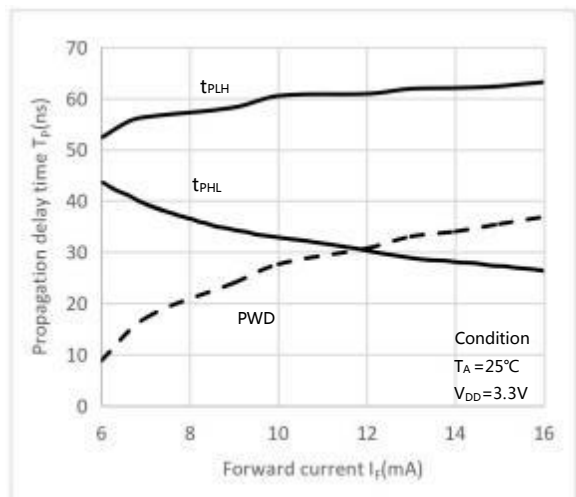


Fig.7 Forward voltage vs. Ambient temperature

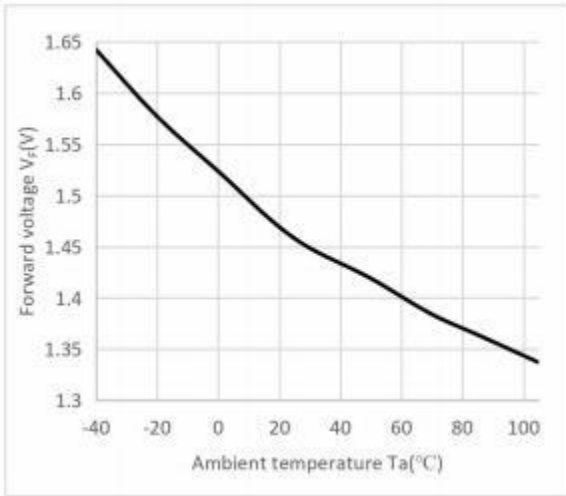


Fig.8 Propagation delay vs. Ambient temperature

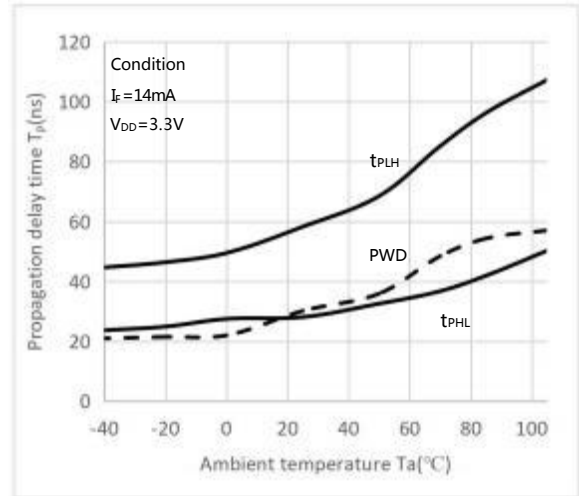
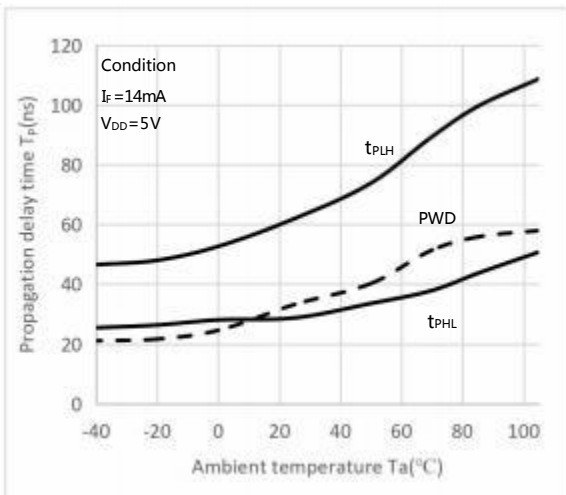
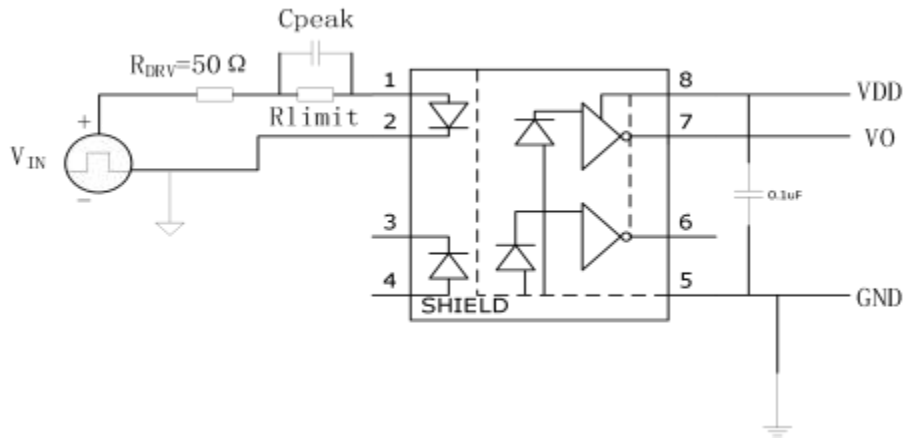


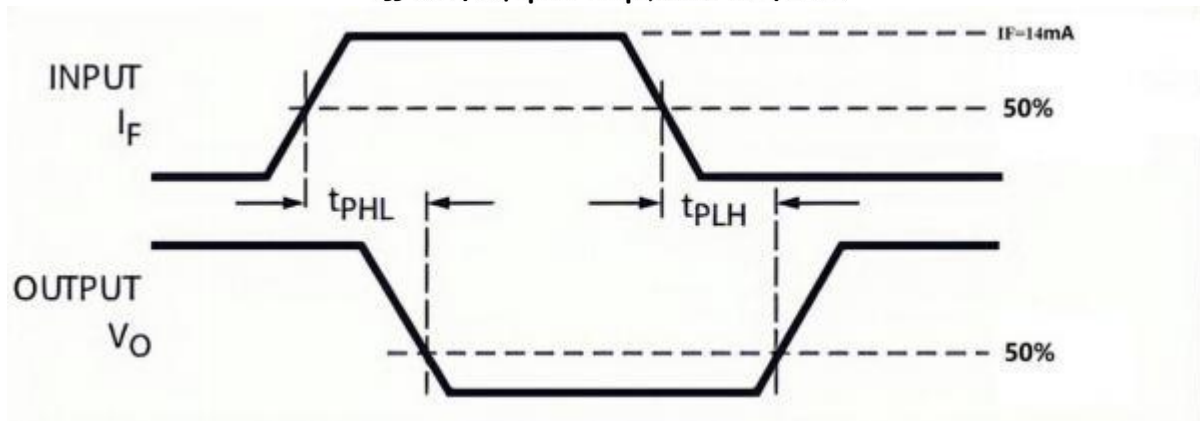
Fig.9 Propagation delay vs. Ambient temperature



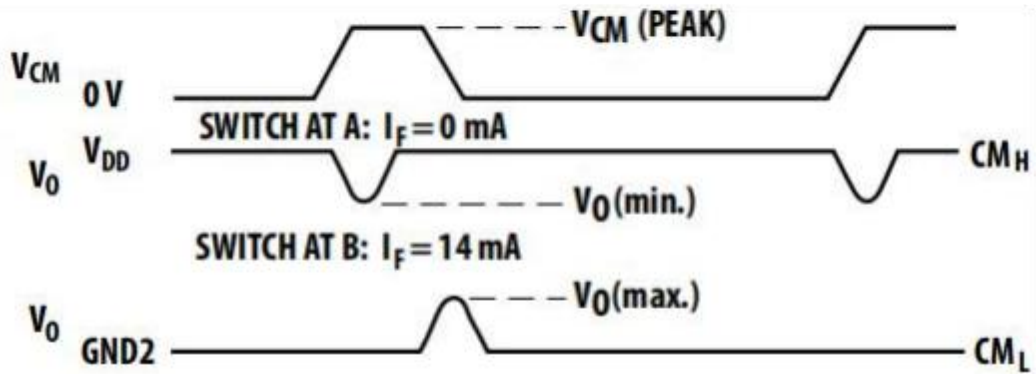
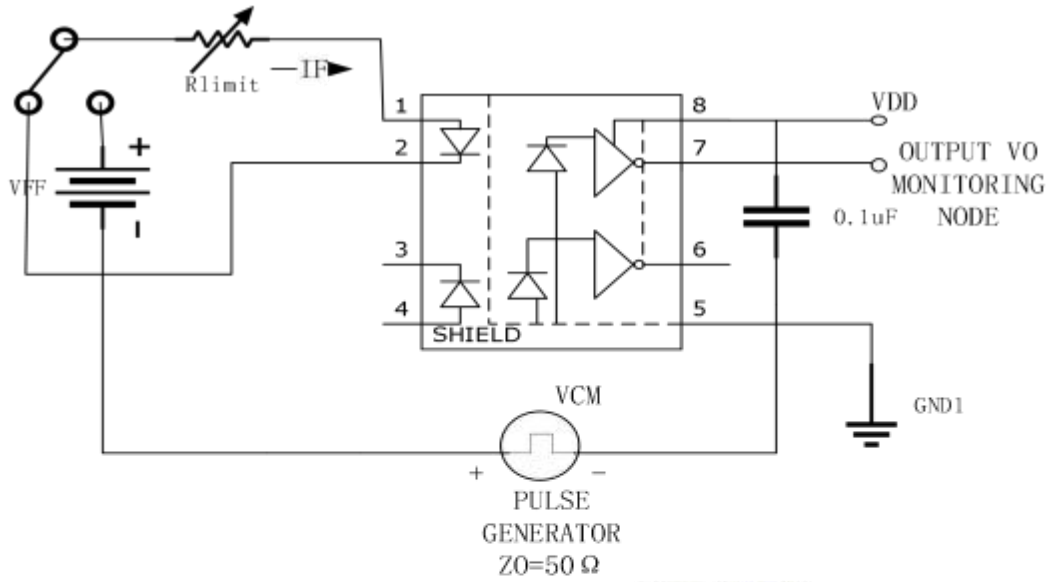
延迟时间测试电路 Propagation Delay Time Test Circuit



$V_{DD}=3.3V / 5V, C_{peak}=100pF, R_{limit}=80\Omega / 210\Omega$

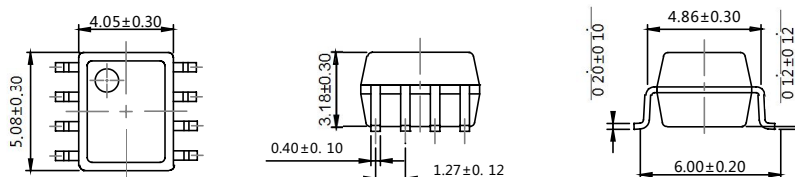


CMR 测试电路 Test Circuit for Common Mode Transient Immunity



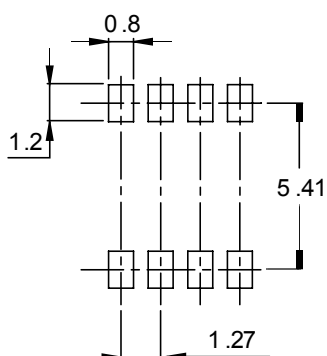
外形尺寸 Outline Dimensions

SOP8



单位 Unit: mm

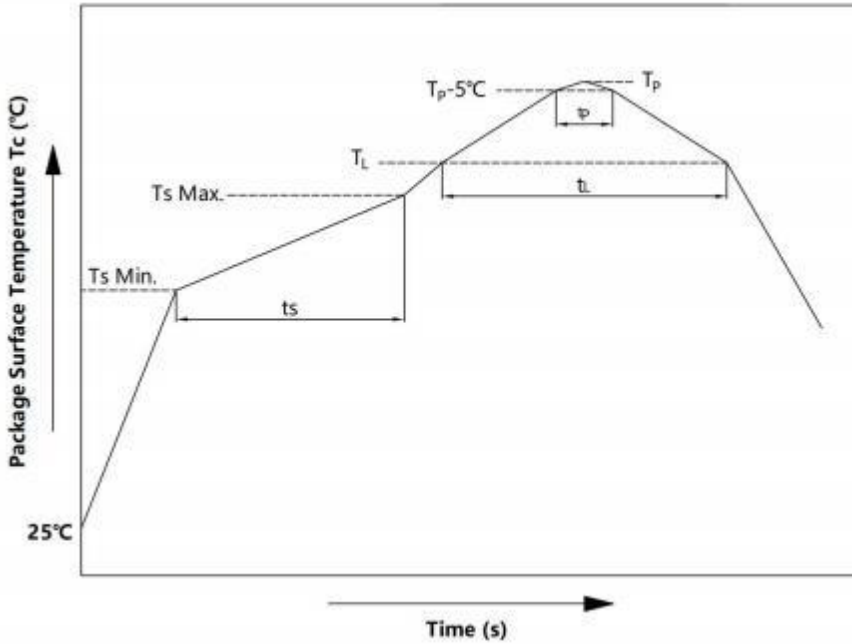
建议焊盘布局 Recommended Pad Layout



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


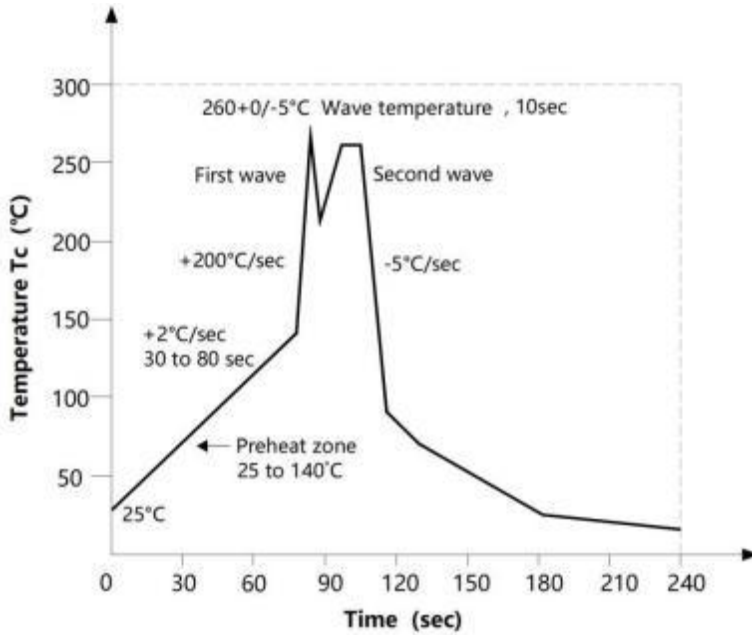
| 项目 Item | 符号 Symbol | 最小值 Min. | 最大值 Max. | 单位 Unit |
|---|--------------|-------------|-------------|------------|
| 预热温度 Preheat Temperature | T_s | 150 | 200 | °C |
| 预热时间 Preheat Time | t_s | 60 | 120 | s |
| 升温速率 Ramp-Up Rate (T_L to T_P) | - | - | 3 | °C/s |
| 液相线温度 Liquidus Temperature | T_L | 217 | | °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 | °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 | °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.

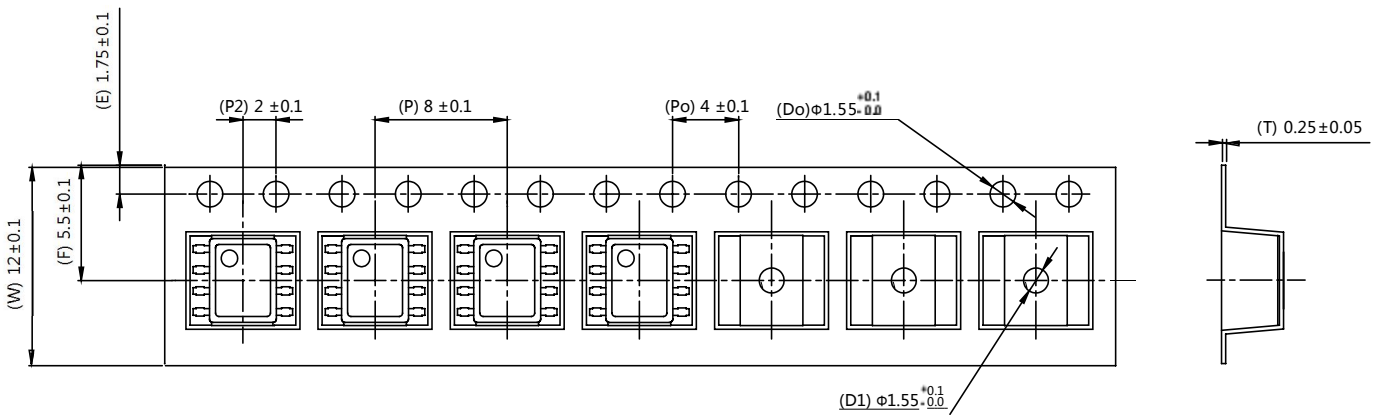
包装 Packing

■ 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 |
|--------------|-------------------------------|-------------------|------------------|---------------------|------------------------------|-------------------|----------------------|--------------------------|
| SOP8 | 编带 ($\phi 330$ mm 蓝盘) | 2k /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 |
| SOP8 | Reel ($\phi 330$ mm Blue) | 2k 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：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：2reels/box
- 4) 示意图 Schematic：



单位 Unit：mm

注意 Attention

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