



ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-060L

Customer: _____

Date: _____

SHENZHEN ORIENT COMPONENTS CO., LTD

Block A 3rd Floor No.4 Building, Tian'an Cyber Park, Huangge Rd, LongGang Dist, Shenzhen, GD

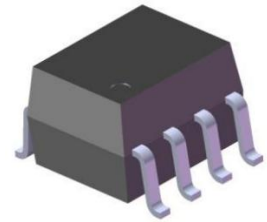
TEL: 0755-29681816

FAX: 0755-29681200

www.orient-opto.com

1. Features

- (1) 3.3V/5V Dual Supply Voltages
- (2) Low power consumption
- (3) 15 kV/μs minimum Common Mode Rejection (CMR) at VCM = 1000 V
- (4) High speed: 15 MBd typical
- (5) LVTTL/LVCMOS compatible
- (6) Low input current capability: 5 mA
- (7) Guaranteed AC and DC performance over temperature: -40°C to +85°C
- (8) Safety approval



- UL approved(No.E323844)
- VDE approved(No.40029733)
- CQC approved (No.CQC19001231254)

- (9) In compliance with RoHS, REACH standards
- (10) MSL Level 1

2. Description

The OR-060L are optically coupled gates that combine a GaAsP light emitting diode and an integrated high gain photo detector. An enable input allows the detector to be strobed. The output of the detector IC is an open collector Schottky-clamped transistor. The internal shield provides a guaranteed common mode transient immunity specification of 15 kV/μs at 3.3V.

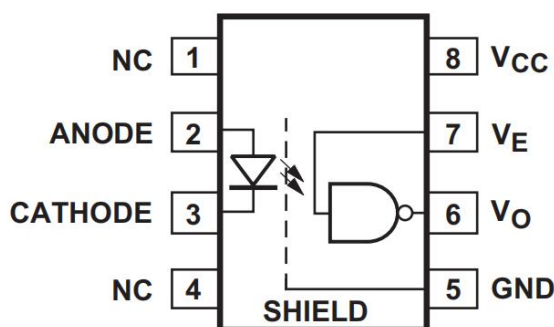
This unique design provides maximum AC and DC circuit isolation while achieving LVTTL/LVCMOS compatibility. The optocoupler AC and DC operational parameters are guaranteed from -40 C to +85 C allowing trouble-free system performance.

These optocouplers are suitable for high speed logic interfacing, input/output buffering, as line receivers in environments that conventional line receivers cannot tolerate and are recommended for use in extremely high ground or induced noise environments.

3. Application Range

- (1) Isolated line receiver
- (2) Computer-peripheral interfaces
- (3) Microprocessor system interfaces
- (4) Digital isolation for A/D, D/A conversion
- (5) Switching power supply
- (6) Instrument input/output isolation
- (7) Ground loop elimination
- (8) Pulse transformer replacement
- (9) Field buses

4. Functional Diagram



**TRUTH TABLE
(POSITIVE LOGIC)**

| LED | ENABLE | OUTPUT |
|-----|--------|--------|
| ON | H | L |
| OFF | H | H |
| ON | L | H |
| OFF | L | H |
| ON | NC | L |
| OFF | NC | H |

5. Absolute Maximum Ratings (Ta=25°C)

| Parameter | | Symbol | Ratings | Unit |
|---------------------------------|--|------------------|----------------------|------------------|
| INPUT | Forward Current* ¹ | I _F | 20 | mA |
| | Reverse Voltage | V _R | 5 | V |
| | Input Power Dissipation | P _I | 40 | mW |
| OUTPUT | Supply Voltage | V _{CC} | 7 | V |
| | Enable Input Voltage (Not to Exceed V _{CC} by more than 500 mV) | V _E | V _{CC} +0.5 | V |
| | Enable Input Current | I _E | 8 | mA |
| | Output Collector Current | I _O | 50 | mA |
| | Output Collector Voltage | V _O | 7 | V |
| | Output Collector Power Dissipation | P _O | 85 | mW |
| Isolation Voltage* ² | | V _{ISO} | 3750 | V _{rms} |
| Operating Ambient Temperature | | T _{Opr} | -40 to +85 | °C |
| Storage Temperature | | T _{stg} | -55 to +125 | °C |

(1) Reduced to 0.3 mA/°C at T_A = 70°C or more.

(2) AC voltage for 1 minute at T_A = 25°C, RH = 60% between input and output.

Pins 1-3 shorted together, 4-6 shorted together.

6. Electrical Optical Characteristics at Ta=25°C

| Parameter | Sym. | Min. | Typ. | Max. | Units | Test Conditions |
|-------------------------------------|----------------------------------|------|------|------|-------|--|
| High Level Output Current | I _{OH} | - | 4.5 | 50 | μA | V _{CC} = 3.3 V, V _E = 2.0 V, V _O = 3.3 V, I _F = 250 μA |
| Input Threshold Current | I _{TH} | - | 3.0 | 5.0 | mA | V _{CC} = 3.3 V, V _E = 2.0 V, V _O = 0.6 V, I _{OL} (Sinking) = 13 mA |
| Low Level Output Voltage | V _{OL} | - | 0.35 | 0.6 | V | V _{CC} = 3.3 V, V _E = 2.0 V, I _F = 5 mA, I _{OL} (Sinking) = 13 mA |
| High Level Supply Current | I _{CCH} | - | 4.7 | 7.0 | mA | V _E = 0.5 V I _F = 0 mA |
| Low Level Supply Current | I _{CCL} | - | 7.0 | 10.0 | mA | V _E = 0.5 V I _F = 10 mA |
| High Level Enable Current | I _{EH} | - | -0.5 | -1.2 | mA | V _{CC} = 3.3 V, V _E = 2.0 V |
| Low Level Enable Current | I _{EL} | - | -0.5 | -1.2 | mA | V _{CC} = 3.3 V, V _E = 0.5 V |
| High Level Enable Voltage | V _{EH} | 2.0 | - | - | V | |
| Low Level Enable Voltage | V _{EL} | - | - | 0.8 | V | |
| Input Forward Voltage | V _F | 1.4 | 1.5 | 1.75 | V | T _A = 25°C, I _F = 10 mA |
| Input Reverse Breakdown Voltage | BV _R | 5 | - | - | V | I _R = 10 μA |
| Input Diode Temperature Coefficient | ΔV _F /ΔT _A | - | -1.6 | - | mV°C | I _F = 10 mA |
| Input Capacitance | C _{IN} | - | 60 | - | pF | f = 1 MHz, V _F = 0 V |

Over Recommended Operating Conditions (T_A = -40°C to +85°C, 2.7V ≤ V_{CC} ≤ 3.6V) unless otherwise specified. All Typical at V_{CC} = 3.3 V, T_A = 25°C. All enable test conditions apply to single channel products only.

7. Electrical Specifications (DC)

| Parameter | Sym. | Min. | Typ. | Max. | Units | Test Conditions |
|-------------------------------------|---------------------------|------|------|------|----------------|--|
| High Level Output Current | I_{OH} | - | 5.5 | 100 | μA | $V_{CC} = 5.5 V, V_O = 5.5 V, I_{FL} = 250 \mu A$ |
| Input Threshold Current | I_{TH} | - | 2.0 | 5.0 | mA | $V_{CC} = 5.5 V, V_O = 0.6 V, I_{OL} > 13 mA$ |
| Low Level Output Voltage | V_{OL} | - | 0.35 | 0.6 | V | $V_{CC} = 5.5 V, I_F = 5 mA, I_{OL}(\text{Sinking}) = 13 mA$ |
| High Level Supply Current | I_{CCH} | - | 7.0 | 10.0 | mA | $V_E = 0.5 V, V_{CC} = 5.5 V, I_F = 0 mA$ |
| | | - | 6.5 | - | | $V_E = V_{CC}, V_{CC} = 5.5 V, I_F = 0 mA$ |
| Low Level Supply Current | I_{CCL} | - | 9.0 | 13.0 | mA | $V_E = 0.5 V, V_{CC} = 5.5 V, I_F = 0 mA$ |
| | | - | 8.5 | - | | $V_E = V_{CC}, V_V = 5.5 V, I_F = 0 mA$ |
| High Level Enable Current | I_{EH} | - | -0.7 | -1.6 | mA | $V_{CC} = 5.5 V, V_E = 2.0 V$ |
| Low Level Enable Current | I_{EL} | - | -0.9 | -1.6 | mA | $V_{CC} = 5.5 V, V_E = 0.5 V$ |
| High Level Enable Voltage | V_{EH} | 2.0 | - | - | V | |
| Low Level Enable Voltage | V_{EL} | - | - | 0.8 | V | |
| Input Forward Voltage | V_F | 1.4 | 1.5 | 1.75 | V | $T_A = 25^\circ C, I_F = 10 mA$ |
| Input Reverse Breakdown Voltage | BV_R | 5 | - | - | V | $I_R = 10 \mu A$ |
| Input Diode Temperature Coefficient | $\Delta V_F / \Delta T_A$ | - | -1.6 | - | MV/ $^\circ C$ | $I_F = 10 mA$ |
| Input Capacitance | C_{IN} | - | 60 | - | pF | $f = 1 MHz, V_F = 0 V$ |

Over recommended operating conditions ($T_A = -40^\circ C$ to $+85^\circ C, 4.5V \leq V_{DD} \leq 5.5V$) unless otherwise specified. All typicals at $V_{CC} = 5 V, T_A = 25^\circ C$.

8. Switching Specifications

| Parameter | Sym. | Min. | Typ. | Max. | Units | Test Conditions |
|--|-----------------------|------|------|------|-------|--|
| Propagation Delay Time to High Output Level | t_{PLH} | - | - | 90 | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Propagation Delay Time to Low Output Level | t_{PHL} | - | - | 75 | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Pulse Width Distortion | $ t_{PHL} - t_{PLH} $ | - | - | 25 | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Propagation Delay Skew | t_{PSK} | - | - | 40 | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Output Rise Time (10-90%) | t_r | - | 45 | - | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Output Fall Time (90-10%) | t_f | - | 20 | - | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Propagation Delay Time of Enable from V_{EH} to V_{EL} | t_{ELH} | - | 45 | - | ns | $R_L = 350 \Omega$, $C_L = 15 \text{ pF}$, $V_{EL} = 0 \text{ V}$, $V_{EH} = 3 \text{ V}$ |
| Propagation Delay Time of Enable from V_{EL} to V_{EH} | t_{EHL} | - | 30 | - | ns | $R_L = 350 \Omega$, $C_L = 15 \text{ pF}$, $V_{EL} = 0 \text{ V}$, $V_{EH} = 3 \text{ V}$ |

Over Recommended Operating Conditions ($T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$), $I_F = 7.5 \text{ mA}$ unless otherwise specified. All Typical at $T_A = 25^\circ\text{C}$, $V_{CC} = 3.3 \text{ V}$.

9. Switching Specifications (AC)

| Parameter | Sym. | Min. | Typ. | Max. | Units | Test Conditions |
|--|-----------------------|------|------|------|-------|--|
| Propagation Delay Time to High Output Level | t_{PLH} | 20 | 48 | 75 | ns | $T_A = 25^\circ\text{C}$, $R_L = 350 \Omega$, $C_L = 15 \text{ pF}$ |
| Propagation Delay Time to Low Output Level | t_{PHL} | 25 | 50 | 75 | ns | $T_A = 25^\circ\text{C}$, $R_L = 350 \Omega$, $C_L = 15 \text{ pF}$ |
| Pulse Width Distortion | $ t_{PHL} - t_{PLH} $ | - | 3.5 | 35 | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Propagation Delay Skew | t_{PSK} | - | - | 40 | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Output Rise Time (10-90%) | t_r | - | 24 | - | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Output Fall Time (90-10%) | t_f | - | 10 | - | ns | $R_L = 350 \Omega$ $C_L = 15 \text{ pF}$ |
| Propagation Delay Time of Enable from V_{EH} to V_{EL} | t_{ELH} | - | 30 | - | ns | $R_L = 350 \Omega$, $C_L = 15 \text{ pF}$, $V_{EL} = 0 \text{ V}$, $V_{EH} = 3 \text{ V}$ |
| Propagation Delay Time of Enable from V_{EL} to V_{EH} | t_{EHL} | - | 20 | - | ns | $R_L = 350 \Omega$, $C_L = 15 \text{ pF}$, $V_{EL} = 0 \text{ V}$, $V_{EH} = 3 \text{ V}$ |

Over recommended operating conditions $T_A = -40^\circ\text{C}$ to 85°C , $4.5 \leq V_{CC} \leq 5.5\text{V}$, $I_F = 7.5 \text{ mA}$ unless otherwise specified. All typicals at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

| Parameter | Sym. | Min. | Typ. | Max. | Units |
|--|------|------|------|-------|--|
| Output High Level Common Mode Transient Immunity | CMH | 15 | 25 | kV/μs | V _{CC} = 3.3 V, I _F = 0 mA, V _{O(MIN)} = 2 V, R _L = 350 Ω, T _A = 25°C, V _{CM} = 1000 V and V _{CM} = 10V |
| Output Low Level Common Mode Transient Immunity | CML | 15 | 25 | kV/μs | V _{CC} = 3.3 V, I _F = 7.5 mA, V _{O(MAX)} = 0.8 V, R _L = 350 Ω, T _A = 25°C, V _{CM} = 1000 V and V _{CM} = 10V |
| Output High Level Common Mode Transient Immunity | CMH | 10 | 15 | kV/μs | V _{CC} = 5 V, I _F = 0 mA, V _{O(MIN)} = 2 V, R _L = 350 Ω, T _A = 25°C, V _{CM} = 1000 V |
| Output Low Level Common Mode Transient Immunity | CML | 10 | 15 | kV/μs | V _{CC} = 5 V, I _F = 7.5 mA, V _{O(MAX)} = 0.8 V, R _L = 350 Ω, T _A = 25°C, V _{CM} = 1000 V |

10. Order Information

Part Number

OR-060L-Y-Z

Note

060L = Part Number.

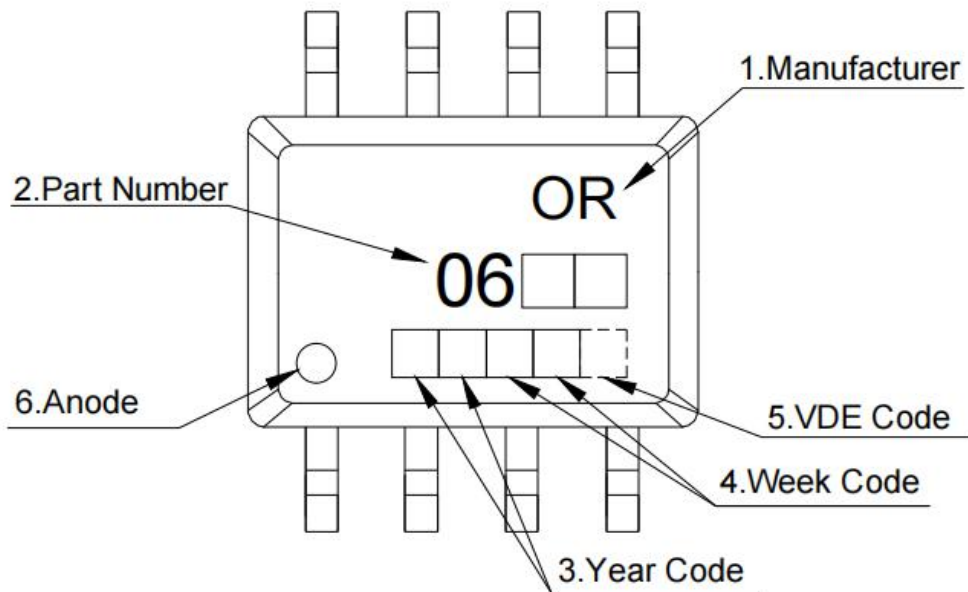
Y = Tape and reel option (TA,TA1 or none).

Z = ‘V’ code for VDE safety (This options is not necessary).

* VDE Code can be selected.

| Option | Description | Packing quantity |
|--------|--|---------------------|
| S(TA) | Surface mount lead form (low profile) + TA tape & reel option | 1000 units per reel |
| S(TA1) | Surface mount lead form (low profile) + TA1 tape & reel option | 1000 units per reel |

11. Naming Rule

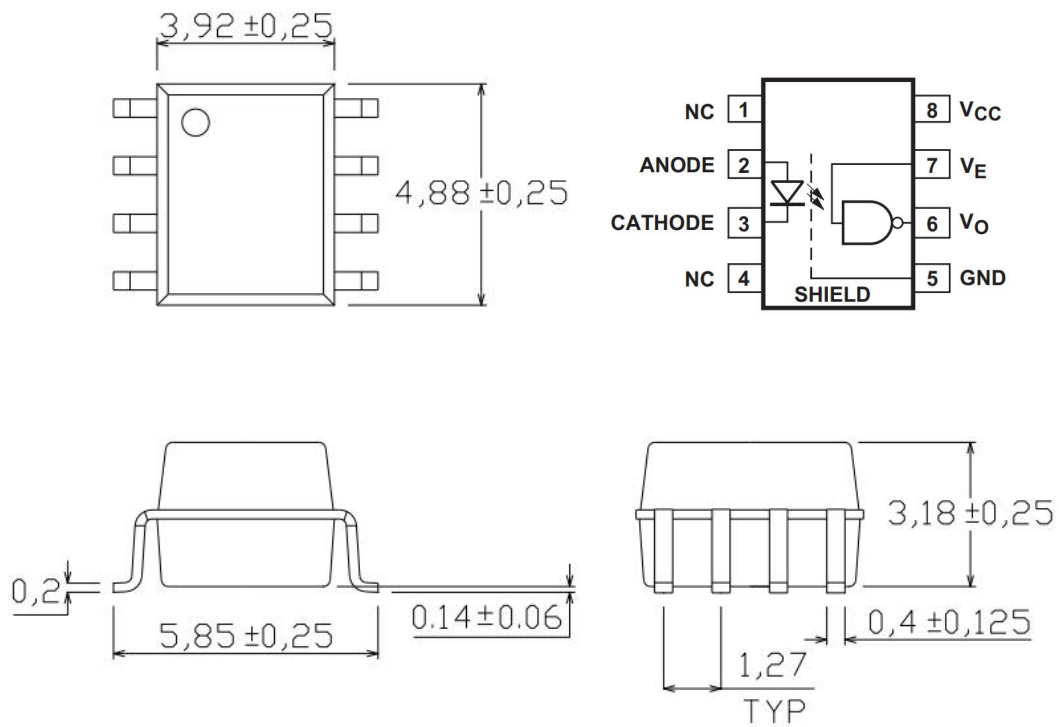


1. Manufacturer : ORIENT.
2. Part Number : 060L.
3. Year Code : '21' means '2021' and so on.
4. Week Code : 01 means the first week, 02 means the second week and so on.
5. VDE Code (Optional)
6. Anode.

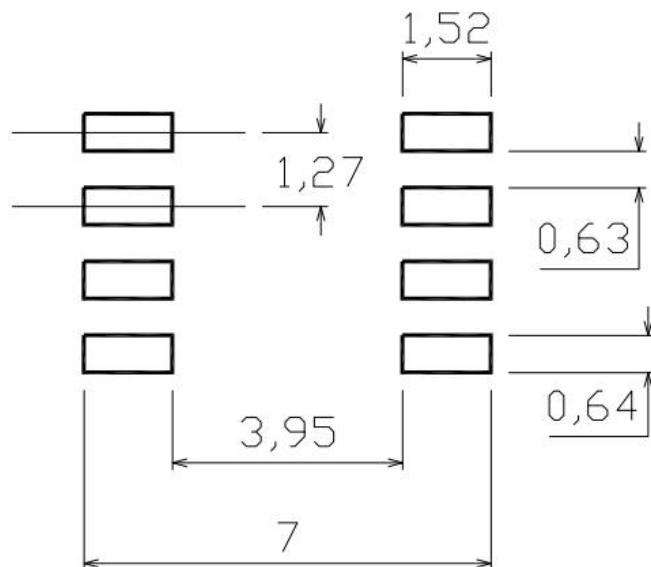
* VDE Mark can be selected.

12. Package Dimension

OR-060L



13. Recommended Foot Print Patterns (Mount Pad)

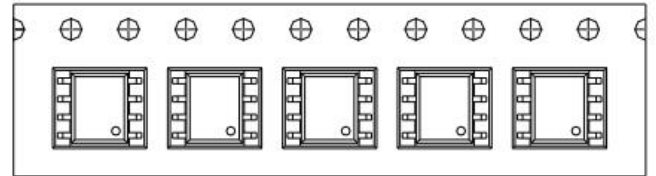
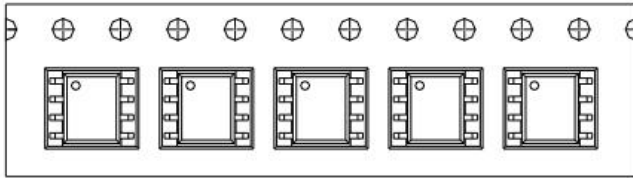


unit: mm

14. Taping Dimensions

(1)OR-06XX-TA1

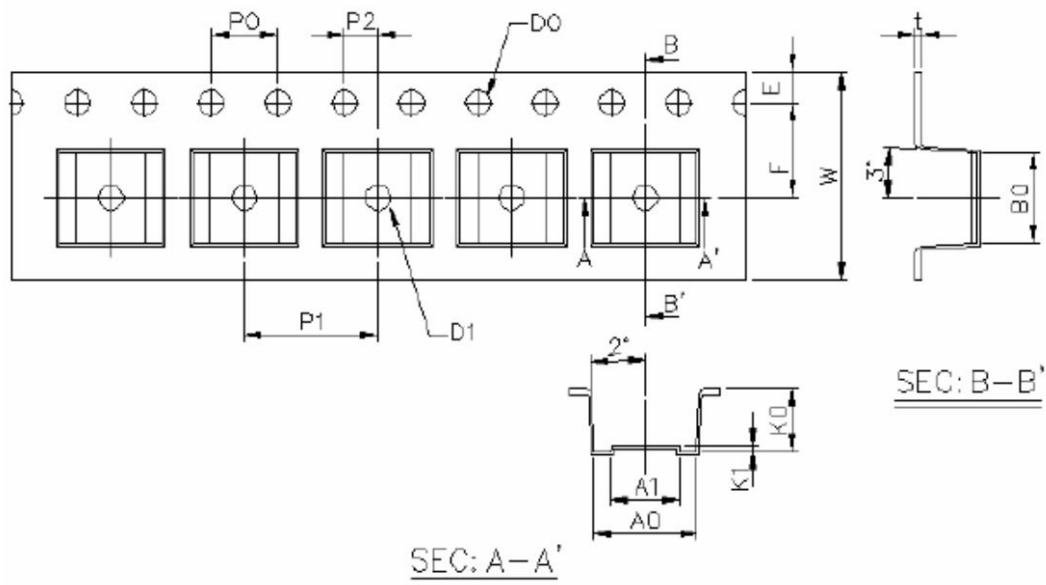
(2)OR-06XX-TA



Direction of feed from reel



Direction of feed from reel



| | | | | | | | |
|---------------|-----------|-----------|-----------|-----------|-------------------|-----------|-----------|
| Dimension No. | A0 | A1 | B0 | D0 | D1 | E | F |
| Dimension(mm) | 6.2±0.1 | 4.1±0.1 | 5.28±0.1 | 1.5±0.1 | 1.5±0.3 | 1.75±0.1 | 5.5±0.1 |
| Dimension No. | Po | P1 | P2 | t | W | K0 | K1 |
| Dimension(mm) | 4.0±0.1 | 8.0±0.1 | 2.0±0.1 | 0.4±0.1 | 12.0+0.3/ -0.1 | 3.7±0.1 | 0.3±0.1 |

| | |
|--------------------|--------|
| Encapsulation type | TA1/TA |
| amount (pcs) | 2000 |

15. Package Dimension

(1) package dimension


| Packing Information | |
|-----------------------------|---------------|
| Packing type | Reel type |
| Tape Width | 12mm |
| Qty per Reel | 2,000pcs |
| Small box (inner) Dimension | 345*345*45mm |
| Large box (Outer) Dimension | 480x360x360mm |
| Max qty per small box | 4,000pcs |
| Max qty per large box | 40,000pcs |

(2)Packing Label Sample



Material Code : 120PCXXXXXX
 P/N : OR-XXXXXX
Lot No. : XXXXXX-XXXXX-TX-X
D/C : XXXX
Qty : XXXX PCS





内箱码

外箱码

“XXXXXXXXXXXXXXXXXX” (一体机序列码)

Made in China

Note:

1. Material Code :Product ID.
2. P/N :Contents with "Order Information" in the specification.
3. Lot No. :Product data.
4. D/C :Product weeks.
5. Quantity :Packaging quantity.

16. Reliability Test

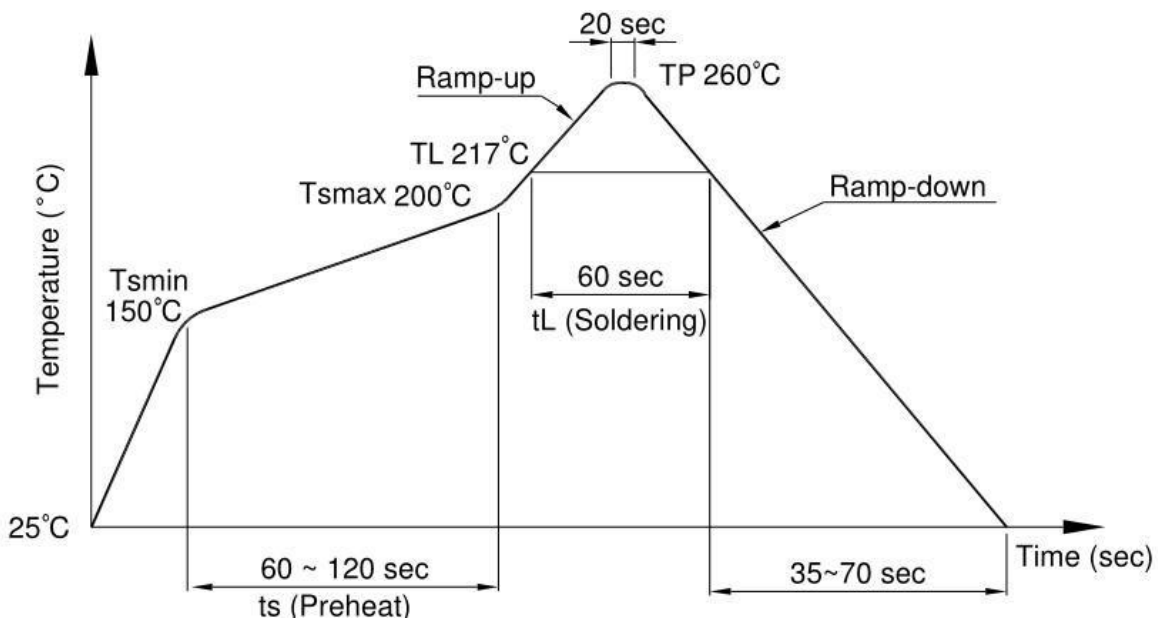
| NO. | ITEMS | Reliability Testing | | | | |
|-----|---------------------|---------------------|---|--------------|---------------------------|-------------|
| | | QTY. (Pcs) | Condition | Process | Device | Standard |
| 1 | RSH 耐焊接热 | 22 | 260±5°C | 5s/3 次 | 锡炉 | JESD22-A106 |
| 2 | HTSL 高温存储 | 77 | 125°C | 168 hrs | 高温烤箱 测试仪 | JESD22-A103 |
| | | | | 500 hrs | | |
| | | | | 1000 hrs | | |
| 3 | LTSL 低温存储 | 77 | -40°C | 168 hrs | 低温箱 测试仪 | JESD22-A119 |
| | | | | 500 hrs | | |
| | | | | 1000 hrs | | |
| 4 | TC 温度循环 | 77 | H:125°C 15min ↓5min L:-55°C 15min | 300 cycle | 冷热冲击 机 | JESD22-A104 |
| 5 | TS 温度冲击 | 77 | H:100°C 5min ↓15s L:-40°C 5min | 300 cycle | 冷热冲击 机 | JESD22-A106 |
| 6 | HTOL 高温操作 | 77 | 100°C IF=10mA Vcc=5V | 168 hrs | 高温烤箱 测试仪、 老化电路 板 | JESD22-A108 |
| | | | | 500 hrs | | |
| | | | | 1000 hrs | | |
| 7 | ESD- HBM 人体模式 | 22 | ≥8KV 1Cycle | 1次 | ESD静电 测试仪 | JESD22-A114 |
| 8 | SD 可焊性 | 22 | Pb-free 245±5°C | 5s/1次 | 锡炉 | JESD22-B102 |
| 9 | HTHB 温湿寿命 试验 | 77 | 85°C,85%RH IF=10mA,Vcc=5V | 168 hrs | 恒温恒湿 机, 测试 仪 | JESD22-A101 |
| | | | | 500 hrs | | |
| | | | | 1000 hrs | | |
| 10 | Autoclave 压力锅 | 77 | Ta=121 °C,100%RH,2atm | 96hrs | 压力锅 | JESD22-A102 |

17. Temperature Profile Of Soldering

(1).IR Reflow soldering (JEDEC-STD-020C compliant)

One time soldering reflow is recommended within the condition of temperature and time profile shown below. Do not solder more than three times.

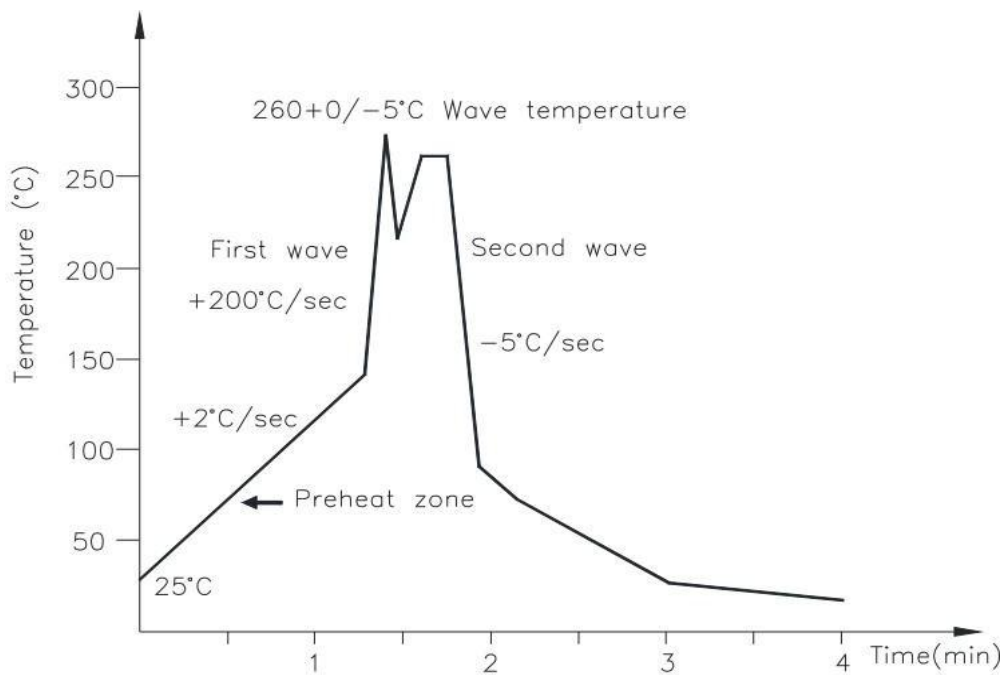
| Profile item | Conditions |
|---|-----------------------------|
| Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts) | 150°C 200°C 90±30 sec |
| Soldering zone - Temperature (TL) - Time (t L) | 217°C 60 sec |
| Peak Temperature | 260°C |
| Peak Temperature time | 20 sec |
| Ramp-up rate | 3°C / sec max. |
| Ramp-down rate from peak temperature | 3~6°C / sec |
| Reflow times | ≤3 |



(3) .Wave soldering (JEDEC22A111 compliant)

One time soldering is recommended within the condition of temperature.

| | |
|---------------------|--------------|
| Temperature | 260+0/-5°C |
| Time | 10 sec |
| Preheat temperature | 5 to 140°C |
| Preheat time | 30 to 80 sec |



(3).Hand soldering by soldering iron

Allow single lead soldering in every single process. One time soldering is recommended.

| | |
|-------------|------------|
| Temperature | 380+0/-5°C |
| Time | 3 sec max |

18. CHARACTERISTICS CURVES (TYPICAL PERFORMANCE)

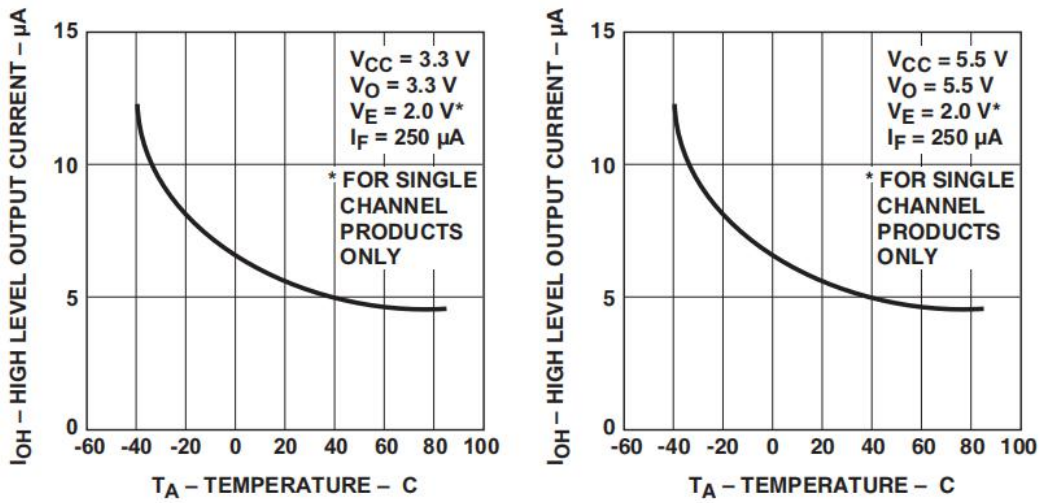


Figure 1. Typical high level output current vs. temperature.

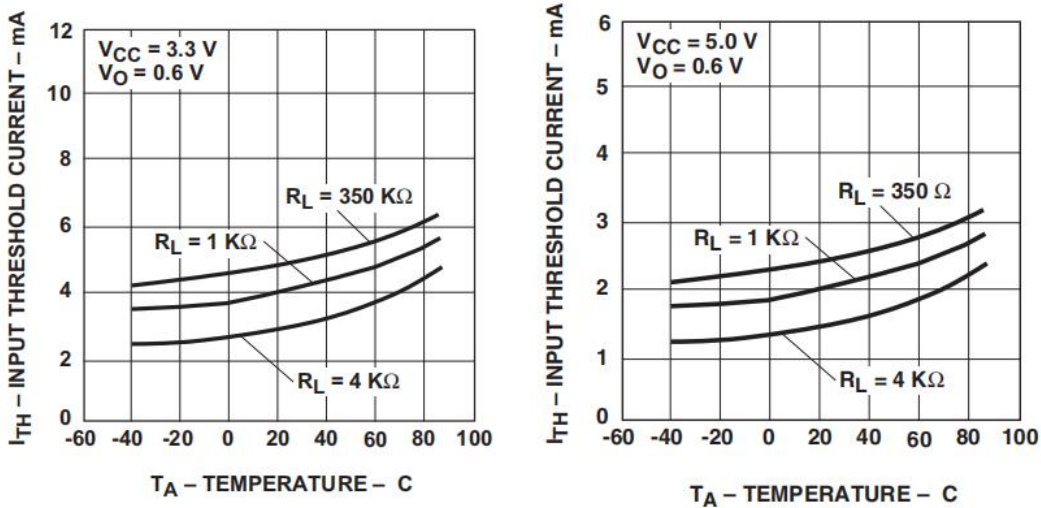


Figure 2. Typical output voltage vs. forward input current.

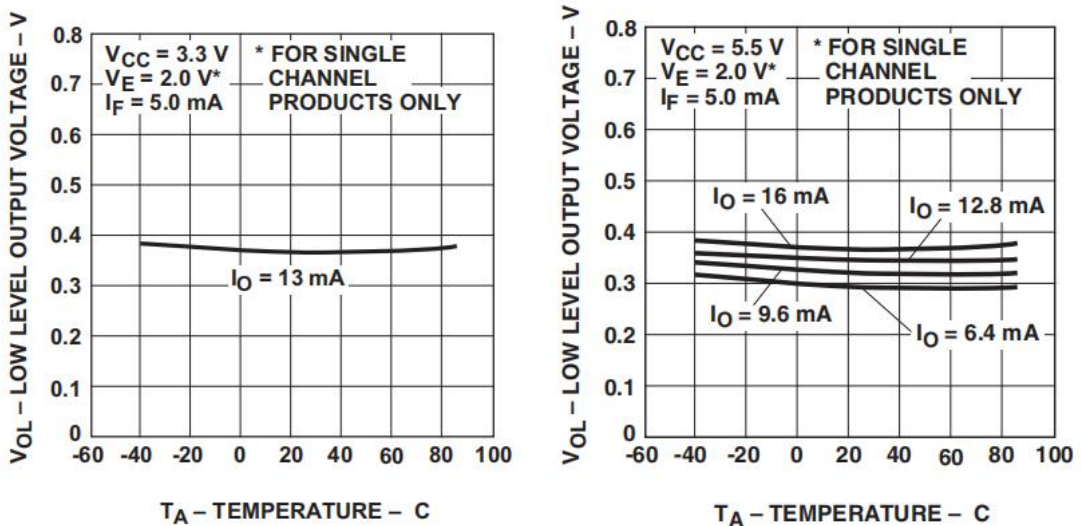


Figure 3. Typical low level output voltage vs. temperature.

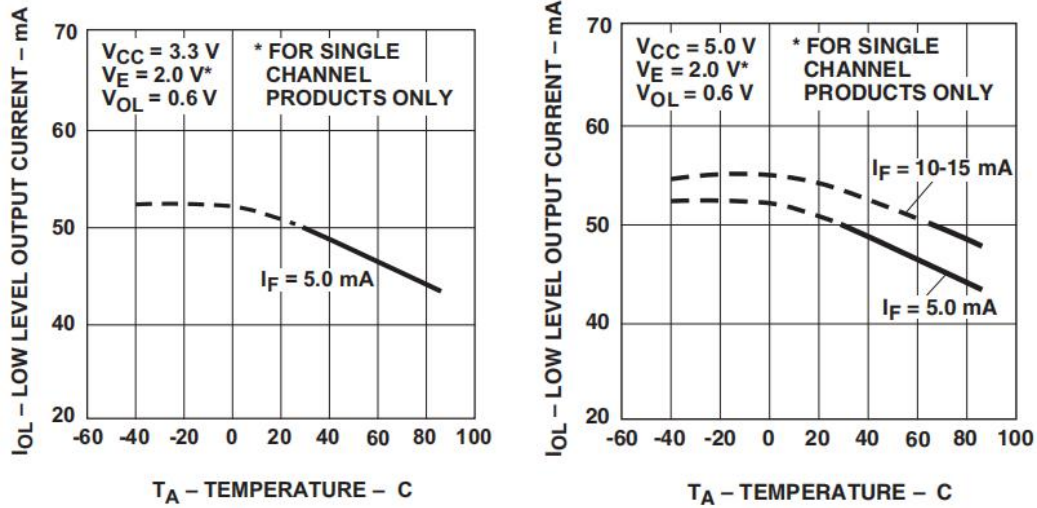


Figure 4. Typical low level output current vs. temperature.

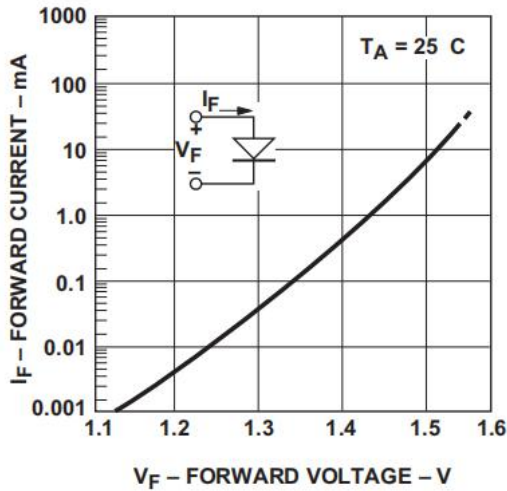


Figure 5. Typical input diode forward characteristic.

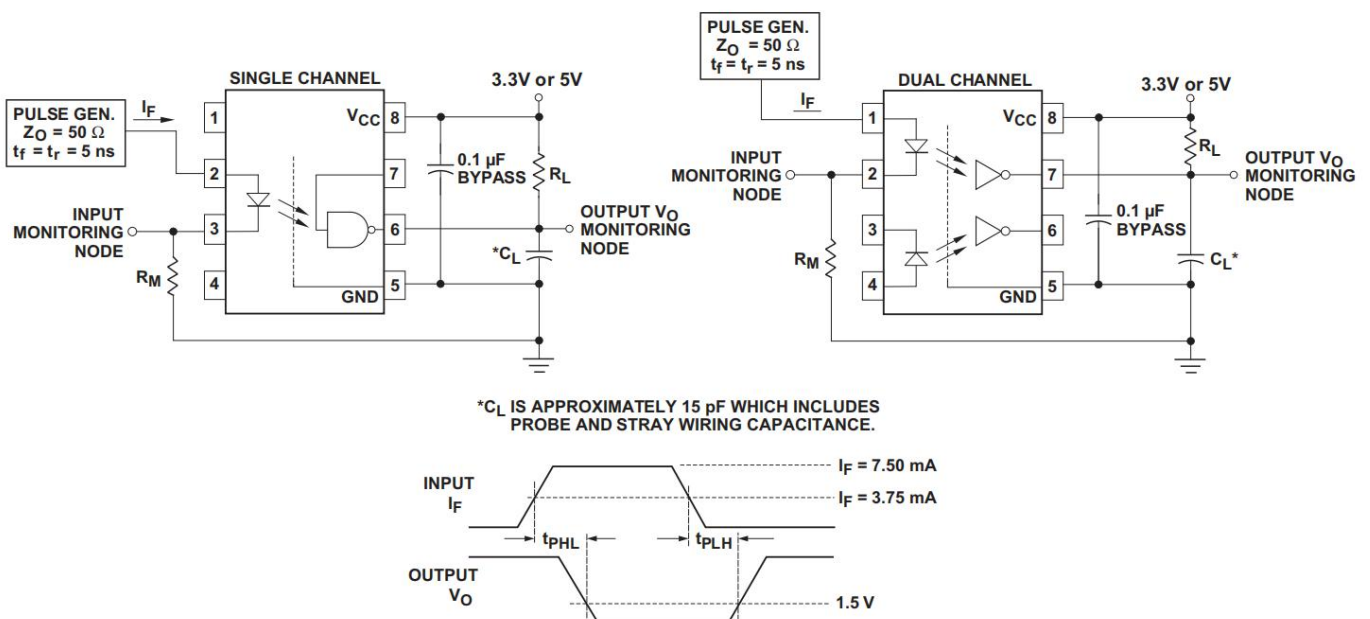


Figure 6. Test circuit for t_{PHL} and t_{PLH} .

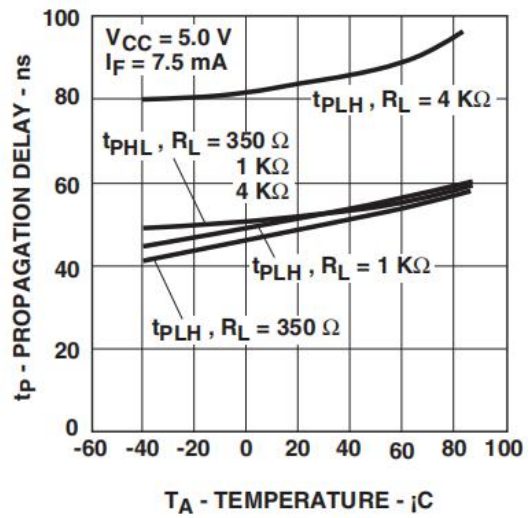
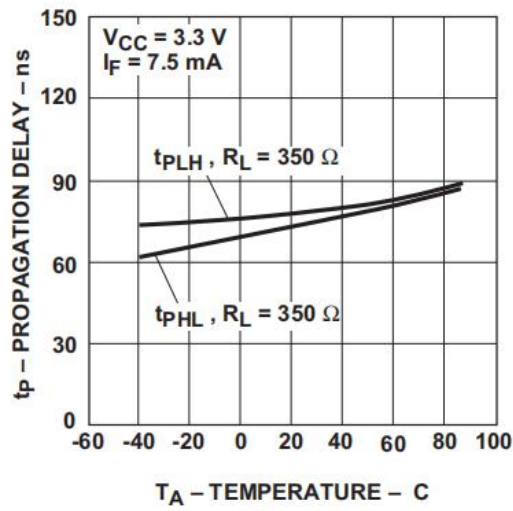


Figure 7. Typical propagation delay vs. temperature.

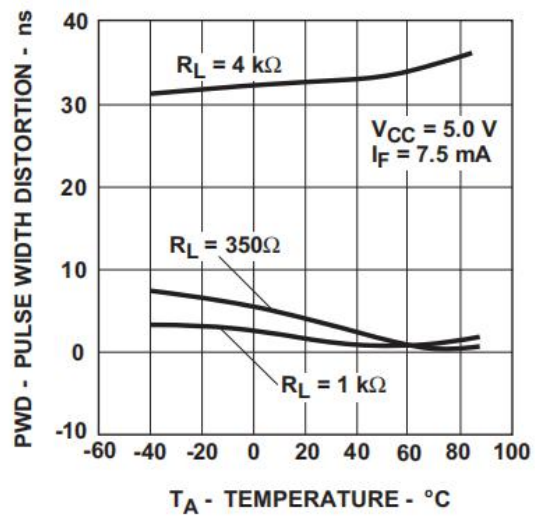
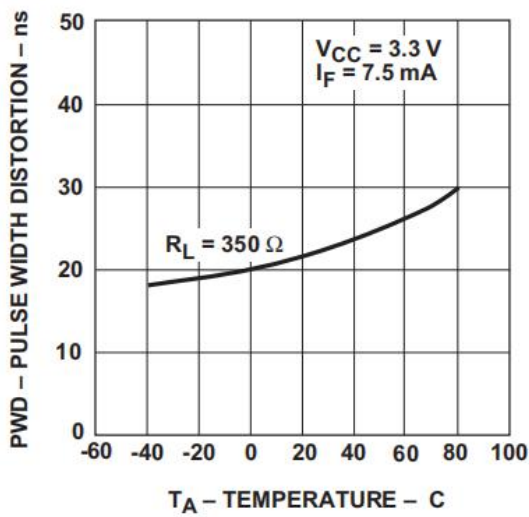


Figure8. Typical pulse width distortion vs. temperature.

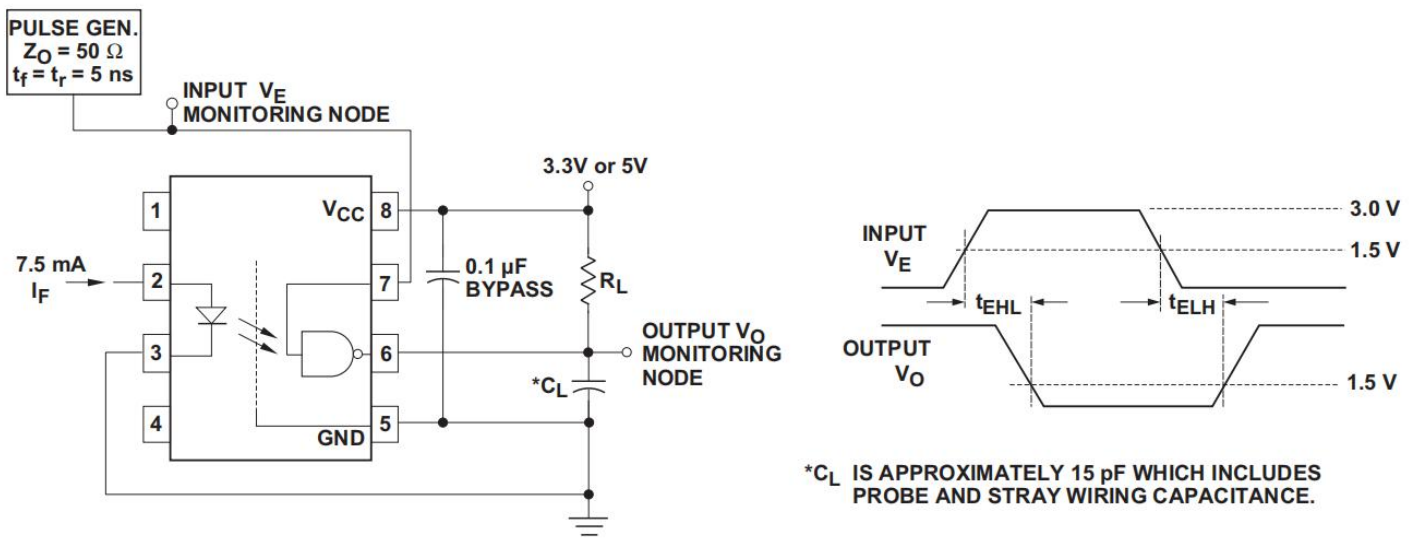


Figure 9. Test circuit for t_{EHL} and t_{ELH} .

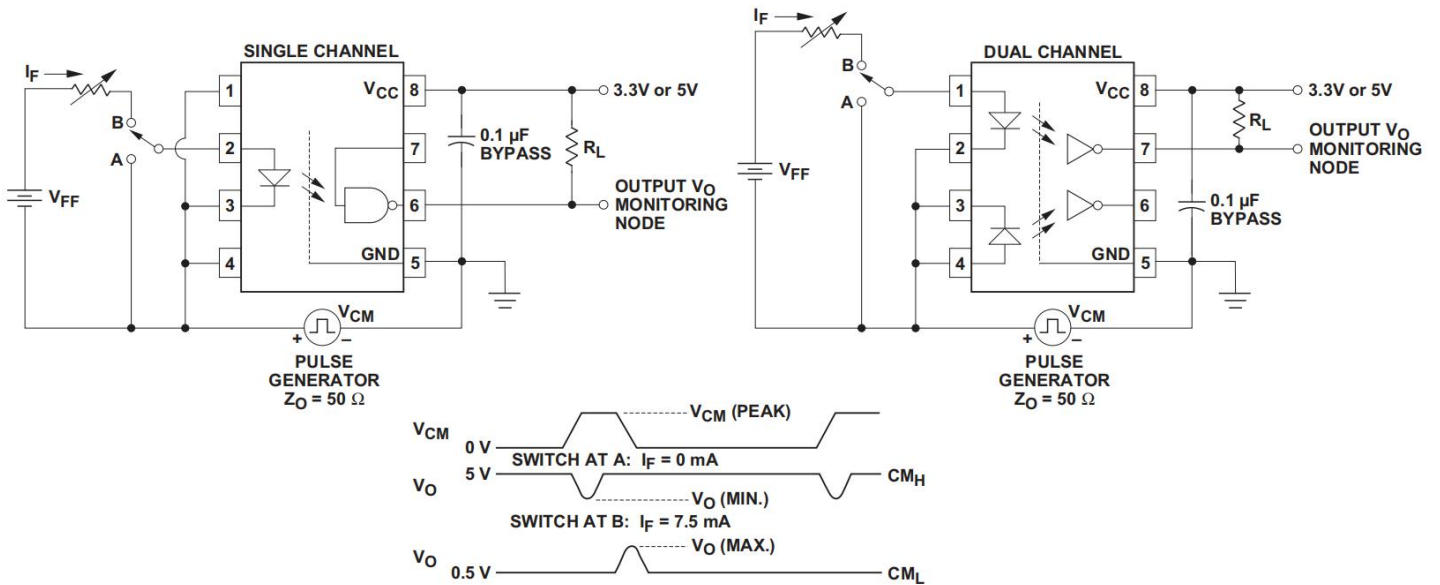


Figure 10. Test circuit for common mode transient immunity and typical waveforms.

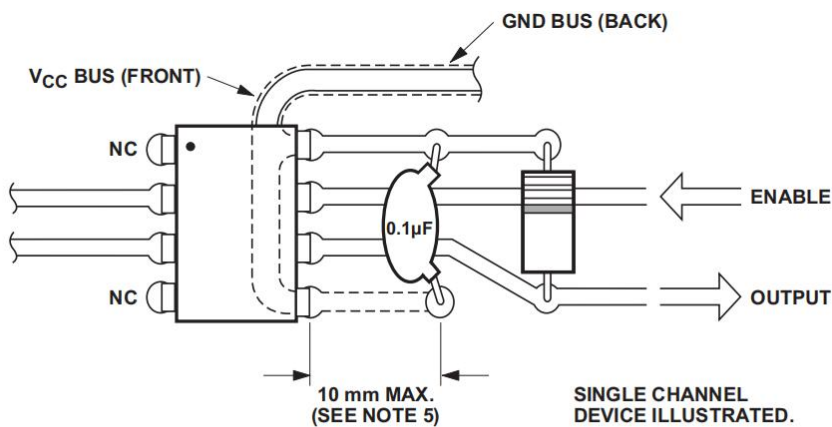
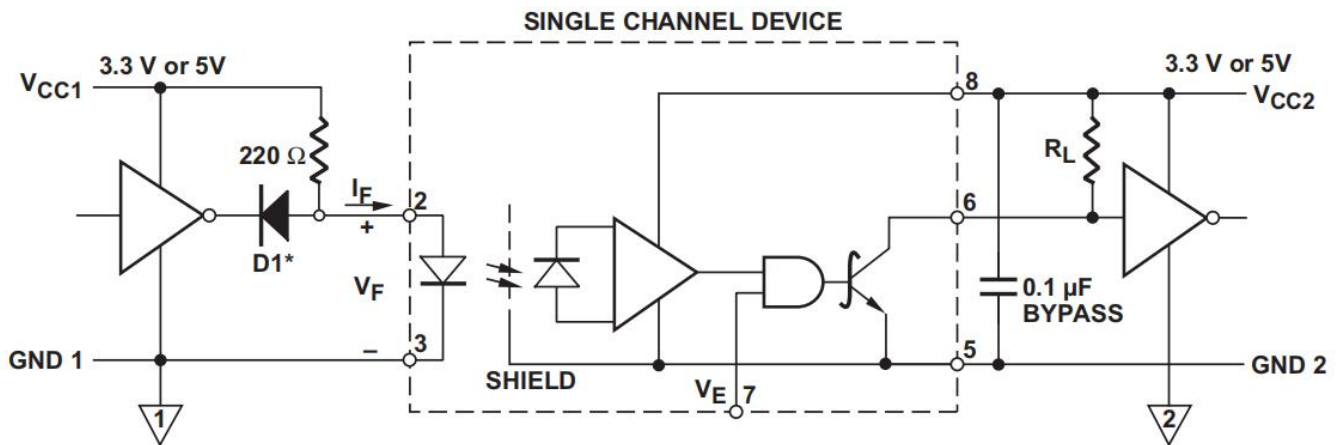


Figure 11. Recommended printed circuit board layout.



*DIODE D1 (1N916 OR EQUIVALENT) IS NOT REQUIRED FOR UNITS WITH OPEN COLLECTOR OUTPUT.

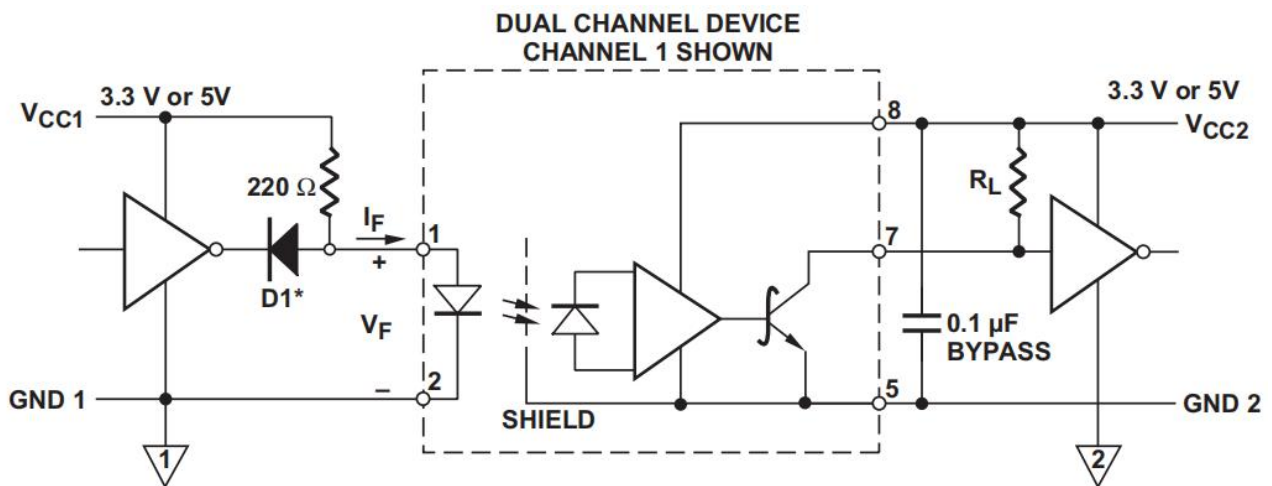


Figure 12. Recommended LVTTTL interface circuit.