



ORIENT

Photo coupler

Product Data Sheet

Name: OR-M6XX

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) Compliance Halogens Free (Br < 900ppm, Cl < 900ppm, Br+Cl <1500ppm)
- (2) 3.3V / 5V supply voltage
- (3) low power consumption
- (4) high speed: 10MBd(typical)
- (5) VCM=1000V, and the lowest common mode inhibition (CMR) is 10 kV/μs
- (6) when - 40 °C ~ + 125 °C temperature of ac and dc performance
- (7) Safety approval
 - UL approved(No.E323844)
 - VDE approved(No.40029733)
 - CQC approved (No.CQC19001231256)
- (8) In compliance with RoHS, REACH standards
- (9) MSL Class I



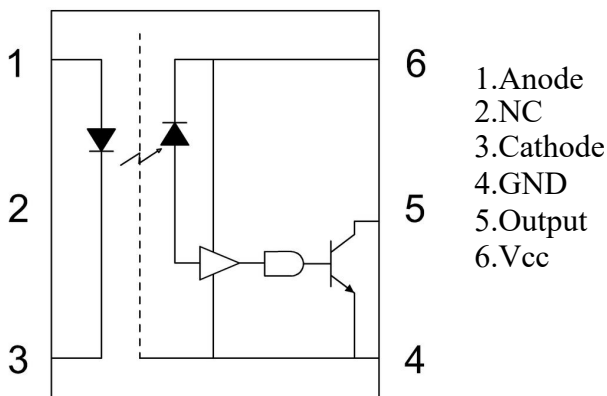
2. Instructions

OR-M6XX is made up of an efficient AlGaAs light-emitting diode and high-speed optical detector. This design provides good ac and dc isolation between the input and output ends of the photoelectric coupler. The output characteristic of the photodetector is a collector open circuit schottky clamp transistor. The photoelectric coupler operating temperature range: - 40 °C ~ + 125 °C.

3. Application Range

- (1)Ground loop elimination
- (2)LSTTL to TTL, LSTTL or 5 volt CMOS
- (3)Line receiver, data transmission
- (4)Data multiplexing
- (5)Switching power supplies
- (6)Pulse transformer replacement
- (7)Computer peripheral interface

4. Functional Diagram



- 1. Anode
- 2. NC
- 3. Cathode
- 4. GND
- 5. Output
- 6. Vcc

Truth table

| Input (LED) | Output |
|---------------|--------|
| ON | L |
| OFF | H |

0.1 capacitor F bypass capacitance needs to be connected between A Pin4 and Pin6

5. Absolute Maximum Ratings (Ta=25°C)*1

| Parameter | | Symbol | Rated Value | Unit |
|---------------------|------------------------------------|------------------|-------------|------------------|
| Input | Average Forward Input Current | I _F | 50 | mA |
| | Reverse Input Voltage | V _R | 5 | V |
| | Power Dissipation | P _I | 40 | mW |
| Output | Output Collector Current | I _O | 50 | mA |
| | Output Collector Voltage | V _O | 7 | V |
| | Output Collector Power Dissipation | P _O | 85 | mW |
| Supply Voltage | | V _{CC} | 7 | V |
| Insulation Voltage | | V _{iso} | 3750 | V _{rms} |
| Working Temperature | | T _{opr} | -40 ~ +125 | °C |
| Storage Temperature | | T _{stg} | -55 ~ +150 | |
| *2 | Soldering Temperature | T _{sol} | 260 | |

*1. Room temperature = 25 °C. Exceeding the maximum absolute rating can permanently damage the device. Working long hours at the maximum absolute rating can affect reliability.

*2. soldering time is 10 seconds.

6. Recommended Operating Conditions

| Parameter | Symbol | Min | Max | Unit |
|--|-----------------|-----|------|-----------|
| Operating Temperature | T _A | -40 | 125 | °C |
| Supply Voltage | V _{CC} | 2.7 | 3.6 | V |
| | | 4.5 | 5.5 | |
| Low Level Input Current | I _{FL} | 0 | 250 | μA |
| High Level Input Current | I _{FH} | 5 | 15 | mA |
| Output Pull-up Resistor | R _L | 330 | 4000 | Ω |
| Fan Out (at R _L =1kΩ per channel) | N | — | 5 | TTL Loads |

7. Opto-Electronic Characteristics

| | Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|-----------------|--|-------------------------|-----|------|-----|---------------|---|
| Input | Forward Voltage | V_F | — | 1.38 | 1.8 | V | $I_F = 10\text{mA}$ $T_A = 25^\circ\text{C}$ |
| | Temperature Coefficient OF Forward Voltage | $\Delta V_F / \Delta T$ | — | -1.6 | — | mV/°C | $I_F = 10\text{mA}$ |
| | Reverse Voltage | BV_R | 5 | — | — | V | $I_R = 10\mu\text{A}$ |
| | Input Threshold Current | I_{TH} | — | 1.5 | 5 | mA | $V_E = 2\text{V}, V_{CC} = 3.3\text{V}$ $V_O = 0.6\text{V}$ $I_{OL} (\text{sinking}) = 13\text{mA}$ |
| | Input Capacitance | C_{IN} | — | 34 | — | pF | $f = 1\text{MHz}, V_F = 0\text{V}$ |
| Detector | High Level Supply Current | I_{CCH} | — | 3.8 | 7 | mA | $V_{CC} = 3.3\text{V}, I_F = 0\text{mA}$ |
| | Low Level Supply Current | I_{CCL} | — | 5.8 | 10 | mA | $V_{CC} = 3.3\text{V}, I_F = 10\text{mA}$ |
| | High Level Output Current | I_{OH} | — | 5 | 100 | μA | $V_{CC} = 3.3\text{V}$, $V_O = 3.2\text{V}, I_F = 250\mu\text{A}$ |
| | Low Level Output Voltage | V_{OL} | — | 0.3 | 0.6 | V | $V_{CC} = 3.3\text{V}$, $I_F = 5\text{mA}$, $I_{OL} (\text{sinking}) = 13\text{mA}$ |

Recommended temperature range ($T_A = -40^\circ\text{C} \text{---} +125^\circ\text{C}$, $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated.
Typical values $T_A = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$.

| Parameter | | Symbol | Min | Typ | Max | Unit | Condition |
|-----------------|--|-------------------------|-----|------|-----|---------------|---|
| Input | Forward Voltage | V_F | — | 1.38 | 1.8 | V | $I_F = 10\text{mA}$ $T_A = 25^\circ\text{C}$ |
| | Temperature Coefficient OF Forward Voltage | $\Delta V_F / \Delta T$ | — | -1.6 | — | mV/°C | $I_F = 10\text{mA}$ |
| | Reverse Voltage | BV_R | 5 | — | — | V | $I_R = 10\mu\text{A}$ |
| | Input Threshold Current | I_{TH} | — | 1.5 | 5 | mA | $V_{CC} = 5.5\text{V}, V_O = 0.6\text{V}$ $I_{OL} > 13\text{mA}$ |
| | Input Capacitance | C_{IN} | — | 34 | — | pF | $f = 1\text{MHz}, V_F = 0\text{V}$ |
| Detector | High Level Supply Current | I_{CCH} | — | 6 | 10 | mA | $V_{CC} = 5.5\text{V}, I_F = 0\text{mA}$ |
| | Low Level Supply Current | I_{CCL} | — | 8 | 13 | mA | $V_{CC} = 5.5\text{V}, I_F = 10\text{mA}$ |
| | High Level Output Current | I_{OH} | — | 3 | 100 | μA | $V_{CC} = 5.5\text{V}$, $V_O = 5.5\text{V}, I_F = 250\mu\text{A}$ |
| | Low Level Output Voltage | V_{OL} | — | 0.4 | 0.6 | V | $V_{CC} = 5.5\text{V}$, $I_F = 5\text{mA}$, $I_{OL} (\text{sinking}) = 13\text{mA}$ |

Recommended temperature range ($T_A = -40^\circ\text{C} \text{---} +125^\circ\text{C}$, $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated. Typical values $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$.

8. Switching Characteristics

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|---|---------------------|-----|-----|-----|------|-------------------------------|
| Propagation delay time to output High level | t_{PLH} | — | 60 | 90 | ns | $R_L=350\Omega$ $C_L=15pF$ |
| Propagation delay time to output Low level | t_{PHL} | — | 25 | 75 | ns | |
| Pulse Width Distortion | $ t_{PLH}-t_{PHL} $ | — | 35 | 45 | ns | |
| Output Rise Time (10 to 90%) | t_r | — | 27 | — | ns | |
| Output Fall Time (90 to 10%) | t_f | — | 6.6 | — | ns | |
| Propagation Delay Skew | t_{PSK} | — | — | 40 | ns | |

Recommended temperature range ($T_A = -40^\circ\text{C} \sim +125^\circ\text{C}$, $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated.

Typical values $T_A = 25^\circ\text{C}$, $V_{CC} = 3.3\text{V}$.

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|---|---------------------|-----|-----|-----|------|---|
| Propagation delay time to output High level | t_{PLH} | — | 45 | 75 | ns | $R_L=350\Omega$, $C_L=15pF$, $T_A=25^\circ\text{C}$ |
| | | — | — | 100 | | |
| Propagation delay time to output Low level | t_{PHL} | — | 25 | 75 | ns | $R_L=350\Omega$, $C_L=15pF$, $T_A=25^\circ\text{C}$ |
| | | — | — | 100 | | |
| Pulse Width Distortion | $ t_{PLH}-t_{PHL} $ | — | 10 | 35 | ns | $R_L=350\Omega$, $C_L=15pF$ |
| Output Rise Time (10 to 90%) | t_r | — | 22 | — | ns | |
| Output Fall Time (90 to 10%) | t_f | — | 6.9 | — | ns | |
| Propagation Delay Skew | t_{PSK} | — | — | 40 | ns | |

Recommended temperature range ($T_A = -40^\circ\text{C} \sim +125^\circ\text{C}$, $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$), $I_F = 7.5\text{mA}$ Unless otherwise stated.

Typical values $T_A = 25^\circ\text{C}$, $V_{CC} = 5.0\text{V}$.

| Parameter | Symbol | Part Number | Min | Typ | Max | Unit | Condition |
|---|-----------------|-------------|-------|-----|-----|------|--|
| Logic High Common Mode Transient Immunity | CM _H | M600 | — | — | — | V/μs | I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, T _A =25°C V _{CM} =10Vp-p |
| | | M601 | 5000 | — | — | | I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, T _A =25°C V _{CM} =50Vp-p |
| | | M611 | 20000 | — | — | | I _F = 7.5mA , V _{OH} =2.0V, R _L =350Ω, T _A =25°C V _{CM} =1000Vp-p |
| Logic Low Common Mode Transient Immunity | CM _L | M600 | — | — | — | V/μs | I _F = 0mA , V _{OL} =0.8V, R _L =350Ω, T _A =25°C V _{CM} =10Vp-p |
| | | M601 | 5000 | — | — | | I _F = 0mA , V _{OL} =0.8V, R _L =350Ω, T _A =25°C V _{CM} =50Vp-p |
| | | M611 | 20000 | — | — | | I _F = 0mA , V _{OL} =0.8V, R _L =350Ω, T _A =25°C V _{CM} =1000Vp-p |

| Parameter | Symbol | Min | Typ | Max | Unit | Condition |
|---|--------|------|------------------|-----|------|--|
| Input-Output Insulation Leakage Current | II-O | — | — | 1 | μA | 45% RH,t=5s, VI-O = 3kV DC,TA =25 C |
| Withstand Insulation Test Voltage | VISO | 3750 | — | — | VRMS | RH ≤ 50%, t =1min,TA=25°C |
| Input-Output Resistance | RI-O | — | 10 ¹² | — | Ω | VI-O = 500V DC |
| Input-Output Capacitance | CI-O | — | 1 | — | p | f = 1MHz, TA = 25 C |

Recommended temperature range (T_A=40°C-125°C) Unless otherwise stated. Typical values T_A=25°C.

9. Order Information

Part Number

OR-M6XX-W-Y-Z

Note

XX = Type code. ('00', '01', '11')

W = Tape and reel option. (TP or TP1).

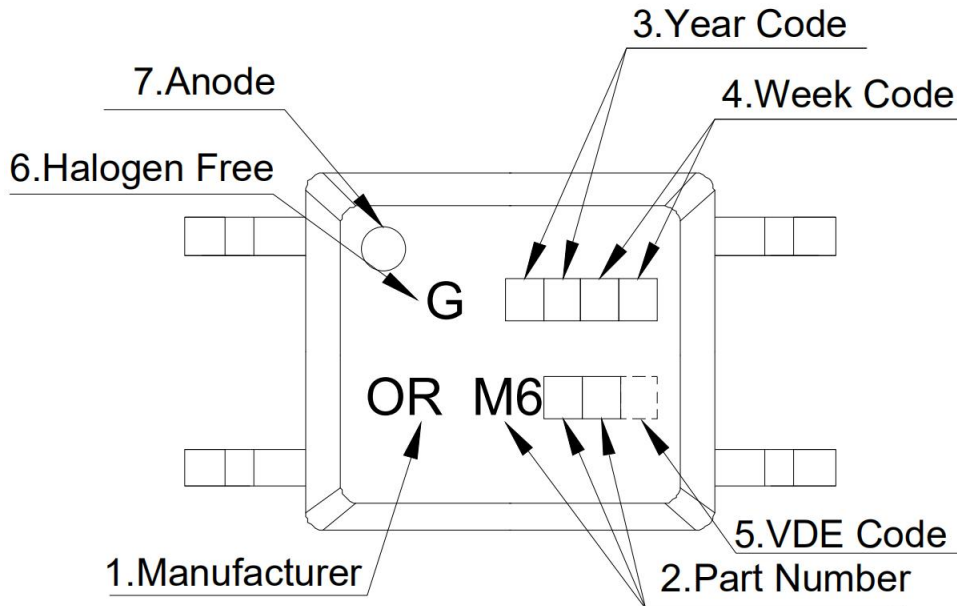
Y = 'V' code for VDE safety (This options is not necessary).

Z = 'G' code for Halogen free.

* VDE Code can be selected.

| Option | Description | Packing quantity |
|--------|--|---------------------|
| TP | Surface mount lead form (low profile) + TP tape & reel option | 3000 units per reel |
| TP1 | Surface mount lead form (low profile) + TP1 tape & reel option | 3000 units per reel |

10. Naming Rule



1. Manufacturer : ORIENT.

2. Part Number : M600, M601 or M611.

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.

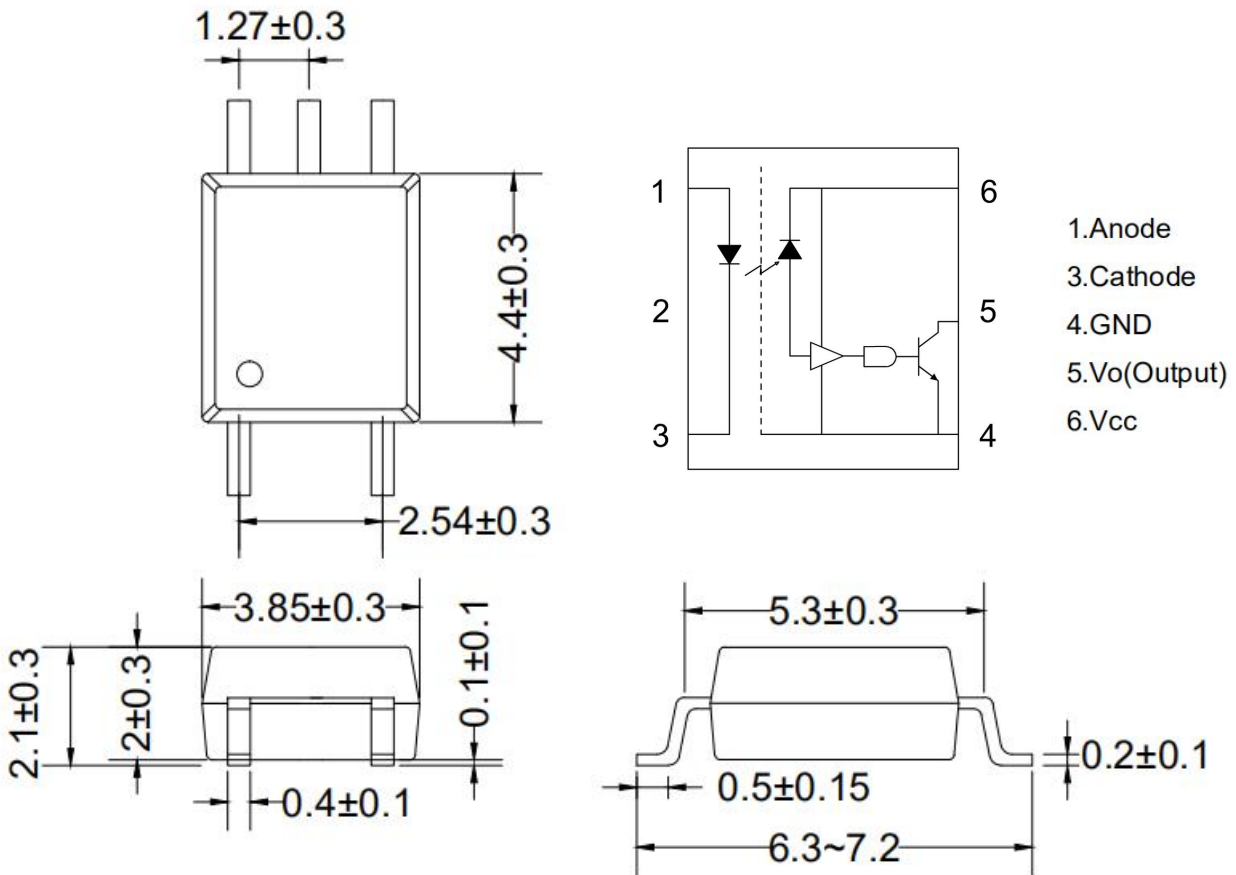
5. VDE Code . (Optional)

6. HF Code 'G': Halogen Free.

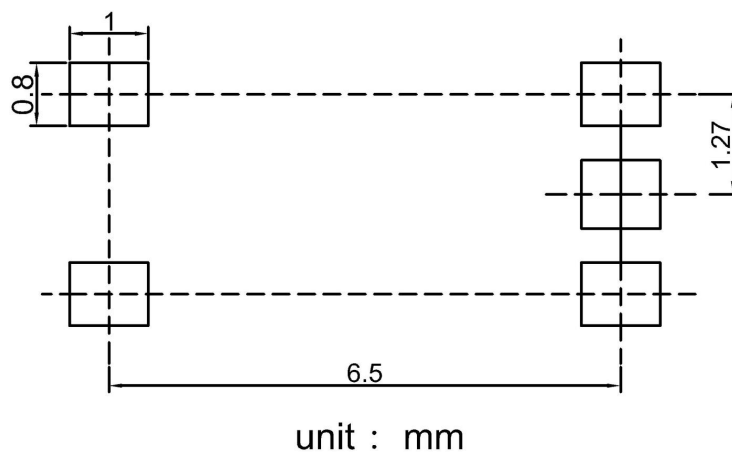
7. Anode.

* VDE Code can be selected.

11. Outer Dimension

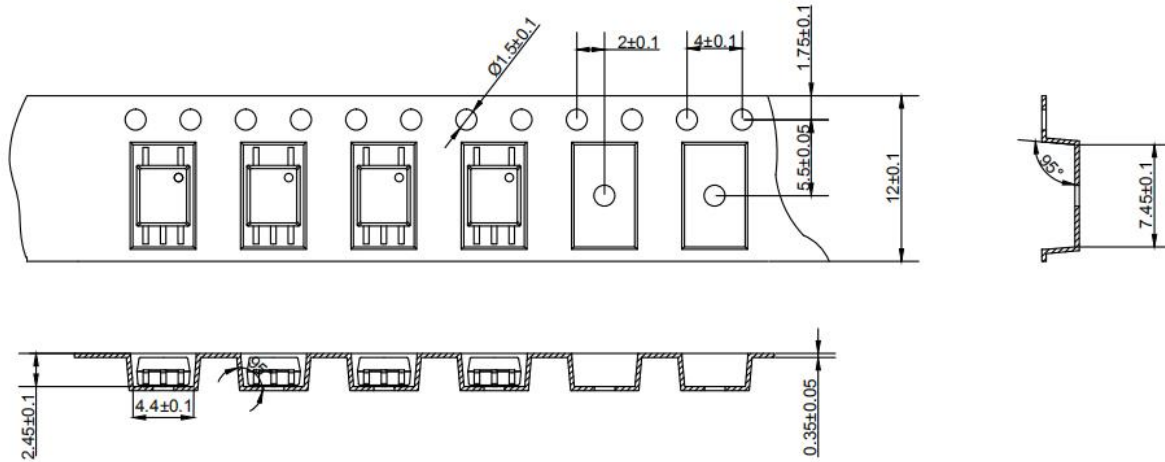


12. Recommended Foot Print Patterns (Mount Pad)

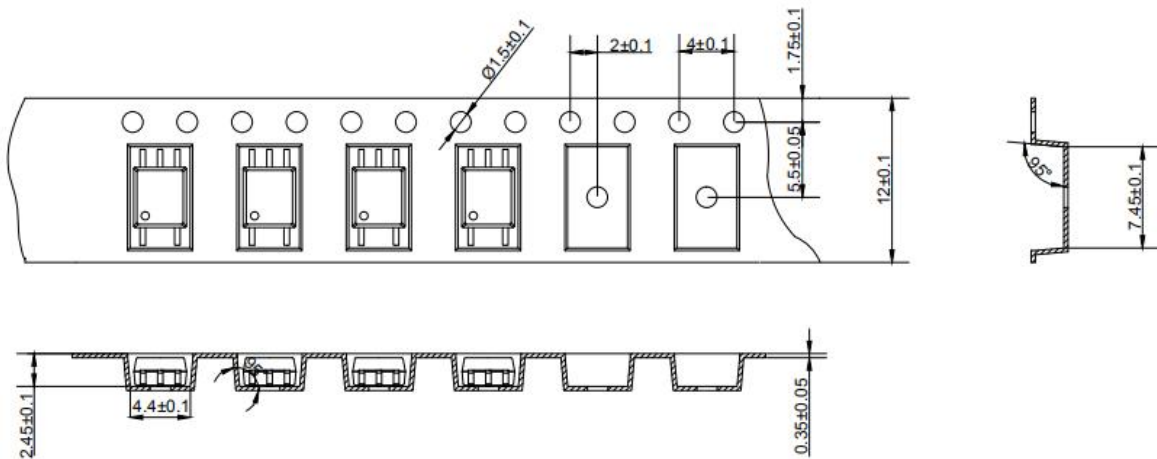


13. Taping Dimensions

(1) OR-M6XX-TP



(2) OR-M6XX-TP1



| Description | Symbol | Dimension in mm(inch) |
|--|--------|-----------------------|
| Tape wide | W | 12 ± 0.3 (0.472) |
| Pitch of sprocket holes | P0 | 4 ± 0.1 (0.157) |
| Distance of compartment | F | 5.5 ± 0.1 (0.217) |
| | P2 | 2 ± 0.1 (0.079) |
| Distance of compartment to compartment | P1 | 8 ± 0.1 (0.315) |

| | |
|--------------------|--------|
| Encapsulation type | TP/TP1 |
| amount (pcs) | 3000 |

14. Package Dimension

(1) package dimension

| Packing Information | |
|-----------------------------|---------------|
| Packing type | Reel type |
| Tape Width | 12mm |
| Qty per Reel | 3,000pcs |
| Small box (inner) Dimension | 345*345*45mm |
| Large box (Outer) Dimension | 480x360x360mm |
| Max qty per small box | 6,000pcs |
| Max qty per large box | 60,000pcs |

(2) Packing Label Sample



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.

15. Reliability Test

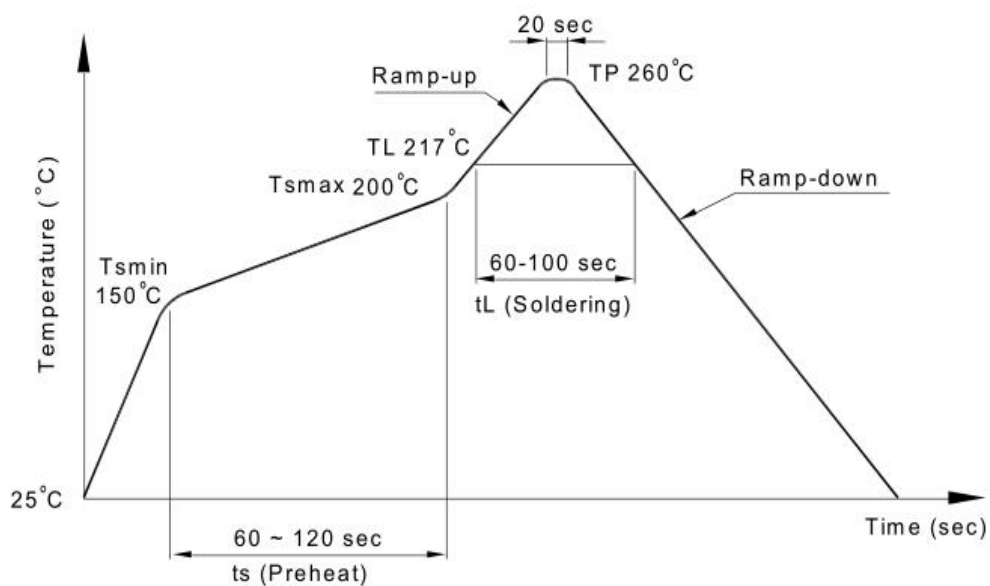
| NO. | ITEMS | Reliability Testing | | | | |
|-----|---------------------|---------------------|---|--------------|---------------------------|-------------|
| | | QTY. (Pcs) | Condition | Process | Device | Standard |
| 1 | RSH 耐焊接热 | 22 | 260±5°C | 5s/3 次 | 锡炉 | JESD22-A106 |
| 2 | HTSL 高温存储 | 77 | 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-HB M 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 |

16. Temperature Profile Of Soldering

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

Note: one solder backflow is recommended under the conditions described below in the temperature and time profile. Do not weld more than three times.

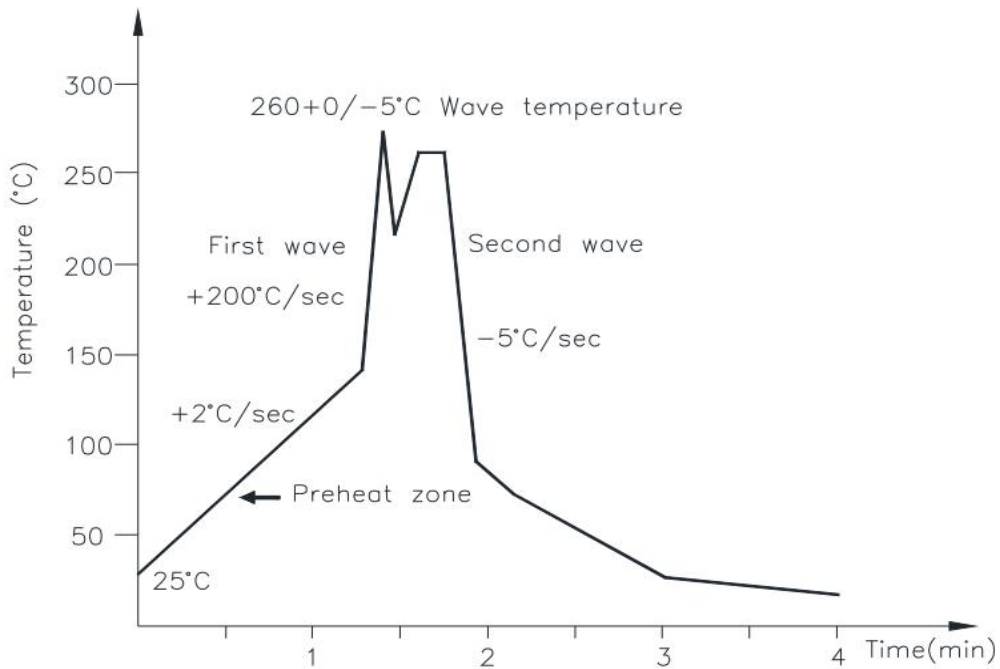
| Profile item | Conditions |
|--------------------------------------|----------------|
| Preheat | |
| - Temperature Min (T Smin) | 150°C |
| - Temperature Max (T Smax) | 200°C |
| - Time (min to max) (ts) | 90±30 sec |
| Soldering zone | |
| - Temperature (TL) | 217°C |
| - Time (t L) | 60 sec |
| 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 |



(2) Wave soldering (JEDEC22A111 compliant)

One-time welding is recommended under the temperature condition.

| | |
|---------------------|--------------|
| 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

Single lead welding is allowed in each process and one-time welding is recommended.

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

17. Switching time test circuit

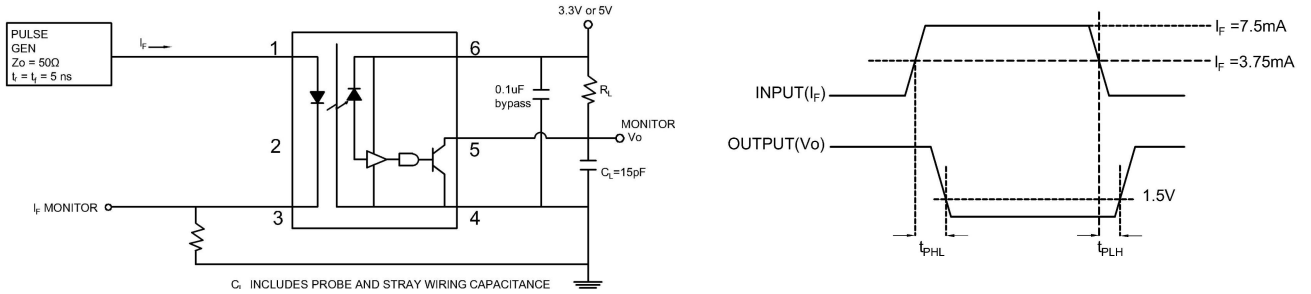


Figure 1: Test Circuit for T_{PHL} and T_{PLH}

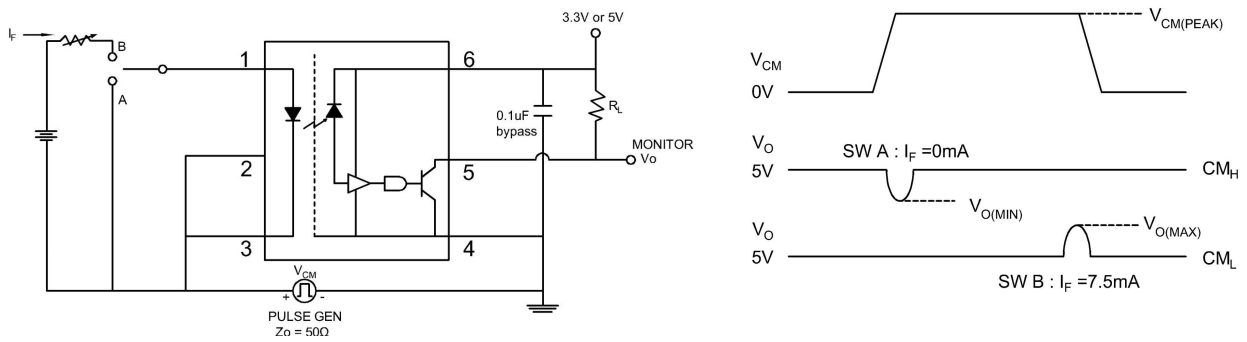


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

18. Characteristics Curve

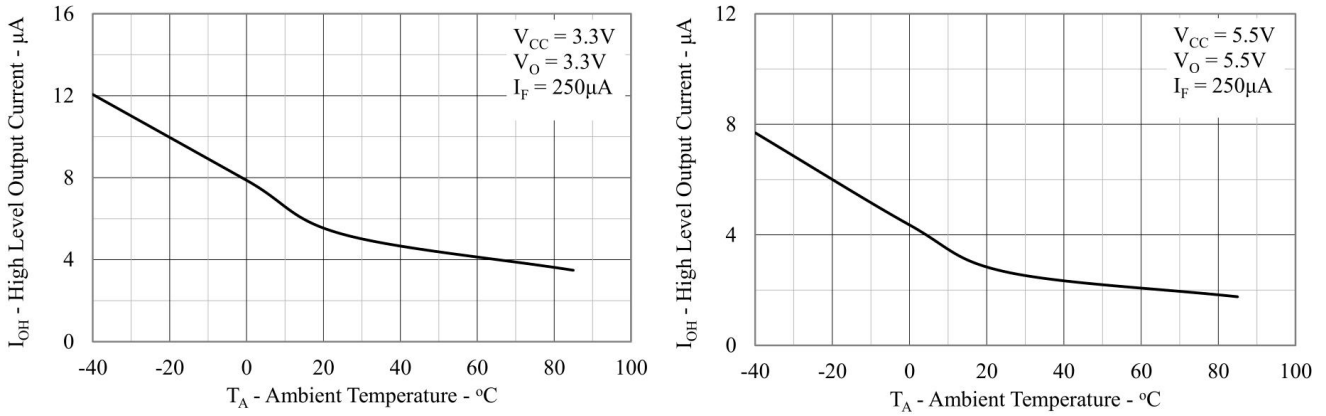


Figure 3: Typical high level output current vs. temperature.

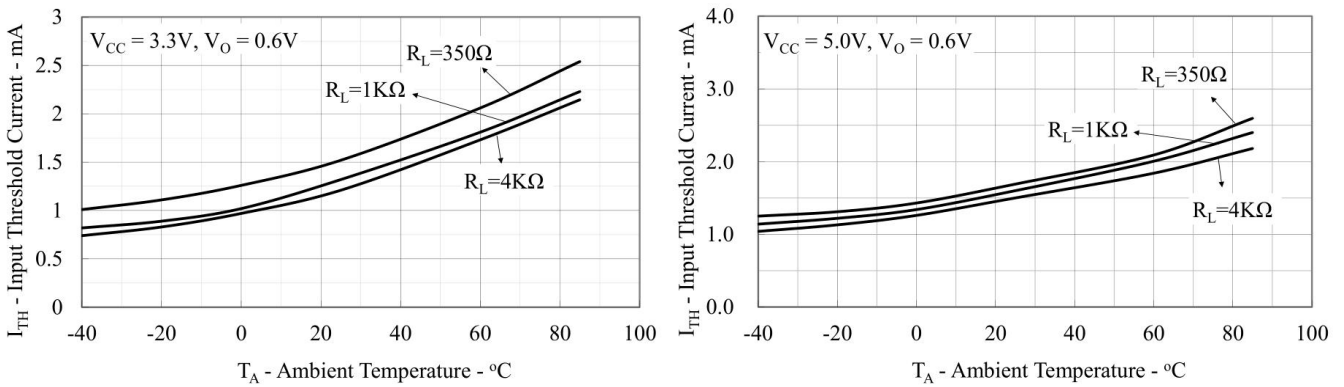


Figure 4: Typical Input Diode Threshold Current vs. Ambient Temperature

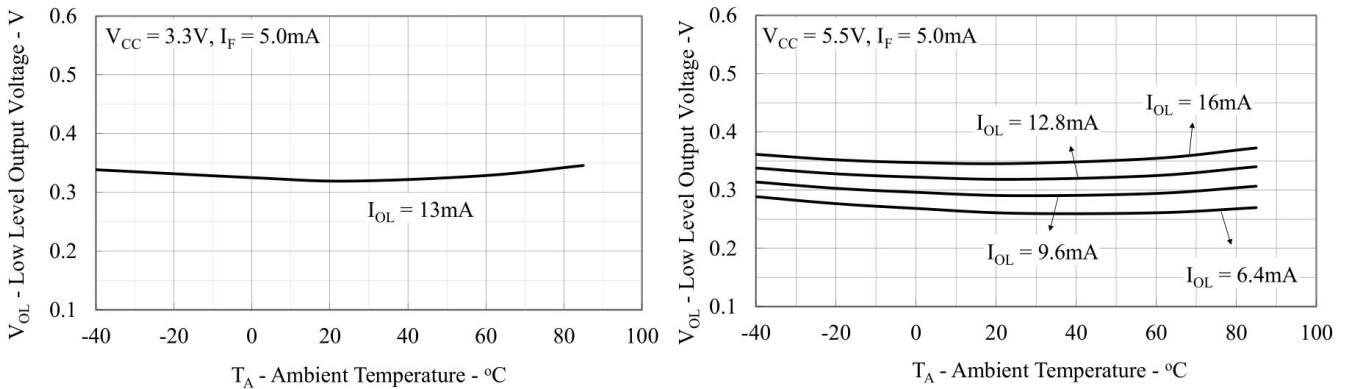


Figure 5: Typical Low Level Output Voltage vs. Ambient Temperature

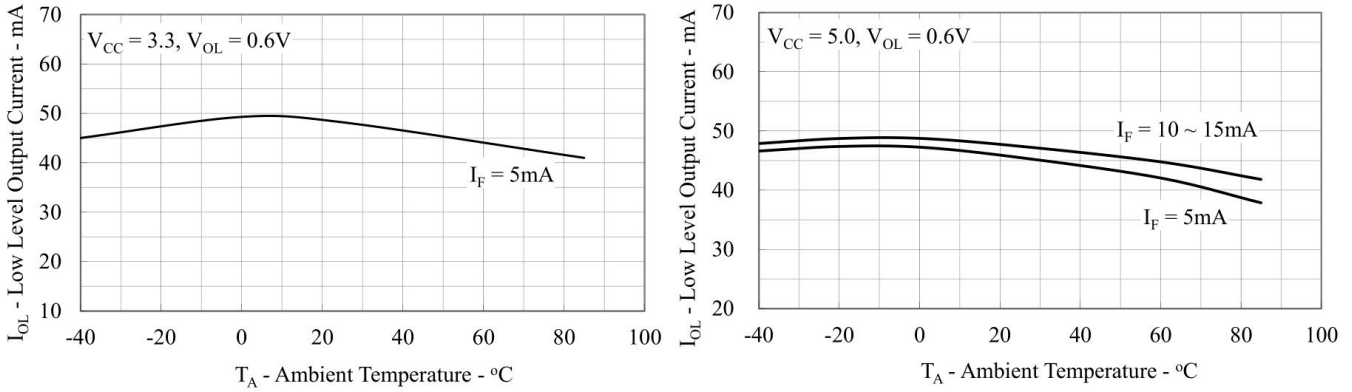


Figure 6: Typical Low Level Output Current vs. Ambient Temperature

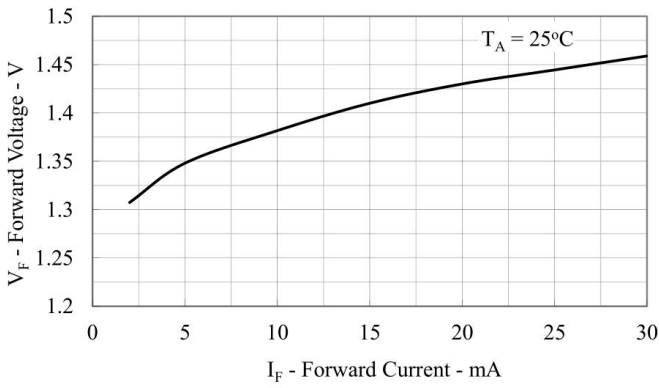


Figure 7: Typical Input Diode Forward Characteristics

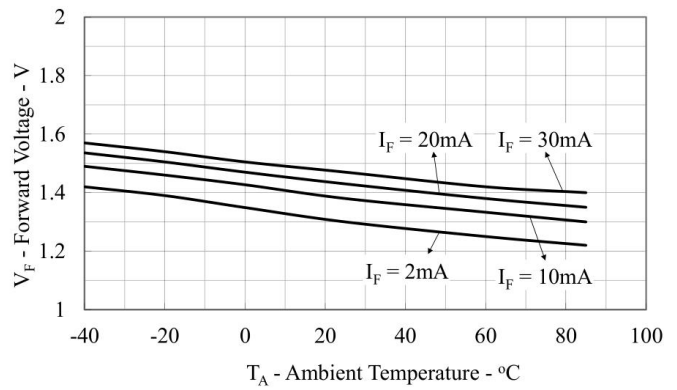


Figure 8: Typical Input Diode Forward Voltage vs. Ambient Temperature

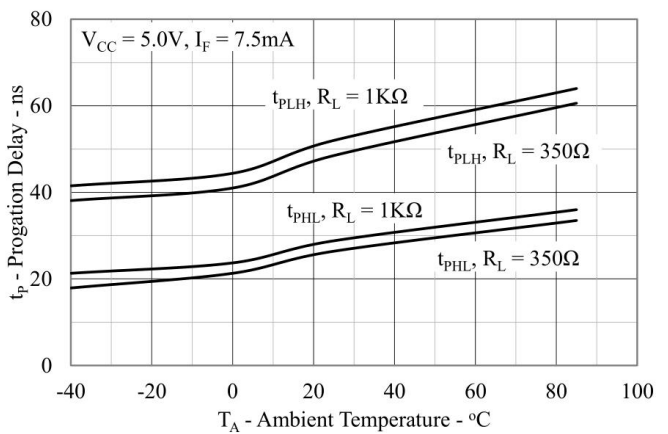
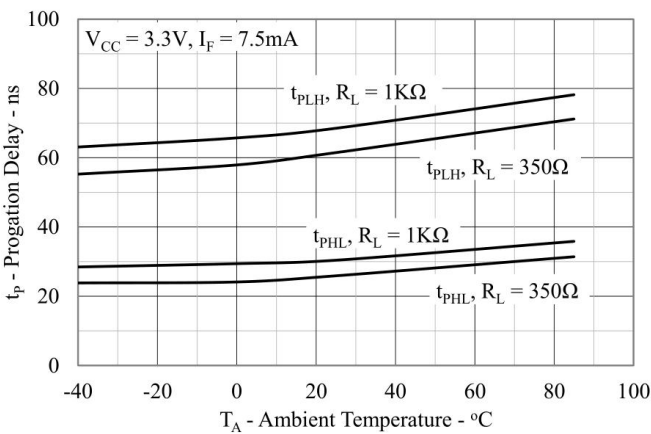


Figure 9: Typical Propagation Delay vs. Ambient Temperature

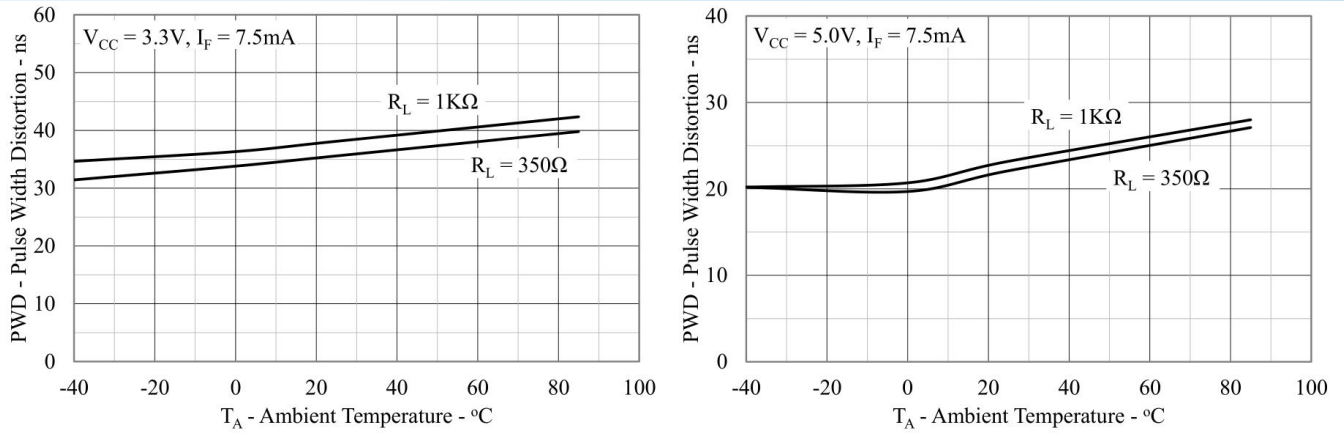


Figure 10: Typical Pulse Width Distortion vs. Ambient

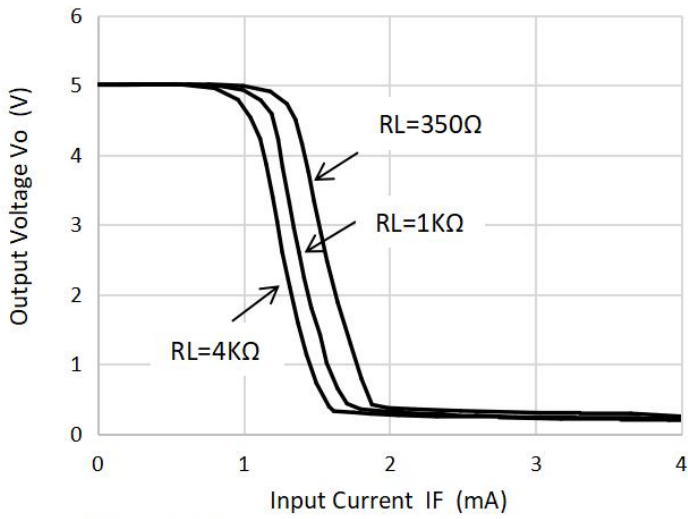


Figure 11: Input Current vs Output Voltage