



# ORIENT

## Photo coupler

### Product Data Sheet

Part Number: OR-045X\_OR-050X

Customer: \_\_\_\_\_

Date: \_\_\_\_\_

**SHENZHEN ORIENT COMPONENTS CO., LTD**

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

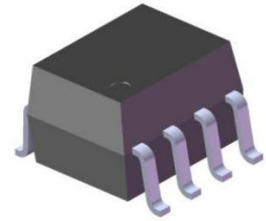
TEL: 0755-29681816

FAX: 0755-29681200

[www.orient-opto.com](http://www.orient-opto.com)

**1. Features**

- (1) High speed 1Mbit/s
- (2) 15kV/ $\mu$ s minimum common mode transient immunity at VCM= 1500V (OR-0453)
- (3) High isolation voltage between input and output (Viso=3750 Vrms )
- (4) Guaranteed performance from 0°C to 70°C
- (5) Wide operating temperature range of -55°C to 100°C
- (6) Safety approval
  - UL approved(No.E323844)
  - VDE approved(No.40029733)
  - CQC approved (No.CQC19001231254 )
- (7) In compliance with RoHS, REACH standards
- (8) MSL Level 1



**2. Description**

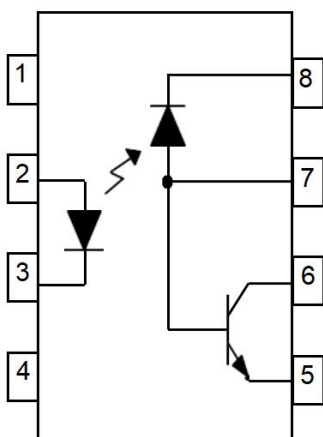
The OR-0500, OR-0501, OR-0452 and OR-0453 devices each consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photodiode bias and output-transistor collector increase the speed by several orders of magnitude over conventional photo transistor couplers by reducing the base-collector capacitance of the input transistor. The devices are packaged in an 8-pin small outline package which conforms to the standard SO-8 footprint.

**3. Application Range**

- (1) Line receivers
- (2) Telecommunication equipments
- (3) Power transistor isolation in motor drives
- (4) Replacement for low speed phototransistor photo couplers
- (5) Feedback loop in switch-mode power supplies
- (6) Home appliances
- (7) High speed logic ground isolation

**4. Functional Diagram**

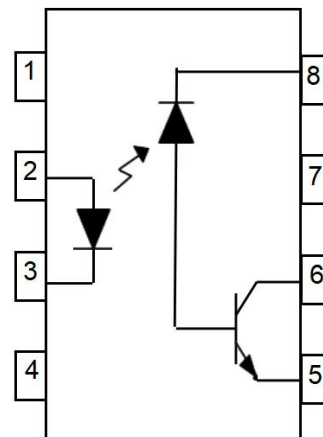
OR-0500/OR-0501



Pin Configuration

- 1. No Connection
- 2. Anode
- 3. Cathode
- 4. No Connection
- 5. Gnd
- 6. Vout
- 7. V<sub>B</sub>
- 8. V<sub>CC</sub>

OR-0452/OR-0453



Pin Configuration

- 1. No Connection
- 2. Anode
- 3. Cathode
- 4. No Connection
- 5. Gnd
- 6. Vout
- 7. No Connection
- 8. V<sub>CC</sub>

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

Parameter		Symbol	Rating	Unit
<b>Input</b>	Forward current	$I_F$	25	mA
	Peak forward current (50% duty, 1ms P.W)	$I_{FP}$	50	mA
	Peak transient current ( $\leq 1\mu s$ P.W,300pps)	$I_{Ftrans}$	1	A
	Reverse voltage	$V_R$	5	V
	Power dissipation	$P_{IN}$	45	mW
<b>Output</b>	Power dissipation	$P_O$	100	mW
	Emitter-Base reverse voltage	OR-0500 OR-0501 $V_{EBR}$	5	V
	Base current	OR-0500 OR-0501 $I_B$	5	mA
	Average Output current	$I_{O(AVG)}$	8	mA
	Peak Output current	$I_{O(PK)}$	16	mA
	Output voltage	$V_O$	-0.5 to 20	V
	Supply voltage	$V_{CC}$	-0.5 to 30	V
Isolation voltage *1		$V_{ISO}$	3750	V rms
Operating temperature		$T_{OPR}$	-55 ~ +100	°C
Storage temperature		$T_{STG}$	-55 ~ +125	°C
Soldering temperature *2		$T_{SOL}$	260	°C

**Notes**

\*1 AC for 1 minute, R.H.= 40 ~ 60% R.H. In this test, pins 1, 2, 3, 4 are shorted together, and pins 5, 6, 7, 8 are shorted together.

\*2 For 10 seconds.

**6. Electrical Specifications (TA=0 to 70°C unless specified otherwise)**

Parameter		Symbol	Min.	Typ.	Max.	Unit	Condition	
Input	Forward Voltage	$V_F$	—	1.45	1.8	V	$I_F = 16\text{mA}$	
	Reverse Voltage	$V_R$	5.0	—	—	V	$I_R = 10\mu\text{A}$	
	Temperature coefficient of forward voltage	$\Delta V_F/\Delta T_A$	—	-1.9	—	mV/°C	$I_F = 16\text{mA}$	
Output	Logic High Output Current	$I_{OH}$	—	0.001	0.5	$\mu\text{A}$	$I_F=0\text{mA}, V_O=V_{CC}=5.5\text{V}, T_A=25^\circ\text{C}$	
			—	0.01	1		$I_F=0\text{mA}, V_O=V_{CC}=15\text{V}, T_A=25^\circ\text{C}$	
			—	—	50		$I_F=0\text{mA}, V_O=V_{CC}=15\text{V}$	
	Logic Low Supply Current	$I_{CCL}$	—	140	200	$\mu\text{A}$	$I_F=16\text{mA}, V_O=\text{Open}, V_{CC}=15\text{V}$	
	Logic High Supply Current	$I_{CCH}$	—	0.01	1	$\mu\text{A}$	$I_F=0\text{mA}, V_O=\text{Open}, V_{CC}=15\text{V}, T_A=25^\circ\text{C}$	
—			—	2	$I_F=0\text{mA}, V_O=\text{Open}, V_{CC}=15\text{V}$			
Transfer Characteristics	Current Transfer Ratio	CTR	OR-0500	7	—	50	%	$I_F = 16\text{mA}, V_O = 0.4\text{V}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$
			OR-0501 OR-0452 OR-0453	19	—	50		
			OR-0500	5	—	—		$I_F = 16\text{mA}, V_O = 0.5\text{V}, V_{CC}=4.5\text{V}$
			OR-0501 OR-0452 OR-0453	15	—	—		
	Logic Low Output Voltage	$V_{OL}$	OR-0500	—	0.18	0.4	V	$I_F = 16\text{mA}, I_O = 1.1\text{mA}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$
			OR-0501 OR-0452 OR-0453	—	0.18	0.4		$I_F = 16\text{mA}, I_O = 3\text{mA}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$
			OR-0500	—	—	0.5		$I_F = 16\text{mA}, I_O = 0.8\text{mA}, V_{CC}=4.5\text{V}$
			OR-0501 OR-0452 OR-0453	—	—	0.5		$I_F = 16\text{mA}, I_O = 2.4\text{mA}, V_{CC}=4.5\text{V}$

**7. Switching Specifications ( $T_A=0$  to  $70^\circ\text{C}$  unless specified otherwise,  $I_F=16\text{mA}$ ,  $V_{CC}=5\text{V}$ )**

Parameter		Symbol	Min.	Typ.	Max.	Units	Test Conditions
Propagation Delay Time to High Output Level	OR-0500	$t_{PLH}$	—	—	1.5	$\mu\text{s}$	$R_L=4.1\text{K}\Omega$ , $T_A=25^\circ\text{C}$
			—	—	2.0		$R_L=4.1\text{K}\Omega$
	OR-0501 OR-0452 OR-0453		—	—	0.8		$R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$
			—	—	1.0		$R_L=1.9\text{K}\Omega$
Propagation Delay Time to Low Output Level	OR-0500	$t_{PHL}$	—	—	1.5	$\mu\text{s}$	$R_L=4.1\text{K}\Omega$ , $T_A=25^\circ\text{C}$
			—	—	2.0		$R_L=4.1\text{K}\Omega$
	OR-0501 OR-0452 OR-0453		—	—	0.8		$R_L=1.9\text{K}\Omega$ , $T_A=25^\circ\text{C}$
			—	—	1.0		$R_L=1.9\text{K}\Omega$
Common Mode Transient Immunity at Logic High	OR-0500	$CM_H$	—	1,000	—	$\text{V}/\mu\text{s}$	$I_F = 0\text{mA}$ , $V_{CM}=10\text{Vp-p}$ , $R_L=4.1\text{K}\Omega$ , $T_A =25^\circ\text{C}$
	OR-0452 OR-0501		—	1,000	—		$I_F = 0\text{mA}$ , $V_{CM}=10\text{Vp-p}$ , $R_L=1.9\text{K}\Omega$ , $T_A =25^\circ\text{C}$
	OR-0453		15000	—	—		$I_F = 0\text{mA}$ , $V_{CM}=1500\text{Vp-p}$ , $R_L=1.9\text{K}\Omega$ , $T_A =25^\circ\text{C}$
Common Mode Transient Immunity at Logic Low	OR-0500	$CML$	—	1,000	—	$\text{V}/\mu\text{s}$	$I_F = 16\text{mA}$ , $V_{CM}=10\text{Vp-p}$ , $R_L=4.1\text{K}\Omega$ , $T_A =25^\circ\text{C}$
	OR-0452 OR-0501		—	1,000	—		$I_F = 16\text{mA}$ , $V_{CM}=10\text{Vp-p}$ , $R_L=1.9\text{K}\Omega$ , $T_A =25^\circ\text{C}$
	OR-0453		15000	—	—		$I_F = 16\text{mA}$ , $V_{CM}=1500\text{Vp-p}$ , $R_L=1.9\text{K}\Omega$ , $T_A =25^\circ\text{C}$

 \* Typical values at  $T_a = 25^\circ\text{C}$



## 8. Order Information

### Part Number

**OR-045X-Y-Z**  
**OR-050X-Y-Z**

### Note

045X(X = 0 or 1) /050X (X = 2 or 3) = Part Number.

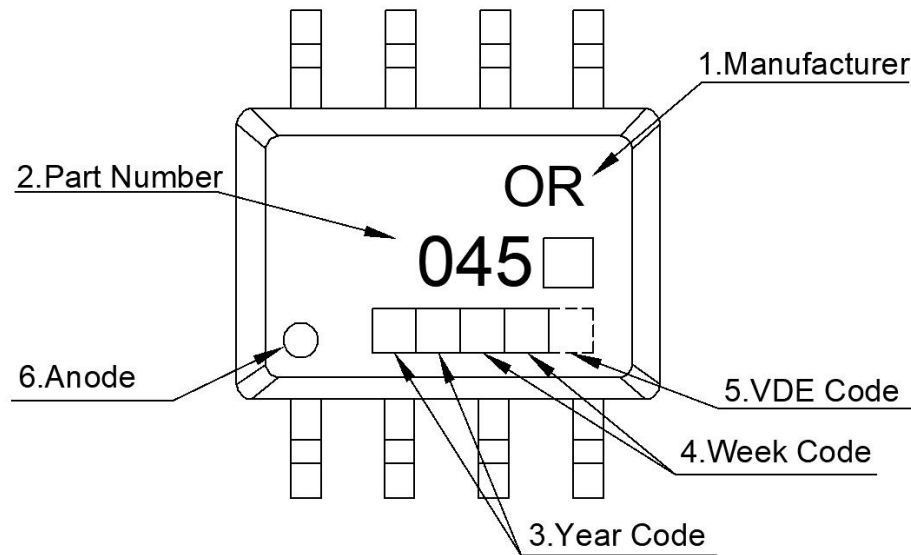
Y = Tape and reel option (TA,TA1 or none).

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

## 9. Naming Rule

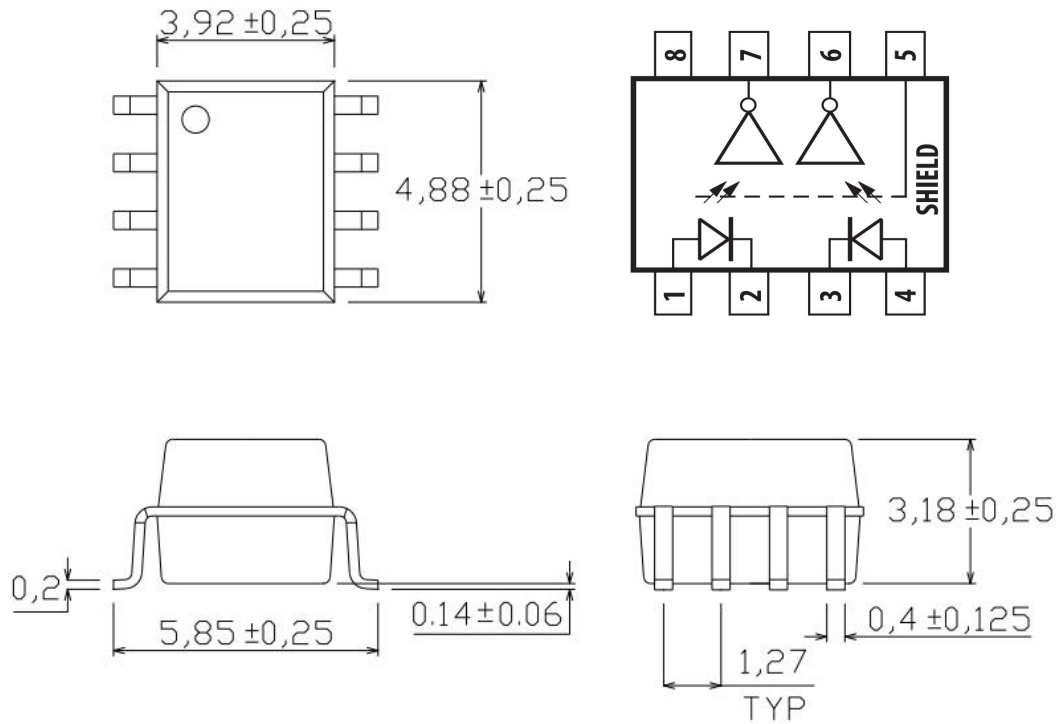


1. Manufacturer : ORIENT.
2. Part Number : 045X / 050X.
3. Year Code  : '21' means '2021' and so on.
4. Week Code : 01 means the first week, 02 means the second week and so on.
5. VDE Code . (Optional)
6. Anode.

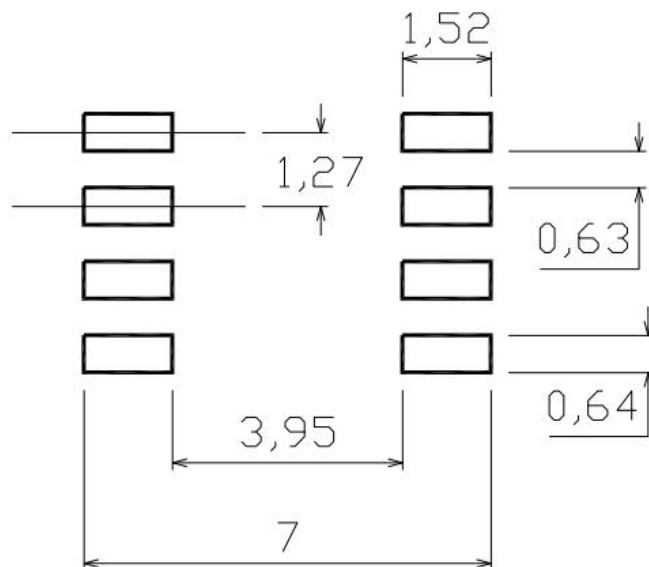
\* VDE mark can be selected.

### 10. Package Dimension

#### OR-045X\_OR-050X



### 11. Recommended Foot Print Patterns (Mount Pad)

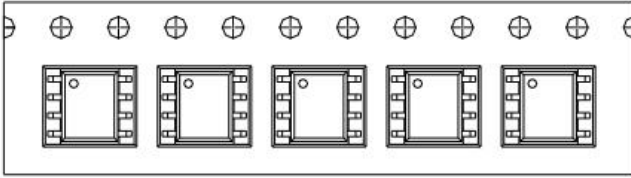


unit: mm

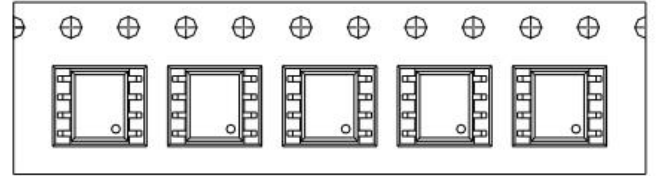


12. Taping Dimensions

(1)TA1 Type



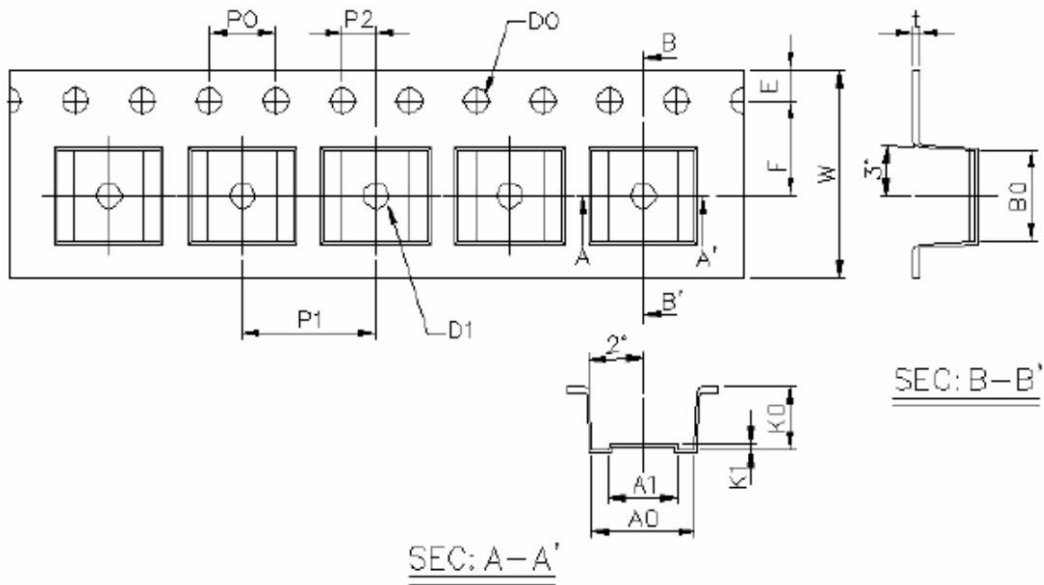
(2)TA Type



Direction of feed from reel



Direction of feed from reel



Dimension No.	<b>A0</b>	<b>A1</b>	<b>B0</b>	<b>D0</b>	<b>D1</b>	<b>E</b>	<b>F</b>
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.	<b>Po</b>	<b>P1</b>	<b>P2</b>	<b>t</b>	<b>W</b>	<b>K0</b>	<b>K1</b>
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

### 13. 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.

14. Reliability Test

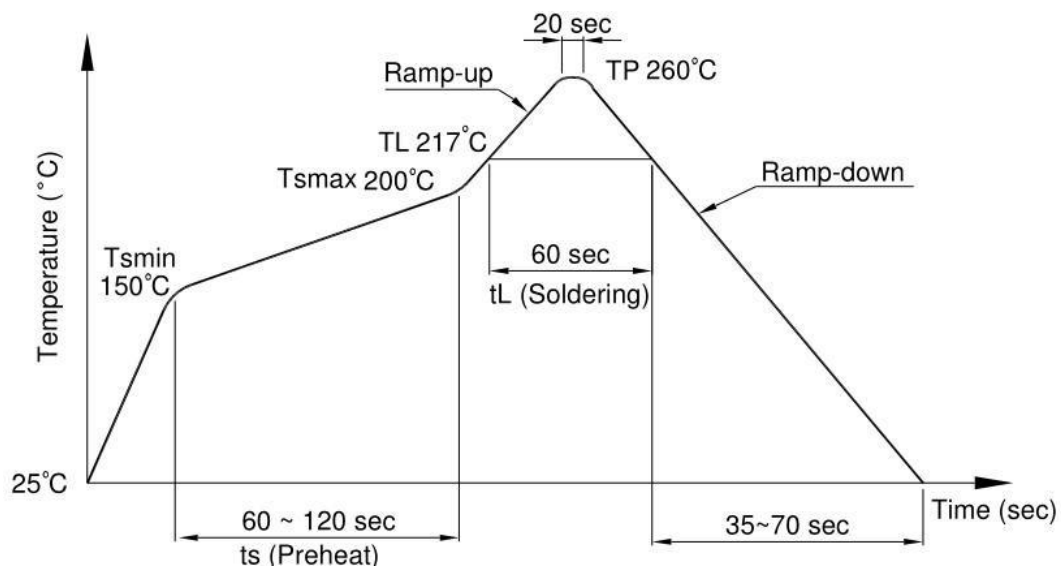
NO.	ITEMS	Reliability Testing				
		QTY. (Pcs)	Condition	Process	Device	Standard
1	RSH 耐焊接热	22	260±5°C	5s/3 次	锡炉	JESD22-A106
2	HTSL 高温存储	77	125°C	168 hrs	高温烤箱 测试仪	JESD22-A103
				500 hrs		
				1000 hrs		
3	LTSL 低温存储	77	-40°C	168 hrs	低温箱 测试仪	JESD22-A119
				500 hrs		
				1000 hrs		
4	TC 温度循环	77	H:125°C 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

### 15. 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.

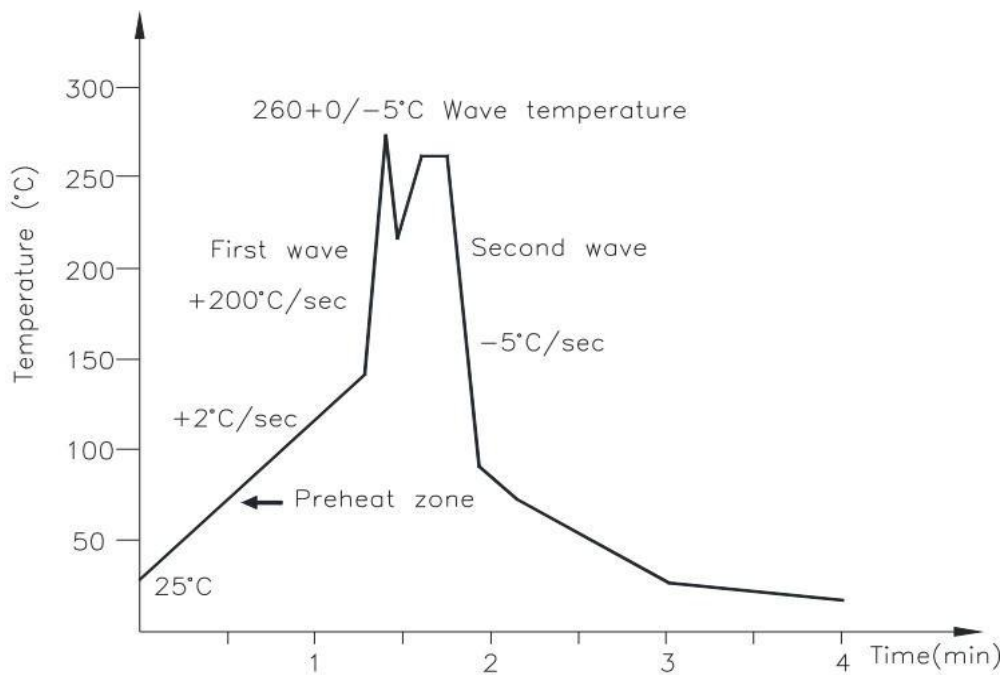
Profile item	Conditions
Preheat - Temperature Min (T Smin ) - Temperature Max (T Smax ) - Time (min to max) (ts)	150°C 200°C 90±30 sec
Soldering zone - Temperature (TL ) - Time (t L )	217°C 60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak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

16. CHARACTERISTICS CURVES (TYPICAL PERFORMANCE)

Figure 1. Forward Current vs Forward Voltage

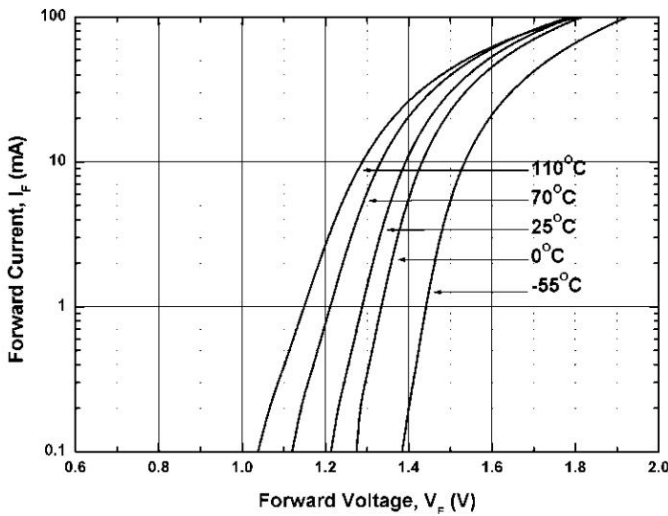


Figure 2. Current Transfer Ratio vs Forward Current

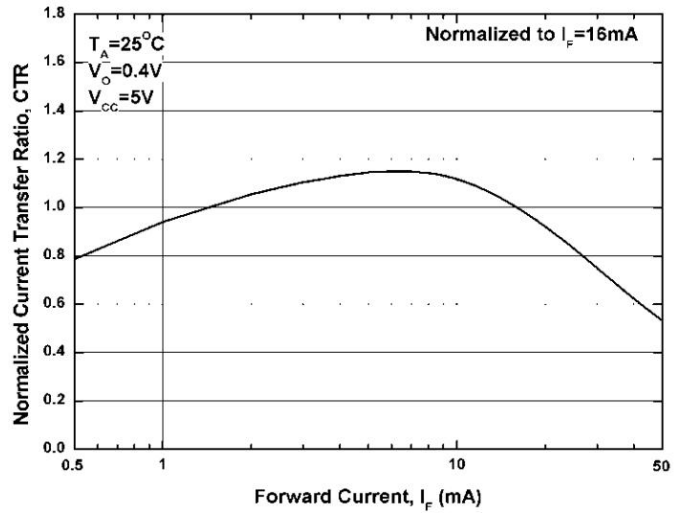


Figure 3. Current Transfer Ratio vs Ambient Temperature

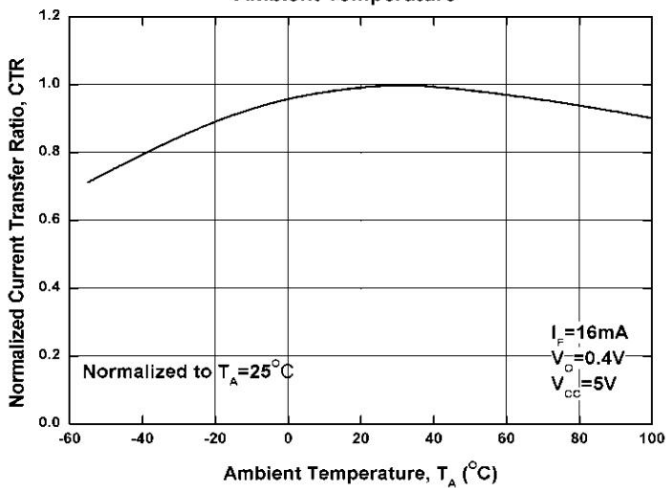


Figure 4. Output Current vs Output Voltage

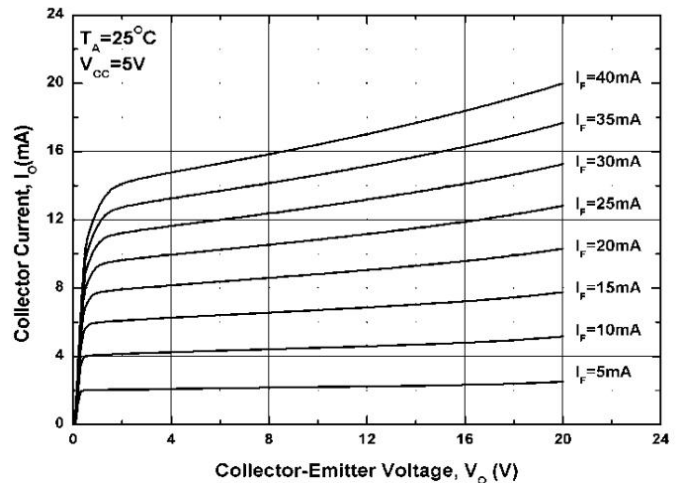


Figure 5. Logic High Output Current vs Ambient Temperature

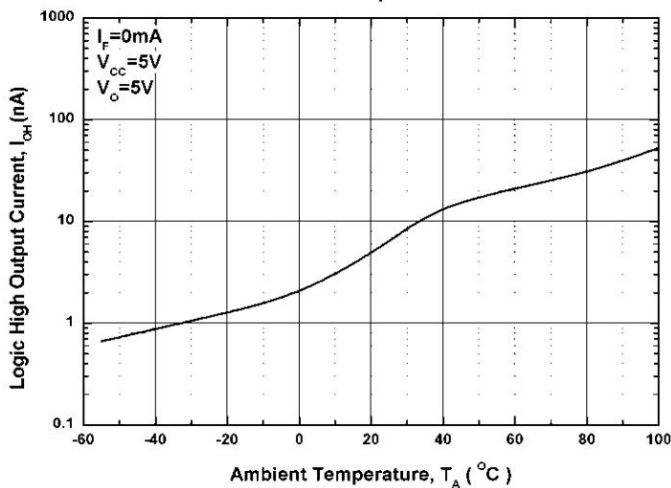


Figure 6. Propagation Delay vs. Load Resistance

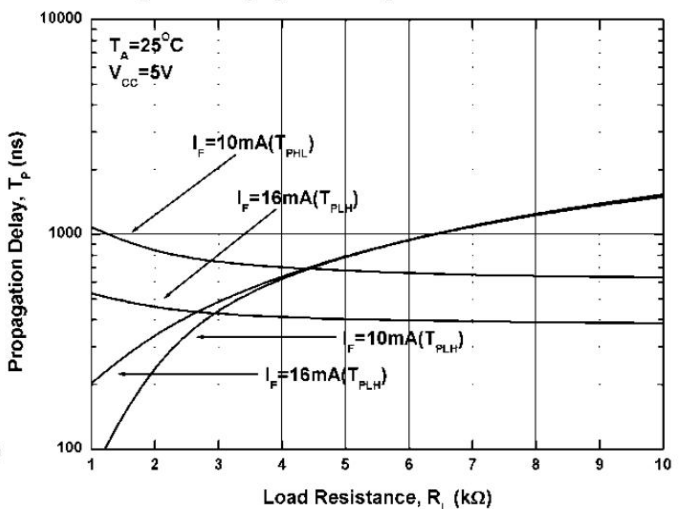


Figure 7. Propagation Delay vs. Temperature

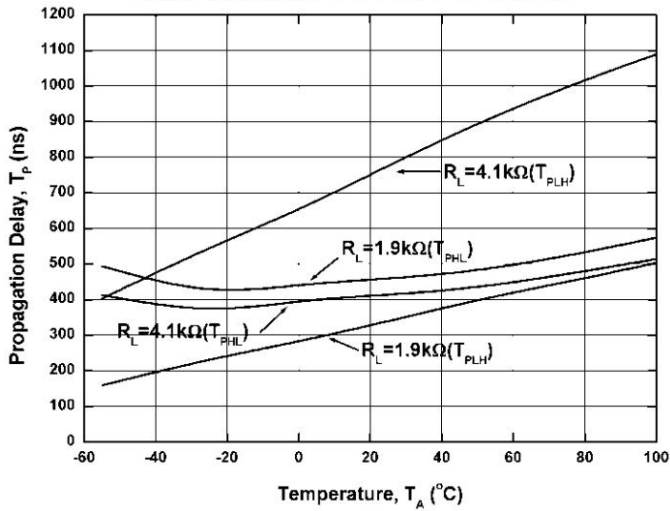


Figure 8 Switching Time Test Circuit & Waveform

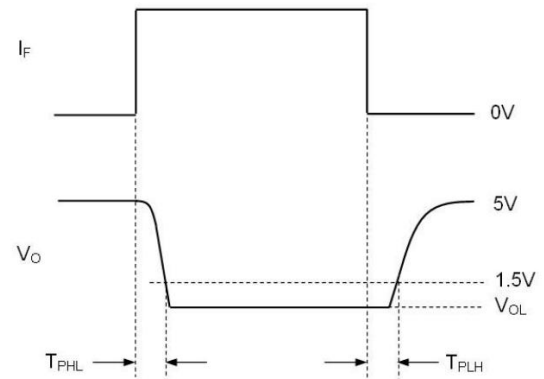
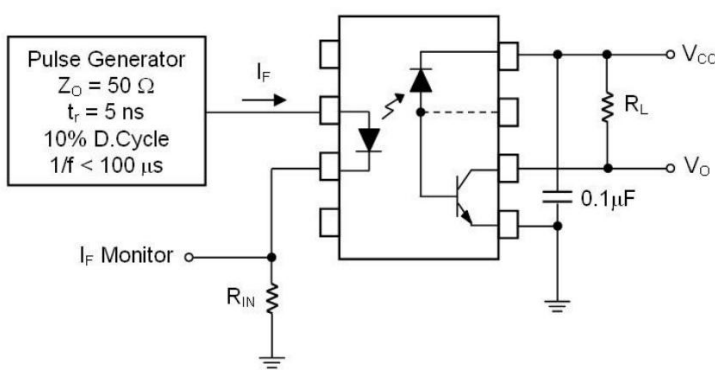


Figure 9 Transient Immunity Test Circuit & Waveform

