



ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-4504

Customer: _____

Date: _____

SHENZHEN ORIENT COMPONENTS CO ., LTD

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

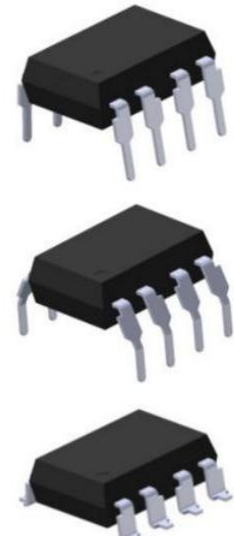
TEL: 0755-29681816

FAX: 0755-29681200

www.orient-opto.com

1. Features

- (1) High speed - 1MBd model
- (2) Adapted to the dual-in-line, lead spacing width, surface installation.
- (3) Store output.
- (4) Safety approval
 - UL approved (No.E323844)
 - VDE approved (No.40029733)
 - CQC approved (No.CQC19001231254)
- (5) In compliance with RoHS, REACH standards
- (6) MSL Class I



2. Instructions

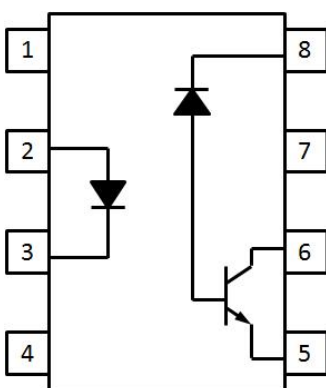
The OR-4504 devices consist of an infrared emitting diode, optically coupled to a high speed photo detector transistor. A separate connection for the photo diode bias and output-transistor collector increase the speed by several orders of magnitude over conventional photo transistor couplers by reducing the base-collector capacitance of the input transistor.

The devices are packaged in an 8-pin DIP package and available in wide-lead spacing and SMD option.

3. Application Range

- (1) Inverter circuits and IPM interface
- (2) Line receivers
- (3) High speed logic ground isolation
- (4) Analog signal ground isolation
- (5) Replaces pulse transformers

4. Functional Diagram



Pin Configuration

- 1. No Connection
- 2. Anode
- 3. Cathode
- 4. No Connection
- 5. Gnd
- 6. Vout
- 7. No Connection
- 8. Vcc

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

Parameter		Symbol	Rated Value	Unit
Input	Average Forward Input Current	I_F	25	mA
	Peak forward Current (50% duty, 1ms P.W)	I_{FP}	50	mA
	Reverse Input Voltage	V_R	5	V
	Peak Transient Current ($\leq 1\mu s$ P.W, 300pps)	I_{Ftrans}	1	A
	Power Dissipation	P_I	45	mW
Output	Output Collector Current	I_O	8	mA
	Output Collector Voltage	V_O	20	V
	Output Collector Power Dissipation	P_O	100	mW
Supply Voltage		V_{CC}	30	V
Insulation Voltage		V_{iso}	5000	Vrms
Working Temperature		T_{opr}	-40 ~ + 110	°C
Storage Temperature		T_{stg}	-55 ~ + 125	
*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. Electrical optical characteristics (at TA=25°C)

Parameter		Symbol	Min	Typ	Max	Unit	Condition
Input	Forward Voltage	V_F	---	1.4	1.7	V	$I_F = 16\text{mA}$
	Reverse Voltage	V_R	5	---	---	V	$I_R = 10\mu\text{A}$
Output	High Level Output Current	I_{OH}	---	---	0.5	μA	$V_{CC}=5.5\text{V}, V_O=5.5\text{V}, I_F=0\text{mA}$
			---	---	1		$V_{CC}=15\text{V}, V_O=15\text{V}, I_F=0\text{mA}$
	High Level Supply Current	I_{CCL}	---	400	---	μA	$I_F=16\text{mA}, V_O=\text{open}, (V_{CC}=15\text{V})$
	Low Level Supply Current	I_{CCH}	---	---	1	μA	$I_F=0\text{mA}, V_O=\text{open}, (V_{CC}=15\text{V})$
Transfer Characteristics	Current Transfer Ratio	CTR	25	---	60	%	$I_F = 16\text{mA}, V_O = 0.4\text{V}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$
			21	35	---		$I_F = 16\text{mA}, V_O = 0.5\text{V}, V_{CC}=4.5\text{V},$
			26	---	65		$I_F = 12\text{mA}, V_O = 0.4\text{V}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$
			22	39	---		$I_F = 12\text{mA}, V_O = 0.5\text{V}, V_{CC}=4.5\text{V}$
	Logic Low Output Voltage	V_{OL}	---	0.25	0.4	V	$I_F = 16\text{mA}, I_O = 4.0\text{mA}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$
			---	---	0.5		$I_F = 16\text{mA}, I_O = 3.3\text{mA}, V_{CC}=4.5\text{V}, T_A=25^\circ\text{C}$

7. Switching Characteristics (at TA=25°C)

Parameter	Symbol	Min.	Typ*	Max.	Unit	Conditions
Propagation Delay Time to Logic Low	t_{pHL}	---	0.25	0.4	μs	Pulse f=20KHz, Duty cycle = 10%, If= 16mA, Vcc=5V, Rl=1.9K Ω , Vthhl=1.5V, Ta =25°C
		---	0.6	0.8		Pulse f=10kHz, Duty cycle = 50%, If= 12mA, Vcc=15V, Rl=20K Ω , Vthhl=1.5V, Ta =25°C
		---	---	0.4		Pulse f=20kHz Duty cycle = 10%, If= 16mA, Vcc=5V, Rl=1.9k Ω , Vthhl=1.5V
		---	---	1.0		Pulse f=10kHz, Duty cycle = 50%, If= 12mA, Vcc=15V, Ri=20k Ω , Vthhl=1.5V
		---	0.25	0.4		Pulse f=20kHz Duty cycle = 10%, If= 16mA, Vcc=5V, Rl=1.9k Ω , Vthlh=1.5V, Ta =25°C
Propagation Delay Time to Logic High	t_{pLH}	---	1.0	1.2	μs	Pulse f=10kHz, Duty cycle = 50%, If= 12mA, Vcc=15V, Rl=20K Ω , Vthlh=1.5V, Ta =25°C
		---	---	0.7		Pulse f=20kHz Duty cycle = 10%, If= 16mA, Vcc=5V, Rl=1.9k Ω , Vthlh=2V
		---	---	1.4		Pulse f=10kHz, Duty cycle = 50%, If= 12mA, Vcc=15V, Ri=20k Ω , Vthlh=2V
Propagation Delay Difference Between Any 2 Parts	$t_{pLH}-t_{pHL}$	-0.4	0.4	0.9	V/ μs	Pulse f=10kHz Duty cycle = 50%, If= 12mA, Vcc=15V, Rl=20K Ω , Vthhl=1.5V, Vthlh=2V, Ta =25°C
		-0.7	---	1.3		Pulse f=10kHz, Duty cycle = 50%, If= 12mA, Vcc=15V, Rl=20K Ω , Vthlh=1.5V, Vthlh=2V
Common Mode Transient Immunity at Logic Low	CM_I	1,000	10,000	---	V/ μs	If= 16mA, Vcm=10Vp-p, Rl=4.1K Ω , Ta =25°C
		1,000	10,000	---		If= 16mA, Vcm=1000Vp-p, Rl=1.9K Ω , Ta=25°C

8. Isolation characteristics (at TA=25°C)

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input-Output Insulation Leakage Current	I _{I-O}	45% RH,t=5s, V _{I-O} = 3kV DC,T _A =25 C	—	—	1	μA
Withstand Insulation Test Voltage	V _{ISO}	RH ≤ 50%, t =1min,T _A =25°C	5000	—	—	V _{RMS}
Input-Output Resistance	R _{I-O}	V _{I-O} =5000V DC	5x10 ¹⁰	10 ¹²	—	Ω

Typical values of TA = 25 °C

9. Order Information

Part Number

OR-4504U-Y-Z

Note

4504 = Part Number.

U = Lead form option (S, M or none)

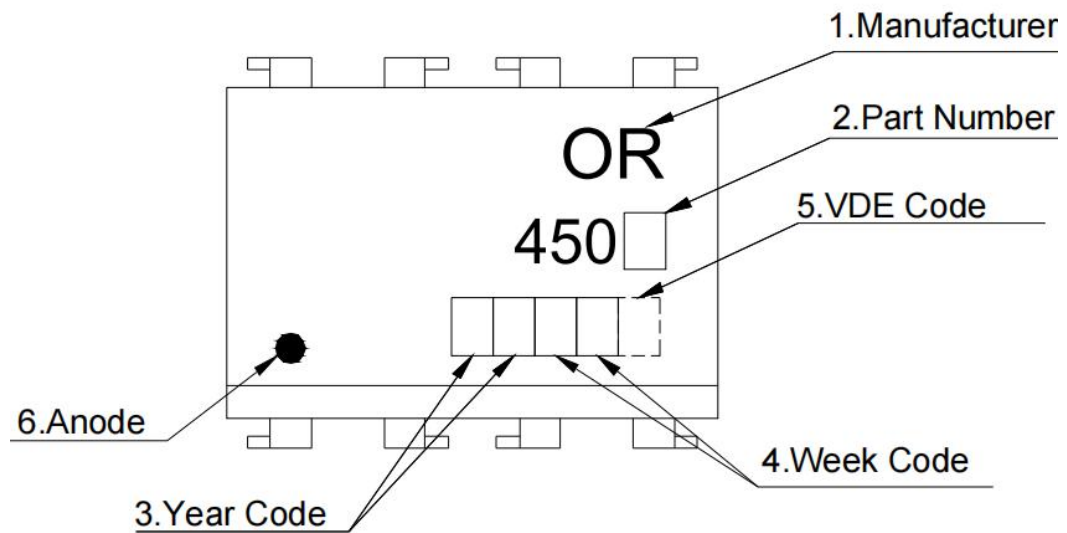
Y = Tape and reel option (TA,TA1 or none).

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

* VDE Code can be selected.

Option	Description	Packing quantity
None	Standard SMD Option	45 units per tube
M	Wide lead bend (0.4 inch spacing)	45 units per tube
TA	Surface mount lead form (low profile) + TA tape & reel option	1000 units per reel
TA1	Surface mount lead form (low profile) + TA1 tape & reel option	1000 units per reel

10. Naming Rule

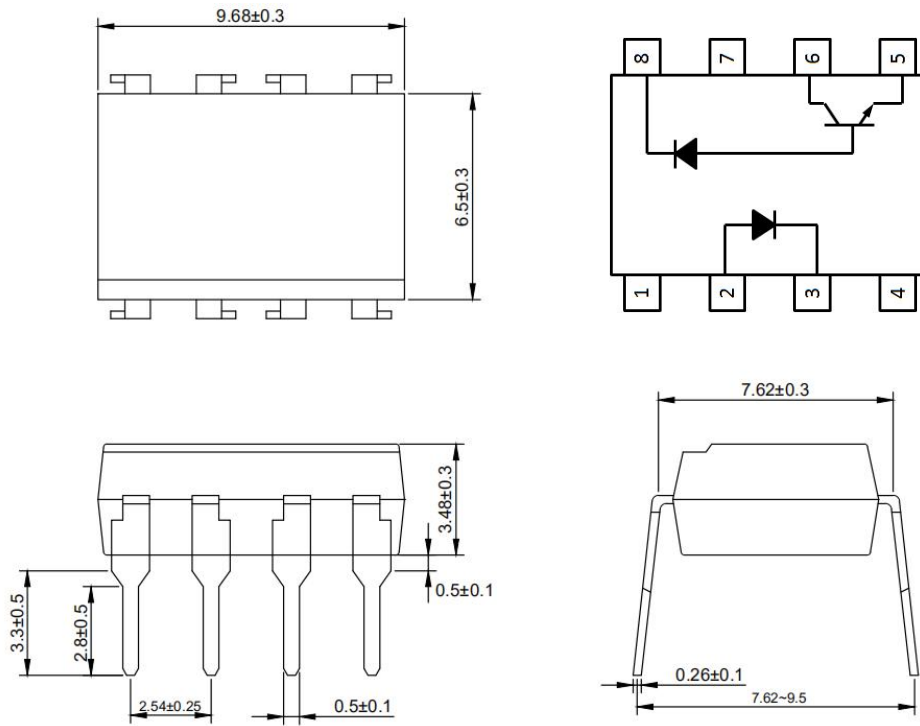


1. Manufacturer : ORIENT.
2. Part Number :4504.
3. Year Code : '21' means '2021' and so on.
4. Week Code : 01 means the first week, 02 means the second week and so on.
5. VDE Code . (Optional)
6. Anode.

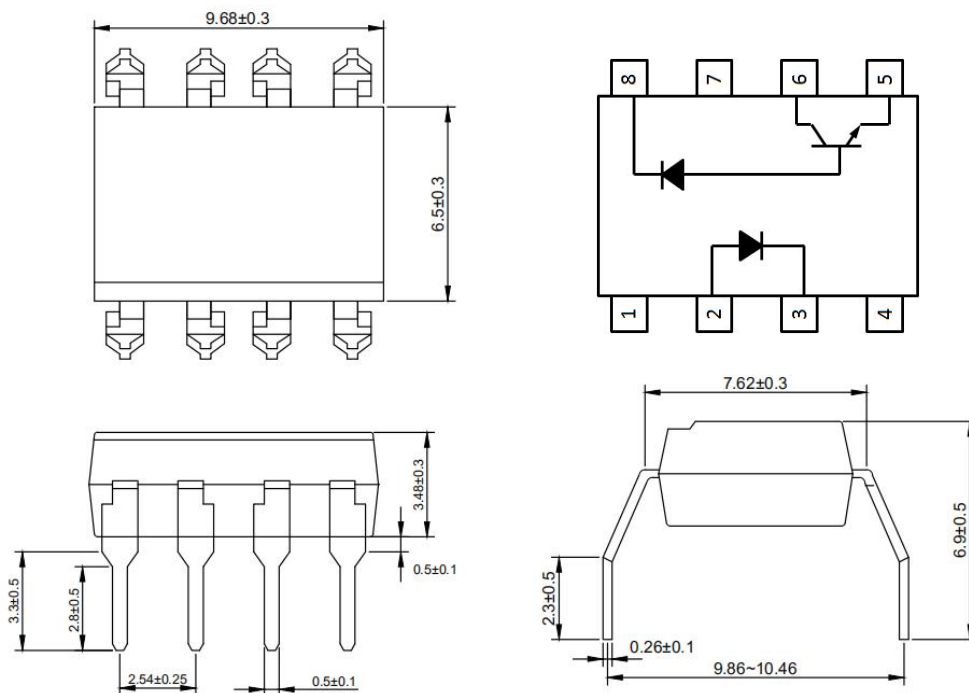
* VDE Mark can be selected.

11. Outer Dimension

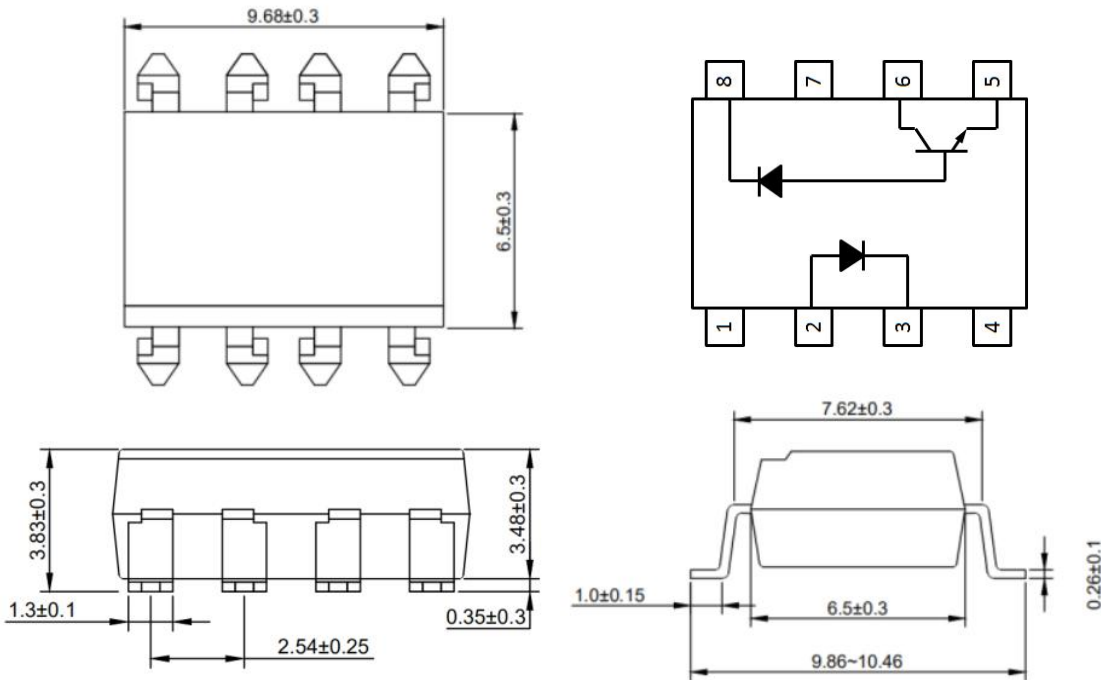
(1) OR-4504



(2) OR-4504M

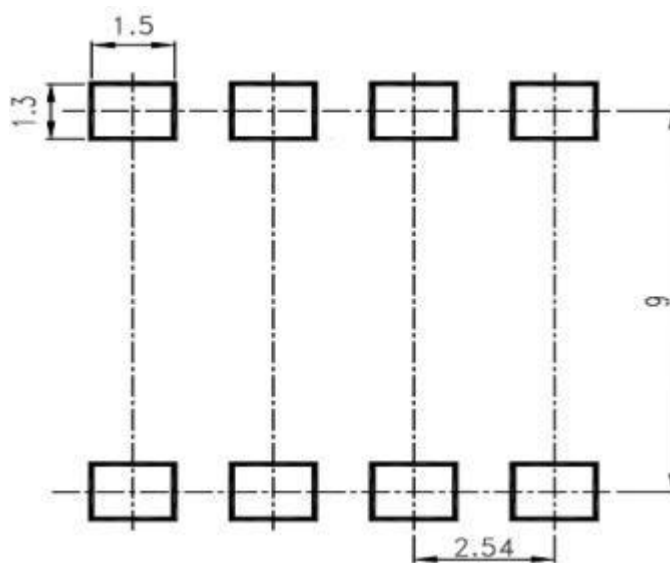


(3) OR-4504S



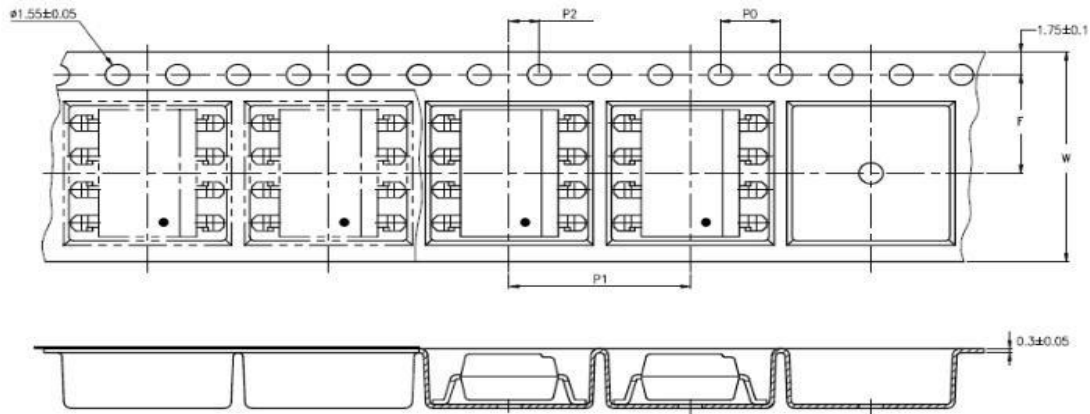
12. Recommended Foot Print Patterns (Mount Pad)

(unit: mm)

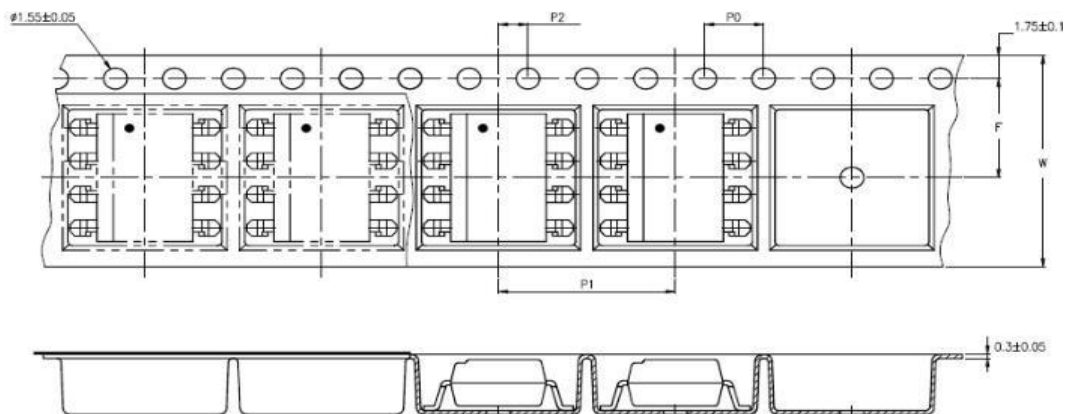


13. Taping Dimensions

(1)OR-4504S-TA



(2)OR-4504S-TA1



type	symbol	Dimensions: mm (inches)
bandwidth	W	16±0.3 (0.63)
pitch	P0	4±0.1 (0.15)
pitch	F	7.5±0.1 (0.295)
	P2	2±0.1 (0.079)
interval	P1	12±0.1 (0.472)

Encapsulation type	TA/TA1
Amount(pcs)	1000

14. Package Dimension

(1) package dimension

DIP Type

Packing Information	
Packing type	Tube
Qty per Tube	45pcs
Small box (Inner) Dimension	525*128*60mm
Large box (Outer) Dimension	545*290*335mm
The Amount per Inner Box	2,250pcs
The Amount per Outer Box	22,500pcs

SOP Type

Packing Information	
Packing type	Reel type
Tape Width	16mm
Qty per Reel	1,000pcs
Small box (inner) Dimension	345*345*58.5mm
Large box (Outer) Dimension	620x360x360mm
Max qty per small box	2,000pcs
Max qty per large box	20,000pcs

(2)Packing Label Sample



The label sample includes the ORIENT logo, CE, UL, and RoHS REACH certification marks. It features a barcode and the following text: Material Code: 120PCXXXXX, P/N: OR-XXXXXX, Lot No.: XXXXXX-XXXXX-TX-X, D/C: XXXX, Qty: XXXX PCS. It also contains two boxes for '内箱码' (Inner Box Code) and '外箱码' (Outer Box Code), a 1D barcode, and the text 'XXXXXXXXXXXXXXXXXX' (一体机序列码) and '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.

15. Reliability Test

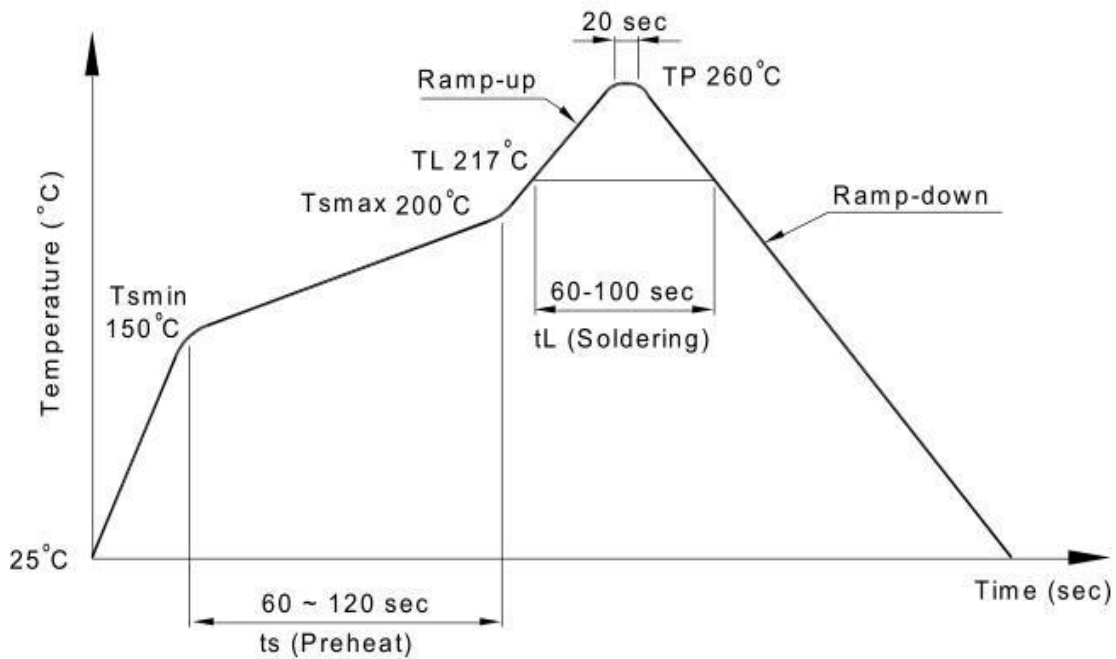
NO.	ITEMS	Reliability Testing				
		QTY. (Pcs)	Condition	Process	Device	Standard
1	RSH 耐焊接热	22	260±5°C	5s/3 次	锡炉	JESD22-A106
2	HTSL 高温存储	77	125°C	168 hrs	高温烤箱 测试仪	JESD22-A103
				500 hrs		
				1000 hrs		
3	LTSL 低温存储	77	-40°C	168 hrs	低温箱 测试仪	JESD22-A119
				500 hrs		
				1000 hrs		
4	TC 温度循环	77	H:125°C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

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.

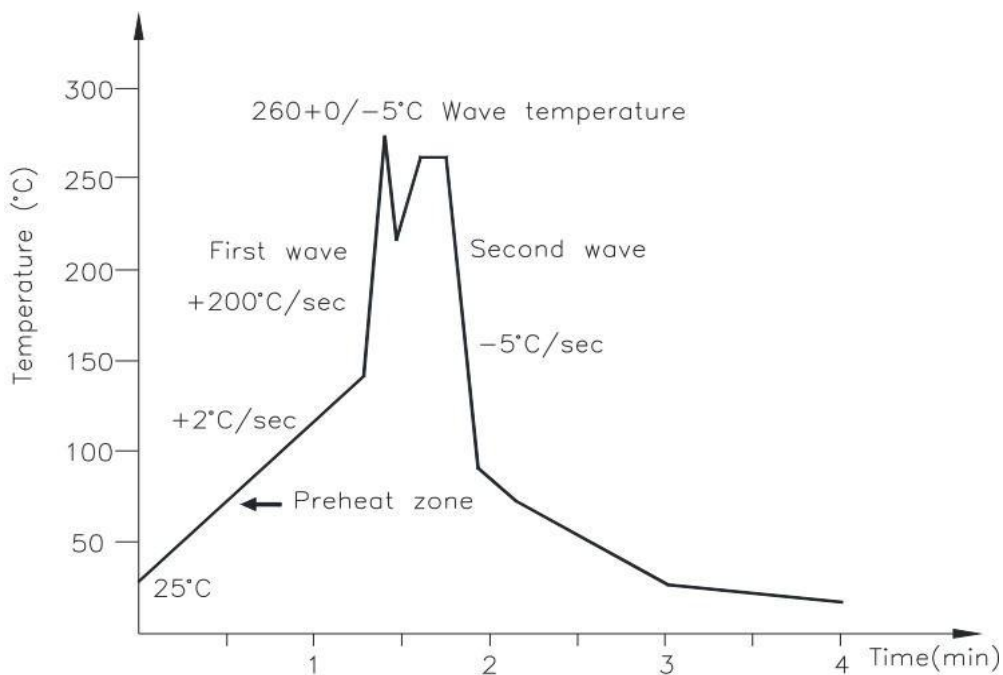
Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	150°C 200°C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	217°C 60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak temperature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



(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

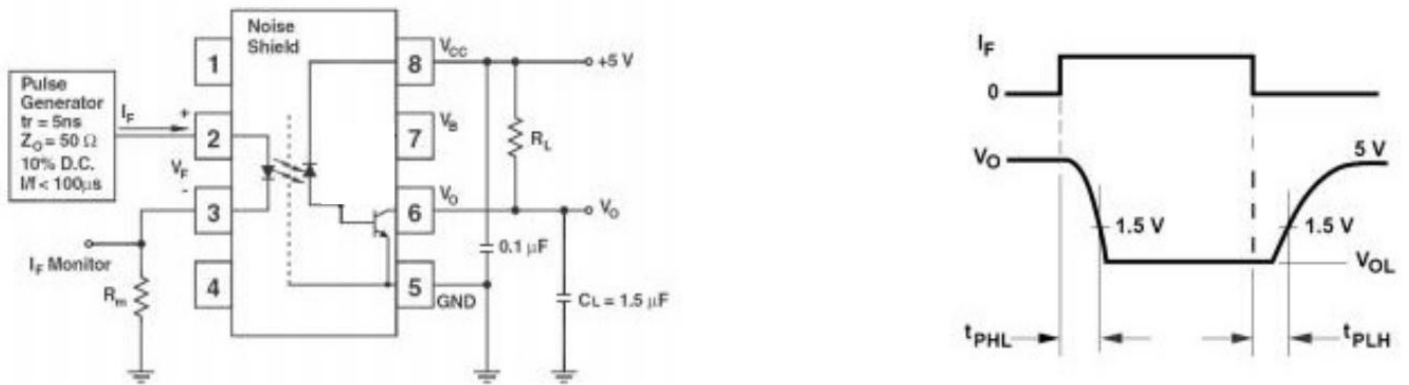


Figure 1: Test Circuit for t_{PHL} and t_{PLM}

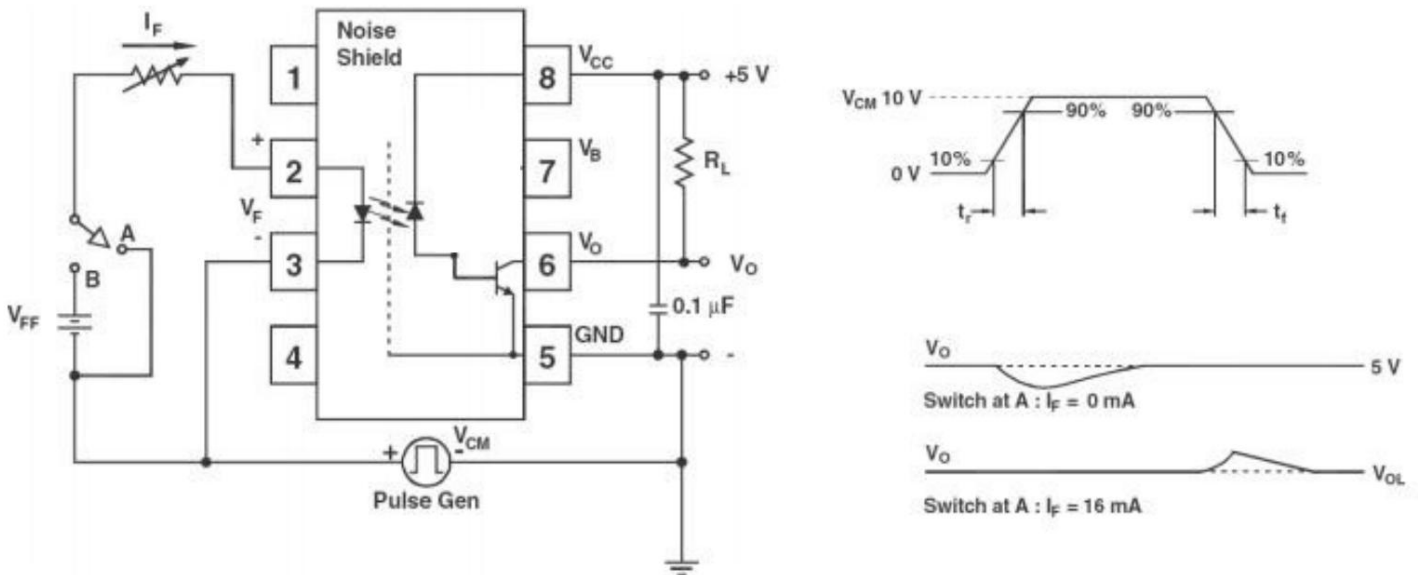


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

18. Characteristics Curve

Fig.1 Forward Current vs. Forward Voltage

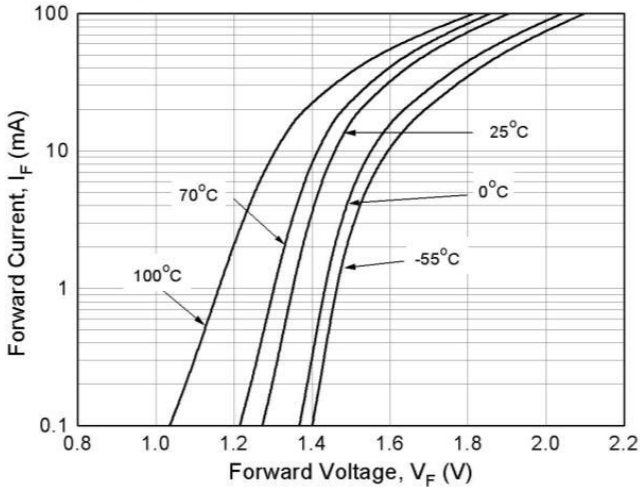


Figure 2. Normalized Current Transfer Ratio vs. Forward Current

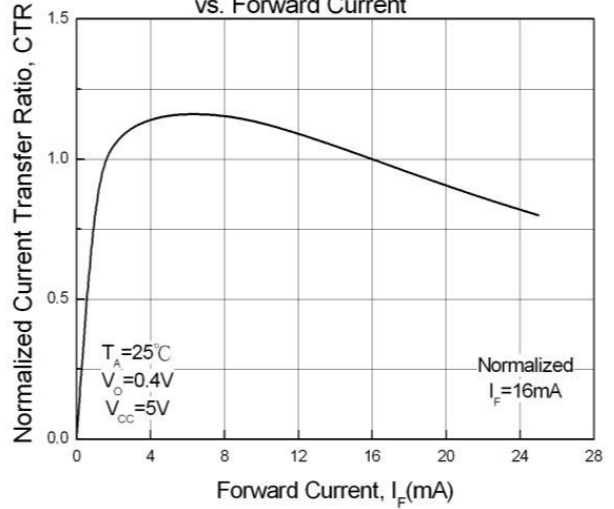


Figure 3. Normalized Current Transfer Ratio vs. Ambient Temperature

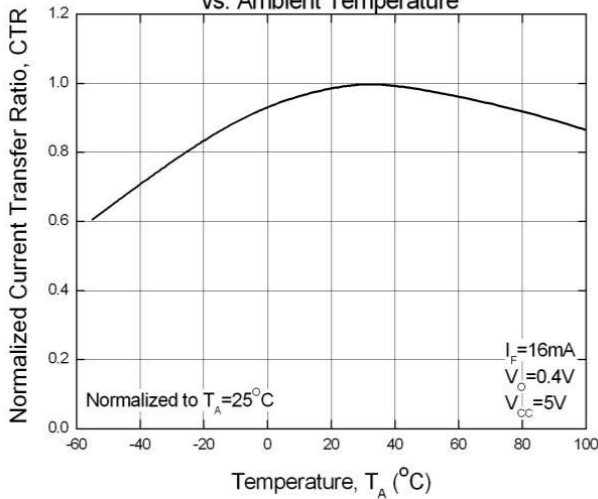


Figure 4. Output Current vs Output Voltage

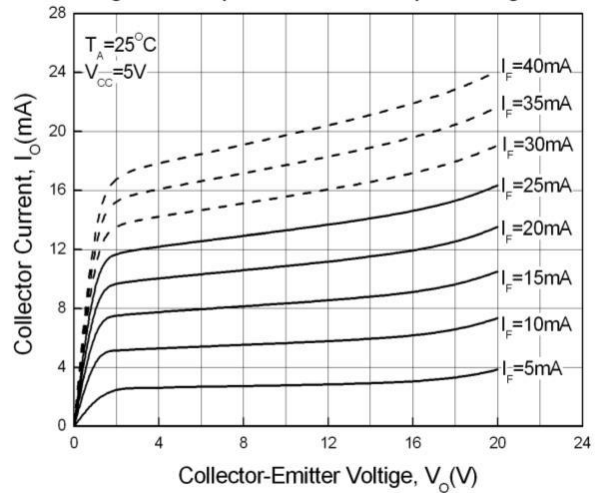


Figure 5. Logic High Output Current vs Ambient Temperature

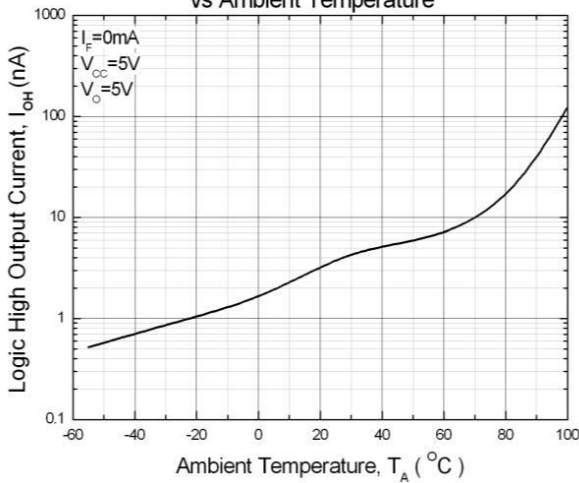


Figure 6. Propagation Delay vs. Temperature

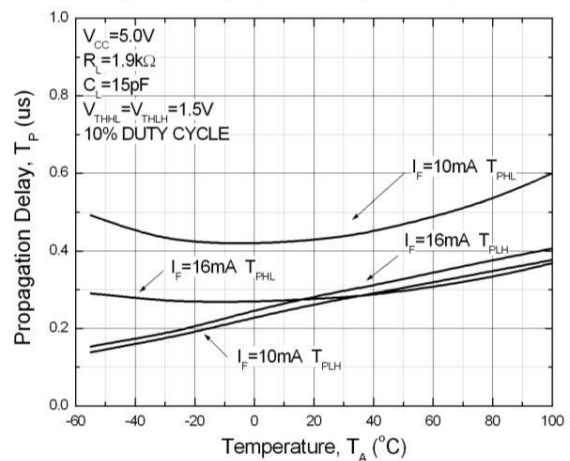


Figure 7. Propagation Delay vs. Load Resistance

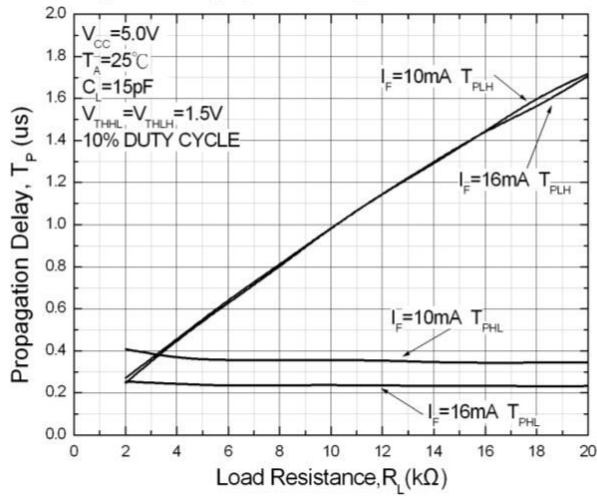


Figure 8. Propagation Delay vs. Load Resistance

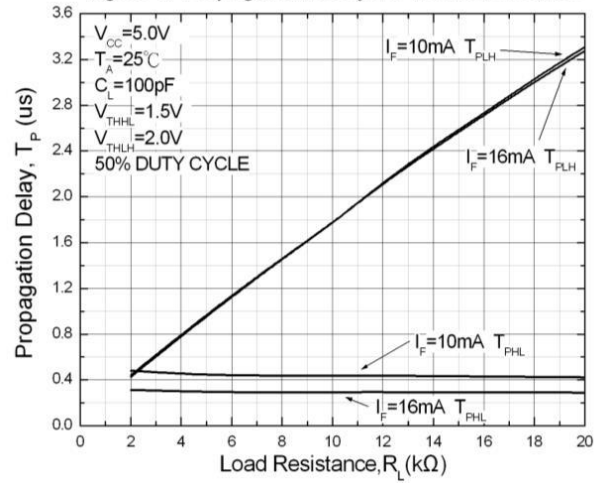


Figure 9. Propagation Delay vs. Temperature

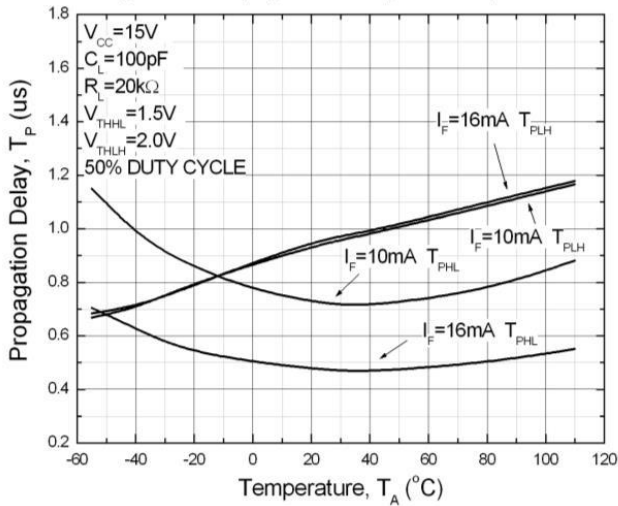


Figure 10. Propagation Delay vs. Load Resistance

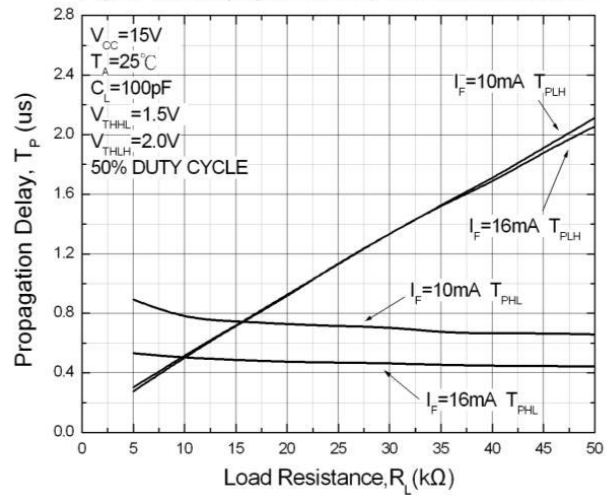


Figure 11. Propagation Delay vs. Load Capacitance

