



ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-0601

Customer: _____

Date: _____

SHENZHEN ORIENT COMPONENTS CO., LTD

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

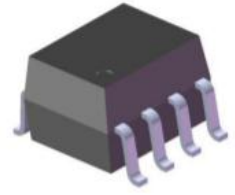
TEL: 0755-29681816

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www.orient-opto.com

1. Features

- (1) High speed 10Mbit/s.
- (2) 10kV/ μ s minimum common mode transient immunity at $V_{CM}=1KV$.
- (3) Guaranteed performance from -40 to $85^{\circ}C$.
- (4) Logic gate output.
- (5) High isolation voltage between input and output ($V_{iso}=3750V_{rms}$).
- (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. Instructions

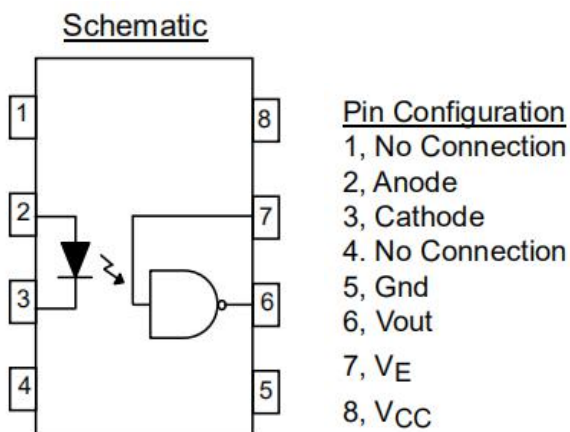
The OR-0601 device each consists of an infrared emitting diode optically coupled to a high speed integrated photo detector logic gate with a strobable output.

The devices are packaged in an 8-pin small outline package which conforms to the standard SO8 footprint.

3. Application Range

- | | |
|--|---------------------------------------|
| (1) Ground loop elimination | (5) Switching power supplies |
| (2) LSTTL to TTL, LSTTL or 5 volt CMOS | (6) Pulse transformer replacement |
| (3) Line receiver, data transmission | (7) Computer peripheral interface |
| (4) Data multiplexing | (8) High speed logic ground isolation |

4. Functional Diagram



Truth Table (Positive Logic)

Input	Enable	Output
H	H	L
L	H	H
H	L	H
L	L	H
H	NC	L
L	NC	H

A $0.1\mu F$ bypass capacitor must be connected between pins 8 and 5

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

Parameter		Symbol	Rated Value	Unit
Input	Average Forward Input Current	I _F	20	mA
	Reverse Input Voltage	V _R	5	V
	Power Dissipation	P _I	40	mW
	Enable Input Voltage	V _E	VCC+0.5	V
	Enable Input current	I _E	5	mA
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 ~ + 85	°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. Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Operating Temperature	T_A	-40	110°C	°C
Supply Voltage	V_{CC}	4.5	5.5	V
Low Level Input Current	I_{FL}	0	250	μA
High Level Input Current	I_{FH}	5	15	mA
Low Level Enable Voltage	V_{EL}	0	0.8	V
High Level Enable Voltage	V_{EH}	2	V_{CC}	V
Output Pull-up Resistor	R_L	330	4k	Ω
Fan Out (at $R_L=1k\Omega$ per channel)	N	—	5	TTL Loads

7. Opto-electronic Characteristics

Parameter		Symbol	Min	Typ	Max	Unit	Condition
Input	Forward Voltage	V_F	1.3	—	1.8	V	$I_F = 10\text{mA}$
	Temperature Coefficient OF Forward Voltage	$\Delta V_F / \Delta T$	—	-1.5	—	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	10	μA	$V_E = 0.5\text{V}, V_{CC} = 3.3\text{V}, I_F = 0\text{mA}$
	Low Level Supply Current	I_{CCL}	—	5.8	13	mA	$V_E = 0.5\text{V}, V_{CC} = 3.3\text{V}, I_F = 10\text{mA}$
	High Level Enable Current	I_{EH}	—	-0.19	-1.6	mA	$V_{CC} = 3.3\text{V}, V_E = 2\text{V}$
	Low Level Enable Current	I_{EL}	—	-0.41	-1.6	mA	$V_{CC} = 3.3\text{V}, V_E = 0.5\text{V}$
	High Level Enable Voltage	V_{EH}	2	—	—	V	
	Low Level Enable Voltage	V_{EL}	—	—	0.8	V	
	High Level Output Current	I_{OH}	—	5	100	μA	$V_E = 2\text{V}, V_{CC} = 3.3\text{V}, V_O = 3.2\text{V}, I_F = 250\mu\text{A}$
	Low Level Output Voltage	V_{OL}	—	0.3	0.6	V	$V_E = 2\text{V}, V_{CC} = 3.3\text{V}, I_F = 5\text{mA}, I_{OL}(\text{sinking}) = 13\text{mA}$

Recommended temperature range ($T_A = -40^\circ\text{C} \sim +110^\circ\text{C}$, $2.7\text{V} \leq V_{CC} \leq 3.6\text{V}$), $I_F = 7.5\text{mA}$ 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	1.7	V	$I_F = 10\text{mA}$
	Temperature Coefficient OF Forward Voltage	$\Delta V_F / \Delta T$	—	-1.5	—	mV/°C	$I_F = 10\text{mA}$
	Reverse Voltage	BV_R	5	—	—	V	$I_R = 10\mu\text{A}$
	Input Threshold Current	I_{TH}	—	1.35	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}	—	6.1	10	μA	$V_E = 0.5\text{V}$, $V_{CC}=5.5\text{V}, I_F=0\text{mA}$
	Low Level Supply Current	I_{CCL}	—	8.3	13	mA	$V_E = 0.5\text{V}$, $V_{CC}= 5.5\text{V}, I_F=10\text{mA}$
	High Level Enable Current	I_{EH}	—	-0.6	-1.6	mA	$V_{CC}= 5.5\text{V}, V_E=2\text{V}$
	Low Level Enable Current	I_{EL}	—	-0.9	-1.6	mA	$V_{CC}= 5.5\text{V}, V_E=0.5\text{V}$
	High Level Enable Voltage	V_{EH}	2	—	—	V	
	Low Level Enable Voltage	V_{EL}		—	0.8	V	
	High Level Output Current	I_{OH}	—	0.9	100	μA	$V_E=2\text{V}, V_{CC}=5.5\text{V}$, $V_O=5.5\text{V}, I_F=250\mu\text{A}$
	Low Level Output Voltage	V_{OL}	—	0.3	0.6	V	$V_E=2\text{V}, V_{CC}=5.5\text{V}$, $I_F=5\text{mA}$, $I_{OL}(\text{sinking}) = 13\text{mA}$

Recommended temperature range($T_A = -40^\circ\text{C} \sim +110^\circ\text{C}$, $4.5\text{V} \leq V_{CC} \leq 5.5\text{V}$), $I_F = 7.5\text{mA}$ 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}	25	48	90	ns	$R_L=350\Omega$ $C_L=15pF$
Propagation delay time to output Low level	t_{PHL}	25	35	75	ns	
Pulse Width Distortion	$ t_{PLH}-t_{PHL} $	—	13	—	ns	
Output Rise Time (10 to 90%)	t_r	—	21	—	ns	
Output Fall Time (90 to 10%)	t_f	—	6.6	—	ns	
Propagation Delay Time of Enable from V_{EH} to V_{EL}	t_{ELH}	—	27	—	ns	$R_L=350\Omega$ $C_L=15pF$ $V_{EL}=0V$ $V_{EH}=3V$
Propagation Delay Time of Enable from V_{EL} to V_{EH}	t_{EHL}	—	9	—	ns	

Recommended temperature range ($T_A = -40^\circ C \sim +110^\circ C$, $2.7V \leq V_{CC} \leq 3.6V$), $I_F = 7.5mA$ Unless otherwise stated. Typical values $T_A = 25^\circ C$, $V_{CC} = 3.3V$.

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Propagation delay time to output High level	t _{PLH}	25	40	75	ns	T _A =25°C R _L =350Ω C _L =15pF
		—	—	100		
Propagation delay time to output Low level	t _{PHL}	25	32	75	ns	
		—	—	100		
Pulse Width Distortion	t _{PLH} -t _{PHL}	—	8	—	ns	R _L =350Ω 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 Time of	t _{ELH}	—	28	—	ns	R _L =350Ω
Enable from V _{EH} to V _{EL}						C _L =15pF V _{EL} =0V V _{EH} =3V
Propagation Delay Time of Enable from V _{EL} to V _{EH}	t _{EHL}	—	12	—	ns	

Recommended temperature range ($T_A = -40^\circ C \sim +110^\circ C$, $4.5V \leq V_{CC} \leq 5.5V$), $I_F = 7.5mA$ Unless otherwise stated. Typical values $T_A = 25^\circ C$, $V_{CC} = 5.0V$.

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Logic High Common Mode Transient Immunity	$ CM_H $	10	15	—	kV/ μ s	$V_{CC}=3.3V, V_{CM}=1000V, R_L=350\Omega$ $I_F=0mA, T_A=25^\circ C$
		10	15	—		$V_{CC}=5V, V_{CM}=1000V, R_L=350\Omega$ $I_F=0mA, T_A=25^\circ C$
Logic Low Common Mode Transient Immunity	$ CM_L $	10	15	—	kV/ μ s	$V_{CC}=3.3V, V_{CM}=1000V, R_L=350\Omega$ $I_F=10mA, T_A=25^\circ C$
		10	15	—		$V_{CC}=5V, V_{CM}=1000V, R_L=350\Omega$ $I_F=10mA, T_A=25^\circ C$

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Input-Output Insulation Leakage Current	I_{I-O}	—	—	1	μA	45% RH, $t=5s$, $V_{I-O} = 3kV$ DC, $T_A = 25^\circ C$
Withstand Insulation Test Voltage	V_{ISO}	3750	—	—	V_{RMS}	$RH \leq 50\%$, $t=1min$, $T_A=25^\circ C$
Input-Output Resistance	R_{I-O}	—	10^{12}	—	Ω	$V_{I-O} = 500V$ DC
Input-Output Capacitance	C_{I-O}	—	1		p	$f = 1MHz$, $T_A = 25^\circ C$

Recommended temperature range ($T_A=40^\circ C-110^\circ C$) Unless otherwise stated. Typical values $T_A = 25^\circ C$.

9. Order Information

Part Number

OR-0601-Y-Z

Note

0601 = Part Number.

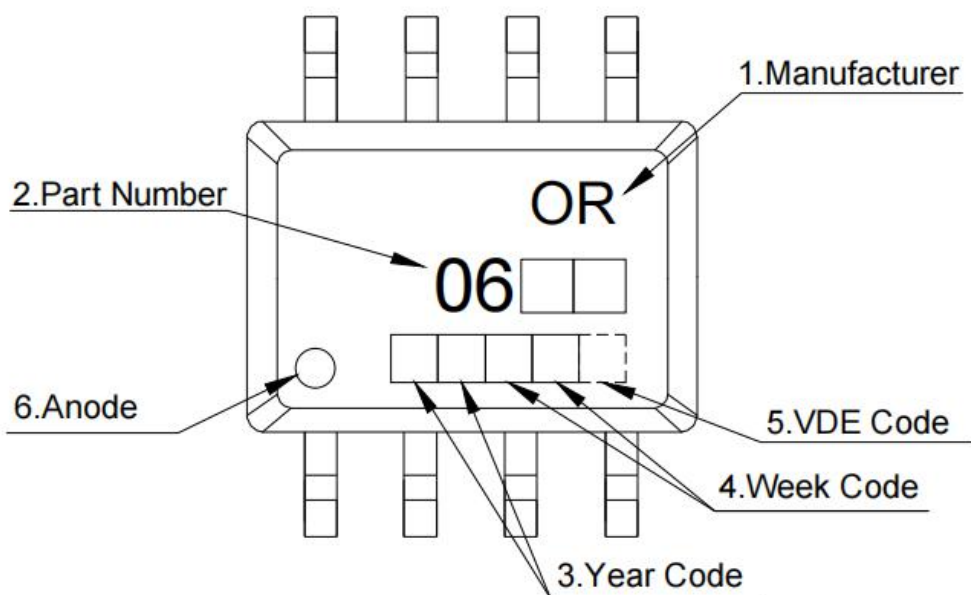
Y = Tape and reel option (TA,TA1 or none).

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

* VDE Code can be selected.

Option	Description	Packing quantity
TA	Surface mount lead form (low profile) + TA tape & reel option	2000 units per reel
TA1	Surface mount lead form (low profile) + TA1 tape & reel option	2000 units per reel

10. Naming Rule

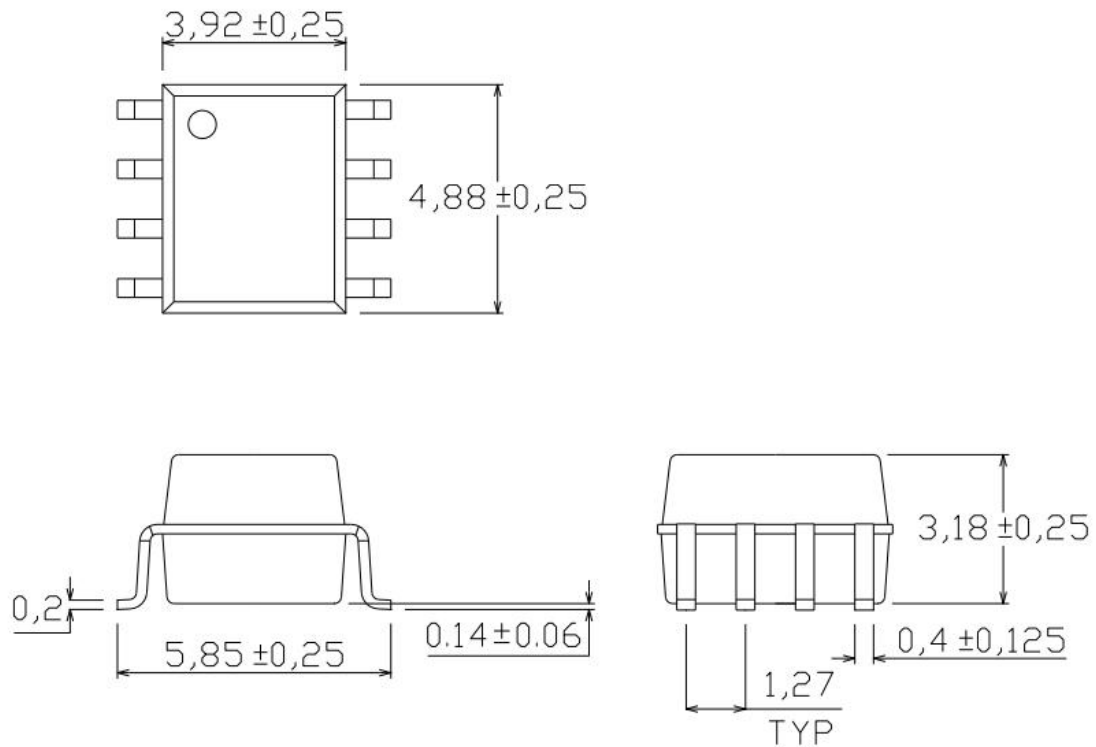


1. Manufacturer : ORIENT.
2. Part Number : 0601.
3. Year Code : '21' means '2021' and so on.
4. Week Code : 01 means the first week, 02 means the second week and so on.
5. VDE Code (Optional)
6. Anode.

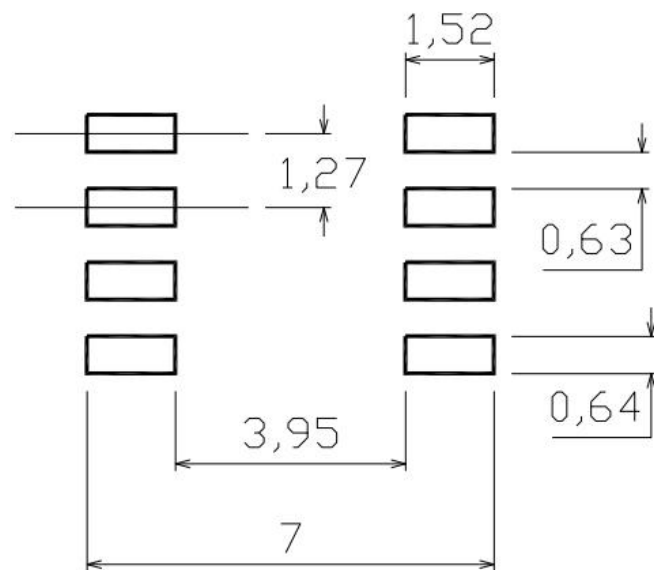
* VDE Mark can be selected.

11. Outer Dimension

OR-06XX



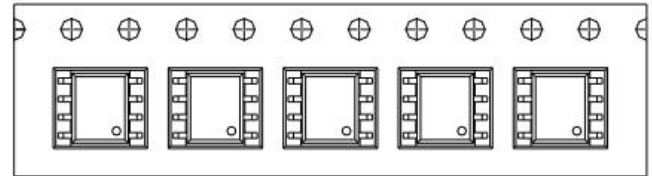
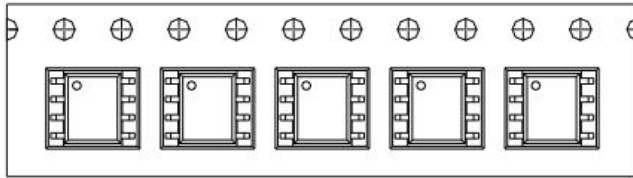
12. Recommended Foot Print Patterns (Mount Pad)



12. Taping Dimensions

(1)OR-06XX-TA1

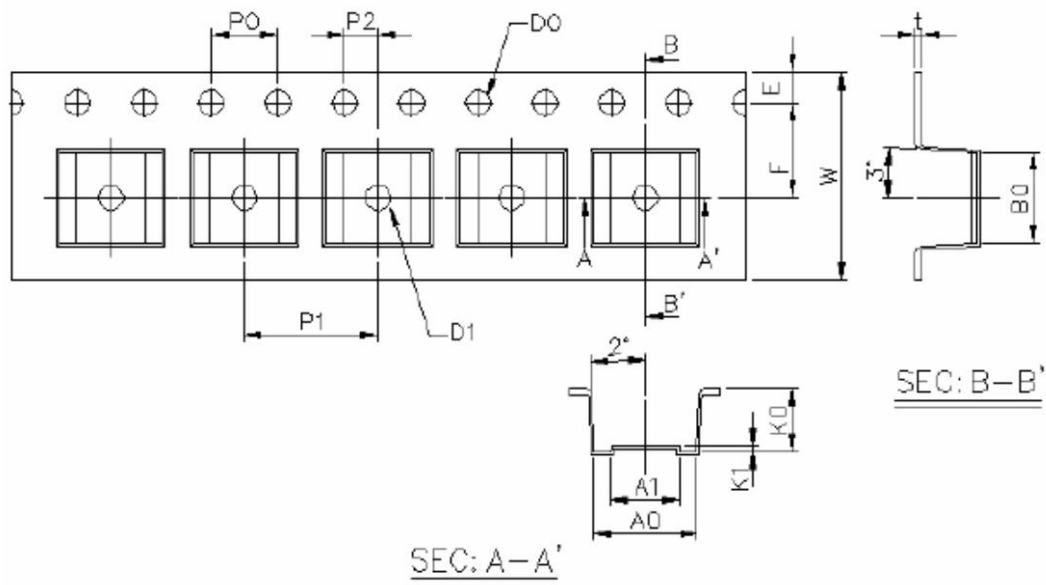
(2)OR-06XX-TA



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.	P0	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

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-XXXX-TX-X D/C : XXXX Qty : XXXX PCS 	  
内箱码 外箱码	“XXXXXXXXXXXXXXXX” (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

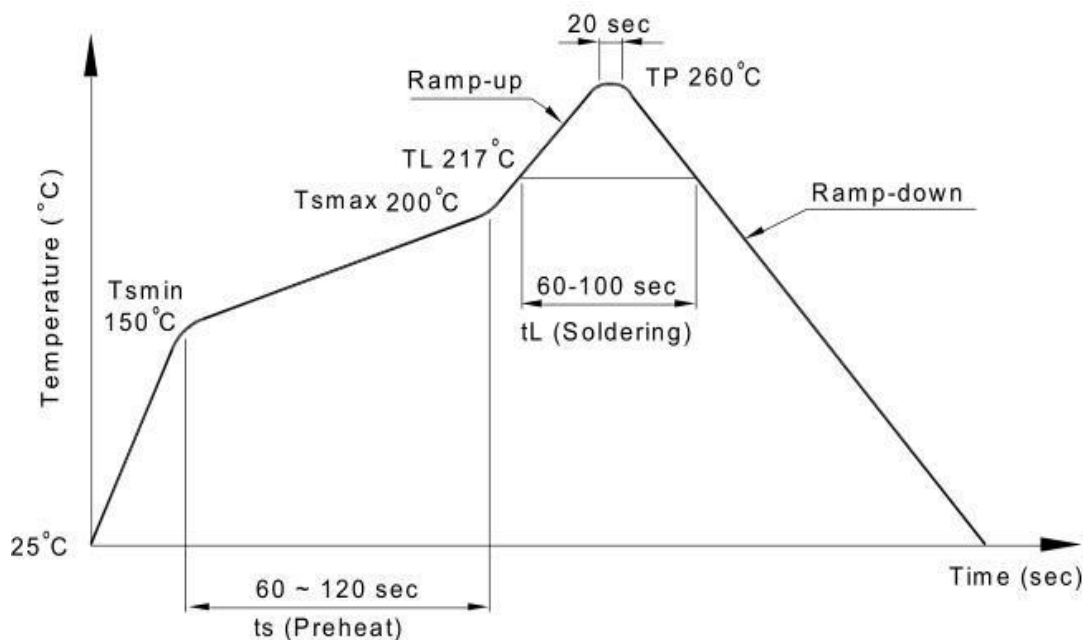
NO.	ITEMS	Reliability Testing				
		QTY. (Pcs)	Condition	Process	Device	Standard
1	RSH 耐焊接热	22	260±5°C	5s/3 次	锡炉	JESD22-A106
2	HTSL 高温存储	77	125°C	168 hrs	高温烤箱 测试仪	JESD22-A103
				500 hrs		
				1000 hrs		
3	LTSL 低温存储	77	-40°C	168 hrs	低温箱 测试仪	JESD22-A119
				500 hrs		
				1000 hrs		
4	TC 温度循环	77	H:125°C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

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

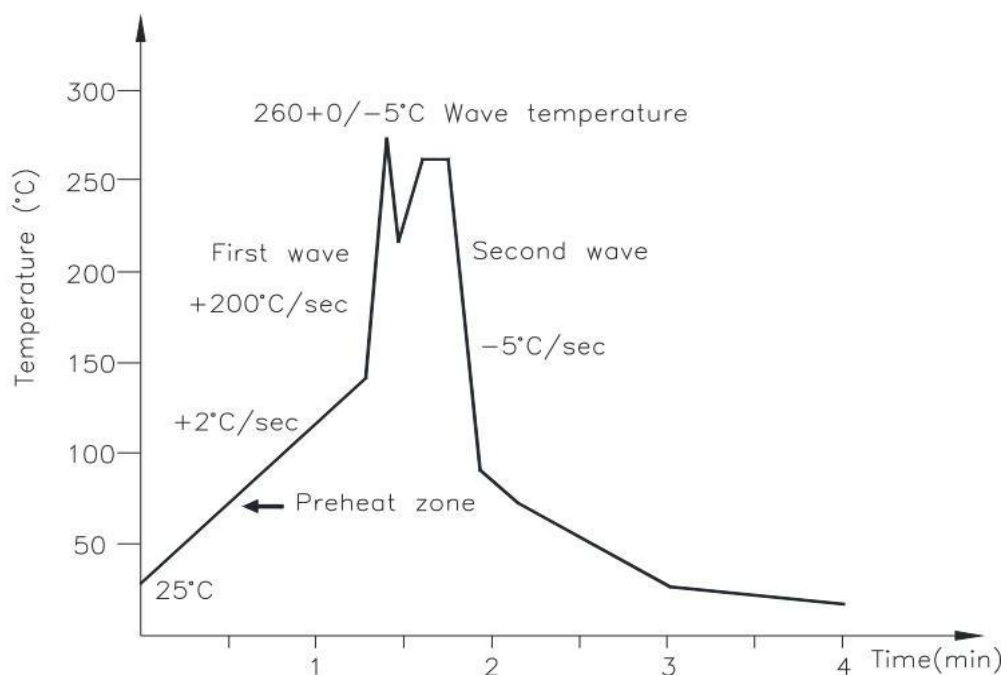
Profile item	Conditions
Preheat	
- Temperature Min (T Smin)	150°C
- Temperature Max (T Smax)	200°C
- Time (min to max) (ts)	90±30 sec
Soldering zone	
- Temperature (TL)	217°C
- Time (t L)	60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak temperature	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 80sec



(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

16. Switching time test circuit

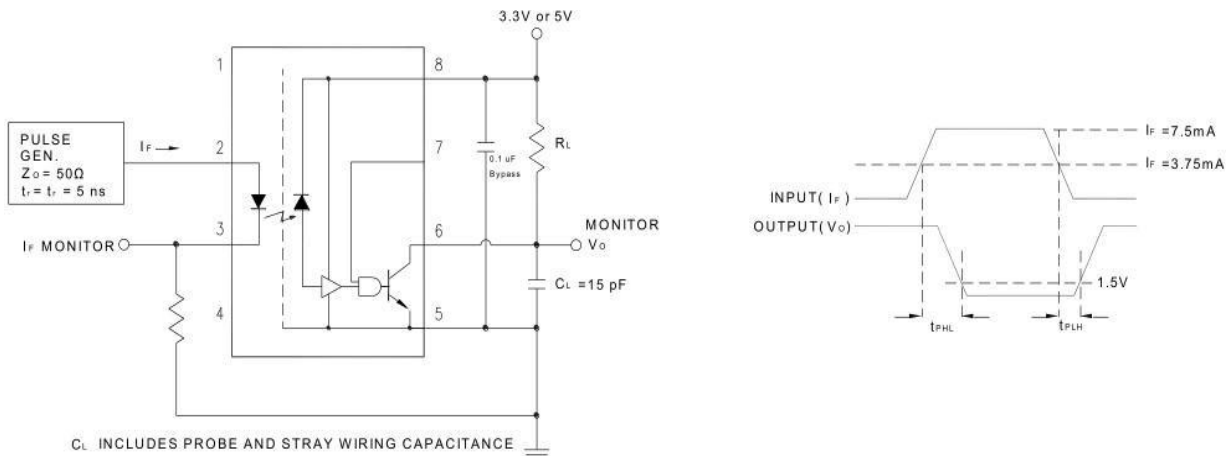


Figure 1: Test Circuit for t_{PHL} and t_{PLH}

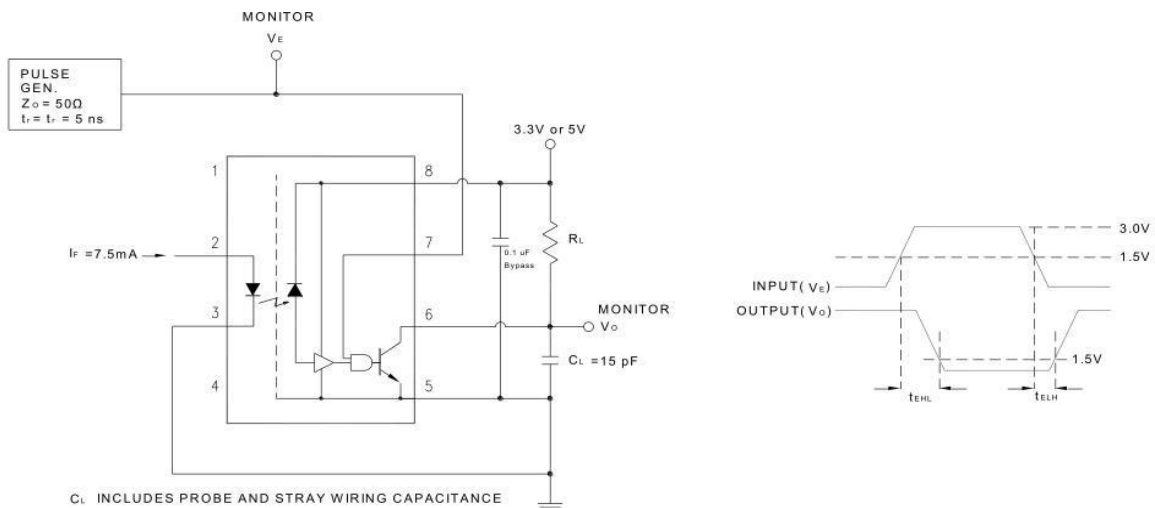


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

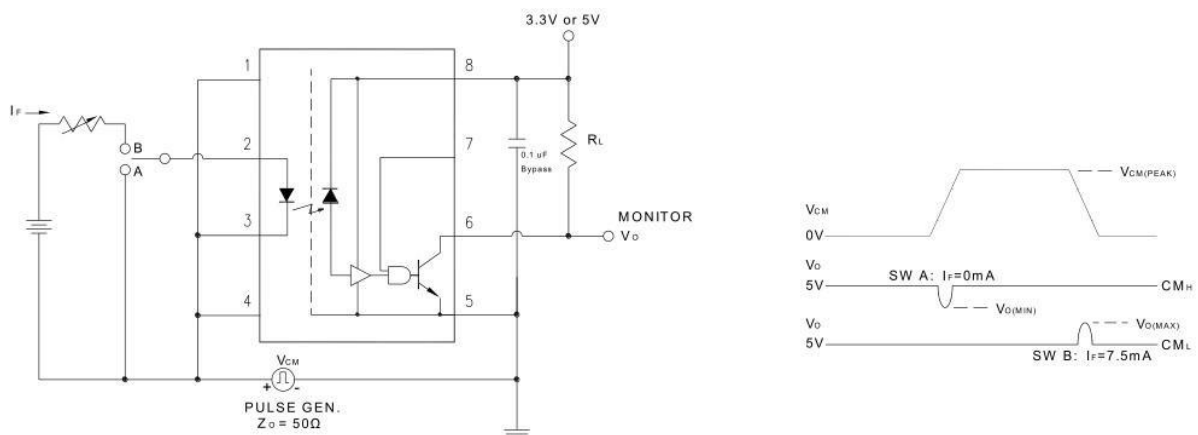


Figure 3: Single Channel Test Circuit for Common Mode Transient Immunity

17. Characteristics Curve

Figure 1. Forward Current vs Forward Voltage

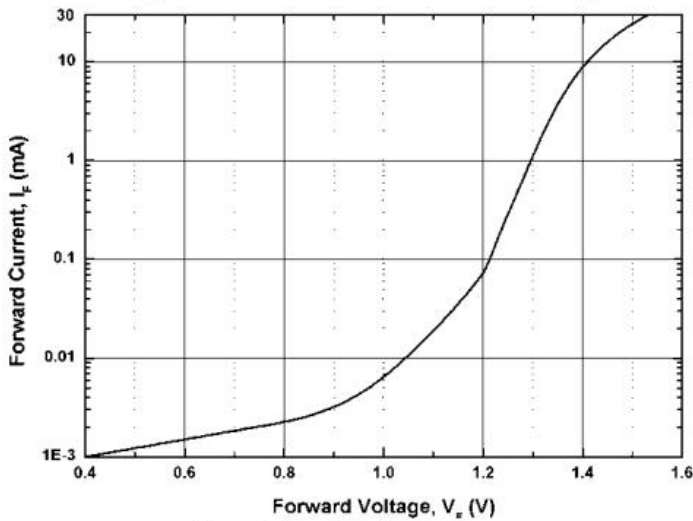


Figure 3. Low Level Output Current vs Ambient Temperature

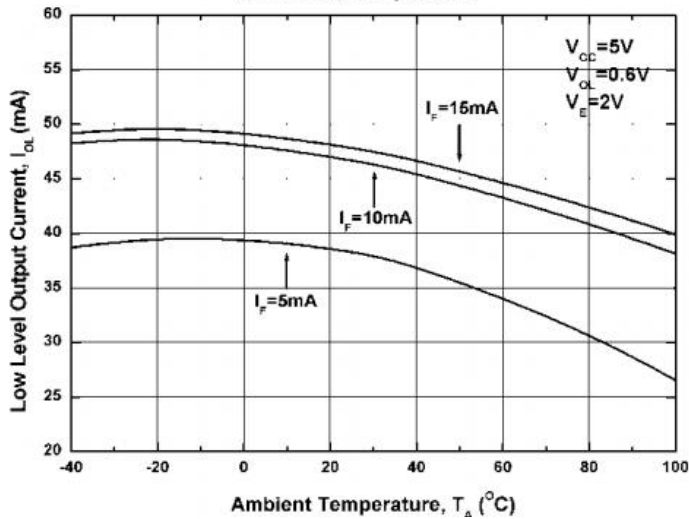


Figure 5. Input Current vs Output Voltage

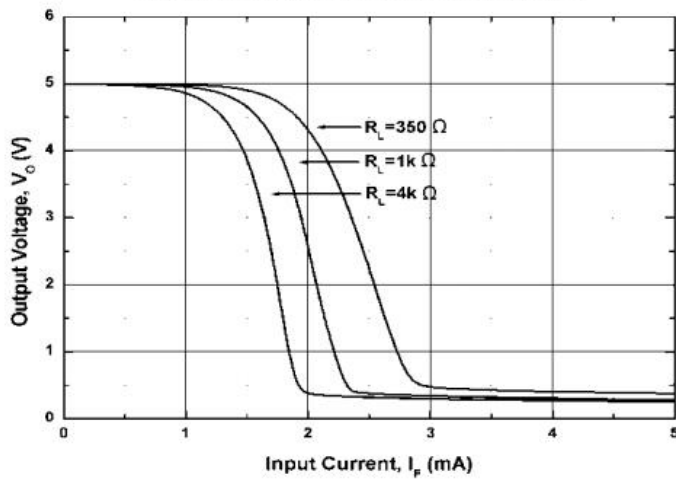


Figure 2. Low Level Output Voltage vs Ambient Temperature

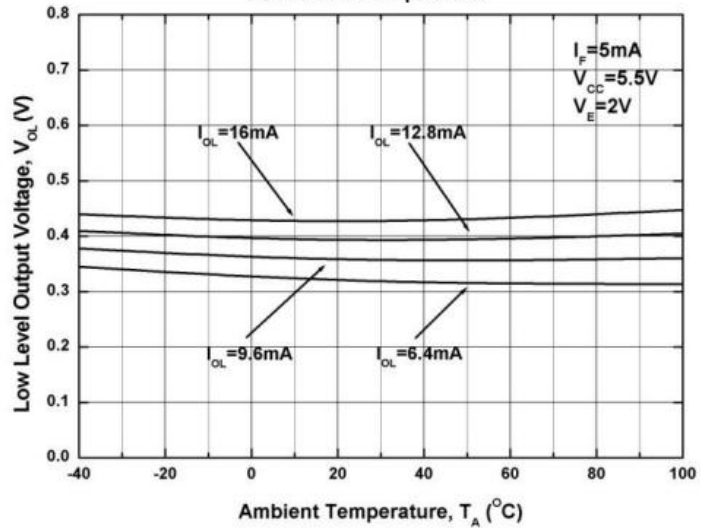


Figure 4. Input Threshold Current vs Ambient Temperature

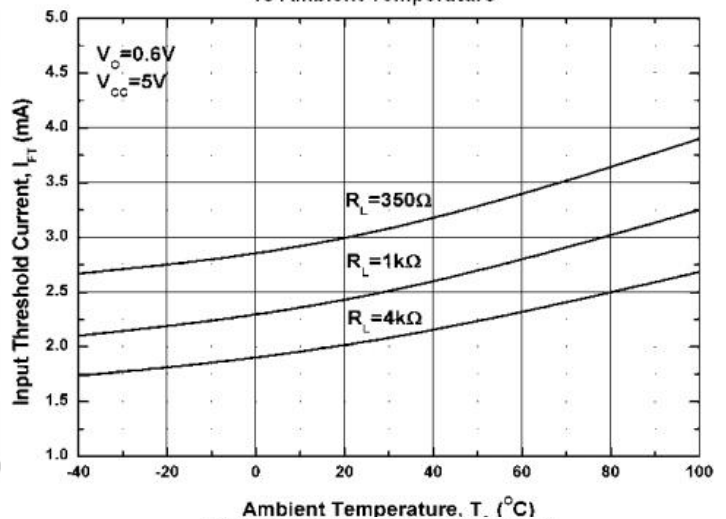


Figure 6. High Level Output Current vs Ambient Temperature

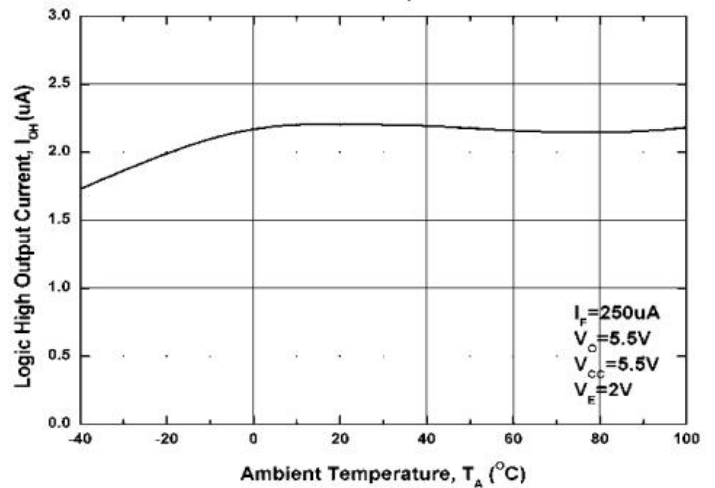


Figure 7. Propagation Delay vs. Forward Current

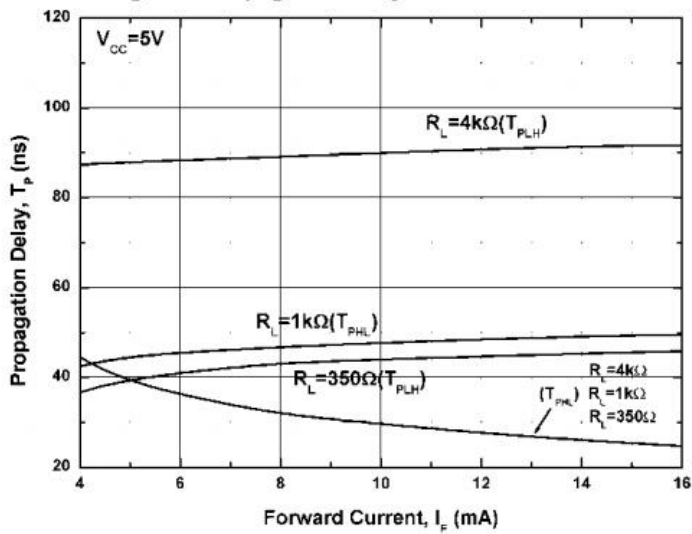


Figure 8. Propagation Delay vs. Temperature

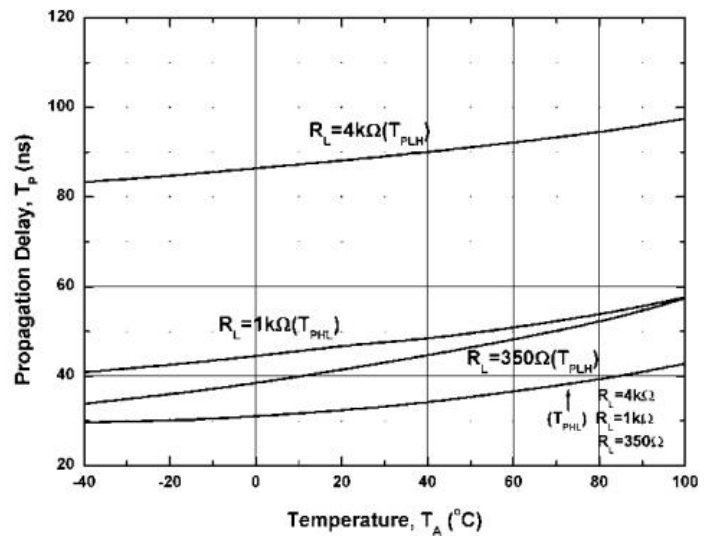


Figure 9. Pulse Width Distortion vs. Temperature

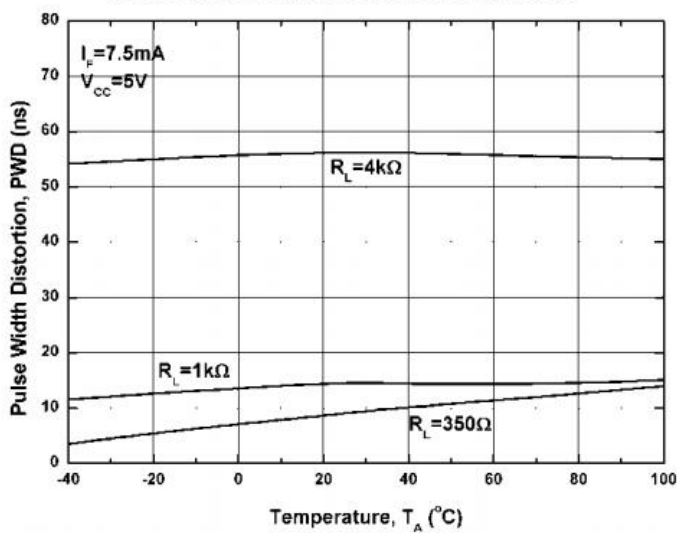


Figure 10. Rise and Fall Time vs. Temperature

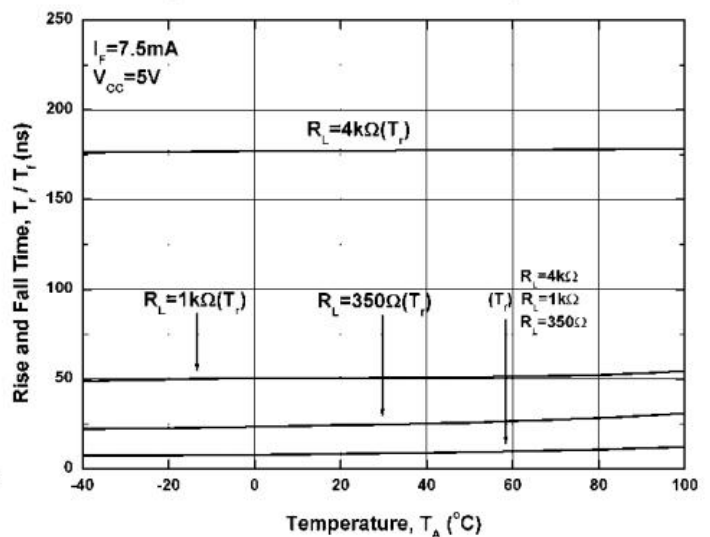


Figure 11. Enable Propagation Delay vs. Temperature

