



# ORIENT

## Photo coupler

### Product Data Sheet

Part Number: OR-6N137

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

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

**SHENZHEN ORIENT COMPONENTS CO., LTD**

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

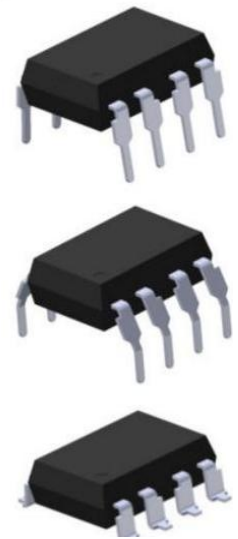
TEL: 0755-29681816

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

### 1. Features

- (1) 3.3v / 5V supply voltage
- (2) Low power consumption
- (3) High speed: 15MBd(typical)
- (4)  $V_{CM}=1000V$ , and the lowest common mode inhibition (CMR) is 10 kv/ $\mu$ s.
- (5) - 40 °C ~ + 110 °C temperature of AC and DC performance.
- (6) Safety approval
  - UL approved (No.E323844)
  - VDE approved (No.40029733)
  - CQC approved (No.CQC19001231254 )
- (7) In compliance with RoHS, REACH standards
- (8) MSL Class I



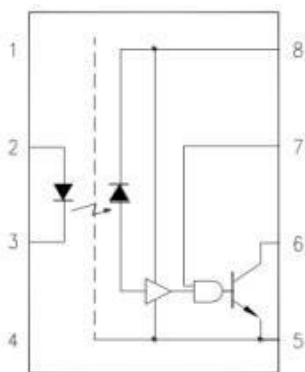
### 2. Instructions

6N137 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 total mode transient immunity should reach 10 kv/pa at 3.3 v. The photoelectric couple operating temperature range: - 40 °C ~ + 110 °C.

### 3. Application Range

- 1. line receiver isolation
- 2. A/ D, D/A converted digital signal isolation
- 3. eliminate noise from the ground loop
- 4. switching power supply
- 5. alternative pulse transformers
- 6. motor control system
- 7. interface of microprocessor system, computer and peripheral equipment

### 4. Functional Diagram



- 1. NC                      5. GND
- 2. Anode                6. Output
- 3. Cathode            7.  $V_E$ (Enable)
- 4. NC                    8.  $V_{CC}$

Truth table

Input (LED)	Enable	Output
ON	H	L
OFF	H	H
ON	L	H
OFF	L	H
ON	NC	L
OFF	NC	H

0.1 capacitor F bypass capacitance needs to be connected between A Pin8 and Pin5

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

Parameter		Symbol	Rated Value	Unit
Input	Average Forward Input Current	I <sub>F</sub>	20	mA
	Reverse Input Voltage	V <sub>R</sub>	5	V
	Power Dissipation	P <sub>I</sub>	40	mW
	Enable Input Voltage	V <sub>E</sub>	V <sub>CC</sub> +0.5	V
	Enable Input current	I <sub>E</sub>	5	mA
Output	Output Collector Current	I <sub>O</sub>	50	mA
	Output Collector Voltage	V <sub>O</sub>	7	V
	Output Collector Power Dissipation	P <sub>O</sub>	85	mW
Supply Voltage		V <sub>CC</sub>	7	V
Insulation Voltage		V <sub>iso</sub>	5000	V <sub>rms</sub>
Working Temperature		T <sub>opr</sub>	-40 ~ + 110	°C
Storage Temperature		T <sub>stg</sub>	-55 ~ + 125	
*2	Soldering Temperature	T <sub>sol</sub>	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 <sub>A</sub>	-40	110	°C
Supply Voltage	V <sub>CC</sub>	2.7	3.6	V
		4.5	5.5	
Low Level Input Current	I <sub>FL</sub>	0	250	μA
High Level Input Current	I <sub>FH</sub>	5	15	mA
Low Level Enable Voltage	V <sub>EL</sub>	0	0.8	V
High Level Enable Voltage	V <sub>EH</sub>	2	V <sub>CC</sub>	V
Output Pull-up Resistor	R <sub>L</sub>	330	4000	Ω
Fan Out (at R <sub>L</sub> =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	1.7	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	$I_{TH}$	—	1.5	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	$\mu\text{A}$	$V_E = 0.5\text{V},$ $V_{CC} = 3.3\text{V}, I_F = 0\text{mA}$
	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	$\mu\text{A}$	$V_E = 2\text{V}, V_{CC} = 3.3\text{V},$ $V_O = 3.2\text{V}, I_F = 250\mu\text{A}$
	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	
<b>Input</b>	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	$f = 1\text{MHz}, V_F = 0\text{V}$
<b>Detector</b>	High Level Supply Current	$I_{CCH}$	—	6.1	10	$\mu\text{A}$	$V_E = 0.5\text{V},$ $V_{CC} = 5.5\text{V}, I_F = 0\text{mA}$
	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	$\mu\text{A}$	$V_E = 2\text{V}, V_{CC} = 5.5\text{V},$ $V_O = 5.5\text{V}, I_F = 250\mu\text{A}$
	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	$T_A=25^\circ C,$ $R_L=350\Omega,$ $C_L=15pF$
		—	—	100		
Propagation delay time to output Low Level	$t_{PHL}$	25	32	75	ns	
		—	—	100		
Pulse Width Distortion	$ t_{PLH}-t_{PHL} $	—	8	—	ns	
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 Enable from $V_{EH}$ to $V_{EL}$	$t_{ELH}$	—	28	—	ns	$R_L=350\Omega$ $C_L=15pF$ $V_{EL}=0V$ $V_{EH}=3V$
Propagation Delay Time of Enable from $V_{EL}$ to $V_{EH}$	$t_{EHL}$	—	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 <sub>H</sub>	10	15	—	kV/μs	V <sub>CC</sub> =3.3V, V <sub>CM</sub> =1000V, R <sub>L</sub> =350Ω I <sub>F</sub> =0mA, T <sub>A</sub> =25°C
		10	15	—		V <sub>CC</sub> =5V, V <sub>CM</sub> =1000V, R <sub>L</sub> =350Ω I <sub>F</sub> =0mA, T <sub>A</sub> =25°C
Logic Low Common Mode Transient Immunity	CM <sub>L</sub>	10	15	—	kV/μs	V <sub>CC</sub> =3.3V, V <sub>CM</sub> =1000V, R <sub>L</sub> =350Ω I <sub>F</sub> =10mA, T <sub>A</sub> =25°C
		10	15	—		V <sub>CC</sub> =5V, V <sub>CM</sub> =1000V, R <sub>L</sub> =350Ω I <sub>F</sub> =10mA, T <sub>A</sub> =25°C

Parameter	Symbol	Min	Typ	Max	Unit	Condition
Input-Output Insulation Leakage Current	I <sub>I-O</sub>	—	—	1	μA	45% RH, t=5s, V <sub>I-O</sub> = 3KV DC, T <sub>A</sub> =25 C
Withstand Insulation Test Voltage	V <sub>ISO</sub>	5000	—	—	V <sub>RMS</sub>	RH ≤ 50%, t =1min, T <sub>A</sub> =25°C
Input-Output Resistance	R <sub>I-O</sub>	—	10 <sup>12</sup>	—	Ω	V <sub>I-O</sub> =500V DC
Input-Output Capacitance	C <sub>I-O</sub>	—	1		p	f = 1MHz, T <sub>A</sub> = 25 C

Recommended temperature range (T<sub>A</sub>=40°C-110°C) Unless otherwise stated. Typical values T<sub>A</sub> =25°C.

## 9. Order Information

### Part Number

**OR-6N137Y-Z**

### Note

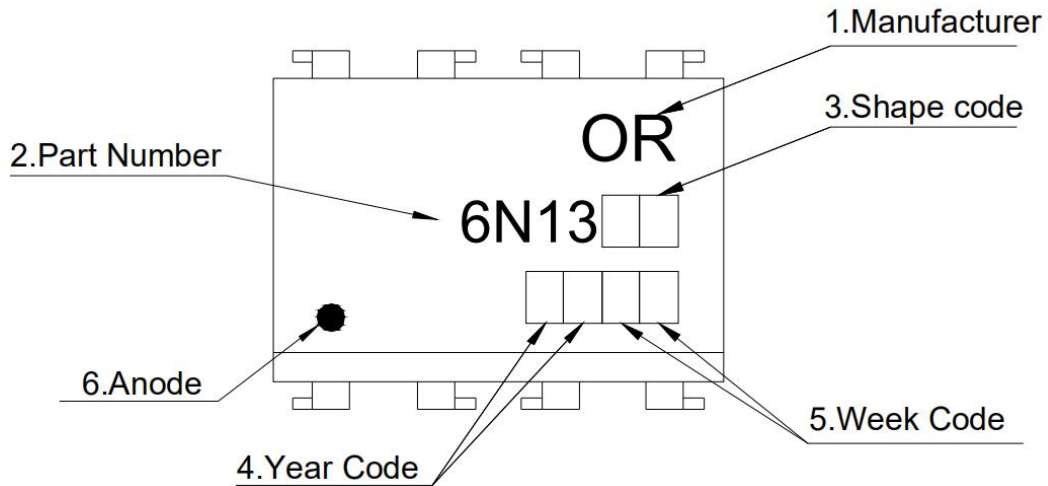
Y = Lead form option (S, M or none)

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

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



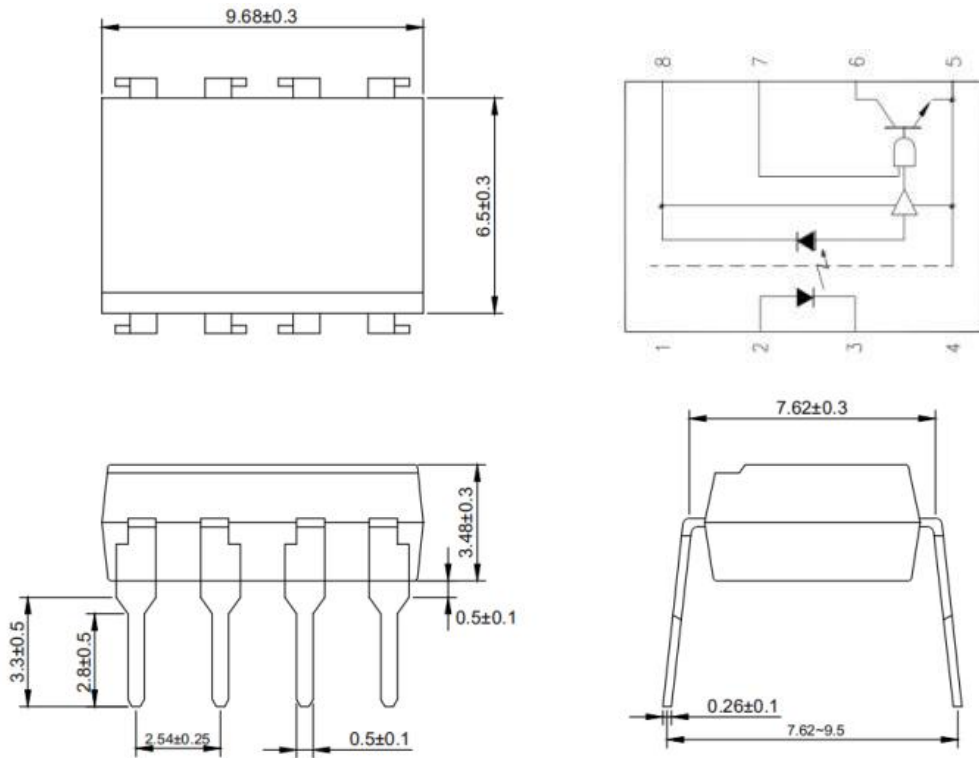
## 10. Naming Rule



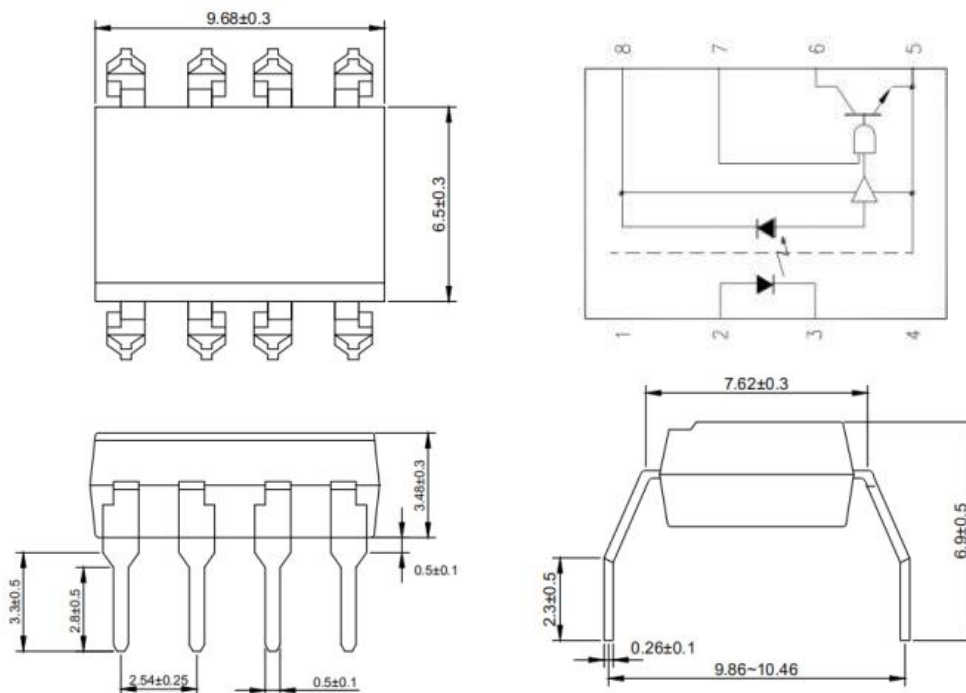
1. Manufacturer : ORIENT.
2. Part Number : 6N137.
3. Shape Code .
4. Year Code  : '21' means '2021' and so on.
5. Week Code : 01 means the first week, 02 means the second week and so on.
6. Anode.

## 11. Outer Dimension

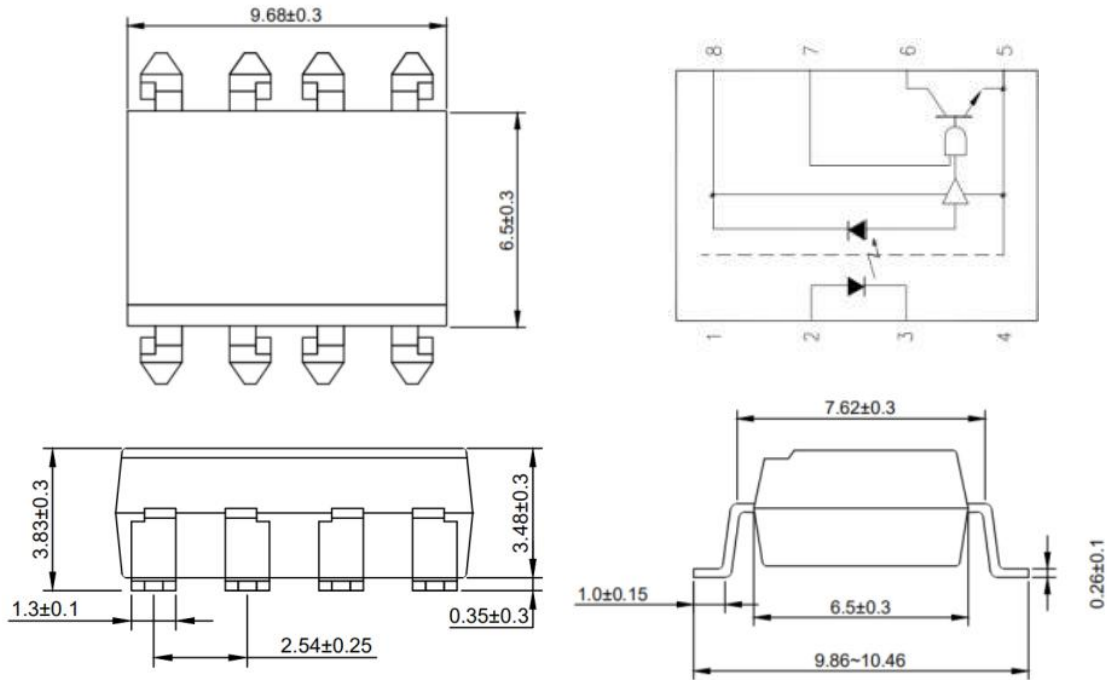
### (1) OR-6N137



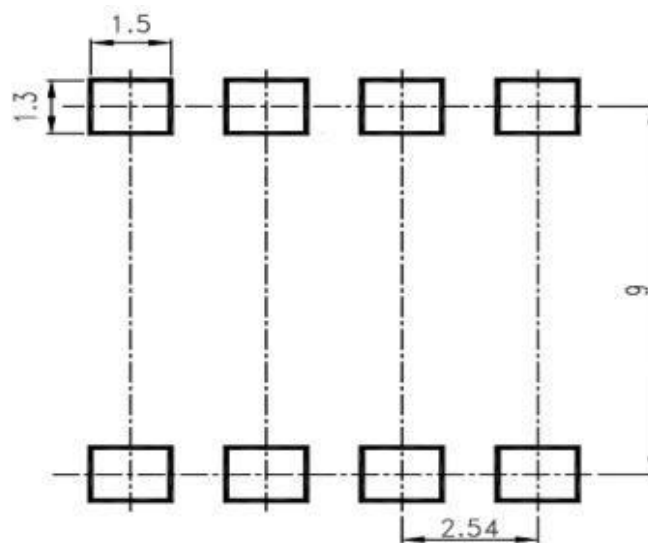
### (2) OR-6N137M



(3) OR-6N137S



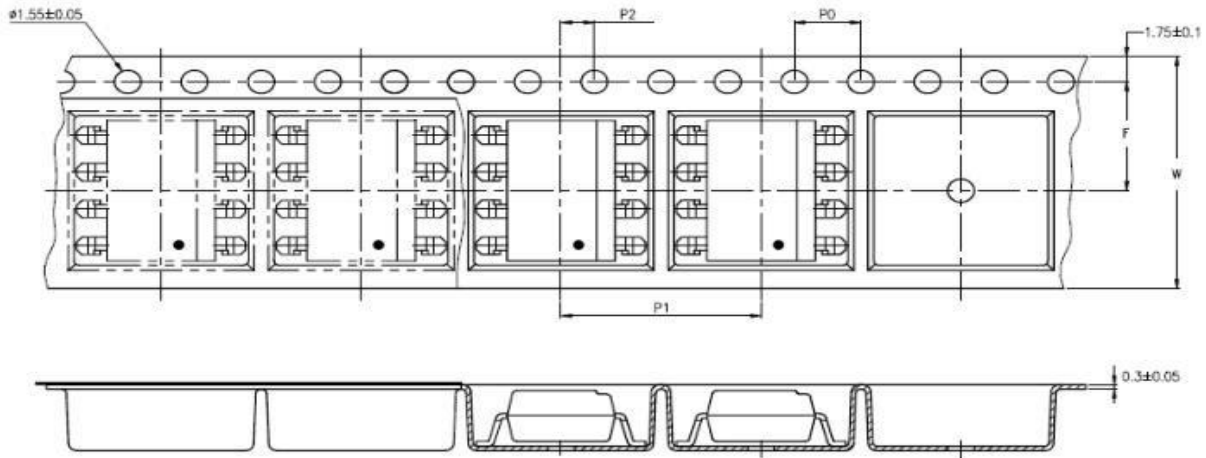
12、 Recommended Foot Print Patterns (Mount Pad)



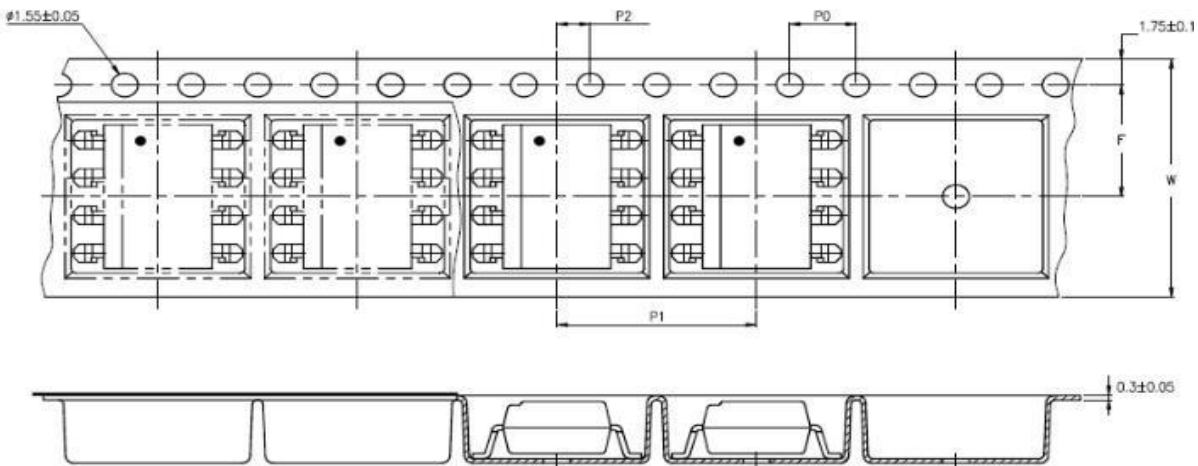
unit: mm

## 12. Taping Dimensions

### (1) OR-6N137S-TA



### (2) OR-6N137S-TA1



type	symbol	Size: mm ( inches )
bandwidth	W	$16 \pm 0.3$ (0.63)
pitch	P0	$4 \pm 0.1$ (0.15)
	F	$7.5 \pm 0.1$ (0.295)
pitch	P2	$2 \pm 0.1$ (0.079)
	P1	$12 \pm 0.1$ (0.472)

Encapsulation type	TA/TA1
amount (pcs)	1000

### 13. 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



**Note:**

1. P/N :Contents with "Order Information" in the specification.
2. LOT NO : The production lot.
3. BATCH : The Electrical rank.
4. Quantity :Packaging quantity.
5. Product Data :Date of manufacture.

## 14. Reliability Test

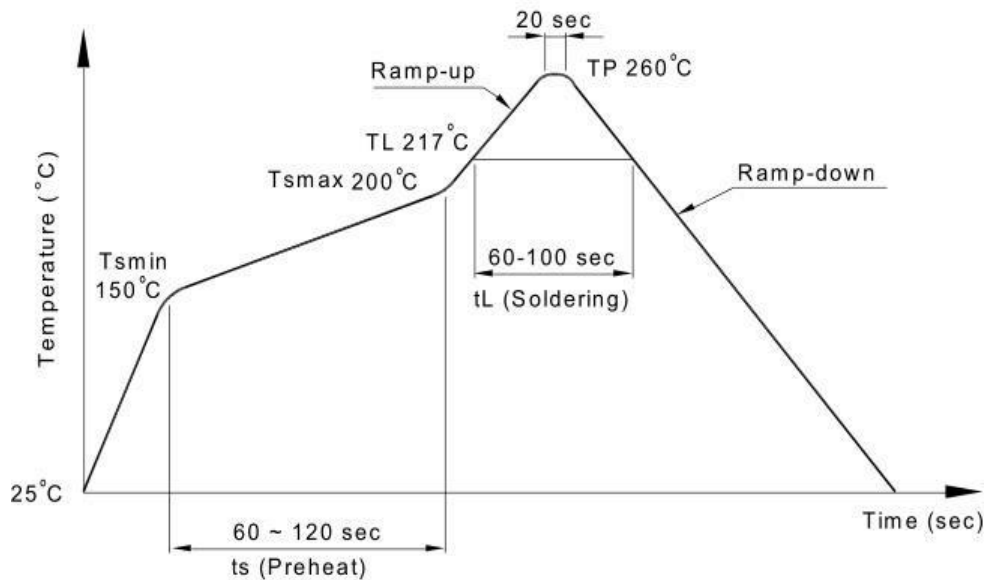
NO.	ITEMS	Reliability Testing				
		QTY. (Pcs)	Condition	Process	Device	Standard
1	RSH 耐焊接热	22	260±5°C	5s/3 次	锡炉	JESD22-A106
2	HTSL 高温存储	77	125°C	168 hrs	高温烤箱 测试仪	JESD22-A103
				500 hrs		
				1000 hrs		
3	LTSL 低温存储	77	-40°C	168 hrs	低温箱 测试仪	JESD22-A119
				500 hrs		
				1000 hrs		
4	TC 温度循环	77	H:125°C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

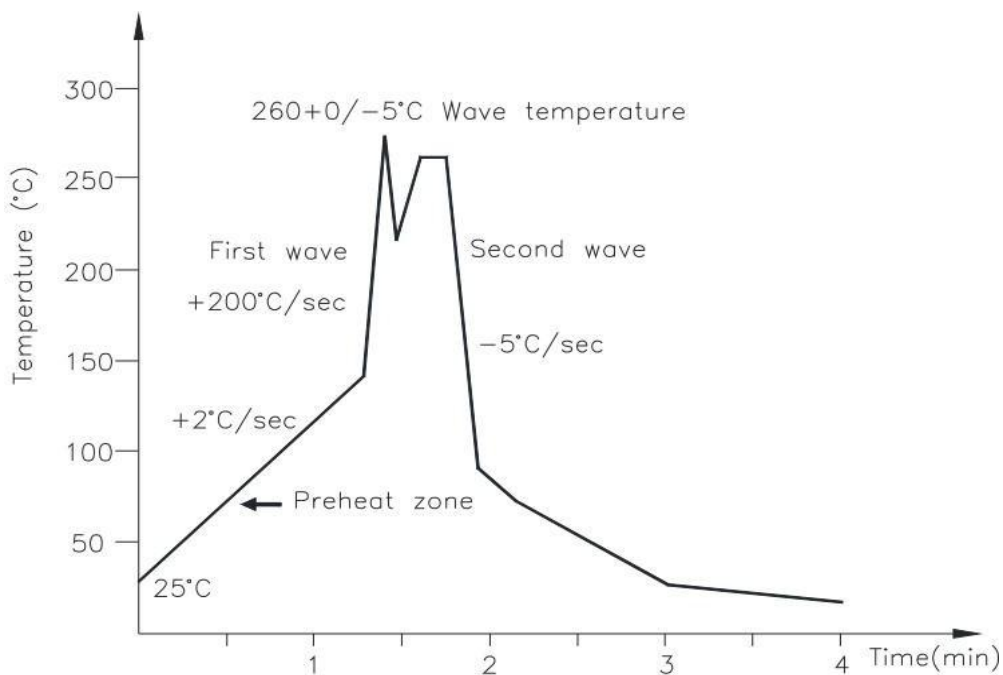
Profile item	Conditions
Preheat - Temperature Min (T Smin ) - Temperature Max (T Smax ) - Time (min to max) (ts)	150°C 200°C 90±30 sec
Soldering zone - Temperature (TL ) - Time (t L )	217°C 60 sec
Peak Temperature	260°C
Peak Temperature time	20 sec
Ramp-up rate	3°C / sec max.
Ramp-down rate from peak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



### 16. Switching time test circuit

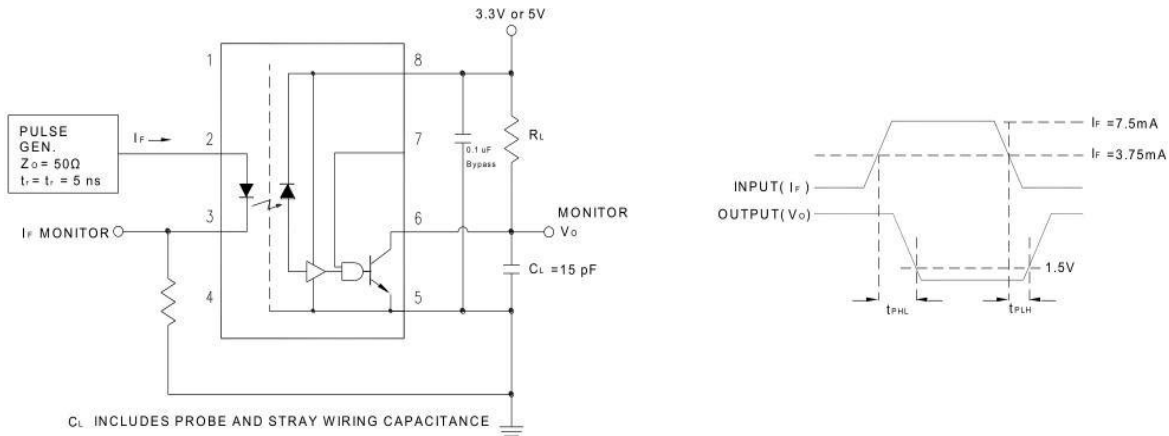


Figure 1: Test Circuit for  $t_{PHL}$  and  $t_{PLH}$

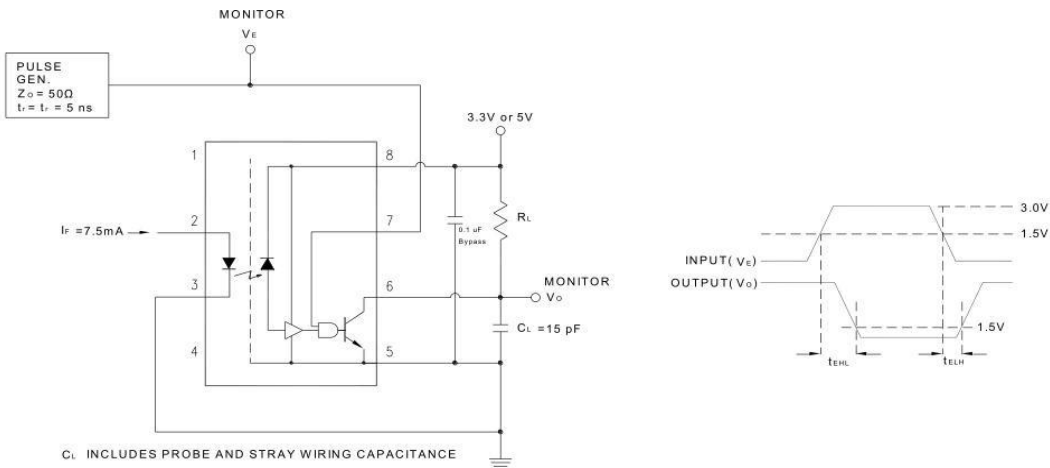


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

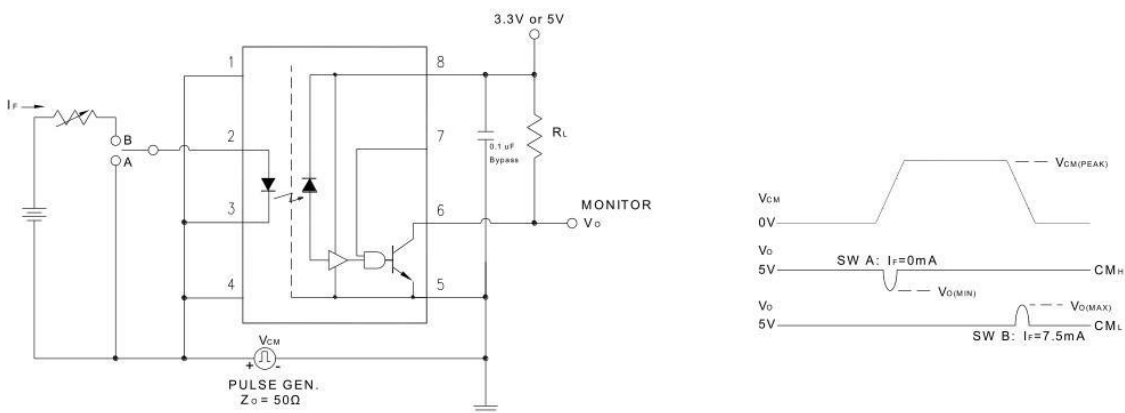


Figure 3: Single Channel Test Circuit for Common Mode Transient Immunity

## 17. Characteristics Curve

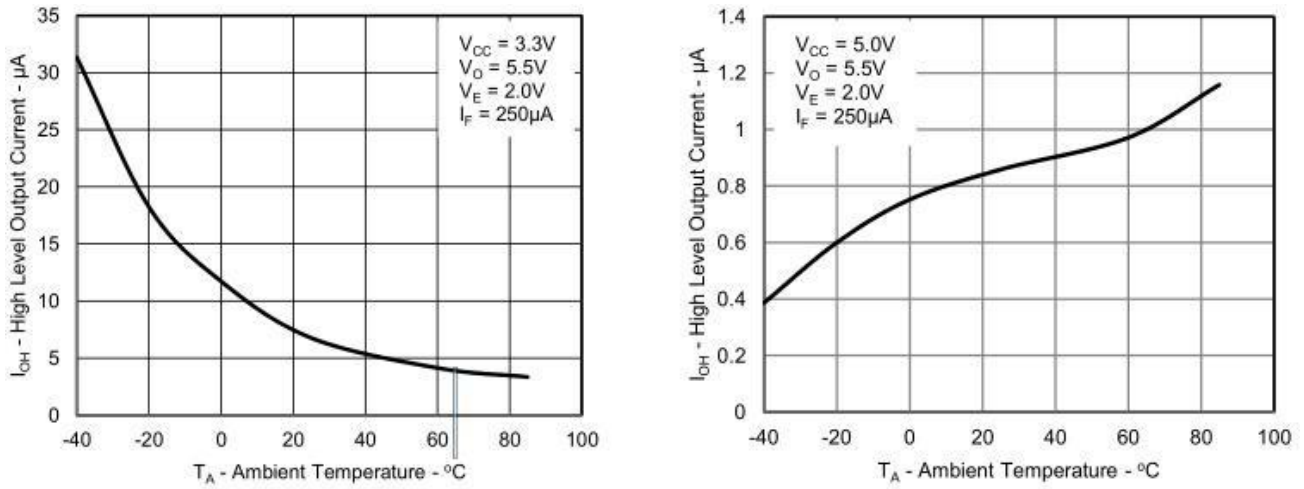


Figure 4: Typical High Level Output Current vs. Ambient Temperature

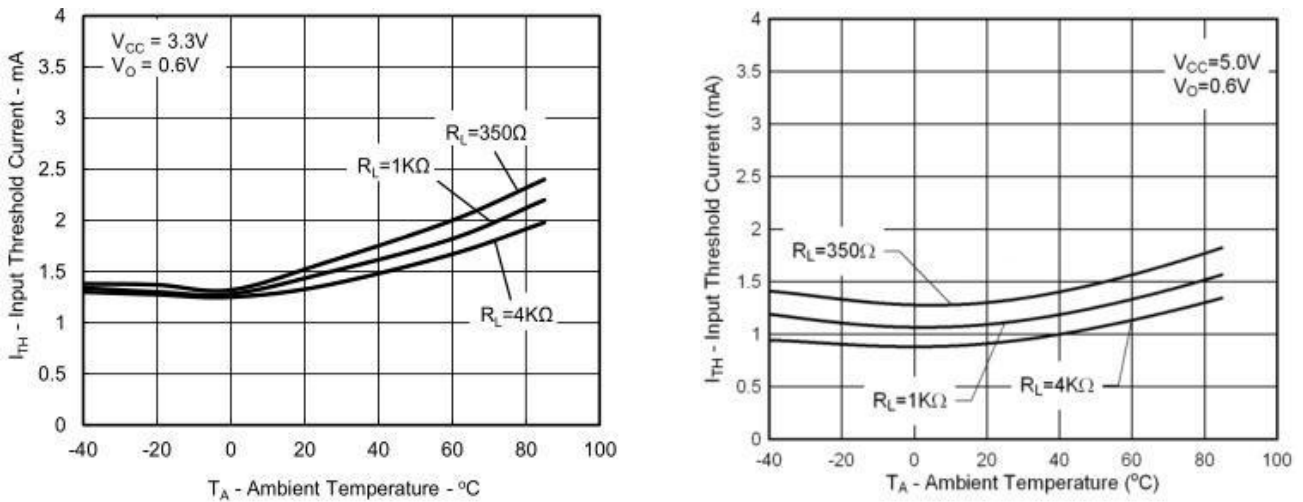


Figure 5: Typical Input Diode Threshold Current vs. Ambient Temperature

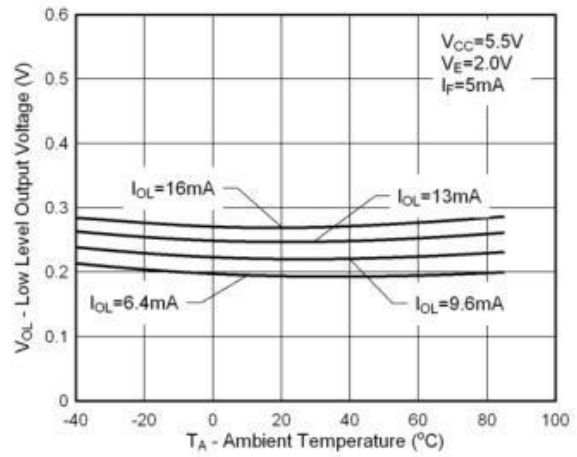
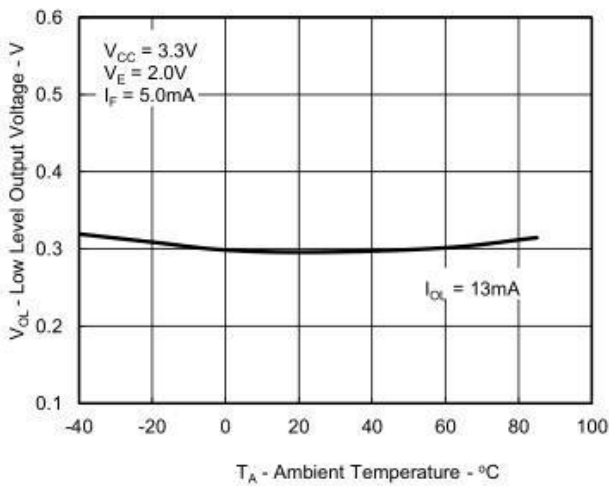


Figure 6: Typical Low Level Output Voltage vs. Ambient Temperature

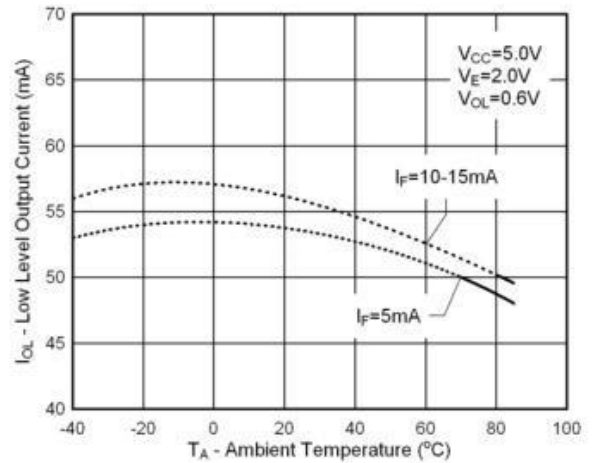
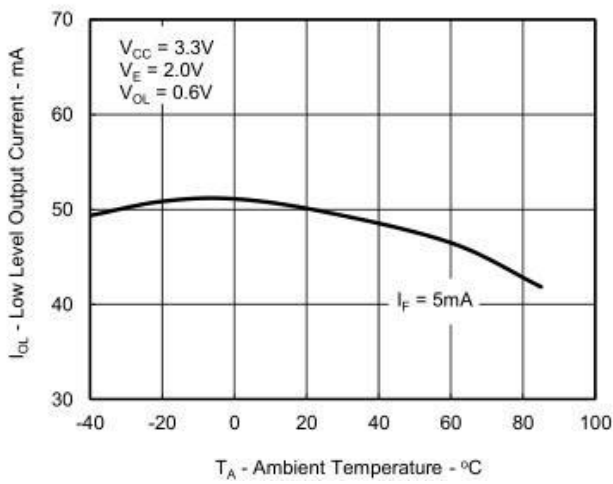


Figure 7: Typical Low Level Output Current vs. temperature

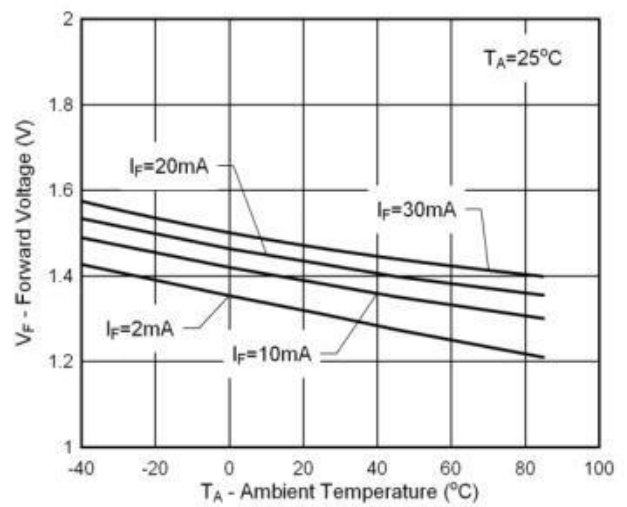
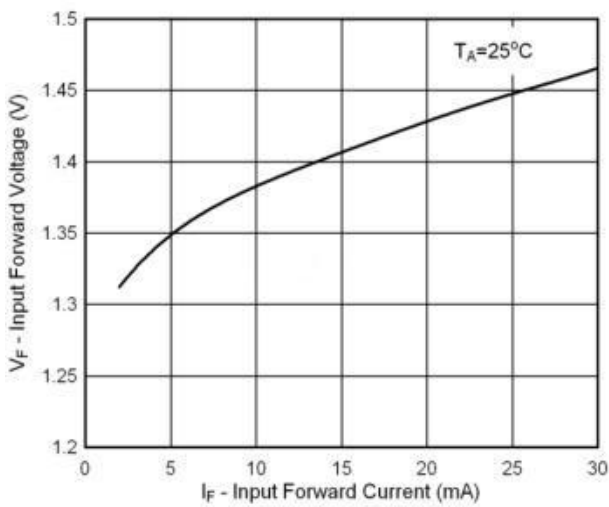


Figure 8: Typical Input Diode Forward Characteristic

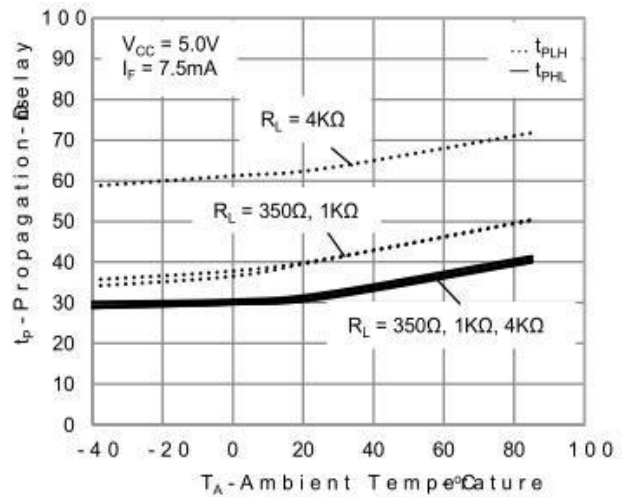
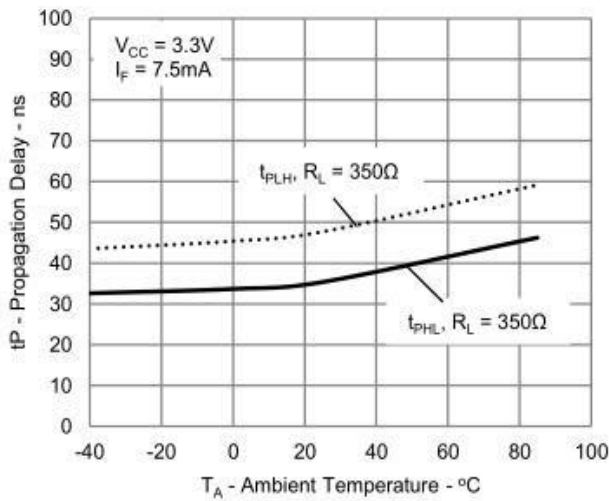


Figure 9: Typical Propagation Delay vs. Ambient Temperature

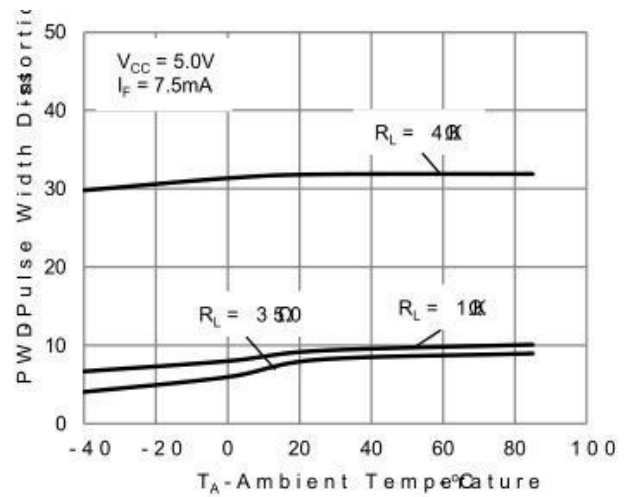
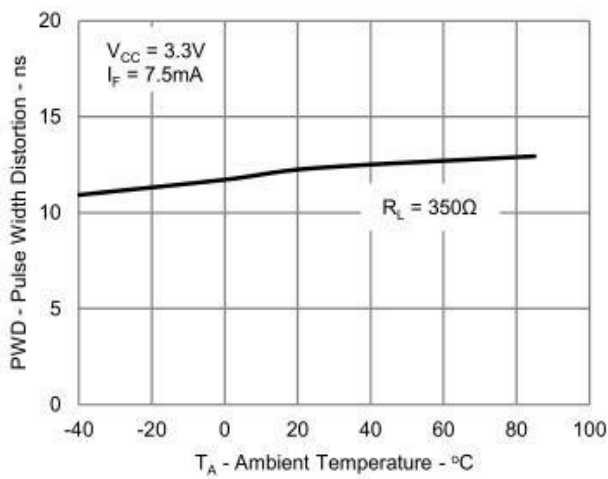


Figure 10: Typical Pulse Width Distortion vs. Ambient Temperature

单击下面可查看定价，库存，交付和生命周期等信息

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