ORIENT

Photo coupler

Product Data Sheet

Part Number: OR-6N137

Customer: _____

Date: _____

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1. Features

(1) 3.3v / 5V supply voltage
(2) low power consumption
(3) high speed: 15MBd(typical)
(4) VCM=1000V, and the lowest common mode inhibition (CMR) is 10 kv/μs.
(5) when - 40 ℃ ~ + 110 ℃ temperature of ac and dc performance.
(6) MSL Class Ⅰ

2. Instructions

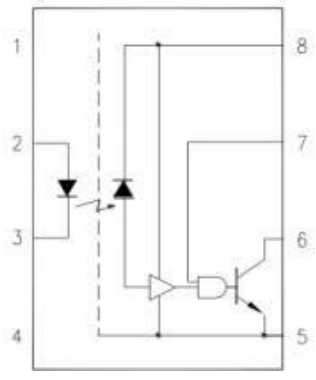
6N137 is made up of an efficient AlGaAs light-emitting diode and high-speed optical detector. This design provides good ac and dc isolation between the input and output ends of the photoelectric coupler. The output characteristic of the photodetector is a collector open circuit schottky clamp transistor. The total mode transient immunity should reach 10 kv/pa at 3.3 v.

The photoelectric coupler operating temperature range: - 40 ℃ ~ + 110 ℃.

3. Application Range

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

4. Functional Diagram



1. NC 5.GND
2. Anode 6.Output
3. Cathode 7.VE(Enable)
4. NC 8.Vcc

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℃)*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	mV
	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}	5000	Vrms
Working Temperature		T_{opr}	-40 ~ + 110	℃
Storage Temperature		T_{stg}	-55 ~ + 125	
*2	Soldering Temperature	T_{sol}	260	

*1. Room temperature = 25 ℃. 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 ℃	℃
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
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 RL=1kΩ per channel)	N	—	5	TTL Loads

7. Opto-electronic Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input						
Forward voltage	V_F	I_F= 10mA	—	1.38	1.7	V
Temperature Coefficient OF Forward Voltage	$\Delta V_F/ \Delta T$	I_F= 10mA	—	-1.5	—	mV/℃
Reverse Voltage	BV_R	I_R = 10μA	5	—	—	V
Input Threshold Current	I_{TH}	V_E=2V,V_{CC}=3.3V V_O=0.6V I_{OL} (sinking) =13mA	—	1.5	5	mA
Input Capacitance	C_{IN}	f = 1MHz, VF = 0V	—	34	—	pF
Detector						
High Level Supply Current	I_{CCH}	V_E= 0.5V, V_{CC}=3.3V,I_F=0mA	—	3.8	10	μA
Low Level Supply Current	I_{CCL}	V_E= 0.5V, V_{CC}= 3.3V,I_F=10mA	—	5.8	13	mA
High Level Enable Current	I_{EH}	V_{CC}= 3.3V,V_E=2V	—	-0.19	-1.6	mA
Low Level Enable Current	I_{EL}	V_{CC}= 3.3V,V_E=0.5V	—	-0.41	-1.6	mA
High Level Enable Voltage	V_{EH}		2	—	—	V
Low Level Enable Voltage	V_{EL}			—	0.8	V
High Level Output Current	I_{OH}	V_E=2V, V_{CC}=3.3V, V_O=3.2V,I_F=250μA	—	5	100	μA
Low Level Output Voltage	V_{OL}	V_E=2V, V_{CC}=3.3V, I_F=5mA, I_{OL} (sinking) = 13mA	—	0.3	0.6	V

Recommended temperature range (T_A= -40℃—+110℃,2.7V≤V_{CC}≤3.6 V),I_F= 7.5mA Unless otherwise stated. Typical valuesT_A =25℃,V_{CC} = 3.3 V.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Input						
Forward voltage	V_F	I_F= 10mA	—	1.38	1.7	V
Temperature Coefficient OF Forward Voltage	$\Delta V_F/ \Delta T$	I_F= 10mA	—	-1.5	—	mV/℃
Reverse Voltage	BV_R	I_R = 10μA	5	—	—	V
Input Threshold Current	I_{TH}	V_{CC}=5.5V,V_O=0.6V I_{OL}>13mA	—	1.35	5	mA
Input Capacitance	C_{IN}	f = 1MHz, V_F = 0V	—	34	—	pF
Detector						
High Level Supply Current	I_{CCH}	V_E= 0.5V, V_{CC}=5.5V,I_F=0mA	—	6.1	10	μA
Low Level Supply Current	I_{CCL}	V_E= 0.5V, V_{CC}= 5.5V,I_F=10mA	—	8.3	13	mA
High Level Enable Current	I_{EH}	V_{CC}= 5.5V,V_E=2V	—	-0.6	-1.6	mA
Low Level Enable Current	I_{EL}	V_{CC}= 5.5V,V_E=0.5V	—	-0.9	-1.6	mA
High Level Enable Voltage	V_{EH}		2	—	—	V
Low Level Enable Voltage	V_{EL}			—	0.8	V
High Level Output Current	I_{OH}	V_E=2V, V_{CC}=5.5V, V_O=5.5V,I_F=250μA	—	0.9	100	μA
Low Level Output Voltage	V_{OL}	V_E=2V, V_{CC}=5.5V, I_F=5mA, I_{OL} (sinking) = 13mA	—	0.3	0.6	V

Recommended temperature range(T_A= -40℃—+110℃,4.5V≤V_{CC}≤5.5V),I_F= 7.5mA Unless otherwise stated.

Typical values T_A =25℃,V_{CC} = 5.0V.

8. Switching Characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Propagation delay time to output High level	t_{PLH}	R_L=350Ω C_L=15pF	25	48	90	ns
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%)	tr		—	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}	R_L=350Ω C_L=15pF V_{EL}=0V V_{EH}=3V	—	27	—	ns
Propagation Delay Time of Enable from V_{EL} to V_{EH}	t_{EHL}		—	9	—	ns

Recommended temperature range (T_A= -40℃—+110℃,2.7V≤V_{CC}≤3.6 V),I_F= 7.5mA Unless otherwise stated. Typical values T_A =25℃,V_{CC} = 3.3 V。

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Propagation delay time to output High level	t_{PLH}	T_A=25 ℃ R_L=350 Ω C_L=15pF	25	40	75	ns
			—	—	100	
Propagation delay time to output Low level	t_{PHL}		25	32	75	ns
			—	—	100	
Pulse Width Distortion	$\|t_{PLH}-t_{PHL}\|$	R_L=350Ω C_L=15pF	—	8	—	ns
Output Rise Time (10 to 90%)	tr		—	22	—	ns
Output Fall Time (90 to 10%)	t_f		—	6.9	—	ns
Propagation Delay Time of	t_{ELH}	R_L=350Ω	—	28	—	ns

Enable from V_{EH} to V_{EL}		C_L=15pF				
Propagation Delay Time of Enable from V_{EL} to V_{EH}	t_{EHL}	V_{EL}=0V V_{EH}=3V	—	12	—	ns

Recommended temperature range (T_A= -40℃—+110℃,4.5V≤V_{CC}≤5.5V),I_F= 7.5mA Unless otherwise stated. Typical values T_A =25℃,V_{CC} = 5.0 V。

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

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℃	5000	—	—	V_{RMS}
Input-Output Resistance	R_{I-O}	V_{I-O} = 500V DC	—	10^{12}	—	Ω
Input-Output Capacitance	C_{I-O}	f = 1MHz, T_A = 25 C	—	1		p

Recommended temperature range (T_A=40℃-110℃) Unless otherwise stated. Typical values T_A =25℃.

9. Order Information

Part Number

OR-6N137X-Z

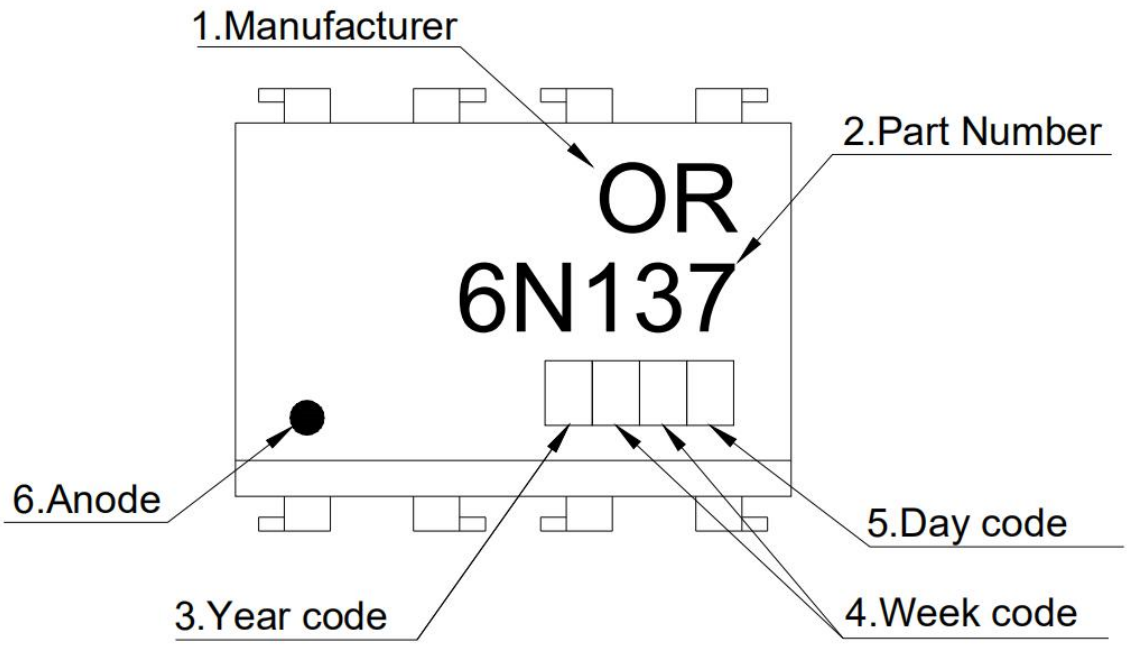
Note

X = Lead form option (S, M or none)
Z = Tape and reel option (TA,TA1 or none).

* Halogen Free can be selected.
* 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



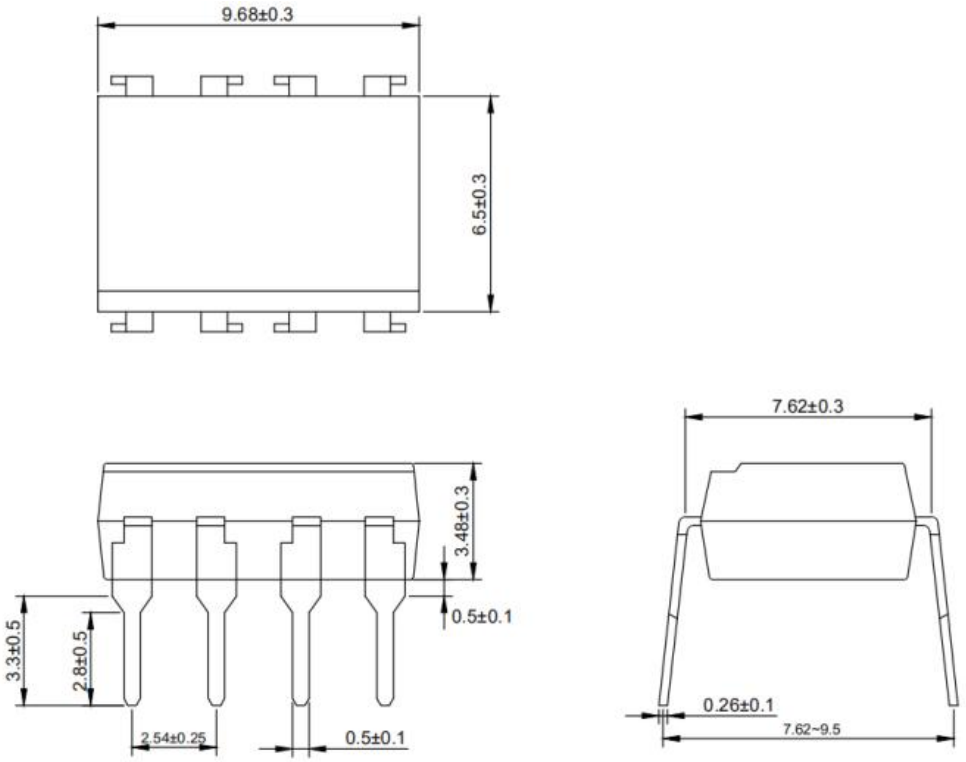
NOTE:

1. ORIENT.
2. Type Code.
3. Year Code： '9' means '2019' and so on.
4. Week Code： 01 represents the first week, 02 represents the second week, and so on.
5. Day Code： 'A to F' means 'Monday to Sunday'.
6. Anode.

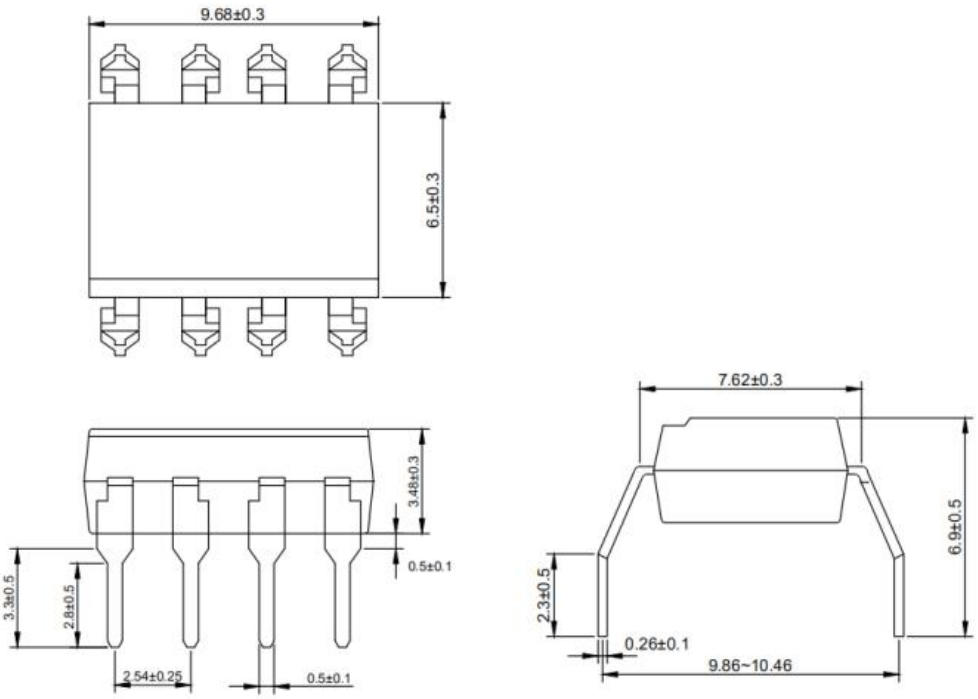
* If the photo coupler is Free from Halogen，there will be a ' G' mark in the upper left corner.
* VDE Code can be selected.

11. Outer Dimension

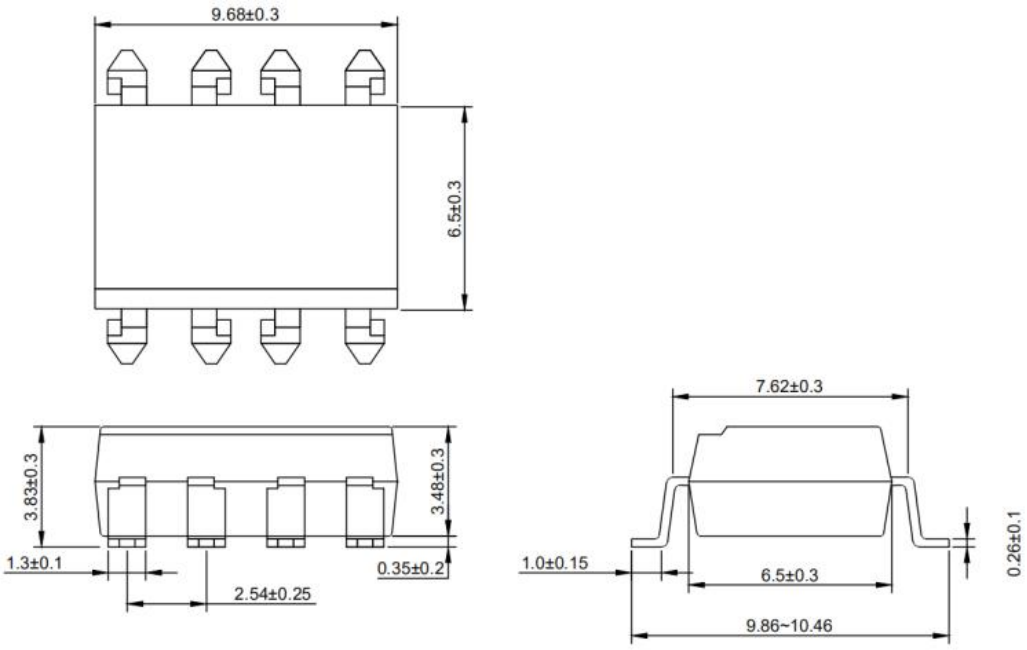
(1) OR-6N137



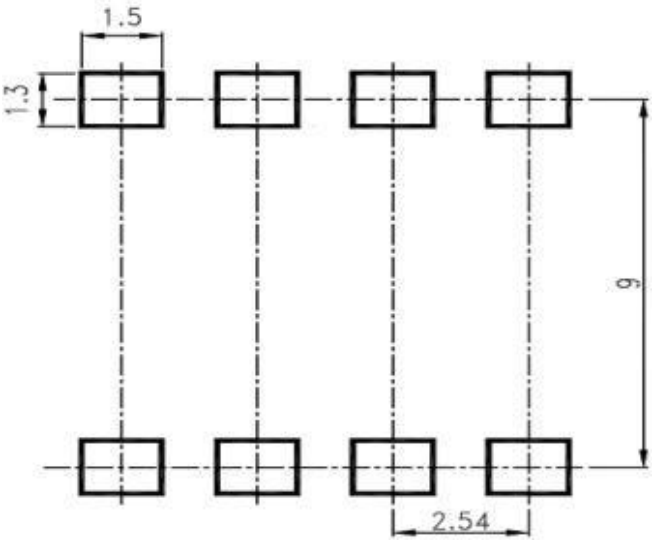
(2) OR-6N137M



(3) OR-6N137S



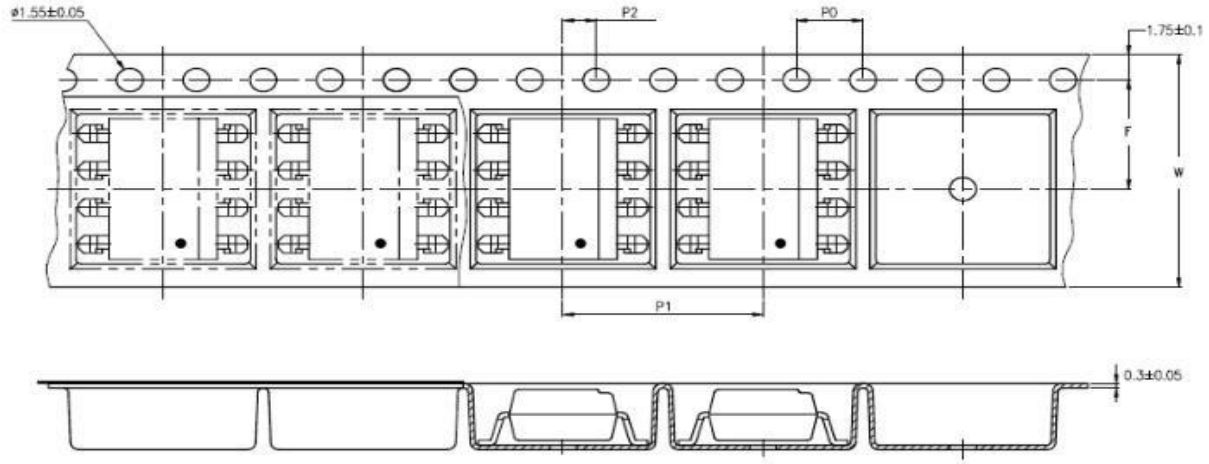
12、Recommended Foot Print Patterns (Mount Pad)



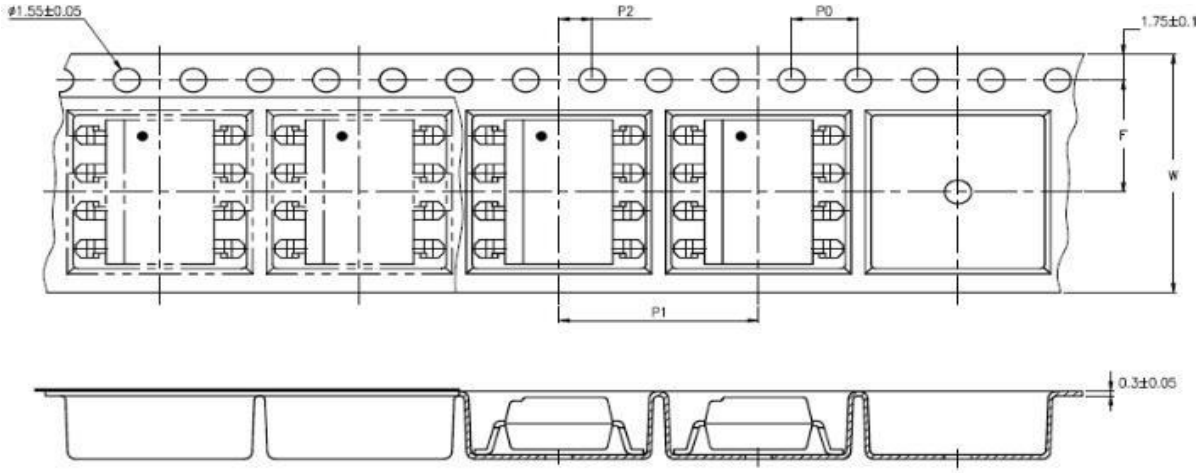
unit：mm

12. Taping Dimensions

(1) OR-6N137-TA



(2) OR-6N137-TA1



type	symbol	Size: 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

13. Package Dimension

(1) package dimension

DIP/M type

Packing Information	
Packing type	Tube(Plug)
Qty per Tube	45
Small box (inner) Dimenaion	525*132*60mm
Max qty per small box	2250
Large box (Outer) Dimenaion	530*290*335mm
Max qty per large box	22500

SOP type

Packing Information	
Packing type	Reel type
Tape Width	16mm
Qty per Reel	1000
Small box (inner) Dimenaion	345*345*60mm
Max qty per small box	2000
Large box (Outer) Dimenaion	620x360x360mm
Max qty per large box	20000

(2)Packing Label Sample

1. MTL NO:Contents with "Order Information" in the specification.
2. LOT NO:The production cycle of the product.
3. BATCH:The CTR RANK of the product.
4. Quantity:Product packaging quantity.
5. Product Data: The data when product be made.

14. Reliability Test

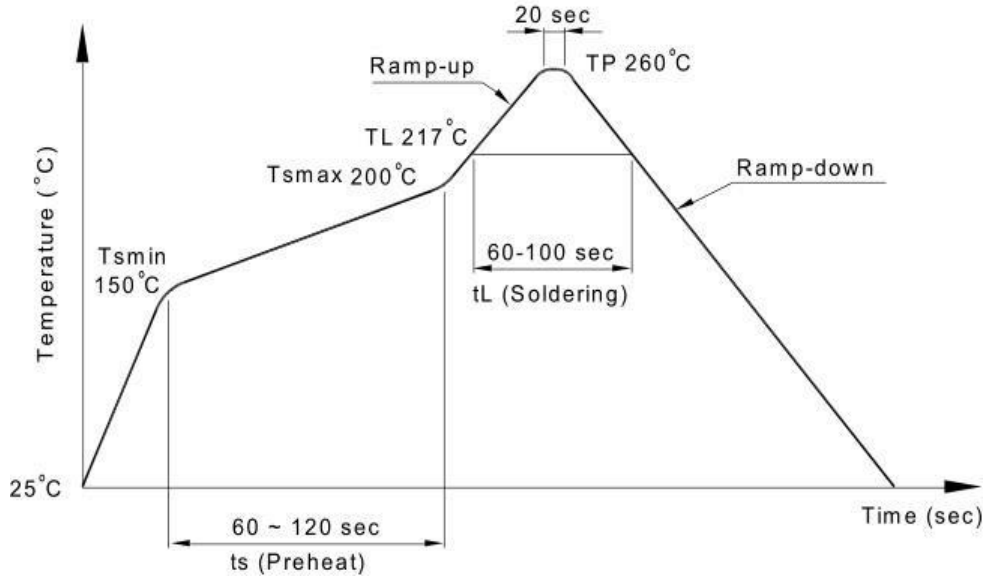
NO.	Item	Condition	Quantity	Cycle	Reference Standards
1	RSH, Resistance to Solder Heat	260±5°C,20s/cycle	22	3 cycles	JESC22A-106
2	SD, Solderability	260±5°C, 10s/cycle	22	1 cycle	JESD22-B102
3	TC, Temperature Cycle	H： 125°C 15min ∫ 5min L: -55°C 15min	77	300cycles	JESC22A-104
4	TS, Thermal Shock	H:100°C 5min ∫ 15s L:-10°C 5min	77	300cysles	JESC22A-106
5	LTSL, Low Temperature Storage	T:-55°C	77	1000h	JESD22-A119
6	HTSL, High Temperature Storage	T:125°C	77	1000h	JESC22A-103
7	THB, High Temperature High Humidity	T:85°C RH： 85%	77	1000h	JESC22A-101
8	HTOL DC Operating Life	T： 110°C IF=10mA VCC=5V	77	1000h	MIL-STD-750 Method 1037
9	ESD-HBM Human Body Model ESD	Ta=25° C, Reference JESD22-A114	6	1 cycle	JESD22-A114

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.

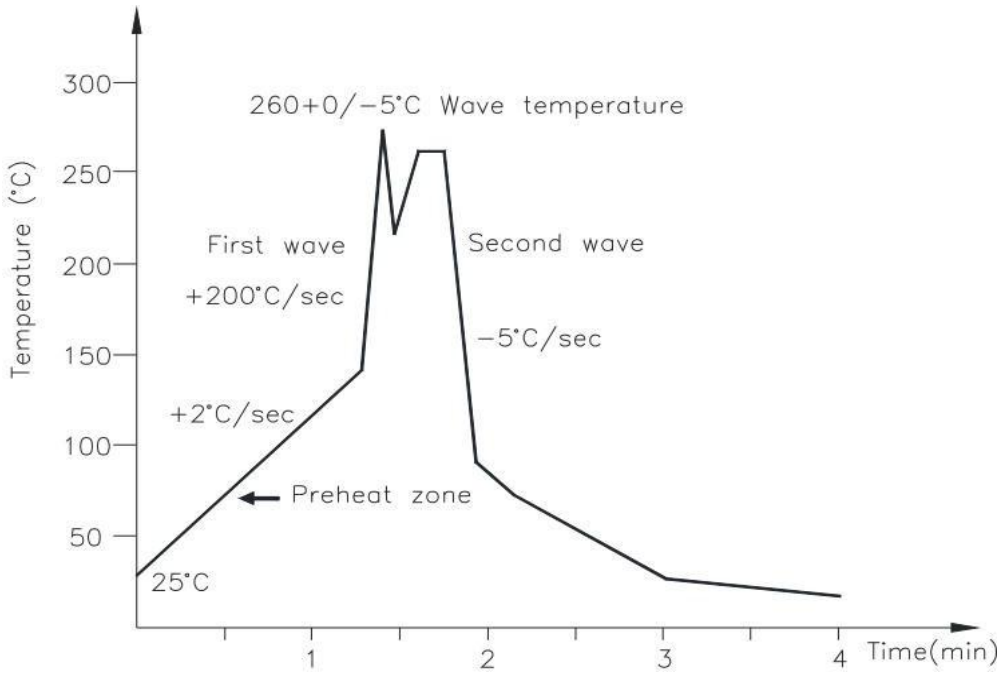
Profile item	Conditions
Preheat - Temperature Min (T Smin) - Temperature Max (T Smax) - Time (min to max) (ts)	 150˚C 200˚C 90±30 sec
Soldering zone - Temperature (TL) - Time (t L)	 217˚C 60 sec
Peak Temperature	260˚C
Peak Temperature time	20 sec
Ramp-up rate	3˚C / sec max.
Ramp-down rate from peak temperature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



(2) Wave soldering (JEDEC22A111 compliant)

One-time welding is recommended under the temperature condition.

Temperature Time	260+0/-5˚C 10 sec
Preheat temperature Preheat time	5 to 140˚C 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 Time	380+0/-5˚C 3 sec max

16. Switching time test circuit

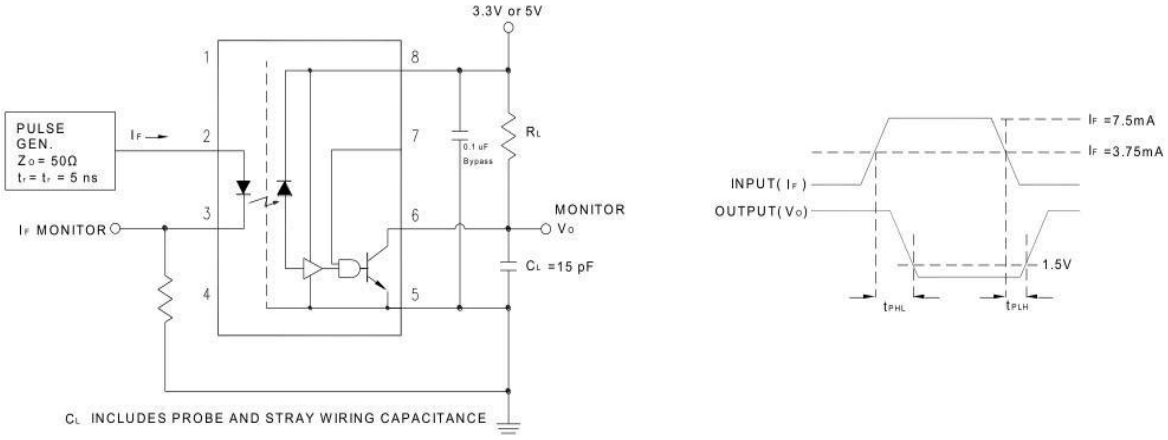


Figure 1: Test Circuit for t_{PHL} and t_{PLH}

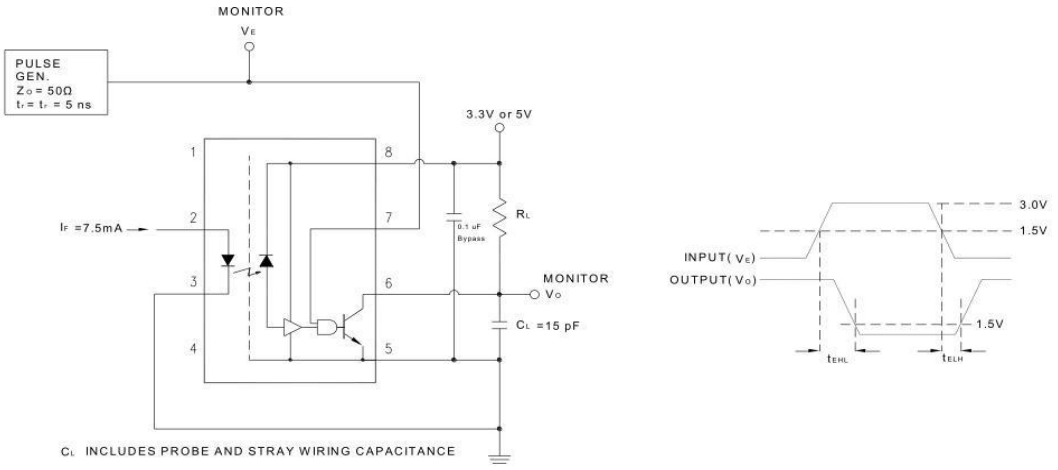


Figure 2: Single Channel Test Circuit for Common Mode Transient Immunity

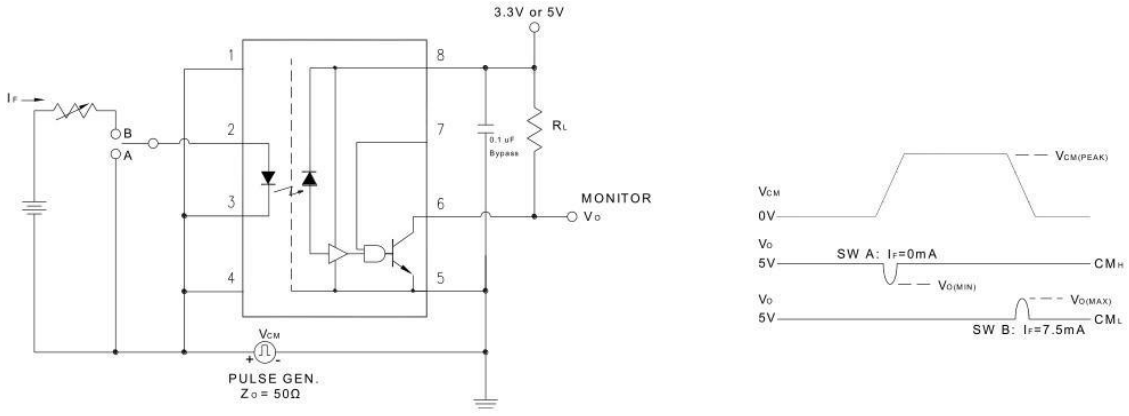


Figure 3: Single Channel Test Circuit for Common Mode Transient Immunity

17. Characteristics Curve

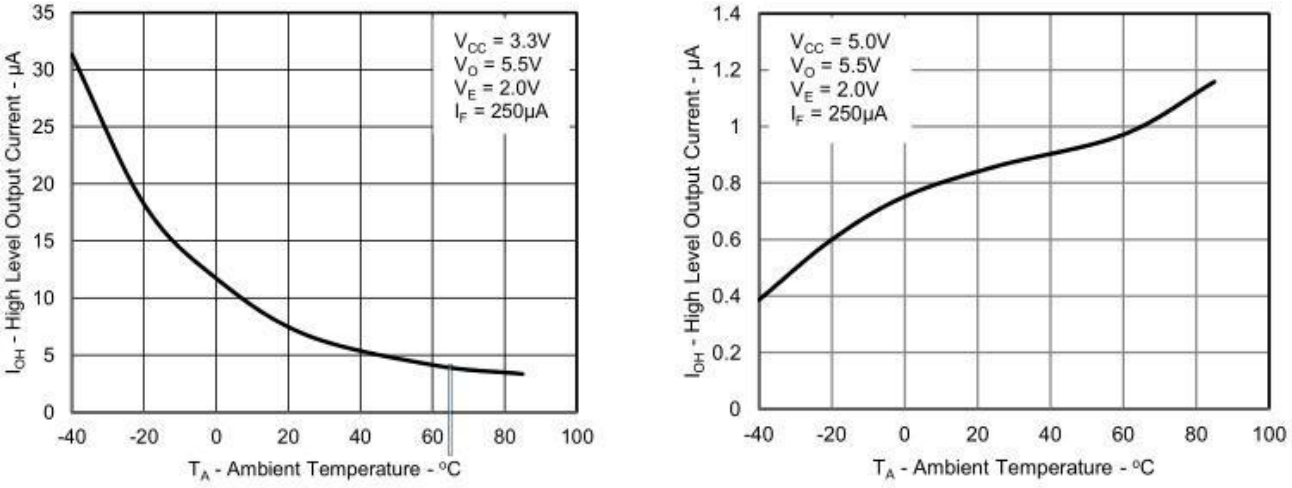


Figure 4: Typical High Level Output Current vs. Ambient Temperature

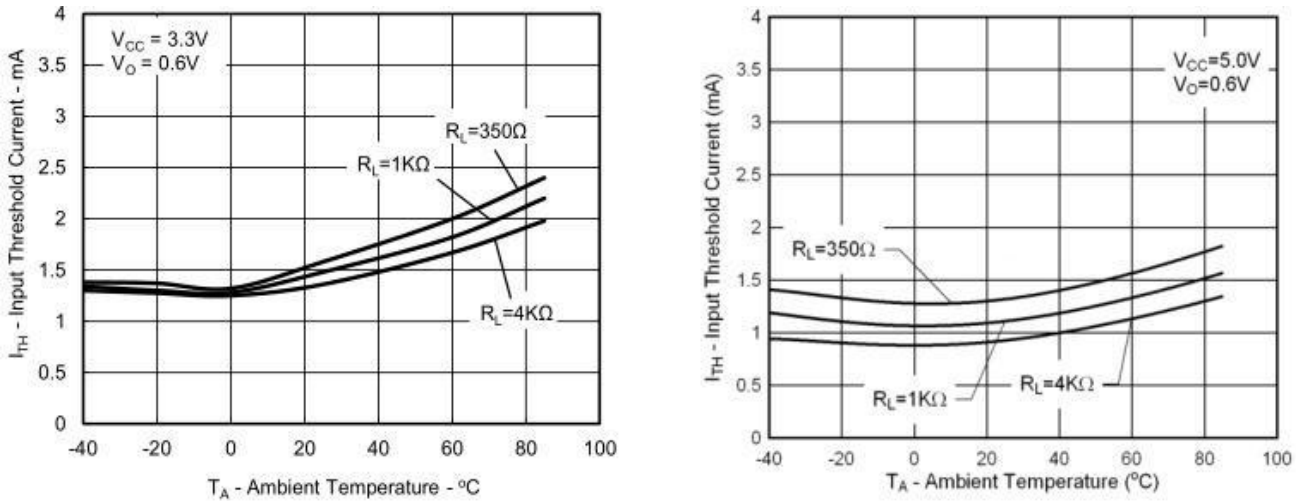


Figure 5: Typical Input Diode Threshold Current vs. Ambient Temperature

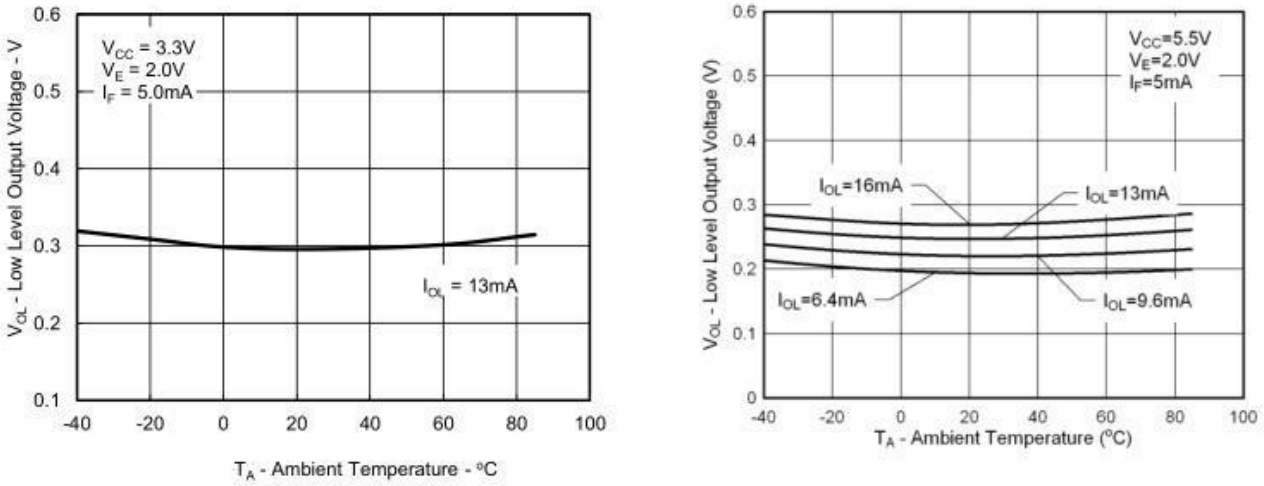


Figure 6: Typical Low Level Output Voltage vs. Ambient Temperature

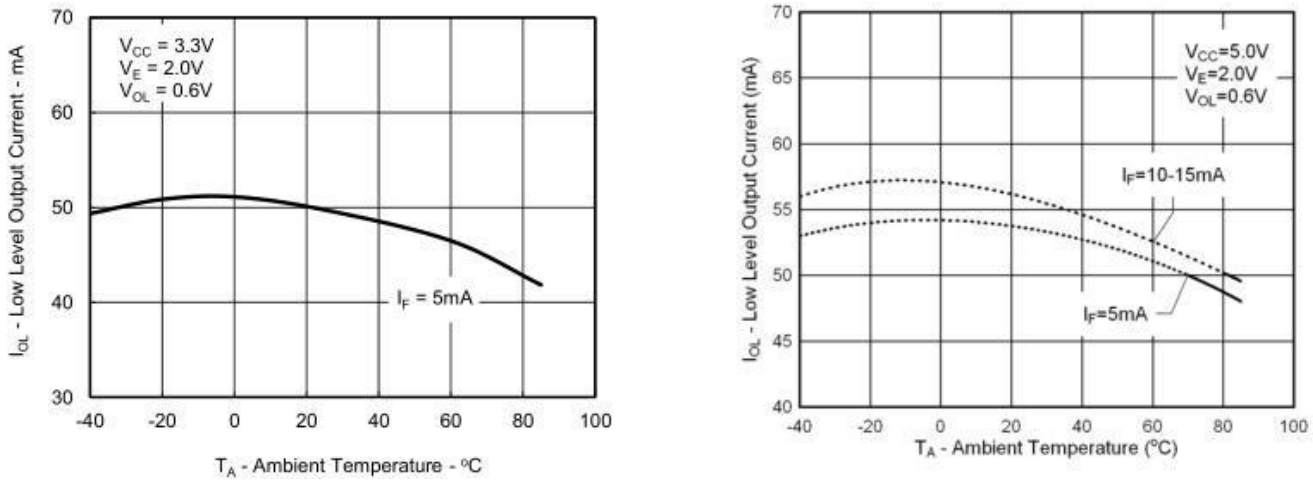


Figure 7: Typical Low Level Output Current vs. temperature

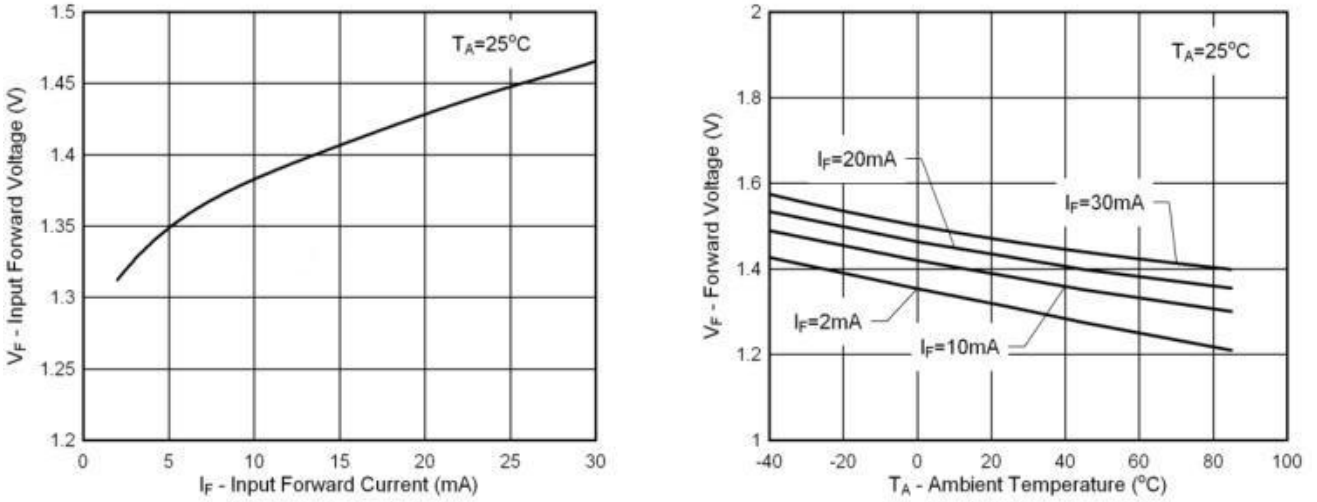


Figure 8: Typical Input Diode Forward Characteristic

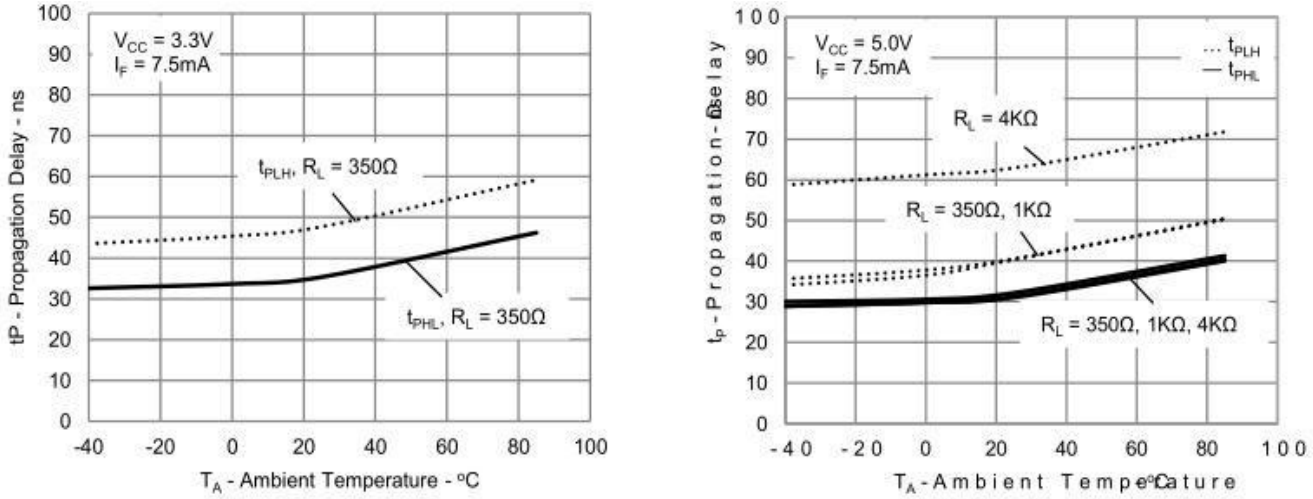


Figure 9: Typical Propagation Delay vs. Ambient Temperature

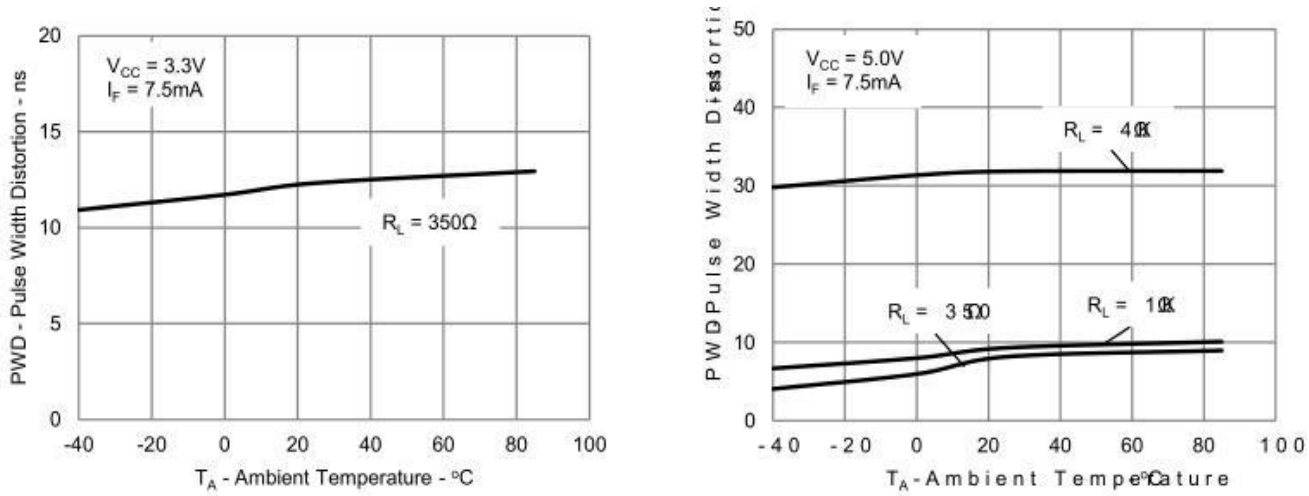


Figure 10: Typical Pulse Width Distortion vs. Ambient Temperature