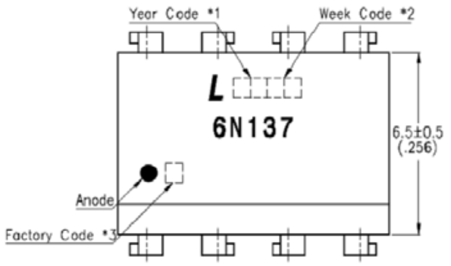
Ordering Information

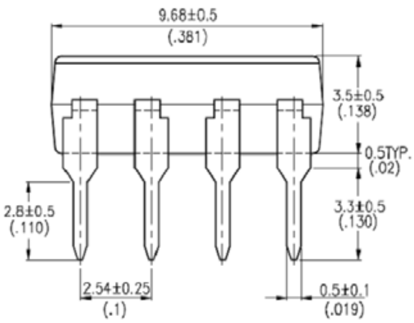
Part	Option	Minimum CMR		Input-On Current (mA)	Output Enable	Remarks
		dV/dt (V/µs)	V_{CM} (V)			
6N137	-L	1,000	20	5	YES	Single Channel, DIP-8
	M-L					Single Channel, Wide Lead Spacing
	S-L					Single Channel, SMD-8

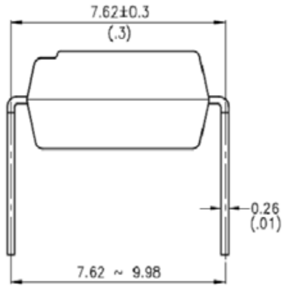
Package Dimensions

8-pin DIP Package (6N137-L)



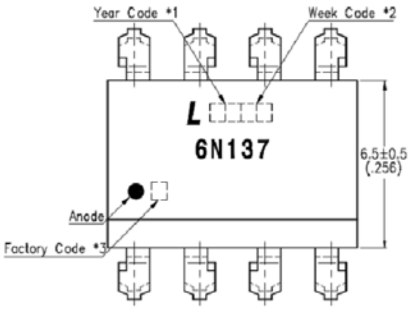
*1. Year date code.
*2. 2-digit work week.
*3. Factory identification mark
(Z : Taiwan, Y : Thailand).
Dimensions are in Millimeters and (Inches).



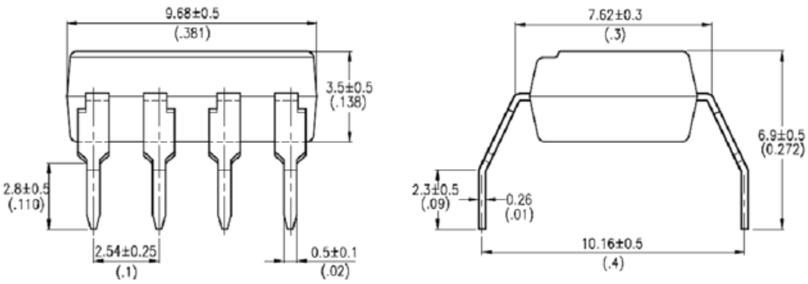


Package Dimensions

8-pin DIP Wide Lead Spacing Package (6N137M-L)

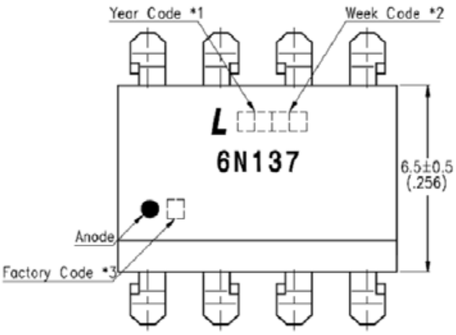


*1. Year date code.
*2. 2-digit work week.
*3. Factory identification mark
(Z : Taiwan, Y : Thailand).
Dimensions are in Millimeters and (Inches).

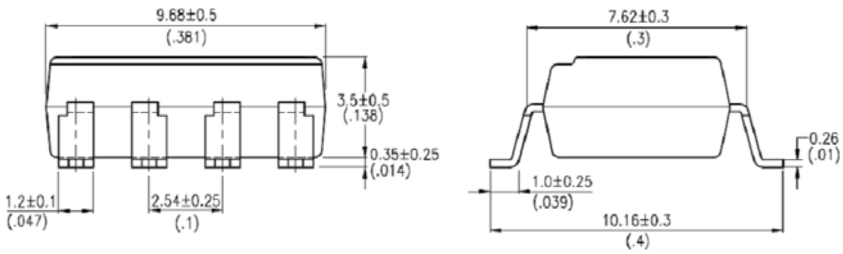


Package Dimensions

8-pin DIP Surface Mount Package (6N137S-L)

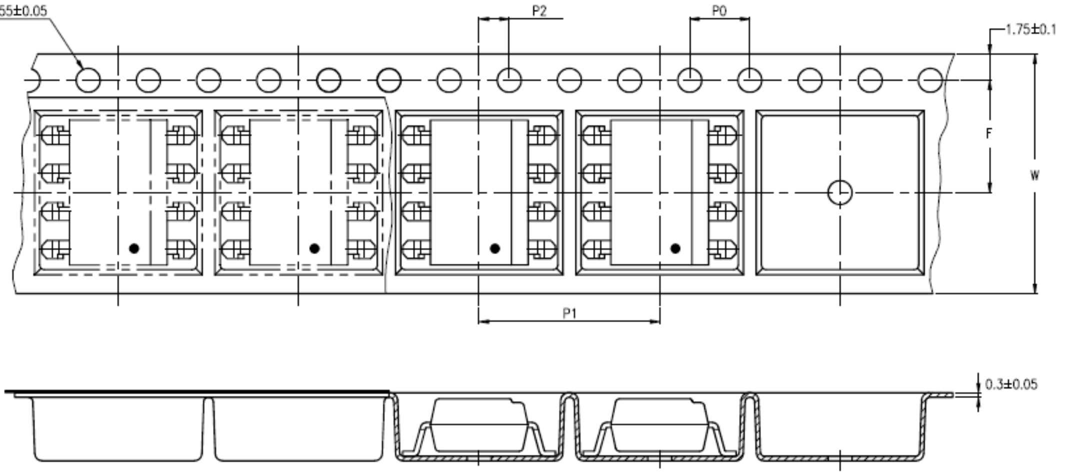


*1. Year date code.
*2. 2-digit work week.
*3. Factory identification mark
(Z : Taiwan, Y : Thailand).
Dimensions are in Millimeters and (Inches).

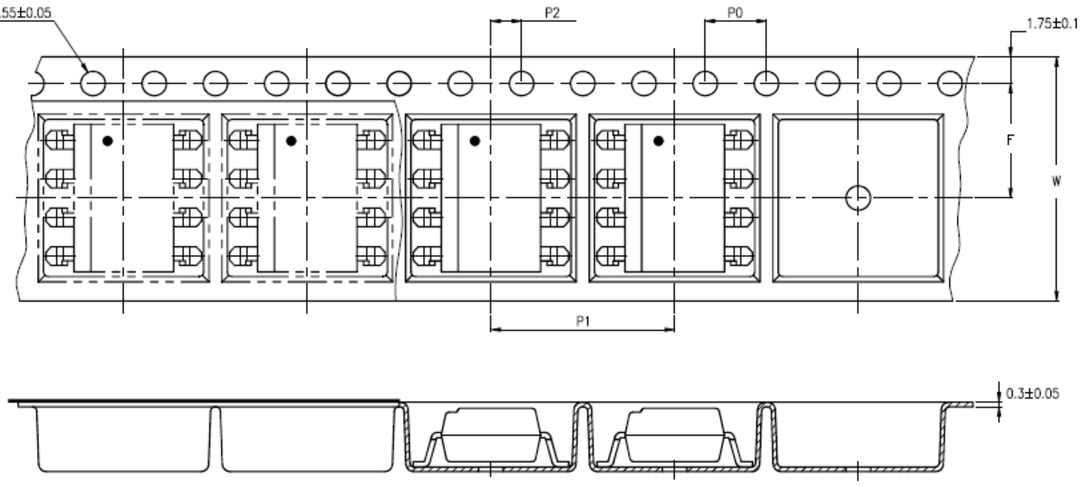


Taping Dimensions

6N137S-TA-L

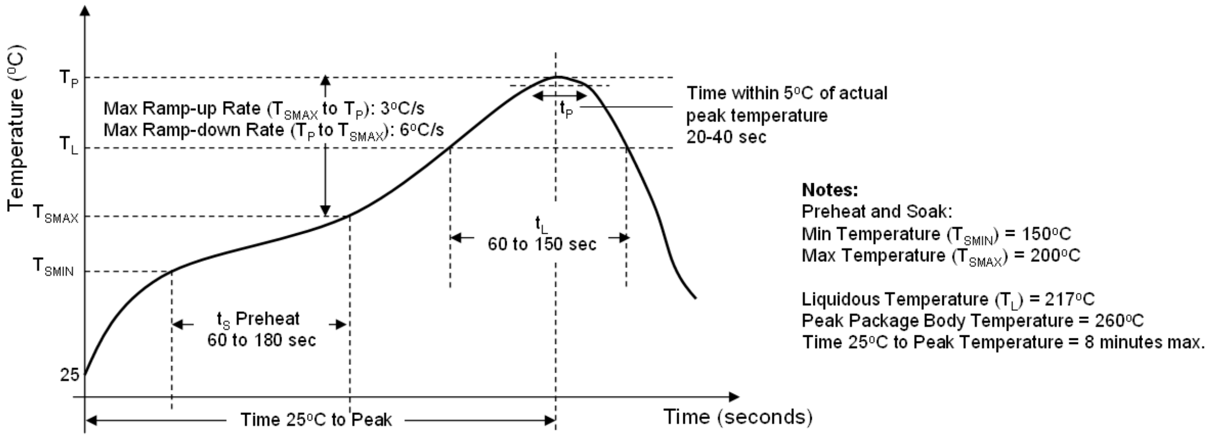


6N137S-TA1-L



Description	Symbol	Dimensions in millimeters (inches)
Tape wide	W	16 ± 0.3 (.63)
Pitch of sprocket holes	P0	4 ± 0.1 (.15)
Distance of compartment	F P2	7.5 ± 0.1 (.295) 2 ± 0.1 (.079)
Distance of compartment to compartment	P1	12 ± 0.1 (.472)

Recommended Lead Free Reflow Profile



Absolute Maximum Ratings*1

Parameter	Symbol	Min	Max	Units	Note
Storage Temperature	T_{ST}	-55	125	°C	
Operating Temperature	T_A	-40	85	°C	
Isolation Voltage	V_{ISO}		5000	V_{RMS}	
Supply Voltage	V_{CC}		7	V	
Lead Solder Temperature * 2			260	°C	
Input					
Average Forward Input Current	I_F		20	mA	2
Reverse Input Voltage	V_R		5	V	
Input Power Dissipation	P_I		40	mW	
Enable Input Voltage	V_E		V_{CC}+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	

1.Ambient temperature = 25°C, unless otherwise specified. Stresses exceeding the absolute maximum ratings can cause permanent damage to the device. Exposure to absolute maximum ratings for long periods of time can adversely affect reliability.

2.260°C for 10 seconds. Refer to Lead Free Reflow Profile.

Recommended Operating Conditions

Parameter		Symbol	Min	Max	Units
Operating Temperature		T_A	-40	85	°C
Supply Voltage		V_{CC}	4.5	5.5	V
Low Level Input Current		I_{FL}	0	250	μA
High Level Input Current	6N137-L	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=1kΩ per channel)		N		5	TTL Loads

Electrical Specifications

Parameters	Test Condition	Symbol	Min	Typ	Max	Units	Note
Input							
Input Forward Voltage	I_F = 10mA	V_F		1.38	1.70	V	
Input Forward Voltage Temperature Coefficient	I_F = 10mA	$\Delta V_F / \Delta T$		-1.5		mV/°C	
Input Reverse Voltage	I_R = 10μA	BV_R	5			V	
Input Threshold Current	V_E = 2V, V_{CC} = 5.5V, I_{OL} (sinking) = 13mA	I_{TH}		1.35	5	mA	
				$2^{(1)}$	3	mA	
Input Capacitance	f = 1MHz, V_F = 0V	C_{IN}		34		pF	
Output							
High Level Supply Current	V_E = 0.5V, V_{CC} = 5.5V, I_F = 0mA	I_{CCH}		7.4	10	mA	
Low Level Supply Current	V_E = 0.5V, V_{CC} = 5.5V, I_F = 10mA	I_{CCL}		10	13	mA	
High Level Enable Current	V_E = 2V	I_{EH}		-0.6	-1.6	mA	
Low Level Enable Current	V_E = 0.5V	I_{EL}		-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	V_E = 2V, V_{CC} = 5.5V, V_O = 5.5V, I_F = 250μA	I_{OH}			100	μA	
Low Level Output Voltage	V_E = 2V, V_{CC} = 5.5V, I_F = 5mA, I_{OL} (sinking) = 13mA	V_{OL}		0.25	0.60	V	

Specified over recommended temperature (T_A = -40°C to +85°C) unless otherwise specified. Typical values applies to V_{CC} = 5V, T_A = 25°C. See note 1.

Switching Specifications

Parameter	Test Condition	Symbol	Min	Typ	Max	Units	Note
Propagation Delay Time to High Output Level	R_L = 350Ω, C_L = 15pF	t_{PLH}	25	40	100	ns	3
Propagation Delay Time to Low Output Level	R_L = 350Ω, C_L = 15pF	t_{PHL}	25	27	100	ns	4
Pulse Width Distortion	R_L = 350Ω, C_L = 15pF	$\|t_{PLH} - t_{PHL}\|$		12		ns	
Propagation Delay Skew	R_L = 350Ω, C_L = 15pF	t_{PSK}					
Output Rise Time (10 to 90%)	R_L = 350Ω, C_L = 15pF	t_r		20		ns	
Output Fall Time (90 to 10%)	R_L = 350Ω, C_L = 15pF	t_f		6.6		ns	
Propagation Delay Time of Enable from V_{EH} to V_{EL}	R_L = 350Ω, C_L = 15pF, V_{EL} = 0V, V_{EH} = 3V	t_{ELH}		28		ns	5
Propagation Delay Time of Enable from V_{EL} to V_{EH}	R_L = 350Ω, C_L = 15pF, V_{EL} = 0V, V_{EH} = 3V	t_{EHL}		12		ns	6
Logic High Common Mode Transient Immunity	$\|V_{CM}\|$ = 20V, V_{CC} = 5V, I_F = 0mA, $V_{O(MIN)}$ = 2V, R_L = 350Ω, T_A = 25°C	$\|CM_H\|$	1,000			V/µs	7,9
Logic Low Common Mode Transient Immunity	$\|V_{CM}\|$ = 20V, V_{CC} = 5V, I_F = 7.5mA, $V_{O(MIN)}$ = 0V, R_L = 350Ω, T_A = 25°C	$\|CM_L\|$	1,000			V/µs	8,9

Specified over recommended temperature (T_A = -40°C to +85°C), V_{CC} = 5V, I_F = 7.5mA unless otherwise specified. Typical values applies to V_{CC} = 5V, T_A = 25°C.

Isolation Characteristics

Parameter	Test Condition	Symbol	Min	Typ	Max	Units	Note
Input-Output Insulation Leakage Current	45% RH, t = 5s, V_{I-O} = 3kV DC, T_A = 25°C	I_{I-O}			1.0	μA	10,11
Withstand Insulation Test Voltage	RH ≤ 50%, t = 1min, T_A = 25°C	V_{ISO}	5000			V	10,11,12
Input-Output Resistance	V_{I-O} = 500V DC	R_{I-O}		6.5×10^{11}		Ω	10
Input-Output Capacitance	f = 1MHz, T_A = 25°C	C_{I-O}		1.0		pF	10

Specified over recommended temperature (T_A = -40°C to +85°C) unless otherwise specified. Typical values applies to T_A = 25°C

Notes

1. A 0.1μF or bigger bypass capacitor for V_{CC} is needed as shown in Fig.1
2. Peaking driving circuit may be used to speed up the LED. The peak drive current of LED may go up to 50mA and maximum pulse width 50ns, as long as average current doesn't exceed 20mA.
3. t_{PLH} (propagation delay) is measured from the 3.75 mA point on the falling edge of the input pulse to the 1.5 V point on the rising edge of the output pulse.
4. t_{PHL} (propagation delay) is measured from the 3.75 mA point on the rising edge of the input pulse to the 1.5 V point on the falling edge of the output pulse.
5. The t_{ELH} enable propagation delay is measured from the 1.5 V point on the falling edge of the enable input pulse to the 1.5 V point on the rising edge of the output pulse.
6. The t_{EHL} enable propagation delay is measured from the 1.5 V point on the rising edge of the enable input pulse to the 1.5 V point on the falling edge of the output pulse.
7. CM_H is the maximum tolerable rate of rise of the common mode voltage to assure that the output will remain in a high logic state (i.e., VO > 2.0 V).
8. CM_L is the maximum tolerable rate of fall of the common mode voltage to assure that the output will remain in a low logic state (i.e., VO < 0.8 V).
9. No external pull up is required for a high logic state on the enable input. If the enable pin is not used, tying it to V_{CC}.
10. Device is considered a two-terminal device: pins 1, 2, 3, and 4 shorted together, and pins 5, 6, 7, and 8 shorted together.
11. In accordance with UL1577, each optocoupler is proof tested by applying an insulation test voltage 3000 V rms for one second (leakage current less than 5 uA). This test is performed before the 100% production test for partial discharge
12. In accordance with UL 1577, each optocoupler is proof tested by applying an insulation test voltage 6000 V rms for one second (leakage current less than 5 uA). This test is performed before the 100% production test for partial discharge

Switching Time Test Circuit

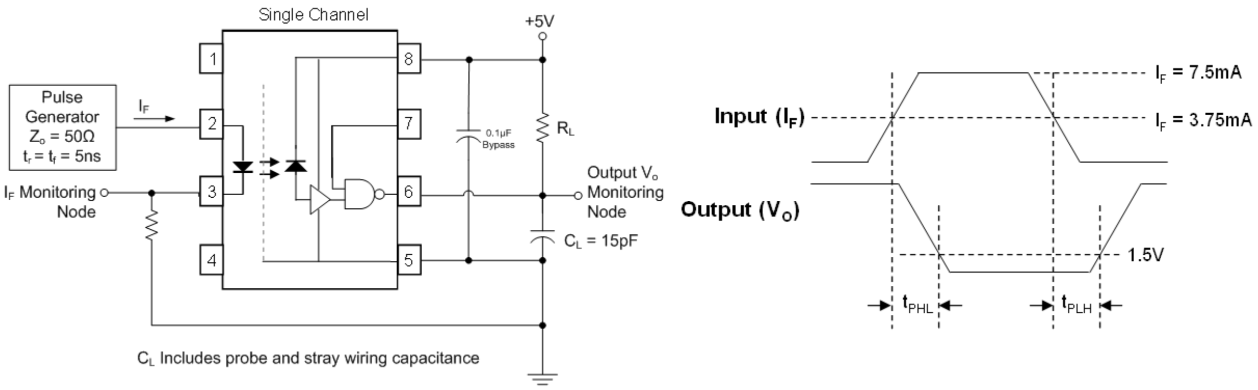


Figure 1: Single Channel Test Circuit for t_{PHL} and t_{PLH}

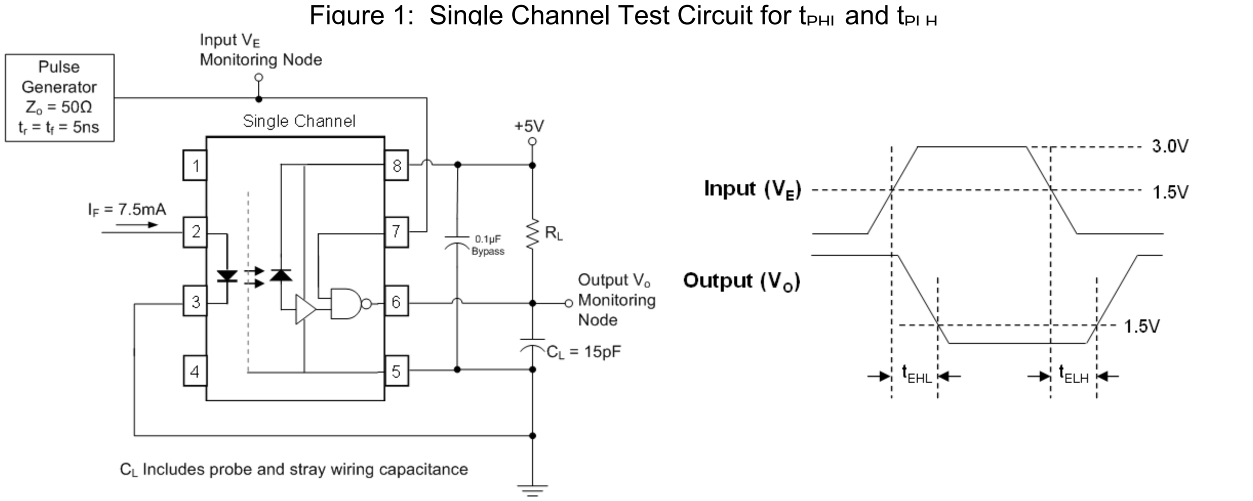


Figure 2: Single Channel Test Circuit for t_{EHL} and t_{ELH}

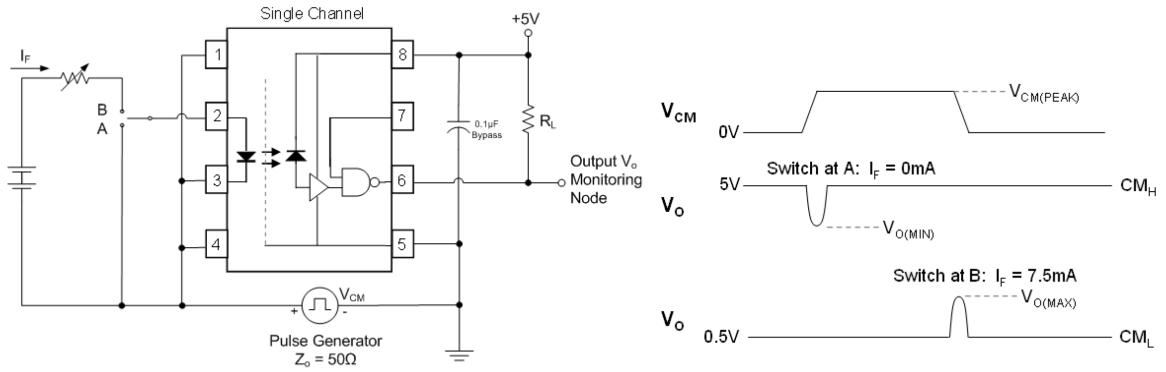


Figure 3: Single Channel Test Circuit for Common Mode Transient Immunity

Characteristics Curves

Figure 4: Typical Input Diode Forward Characteristics

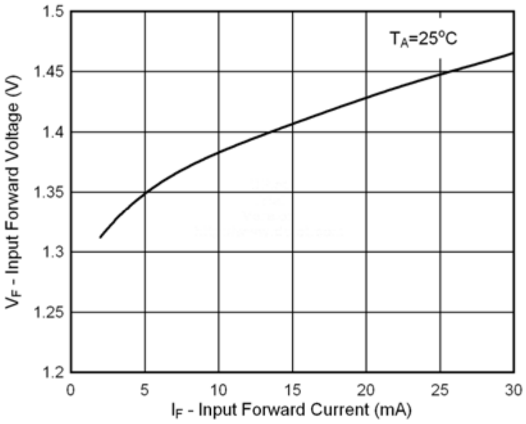


Figure 5: Typical Input Diode Forward Voltage vs. Ambient Temperature

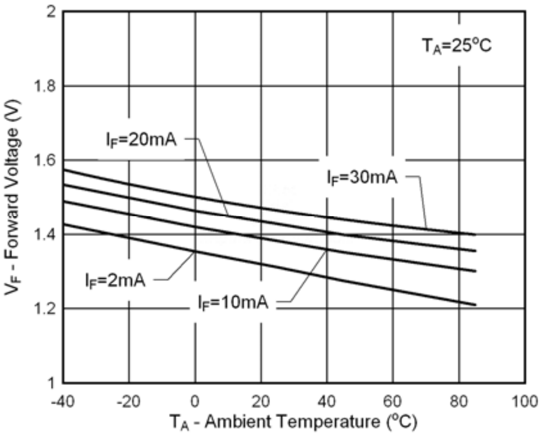


Figure 6: Typical Input Diode Threshold Current vs. Ambient Temperature

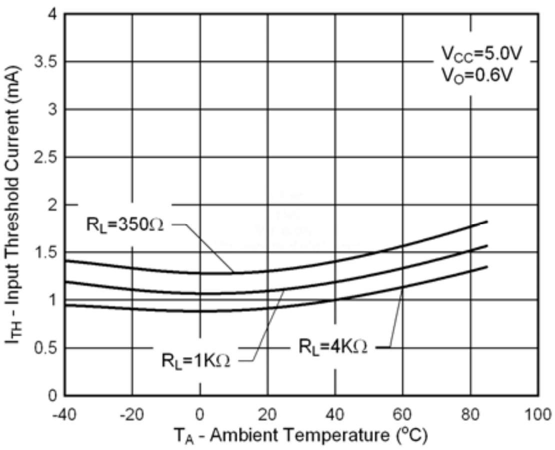


Figure 7: Typical Output Voltage vs. Input Forward Current

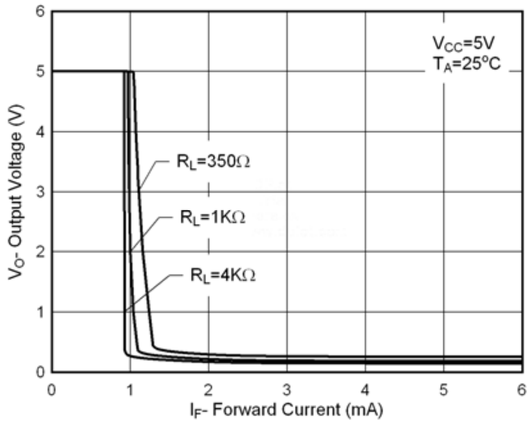


Figure 8: Typical Low Level Output Voltage vs. Ambient Temperature

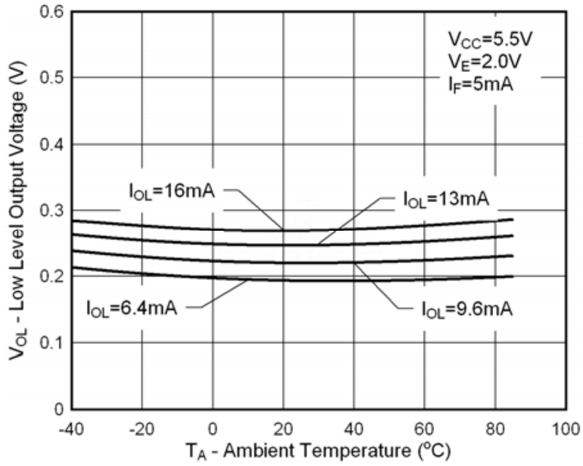
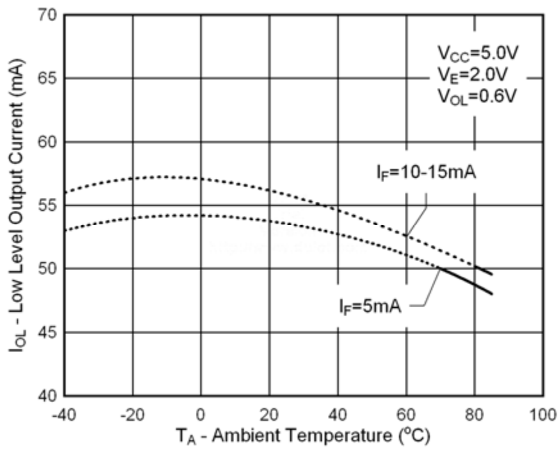


Figure 9: Typical Low Level Output Current vs. Ambient Temperature



Characteristics Curves

Figure 10: Typical Enable Propagation Delay vs. Ambient Temperature

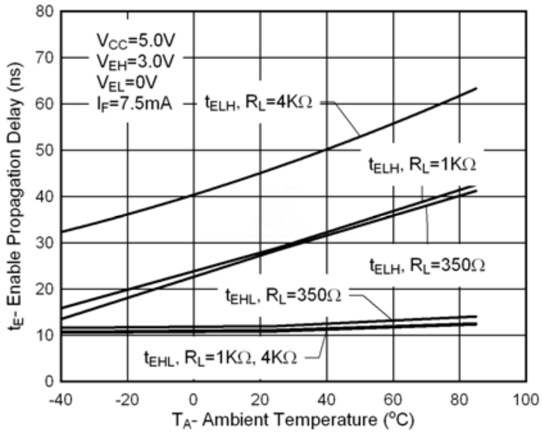


Figure 13: Typical Propagation Delay vs. Input Forward Current

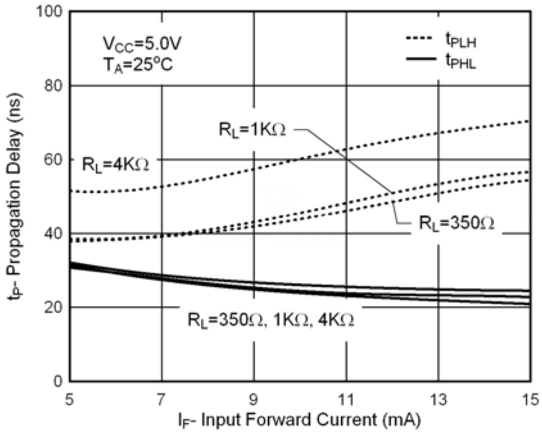


Figure 11: Typical Rise and Fall Time vs. Ambient Temperature

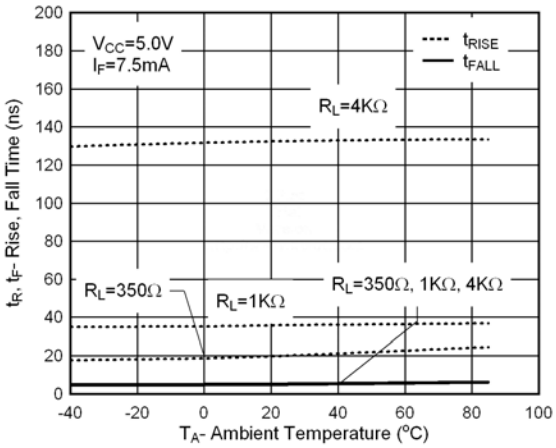


Figure 14: Typical Pulse Width Distortion vs. Input Forward Current

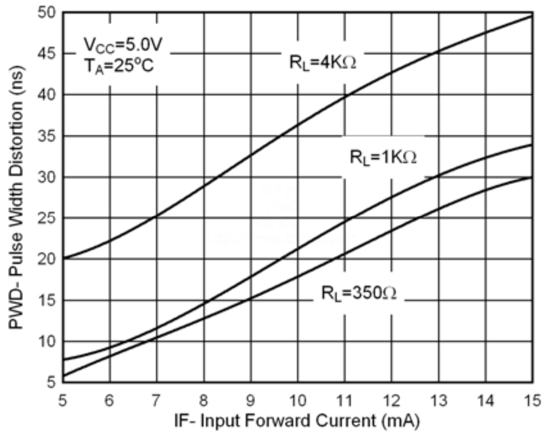


Figure 12: Typical Propagation Delay vs. Ambient

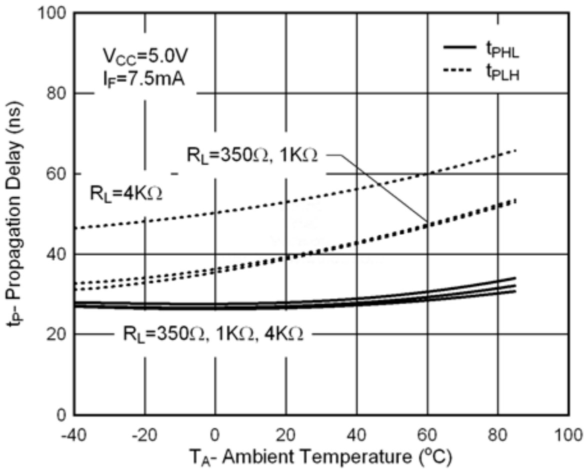
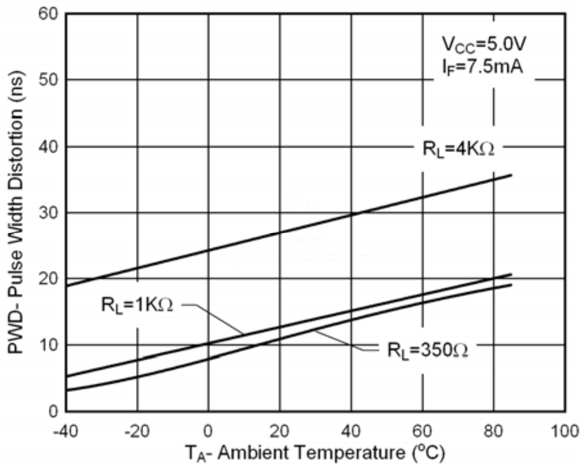


Figure 15: Typical Pulse Width Distortion vs. Ambient Temperature



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