

**DESCRIPTION**

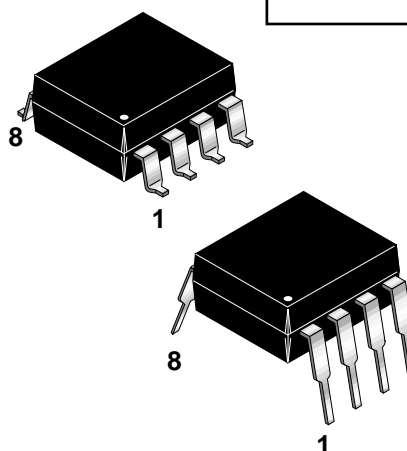
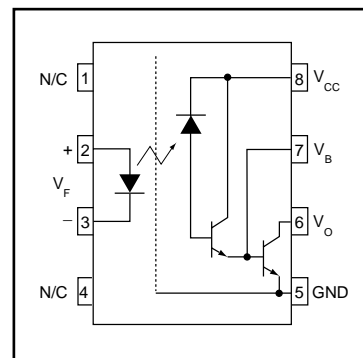
The CNW138 and CNW139 are high isolation voltage optocouplers, comprising an infrared emitting AlGaAs diode, optically coupled to a high gain split Darlington photodetector in an 8-pin wide body dual-in-line package (DIP).

**FEATURES**

- Wide body DIL encapsulation, with a pin distance of 10.16 mm
- Minimum clearance of 9.6 mm and minimum creepage of 10 mm
- High current transfer ratio
- Short propagation delay times
- TTL compatible
- Low saturation voltage
- High transient immunity
- Maximum permissible voltage of 8000 V (peak) and maximum operating isolation voltage of 1000 V (RMS) in accordance with VDE 00884
- UL recognized (File # E90700)

**APPLICATIONS**

- Line receivers
- Logic families ground isolation
- Low power systems
- Line voltage status indicator.



<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25^\circ\text{C}$ unless otherwise specified)				
Parameters	Symbol	Device	Value	Units
<b>TOTAL DEVICE</b>				
Storage Temperature	$T_{STG}$	All	-55 to +150	$^\circ\text{C}$
Operating Temperature	$T_{OPR}$	All	-55 to +85	$^\circ\text{C}$
Lead Solder Temperature	$T_{SOL}$	All	260 for 10 sec	$^\circ\text{C}$
<b>EMITTER</b>				
Continuous Forward Current (DC)	$I_F$	All	100	mA
Reverse Voltage (DC)	$V_R$	All	5	V
Forward Current - Peak (1 $\mu\text{s}$ pulse, $f = 300$ Hz)	$I_F(pk)$	All	1	A
LED Power Dissipation (up to $T_A = 70^\circ\text{C}$ )	$P_D$	All	250	mW
<b>DETECTOR</b>				
Collector Current (DC)	$I_C$	All	60	mA
Output Voltage (pins 6 & 5)	$V_O$	CNW138	-0.5 to 7	V
		CNW139	-0.5 to 18	
Supply Voltage (pins 8 & 5)	$V_{CC}$	CNW138	-0.5 to 7	V
		CNW139	-0.5 to 18	
Emitter-Base Voltage (pins 7 & 5)	$V_{EBO}$	All	5	V
Total Power Dissipation (up to $T_A = 70^\circ\text{C}$ )	$P_D$	All	100	mW

<b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ Unless otherwise specified)							
<b>INDIVIDUAL COMPONENT CHARACTERISTICS</b>							
Parameter	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
<b>EMITTER</b> Forward Voltage	$I_F = 1.6\text{ mA}$	$V_F$	All	1.25	1.5	1.7	V
	$I_F = 1.6\text{ mA}, T_A = 0\text{ to }70^\circ\text{C}$			1.1		1.8	
Input Reverse Current	$V_R = 5\text{ V}$	$I_R$	All			10	$\mu\text{A}$
	$V_R = 5\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$					100	
Diode Capacitance	$V_D = 0, f = 1\text{ MHz}$	$C_d$	All		200		pF
<b>DETECTOR</b> Collector-Emitter Breakdown Voltage	$I_C = 1\text{ mA}$	$BV_{CEO}$	CNW138	7			V
			CNW139	18			
Emitter-Base Breakdown Voltage	$I_C = 0.1\text{ mA}$	$BV_{EBO}$	All	0.5			V
Logic High Output Current	$I_F = 0, V_O = V_{CC} = 7\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$	$I_{OH}$	CNW138		0.05	250	$\mu\text{A}$
	$I_F = 0, V_O = V_{CC} = 18\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$		CNW139		0.1	100	
Logic High Supply Current	$I_F = 0, I_O = 0, V_{CC} = 18\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$	$I_{CCH}$	All		0.01	1	$\mu\text{A}$
Logic Low Supply Current	$I_F = 1.6\text{ mA}, I_O = 0, V_{CC} = 18\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$	$I_{CCL}$	All		0.5	2	mA

<b>ISOLATION CHARACTERISTICS</b>							
Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units	
Isolation Capacitance	$V_{I-O} = 0\text{ V}, f = 1\text{ MHz}$	$C_{ISO}$		0.4	0.6	pF	
Isolation Resistance	$V_{I-O} = \pm 500\text{ V (DC)}$	$R_{ISO}$	$10^{12}$	$10^{13}$		$\Omega$	
Input-Output Isolation Voltage	T = 1 min. (Peak value)	$V_{ISO}$	7070			V	
	T = 1 min. (RMS value)		5000				
Maximum Operating Isolation Voltage	RMS value	$V_{IORM}$	1000			V	

<b>TRANSFER CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ Unless otherwise specified)							
Parameter	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
<b>TOTAL DEVICE</b> Current Transfer Ratio	$I_F = 1.6\text{ mA}, V_O = 0.4\text{ V}, V_{CC} = 4.5\text{ V}, T_A = 0\text{ to }70^\circ\text{C}, \text{DC}$	CTR	CNW138	300			%
	$I_F = 0.5\text{ mA}, V_O = 0.4\text{ V}, V_{CC} = 4.5\text{ V}, T_A = 0\text{ to }70^\circ\text{C}, \text{DC}$		CNW139	500			
Logic Low Output Voltage	$I_F = 1.6\text{ mA}, I_C = 4.8\text{ mA}, V_{CC} = 4.5\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$	$V_{OL}$	CNW138			0.4	V
	$I_F = 1.6\text{ mA}, I_C = 8\text{ mA}, V_{CC} = 4.5\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$		CNW139			0.4	
	$I_F = 5\text{ mA}, I_C = 15\text{ mA}, V_{CC} = 4.5\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$					0.4	
	$I_F = 12\text{ mA}, I_C = 24\text{ mA}, V_{CC} = 4.5\text{ V}, T_A = 0\text{ to }70^\circ\text{C}$					0.4	

\* Typical values at  $T_A = 25^\circ\text{C}$

<b>SWITCHING CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ Unless otherwise specified)							
Parameter	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
Propagation delay time to logic low at output (Fig. 1)	$R_L = 2.2\text{ k}\Omega, I_F = 1.6\text{ mA}, V_{CC} = 5\text{ V}$	$T_{PHL}$	All		1.5	10	$\mu\text{s}$
	$R_L = 2.2\text{ k}\Omega, I_F = 1.6\text{ mA}, V_{CC} = 5\text{ V}, 0\text{ to }70^\circ\text{C}$					11	
	$R_L = 4.7\text{ k}\Omega, I_F = 0.5\text{ mA}, V_{CC} = 5\text{ V}$				4	25	
	$R_L = 4.7\text{ k}\Omega, I_F = 0.5\text{ mA}, V_{CC} = 5\text{ V}, 0\text{ to }70^\circ\text{C}$					30	
	$R_L = 270\ \Omega, I_F = 12\text{ mA}, V_{CC} = 5\text{ V}$				0.5	1	
	$R_L = 270\ \Omega, I_F = 12\text{ mA}, V_{CC} = 5\text{ V}, 0\text{ to }70^\circ\text{C}$					1.1	
Propagation delay time to logic high at output (Fig. 1)	$R_L = 2.2\text{ k}\Omega, I_F = 1.6\text{ mA}, V_{CC} = 5\text{ V}$	$T_{PLH}$	All		10	35	$\mu\text{s}$
	$R_L = 2.2\text{ k}\Omega, I_F = 1.6\text{ mA}, V_{CC} = 5\text{ V}, 0\text{ to }70^\circ\text{C}$					70	
	$R_L = 4.7\text{ k}\Omega, I_F = 0.5\text{ mA}, V_{CC} = 5\text{ V}$				20	60	
	$R_L = 4.7\text{ k}\Omega, I_F = 0.5\text{ mA}, V_{CC} = 5\text{ V}, 0\text{ to }70^\circ\text{C}$					115	
	$R_L = 270\ \Omega, I_F = 12\text{ mA}, V_{CC} = 5\text{ V}$				2.0	7	
	$R_L = 270\ \Omega, I_F = 12\text{ mA}, V_{CC} = 5\text{ V}, 0\text{ to }70^\circ\text{C}$					11	

<b>TRANSIENT IMMUNITY</b> (see Fig. 2 and note 1)							
Parameter	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
Common mode transient immunity at logic high	$R_L = 2.2\text{ k}\Omega, I_F = 0, V_{CC} = 5\text{ V}, V_{CM} = 10\text{ V}_{(p-p)}$	CMH	All	0.5			$\text{kV}/\mu\text{s}$
Common mode transient immunity at logic low	$R_L = 2.2\text{ k}\Omega, I_F = 1.6\text{ mA}, V_{CC} = 5\text{ V}, V_{CM} = 10\text{ V}_{(p-p)}$	CML	All	-0.5			$\text{kV}/\mu\text{s}$
Common mode rejection ratio	$R_L = 100\ \Omega, I_C = 45\text{ mA}, f = 10\text{ kHz}, V_{CC} = 10\text{ V}$	CMRR	All		-65		dB

Note

1.  $R_{CC} (\text{k}\Omega) = 1\text{ V}/0.15\text{ I}_F (\text{mA})$ , to protect the photodetector against high surge currents.

\* Typical values at  $T_A = 25^\circ\text{C}$

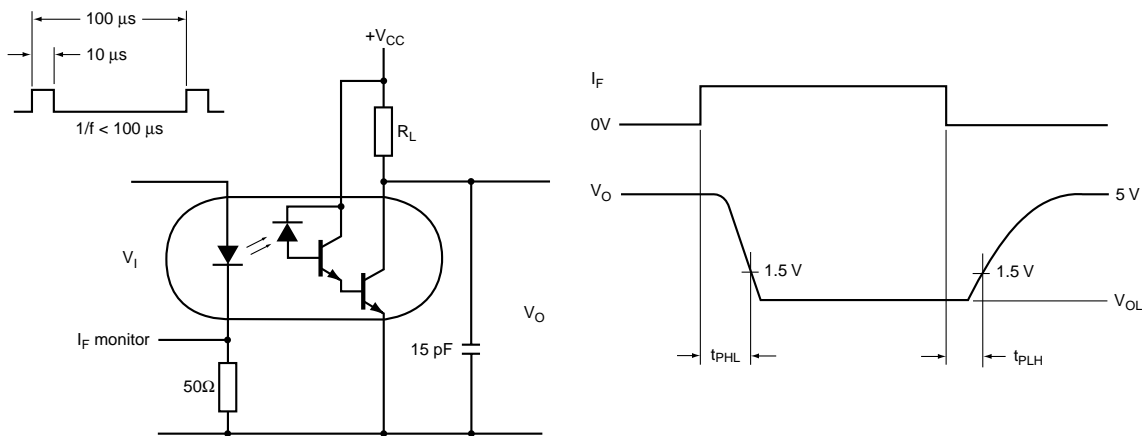


Fig. 1 Switching Times Test Circuit and Waveforms

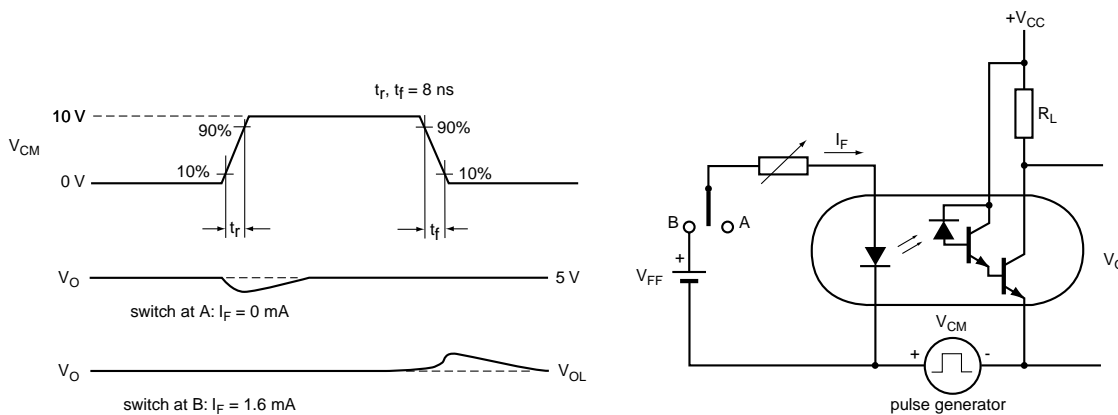


Fig. 2 Transient Immunity Test Circuit and Waveforms

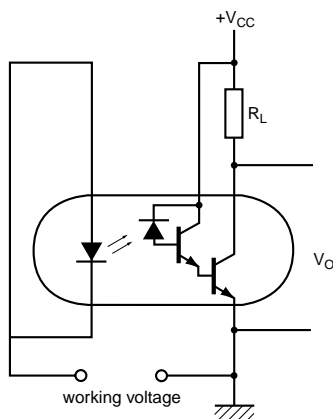
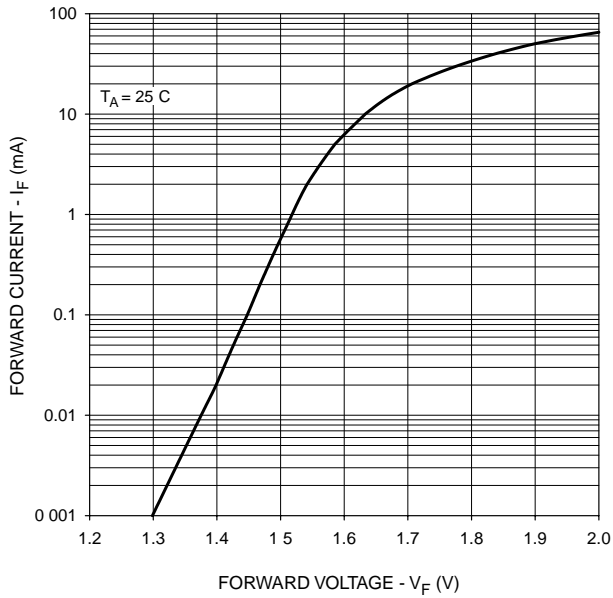
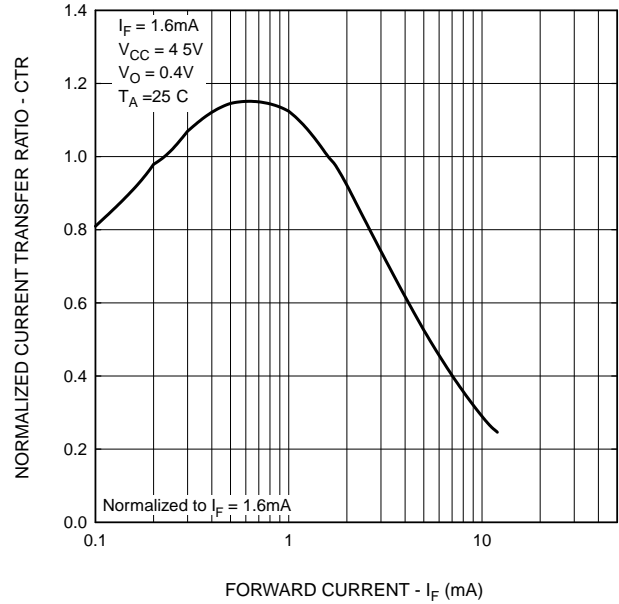


Fig. 3 Logic Output Current Test Circuit

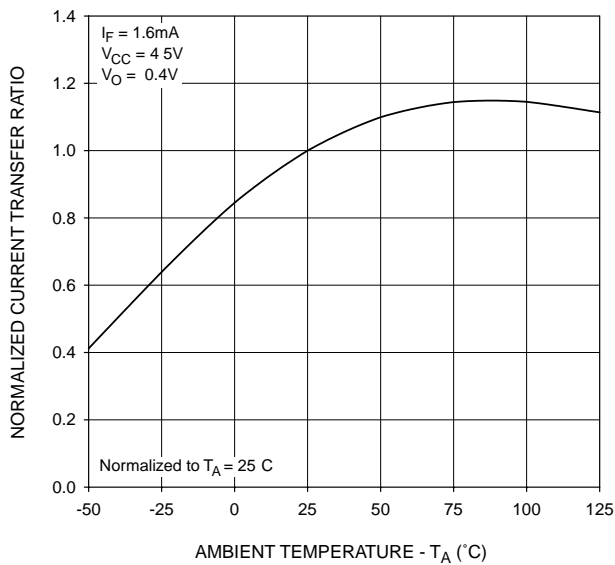
**Fig. 4 LED Forward Current vs. Forward Voltage**



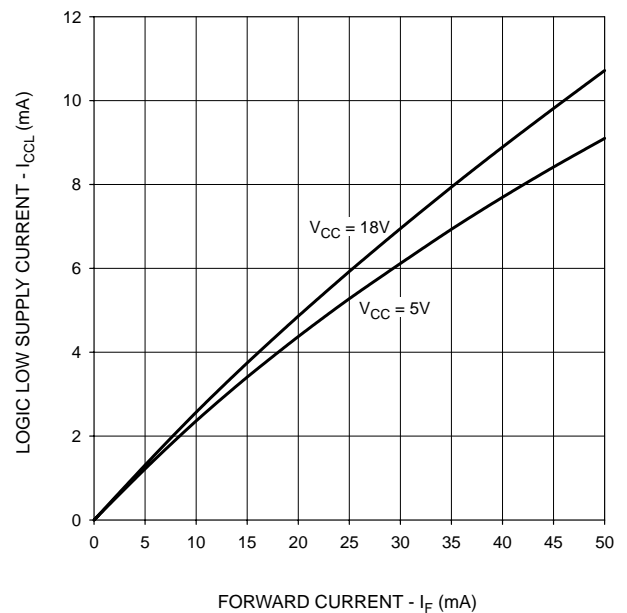
**Fig. 5 Normalized Current Transfer Ratio vs. Forward Current**



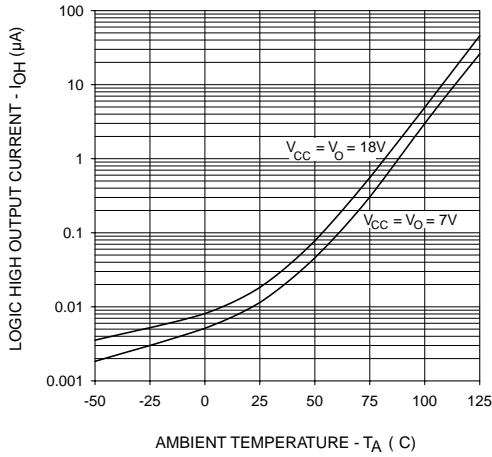
**Fig. 6 Normalized Current Transfer Ratio vs. Ambient Temperature**



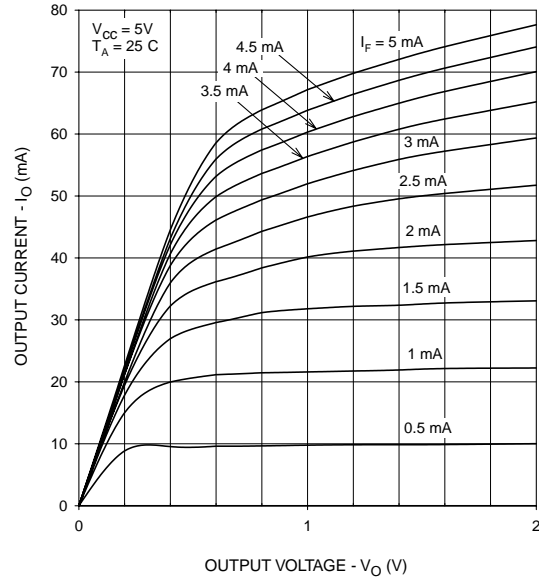
**Fig. 7 Logic Low Supply Current vs. Forward Current**



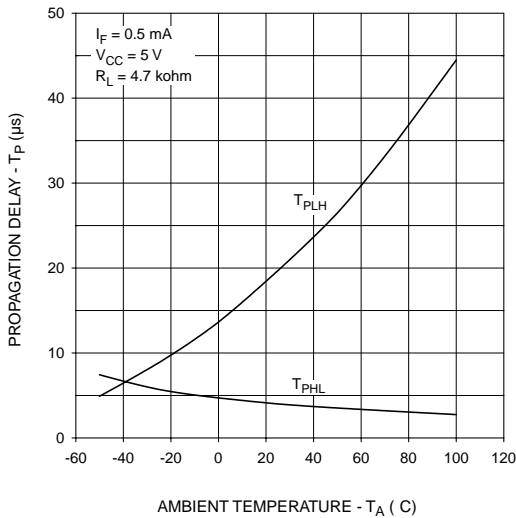
**Fig. 8 Logic High Output Current vs. Ambient Temperature**



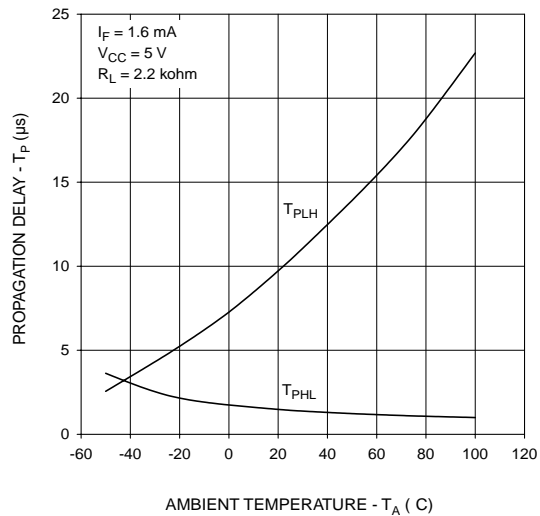
**Fig. 9 Output Current vs. Output Voltage**



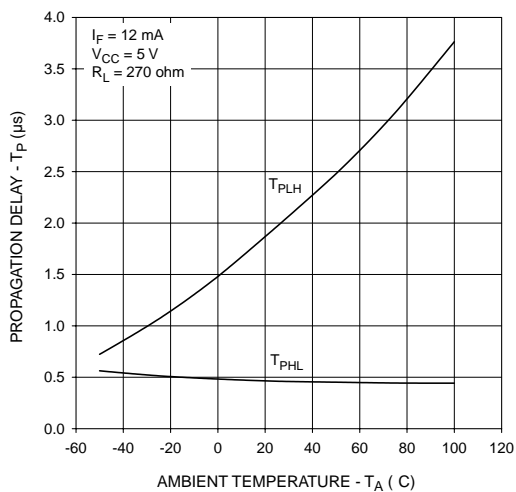
**Fig. 10 Propagation Delay vs. Ambient Temperature**



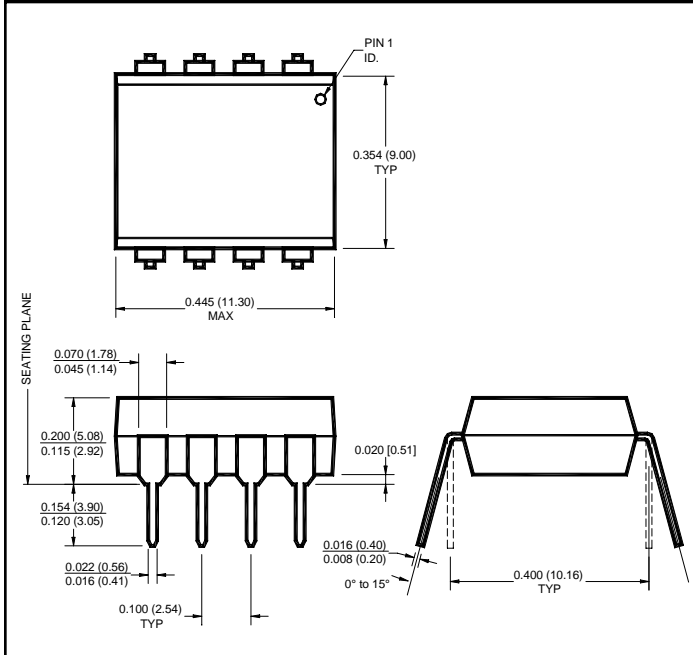
**Fig. 11 Propagation Delay vs. Ambient Temperature**



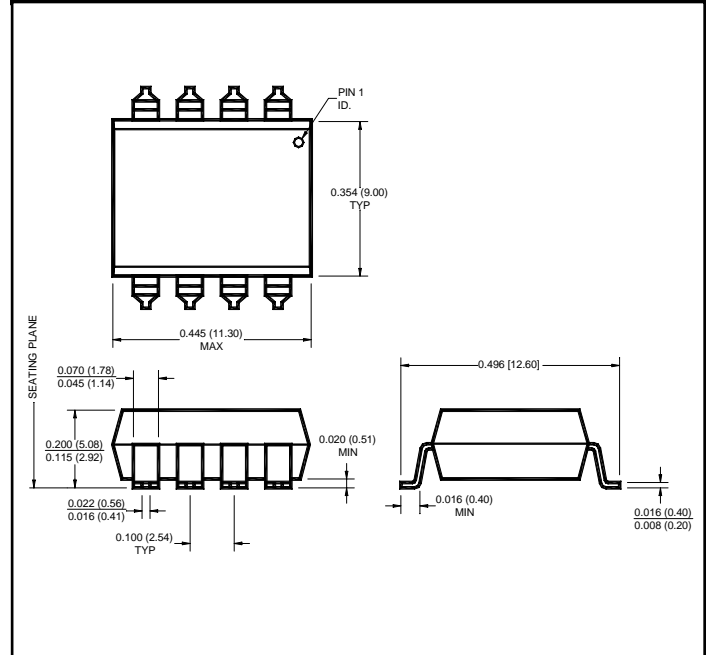
**Fig. 12 Propagation Delay vs. Ambient Temperature**



**Package Dimensions (Through Hole)**



**Package Dimensions (Surface Mount)**



**NOTE**

All dimensions are in inches (millimeters)

**ORDERING INFORMATION**

Option	Order Entry Identifier	Description
S	.S	Surface Mount Lead Bend
300	.300	VDE 0884

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