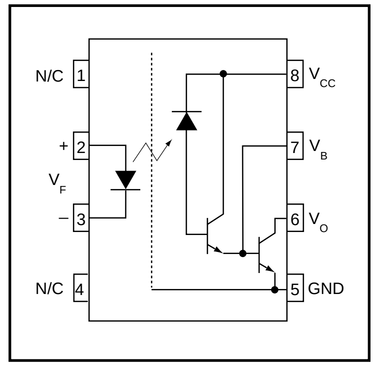
8-PIN WIDE BODY, HIGH-GAIN OPTOCOUPLERS

CNW138 CNW139

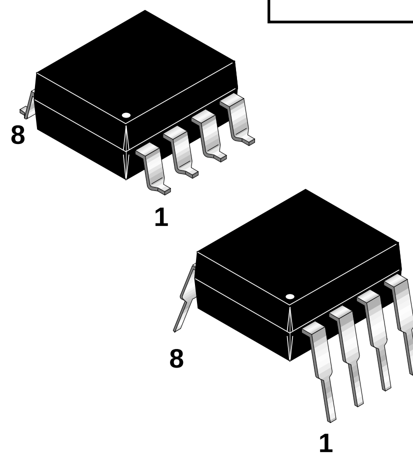


DESCRIPTION

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.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C unless otherwise specified)

Parameters	Symbol	Device	Value	Units
TOTAL DEVICE				
Storage Temperature	T_{STG}	All	-55 to +150	°C
Operating Temperature	T_{OPR}	All	-55 to +85	°C
Lead Solder Temperature	T_{SOL}	All	260 for 10 sec	°C
EMITTER				
Continuous Forward Current (DC)	I_F	All	100	mA
Reverse Voltage (DC)	V_R	All	5	V
Forward Current - Peak (1 µs pulse, f = 300 Hz)	I_F(pk)	All	1	A
LED Power Dissipation (up to T_A = 70°C)	P_D	All	250	mW
DETECTOR				
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°C)	P_D	All	100	mW

ELECTRICAL CHARACTERISTICS (T_A = 25°C Unless otherwise specified)

INDIVIDUAL COMPONENT CHARACTERISTICS

Parameter	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
EMITTER Forward Voltage	I_F = 1.6 mA	V_F	All	1.25	1.5	1.7	V
	I_F = 1.6 mA, T_A = 0 to 70°C			1.1		1.8	
Input Reverse Current	V_R = 5 V	I_R	All			10	µA
	V_R = 5 V, T_A = 0 to 70°C					100	
Diode Capacitance	V_D =0, f = 1MHz	C_d	All		200		pF
DETECTOR Collector-Emitter Breakdown Voltage	I_C = 1 mA	BV_{CEO}	CNW138	7			V
			CNW139	18			
Emitter-Base Breakdown Voltage	I_C = 0.1 mA	BV_{EBO}	All	0.5			V
Logic High Output Current	I_F = 0, V_O = V_{CC} = 7V, T_A = 0 to 70°C	I_{OH}	CNW138		0.05	250	µA
	I_F = 0, V_O = V_{CC} = 18V, T_A = 0 to 70°C		CNW139		0.1	100	
Logic High Supply Current	I_F = 0, I_O = 0, V_{CC} = 18 V, T_A = 0 to 70°C	I_{CCH}	All		0.01	1	µA
Logic Low Supply Current	I_F=1.6 mA, I_O= O, V_{CC}=18 V, T_A= 0 to 70°C	I_{CCL}	All		0.5	2	mA

ISOLATION CHARACTERISTICS

Characteristic	Test Conditions	Symbol	Min	Typ*	Max	Units
Isolation Capacitance	V_{I-O} = 0V, f = 1 MHz	C_{ISO}		0.4	0.6	pF
Isolation Resistance	V_{I-O} = ±500 V (DC)	R_{ISO}	10^{12}	10^{13}		Ω
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

TRANSFER CHARACTERISTICS (T_A = 25°C Unless otherwise specified)

Parameter	Test Conditions	Symbol	Device	Min	Typ*	Max	Unit
TOTAL DEVICE Current Transfer Ratio	I_F = 1.6 mA, V_O = 0.4 V, V_{CC} = 4.5 V, T_A = 0 to 70°C, DC	CTR	CNW138	300			%
			CNW139	500			
	I_F = 0.5 mA, V_O = 0.4 V, V_{CC} = 4.5 V, T_A = 0 to 70°C, DC		CNW139	400			
Logic Low Output Voltage	I_F = 1.6 mA, I_C = 4.8 mA, V_{CC} = 4.5 V, T_A = 0 to 70°C	V_{OL}	CNW138			0.4	V
	I_F = 1.6 mA, I_C = 8 mA, V_{CC} = 4.5 V, T_A = 0 to 70°C		CNW139			0.4	
	I_F = 5 mA, I_C = 15 mA, V_{CC} = 4.5 V, T_A = 0 to 70°C					0.4	
	I_F = 12 mA, I_C = 24 mA, V_{CC} = 4.5 V, T_A = 0 to 70°C					0.4	

* Typical values at T_A = 25°C

SWITCHING CHARACTERISTICS (T_A = 25°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 kΩ, I_F = 1.6 mA, V_{CC} = 5 V	T_{PHL}	All		1.5	10	µs
	R_L = 2.2 kΩ, I_F = 1.6 mA, V_{CC} = 5 V, 0 to 70°C					11	
	R_L = 4.7 kΩ, I_F = 0.5 mA, V_{CC} = 5 V				4	25	
	R_L = 4.7 kΩ, I_F = 0.5 mA, V_{CC} = 5 V, 0 to 70°C					30	
	R_L = 270 Ω, I_F = 12 mA, V_{CC} = 5 V				0.5	1	
	R_L = 270 Ω, I_F = 12 mA, V_{CC} = 5 V, 0 to 70°C					1.1	
Propagation delay time to logic high at output (Fig. 1)	R_L = 2.2 kΩ, I_F = 1.6 mA, V_{CC} = 5 V	T_{PLH}	All		10	35	µs
	R_L = 2.2 kΩ, I_F = 1.6 mA, V_{CC} = 5 V, 0 to 70°C					70	
	R_L = 4.7 kΩ, I_F = 0.5 mA, V_{CC} = 5 V				20	60	
	R_L = 4.7 kΩ, I_F = 0.5 mA, V_{CC} = 5 V, 0 to 70°C					115	
	R_L = 270 Ω, I_F = 12 mA, V_{CC} = 5 V				2.0	7	
	R_L = 270 Ω, I_F = 12 mA, V_{CC} = 5 V, 0 to 70°C					11	

TRANSIENT IMMUNITY (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 kΩ, I_F = 0, V_{CC} = 5 V, V_{CM} = 10 $V_{(p-p)}$	CMH	All	0.5			kV/µs
Common mode transient immunity at logic low	R_L = 2.2 kΩ, I_F = 1.6 mA, V_{CC} = 5 V, V_{CM} = 10 $V_{(p-p)}$	CML	All	-0.5			kV/µs
Common mode rejection ratio	R_L = 100 Ω, I_C = 45 mA, f = 10 kHz, V_{CC} = 10 V	CMRR	All		-65		dB

Note
1. R_{CC} (kΩ) = 1 V/0.15 I_F (mA), to protect the photodetector against high surge currents.

* Typical values at T_A = 25°C

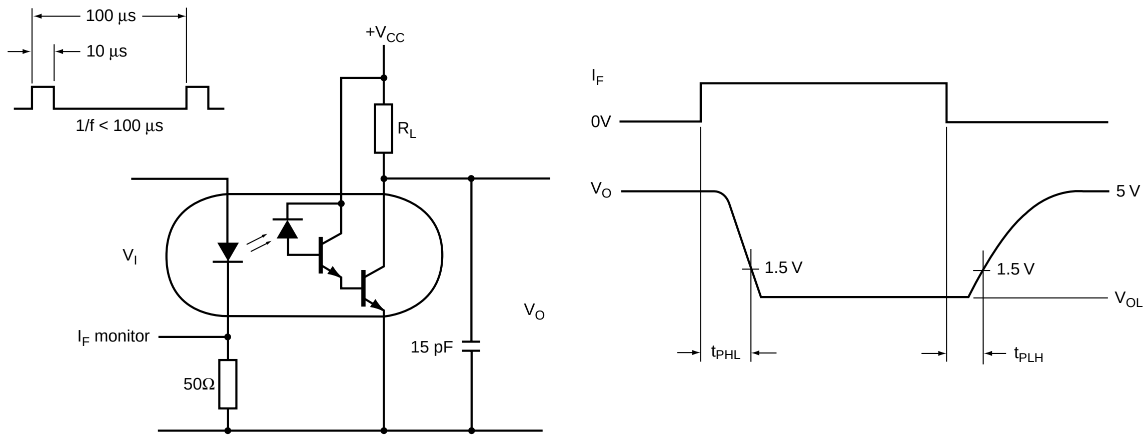


Fig. 1 Switching Times Test Circuit and Waveforms

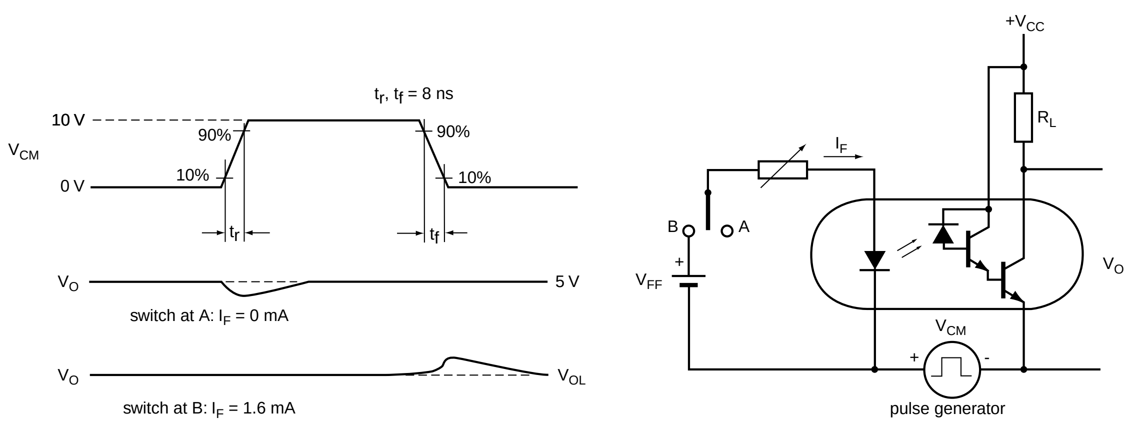


Fig. 2 Transient Immunity Test Circuit and Waveforms

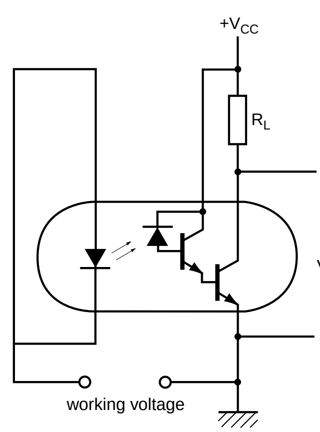


Fig. 3 Logic Output Current Test Circuit

Fig. 4 LED Forward Current vs. Forward Voltage

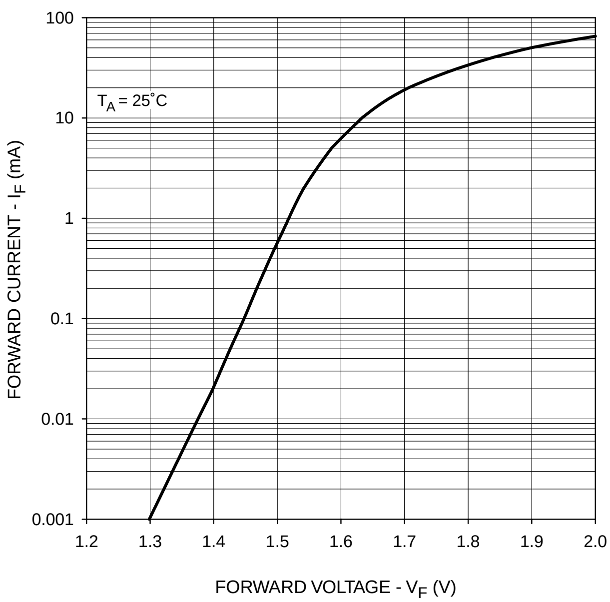


Fig. 5 Normalized Current Transfer Ratio vs. Forward Current

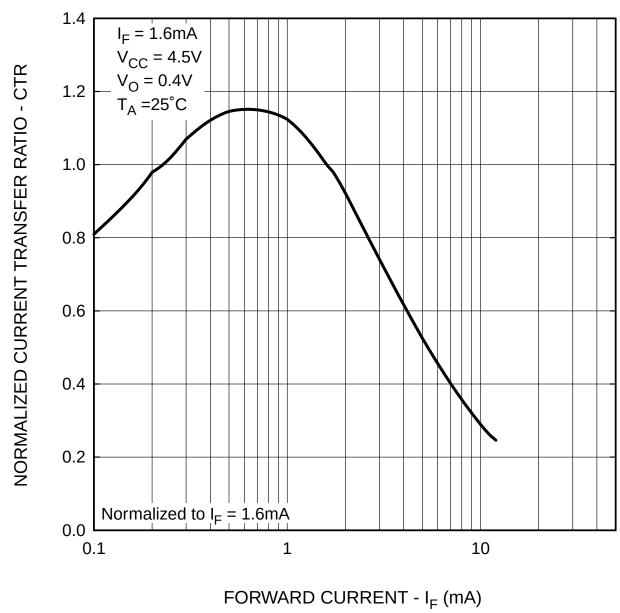


Fig. 6 Normalized Current Transfer Ratio vs. Ambient Temperature

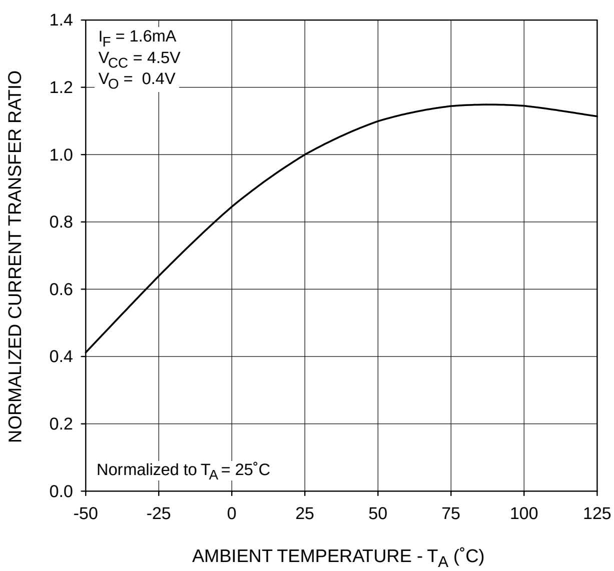


Fig. 7 Logic Low Supply Current vs. Forward Current

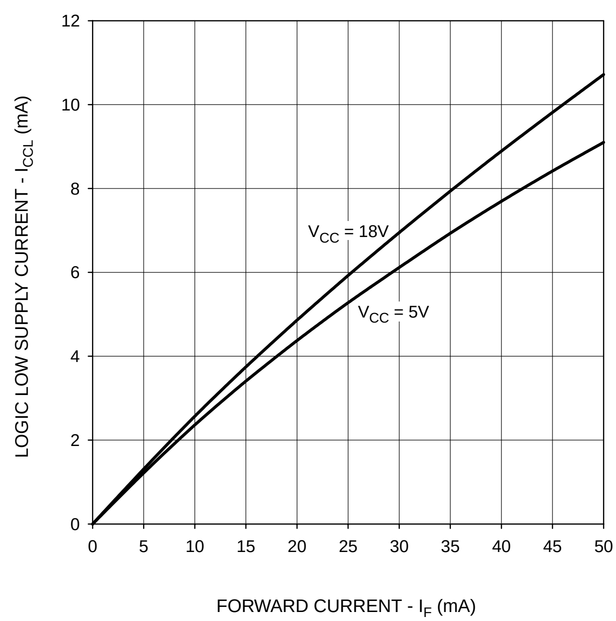


Fig. 8 Logic High Output Current vs. Ambient Temperature

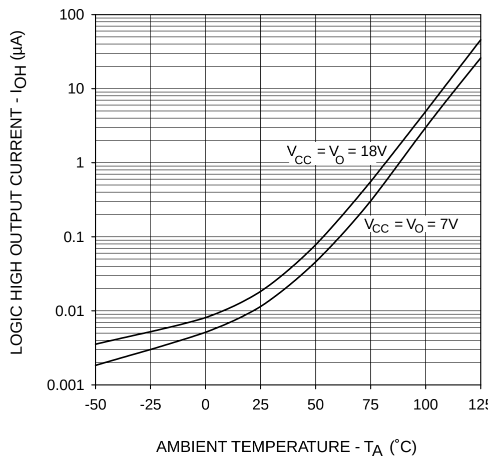


Fig. 9 Output Current vs. Output Voltage

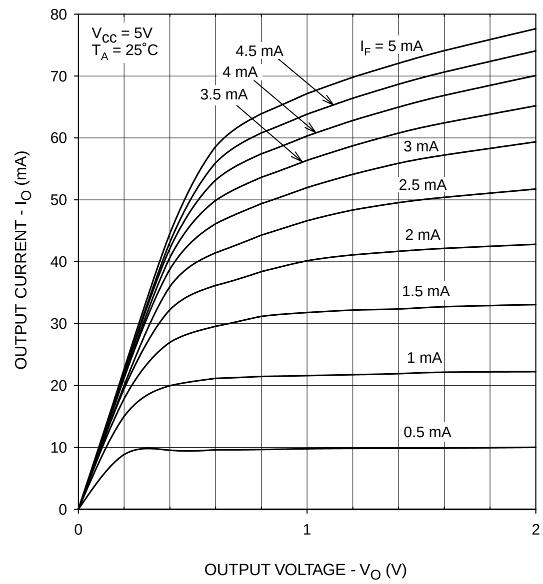


Fig. 10 Propagation Delay vs. Ambient Temperature

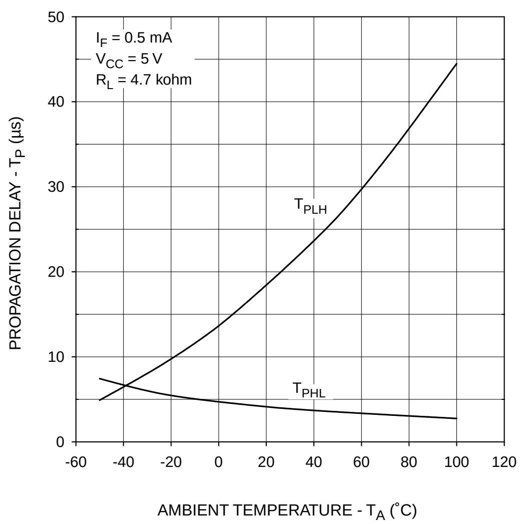


Fig. 11 Propagation Delay vs. Ambient Temperature

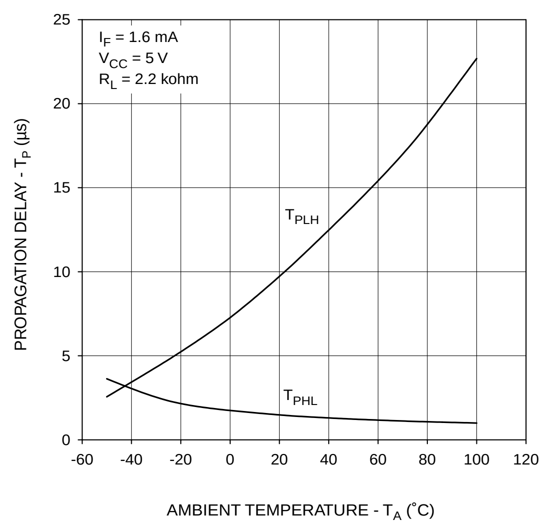
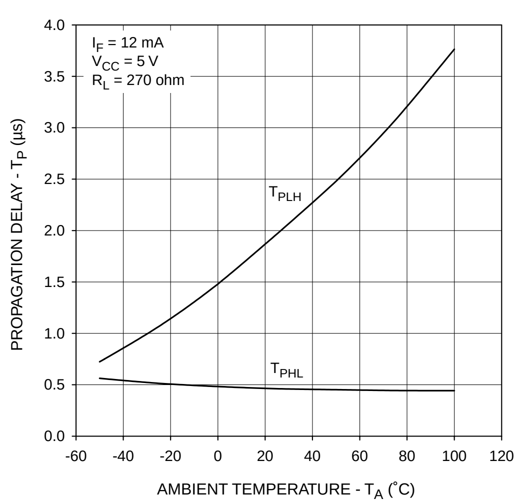
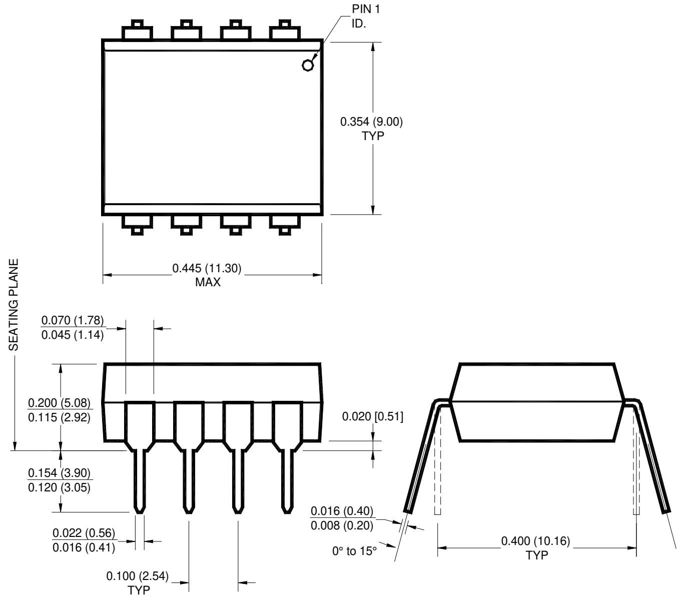


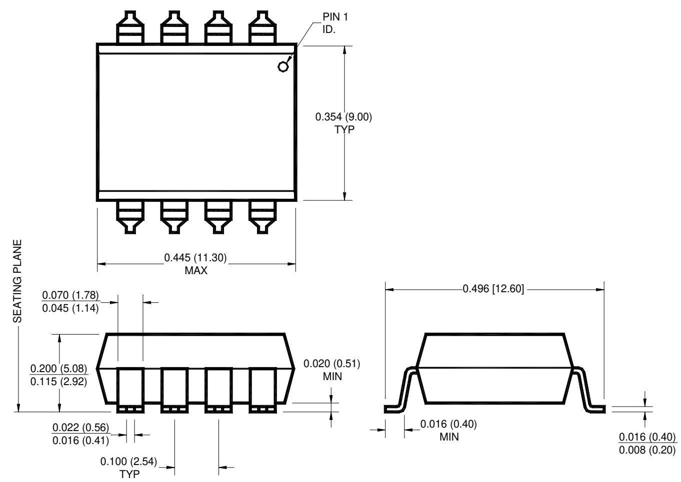
Fig. 12 Propagation Delay vs. Ambient Temperature



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