

**DATA SHEET**

# OLS400: Hermetic Surface-Mount Low-Input Current Optocoupler

**Features**

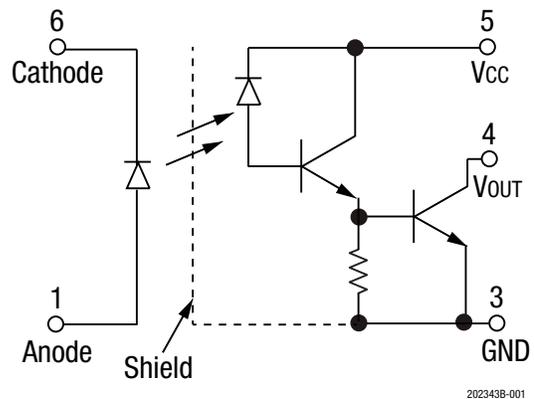
- Electrical parameters guaranteed over  $-55\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$  ambient temperature range
- 1500 V<sub>DC</sub> electrical isolation
- Low input current: 0.5 mA
- Low output V<sub>SAT</sub>: 0.1 V typical
- High current transfer ratio (CTR): 1000% typical
- Low power consumption
- Similar to industry standard parts: 6N138/6N139 in plastic and 6N140 in hermetic dual in line packages (DIPs)
- Offers 100% high reliability screenings

**Description**

The OLS400 has a high CTR at low input currents, making it ideal for applications such as Metal Oxide Semiconductors (MOS), Complementary MOSs (CMOS), and low-power logic interfacing or RS-232C data transmission systems. Each OLS400 has an LED and integrated photodiode Darlington detector I/C, mounted and coupled in a custom hermetic surface-mount Leadless Chip Carrier (LCC) package that provides 1500 V<sub>DC</sub> electrical isolation between the input and output.

The Darlington detector has an integrated base-to-emitter resistor for superior high-temperature performance. The split Darlington design permits lower output saturation voltage and higher switching speed operation than is possible with conventional photo-Darlington designs.

Device mounting is achieved with reflow soldering or conductive epoxies. The pads are gold plated and RoHS compliant.



**Figure 1. OLS400 Block Diagram**

Figure 1 shows the OLS400 functional block diagram. Table 1 provides the OLS400 absolute maximum ratings. Table 2 provides the OLS400 electrical specifications.

Figures 2 through 5 illustrate the OLS400 typical performance characteristics. Figure 6 shows the OLS400 switching test circuit. Figure 7 provides the OLS400 package dimensions.

**Table 1. OLS400 Absolute Maximum Ratings<sup>1</sup>**

Parameter	Symbol	Minimum	Maximum	Units
<b><i>Coupled</i></b>				
Input to output isolation voltage	V <sub>OC</sub>	-1500	+1500	V
Storage temperature	T <sub>STG</sub>	-65	+150	°C
Operating temperature	T <sub>A</sub>	-55	+125	°C
Mounting temperature range (3 minutes maximum)			+240	°C
<b><i>Input Diode</i></b>				
Average input current	I <sub>DD</sub>		20	mA
Peak forward current (≤ 1 ms duration)	I <sub>F</sub>		40	mA
Reverse voltage	V <sub>R</sub>		5	V
Power dissipation	P <sub>O</sub>		36	mW
<b><i>Output Detector</i></b>				
Average output current			+40	mA
Supply voltage	V <sub>CC</sub>	-0.5	+20.0	V
Output voltage	V <sub>OUT</sub>	-0.5	+20.0	V
Power dissipation	P <sub>O</sub>		+50	mW

<sup>1</sup> Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to the device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

<sup>2</sup> Measured between pins 1, 2, and 6 shorted together, and pins 3, 4, and 5 shorted together. T<sub>A</sub> = 25°C and duration = 1 s.

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**CAUTION:** *Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD precautions should be used at all times.*

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**Table 2. OLS400 Electrical Specifications (Note 1)**  
**(T<sub>A</sub> = 25 °C, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Minimum	Typical	Maximum	Units
Current transfer ratio <sup>2</sup>	CTR	I <sub>F</sub> = 0.5 mA, V <sub>O</sub> = 0.4 V, V <sub>CC</sub> = 4.5 V	300			%
		I <sub>F</sub> = 1.6 mA, V <sub>O</sub> = 0.4 V, V <sub>CC</sub> = 4.5 V	300			%
		I <sub>F</sub> = 5.0 mA, V <sub>O</sub> = 0.4 V, V <sub>CC</sub> = 4.5 V	200			%
Logic:						
Low output voltage	V <sub>OL</sub>	I <sub>F</sub> = 0.5 mA, I <sub>OL</sub> = 1.5 mA, V <sub>CC</sub> = 4.5 V		0.1	0.4	V
		I <sub>F</sub> = 5.0 mA, I <sub>OL</sub> = 10.0 mA, V <sub>CC</sub> = 4.5 V		0.2	0.4	V
High output current	I <sub>OH</sub>	I <sub>F</sub> = 0 mA, V <sub>O</sub> = V <sub>CC</sub> = 18.0 V		0.005	250.00	μA
Low supply current	I <sub>CCL</sub>	I <sub>F</sub> = 1.6 mA, V <sub>CC</sub> = 18 V		0.6	2.0	mA
High supply current	I <sub>CCH</sub>	I <sub>F</sub> = 0 mA, V <sub>CC</sub> = 18.0 V		0.01	40.0	μA
Input:						
Input forward voltage	V <sub>F</sub>	I <sub>F</sub> = 1.6 mA		1.65	2.0	V
Reverse breakdown voltage	B <sub>VR</sub>	I <sub>R</sub> = 10 μA	3			V
Output leakage current <sup>3</sup>	I <sub>I-O</sub>	R <sub>H</sub> ≤ 50%, T <sub>A</sub> = 25 °C, V <sub>I-O</sub> = 1500.0 V <sub>DC</sub>			1.0	μA
Propagation delay time:						
Logic high to low	t <sub>PHL</sub>	I <sub>F</sub> = 0.5 mA, R <sub>L</sub> = 4.7 kΩ, V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25 °C		26.0	100.0	μs
		I <sub>F</sub> = 5 mA, R <sub>L</sub> = 680 Ω, V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25 °C		2	10	μs
Logic low to high	t <sub>PLH</sub>	I <sub>F</sub> = 0.5 mA, R <sub>L</sub> = 4.7 kΩ, V <sub>CC</sub> = 5.0 V, T <sub>A</sub> = 25 °C		28	60	μs
		I <sub>F</sub> = 5 mA, R <sub>L</sub> = 680 Ω, V <sub>CC</sub> = 5 V, T <sub>A</sub> = 25 °C		10	30	μs

<sup>1</sup> Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to the device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

<sup>2</sup> CTR is defined as the ratio of the output collector current I<sub>C</sub> to the forward LED current I<sub>F</sub>, multiplied by 100%.

<sup>3</sup> Measured between pins 1, 2, and 6 shorted together, and pins 3, 4, and 5 shorted together. T<sub>A</sub> = 25°C and duration = 1 s.

### Typical Performance Characteristics

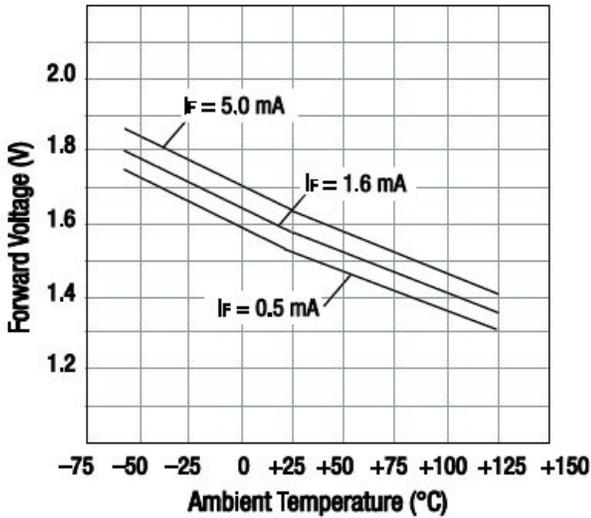


Figure 2. Forward Current vs Temperature

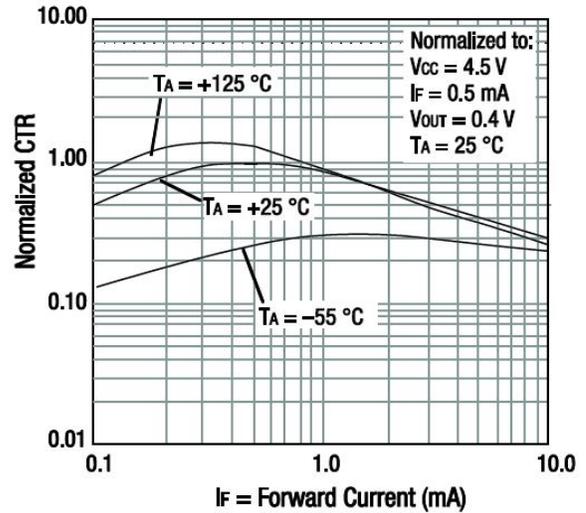


Figure 3. Normalized CTR vs Input Diode Forward Current

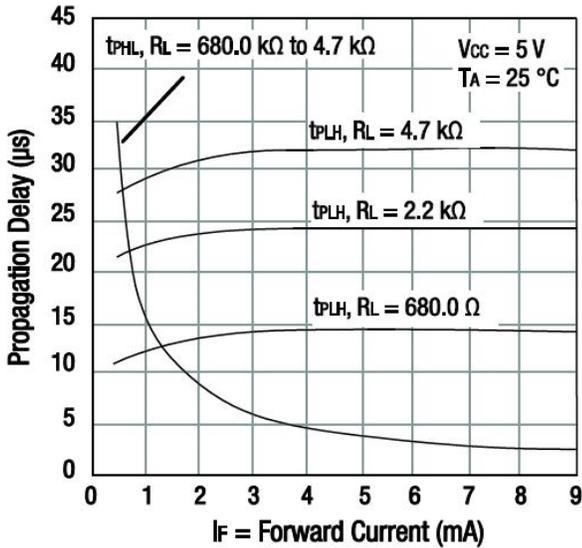


Figure 4. Propagation Delay vs Input Diode Forward Current

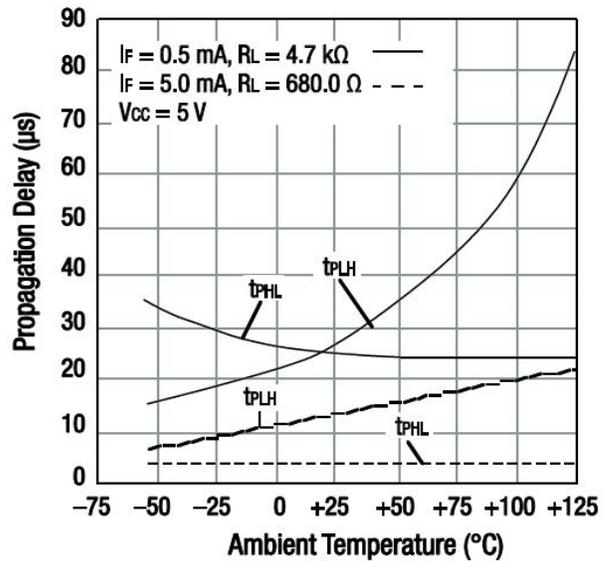


Figure 5. Propagation Delay vs Temperature

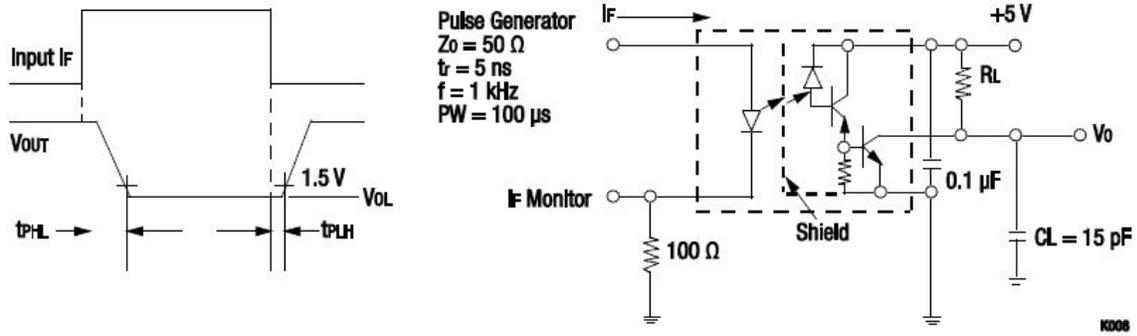
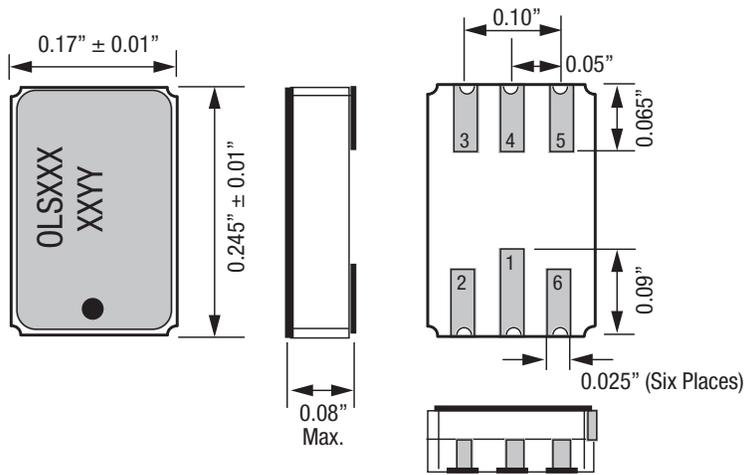


Figure 6. OLS400 Switching Test Circuit



202343B-007

Figure 7. OLS400 Package Dimensions

## Ordering Information

Model Name	Manufacturing Part Number
OLS400: High-Speed Hermetic, Low-Input Current Optocoupler	OLS400

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