

DATA SHEET

# OLS449: Radiation-Tolerant Phototransistor Hermetic Surface-Mount Optocoupler

## Features

- Radiation tolerant version of the 4N49U
- High current transfer ratio (CTR) is guaranteed:
  - Over  $-55\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$  ambient temperature range
  - At LED current of 1mA
- 1000 V<sub>DC</sub> electrical isolation
- Same reliable processing and construction as the OLS249, but with a higher CTR
- High-reliability screenings are available

## Description

The OLS449 is specifically designed for high reliability and space applications that require optical isolation in radiation environments such as gamma, neutron, and proton radiation with a high CTR and low saturation V<sub>CE</sub>. Each optocoupler consists of an LED and N-P-N silicon phototransistor that is electrically isolated, but optically coupled inside a hermetic six-pin Leadless Chip Carrier (LCC) package.

Electrical parameters are similar to the JEDEC registered 4N49 optocoupler, but with a higher CTR and better CTR degradation characteristics due to radiation exposure.

The OLS449 is designed for a low LED operating current while providing excellent radiation tolerance margins. The OLS449 has 100 percent high-reliability screenings available.

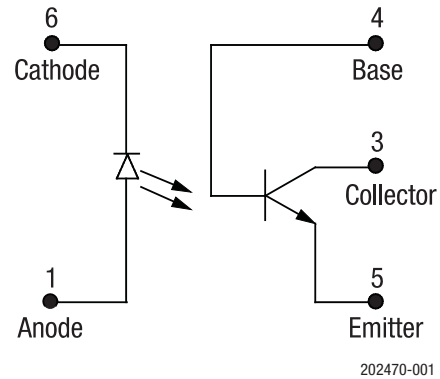


Figure 1. OLS449 Block Diagram

A functional block diagram of the OLS449 is shown in Figure 1. The absolute maximum ratings of the OLS449 are provided in Table 1. Electrical specifications are provided in Table 2.

Typical performance characteristics of the OLS449 are illustrated in Figures 2 through 4. A typical switching test circuit is shown in Figure 5 and package dimensions for the OLS449 are provided in Figure 6.

**Table 1. OLS449 Absolute Maximum Ratings<sup>1</sup>**

Parameter	Symbol	Minimum	Maximum	Units
<b><i>Coupled</i></b>				
Input to output isolation voltage <sup>2</sup>	V <sub>DC</sub>	-1000	+1000	V
Storage temperature range	T <sub>STG</sub>	-65	+150	°C
Operating temperature range	T <sub>A</sub>	-55	+125	°C
Lead temperature range for 10 sec			240	°C
<b><i>Input Diode</i></b>				
Average input current	I <sub>DD</sub>		40	mA
Peak forward current <sup>3</sup>	I <sub>F</sub>		1	A
Reverse voltage	V <sub>R</sub>		2	V
Power dissipation	P <sub>D</sub>		70	mW
<b><i>Output Detector</i></b>				
Collector to emitter voltage	V <sub>CE</sub>		65	V
Emitter to base voltage	V <sub>EB</sub>		7	V
Collector to base voltage	V <sub>CB</sub>		65	V
Continuous collector current	I <sub>CC</sub>		50	mA
Power dissipation <sup>4</sup>	P <sub>D</sub>		300	mW

<sup>1</sup> Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to 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.

<sup>3</sup> Value applies for P<sub>w</sub> ≤ 1 μs, PRR ≤ 300 pps.

<sup>4</sup> Derate linearly at 3 mW/°C above 25 °C.

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**ESD HANDLING:** *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 when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.*

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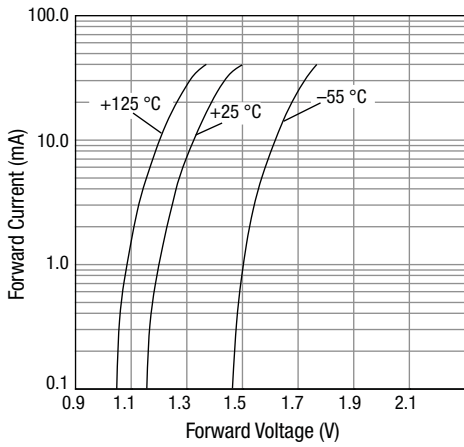
**Table 2. OLS449 Electrical Specifications<sup>1</sup>**  
**(T<sub>A</sub> = 25 °C, Unless Otherwise Noted)**

Parameter	Symbol	Test Condition	Min	Max	Units
On-State:					
Collector current	I <sub>C_ON</sub>	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V	15	40	mA
		I <sub>F</sub> = +1 mA, V <sub>CE</sub> = +5 V, T <sub>A</sub> = -55 °C	+7		mA
		I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V, T <sub>A</sub> = 125 °C	7		mA
Collector to base current	I <sub>CB_ON</sub>	I <sub>F</sub> = 10 mA, V <sub>CB</sub> = 5 V	300		μA
Saturation voltage	V <sub>CE_SAT</sub>	I <sub>F</sub> = 1.0 mA, I <sub>C</sub> = 5.0 mA		0.3	V
Breakdown voltage:					
Collector to emitter	BV <sub>CEO</sub>	I <sub>CE</sub> = 1 mA	65		V
Collector to base	BV <sub>CBO</sub>	I <sub>CB</sub> = 100 μA	65		V
Emitter to base	BV <sub>EBO</sub>	I <sub>EB</sub> = 100 μA	7		V
Off-state leakage current:					
Collector to emitter	I <sub>CE_OFF</sub>	V <sub>CE</sub> = 20 V		100	nA
		V <sub>CE</sub> = 20 V, T <sub>A</sub> = 125 °C		100	μA
Collector to base	I <sub>CB_OFF</sub>	V <sub>CB</sub> = 20 V		10	nA
Input:					
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = +10.0 mA, T <sub>A</sub> = -55 °C	+1.3	+1.9	V
		I <sub>F</sub> = 10.0 mA	1.2	1.7	V
		I <sub>F</sub> = 10.0 mA, T <sub>A</sub> = 125 °C	1.1	1.6	V
Reverse current	I <sub>R</sub>	V <sub>R</sub> = 2 V		100	μA
Output resistance <sup>2</sup>	R <sub>L_0</sub>	V <sub>L_0</sub> = ±1000 V <sub>DC</sub>	10 <sup>11</sup>		Ω
Output capacitance <sup>2</sup>	C <sub>L_0</sub>	V <sub>L_0</sub> = 0 V, f = 1 MHz		5	pF
Time:					
Rise	t <sub>r</sub>	V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω		25	μs
Fall	t <sub>f</sub>	I <sub>F</sub> = 5 mA		25	μs

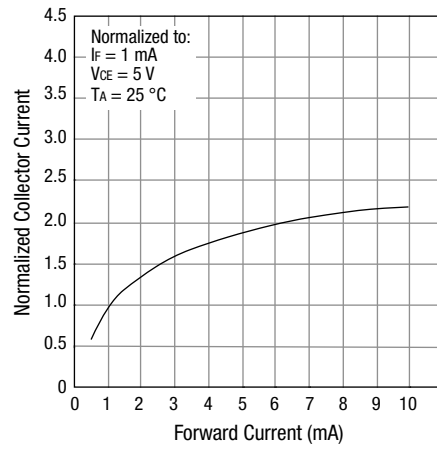
<sup>1</sup> Performance is guaranteed only under the conditions listed in the above table.

<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.

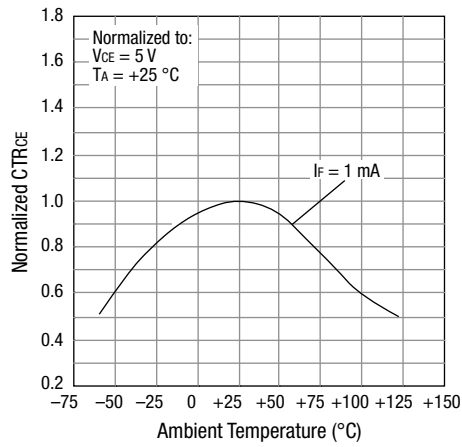
**Typical Performance Characteristics**  
 (T<sub>A</sub> = -55 °C to +125 °C, Unless Otherwise Noted)



**Figure 2. Forward Current vs Forward Voltage**



**Figure 3. Normalized Collector Current vs Forward Current**



**Figure 4. Normalized CTR<sub>CE</sub> vs Temperature**

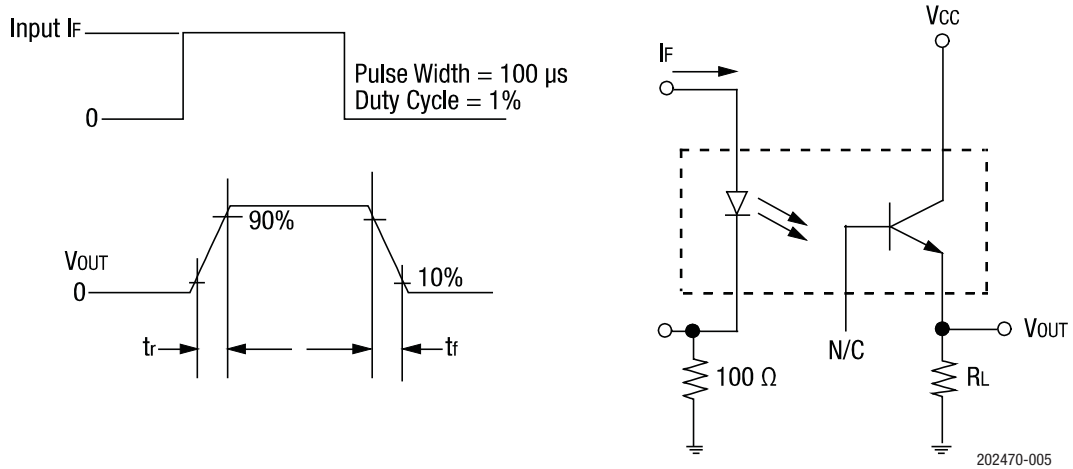


Figure 5. OLS449 Switching Test Circuit

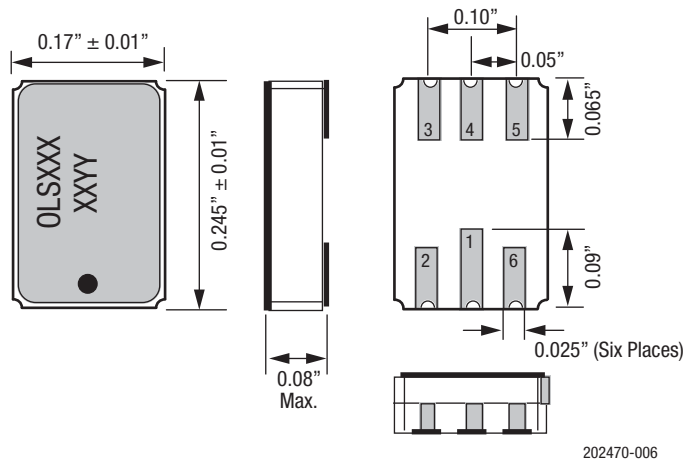


Figure 6. OLS449 Package Dimensions

## Ordering Information

Model Name	Manufacturing Part Number
OLS449: Radiation-Tolerant, Phototransistor Hermetic Surface-Mount Optocoupler	OLS449

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