

**DATA SHEET**

# OLC049: Radiation-Tolerant, Phototransistor Surface-Mount Optocoupler

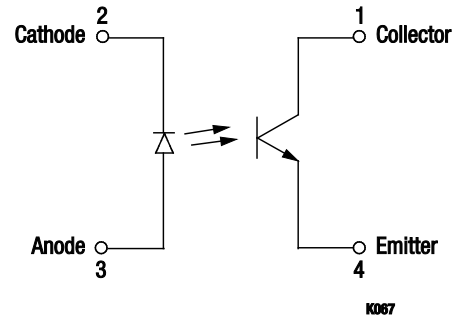
## Features

- Miniature non-hermetic surface-mount package
- Radiation tolerant
- High CTR guaranteed over  $-55\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$  ambient temperature range
- 1000 V<sub>DC</sub> electrical isolation

## Description

The OLC049 can be used for large satellite constellation applications that require optical isolation in radiation environments such as gamma, neutron, and proton radiation with a high Current Transfer Ratio (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 non-hermetic, four-pin Leadless Chip Carrier (LCC) package.

The hermetic surface-mount variant of the OLC049 optocoupler is available as the OLS049, both in a non-screened catalog version as well as a high-reliability screened version.



**Figure 1. OLC049 Block Diagram**

A functional block diagram of the OLC049 is shown in Figure 1. The absolute maximum ratings of the OLC049 are provided in Table 1. Electrical specifications are provided in Table 2.

Typical performance characteristics of the OLC049 are illustrated in Figures 2 through 4. A typical switching test circuit is shown in Figure 5 and package dimensions for the OLC049 are provided in Figure 6.

**Table 1. OLC049 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
Soldering temperature (heated collet, 5 seconds)			260	°C
Soldering temperature (vapor phase reflow, 30 seconds)			215	°C
<b><i>Input Diode</i></b>				
Average input current	I <sub>DD</sub>		40	mA
Peak forward current (≤1 ms duration)	I <sub>F</sub>		1	A
Reverse voltage	V <sub>R</sub>		2	V
Power dissipation <sup>3</sup>	P <sub>D</sub>		60	mW
<b><i>Output Detector</i></b>				
Collector to emitter voltage	V <sub>CE</sub>		60	V
Emitter to collector voltage	V <sub>EC</sub>		5	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 and 4 shorted together, and pins 2 and 3 shorted together. T<sub>A</sub> = 25 °C and duration = 1 s.

<sup>3</sup> Derate linearly at 1 mW/°C above 65 °C.

<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. OLC049 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 I <sub>F</sub> = 2.0 mA, V <sub>CE</sub> = +5.0 V, T <sub>A</sub> = -55 °C I <sub>F</sub> = 2 mA, V <sub>CE</sub> = 5 V, T <sub>A</sub> = 100 °C	2 +2.8 2	12	mA
Saturation voltage	V <sub>CE_SAT</sub>	I <sub>F</sub> = 2.0 mA, I <sub>C</sub> = 2.0 mA		0.3	V
Breakdown voltage: Collector to emitter Emitter to collector	BV <sub>CEO</sub> BV <sub>ECO</sub>	I <sub>CE</sub> = 1 mA I <sub>EC</sub> = 100 μA	60 5		V
Leakage current, collector to emitter	I <sub>CE_OFF</sub>	V <sub>CE</sub> = 20 V V <sub>CE</sub> = 20 V, T <sub>A</sub> = 100 °C		100 100	nA μA
Input: Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 10.0 mA, T <sub>A</sub> = -55 °C I <sub>F</sub> = 10.0 mA I <sub>F</sub> = 10.0 mA, T <sub>A</sub> = 100 °C	+1.4 1.2 1.1	+2.0 1.8 1.7	V V 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 Fall	t <sub>r</sub> t <sub>f</sub>	V <sub>CC</sub> = 10 V, R <sub>L</sub> = 100 Ω I <sub>F</sub> = 10 mA		25 25	μs μs

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

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

## Typical Performance Characteristics

( $T_A = -55\text{ }^\circ\text{C}$  to  $+125\text{ }^\circ\text{C}$ , Unless Otherwise Noted)

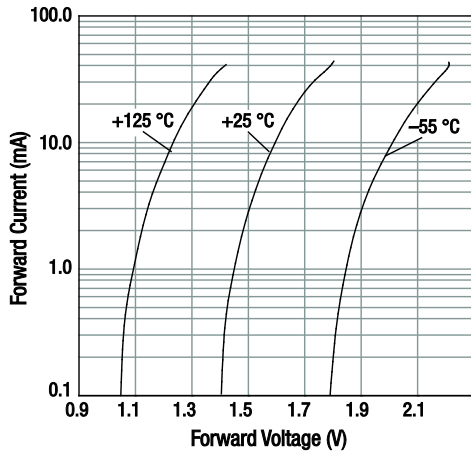


Figure 2. Forward Current vs Forward Voltage

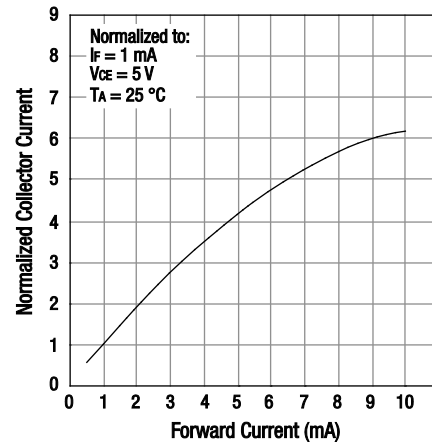


Figure 3. Normalized Collector Current vs Forward Current

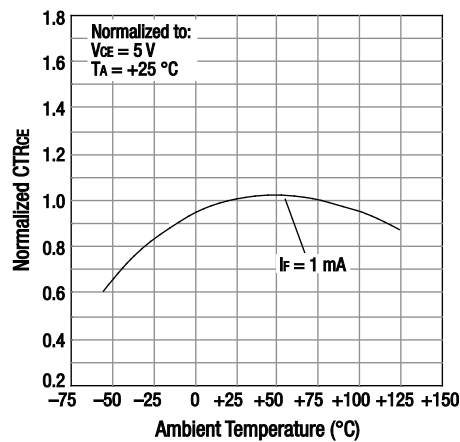


Figure 4. Normalized  $CTR_{ce}$  vs Temperature

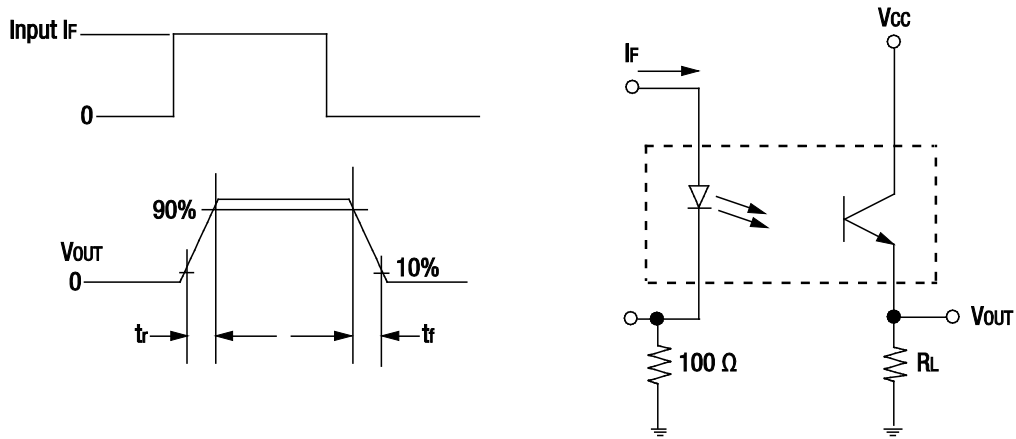
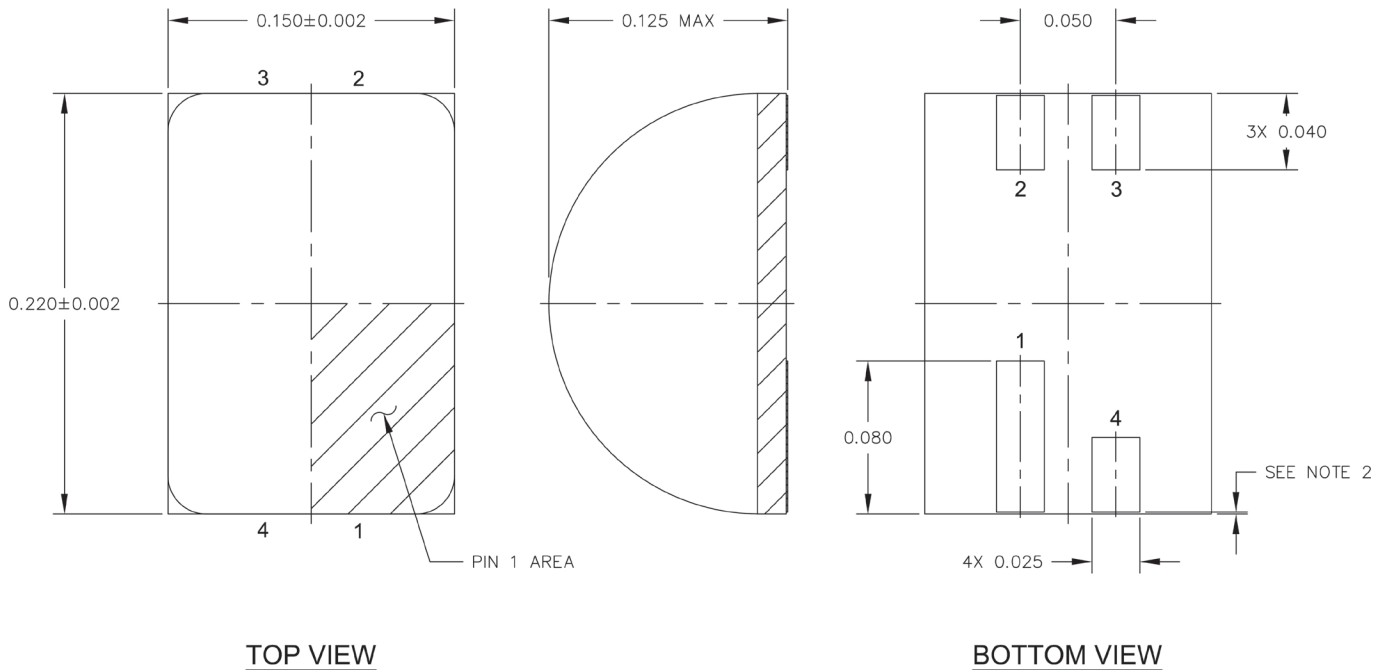


Figure 5. OLC049 Switching Test Circuit



NOTES:

1. ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE NOTED.
2. METALIZATION PULL BACK FROM SUBSTRATE EDGE: 0.002 MAXIMUM.
3. UNLESS SPECIFIED DIMENSIONS ARE SYMMETRICAL ABOUT CENTER LINES.

Figure 6. OLC049 Package Dimensions

## Ordering Information

Model Name	Manufacturing Part Number
OLC049: Radiation-Tolerant, Phototransistor Non-hermetic Surface-Mount Optocoupler	OLC049

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