DATA SHEET

# OLC449: Radiation-Tolerant Phototransistor Non-Hermetic Surface-Mount Optocoupler

## Features

- Radiation tolerant version of the 4N49U
- High current transfer ratio (CTR) is guaranteed:
  - Over –55 °C to +125 °C ambient temperature range
  - At LED current of 1mA
- 1000 $V_{DC}$ electrical isolation
- Same processing and construction as the OLC249, but with a higher CTR

## Description

The OLC449 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 CTR and low saturation VCE. Each optocoupler consists of an LED and N-P-N silicon phototransistor that is electrically isolated, but optically coupled inside a non-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 hermetic surface mount variant of the OLC449 optocoupler is available as the OLS449, both in a non-screened catalog version as well as a high-reliability screened version.

The OLC449 is designed for a low LED operating current while providing excellent radiation tolerance margins.

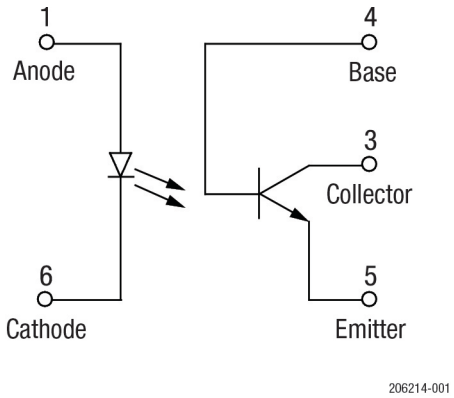


**Figure 1. OLC449 Block Diagram**

A functional block diagram of the OLC449 is shown in Figure 1. The absolute maximum ratings of the OLC449 are provided in Table 1. Electrical specifications are provided in Table 2.

Typical performance characteristics of the OLC449 are illustrated in Figures 2 through 4. A typical switching test circuit is shown in Figure 5 and package dimensions for the OLC449 are provided in Figure 6.

**Table 1. OLC449 Absolute Maximum Ratings[1]**

| Parameter | Symbol | Minimum | Maximum | Units |
|---|---|---|---|---|
| ***Coupled*** | | | | |
| Input to output isolation voltage[2] | $V_{DC}$ | –1000 | +1000 | V |
| Storage temperature range | $T_{STG}$ | –65 | +150 | °C |
| Operating temperature range | $T_A$ | –55 | +125 | °C |
| Lead temperature range for 10 sec | | | 240 | °C |
| ***Input Diode*** | | | | |
| Average input current | $I_{DD}$ | | 40 | mA |
| Peak forward current[3] | $I_F$ | | 1 | A |
| Reverse voltage | $V_R$ | | 2 | V |
| Power dissipation | $P_D$ | | 70 | mW |
| ***Output Detector*** | | | | |
| Collector to emitter voltage | $V_{CE}$ | | 65 | V |
| Emitter to base voltage | $V_{EB}$ | | 7 | V |
| Collector to base voltage | $V_{CB}$ | | 65 | V |
| Continuous collector current | $I_{CC}$ | | 50 | mA |
| Power dissipation[4] | $P_D$ | | 300 | mW |

1 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.

2 Measured between pins 1, 2, and 6 shorted together, and pins 3, 4, and 5 shorted together. $T_A$ = 25 °C and duration = 1 s.

3 Value applies for Pw ≤ 1 μs, PRR ≤ 300 pps.

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

***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.*

**Table 2. OLC449 Electrical Specifications[1]**
**($T_A$ = 25 °C, Unless Otherwise Noted)**

| Parameter | Symbol | Test Condition | Min | Max | Units |
|---|---|---|---|---|---|
| On-State: | | | | | |
| Collector current | $I_{C\_ON}$ | $I_F$ = 1 mA, $V_{CE}$ = 5 V | 15 | 40 | mA |
| | | $I_F$ = +1 mA, $V_{CE}$ = +5 V, $T_A$ = –55 °C | +7 | | mA |
| | | $I_F$ = 1 mA, $V_{CE}$ = 5 V, $T_A$ = 125 °C | 7 | | mA |
| Collector to base current | $I_{CB\_ON}$ | $I_F$ = 10 mA, $V_{CB}$ = 5 V | 300 | | µA |
| Saturation voltage | $V_{CE\_SAT}$ | $I_F$ = 1.0 mA, $I_C$ = 5.0 mA | | 0.3 | V |
| Breakdown voltage: | | | | | |
| Collector to emitter | $BV_{CEO}$ | $I_{CE}$ = 1 mA | 65 | | V |
| Collector to base | $BV_{CBO}$ | $I_{CB}$ = 100 µA | 65 | | V |
| Emitter to base | $BV_{EBO}$ | $I_{EB}$ = 100 µA | 7 | | V |
| Off-state leakage current: | | | | | |
| Collector to emitter | $I_{CE\_OFF}$ | $V_{CE}$ = 20 V | | 100 | nA |
| | | $V_{CE}$ = 20 V, $T_A$ = 125 °C | | 100 | µA |
| Collector to base | $I_{CB\_OFF}$ | $V_{CB}$ = 20 V | | 10 | nA |
| Input: | | | | | |
| Forward voltage | $V_F$ | $I_F$ = +10.0 mA, $T_A$ = –55 °C | +1.3 | +1.9 | V |
| | | $I_F$ = 10.0 mA | 1.2 | 1.7 | V |
| | | $I_F$ = 10.0 mA, $T_A$ = 125 °C | 1.1 | 1.6 | V |
| Reverse current | $I_R$ | $V_R$ = 2 V | | 100 | µA |
| Output resistance[2] | $R_{I\_O}$ | $V_{I\_O}$ = ±1000 $V_{DC}$ | $10^{11}$ | | Ω |
| Output capacitance[2] | $C_{I\_O}$ | $V_{I\_O}$ = 0 V, f = 1 MHz | | 5 | pF |
| Time: | | | | | |
| Rise | $t_r$ | $V_{CC}$ = 10 V, $R_L$ = 100 Ω | | 25 | µs |
| Fall | $t_f$ | $I_F$ = 5 mA | | 25 | µs |

1 Performance is guaranteed only under the conditions listed in the above table.

2 Measured between pins 1, 2, and 6 shorted together, and pins 3, 4, and 5 shorted together. $T_A$ = 25 °C and duration = 1 s.

## Typical Performance Characteristics

**($T_A$ = –55 °C to +125 °C, Unless Otherwise Noted)**

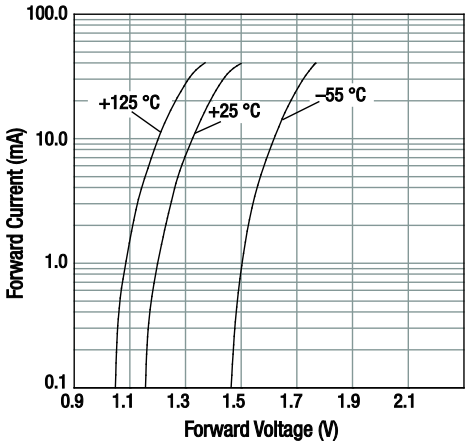


**Figure 2. Forward Current vs Forward Voltage**

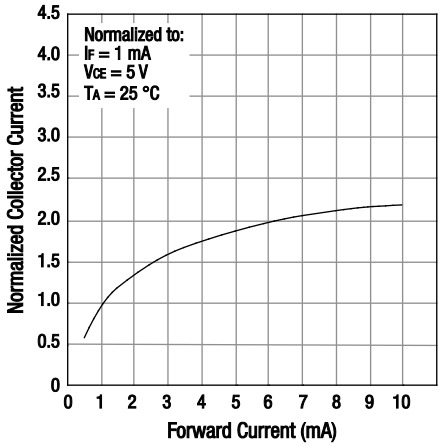


**Figure 3. Normalized Collector Current vs Forward Current**

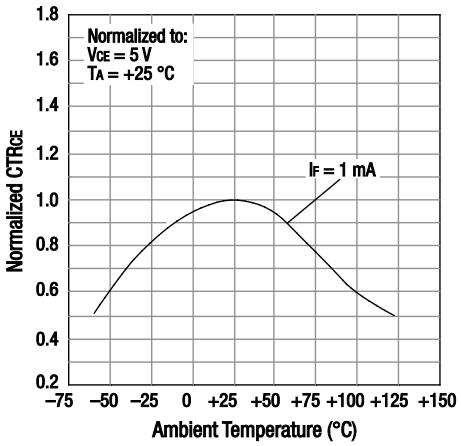


**Figure 4. Normalized $CTR_{CE}$ vs Temperature**

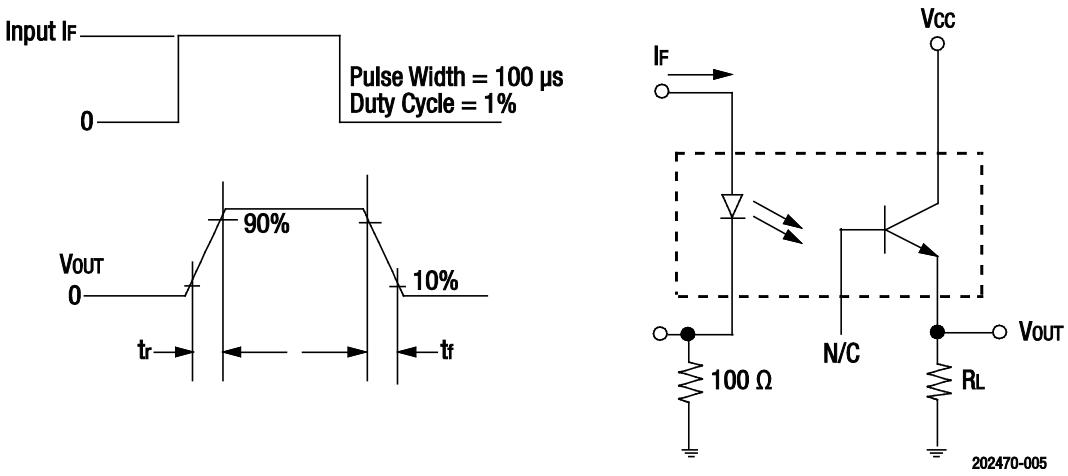


**Figure 5. OLC449 Switching Test Circuit**

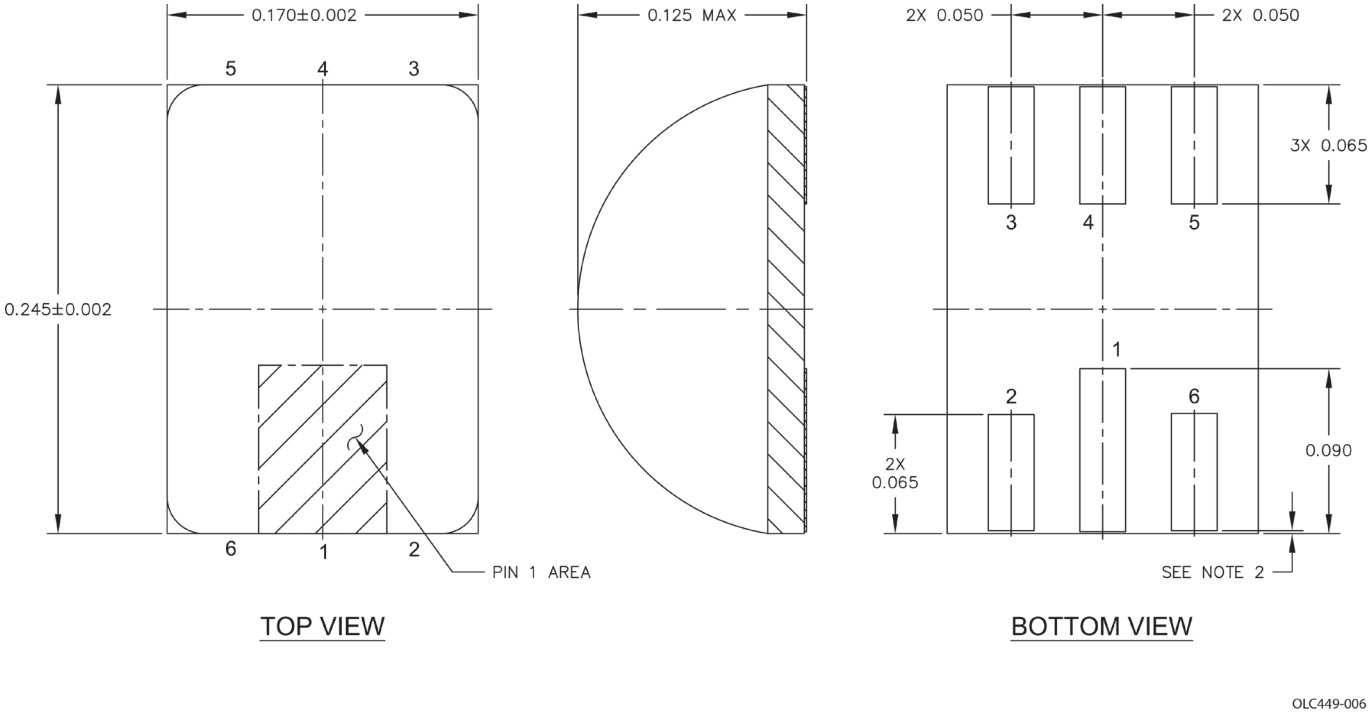


**Figure 6. OLC449 Package Dimensions**

## Ordering Information

| Model Name | Manufacturing Part Number |
|---|---|
| OLC449: Radiation-Tolerant, Phototransistor Surface-Mount Optocoupler | OLC449 |