DATA SHEET

OLS449: Radiation-tolerant Phototransistor, Hermetic Surface-mount Optocoupler

Applications

- High reliability optical isolation for aerospace and industrial circuits

Features

- Radiation tolerant version of 4N49U
- High current transfer ratio (CTR) is guaranteed
  - Over –55 to +125 °C ambient temperature range
  - At LED current of 1 mA
- 1500 V_{DC} electrical isolation
- Same reliable processing and construction as the OLS249, but with a higher CTR
- High-reliability screenings available
- For RoHS and other product compliance information, see the Skyworks Certificate of Conformance.

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_{CE}. Each optocoupler consists of an LED and NPN 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.

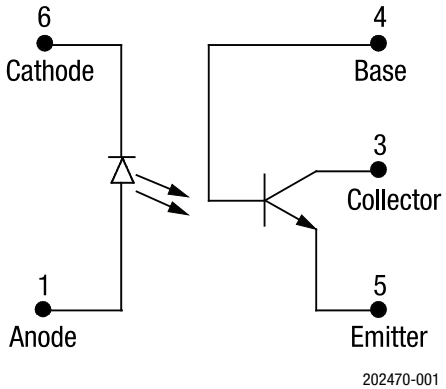

Figure 1. Functional Block Diagram

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.

A typical switching test circuit is shown in Figure 2. Typical performance characteristics are illustrated in Figures 3 through 5, package dimensions are provided in Figure 6.

Electrical and Mechanical Specifications

Table 1. Absolute Maximum Ratings[1]

Parameter	Symbol	Min	Max	Units
Coupled				
Input to output isolation voltage[2]	V_{DC}	–1500	+1500	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 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.
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. De-rate linearly at 3 mW/°C above 25 °C.

ESD Handling: Industry-standard ESD handling precautions must be adhered to at all times to avoid damage to this device.

Table 2. 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		
		I_F = 1 mA, V_{CE} = 5 V, T_A = 125 °C	7		
On-State: 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
Breakdown voltage, collector to base	BV_{CBO}	I_{CB} = 100 µA	65		V
Breakdown voltage, 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
Off-state leakage current, 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
Input reverse current	I_R	V_R = 2 V		100	µA
Input output resistance[2]	R_{I_O}	V_{I_O} = ±1500 V_{DC}	10^{11}		Ω
Input 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 I_F = 5 mA		25	µs
Time: fall	t_f			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.

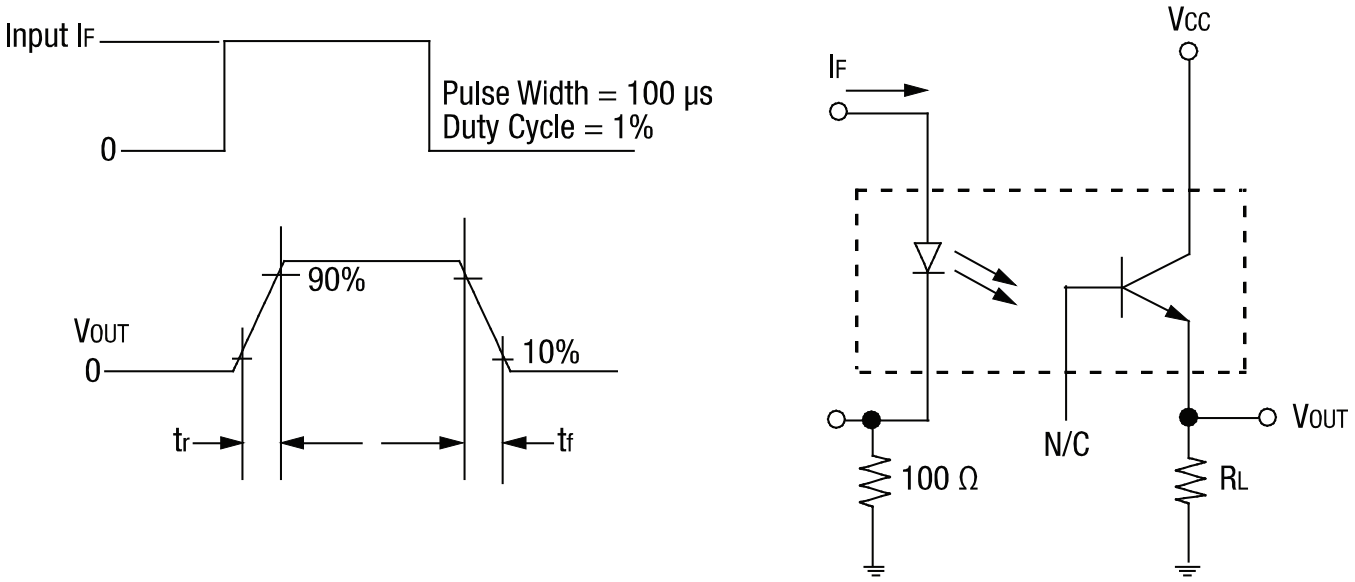

Figure 2. Switching Test Circuit

Typical Performance Characteristics (T_A = –55 °C to 125 °C, Unless Otherwise Noted)

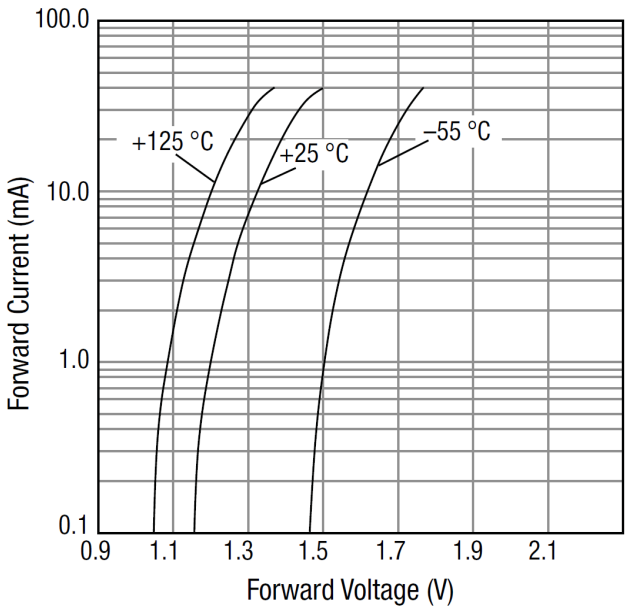

Figure 3. Forward Current vs Forward Voltage

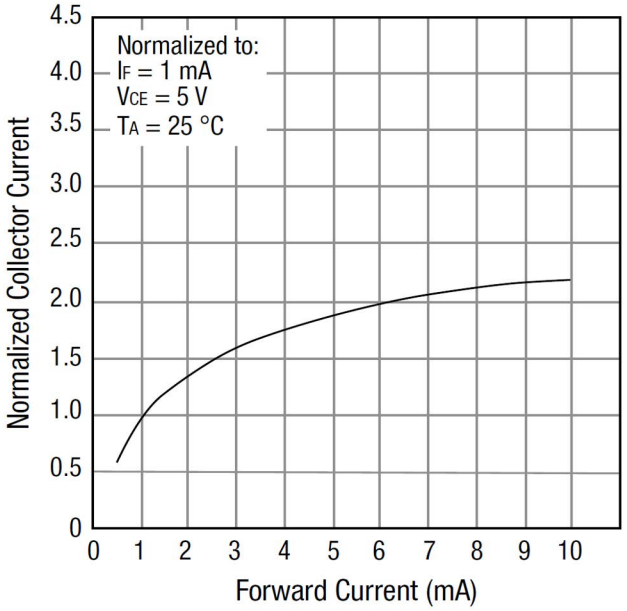

Figure 4. Normalized Collector Current vs Forward Current

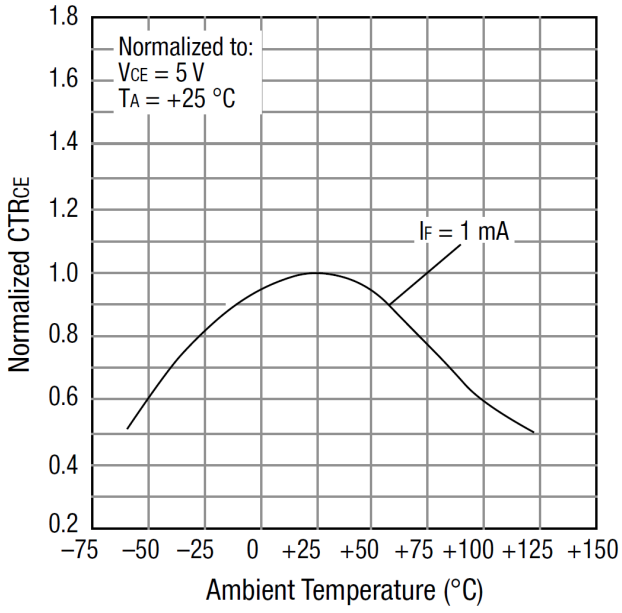

Figure 5. Normalized CTR_{CE} vs Temperature

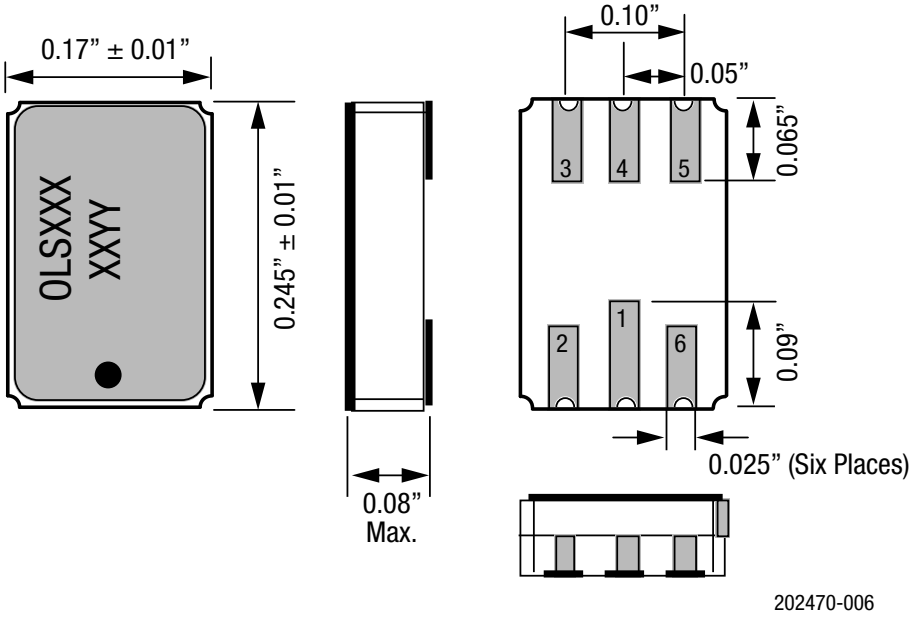

Figure 6. Package Dimensions

Ordering Information

Part Number	Description
OLS449	Radiation-tolerant Phototransistor, Hermetic Surface-mount Optocoupler