



SKYWORKS®

## DATA SHEET

# OLS249, OLF249, OLH249, OLI249, OLC249: Radiation-tolerant, Transistor Output Optocoupler with Base Connection

## Applications

- Aerospace
- Defense
- Industrial

## Features

- High voltage electrical isolation
- High CTR
- CMOS to LSTTL or TTL compatibility
- Various packages available to fit application
  - Small footprint, hermetic packages (LCC, FP, TO-5)
  - Cost-effective package (Glob Top SMT)
  - Hybrid assembly package (Glob Top)
- Radiation tolerant version of 4N49U
- High-reliability screening available
  - MIL-STD-883 Class B equivalent
  - MIL-PRF-19500 JAN, JANTX, JANTXV, JANS equivalent
  - MIL-PRF-38534 Class H, K equivalent
  - Per customer requirements
- For RoHS and other product compliance information, see the [Skyworks Certificate of Conformance](#).

## Description

The OLx249 is designed for applications that require optical isolation with a high CTR and low saturation VCE. Each optocoupler consists of an LED and NPN silicon phototransistor that is electrically isolated, but optically coupled inside a hermetic (LCC, FP, TO-5) or non-hermetic (Glob Top) package.

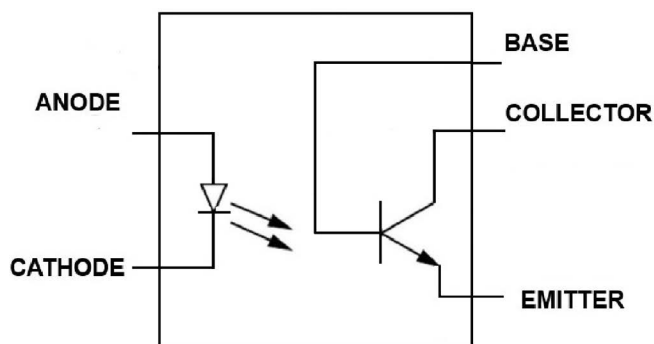
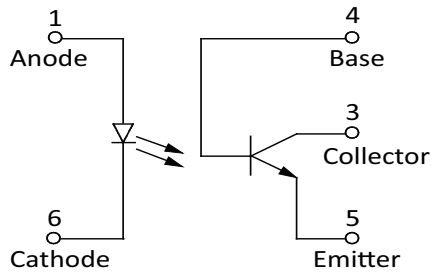


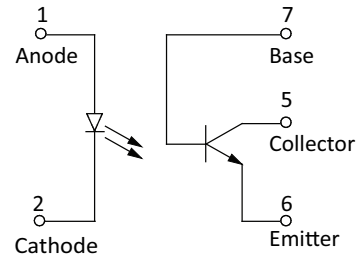
Figure 1. Block Diagram

Electrical parameters are comparable to the JEDEC registered 4N49 optocoupler, but with a higher CTR and better CTR degradation characteristics due to radiation exposure. The low input current makes the OLx249 well-suited for direct Complementary Metal Oxide Semiconductor (CMOS) to Low Power Schottky Transistor-Transistor Logic (LSTTL)/Transistor-to-Transistor Logic (TTL) interfaces.

OLx249 devices are offered as unscreened versions as well as screened to customer requirements, including MIL-STD-883 Class B equivalent, MIL-PRF-19500 JAN, JANTX, JANTXV, JANS equivalent and MIL-PRF-38534 Class H, K equivalent.

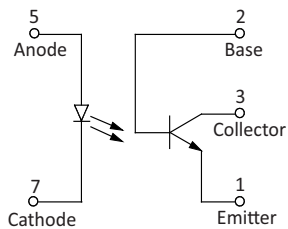
**Hermetic 6-Lead LCC (OLS249YYY-N)**

Pin 2: N/C

**Hermetic 8-Lead Flatpack (OLF249YYY-N)**

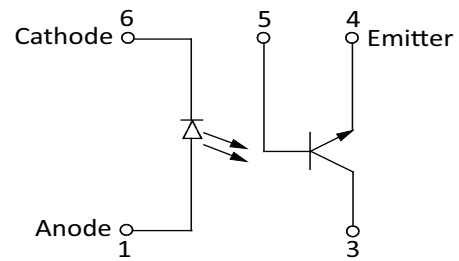
Pins 3, 8: N/C

Pin 4: Electrically connected to seal ring

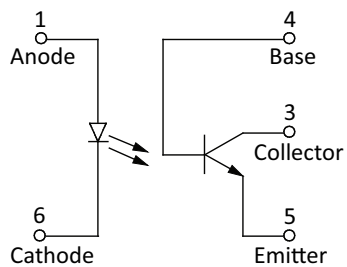
**Hermetic 6-Lead TO-5 (OLH249YYY-N)**

Pin 6: N/C

Pin 3: Connected to case.

**Non-Hermetic 6-Lead Glob Top (OLI249YYY-N)**

Pin 2: N/C

**Non-Hermetic 6-Lead Glob Top SMT (OLC249YYY-N)**

Pin 2: N/C

**Figure 2. Pinouts**

## Electrical and Mechanical Specifications

Table 1. OLx249 Absolute Maximum Ratings<sup>1</sup>(T<sub>A</sub> = 25 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Max	Units
Input					
Average forward current	I <sub>DD</sub>			40	mA
Average forward current derating	ΔI <sub>F</sub> /ΔT <sub>A</sub>	T <sub>A</sub> ≥ 65 °C		0.67	mA/°C
Peak forward current	I <sub>F</sub>	OLF249/OLH249/OLS249, pulsewidth ≤ 1 uS, PRR ≤ 300 pps		1	A
		OLC249/OLI249, pulsewidth ≤ 1 mS		0.06	
Reverse voltage	V <sub>R</sub>			2	V
Input power dissipation	P <sub>D</sub>			70	mW
Output					
Collector to emitter voltage	V <sub>CEO</sub>			65	V
Emitter to base voltage	V <sub>EBO</sub>			7	V
Collector to base voltage	V <sub>CBO</sub>			65	V
Continuous collector current	I <sub>CC</sub>			50	mA
Output power dissipation	P <sub>D</sub>	OLH249/OLF249/OLS249		300	mW
		OLC249/OLI249		200	
Output power dissipation derating	ΔP <sub>O</sub> /ΔT <sub>A</sub>	T <sub>A</sub> ≥ 25 °C, OLH249/OLF249/OLS249		3.0	mW/°C
		T <sub>A</sub> ≥ 25 °C, OLC249/OLI249		2.0	
Coupler					
Input to output isolation voltage <sup>2</sup>	V <sub>DC</sub>	T <sub>A</sub> = 25 °C, duration = 1 s, OLI249/OLS249	−1500	1500	V
		T <sub>A</sub> = 25 °C, duration = 1 s, OLC249/ OLF249/OLH249	−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	T <sub>SLD</sub>	< 10 seconds		240	°C
Electrostatic Discharge					
MIL-STD-883, Method 3015 Human Body Model (HBM)	ESD	Class 1C rating		2000	V

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. OLS249/OLC249: Measured between pins 1, 2, and 6 shorted together, and pins 3, 4, and 5 shorted together.  
OLF249: Measured between pins 1, 2, 3, and 4 shorted together, and pins 5, 6, 7, and 8 shorted together.  
OLH249: Measured between pins 5, 6, and 7 shorted together, and pins 1, 2, and 3 shorted together.  
OLI249: Measured between pins 1 and 6 shorted together, and pins 2, 3, 4, and 5 shorted together.

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

Table 2. OLx249 Electrical Specifications<sup>1</sup>(T<sub>A</sub> = 25 °C, unless otherwise noted)

Parameter	Symbol	Conditions	Min	Typ	Max	Units
Input						
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 10.0 mA, 25 °C	1.2		1.8	V
		I <sub>F</sub> = 10.0 mA, 125 °C	1.1		1.7	
		I <sub>F</sub> = 10.0 mA, −55 °C	1.4		2.0	
Reverse current	I <sub>R</sub>	V <sub>R</sub> = 2 V			100	μA
Output						
Collector emitter breakdown voltage	BV <sub>CEO</sub>	I <sub>CE</sub> = 1 mA	65			V
Collector base breakdown voltage	BV <sub>CBO</sub>	I <sub>CB</sub> = 100 μA	65			V
Emitter base breakdown voltage	BV <sub>EBO</sub>	I <sub>EB</sub> = 100 μA	7			V
Collector emitter dark current	I <sub>CE_OFF</sub>	I <sub>F</sub> = 0 mA, V <sub>CE</sub> = 20 V, 25 °C			100	nA
		I <sub>F</sub> = 0 mA, V <sub>CE</sub> = 20 V, 100 °C		10		μA
		I <sub>F</sub> = 0 mA, V <sub>CE</sub> = 20 V, 125 °C			100	μA
Collector base dark current	I <sub>CB_OFF</sub>	I <sub>F</sub> = 0 mA, V <sub>CB</sub> = 20 V			10	nA
Output capacitance	C <sub>I-O</sub>	V <sub>I-O</sub> = 0 V, f = 1 MHz			5	pF
Coupler						
Current transfer ratio (I <sub>C</sub> /I <sub>F</sub> )	CTR	I <sub>F</sub> = 1 mA, V <sub>CE</sub> = 5 V, 25 °C	200		1200	%
		I <sub>F</sub> = 2 mA, V <sub>CE</sub> = 5 V, 125 °C	200			
		I <sub>F</sub> = 2 mA, V <sub>CE</sub> = 5 V, −55 °C	280			
Collector base current	I <sub>CB_ON</sub>	I <sub>F</sub> = 10 mA, V <sub>CB</sub> = 5 V	30			μA
Collector emitter saturation voltage	V <sub>CE_SAT</sub>	I <sub>F</sub> = 2 mA, I <sub>C</sub> = 2 mA			0.3	V
Output resistance <sup>2</sup>	R <sub>I-O</sub>	OLI249/OLS249, V <sub>I-O</sub> = ±1500 VDC		10 <sup>11</sup>		Ω
		OLC249/OLF249/OLH249, V <sub>I-O</sub> = ±1000 VDC				
Switching Characteristics						
Rise time	t <sub>r</sub>	V <sub>CC</sub> = 10 V, I <sub>F</sub> = 5 mA, R <sub>L</sub> = 100 Ω			25	μS
Fall time	t <sub>f</sub>				25	μS

1. Performance is guaranteed only under the conditions listed in the above table. Catalog OLx249 is 100% tested at 25 °C only.

2. OLS249/OLC249: Measured between pins 1, 2, and 6 shorted together, and pins 3, 4, and 5 shorted together.

OLF249: Measured between pins 1, 2, 3, and 4 shorted together, and pins 5, 6, 7, and 8 shorted together.

OLH249: Measured between pins 5, 6, and 7 shorted together, and pins 1, 2, and 3 shorted together.

OLI249: Measured between pins 1 and 6 shorted together, and pins 2, 3, 4, and 5 shorted together.

T<sub>A</sub> = 25 °C and duration = 1 s.

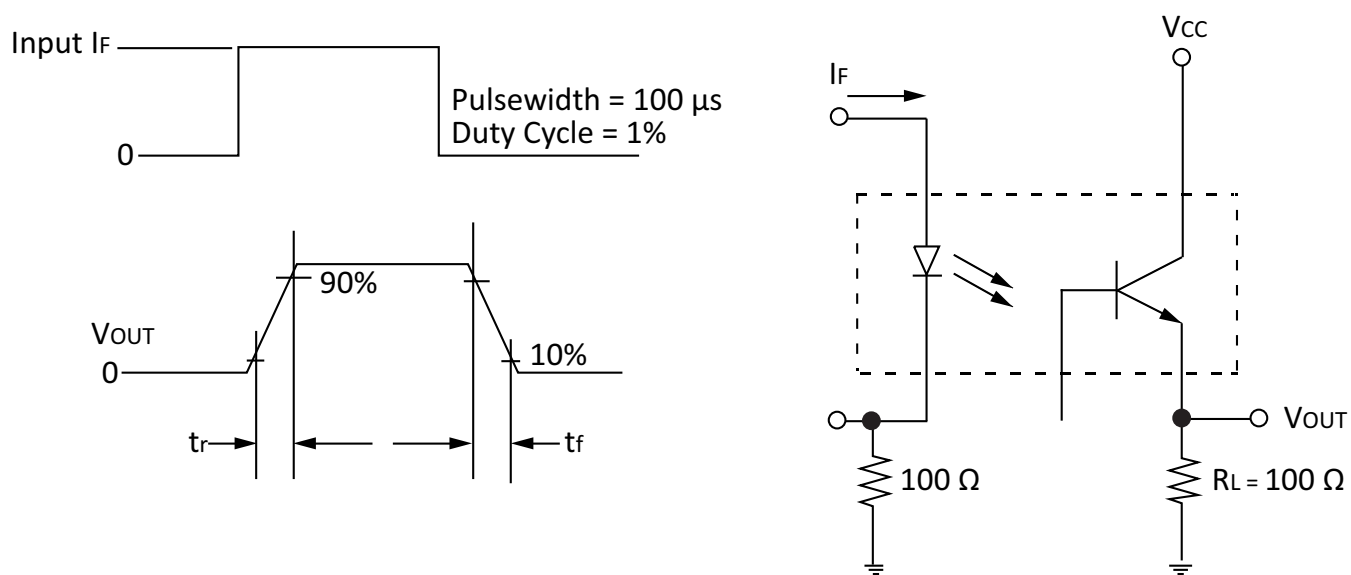


Figure 3. Switching Test Circuit

Typical Performance Characteristics (T<sub>A</sub> = 25 °C, Unless Otherwise Indicated)

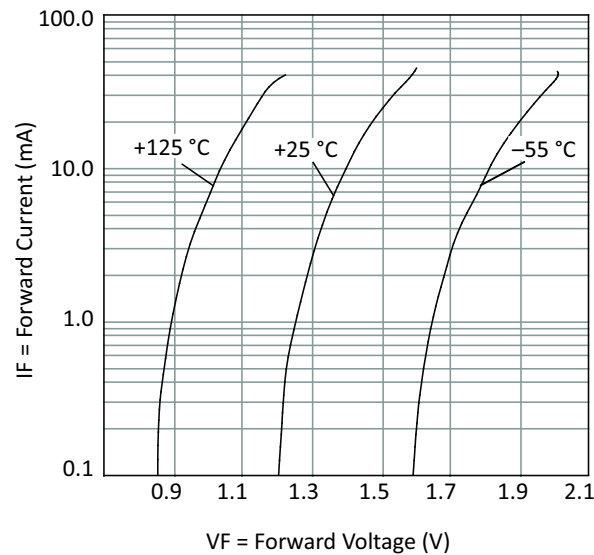


Figure 4. Forward Current vs Diode Forward Voltage

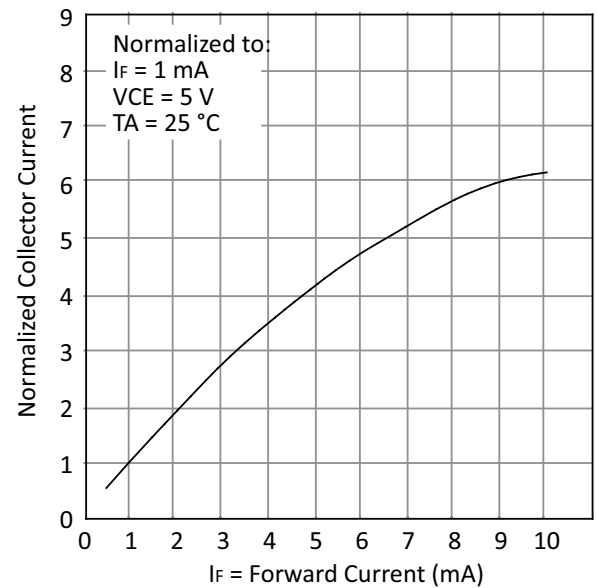


Figure 5. Normalized Collector Current vs Forward Current

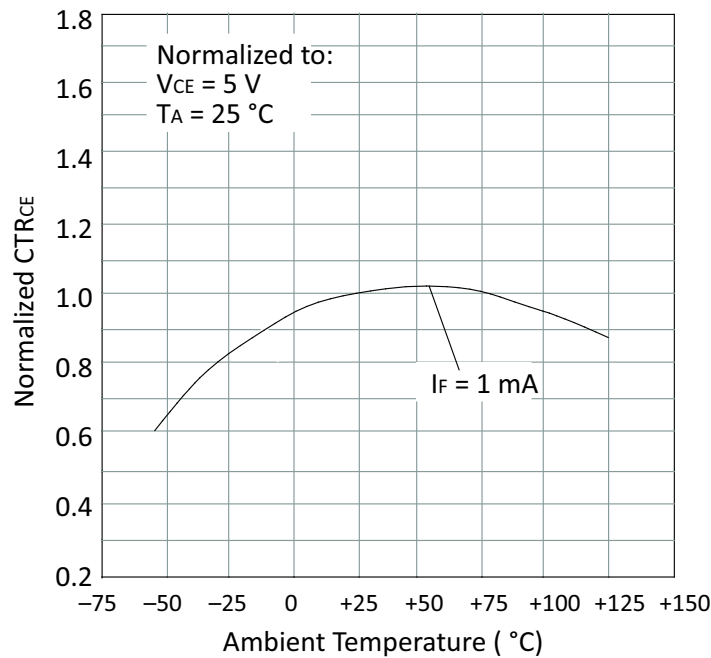


Figure 6. Normalized CTR vs Temperature

## Package and Handling Information

Instructions on the shipping container label regarding exposure to moisture after the container seal is broken must be followed. Otherwise, problems related to moisture absorption may occur when the part is subjected to high temperature during solder assembly.

The OLC249 is rated to Moisture Sensitivity Level 3 (MSL3) at 260 °C (Not applicable for hermetic and OLI249.) For additional information, refer to the Skyworks Application Note, Solder Reflow Information, document number 200164.

Care must be taken when attaching this product, whether it is done manually or in a production solder reflow environment.

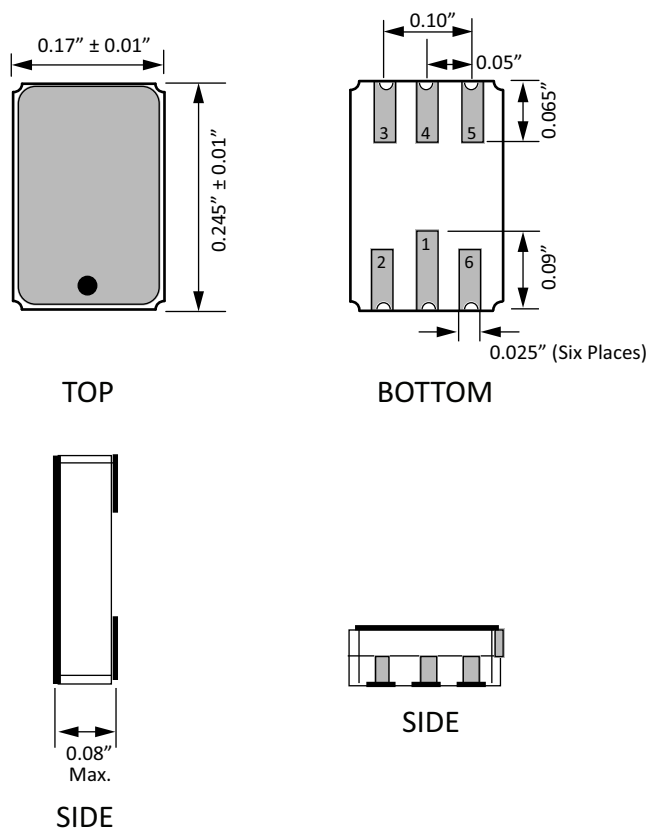


Figure 7. Package Dimensions, 6-Lead LCC

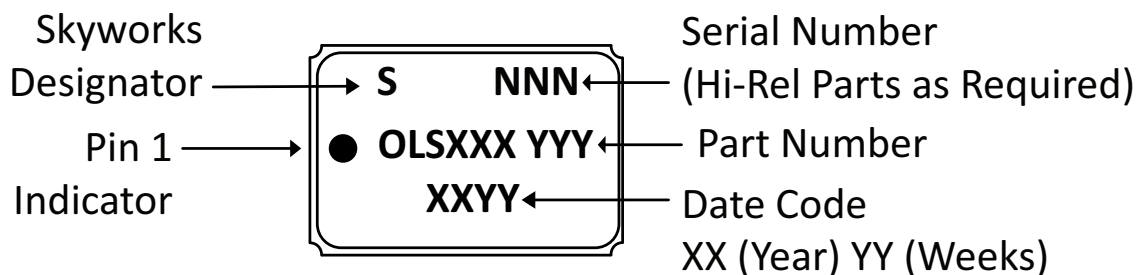


Figure 8. Part Marking, 6-Lead LCC

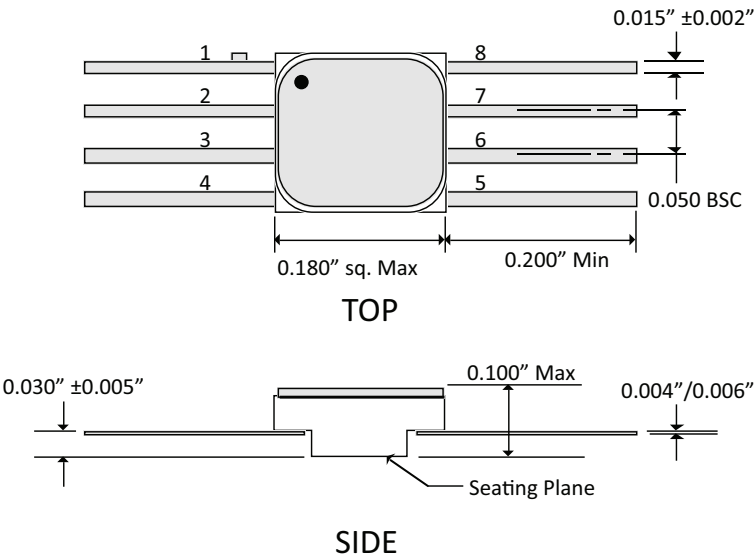


Figure 9. Package Dimensions, 8-Lead Flatpack

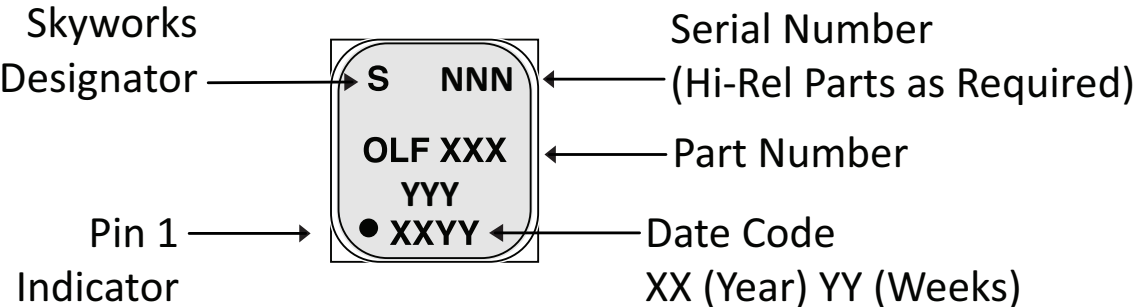
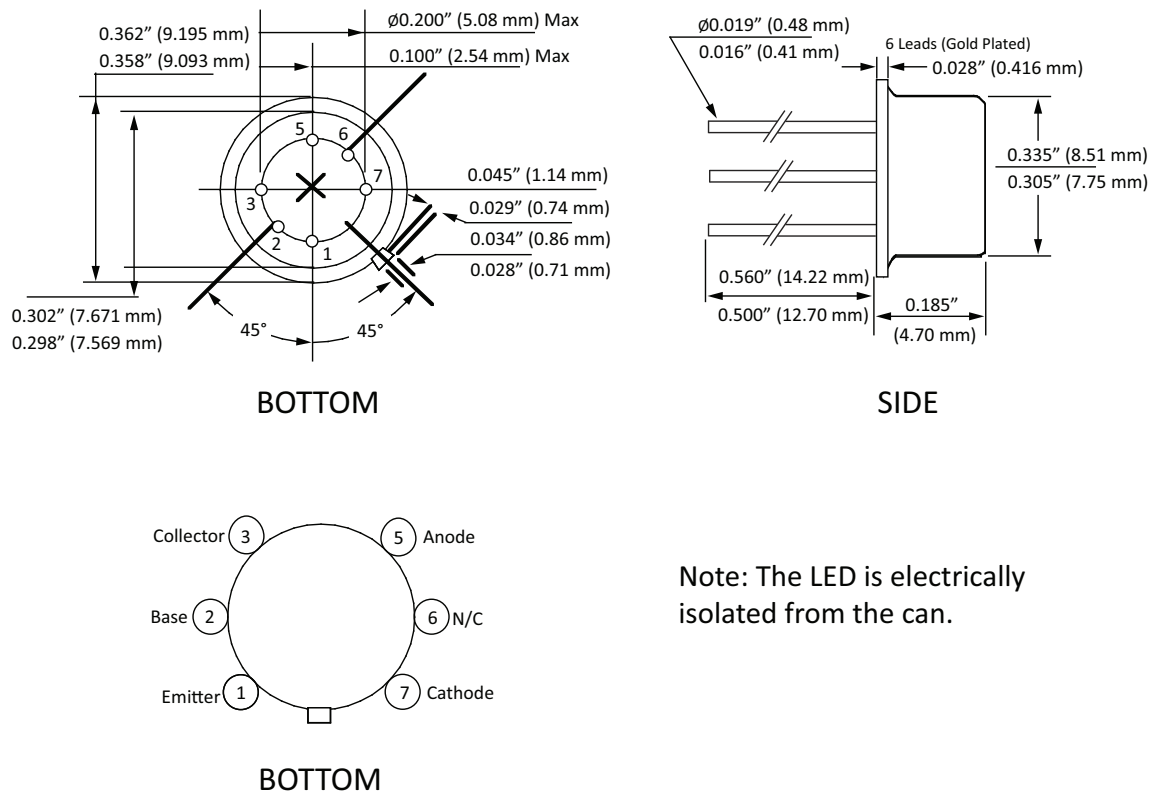


Figure 10. Part Marking, 8-Lead Flatpack



Note: The LED is electrically isolated from the can.

Figure 11. Package Dimensions, 6-Lead TO-5

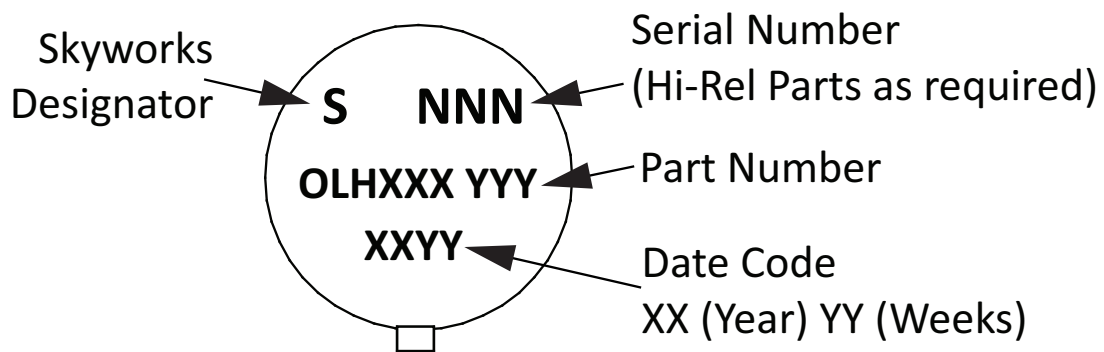


Figure 12. Part Marking, 6-Lead TO-5

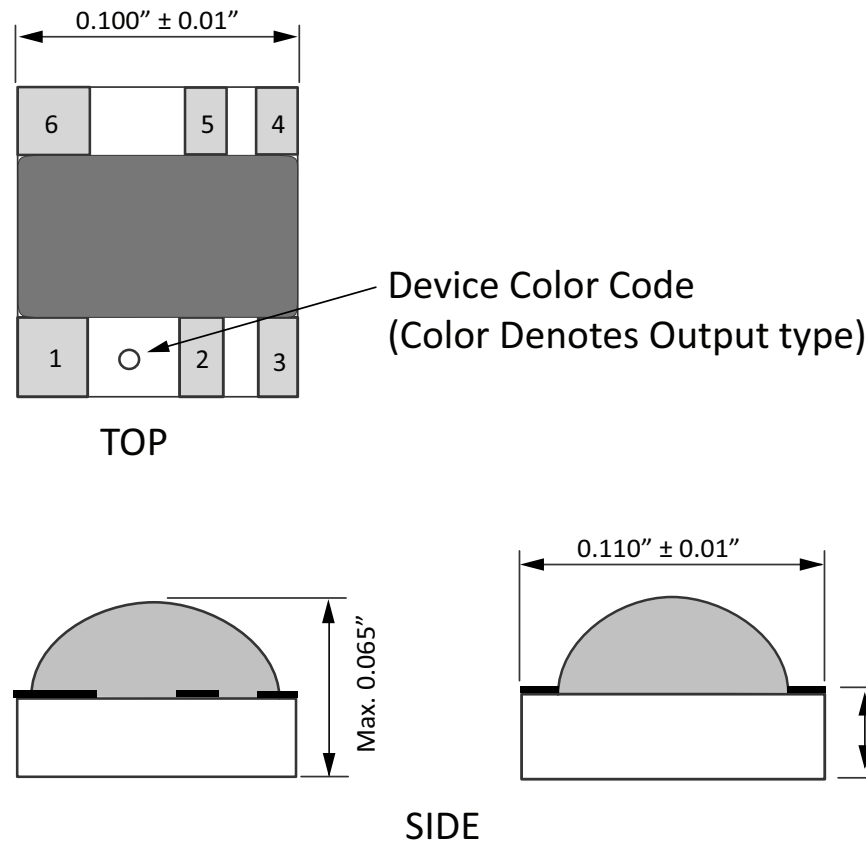


Figure 13. Package Dimensions and Marking, 6-Lead Glob Top for Hybrid Assembly

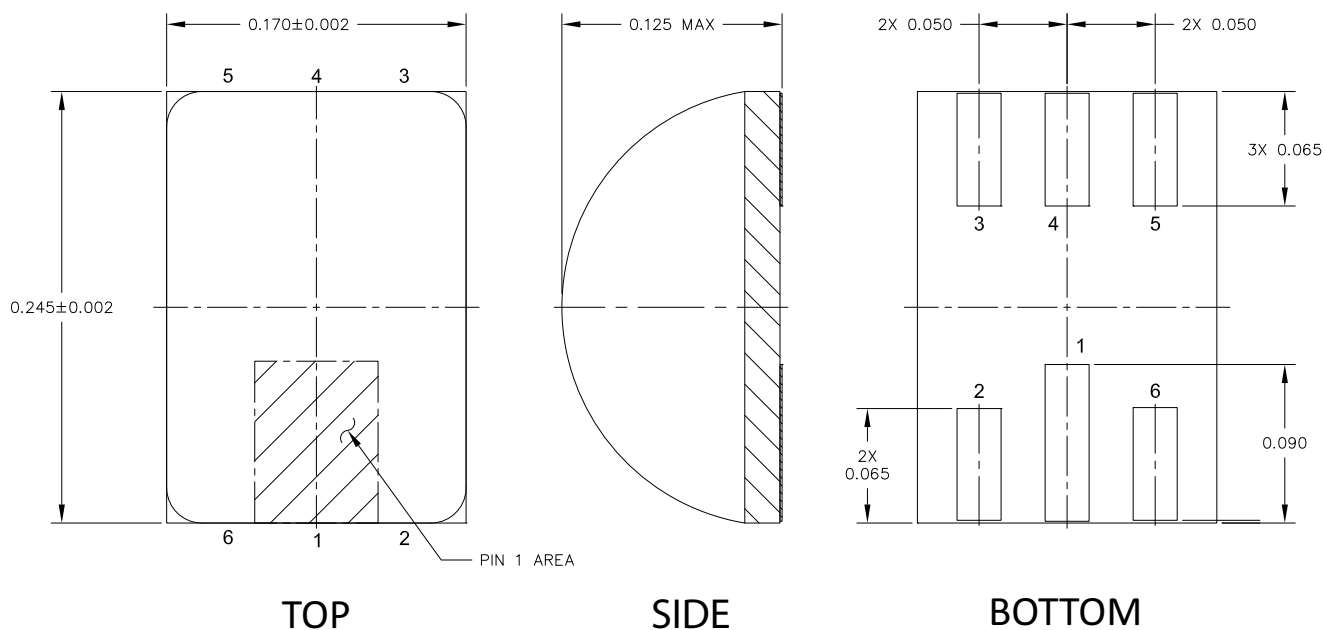


Figure 14. Package Dimensions, 6-Lead Glob Top SMT

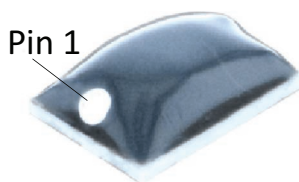


Figure 15. Part Marking, 6-Lead Glob Top SMT

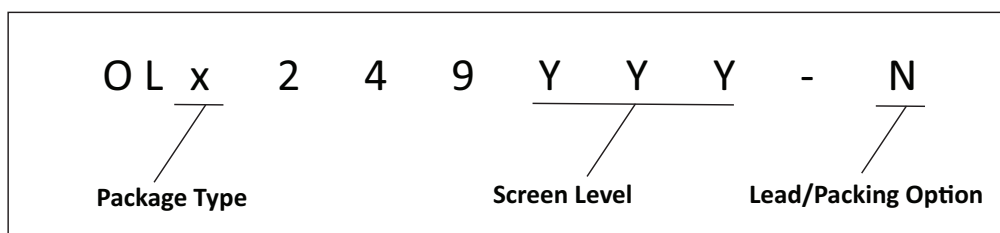
Table 3. Additional Package Information

Lead Style	6-lead LCC (OLS249YYY-N)	8-lead Flatpack (OLF249YYY-N)	6-lead TO-5 (OLH249YYY-N)	6-lead Glob Top (OLI249YYY-N)	6-lead Glob Top SMT (OLC249YYY-N)
	Surface mount	Surface mount	Through hole	Hybrid assembly	Surface mount
Lead finish/plating	Min 60 $\mu\text{in}$ Au over min 80 $\mu\text{in}$ Ni	Min 60 $\mu\text{in}$ Au over min 80 $\mu\text{in}$ Ni	Min 50 $\mu\text{in}$ Au over min 50 $\mu\text{in}$ Ni	Min 2 $\mu\text{in}$ Au over min 2 $\mu\text{in}$ Pd and min 100 $\mu\text{in}$ Ni	Min 2 $\mu\text{in}$ Au over min 2 $\mu\text{in}$ Pd and min 100 $\mu\text{in}$ Ni
Lead thickness	N/A	5 mils	16 mils	N/A	N/A
Hermetic	Yes	Yes	Yes	No	No
CAGE code OJGG3					

Table 4. Related Parts

Part Number	Package	Description	Comments
OLS049	4-lead LCC	Radiation tolerant phototransistor, hermetic surface mount optocoupler	High CTR guaranteed over –55 °C to 125 °C, 1000 VDC isolation voltage
OLC049	4-lead Glob Top	Radiation tolerant phototransistor, surface mount optocoupler	High CTR guaranteed over –55 °C to 125 °C, 1000 VDC isolation voltage
OLS449	6-lead LCC	Radiation tolerant phototransistor, hermetic surface mount optocoupler with base connection	Higher CTR than OLS249, 1500 VDC isolation voltage

## Ordering Information



	Hermetic 6-Lead LCC	Hermetic 8-Lead Flatpack	Hermetic 6-Lead TO-5	Non-Hermetic 6-Lead Glob Top for Hybrid Assembly	Non-Hermetic 6-Lead Glob Top SMT
<b>Screen Level</b>					
Catalog	OLS249	OLF249	OLH249	OLI249	OLC249
MIL-STD-883 Class B equivalent	OLS249SB	OLF249SB	OLH249SB	N/A	N/A
JANTX equivalent	OLS249SX	OLF249SX	OLH249SX	N/A	N/A
JANTXV equivalent	OLS249SXV	OLF249SXV	OLH249SXV	N/A	N/A
JANS equivalent	OLS249PS	OLF249PS	OLH249PS	N/A	N/A
<b>Lead Finish and Packing Options (-N)</b>					
Non-solder dipped and standard packing	Blank	Blank	Blank	Blank	Blank
Solder dipped	-1	-1	-1	N/A	N/A
Tape and reel	-2	N/A	N/A	N/A	N/A
Solder dip and tape and reel	-3	N/A	N/A	N/A	N/A
Standard packing	Tubes	Individual ESD carriers	Conductive carriers	Gel pack	Gel pack

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