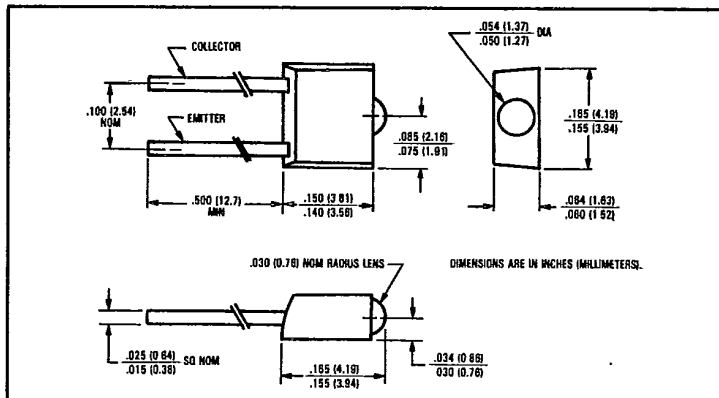
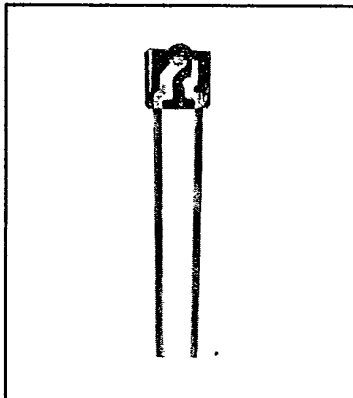




T-41-6)

# NPN Silicon Phototransistors

## Types OP509, OP509SLD, OP509SLC



### Features

- Lensed for high sensitivity
- Can be mounted on 0.100" (2.54 mm) hole centers
- Low cost plastic package
- Mechanically and spectrally matched to the OP169SL and OP269SL series of infrared emitting diodes

### Description

The OP509, OP509SLD, and OP509SLC each consist of an NPN silicon phototransistor mounted in a lensed, clear plastic, end locking package. The lensing effect of the package allows an acceptance half angle of 25° measured from the optical axis to the half power point.

### Absolute Maximum Ratings (T<sub>A</sub> = 25°C unless otherwise noted)

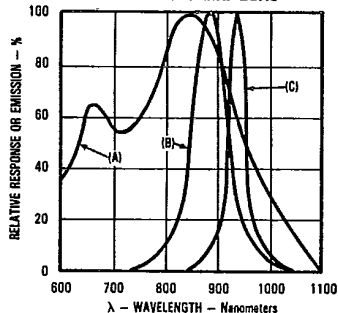
Collector-Emitter Voltage	.....	.30 V
Emitter-Collector Voltage	.....	.5.0 V
Storage and Operating Temperature Range	.....	-40°C to +100°C
Lead Soldering Temperature (1/16 inch [1.6 mm] from case for 5 sec. with soldering iron) <sup>(1)</sup>	.....	.240°C
Power Dissipation	.....	.100 mW <sup>(2)</sup>

### Notes:

- (1) RMA flux is recommended. Duration can be extended to 10 sec. max. when wave soldering.
- (2) Derate linearly 1.33 mW/°C above 25°C.
- (3) Junction temperature maintained at 25°C.
- (4) Light source is an unfiltered tungsten bulb operating at CT = 2870°K or equivalent infrared source.
- (5) To calculate typical collector dark current in  $\mu A$ , use the formula  $I_{CE0} = 10^{10.040 T_A - 3.4}$  where T<sub>A</sub> is ambient temperature in °C.

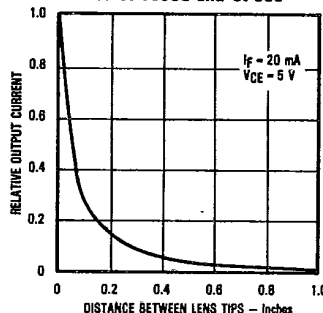
### Typical Performance Curves

Photosensor Spectral Response vs. GaAlAs and GaAs



Test Conditions (LED): T<sub>A</sub> = T<sub>J</sub> = 25°C, I<sub>F</sub> = 100 mA, DC = 0.1%, PW = 100  $\mu s$   
Peak Wavelength -  $\lambda_p$ : (A) XSTR - 850  $\pm$  30 nm, (B) LED GaAlAs - 875  $\pm$  20 nm, (C) LED GaAs - 930  $\pm$  15 nm

Coupling Characteristics of OP169SL and OP509



Types OP509, OP509SLD, OP509SLC

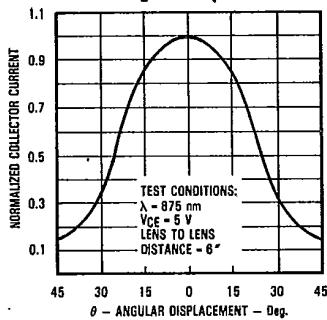
T-41-61

Electrical Characteristics (TA = 25°C unless otherwise noted)

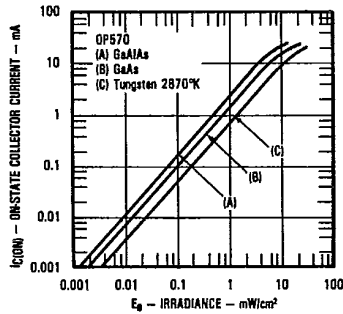
Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_{C(OH)}^{(3)}$	On-State Collector Current	0.060		0.50	mA	$V_{CE} = 5.0 \text{ V}, E_B = 1.00 \text{ mW/cm}^{2(4)}$
		0.170			mA	$V_{CE} = 5.0 \text{ V}, E_B = 1.00 \text{ mW/cm}^{2(4)}$
		0.30			mA	$V_{CE} = 5.0 \text{ V}, E_B = 1.00 \text{ mW/cm}^{2(4)}$
$\Delta I_C / \Delta T$	Relative $I_C$ Changes with Temperature		1.00		%/°C	$V_{CE} = 5.0 \text{ V}, E_B = 1.00 \text{ mW/cm}^2, \lambda = 875 \text{ nm}$
$I_{CEQ}^{(5)}$	Collector Dark Current			100	nA	$V_{CE} = 5.0 \text{ V}, E_B = 0$
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	30			V	$I_C = 100 \mu\text{A}$
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	5.0			V	$I_E = 100 \mu\text{A}$
$V_{CE(SAT)}^{(3)}$	Collector-Emitter Saturation Voltage			0.40	V	$I_C = 250 \mu\text{A}, E_B = 5.0 \text{ mW/cm}^{2(4)}$

Typical Performance Curves

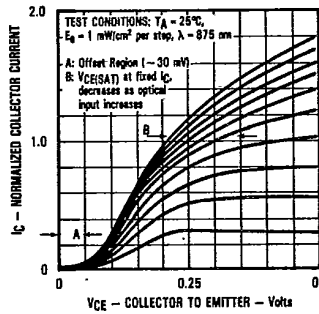
Normalized Collector Current vs. Angular Displacement



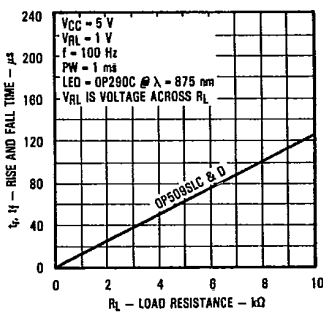
On-State Collector Current vs. Irradiance



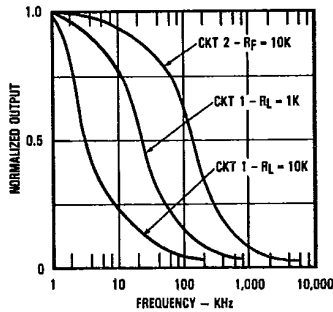
Normalized Collector Current vs. Collector to Emitter Voltage



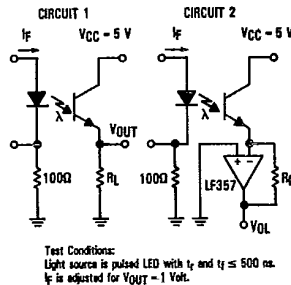
Rise and Fall Time vs. Load Resistance



Normalized Output vs. Frequency



Switching Time Test Circuit



TRW reserves the right to make changes at any time in order to improve design and to supply the best product possible.

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