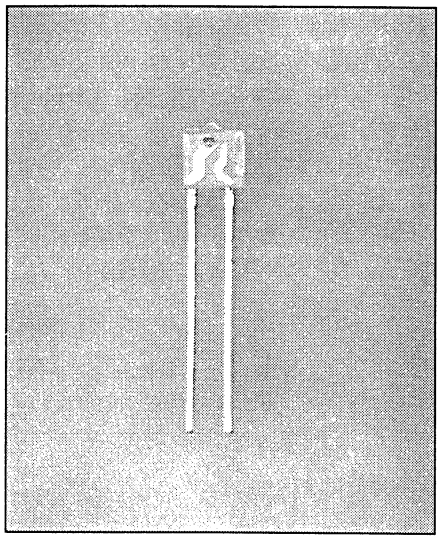
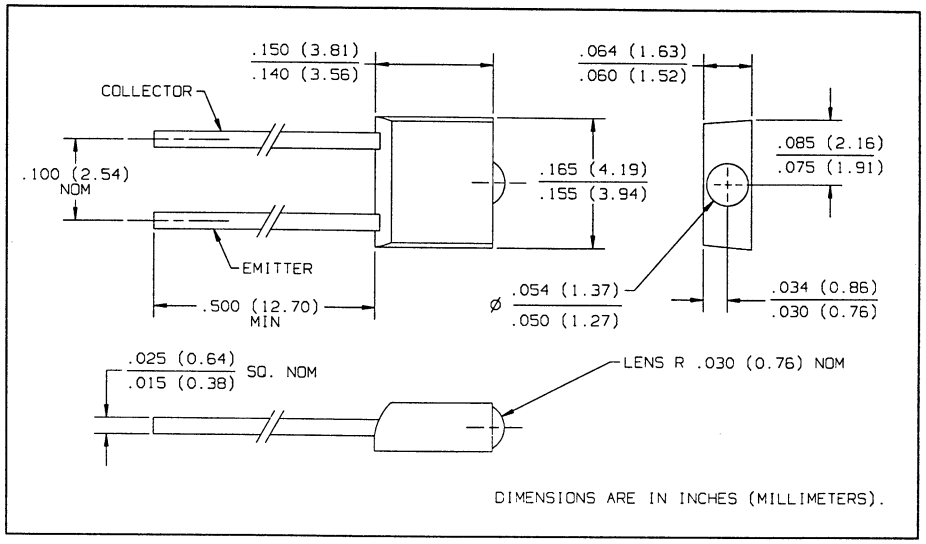
NPN Silicon Phototransistors
Types OP509A, OP509B, OP509C





Features

- Lensed for high sensitivity
- Easily stackable on 0.100 inch (2.54 mm) hole centers
- Low cost plastic package
- Mechanically and spectrally matched to the OP169 and OP269 series of infrared emitting diodes

Description

The OP509 series consist of NPN silicon phototransistors mounted in lensed, clear plastic, "end looking" packages. The lensing effect of the package allows an acceptance half angle of 25° measured from the optical axis to the half power point.

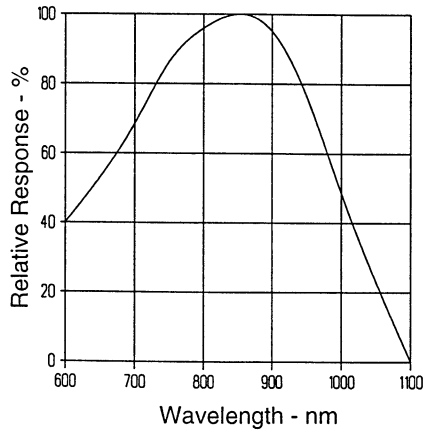
Absolute Maximum Ratings (T_A = 25° C unless otherwise noted)

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]	260° C(1)
Power Dissipation	100 mW(2)

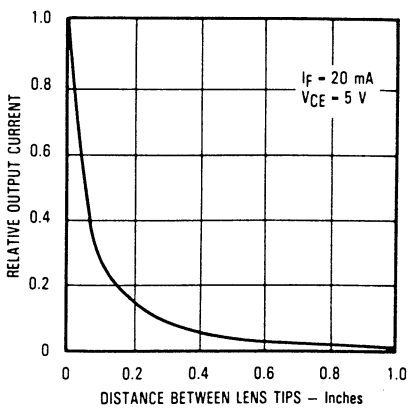
Notes:
(1) RMA flux is recommended. Duration can be extended to 10 seconds max. when flow soldering. Maximum 20 grams force may be applied to the leads when soldering.
(2) Derate linearly 1.33 mW/° C above 25° C.
(3) Light source is an unfiltered GaAs LED with a peak emission wavelength of 935 nm and a radiometric intensity level which varies less than 10% over the entire lens surface of the phototransistor being tested.
(4) To calculate typical collector dark current in μA, use the formula $I_{CEO} = 10^{(0.040T_A - 3.4)}$ where T_A is ambient temperature in ° C.

Typical Performance Curves

Typical Spectral Response



Coupling Characteristics of OP169 and OP509



Types OP509A, OP509B, OP509C

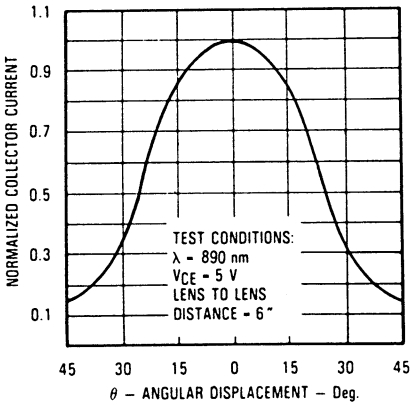
Electrical Characteristics (T_A = 25° C unless otherwise noted)

SYMBOL	PARAMETER		MIN	TYP	MAX	UNITS	TEST CONDITIONS
$I_{C(ON)}$	On-State Collector Current	OP509C OP509B OP509A	0.7 1.4 5.7		10.6	mA	V_{CE} = 5.0 V, E_e = 5 mW/cm$^{2(3)}$
$I_C/\Delta T$	Relative I_C Change with Temperature			1.00		%/°C	V_{CE} = 5.0 V, E_e = 1.0 mW/cm$^{2(3)}$, λ = 890 nm
I_{CEO}	Collector-Dark Current				100	nA	V_{CE} = 10.0 V, E_e = 0$^{(4)}$
$V_{(BR)CEO}$	Collector-Emittor Breakdown Voltage		30			V	I_C = 100 µA
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage		5.0			V	I_E = 100 µA
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage				0.40	V	I_C = 250 µA, E_e = 5 mW/cm$^{2(3)}$

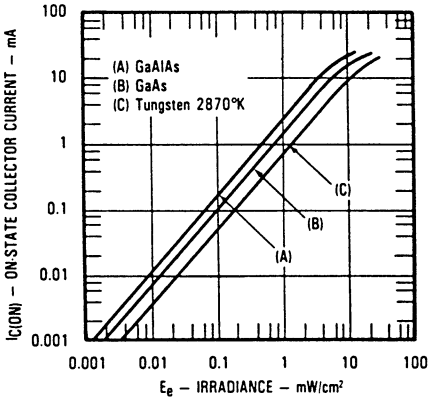
PHOTOSENSORS

Typical Performance Curves

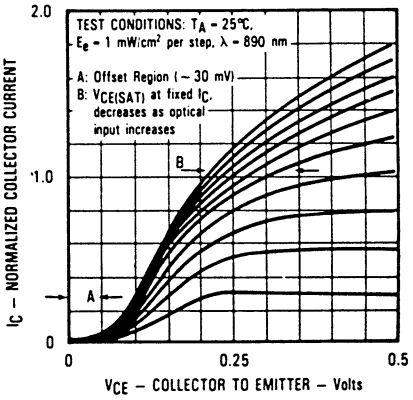
Normalized Collector Current vs. Angular Displacement



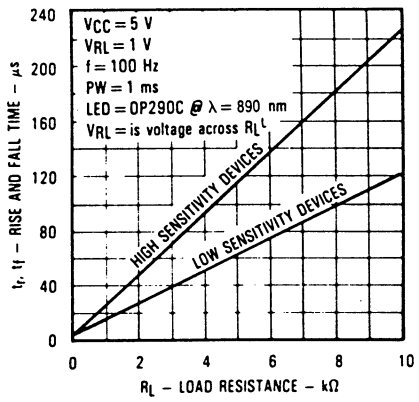
On-State Collector Current vs. Irradiance



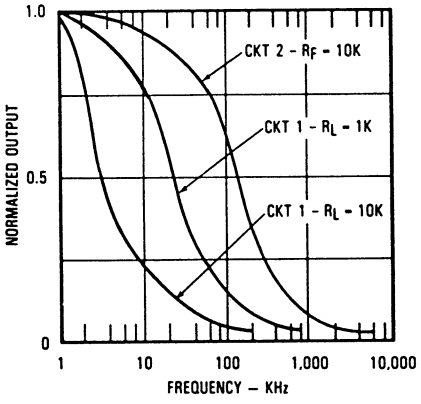
Normalized Collector Current vs. Collector to Emitter Voltage



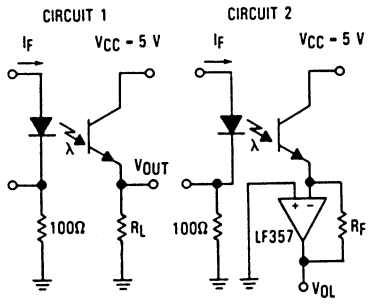
Rise and Fall Time vs Load Resistance



Normalized Output vs. Frequency



Switching Time Test Circuit



Test Conditions:
Light source is pulsed LED with t_r and $t_f \leq$ 500 ns.
I_F is adjusted for V_{OUT} = 1 Volt.