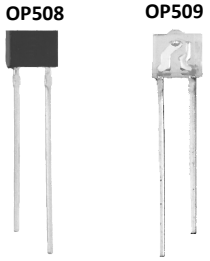
NPN Silicon Phototransistor

OP508F, OP509 Series



Features:

- Flat lensed for wide acceptance angle (OP508F)
- Lensed for high sensitivity (OP509)
- Easily stackable on 0.100” (2.54 mm) hole centers
- Inexpensive plastic package
- Mechanically and spectrally matched to OP168 and OP268 series of infrared emitting diodes

Description:

Each device in the **OP508F** series consists of a NPN silicon phototransistor mounted in a flat, black plastic “end-looking” package. The flat sensing surface allows an acceptance half-angle of 60° when measured from the optical axis to the half power point.

Each device in the **OP509** series consists of a NPN silicon phototransistor mounted in a lensed, clear plastic “end-looking” package. The lensing effect of the package allows an acceptance half-angle of 25° when measured from the optical axis to the half power point.

OP508F and **OP509** series devices can be mounted on 0.100” (2.54 mm) hole centers, which makes them an ideal low-cost alternate to hermetic OP600 sensors. ***OP508F*** *and* ***OP509*** *series devices are mechanically and spectrally matched to the OP168F and OP268F series of infrared emitting diodes.*

Please refer to Application Bulletins 208 and 210 for additional design information and reliability (degradation) data.

For custom versions of the **OP508F, OP509** and **OP538F** series devices please contact your OPTEK representative.

Applications:

- Applications requiring a wide acceptance angle
- Applications requiring high sensitivity
- Space-limited applications

Ordering Information

Part Number	Sensor	Viewing Angle	Lead Length
OP508FA	Phototransistor	120°	0.50"
OP508FC			
OP509A		50°	
OP509B			
OP509C			

RoHS

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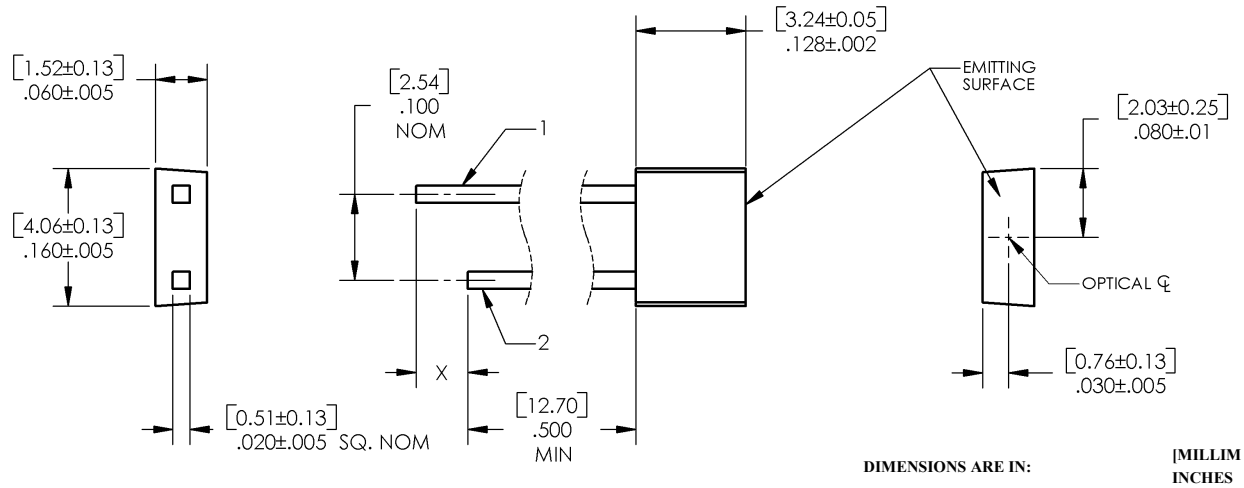
NPN Silicon Phototransistor

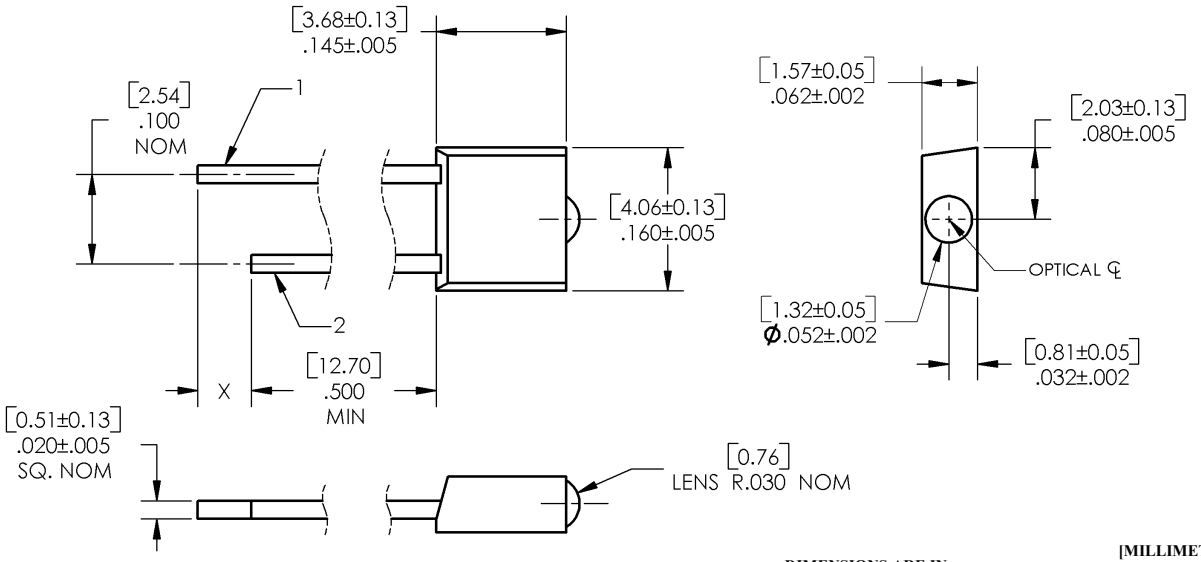
OP508F, OP509 Series

OP508F (A, C)



DIMENSIONS ARE IN: [MILLIM
INCHES

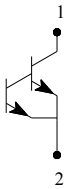
OP509 (A, B)



DIMENSIONS ARE IN: [MILLIMET
INCHES

OP508F & OP509

OP538



Pin #	Transistor
1	Collector
2	Emitter

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NPN Silicon Phototransistor

OP508F, OP509 Series

Electrical Specifications

Absolute Maximum Ratings (T_A = 25° C unless otherwise noted)	
Storage and Operating Temperature Range	-40° C to +100° C
Collector-Emitter Voltage	30 V
Emitter-Collector Voltage	5 V
Lead Soldering Temperature [1/16 inch (1.6 mm) from case for 5 seconds with soldering iron]	260° C(1)
Power Dissipation	100 mW(2)

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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
$I_{C(ON)}$	On-State Collector Current OP509A (Dome Lens) OP508FA (Flat Lens) OP509B (Dome Lens) OP508FC (Flat Lens)	 5.70 2.70 1.40 0.34	 - - - -	 20.00 - 10.60 -	mA	V_{CE} = 5.0 V, E_E = 5 mW/cm^2 (3)
$I_C/\Delta T$	Relative I_C Charge with Temperature	-	1.00	-	%/°C	V_{CE} = 5 V.0, E_E = 1.0 mW/cm^2(3), λ = 890 nm
I_{CEO}	Collector-Dark Current OP508F & OP509 OP538F	 - -	 - -	 100 225	nA	V_{CE} = 10.0 V, E_E = 0(4)
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage OP508F & OP509	 30	 -	 -	V	I_C = 1.00 mA, E_E = 0
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	5	-	-	V	I_E = 100 µA
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage OP508F	-	-	0.4	V	I_C = 300 µA, E_E = 5 mW/cm^2 (3)
	OP509	-	-	0.4	V	I_C = 250 µA, E_E = 5 mW/cm^2 (3)

Notes:

1. RMA flux is recommended. Duration can be extended to 10 seconds maximum when flow soldering. A 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 or GaAlAs LED with a peak emission wavelength of 935 or 890 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 $^{(0.040\ T_A\ -\ 3.4)}$, where T_A is ambient temperature in °C.

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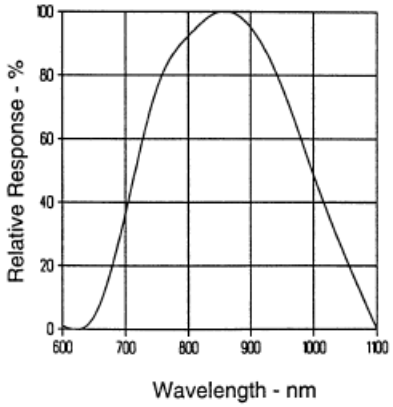
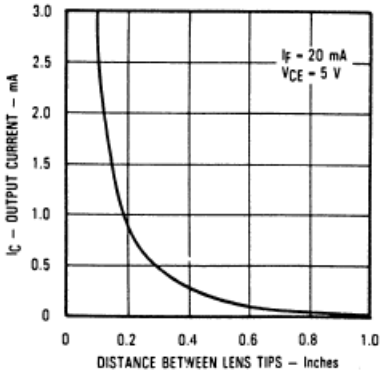
Performance

OP508FA, OP508FC, OP508FD

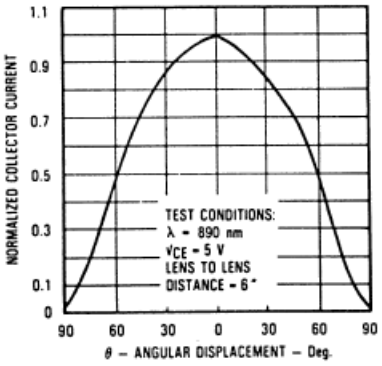
Typical Spectral Response



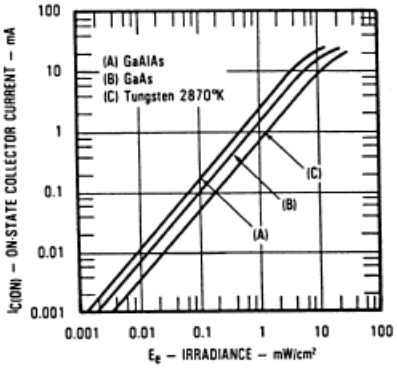
Coupling Characteristics of OP168F and OP508F



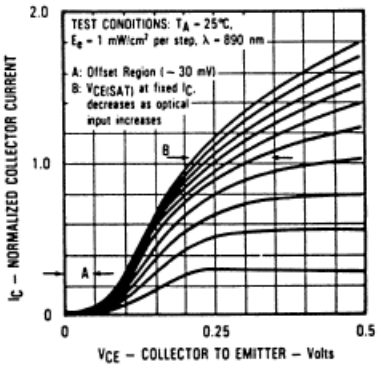
Normalized Collector Current vs. Angular Displacement



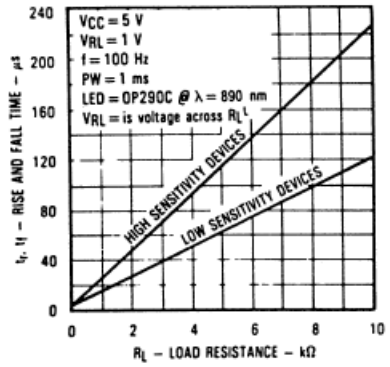
On-State Collector Current vs. Irradiance



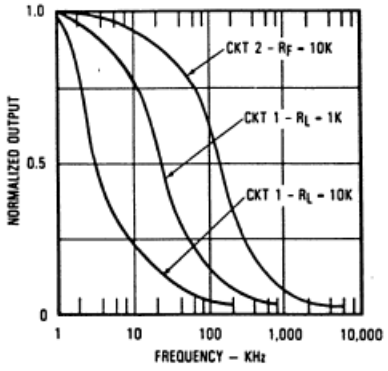
Normalized Collector Current vs. Collector to Emitter Voltage



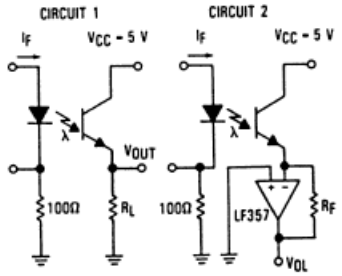
Rise and Fall Time vs Load Resistance



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.

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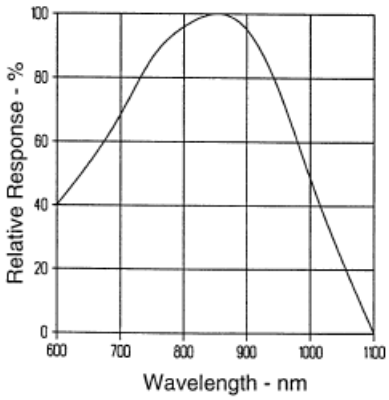
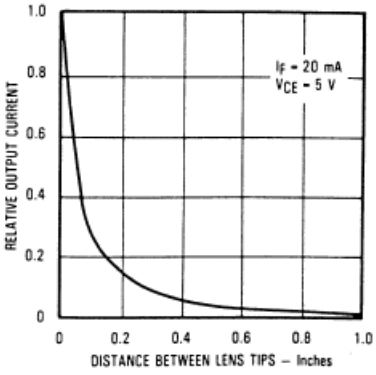
Performance

OP509A, OP509B, OP509D

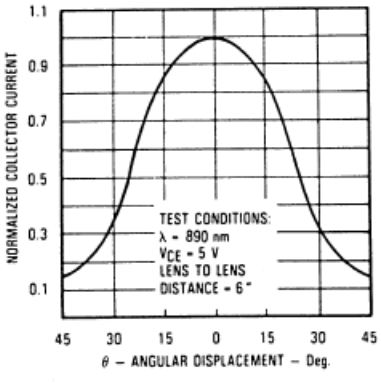
Typical Spectral Response



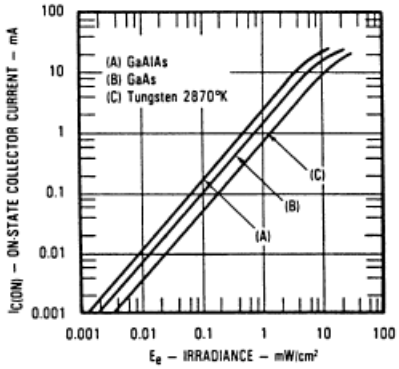
Coupling Characteristics of OP169 and OP509



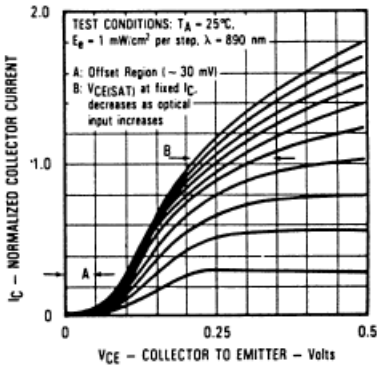
Normalized Collector Current vs. Angular Displacement



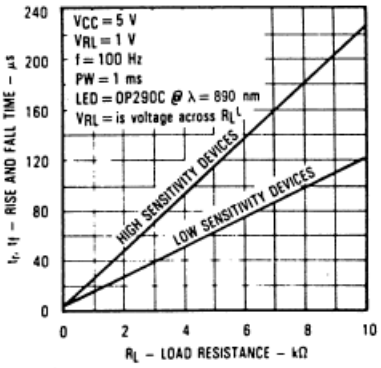
On-State Collector Current vs. Irradiance



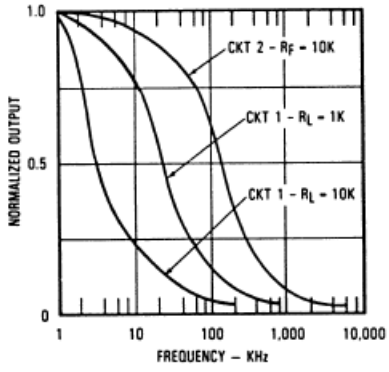
Normalized Collector Current vs. Collector to Emitter Voltage



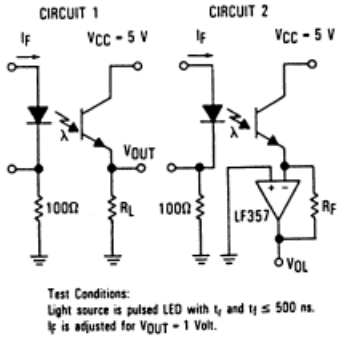
Rise and Fall Time vs Load Resistance



Normalized Output vs. Frequency



Switching Time Test Circuit



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Issue	Change Description	Approval	Date
	Used PDFs from PDF Catalog to write new data sheet.		June 1996
A	Wrote data sheet using above PDFs and information from some unreleased Publisher files (see USED folder). Transferred to new TT Electronics template.		04/04/06 8/2016