

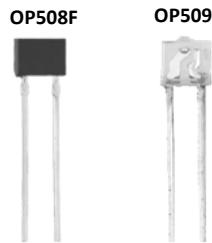
# NPN Silicon Phototransistor

## OP508FA, OP509A, OP509B



### Features:

- Flat lensed for wide acceptance angle (OP508FA)
- Lensed for high sensitivity (OP509)
- Easily stackable on 0.100" (2.54 mm) hole centers
- Inexpensive plastic package
- Mechanically and spectrally matched to OP168F and OP268F series of infrared emitting diodes



### Description:

The **OP508FA** consists of an 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 an 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.

**OP508FA** 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. *OP508FA and OP509 series devices are mechanically and spectrally matched to the OP168F and OP268F series of infrared emitting diodes.*

[Please refer to Application Bulletin 210 for additional thermal design information.](#)

For custom versions of the **OP508FA** and **OP509** 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"
OP509A		50°	
OP509B			



General Note  
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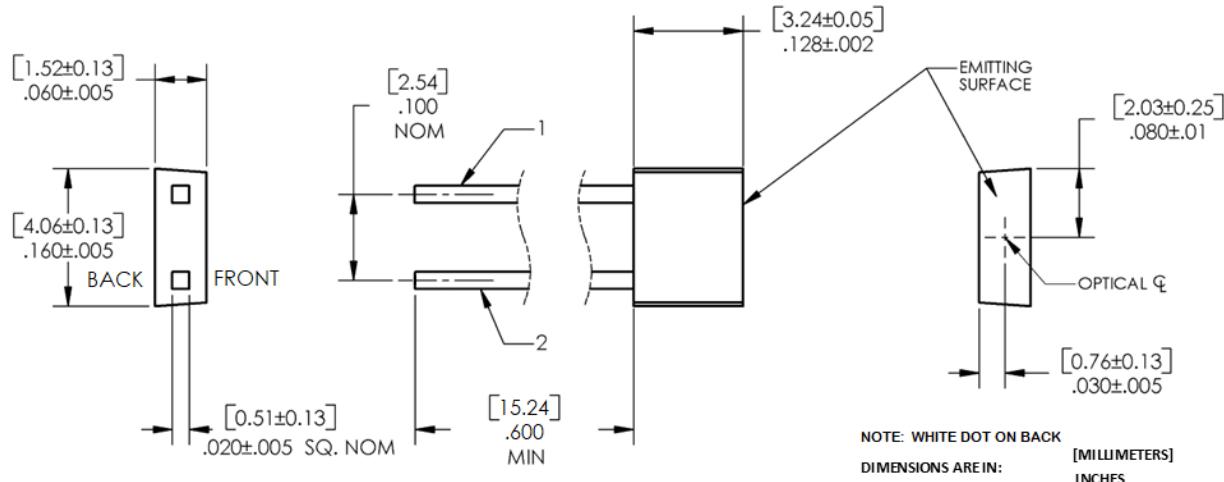
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# NPN Silicon Phototransistor

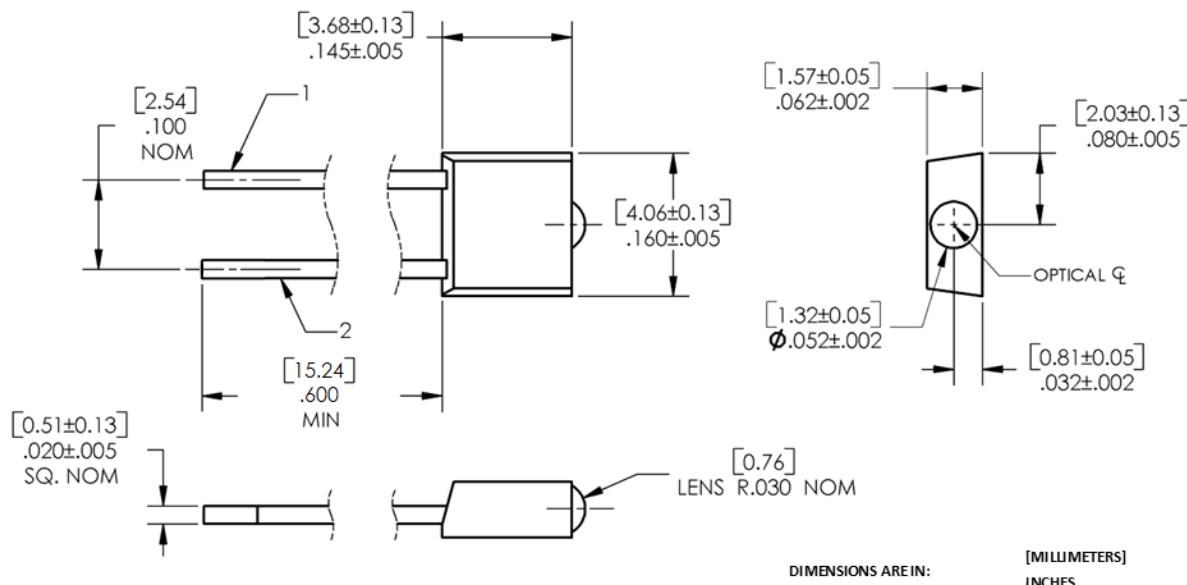
## OP508FA, OP509A, OP509B



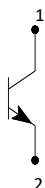
OP508F (A) (Black Plastic Package)



OP509 (A, B) (Lensed Clear Plastic Package)



OP508FA & OP509



Pin #	Transistor
1	Collector
2	Emitter

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# NPN Silicon Phototransistor

## OP508FA, OP509A, OP509B



### Electrical Specifications

**Absolute Maximum Ratings** ( $T_A = 25^\circ C$  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] <sup>(1)</sup>	260° C
Power Dissipation <sup>(2)</sup>	100 mW

**Electrical Characteristics** ( $T_A = 25^\circ C$  unless otherwise noted)

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

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 1.07 mW/ $^\circ C$  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  $\mu$ A, use the formula  $I_{CEO} = 10^{(0.040 T_A - 3.4)}$ , where  $T_A$  is ambient temperature in  $^\circ C$ .

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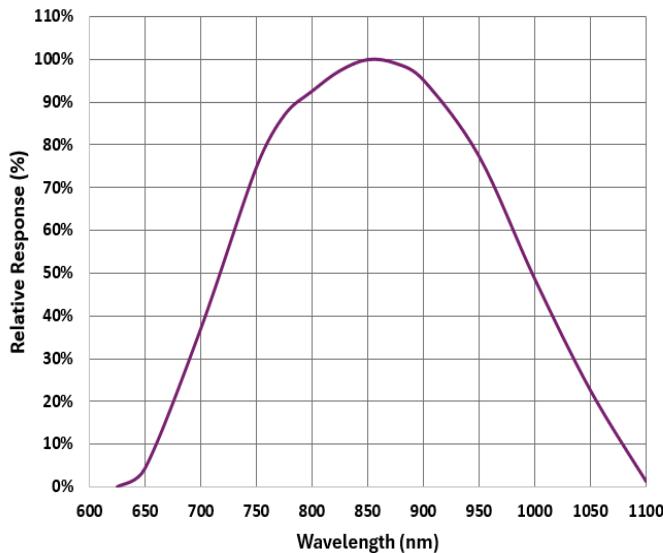
## OP508FA, OP509A, OP509B



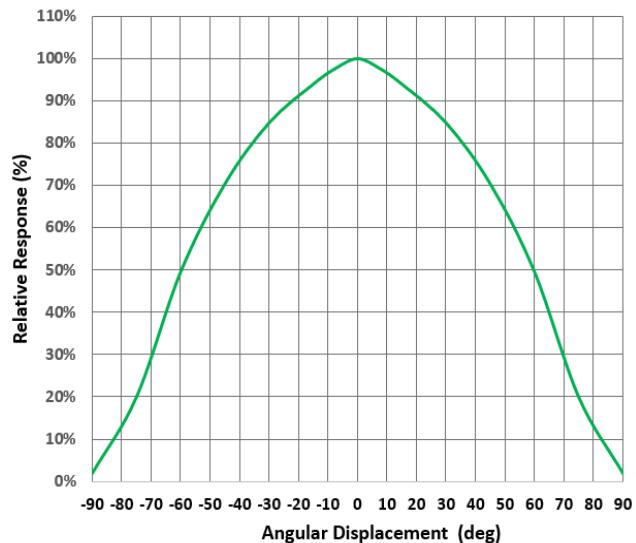
### Typical Performance

OP508FA

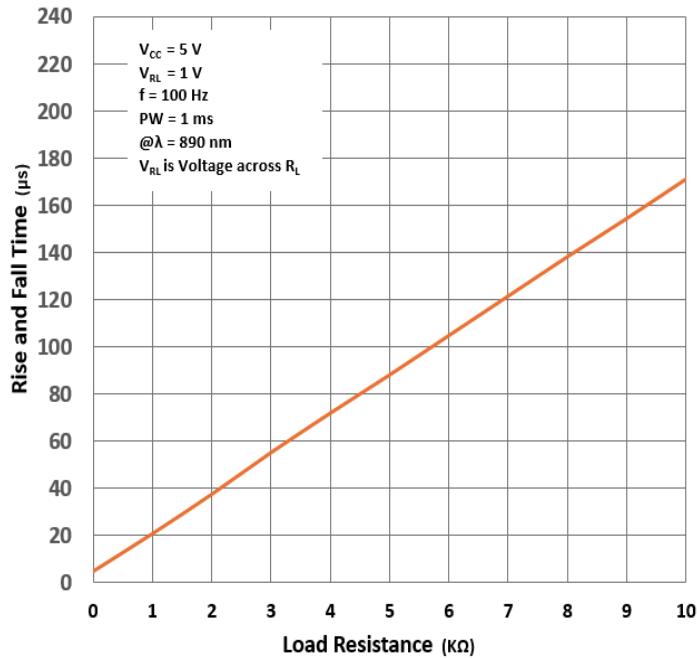
#### Typical Spectral Response



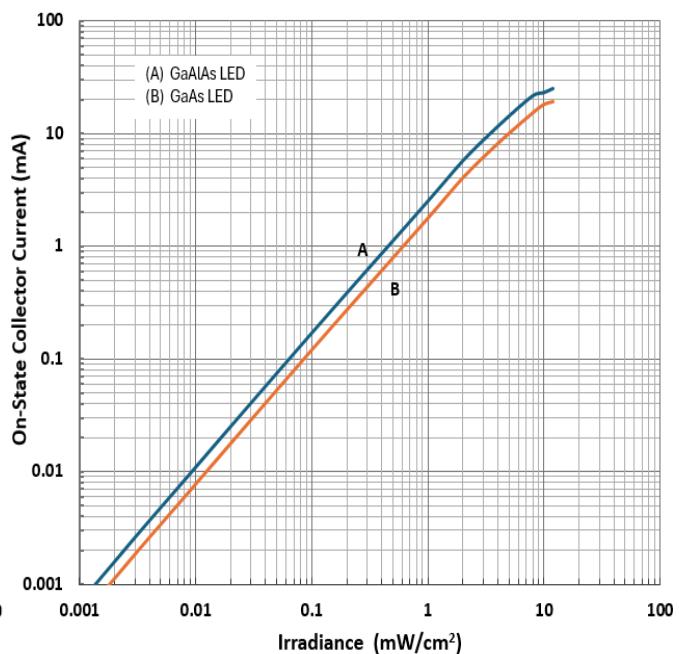
#### Normalized Collector Current vs Angular Response



#### Rise and Fall Times vs Load Resistance



#### On-State Collector Current vs Irradiance



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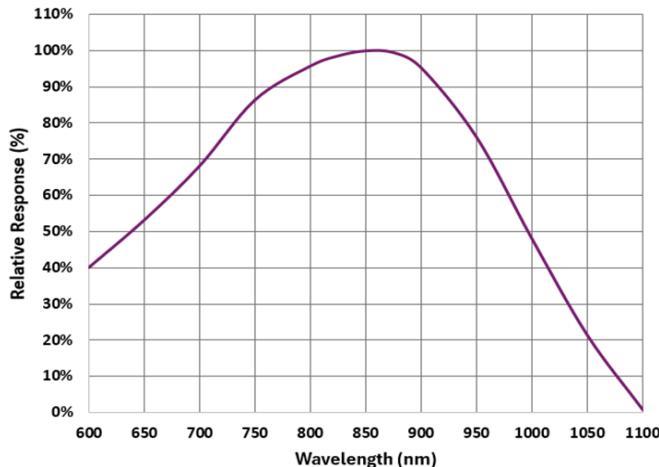
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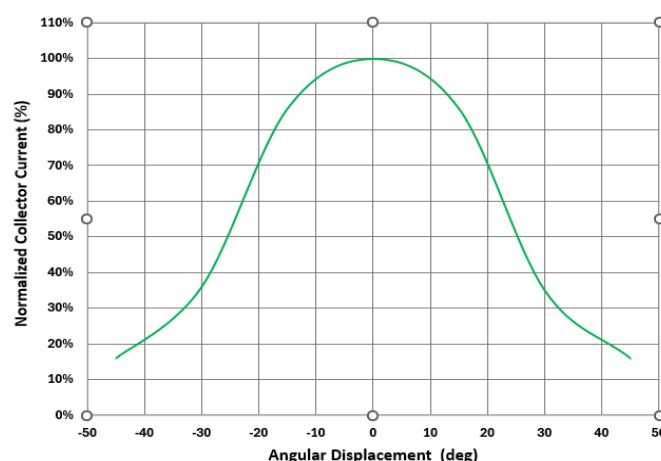
### Typical Performance

OP509A, OP509B

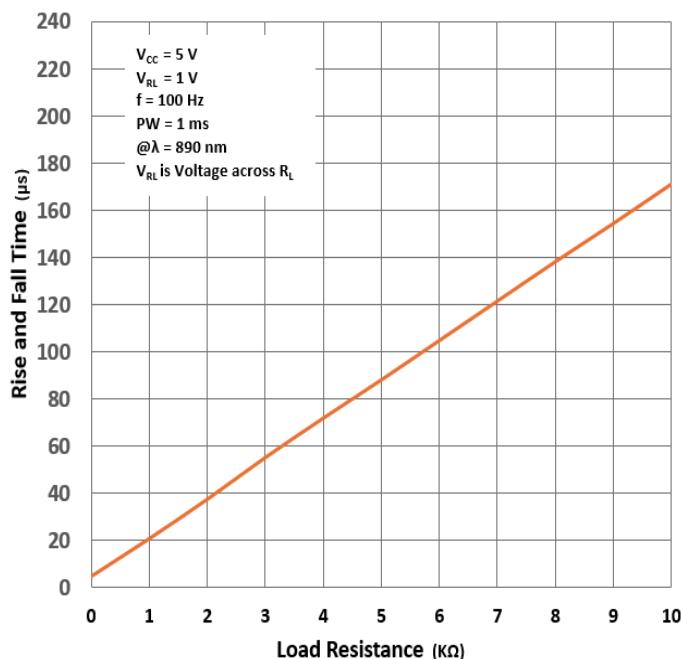
Typical Spectral Response



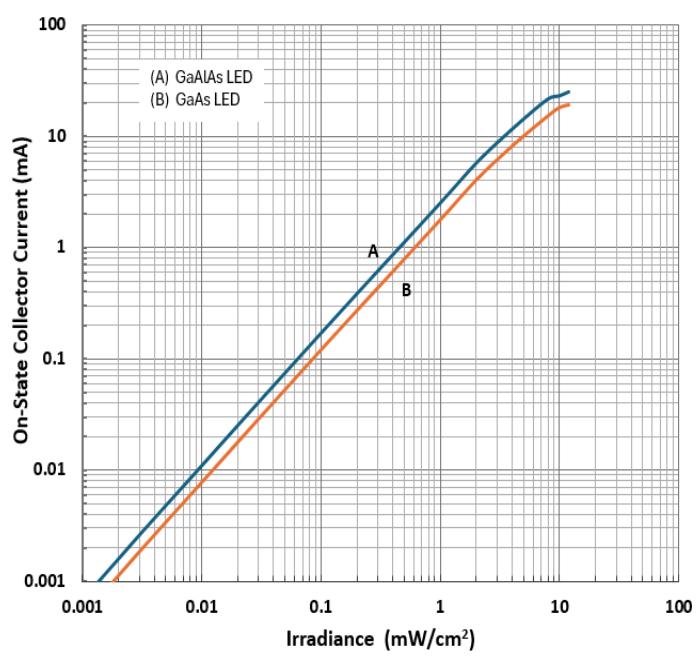
Normalized Collector Current vs Angular Displacement



Rise and Fall Times vs Load Resistance



On-State Collector Current vs Irradiance



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