

# NPN Plastic Silicon Phototransistor

## OP593, OP598, OP798 Series



### Features:

- Dark blue epoxy package
- Wide receiving angle
- Variety of sensitivity ranges
- TO-18 equivalent package style



### Description:

Each device in this series consists of an NPN silicon phototransistor molded in a dark blue epoxy packages. The wide receiving angle (130°) of the **OP593** series devices provides relatively even reception over a large area. The narrow receiving angle (25°) of the **OP598** and **OP798** series devices provides a relatively small reception area.

*These devices are 100% production tested using infrared light for close correlation with OPTEK's GaAs and GaAlAs emitters.*

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

### Applications:

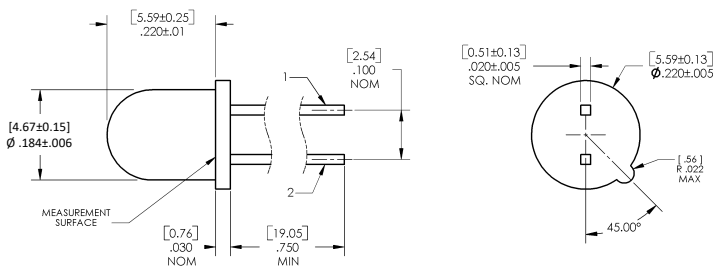
- Non-contact reflective or slotted sensor
- Assembly line automation
- Machine automation
- Machine Safety
- End of travel sensor
- Door sensor
- Safety Curtain



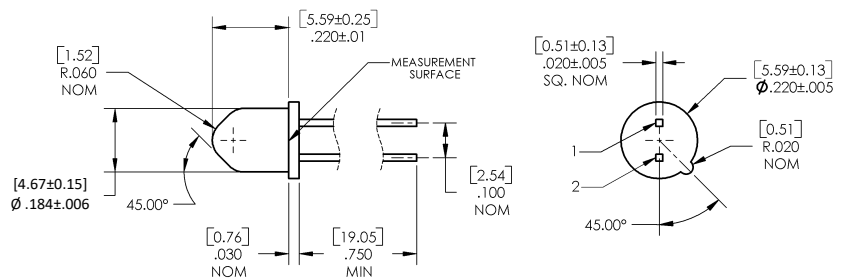
| Pin # | Sensor    |
|-------|-----------|
| 1     | Collector |
| 2     | Emitter   |

| Ordering Information |                            |               |             |
|----------------------|----------------------------|---------------|-------------|
| Part Number          | Sensor                     | Viewing Angle | Lead Length |
| OP593A               | Transistor                 | 130°          | 0.75"       |
| OP593B               |                            |               |             |
| OP593C               |                            |               |             |
| OP598A               | 25°                        |               |             |
| OP598B               |                            |               |             |
| OP598C               |                            |               |             |
| OP798A               | R <sub>BE</sub> Transistor | 25°           |             |
| OP798B               |                            |               |             |
| OP798C               |                            |               |             |
| OP798D               |                            |               |             |

### OP593



### OP598, OP798



**OP555 - CONTAINS POLYSULFONE**  
 To avoid stress cracking, we suggest using ND Industries' **Vibra-Tite** for thread-locking. **Vibra-Tite** evaporates fast without causing structural failure in OPTEK's molded plastics.



RoHS

DIMENSIONS ARE IN: [MILLIMETERS] INCHES

### General Note

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## Electrical Specifications

| Absolute Maximum Ratings ( $T_A = 25^\circ\text{C}$ unless otherwise noted)                 |   |
|---|---|
| Storage and Operating Temperature Range   | $-40^\circ\text{C}$ to $+100^\circ\text{C}$ |
| Collector-Emitter Voltage   | 30 V  |
| Emitter-Collector Voltage   | 5 V   |
| Continuous Collector Current  | 50 mA                                       |
| Lead Soldering Temperature [1/16 inch (1.6 mm) from case for 5 seconds with soldering iron] | $260^\circ\text{C}^{(1)}$                   |
| Power Dissipation   | $250\text{ mW}^{(2)}$                       |

| Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted) |                                      |      |       |       |       |   |
|---|--------------------------------------|------|-------|-------|-------|---|
| SYMBOL  | PARAMETER                            | MIN  | TYP   | MAX   | UNITS | TEST CONDITIONS   |
| $I_{C(ON)}$   | On-State Collector Current           |      |       |       |       | $V_{CE} = 5\text{ V}$ . Light source is an unfiltered GaAlAs LED with a peak emission wavelength of 890 nm and $E_{e(APT)}$ of $1.7\text{ mW/cm}^2$ average within a .250" diameter aperture. |
|   | OP593A                               | 3.0  | -     | 4     | mA    |   |
|   | OP593B                               | 2.0  | -     | 4     |       |   |
|   | OP593C                               | 1.0  | -     | 4     |       |   |
|   | OP598A                               | 7.5  | -     | 10    | mA    |   |
|   | OP598B                               | 5.0  | -     | 10    |       |   |
|   | OP598C                               | 2.5  | -     | 10    |       |   |
|   | OP798A                               | 4.90 | -     | 15.00 | mA    |   |
|   | OP798B                               | 3.30 | -     | 9.20  |       |   |
|   | OP798C                               | 1.90 | -     | 6.10  |       |   |
| OP798D  | 1.90                                 | -    | 15.00 |       |       |   |
| $I_{CEO}$   | Collector-Dark Current               | -    | -     | 100   | nA    | $V_{CE} = 10\text{ V}$ , $E_E = 0$  |
| $V_{(BR)CEO}$   | Collector-Emitter Breakdown Voltage  | 30   | -     | -     | V     | $I_C = 100\ \mu\text{A}$  |
| $V_{(BR)ECO}$   | Emitter-Collector Breakdown Voltage  | 5    | -     | -     | V     | $I_E = 100\ \mu\text{A}$  |
| $V_{CE(SAT)}$   | Collector-Emitter Saturation Voltage | -    | -     | 0.40  | V     | $I_C = 0.4\text{ mA}$ , $E_E = 1.7\text{ mW/cm}^2$  |

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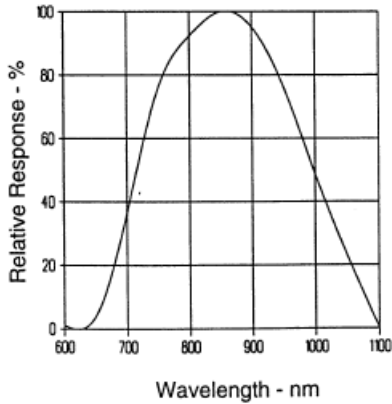
OP593, OP598, OP798 Series



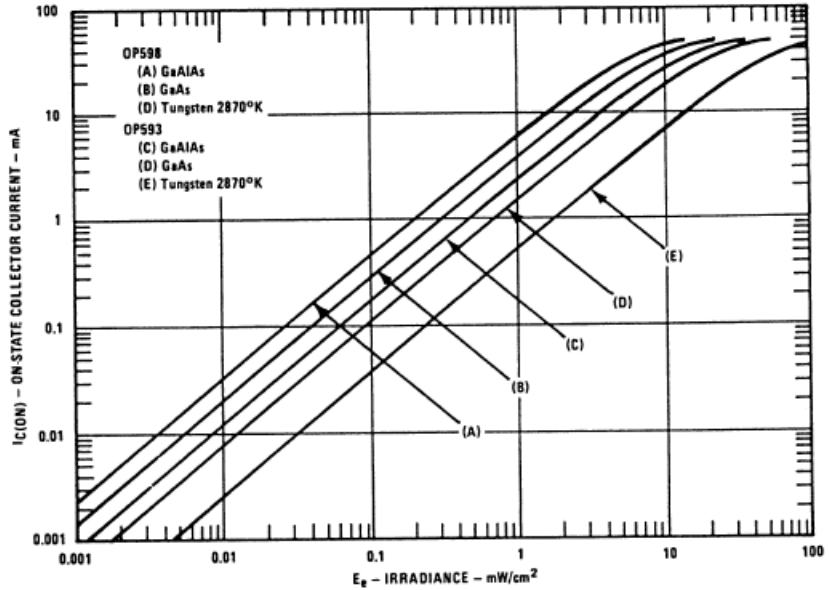
## Performance

OP593, OP598

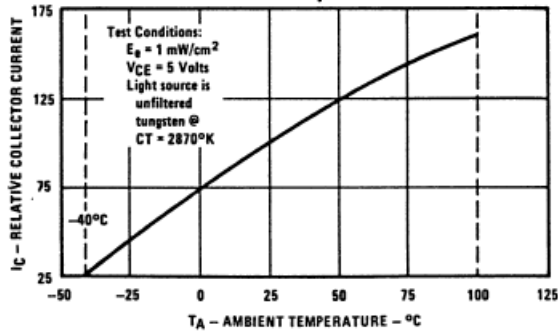
Typical Spectral Response



On-State Collector Current vs. Irradiance



Normalized Collector Current vs. Ambient Temperature



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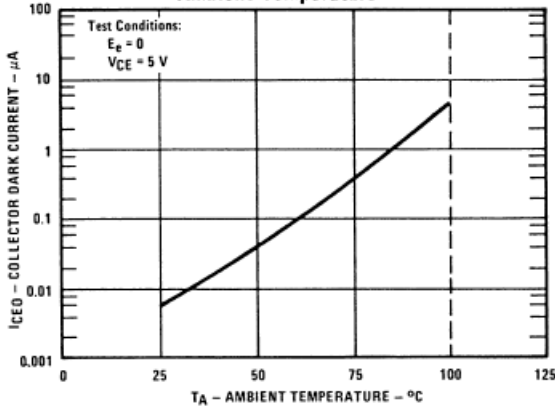
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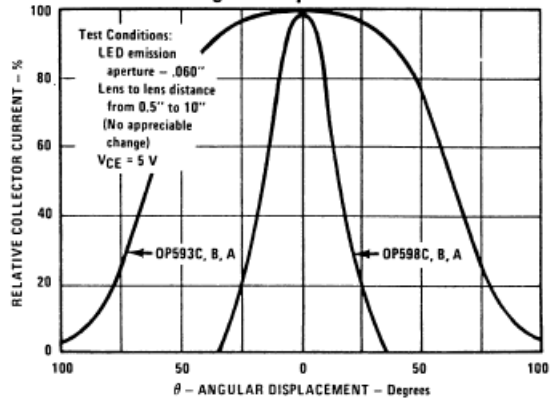


## Performance OP593, OP598

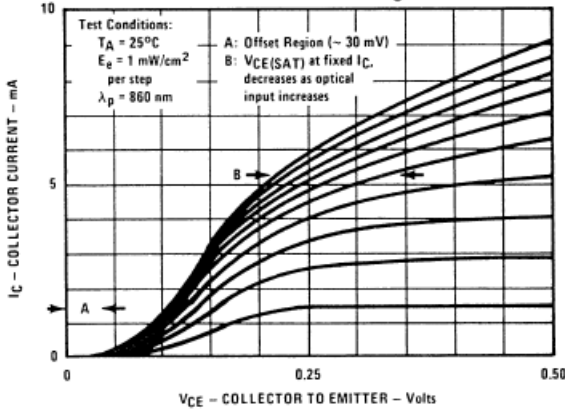
Collector Dark Current vs. Ambient Temperature



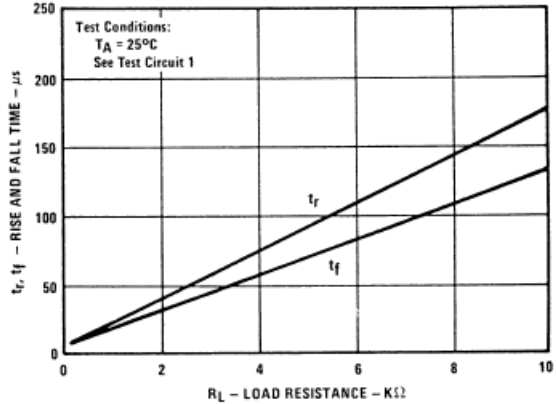
Relative Collector Current vs. Angular Displacement



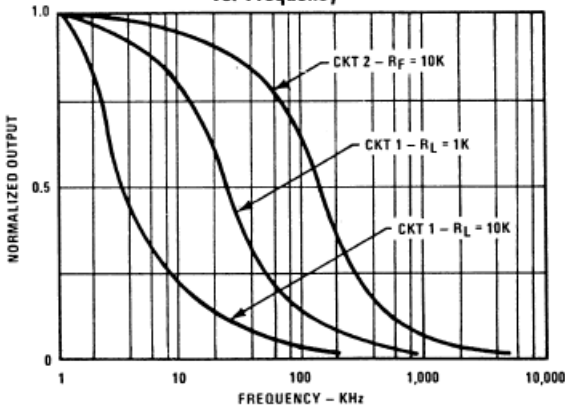
Collector Current vs. Collector to Emitter Voltage



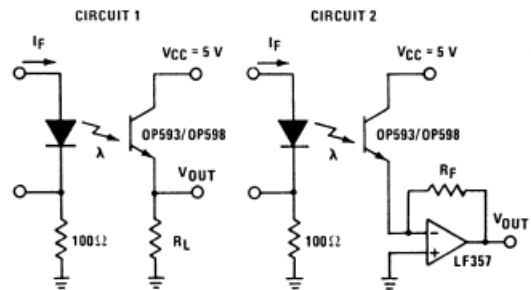
Rise and Fall Time vs. Load Resistance



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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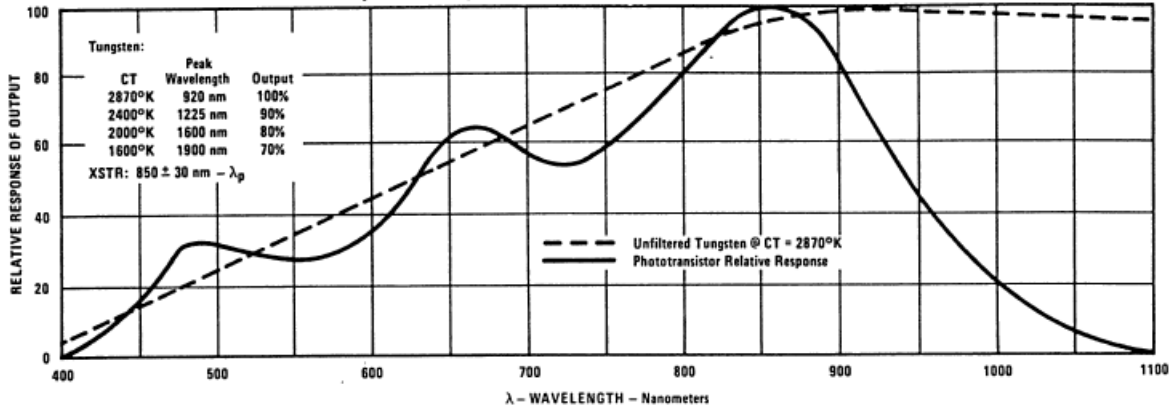
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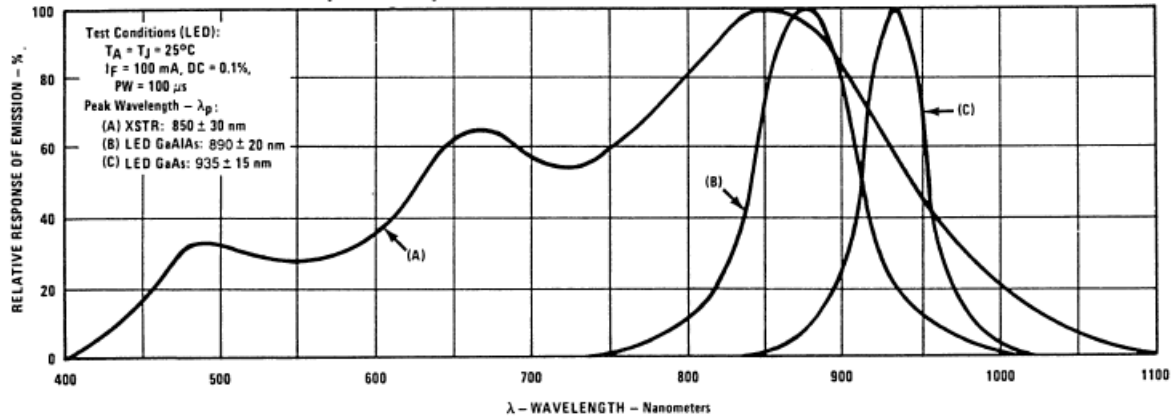
## Performance

OP593, OP598

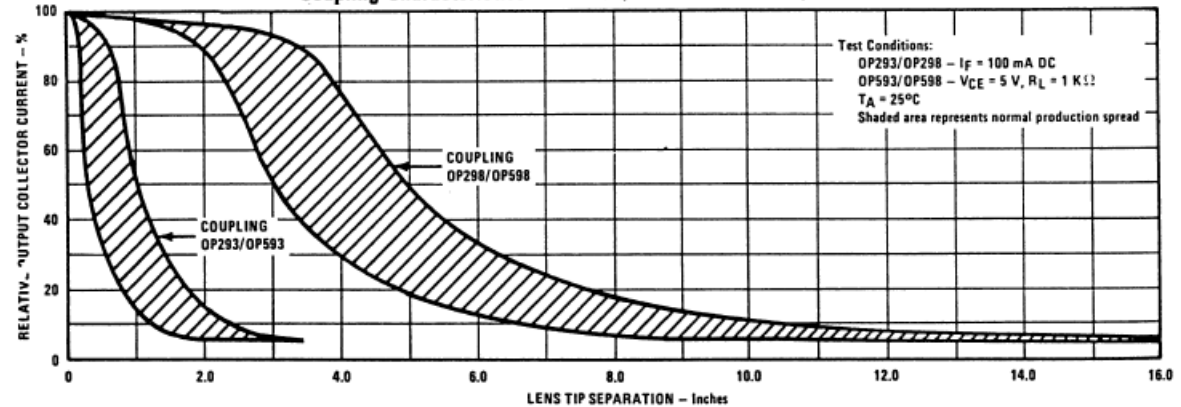
Spectral Response of OP593/OP598 vs. Tungsten



Spectral Response of OP593/OP598 vs. GaAlAs and GaAs



Coupling Characteristics of OP293/OP593 and OP298/OP598



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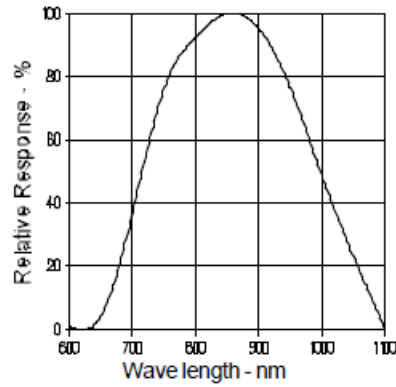
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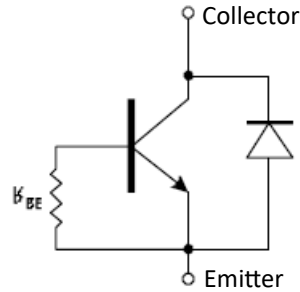
## Performance

OP798

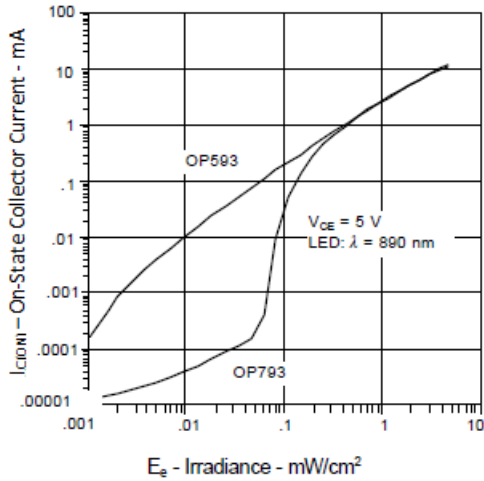
Typical Spectral Response



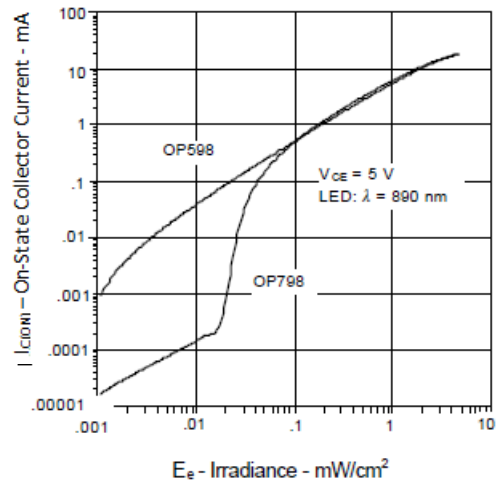
Schematic



On-State Collector Current vs. Irradiance



On-State Collector Current vs. Irradiance



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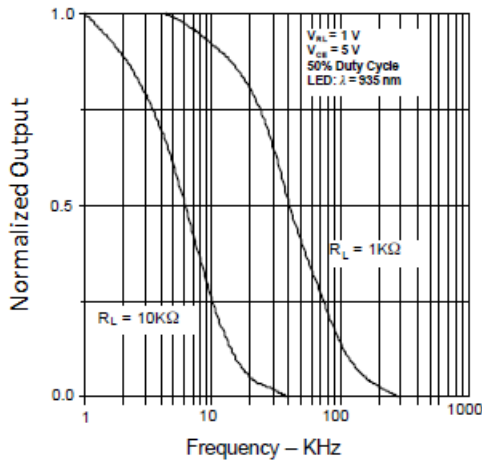
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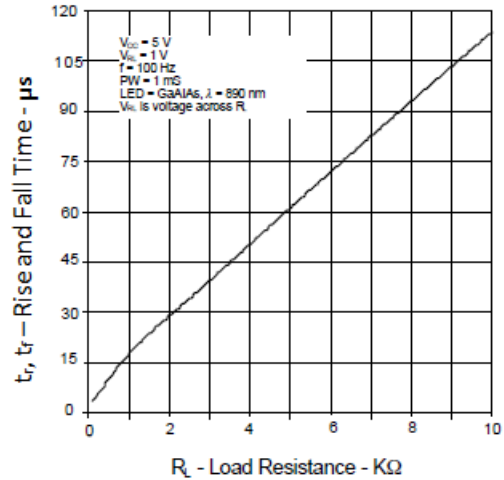
## Performance

OP798

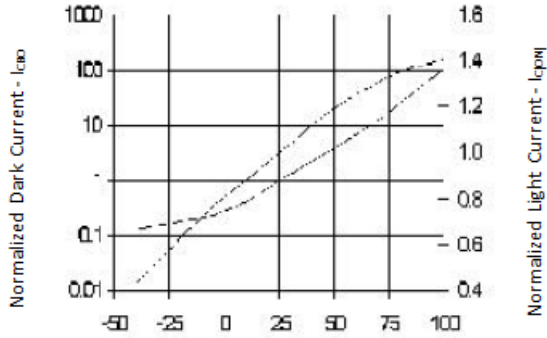
Normalized Output vs. Frequency



Typical Rise and Fall Time vs. Load Resistance



Normalized Light and Dark Current vs. Ambient Temperature



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