

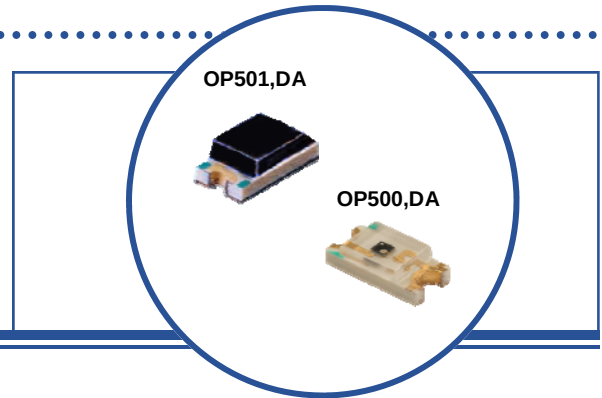
# Silicon Phototransistor and Photo Darlington in Miniature 0805 SMD Package

## OP500, OP501, OP500DA, OP501DA



### Features:

- High photo sensitivity
- Fast response time
- 0805 package size
- Phototransistor or Photo Darlington Output
- Choice of opaque or water clear flat lens



### Description:

Each of these devices consists of a NPN silicon phototransistor mounted in a miniature SMT package with a 0805 size chip carrier that is compatible with most automated mounting and position sensing equipment.

Both **OP500**, **OP500DA** and **OP501**, **OP501DA** have a flat lens. **OP501** and **OP501DA** has an opaque lens that shields the device from stray light, whereas **OP500** and **OP500DA** has a water clear lens. All devices have a wide viewing acceptance angle and higher collector current than devices without lenses especially on the **OP500DA** and **OP501** which incorporate photo darlington die instead on the standard transistor.

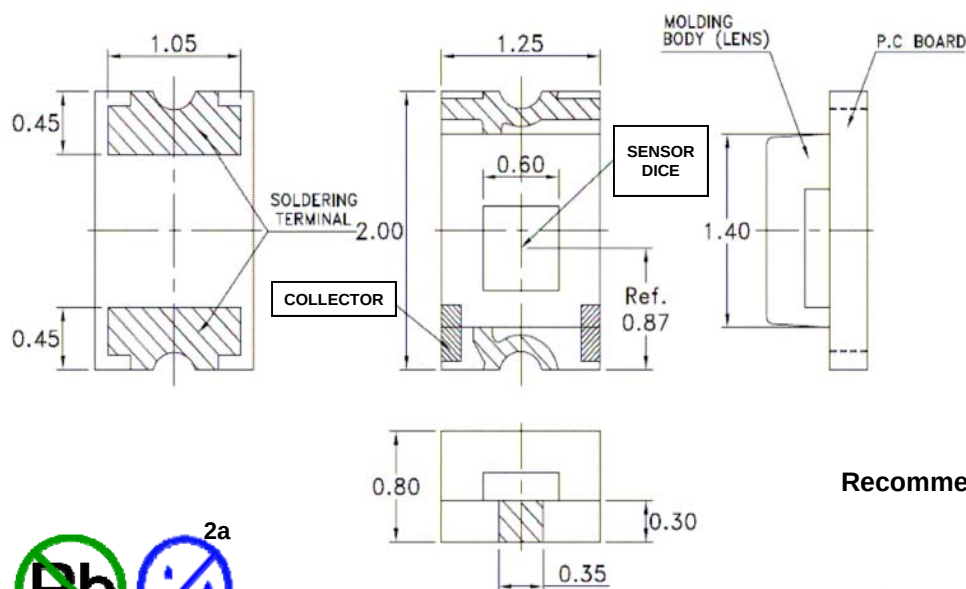
**OP500**, **OP501**, **OP500DA** and **OP501DA** are mechanically and spectrally matched to the **OP200** series infrared LEDs.

### Applications:

- Non-contact position sensing
- Datum detection
- Machine automation
- Optical encoders

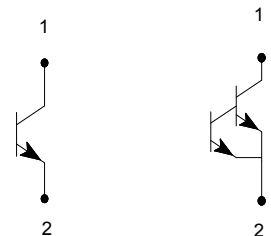
| Ordering Information |                  |               |             |
|----------------------|------------------|---------------|-------------|
| Part Number          | Sensor           | Viewing Angle | Lead Length |
| OP500                | Phototransistor  | 150°          | N/A         |
| OP501                |                  |               |             |
| OP500DA              | Photo Darlington | 150°          |             |
| OP501DA              |                  |               |             |

### OP500, OP501, OP500DA, OP501DA



OP500  
OP501

OP500DA  
OP501DA

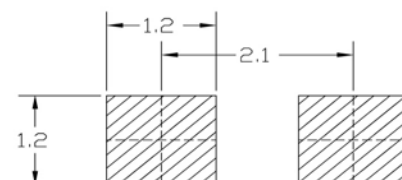


| Pin # | Transistor |
|-------|------------|
| 1     | Collector  |
| 2     | Emitter    |



RoHS Moisture

### Recommended Solder Pad Patterns



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## Absolute Maximum Ratings ( $T_A=25^\circ\text{C}$ unless otherwise noted)

|                                                                      |                   |
|----------------------------------------------------------------------|-------------------|
| Storage Temperature Range                                            | -40° C to +100° C |
| Operating Temperature Range                                          | -25° C to +85° C  |
| Lead Soldering Temperature <sup>(1)</sup>                            | 260° C            |
| Collector-Emitter Voltage<br>OP500, OP501<br>OP500DA, OP501DA        | 30 V<br>35 V      |
| Emitter-Collector Voltage                                            | 5 V               |
| Collector Current<br>OP500, OP501<br>OP500DA, OP501DA                | 20 mA<br>32 mA    |
| Power Dissipation <sup>(2)</sup><br>OP500, OP501<br>OP500DA, OP501DA | 75 mW<br>100 mW   |

## Electrical Characteristics ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

| SYMBOL | PARAMETER | MIN | TYP | MAX | UNITS | TEST CONDITIONS |
|--------|-----------|-----|-----|-----|-------|-----------------|
|--------|-----------|-----|-----|-----|-------|-----------------|

### Input Diode

|               |                                                                          |             |          |            |               |                                                                                                                                                  |
|---------------|--------------------------------------------------------------------------|-------------|----------|------------|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| $I_{C(ON)}$   | On-State Collector Current<br>OP500, OP501<br>OP500DA, OP501DA           | 0.1<br>10.0 | -<br>-   | -<br>-     | mA            | $V_{CE} = 5.0 \text{ V}$ , $E_E = 0.15 \text{ mW/cm}^2$ <sup>(3)</sup><br>$V_{CE} = 5.0 \text{ V}$ , $E_E = 0.15 \text{ mW/cm}^2$ <sup>(3)</sup> |
| $V_{CE(SAT)}$ | Collector-Emitter Saturation Voltage<br>OP500, OP501<br>OP500DA, OP501DA | -<br>-      | -<br>-   | 0.3<br>1.0 | V             | $I_C = 100 \mu\text{A}$ , $E_E = 1.0 \text{ mW/cm}^2$ <sup>(3)</sup><br>$I_C = 1 \text{ mA}$ , $E_E = 0.15 \text{ mW/cm}^2$ <sup>(3)</sup>       |
| $I_{CEO}$     | Collector-Emitter Dark Current                                           | -           | -        | 100        | nA            | $V_{CC} = 5.0 \text{ V}$ <sup>(4)</sup>                                                                                                          |
| $V_{BR(CEO)}$ | Collector-Emitter Breakdown Voltage<br>OP500, OP501<br>OP500DA, OP501DA  | 30<br>35    | -        | -          | V             | $I_C = 100 \mu\text{A}$ , $E_E = 0$                                                                                                              |
| $V_{BR(ECO)}$ | Emitter-Collector Breakdown Voltage<br>OP500, OP501<br>OP500DA, OP501DA  | 5<br>5      | -<br>-   | -<br>-     | V             | $I_E = 100 \mu\text{A}$ , $E_E = 0$<br>$I_C = 100 \mu\text{A}$ , $E_E = 0$                                                                       |
| $t_r, t_f$    | Rise and Fall Times<br>OP500, OP501<br>OP500DA, OP501DA                  | -           | 15<br>50 | -<br>60    | $\mu\text{s}$ | $I_C = 1 \text{ mA}$ , $R_L = 1\text{K}\Omega$<br>$I_C = 1 \text{ mA}$ , $R_L = 1\text{K}\Omega$                                                 |

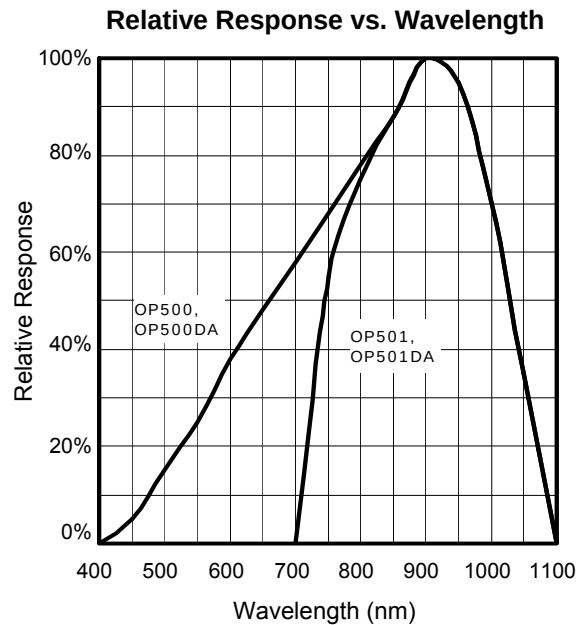
### Notes:

- Solder time less than 5 seconds at temperature extreme.
- Derate linearly at  $2.17 \text{ mW}/^\circ\text{C}$  above  $25^\circ\text{C}$ .
- 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.
- To calculate typical collector dark current in  $\mu\text{A}$ , use the formula  $I_{CEO} = 10^{(0.04 t - 3/4)}$ , where  $T_A$  is the ambient temperature in  $^\circ\text{C}$ .

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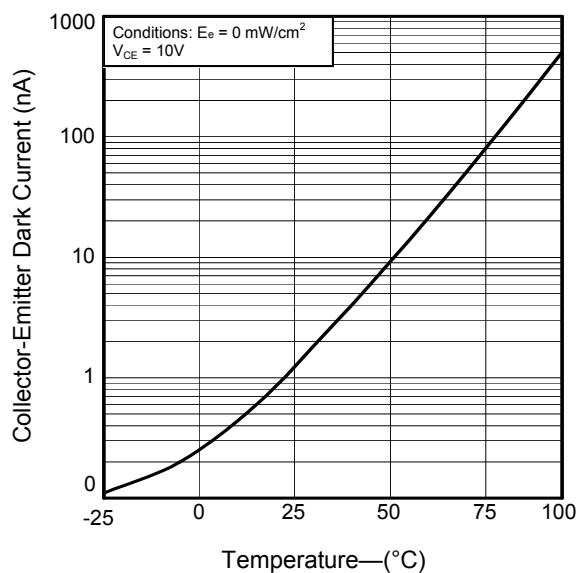
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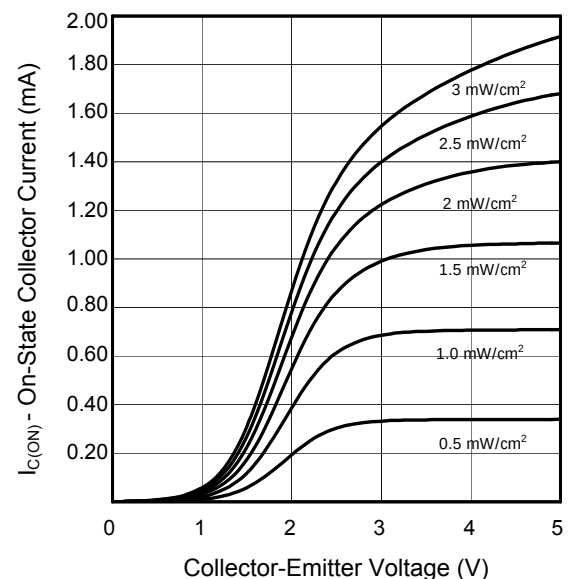


## OP500, OP501

**Collector-Emitter Dark Current  
vs. Temperature— $T_A$**



**Relative On-State Collector Current —  
 $I_C$  (mA)  
vs. Collector-Emitter Voltage— $V_{CE}$  (V)**



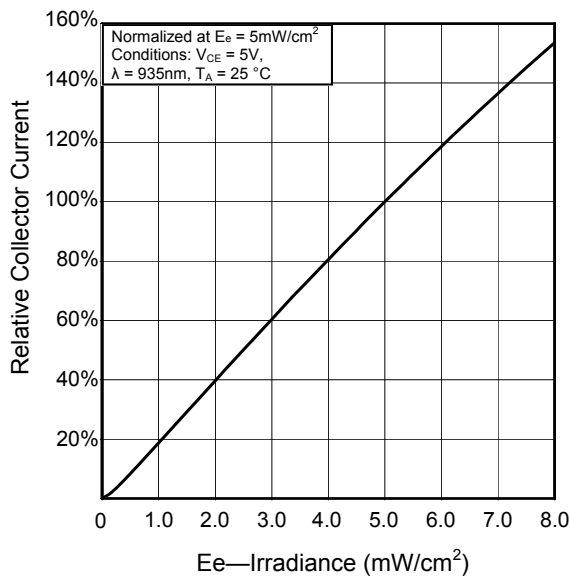
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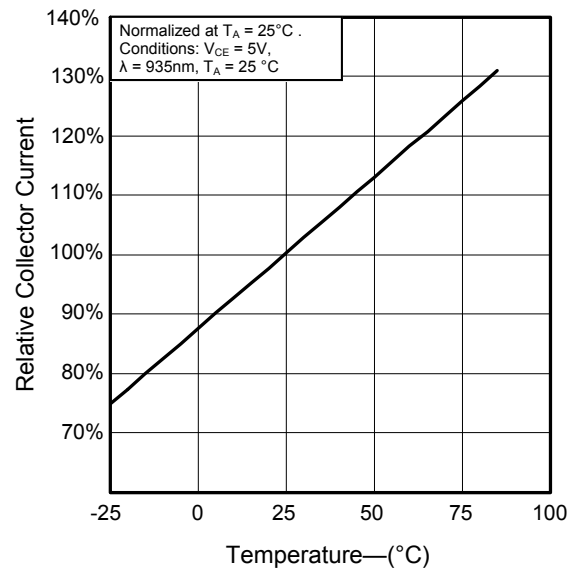


## OP500, OP501

**Relative On-State Collector Current  
vs. Irradiance— $E_e$  ( $\text{mW}/\text{cm}^2$ )**

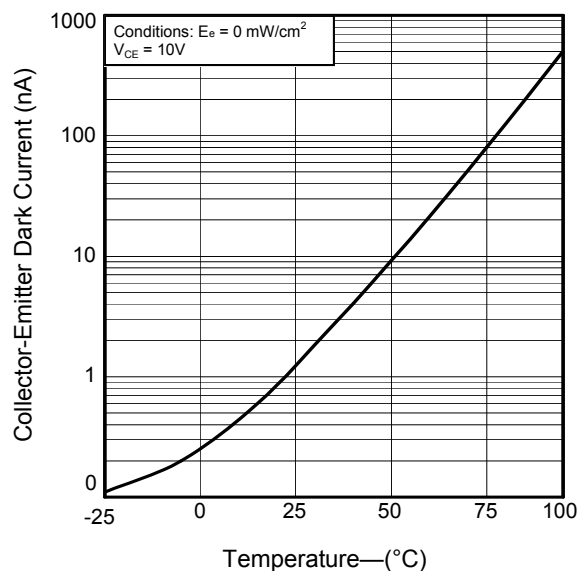


**Relative On-State Collector Current- $I_C$  (mA)  
vs. Temperature— $T_A$**

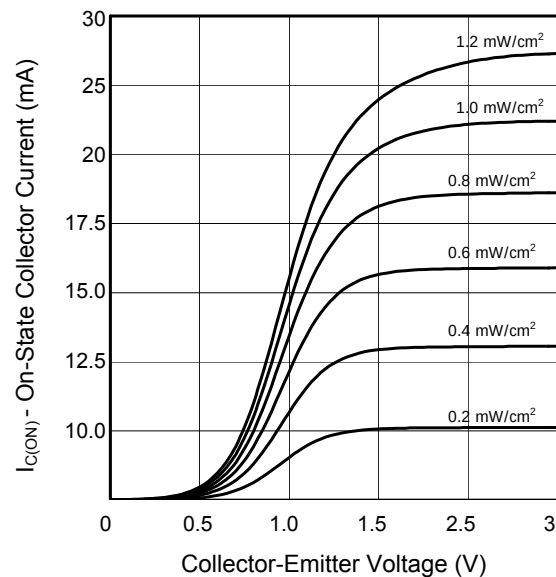


## OP500DA, OP501DA

**Collector-Emitter Dark Current  
vs. Temperature— $T_A$**



**Relative On-State Collector Current –  
 $I_C$  (mA)  
vs. Collector-Emitter Voltage— $V_{CE}$  (V)**

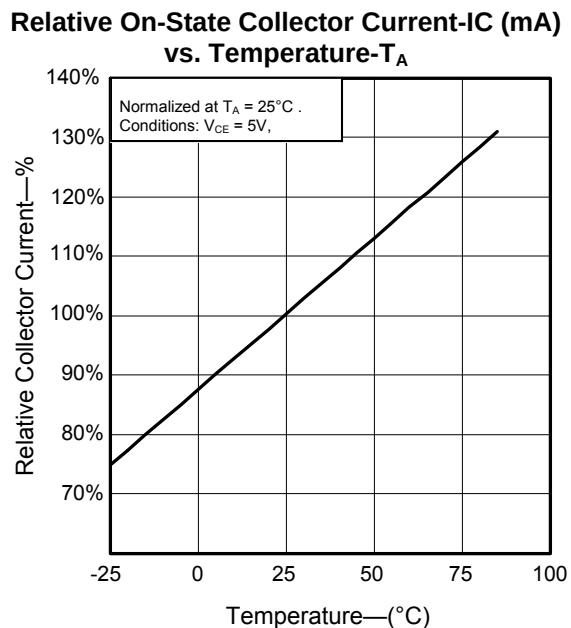
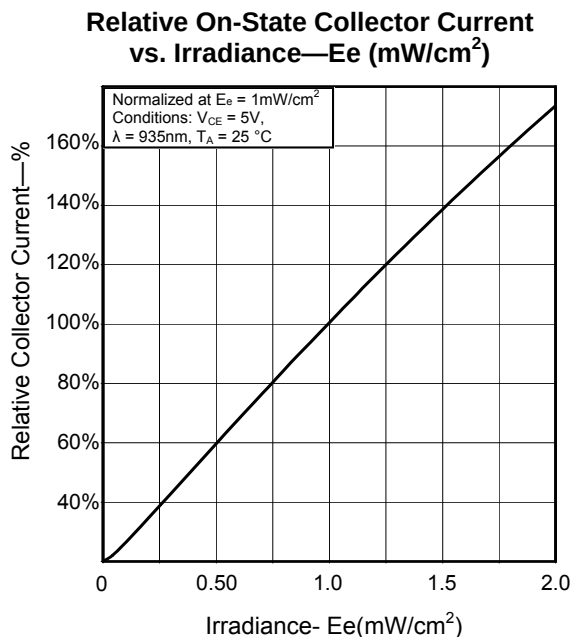


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**OP500DA, OP501DA**



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