

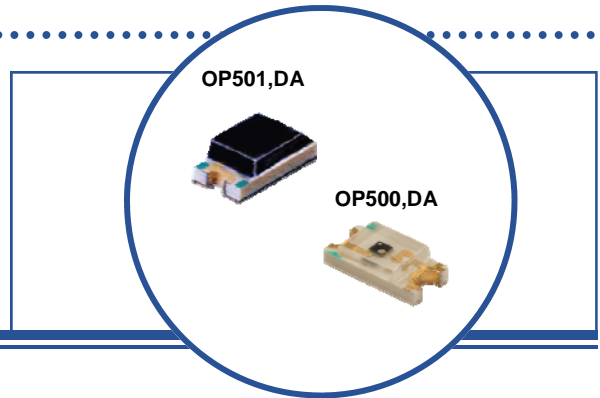
# Silicon Phototransistor and Photo Darlington in Miniature 0805 SMD Package

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.

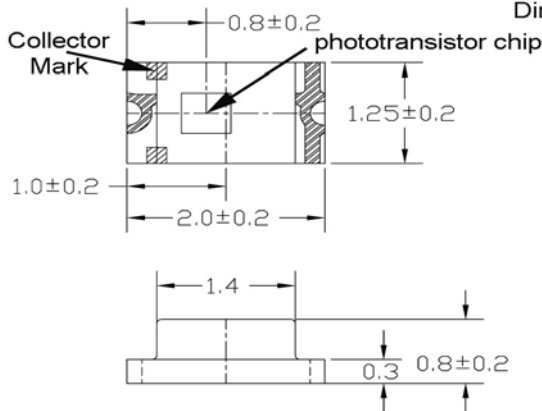
## Applications:

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

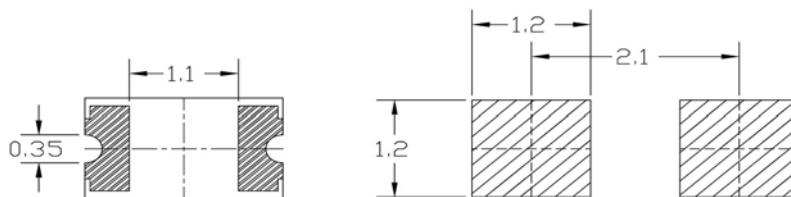
| Ordering Information |                  |               |             |
|----------------------|------------------|---------------|-------------|
| Part Number          | Sensor           | Viewing Angle | Lead Length |
| OP500                | Phototransistor  | 150°          | N/A         |
| OP501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

## OP500, OP501, OP500DA, OP501DA

Dimensions are in millimeters



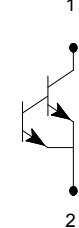
## Recommended footprint



OP500  
OP501



OP500DA  
OP501DA



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



RoHS

OPTEK reserves the right to make changes at any time in order to improve design and to supply the best product possible.

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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**

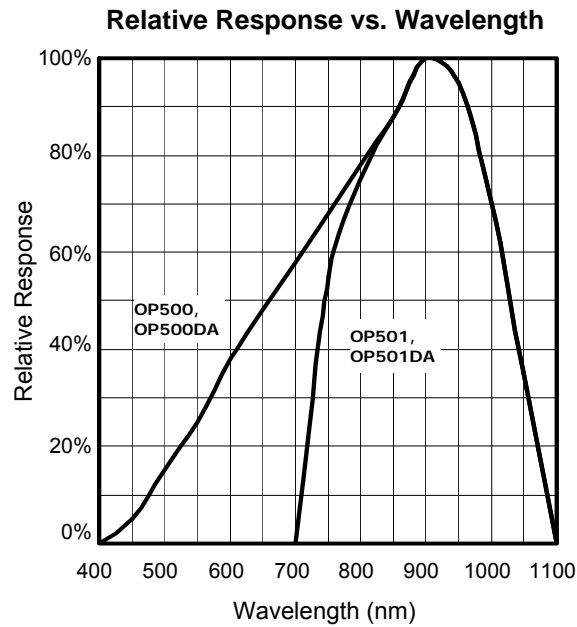
|               |  |             |          |            |               |   |
|---------------|--|-------------|----------|------------|---------------|---|
| $I_{C(ON)}$   | On-State Collector Current<br>OP500, OP501<br>OP500DA, OP501DA           | 0.1<br>10.0 | -<br>-   | -<br>-     | mA            | $V_{CE} = 5.0\text{ V}, E_E = 1.5\text{ mW/cm}^2$ <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>1.7 | 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 mW/° C above 25° 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  $I_{CEO} = 10^{(0.04 T - 3)}$ , where  $T_A$  is the ambient temperature in ° C.

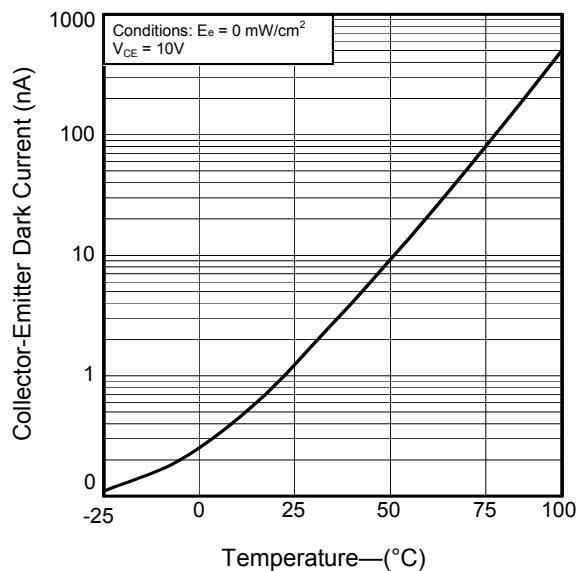
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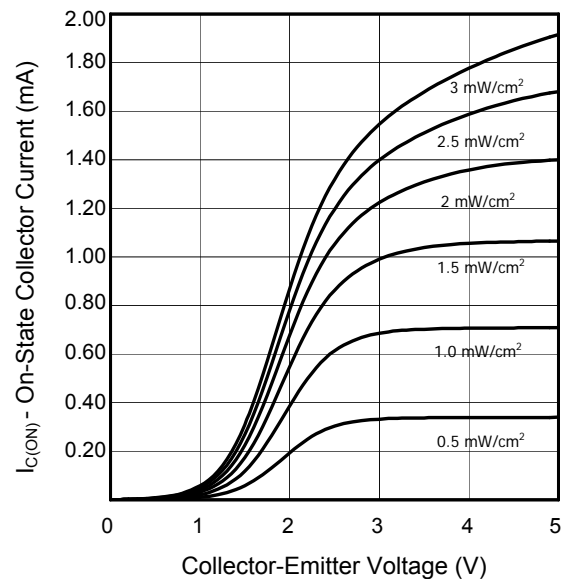


**OP500, OP501**

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



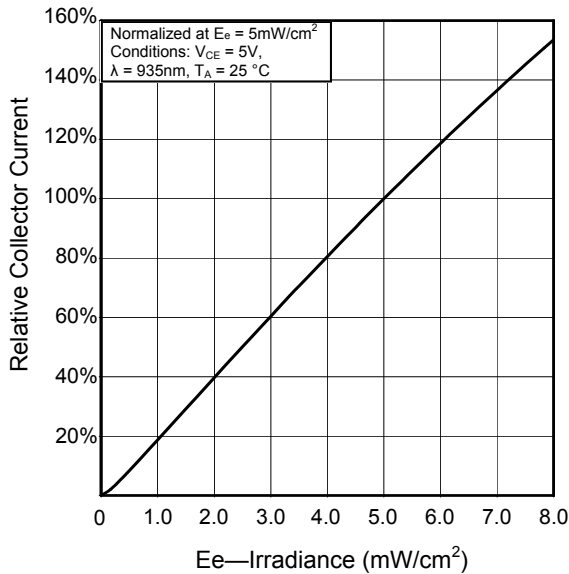
**Relative On-State Collector Current –  $I_c$  (mA) vs. Collector-Emitter Voltage— $V_{CE}$  (V)**



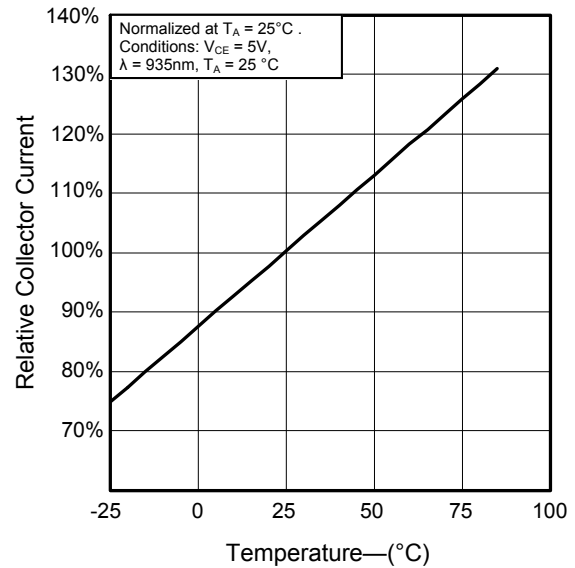
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**OP500, OP501**

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

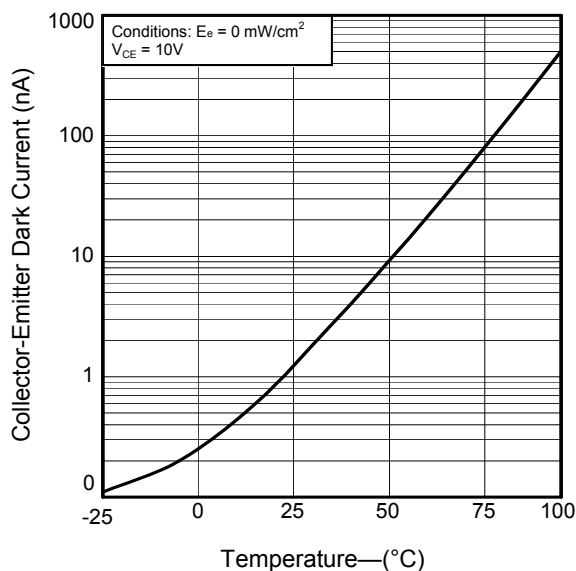


**Relative On-State Collector Current- $I_C$  (mA)  
vs. Temperature- $T_A$**

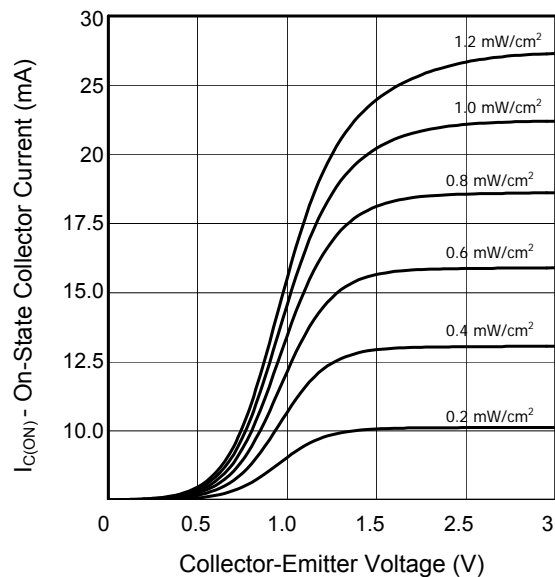


**OP500DA, OP501DA**

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



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

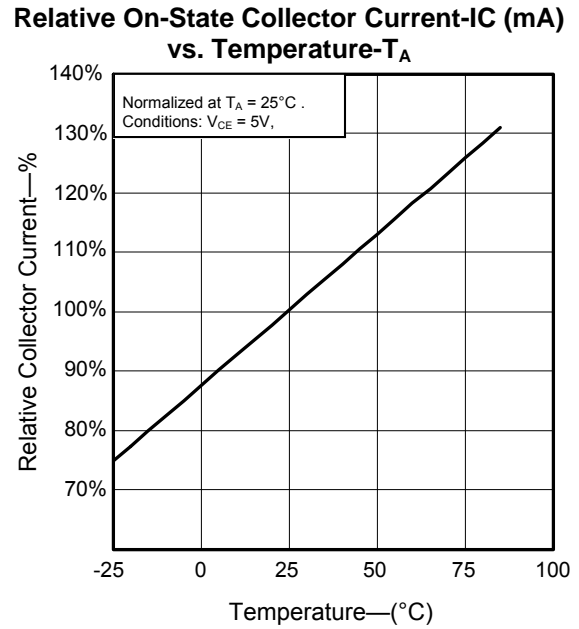
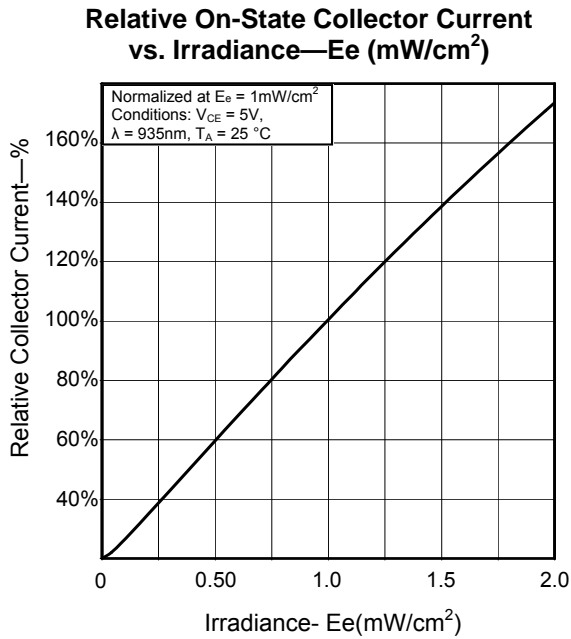


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## OP500DA, OP501DA



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