

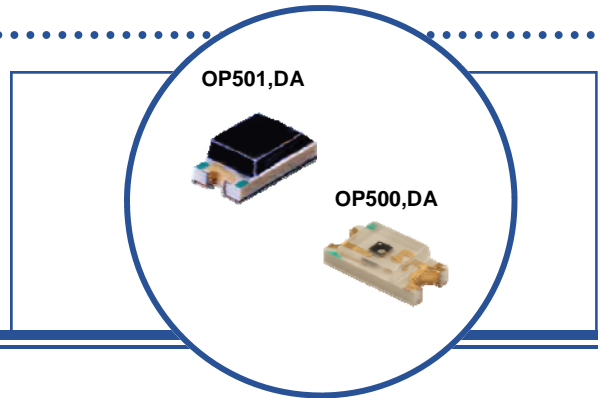
# Silicon Phototransistor and Photo Darlington in Miniature 0805 SMD Package

## 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.

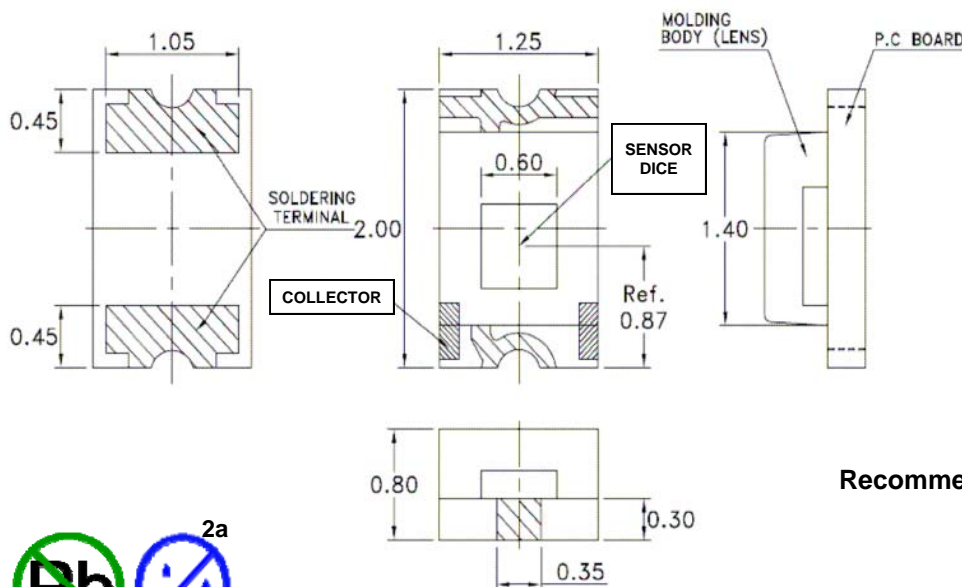
**OP500**, **OP501**, **OP500DA** and **OP501DA** are mechanically and spectrally matched to the **OP200** series infrared LEDs.

### Applications:

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

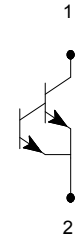
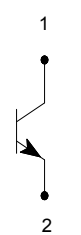
Ordering Information			
Part Number	Sensor	Viewing Angle	Lead Length
OP500	Phototransistor	150°	N/A
OP501			
OP500DA	Photo Darlington	150°	
OP501DA			

### OP500, OP501, OP500DA, OP501DA



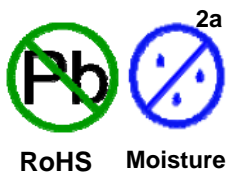
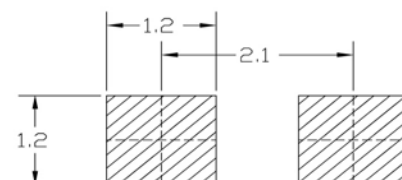
OP500  
OP501

OP500DA  
OP501DA



Pin #	Transistor
1	Collector
2	Emitter

### Recommended Solder Pad Patterns



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 OP500, OP501 OP500DA, OP501DA	30 V 35 V
Emitter-Collector Voltage	5 V
Collector Current OP500, OP501 OP500DA, OP501DA	20 mA 32 mA
Power Dissipation <sup>(2)</sup> OP500, OP501 OP500DA, OP501DA	75 mW 100 mW

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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
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**Input Diode**

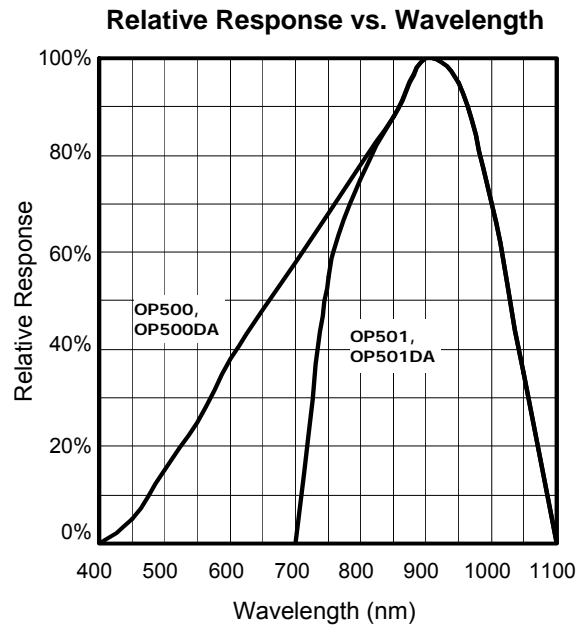
$I_{C(ON)}$	On-State Collector Current OP500, OP501 OP500DA, OP501DA	0.1 10.0	- -	- -	mA	$V_{CE} = 5.0\text{ V}, E_E = 0.15\text{ mW/cm}^2$ <sup>(3)</sup> $V_{CE} = 5.0\text{ V}, E_E = 0.15\text{ mW/cm}^2$ <sup>(3)</sup>
$V_{CE(SAT)}$	Collector-Emitter Saturation Voltage OP500, OP501 OP500DA, OP501DA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

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.

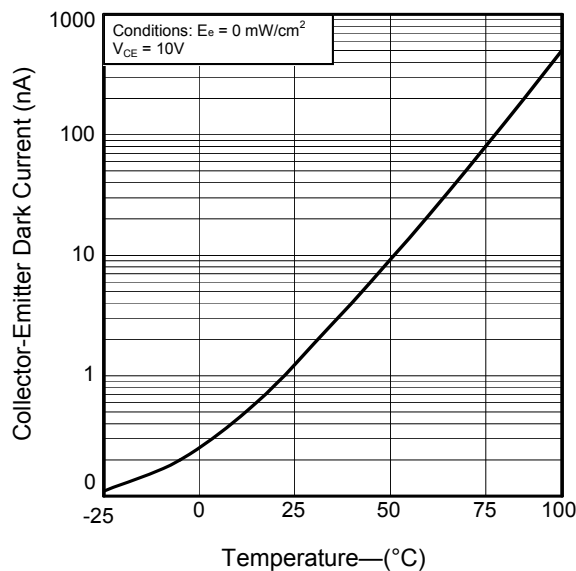
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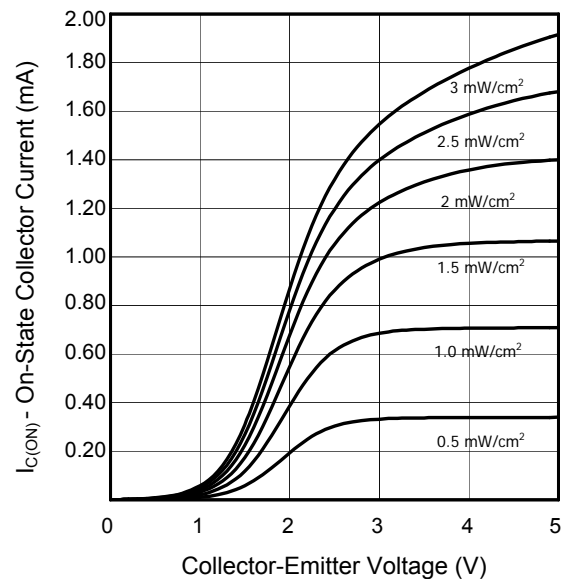


**OP500, OP501**

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



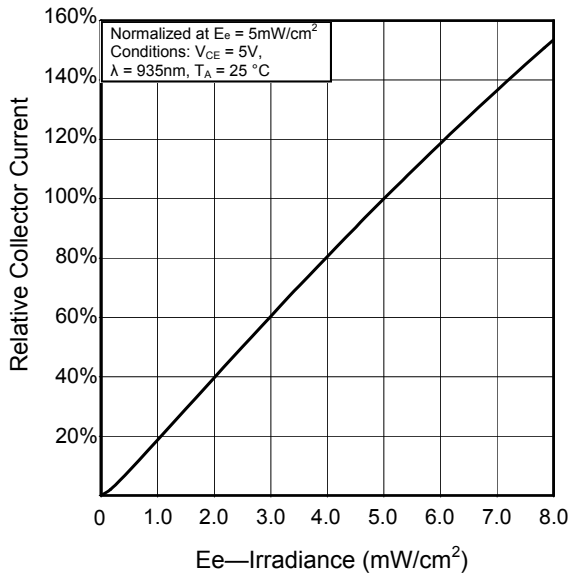
**Relative On-State Collector Current —  $I_c$  (mA) vs. Collector-Emitter Voltage— $V_{CE}$  (V)**



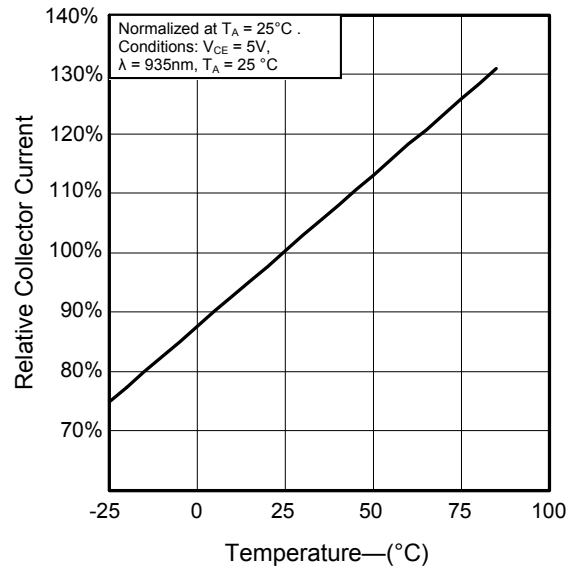
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**OP500, OP501**

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

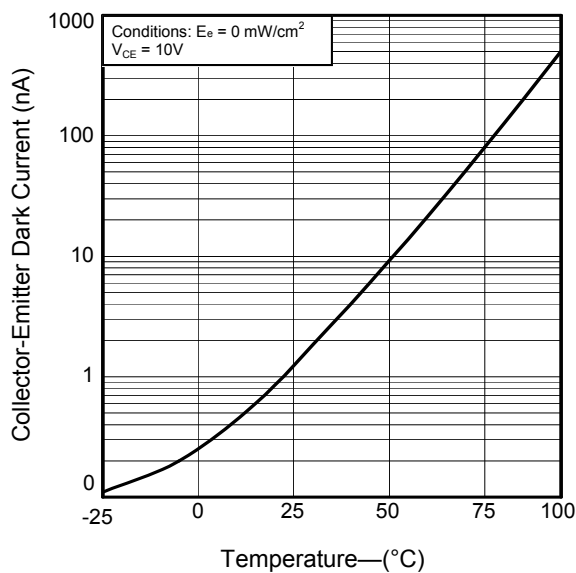


**Relative On-State Collector Current- $I_C$  (mA)  
vs. Temperature- $T_A$**

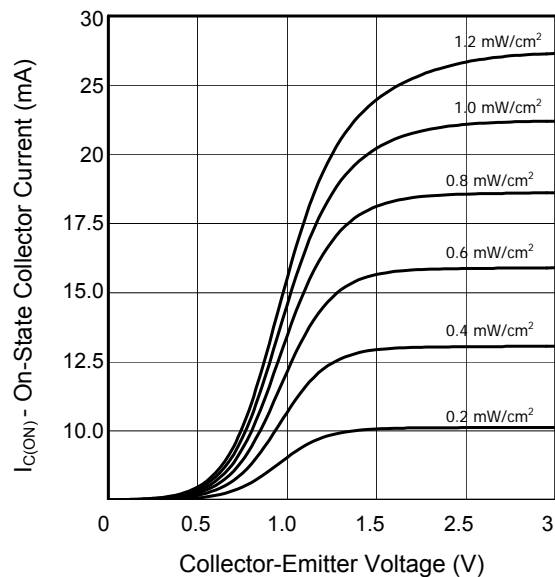


**OP500DA, OP501DA**

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



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



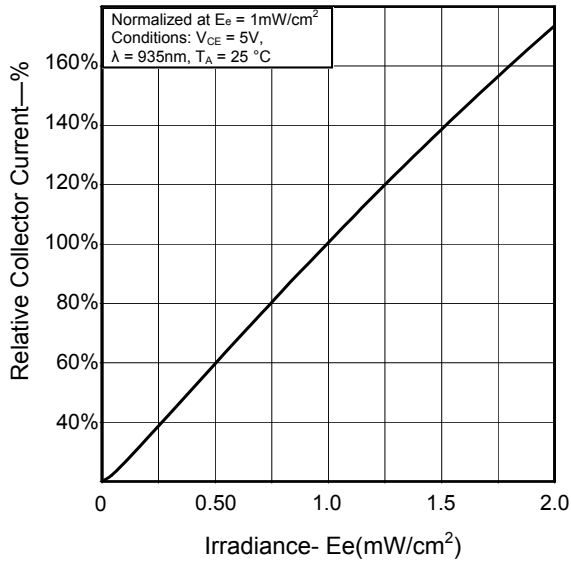
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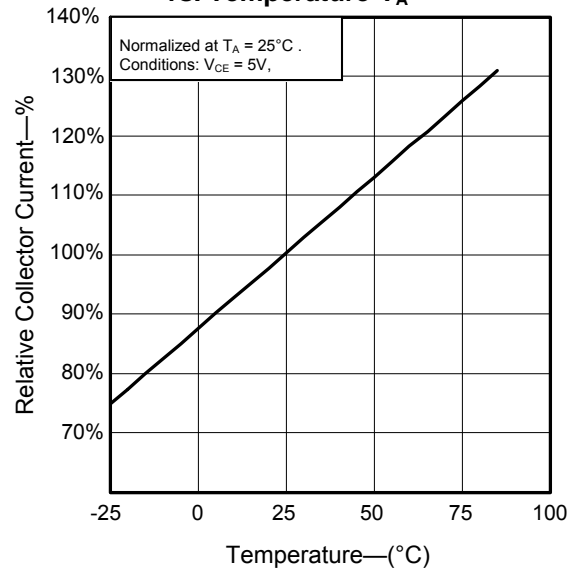


**OP500DA, OP501DA**

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



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



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