

Optoelectronics Division
TRW Electronic Components Group

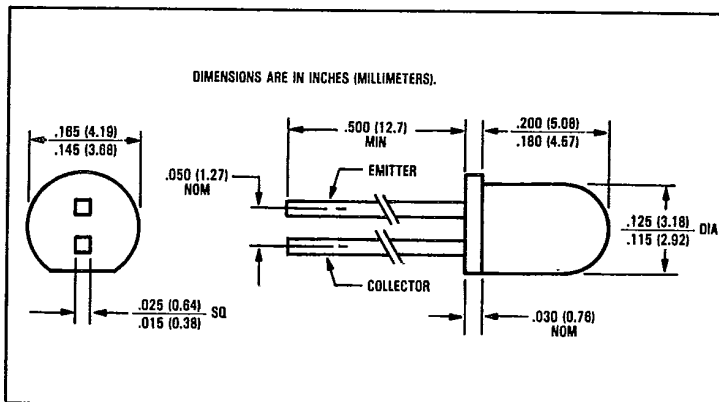
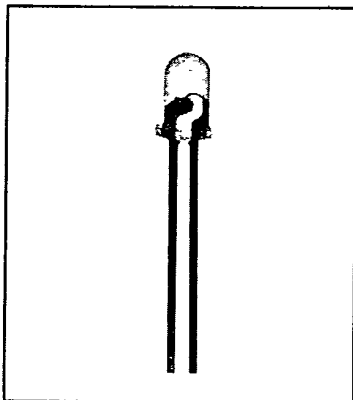
Product Bulletin 5094
January 1985

T-41-61

TRW

Infrared Selected NPN Silicon Phototransistors

Types OP500SR, OP500SRD, OP500SRC, OP500SRB, OP500SRA



Features

- Tested using infrared for close correlation to TRW infrared emitters
- Wide range of collector currents
- Lensed for high sensitivity
- Low cost plastic package

Description

The OP500SR and OP500SRD through SRA each consist 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 8° measured from the optical axis to the half power point. The series is 100% factory tested using infrared for close correlation to TRW GaAs or GaAlAs emitters and the most accurate design-in possible. This series is mechanically and spectrally matched to the OP160SL and OP260SL series of infrared emitting diodes.

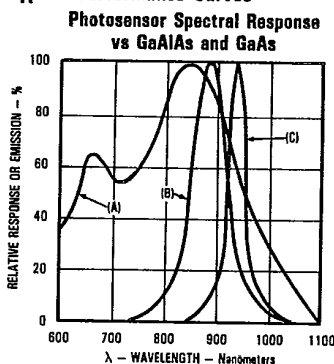
Absolute Maximum Ratings ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Collector-Emitter Voltage	30 V
Emitter-Collector Voltage	5.0 V
Storage and Operating Temperature Range	-40°C to $+100^\circ\text{C}$
Lead Soldering Temperature (1/16 inch [1.6 mm] from case for 5 sec. with soldering iron) ⁽¹⁾	240°C
Power Dissipation	100 mW ⁽²⁾

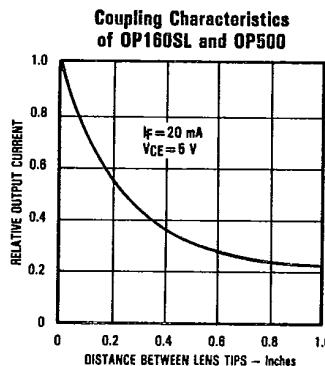
Notes:

- (1) RMA flux is recommended. Duration can be extended to 10 sec. max. when wave soldering.
- (2) Derate linearly 1.33 mW/ $^\circ\text{C}$ above 25°C .
- (3) Junction temperature maintained at 25°C .
- (4) Light source is an unfiltered GaAs LED with a peak emission wavelength of 930 nm and a radiometric intensity level which varies less than 10% over the entire lens surface of the phototransistor being tested.
- (5) To calculate typical collector dark current in μA , use the formula $I_{CE0} = 10^{10} e^{(T_A - 3.4)}$ where T_A is ambient temperature in $^\circ\text{C}$.

Typical Performance Curves



Test Conditions (LED): $T_A = T_J = 25^\circ\text{C}$, $I_f = 100\text{ mA}$,
DC = 0.1%, PW = 100 μs
Peak Wavelength - λ_p : (A) XSTR - $850 \pm 30\text{ nm}$,
(B) LED GaAlAs - $875 \pm 20\text{ nm}$,
(C) LED GaAs - $930 \pm 15\text{ nm}$



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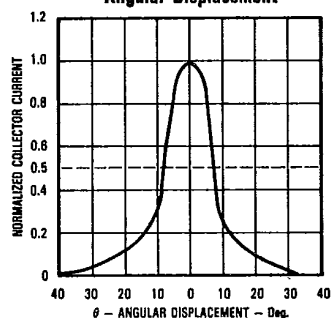
Electrical Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
$I_C(ON)^{(3)}$	On-State Collector Current	OP500SR 0.080 OP500SRD 0.080 OP500SRC 0.160 OP500SRB 0.32 OP500SRA 0.64		0.24 0.48 0.96	mA	$V_{CE} = 5.0\text{ V}$, $E_g = 0.130\text{ mW/cm}^2$ (4) $V_{CE} = 5.0\text{ V}$, $E_g = 0.130\text{ mW/cm}^2$ (4) $V_{CE} = 5.0\text{ V}$, $E_g = 0.130\text{ mW/cm}^2$ (4) $V_{CE} = 5.0\text{ V}$, $E_g = 0.130\text{ mW/cm}^2$ (4) $V_{CE} = 5.0\text{ V}$, $E_g = 0.130\text{ mW/cm}^2$ (4)
$\Delta I_C/\Delta T$	Relative I_C Changes with Temperature		1.00		%/ $^\circ\text{C}$	$V_{CE} = 5.0\text{ V}$, $E_g = 1.00\text{ mW/cm}^2$, $\lambda = 830\text{ nm}$
$I_{CE0}^{(5)}$	Collector Dark Current			100	nA	$V_{CE} = 10.0\text{ V}$, $E_g = 0$
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage	30			V	$I_C = 100\text{ }\mu\text{A}$
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage	5.0			V	$I_E = 100\text{ }\mu\text{A}$
$V_{CE(SAT)}^{(3)}$	Collector-Emitter Saturation Voltage		0.50		V	$I_C = 50\text{ }\mu\text{A}$, $E_g = 0.130\text{ mW/cm}^2$ (4), $\lambda = 830\text{ nm}$

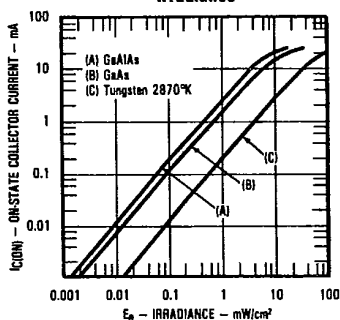
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Typical Performance Curves

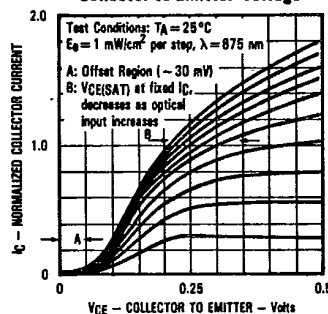
Normalized Collector Current vs Angular Displacement



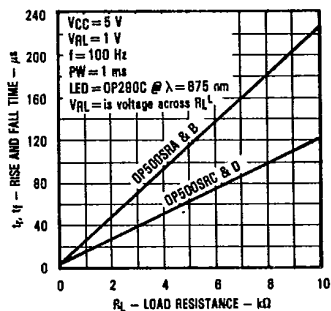
On-State Collector Current vs Irradiance



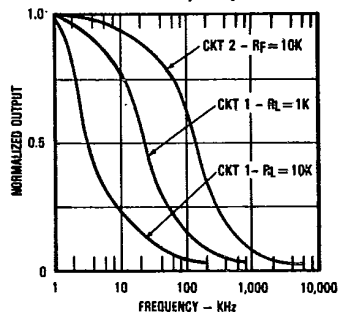
Normalized Collector Current vs Collector-to-Emitter Voltage



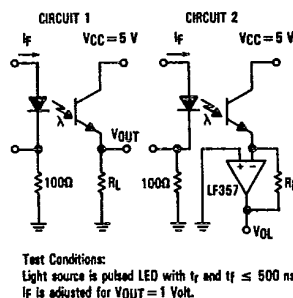
Rise and Fall Time vs Load Resistance



Normalized Output vs Frequency



Switching Time Test Circuit



TRW 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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