

Optoelectronics Division
TRW Electronic Components Group

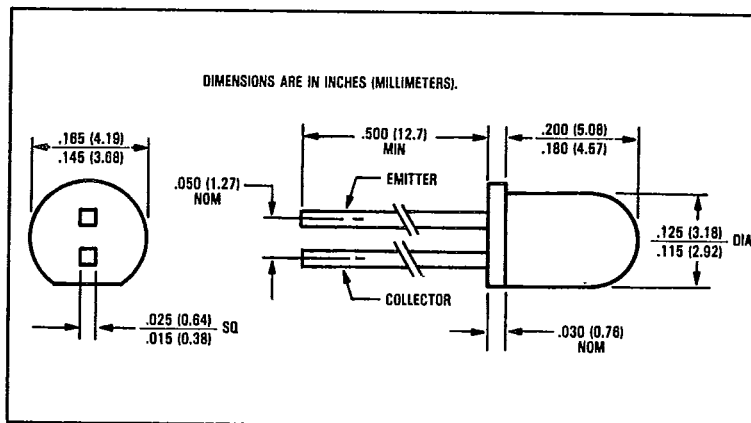
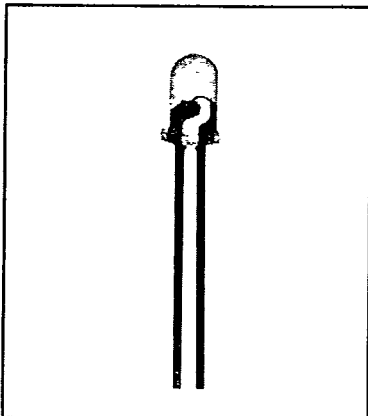
Product Bulletin 5094
January 1985

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)

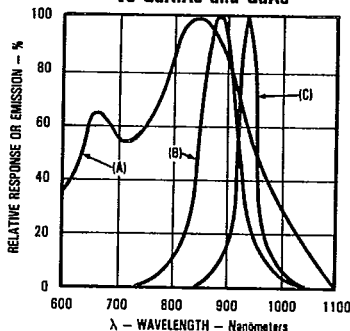
Collector-Emitter Voltage	30 V
Emitter-Collector Voltage	5.0 V
Storage and Operating Temperature Range	-40°C to $+100^\circ\text{C}$
Lead Soldering Temperature (1/16 inch [1.6 mm] from case for 5 sec. with soldering iron) ⁽¹⁾	240°C
Power Dissipation	100 mW ⁽²⁾

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 830 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 $I_{CE0} = 10^{10} 0.40 T_A^{-3.4}$ where T_A is ambient temperature in $^\circ\text{C}$.

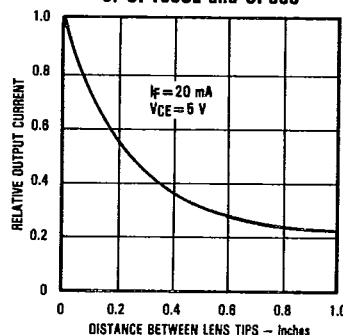
Typical Performance Curves

Photosensor Spectral Response vs GaAlAs and GaAs



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 - $830 \pm 15\text{ nm}$

Coupling Characteristics of OP160SL and OP500



Types OP500SR, OP500SRD, OP500SRC, OP500SRB, OP500SRA

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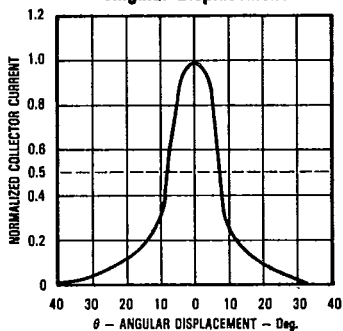
Electrical Characteristics (TA = 25°C unless otherwise noted)

Symbol	Parameter	Min.	Typ.	Max.	Units	Test Conditions
IC(ON) ⁽¹⁾	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	VCE = 5.0 V, Ea = 0.130 mW/cm ² (4) VCE = 5.0 V, Ea = 0.130 mW/cm ² (4) VCE = 5.0 V, Ea = 0.130 mW/cm ² (4) VCE = 5.0 V, Ea = 0.130 mW/cm ² (4) VCE = 5.0 V, Ea = 0.130 mW/cm ² (4)
ΔIC/ΔT	Relative IC Changes with Temperature		1.00		%/°C	VCE = 5.0 V, Ea = 1.00 mW/cm ² , λ = 830 nm
ICEO ⁽⁶⁾	Collector Dark Current			100	nA	VCE = 10.0 V, Ea = 0
V(BR)CEO	Collector-Emitter Breakdown Voltage	30			V	IC = 100 μA
V(BR)ECO	Emitter-Collector Breakdown Voltage	5.0			V	IE = 100 μA
VCE(SAT) ⁽³⁾	Collector-Emitter Saturation Voltage			0.50	V	IC = 50 μA, Ea = 0.130 mW/cm ² (4), λ = 830 nm

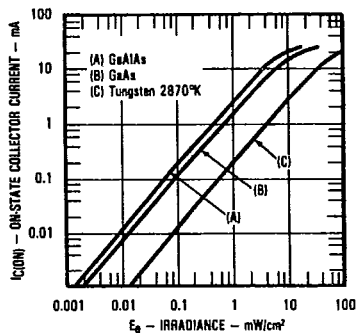
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Typical Performance Curves

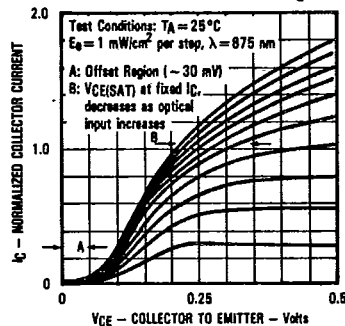
Normalized Collector Current vs Angular Displacement



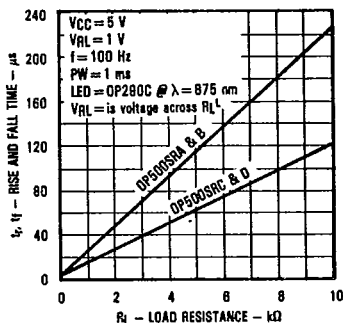
On-State Collector Current vs Irradiance



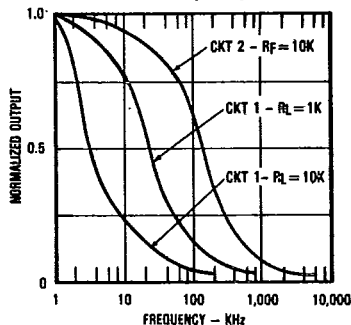
Normalized Collector Current vs Collector-to-Emitter Voltage



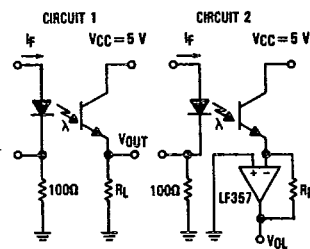
Rise and Fall Time vs Load Resistance



Normalized Output vs Frequency



Switching Time Test Circuit



Test Conditions:
Light source is pulsed LED with tr and tf ≤ 500 ns.
If is adjusted for VOUT = 1 Volt.

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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