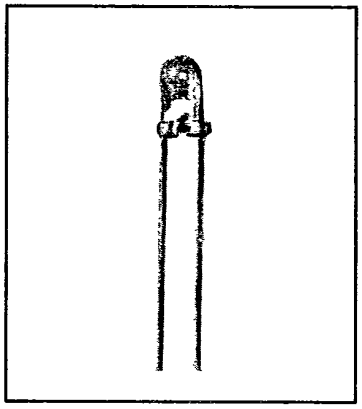
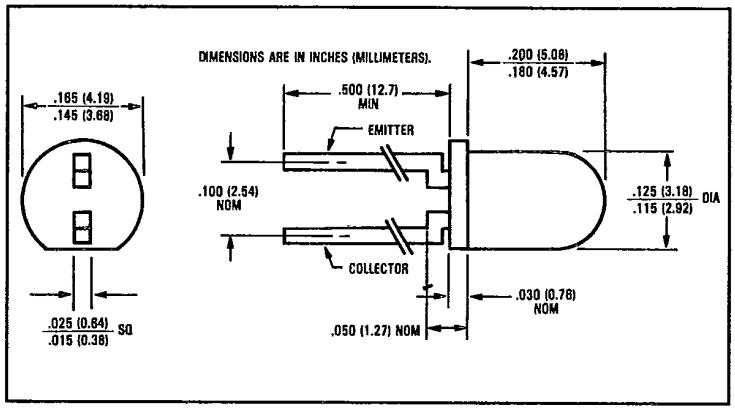
Optoelectronics Division
TRW Electronic Components Group

Product Bulletin 5097
January 1985

NPN Silicon Phototransistors
Types OP501, OP501SLD, OP501SLC, OP501SLB, OP501SLA





Features
- 0.100" (2.54 mm) lead spacing
- Wide range of collector currents
- Lensed for high sensitivity

Description
The OP501 and OP501SLD through SLA 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. This series is identical to the OP500 except for lead spacing. It is mechanically and spectrally matched to the OP160SL and OP161SL series of infrared emitting diodes.

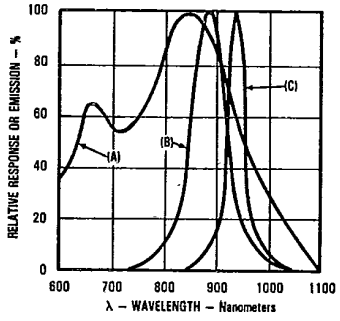
Absolute Maximum Ratings (T_A = 25°C unless otherwise noted)

Collector-Emitter Voltage	30 V
Emitter-Collector Voltage	5.0 V
Storage and Operating Temperature Range	−40°C to +100°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/°C above 25°C.
(3) Junction temperature maintained at 25°C.
(4) Light source is an unfiltered tungsten bulb operating at CT = 2870°K or equivalent infrared source.
(5) To calculate typical collector dark current in μA, use the formula $I_{CEO} = 10^{(0.040\,T_A - 3.4)}$ where T_A is ambient temperature in °C.

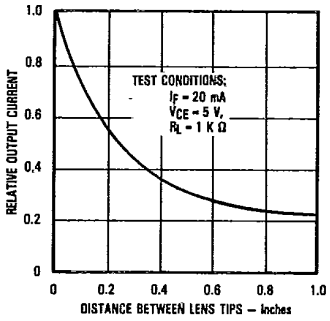
Typical Performance Curves

Photosensor Spectral Response vs. GaAlAs and GaAs



Test Conditions (LED): $T_A = T_J = 25°C$, I_F = 100 mA, DC = 0.1%, PW = 100 μs
Peak Wavelength – λpt: (A) XSTR – 850 ± 30 nm, (B) LED GaAlAs – 875 ± 20 nm, (C) LED GaAs – 930 ± 15 nm

Coupling Characteristics of OP161SL and OP501



Types OP501, OP501SLD, OP501SLC, OP501SLB, OP501SLA

T-41-61

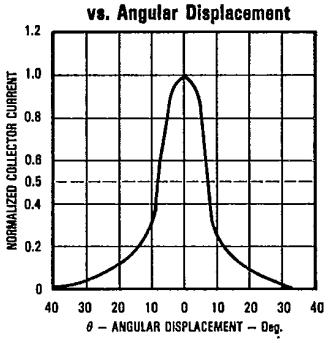
Electrical Characteristics (T_A = 25°C unless otherwise noted)

Symbol	Parameter		Min.	Typ.	Max.	Units	Test Conditions
$I_{C(ON)}$[3]	On-State Collector Current	OP501	4.0			mA	V_{CE} = 5.0 V, E_e = 20 mW/cm²[4]
		OP501SLD	10.0		24	mA	V_{CE} = 5.0 V, E_e = 20 mW/cm²[4]
		OP501SLC	17.0		35	mA	V_{CE} = 5.0 V, E_e = 20 mW/cm²[4]
		OP501SLB	25		50	mA	V_{CE} = 5.0 V, E_e = 20 mW/cm²[4]
		OP501SLA	40			mA	V_{CE} = 5.0 V, E_e = 20 mW/cm²[4]
$\Delta I_C/\Delta T$	Relative I_C Changes with Temperature			1.00		%/°C	V_{CE} = 5.0 V, E_e = 1.00 mW/cm², λ = 875 nm
I_{CEO}[5]	Collector Dark Current				100	nA	V_{CE} = 10.0 V, E_e = 0
$V_{(BR)CEO}$	Collector-Emitter Breakdown Voltage		30			V	I_C = 100 μA
$V_{(BR)ECO}$	Emitter-Collector Breakdown Voltage		5.0			V	I_E = 100 μA
$V_{CE(SAT)}$[3]	Collector-Emitter Saturation Voltage				0.40	V	I_C = 500 μA, E_e = 20 mW/cm²[4]

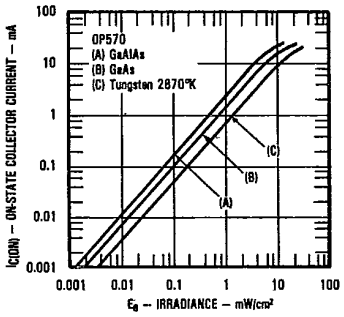
D

Typical Performance Curves

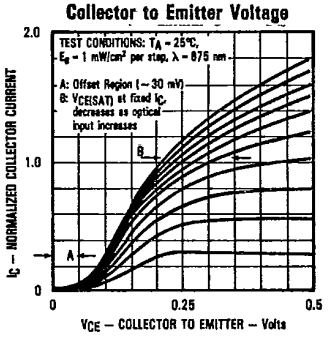
Normalized Collector Current vs. Angular Displacement



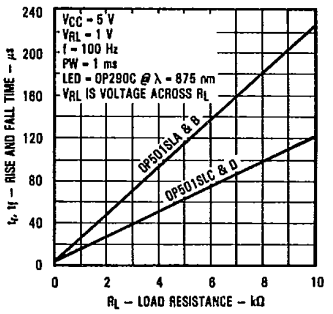
On-State Collector Current vs. Irradiance



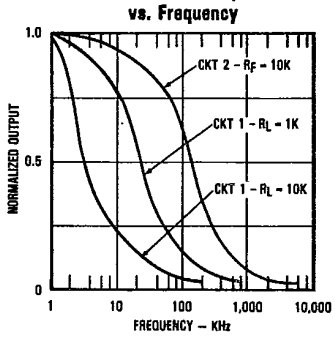
Normalized Collector Current vs. Collector to Emitter Voltage



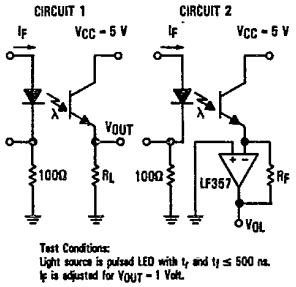
Rise and Fall Time vs. Load Resistance



Normalized Output vs. Frequency



Switching Time Test Circuit



Test Conditions:
Light source is pulsed LED with t_r and $t_f \leq$ 500 ns.
I_F is adjusted for V_{OUT} = 1 Volt.

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

Optoelectronics Division, TRW Electronic Components Group, 1215 W. Crosby Rd., Carrollton, TX 75006 (214) 323-2200, TLX 6716032 or 215849
© TRW Inc. 1985, 1982. TRW is the name and mark of TRW Inc.
Printed in U.S.A.