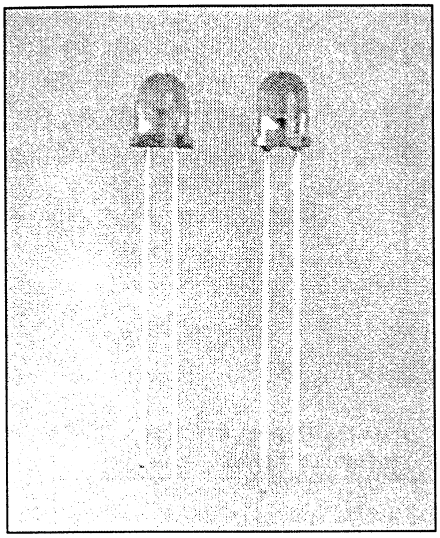
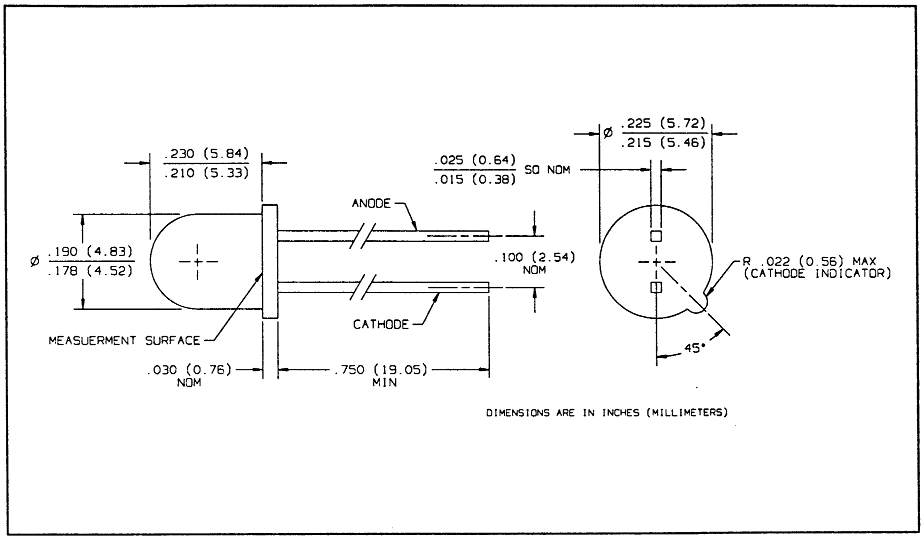
Product Bulletin OP293
June 1996

OPTEK

GaAlAs Plastic Infrared Emitting Diodes
Types OP293 and OP298 Series





Features

- Wide irradiance pattern (OP293 series)
- Narrow irradiance pattern (OP298 series)
- Mechanically and spectrally matched to the OP593 and OP598 series phototransistors
- Variety of power ranges
- Significantly higher power output than GaAs at equivalent drive currents
- Wavelength matched to silicon's peak response
- Low cost replacement for TO-46 hermetic package

Description

The OP293 and OP298 series devices are 890nm high intensity gallium aluminum arsenide infrared emitting diodes molded in IR transmissive packages. The broad irradiance pattern of the OP293 series provides relatively even illumination over a large area. The OP298 series is focused with an emission angle of 25°.

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

Reverse Voltage . . . . 2.0 V
Continuous Forward Current, Free Air . . . . 100 mA[2]
Continuous Forward Current, Board Mounted . . . . 133 mA[3]
Continuous Forward Current, Full Heat Sink . . . . 200 mA[4]
Peak Forward Current (25 µs pulse width) . . . . 2.0 A
Maximum Duty Cycle (250 µs pulse width, @ 2 A). 5.0%
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] . . . . 260° C[1]
Power Dissipation, Free Air. . . . . 142 mW[2]
Power Dissipation, Board Mounted. . . . . 200 mW[3]
Power Dissipation, Full Heat Sink . . . . 400 mW[4]

Notes:
(1) RMA flux is recommended. Duration can be extended to 10 sec max. when flow soldering. Max. 20 grams force may be applied to the leads when soldering.
(2) Measured in Free-Air. Derate power dissipation linearly 1.43 mW/° C above 25° C.
(3) Mounted on 1/16" (1.6 mm) thick PC board with each lead soldered through 80 mil square lands 0.250" (6.35 mm) below flange of device. Derate power dissipation linearly 2.00 mW/° C above 25° C. (Normal Use)
(4) Immersed in silicone fluid to simulate infinite heat sink. Derate power dissipation linearly 2.50 mW/° C above 25° C.
(5) Measurement is taken at the end of a single 100 µs pulse. Heating due to increased pulse rate or pulse width will cause a decrease in reading.
(6) $E_{e(APT)}$ is a measurement of the average apertured radiant energy incident upon a sensing area 0.250" (6.35 mm) in diameter perpendicular to and centered on the mechanical axis of the lens and 0.420" (10.7 mm) from the measurement surface. $E_{e(APT)}$ is not necessarily uniform within the measured area.
(7) Typical Total Power Out (P_O) @ I_F = 100 mA pulsed on OP293C = 13 mW; OP293B = 18 mW; OP293A = 22 mW.
(8) $E_{e(APT)}$ is a measurement of the average apertured radiant energy incident upon a sensing area 0.250" (6.5 mm) in diameter perpendicular to and centered on the mechanical axis of the lens and 1.429" (36.30 mm) from the measurement surface. $E_{e(APT)}$ is not necessarily uniform within the measured area.
(9) For press fit, drill 0.184 ± 0.001" diameter hole.
(10) This dimension is held to within ± 0.005" on the flange edge and may vary ± 0.020" in the area of the leads.
(11) Cathode lead is 0.070" nom shorter than anode lead.

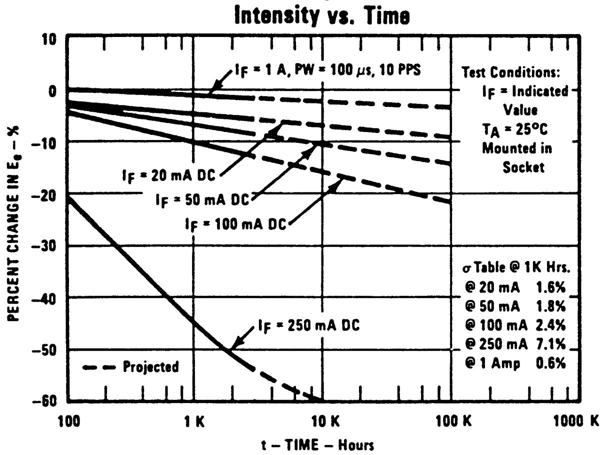
Types OP293 and OP298 Series

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

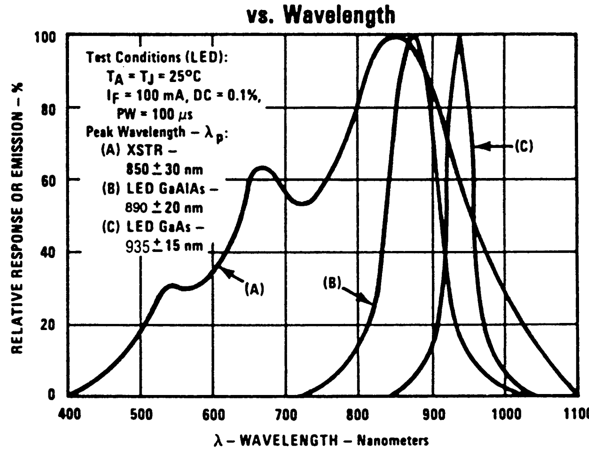
SYMBOL	PARAMETER		MIN	TYP	MAX	UNITS	TEST CONDITIONS
$E_{e(APT)}$	Apertured Radiant Incidence	OP293C	10			mW/cm²	I_F = 100 mA(5)(6)(7)
	*OP293 is measured with a 30°	OP293B	13		26	mW/cm²	I_F = 100 mA(5)(6)(7)
	cone angle at 0.420" (10.67 mm)	OP293A	16			mW/cm²	I_F = 100 mA(5)(6)(7)
		OP298C	1.8			mW/cm²	I_F = 100 mA(5)(6)(7)
	*OP298 is measured with a 10°	OP298B	2.4		4.8	mW/cm²	I_F = 100 mA(5)(6)(7)
	cone angle at 1.429" (36.30 mm)	OP298A	3.0			mW/cm²	I_F = 100 mA(5)(6)(7)
V_F	Forward Voltage				2.0	V	I_F = 1.50 A(5)
I_R	Reverse Current				100	µA	V_R = 2 V
λp	Wavelength at Peak Emission			890		nm	I_F = 10 mA
B	Spectral Bandwidth Between Half Power Points			80		nm	I_F = 10 mA
$\Delta\lambda p/\Delta T$	Spectral Shift with Temperature			+0.18		nm/° C	I_F = Constant
θ_{HP}	Emission Angle at Half Power Points	OP293		60		Deg.	I_F = 20 mA
		OP298		25		Deg.	I_F = 20 mA
t_r	Output Rise Time			500		ns	$I_{F(PK)}$ = 100 mA,
t_f	Output Fall Time			250		ns	PW = 10 µs, D.C. = 10%

Typical Performance Curves

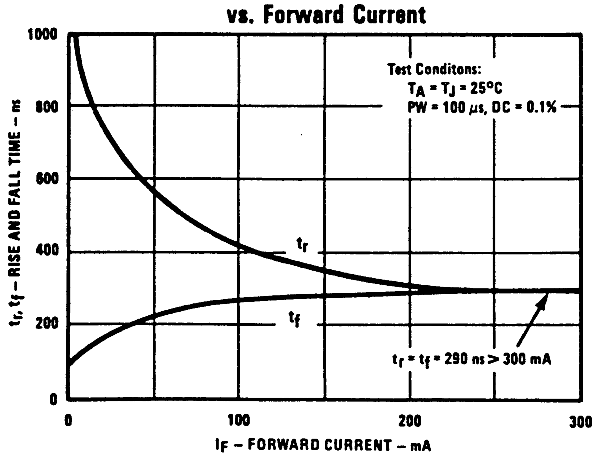
Percent Change in Radiant Intensity vs. Time



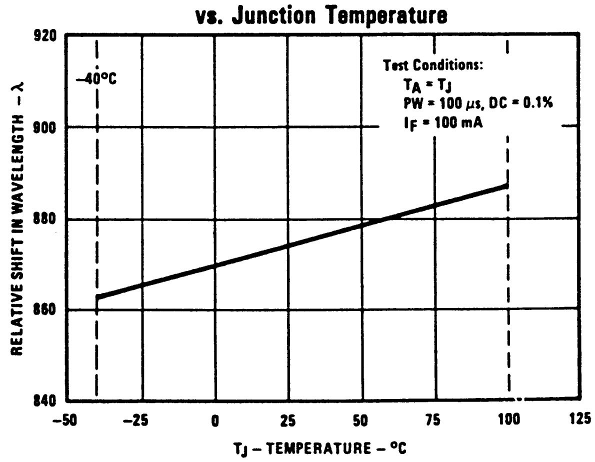
Spectral Response and Emission vs. Wavelength



Rise and Fall Time vs. Forward Current

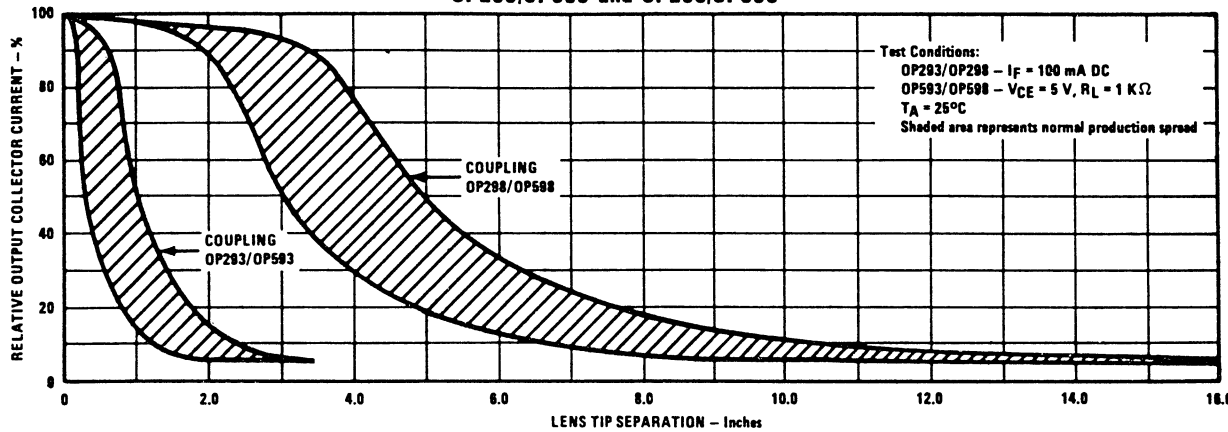


Shift in Peak Wavelength vs. Junction Temperature

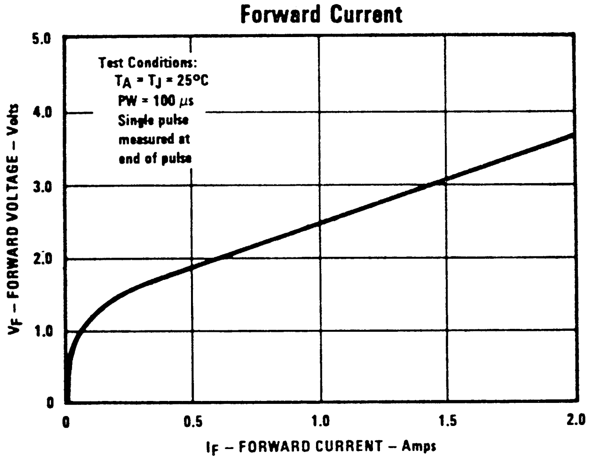


Typical Performance Curves

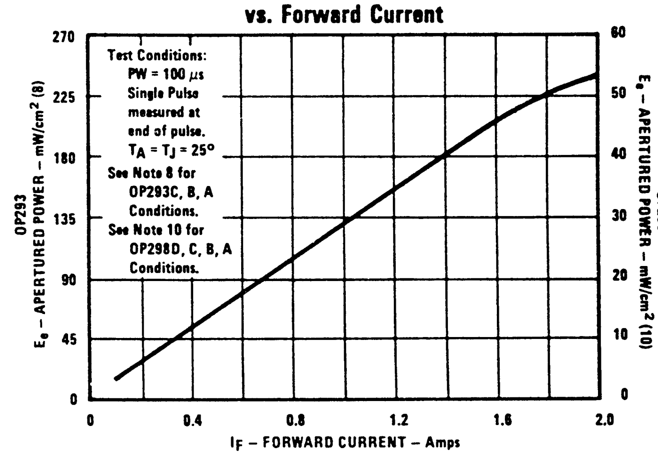
Coupling Characteristics of OP293/OP593 and OP298/OP598



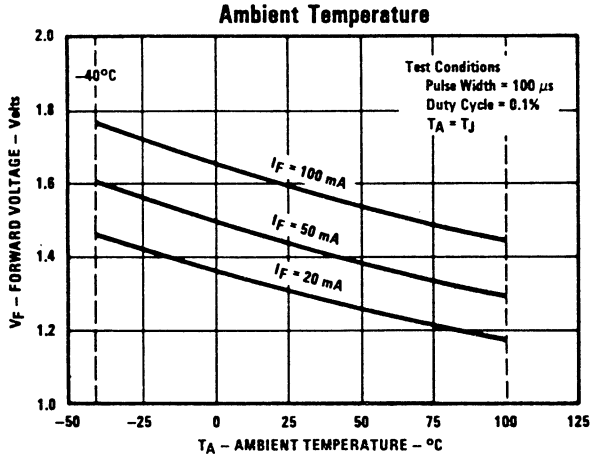
Forward Voltage vs. Forward Current



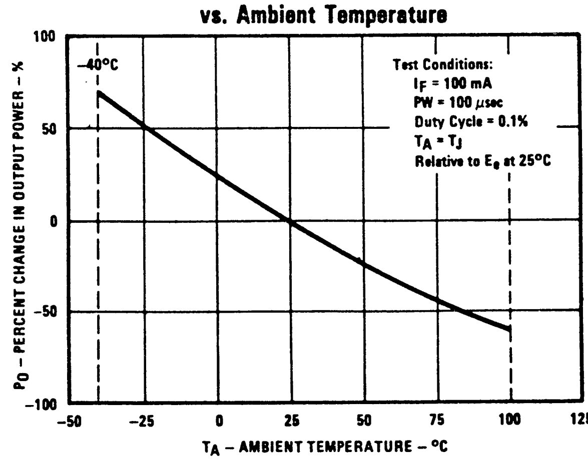
Apertured Power OP293/OP298 vs. Forward Current



Forward Voltage vs. Ambient Temperature

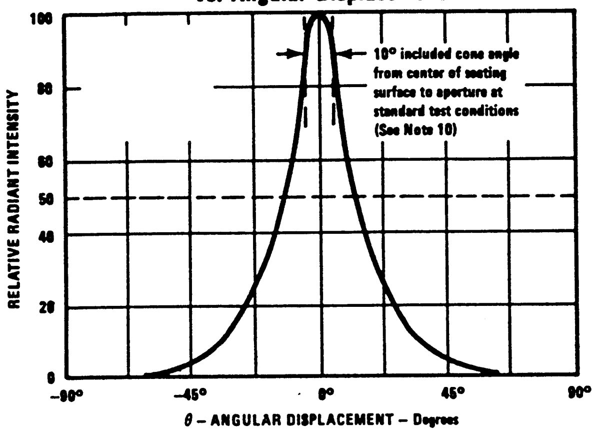


Percent Change in Power Output vs. Ambient Temperature

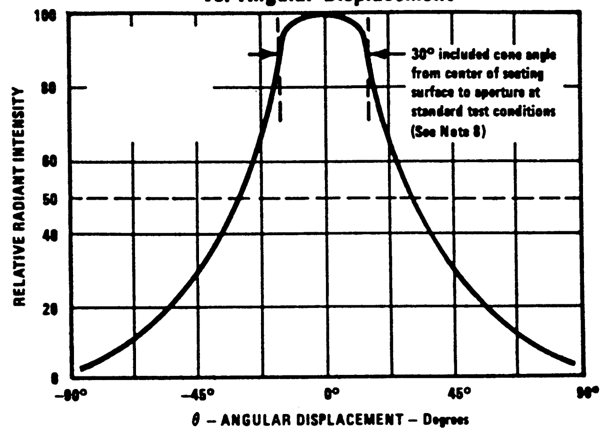


Typical Performance Curves

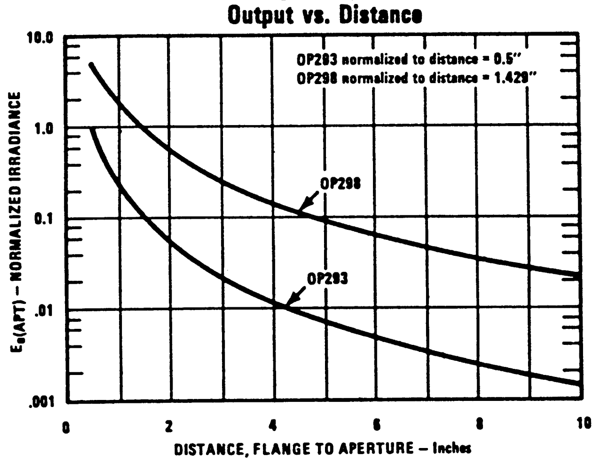
OP298 – Relative Radiant Intensity vs. Angular Displacement



OP293 – Relative Radiant Intensity vs. Angular Displacement



Percent Change in Apertured Power Output vs. Distance



Thermal Parameters

Type Units	R_{THJA} (°C/W)			C_{TH}	τ_{TH}	K
	Free Air(1)	Normal(2)	Infinite Heat Sink(3)	(10^{-5} Ws/°C)	(10^{-2} s)	
All	700	500	250	4.0	1.5	0.008

Notes:

(1) Heat transfer minimized by holding unit in still air with minimum heat transferred through leads by conduction.

(2) Unit mounted in double sided printed circuit board 0.250 inches (6.35 mm) below plastic. The land areas are 0.080 inches square. This simulates normal use.

(3) Unit immersed in circulating silicone fluid holding T_{CASE} @ 25°C. This simulates an infinite heat sink.

Refer to Application Bulletin 200 for use of these constants.