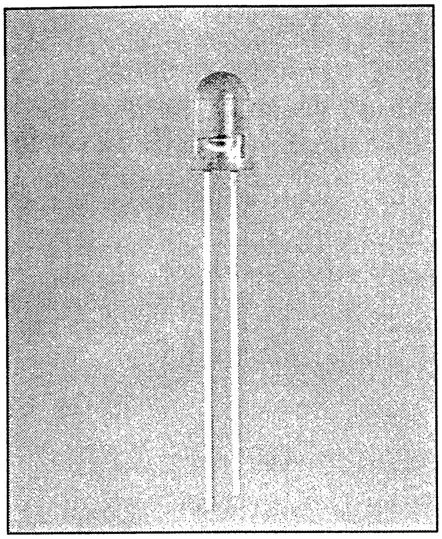
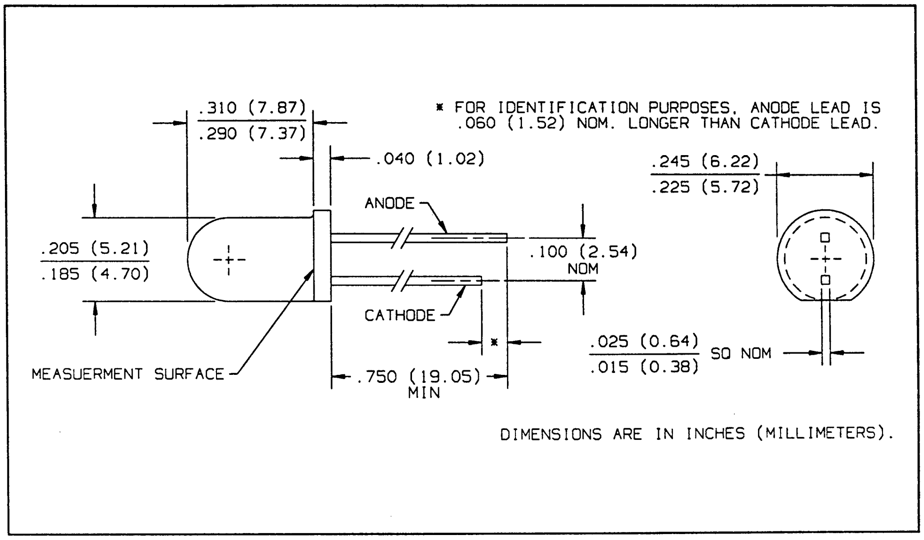
OPTEK

Product Bulletin OP295
June 1996

GaAlAs Plastic Infrared Emitting Diodes
Types OP295, OP296, OP297 Series





Features

- Narrow irradiance pattern
- Significantly higher power output than GaAs at equivalent drive currents
- Wavelength matched to silicon's peak response
- Excellent heat dissipation
- UL recognized, File No. S2047
- T-1 3/4 package style

Description

The OP295, OP296, and OP297 are gallium aluminum arsenide infrared emitting diodes mounted in IR transmissive plastic packages. The OP295 is specified under pulse conditions to 1.5 amps and can be used up to 5 amps. The OP296 is specified under pulse conditions to 100mA and is intended for use as a low cost plastic replacement for TO-46 hermetic units. The OP297 is specified under pulse conditions to 20mA and is intended for use in low current applications. The wavelength is centered at 890 nm and closely matches the spectral response of silicon phototransistors. Each of these unit types are categorized into three ranges of apertured power output. They are also completely characterized for ease of system design. Silver-copper lead frames offer excellent thermal characteristics.

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

Reverse Voltage OP295 . . . . 5.0 V
OP296 . . . . 2.0 V
OP297 . . . . 5.0 V
Continuous Forward Current . . . . 150 mA[1]
Peak Forward Current OP295 (25 µs pulse width) . . . . 5.0 A
OP296 (100 µs pulse width) . . . . 2.0 A
OP297 (100 µs pulse width) . . . . 1.0 A
Maximum Duty Cycle OP295 (25 µs pulse width, @ 5 A) . . . . 1.25%[2]
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[3]
Power Dissipation, Free Air . . . . 333 mW[4]
Power Dissipation, Board Mounted . . . . 533 mW[5]
Power Dissipation, Full Heat Sink . . . . 1.11 W[6]

Notes:

(1) Derate linearly 1.67 mA/° C above 25° C (Free-Air). When used with heat sink (See Note 5) derate linearly 2.07 mA/° C above 65° C (Normal use).
(2) Refer to graph of Maximum Peak Pulse Current vs. Pulse Width.
(3) 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.
(4) Measured in Free-Air. Derate linearly 3.33 mW/° C above 25° C.
(5) 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 linearly 5.33 mW/° C above 25° C.
(6) Immersed in silicone fluid to simulate infinite heat sink. Derate linearly 11.1 mW/° C above 25° C.
(7) 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.
(8) Typical total Power Out (P_O) @ I_F = 20 mA pulsed all units is 3.6 mW, @ I_F = 100 mA is 1 9mW, and @ I_F = 1.5 A is 240 mW.
(9) $E_{e(APT)}$ 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 1.429" (36.30 mm) from the measurement surface. $E_{e(APT)}$ is not necessarily uniform within the measured area.
(10) Measured at the end of a 10 msec. voltage soak.
(11) This dimension is held to within ± 0.005" on the flange edge and may vary ± 0.020" in the area of the leads.
(12) Cathode lead is 0.070" nom shorter than anode lead.

Types OP295, OP296, OP297 Series

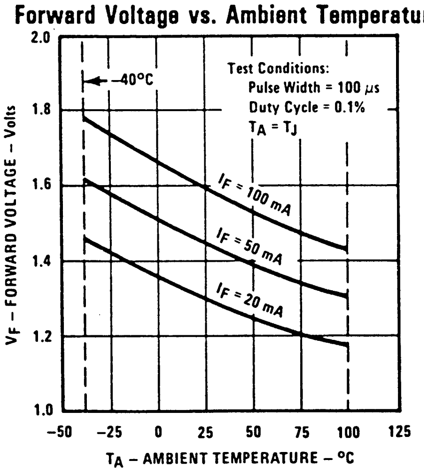
Electrical Characteristics ($T_A = 25^{\circ}$ C unless otherwise noted)

SYMBOL	PARAMETER		MIN	TYP	MAX	UNITS	TEST CONDITIONS
$E_{e(APT)}$	Apertured Radiant Incidence	OP295C	22			mW/cm²	$I_F = 1.50$ A(7)(8)(9)
		OP295B	33		77	mW/cm²	$I_F = 1.50$ A(7)(8)(9)
	*OP295 series is measured into a 10° cone with the aperture 0.1.429" (36.30 mm) from the device measurement surface	OP295A	44			mW/cm²	$I_F = 1.50$ A(7)(8)(9)
		OP296C	1.6			mW/cm²	$I_F = 100$ mA(7)(8)(9)
		OP296B	2.6		6.6	mW/cm²	$I_F = 100$ mA(7)(8)(9)
		OP296A	3.6			mW/cm²	$I_F = 100$ mA(7)(8)(9)
		OP297C	0.30			mW/cm²	$I_F = 20$ mA(7)(8)(9)
		OP297B	0.50		1.3	mW/cm²	$I_F = 20$ mA(7)(8)(9)
		OP297A	0.70			mW/cm²	$I_F = 20$ mA(7)(8)(9)
V_F	Forward Voltage	OP295			4.00	V	$I_F = 1.50$ A(7)
		OP296			2.00	V	$I_F = 100$ mA(7)
		OP298			1.75	V	$I_F = 20$ mA(7)
I_R	Reverse Current	OP295/OP297			10	µA	$V_R = 5$ V(10)
		OP296			100	µA	$V_R = 2$ V(10)
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			20		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%

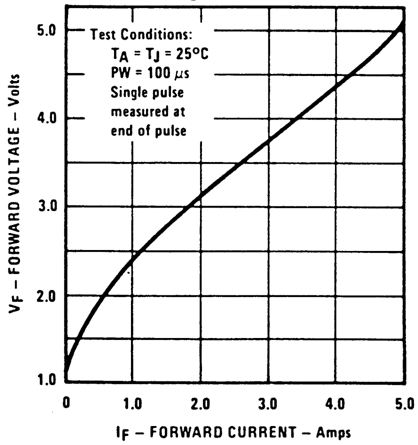
INFRARED EMITTING DIODES

Typical Performance Curves

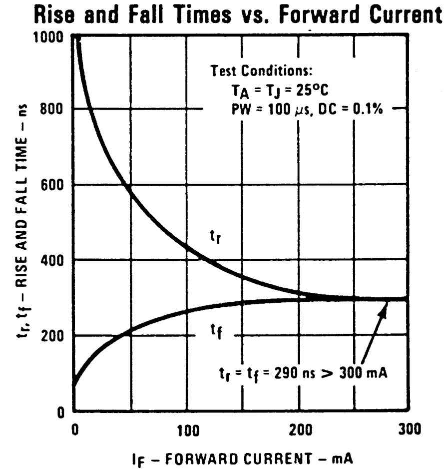
Forward Voltage vs. Ambient Temperature



Forward Voltage vs. Forward Current



Rise and Fall Times vs. Forward Current



Thermal Parameters

Type Units	R_{THJA} (°C/W) Free Air(1)	Normal(2)	Infinite Heat Sink(3)	C_{TH} (10^{-5} Ws/°C)	τ_{TH} (10^{-2} s)	K
All	300	188	90	1.42	0.263	0.008

Refer to Application Bulletin 105 for use of these constants.

Notes to Thermal Parameters

(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.

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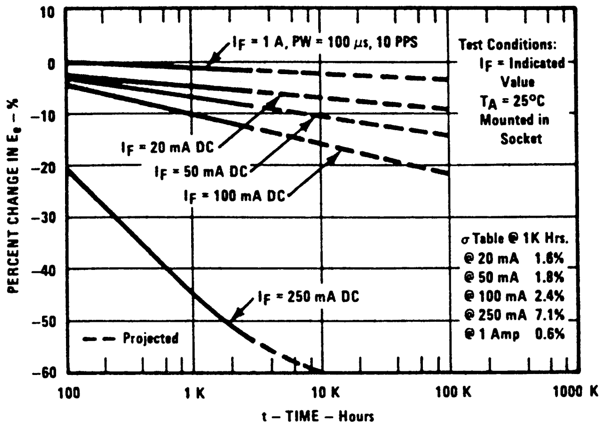
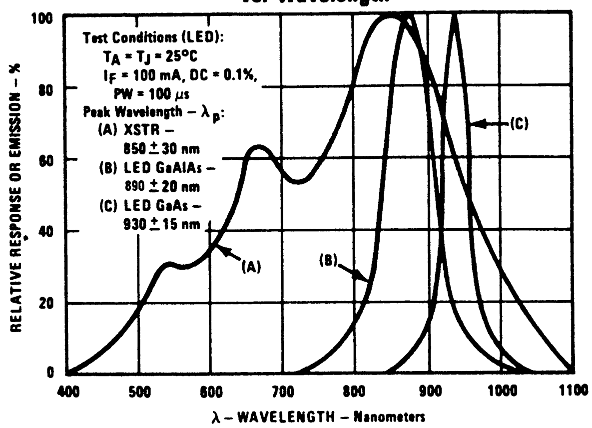
Typical Performance Curves

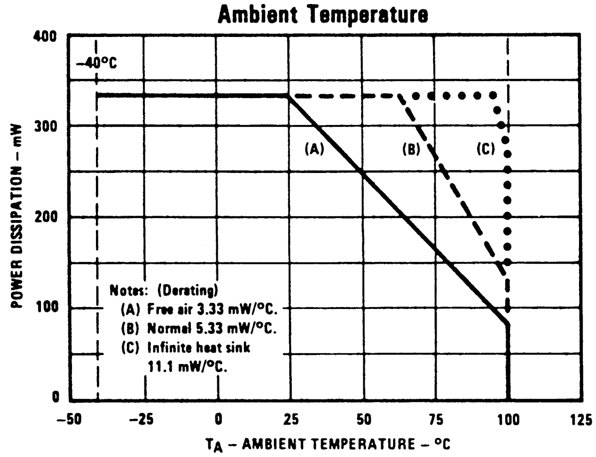
Percent Change in Radiant Intensity vs. Time



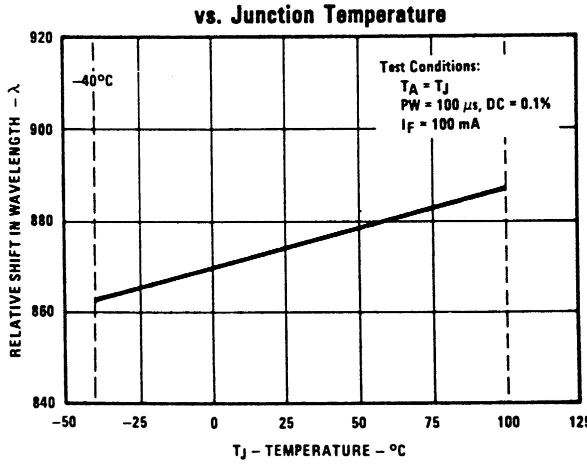
Spectral Response and Emission vs. Wavelength



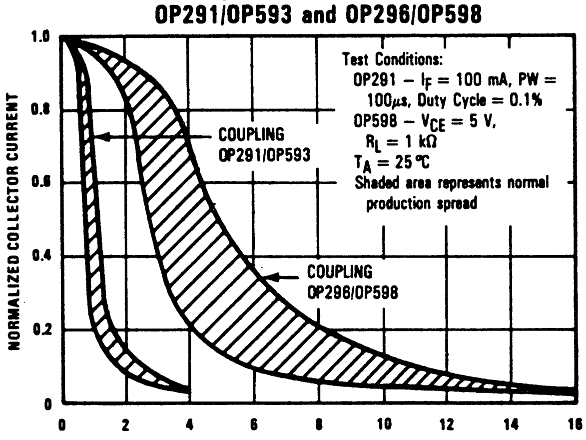
Power Dissipation vs. Ambient Temperature



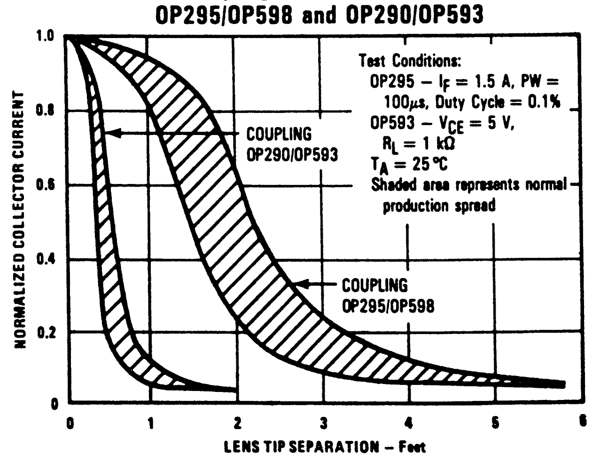
Shift in Peak Wavelength vs. Junction Temperature



Coupling Characteristics of OP291/OP593 and OP296/OP598

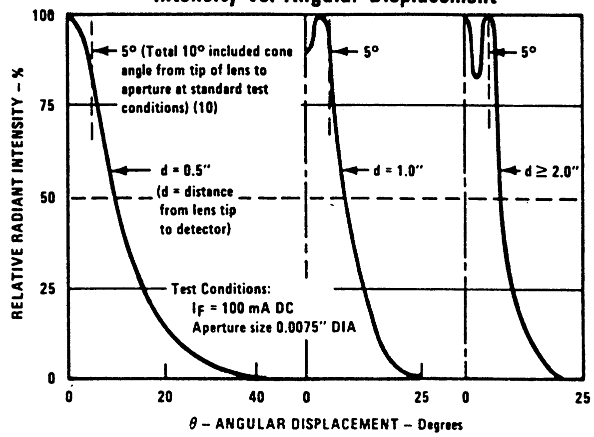


Coupling Characteristics of OP295/OP598 and OP290/OP593

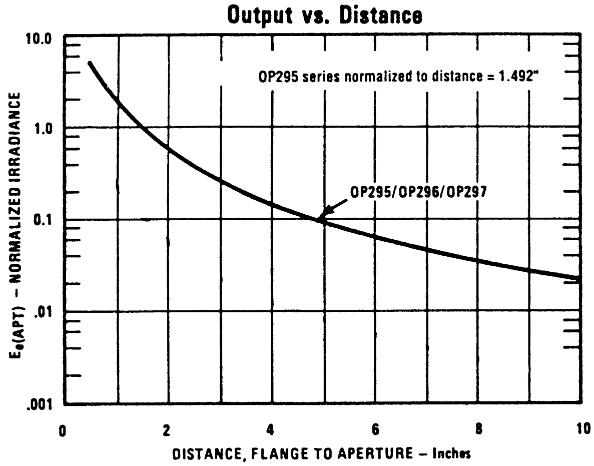


Typical Performance Curves

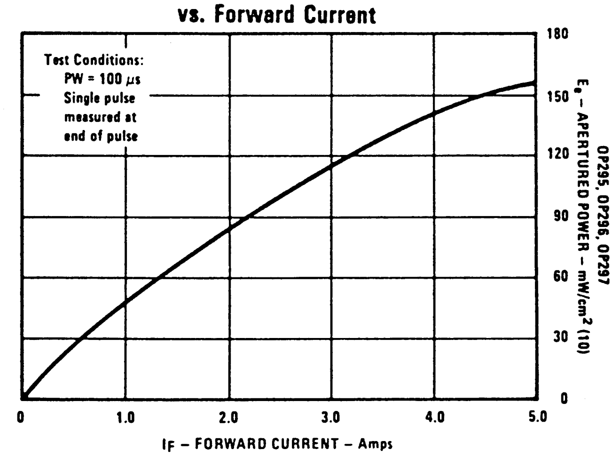
OP295/OP296/OP297 Relative Radiant Intensity vs. Angular Displacement



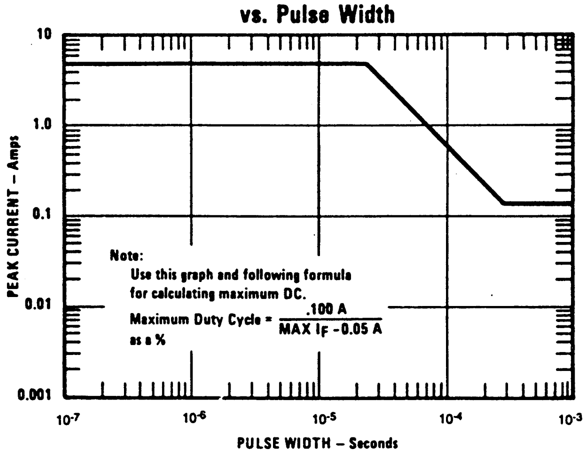
Percent Change in Apertured Power Output vs. Distance



Power Output or Radiant Incidence vs. Forward Current



Maximum Peak Pulse Current vs. Pulse Width



Percent Change in Power Output vs. Ambient Temperature