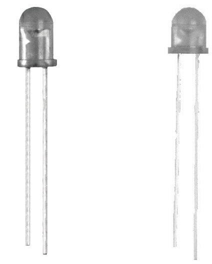
Plastic Infrared Emitting Diode

OP290 Series



Features:

- Choice of narrow or wide irradiance pattern
- Choice of power ranges
- Choice of T-1¾, TO-18 or TO-46 package
- Higher power output than GaAs at equivalent LEDs

Description:

Each device in this series, has a gallium aluminum arsenide (GaAlAs) infrared Light Emitting Diode (LED) in a IR-transmissive plastic molded package. The LED chip has a wavelength centered at 890 nm, which closely matches the spectral response of silicon phototransistors. Only the OP298AA has an LED chip with a center wavelength 875 nm.

For identification purposes, the anode lead of each LED is longer than the cathode lead. (see mechanical drawings on page 2)

OP293 & OP298 part #s are spectrally and mechanically matched to the OP593 and OP598 TO-18 & TO-46 package series phototransistors.
All other part #s are spectrally and mechanically matched to the OP599 T-1¾ package series of phototransistors.

Part#	Molded Plastic Package Design	Emission Angle (FWHM)	Test Current Pulse	Optical Power Out Minimum (mW/cm^2)		
				A	B	C
OP290 (A, B, C)	T-1¾	50°	1.50 A	210	180	150
OP291A	T-1¾	50°	100 mA	16.0	-	-
OP292A	T-1¾	50°	20 mA	2.70	-	-
OP293 (A, B)	TO-18, TO-46	60°	100 mA	16.0	13.0	-
OP294	T-1¾	50°	5.0 mA	0.50	-	-
OP295 (A, B)	T-1¾	20°	1.50 A	44.0	33.0	-
OP296 (A, B)	T-1¾	20°	100 mA	3.60	2.60	-
OP297A	T-1¾	20°	20 mA	0.70	-	-
OP298 (A, B)	TO-18, TO-46	25°	100 mA	3.00	2.40	1.80
OP298AA (1)	TO-18, TO-46	25°	100 mA	3.50	-	-
OP299	T-1¾	20°	5.0 mA	0.15	-	-

Note: 1. The OP298AA LED center wavelength = 875 nm

Please refer to Application Bulletins 208 and 210 for additional design information and reliability (degradation) data.

Applications:

RoHS

- Non-contact reflective object sensor
- Assembly line automation
- Machine automation
- Machine safety
- End of travel sensor
- Door sensor
- Battery-operated applications

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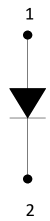
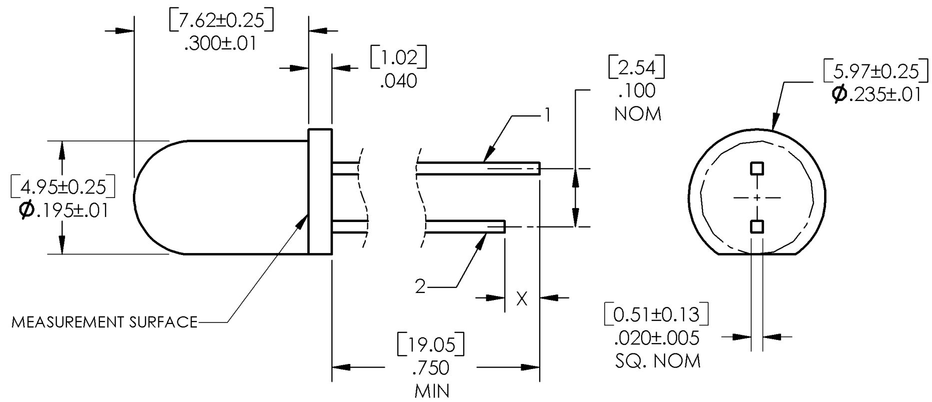
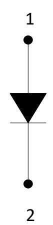


Electrical Connection

Pin #	LED X = 0.060” (1.52 mm)
1	Anode
2	Cathode

T-1¾ Package
OP290, OP291, OP292, OP294, OP295, OP296, OP297, OP299

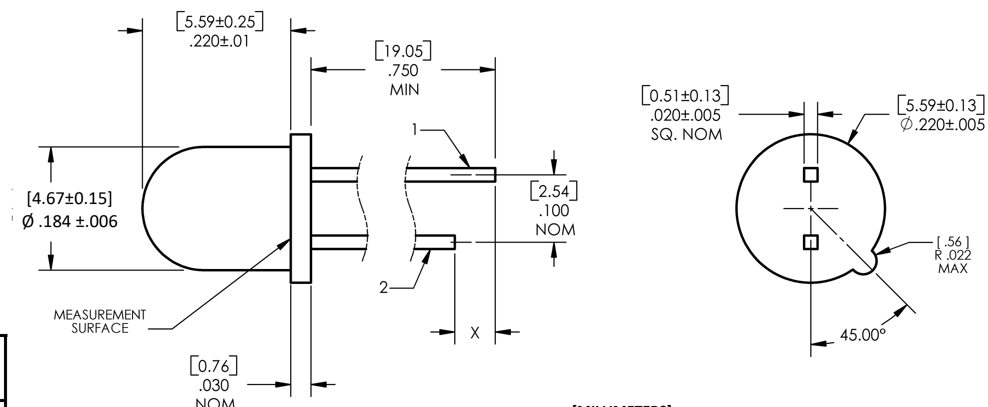




Electrical Connection

Pin #	LED X = 0.060” (1.52 mm)
1	Anode
2	Cathode

TO-18, TO-46 Package
OP293 & OP298



DIMENSIONS ARE IN: **[MILLIMETERS]** **INCHES**

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Electrical Specifications

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

Storage and Operating Temperature Range	-40° C to +100° C
Reverse Voltage	2.0 V
Continuous Forward Current OP290, OP291, OP292 OP294, OP295, OP299 OP295, OP296, OP297	 150 mA 100 mA 150 mA
Continuous Forward Current, OP293, OP298 Free Air Board Mounted	 100 mA 133 mA
Peak Forward Current OP290, OP295 (25 µs pulse width) DC = 1.25% Maximum OP291, OP296 (100 µs pulse width) DC = 2.5% Maximum OP292, OP297 (100 µs pulse width) DC = 6.7% Maximum OP293, OP298 (25 µs pulse width) DC = 2.5% Maximum OP294, OP299 DC = 10% Maximum	 5.0 A 2.0 A 1.00 A 2.0 A 750 mA

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Electrical Specifications

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

Maximum Duty Cycle [(1)] OP290 (25 µs pulse width @ 5 A)	1.25 %
Lead Soldering Temperature [1/16 inch (1.6 mm) from case for 5 seconds with soldering iron] [(2)]	260° C
Power Dissipation, Free Air [(3)] OP290, OP291, OP292, OP295, OP296, OP297 OP293, OP298 Power Dissipation, Board Mounted [(4)] OP290, OP291, OP292, OP295, OP296, OP297 OP293, OP298	333 mW 142 mW 533 mW 200 mW
Power Dissipation [(3)] OP294, OP299	180 mW

Notes:

1. For OP290, OP291, OP292, OP295, OP296 and OP297, refer to graph of Maximum Peak Pulse Current vs Pulse Width.
2. For all OPs in this series, RMA flux is recommended. Duration can be extended to 10 second maximum when soldering. A maximum of 20 grams force may be applied to the leads when flow soldering.
3. For OP290, OP291, OP292, OP295, OP296 and OP297, measured in free-air. Derate linearly 3.33 mW/° C above 25° C. OP293 & OP298 Derate linearly 1.62 mW/° C. OP294 & OP299 Derate linearly 2.00 mW/° C.
4. For OP290, OP291and OP292, 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 62.5°. For OP293 and OP298, mounted on 1/16” (1.60 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). For OP295, OP296 and OP297, 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.

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Electrical Specifications

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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input Diode						
$E_{E(APT)}$ (1)(2)	Apertured Radiant Incidence OP290A OP290B OP290C	 210 180 150	 - - -	 - 300 -	mW/cm^2	I_F = 1.50 A Measured into a 0.250" [6.35 mm] aperture 0.500" (12.7 mm) from the tip of the lens.
	OP293A OP293B	16 16	- -	- -		I_F = 100 mA Measured into a 0.250" [6.35 mm] aperture 0.420" (10.7 mm) from the tip of the lens.
	OP291B OP298A OP298B OP298C	13 3.0 2.4 1.8	22 - - -	26 - 4.8 -		I_F = 100 mA Measured into a 0.250" [6.35 mm] aperture 0.500" (12.7 mm) from the tip of the lens.
	OP292A	2.7	-	-		I_F = 20 mA Measured into a 0.250" [6.35 mm] aperture 0.500" (12.7 mm) from the tip of the lens.
	OP294	0.50	-	1.50		I_F = 5 mA Measured into a 0.250" [6.35 mm] aperture 0.500" (12.7 mm) from the tip of the lens.
	OP295A OP295B	44 33	- -	- 77		I_F = 1.50 A Measured into a 0.250" [6.35 mm] aperture 1.429" (36.3 mm) from the tip of the lens.
	OP296A OP296B OP298AA OP299	3.6 2.6 3.5 0.15	- - - -	- 6.6 - 0.45		I_F = 100 mA Measured into a 0.250" [6.35 mm] aperture 1.429" (36.3 mm) from the tip of the lens.
	OP297A	0.7	-	-		I_F = 5 mA Measured into a 0.250" [6.35 mm] aperture 1.429" (36.3 mm) from the tip of the lens.

Notes:
1. 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.
2. 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 the specified distance from the end of the device. On all models in this series, $E_{E(APT)}$ is not necessarily uniform within the measured area.
3. Measurement is taken at the end of a single 10 ms pulse. Heating due to increased pulse rate or pulse width will cause a decrease in reading.

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Electrical Specifications

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

SYMBOL	PARAMETER	MIN	TYP	MAX	UNITS	TEST CONDITIONS
Input Diode						
V_F	Forward Voltage [3] OP290, OP295 OP291, OP296 OP292, OP297, OP297FAB OP293 (A, B), OP298 (A, B, C) OP298AA OP294, OP299	 - 1.0 1.0 - 1.0 1.0	 - - - - - -	 4.00 2.00 1.75 2.00 2.00 1.50	V	 I_F = 1.50 A I_F = 100 mA I_F = 20 mA I_F = 100 mA I_F = 100 mA I_F = 5 mA
I_R	Reverse Current [3] OP290, OP292 OP291, OP293, OP298 (A, B, C), OP296 OP298AA OP294, OP299 OP295, OP297 OP297FAB	 - - - - - -	 - - - - - -	 10 100 100 10 10 15	µA	 V_R = 5 V V_R = 2 V V_R = 2 V V_R = 2 V V_R = 5 V V_R = 5 V
λ_P	Wavelength at Peak Emission OP290 (A, B, C), OP291A, OP292A, OP293 (A, B), OP294, OP295 (A, B), OP296 (A, B), OP297A, OP298 (A, B, C), OP299 OP298AA	 - - - -	 890 875	 - -	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 OP290, OP291, OP292, OP294 OP293 OP295, OP296, OP297, OP299 OP298	 - - - -	 50 60 20 25	 - - - -	Degree	I_F = 20 mA
t_r	Output Rise Time	-	500	-	ns	$I_{F(PK)}$ = 100 mA, PW = 10 µs, and D.C. = 10.0 %
t_f	Output Fall Time	-	250	-	ns	

Notes:
1. 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.
2. 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 the specified distance from the end of the device. On all models in this series, $E_{E(APT)}$ is not necessarily uniform within the measured area.
3. Measurement is taken at the end of a single 10 ms pulse. Heating due to increased pulse rate or pulse width will cause a decrease in reading.

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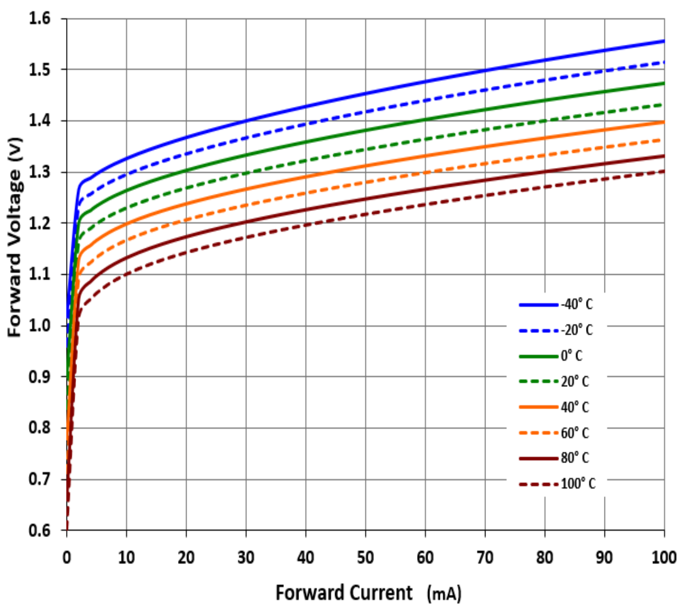
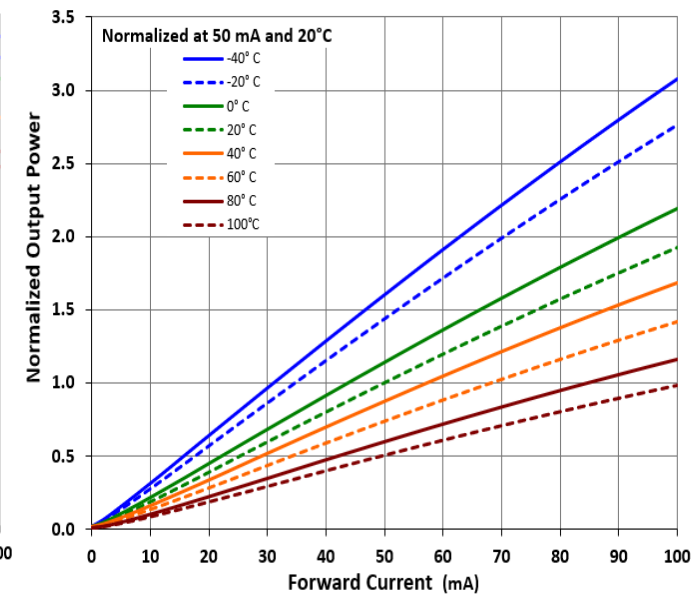
Typical Performance

OP290, OP291, OP292

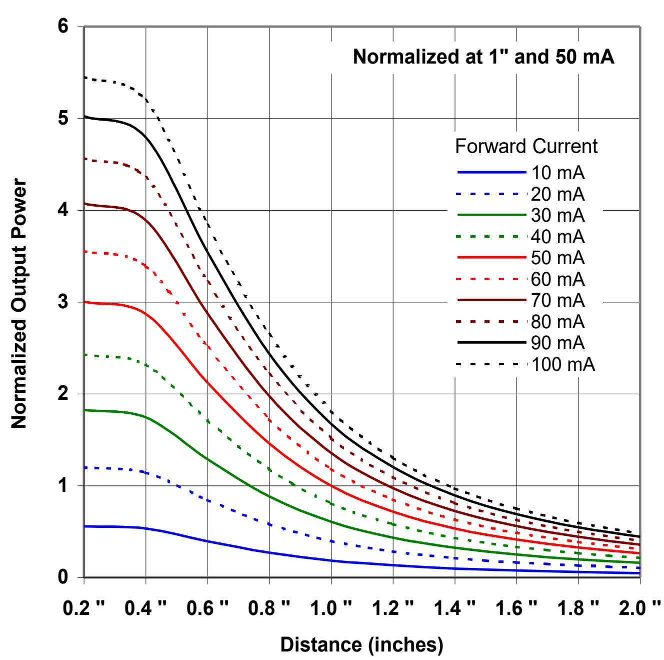
Forward Voltage vs Forward Current vs Temperature



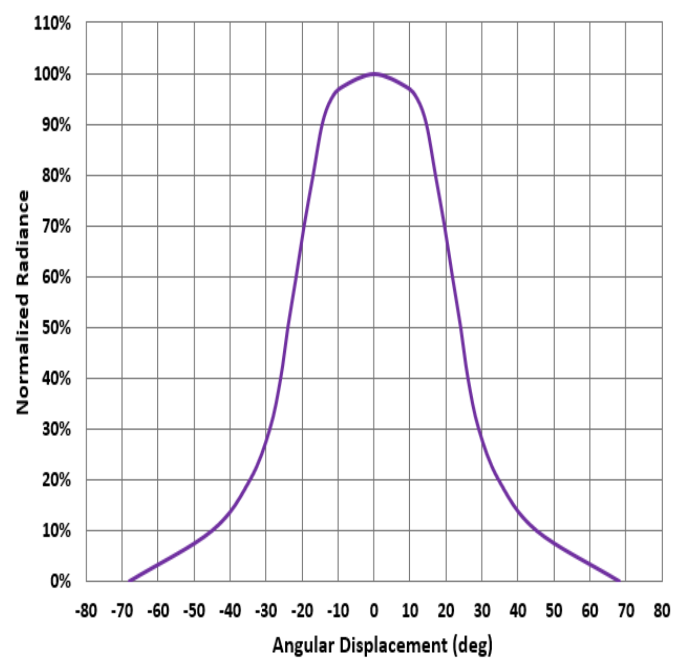
Optical Power vs Forward Current vs Temperature



Distance vs Output Power vs Forward Current



Relative Emission Intensity vs Angular Displacement



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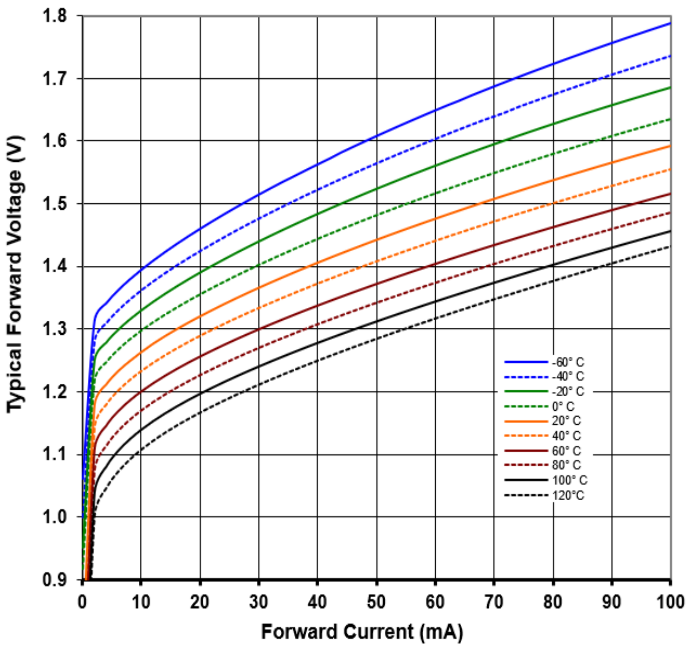
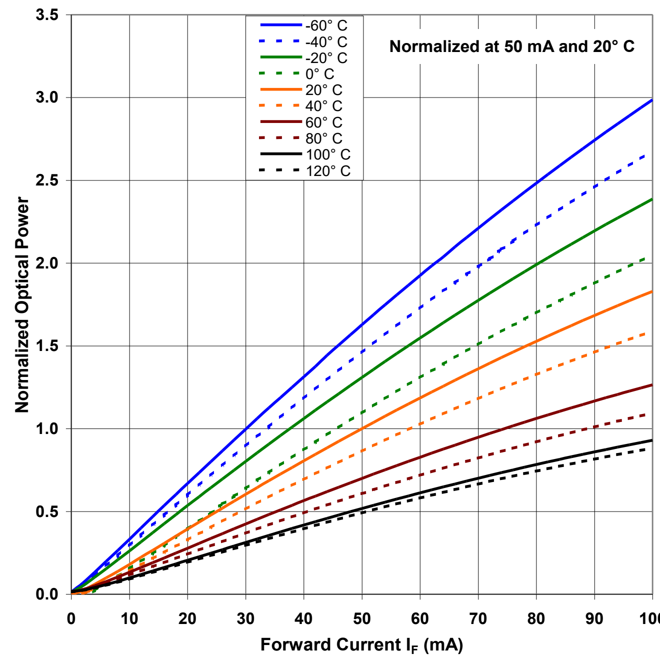
Typical Performance

OP294

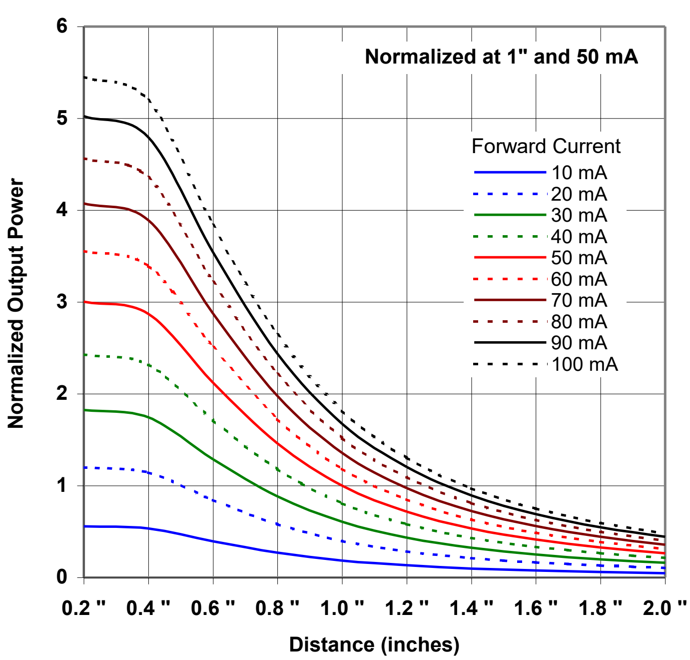
Forward Voltage vs Forward Current vs Temperature



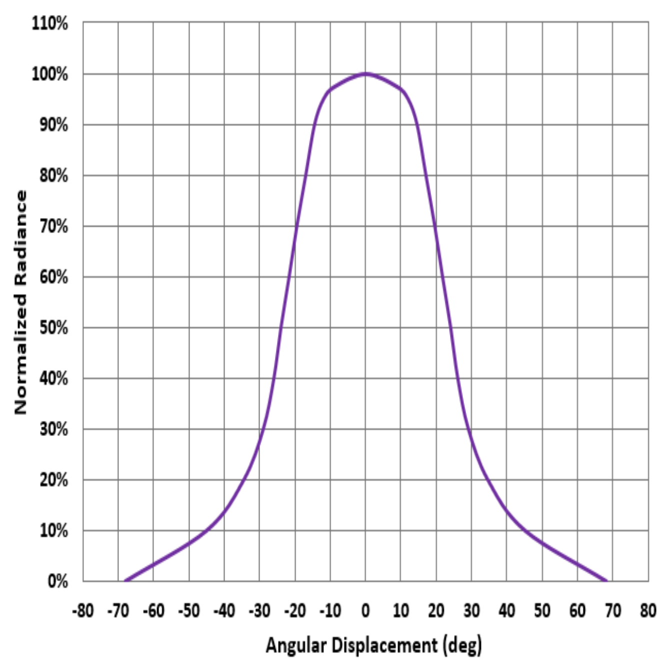
Optical Power vs I_F vs Temperature



Distance vs Output Power vs Forward Current



Relative Emission Intensity vs Angular Displacement



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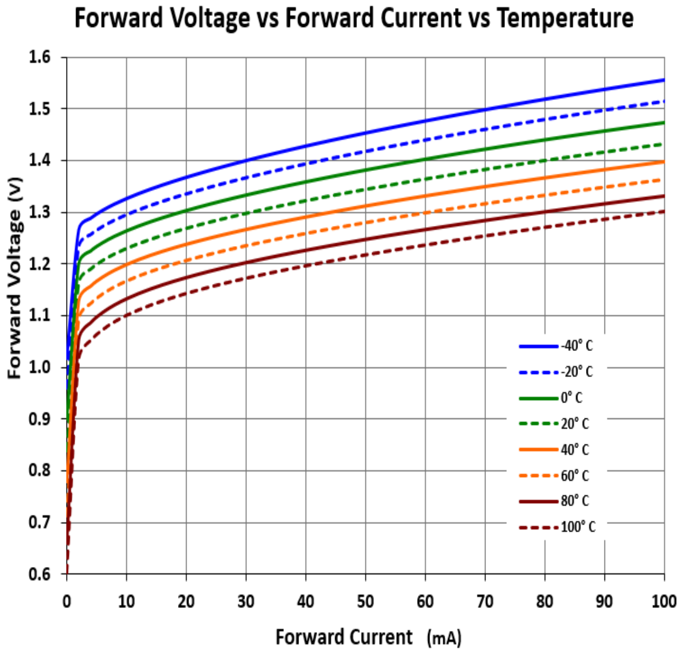
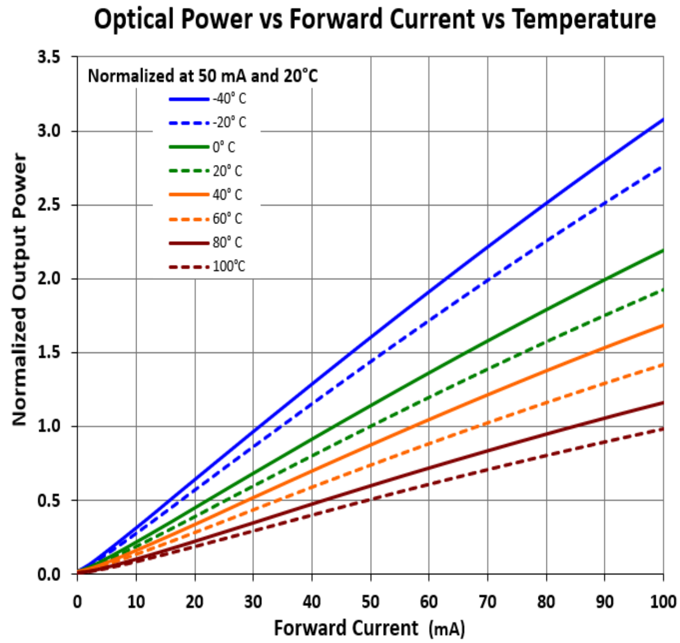
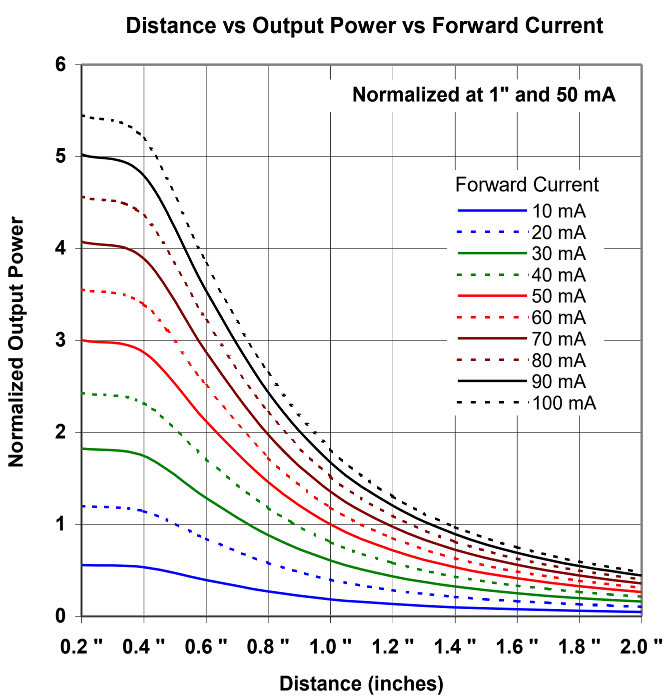
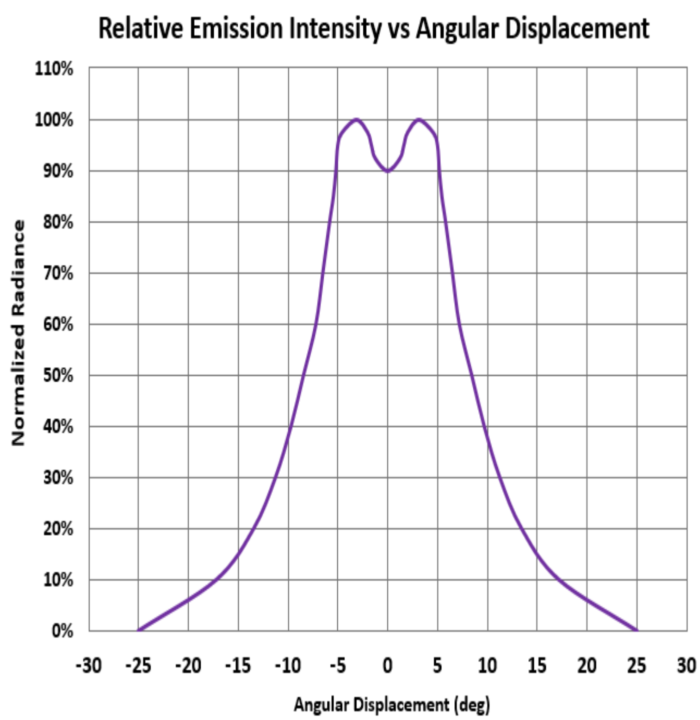
Typical Performance

OP295, OP296, OP297



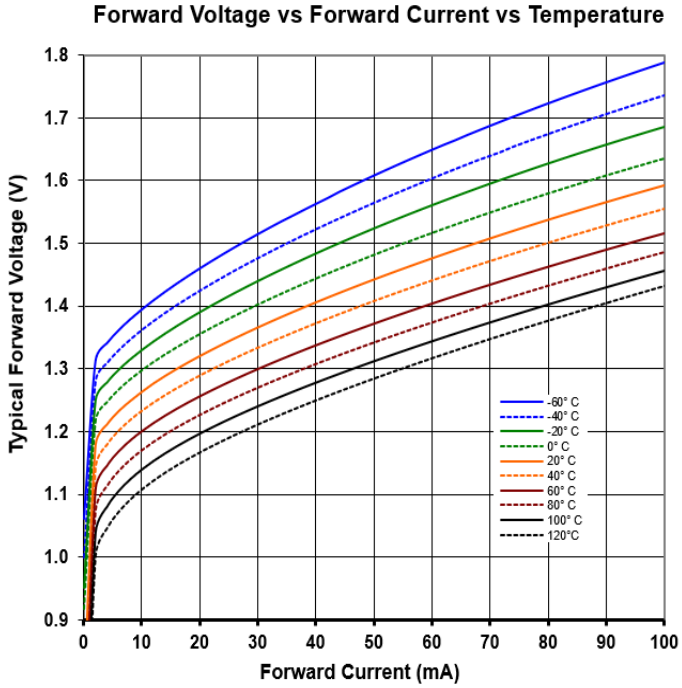


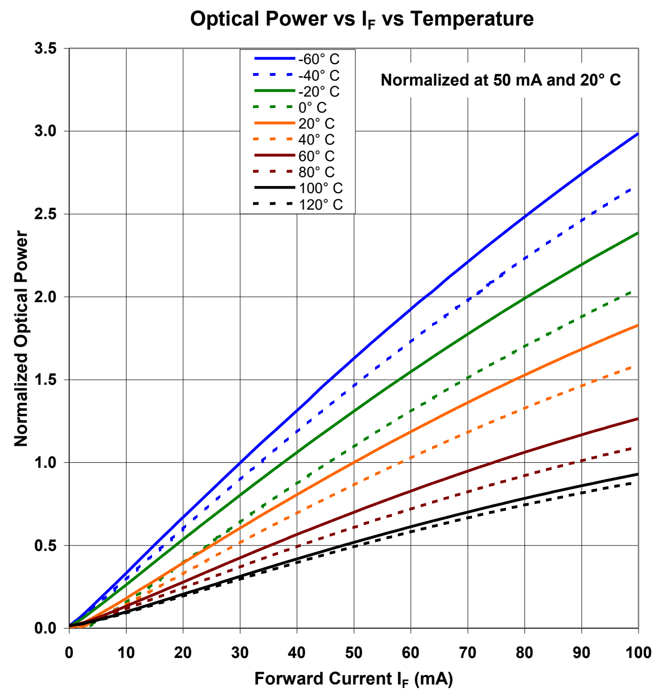


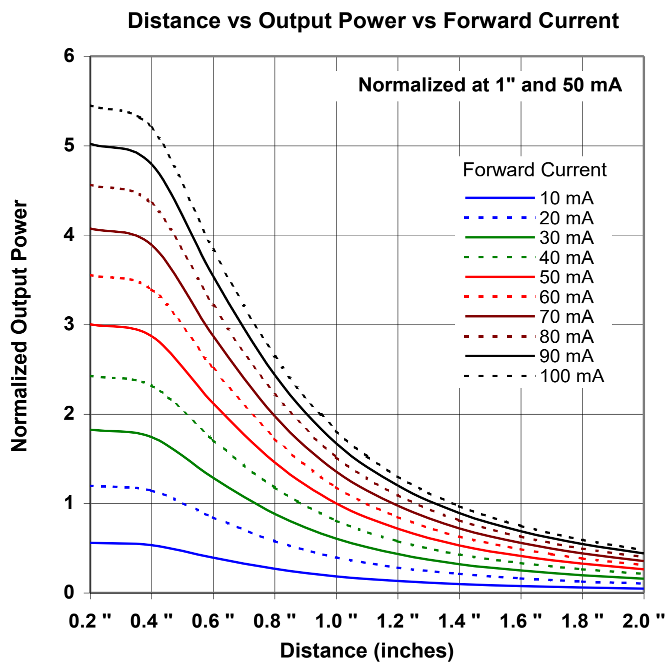


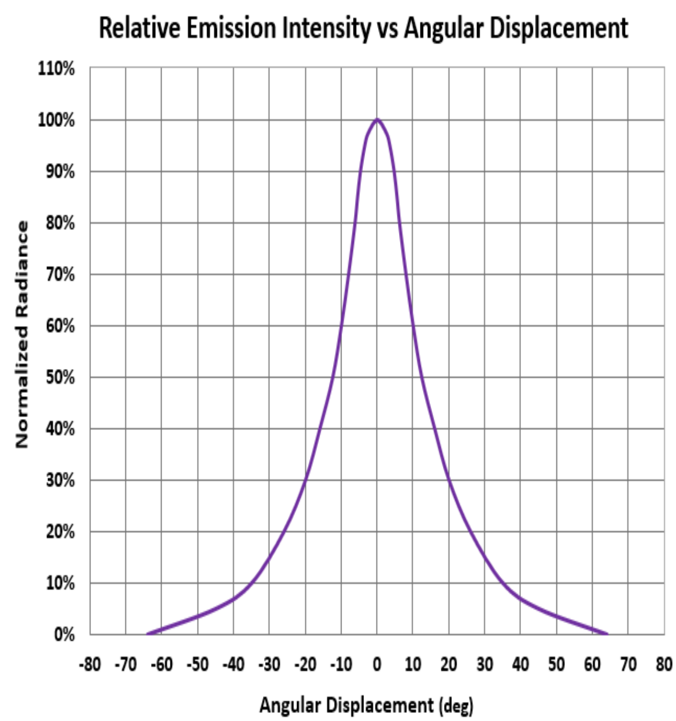
Typical Performance

OP298, OP299









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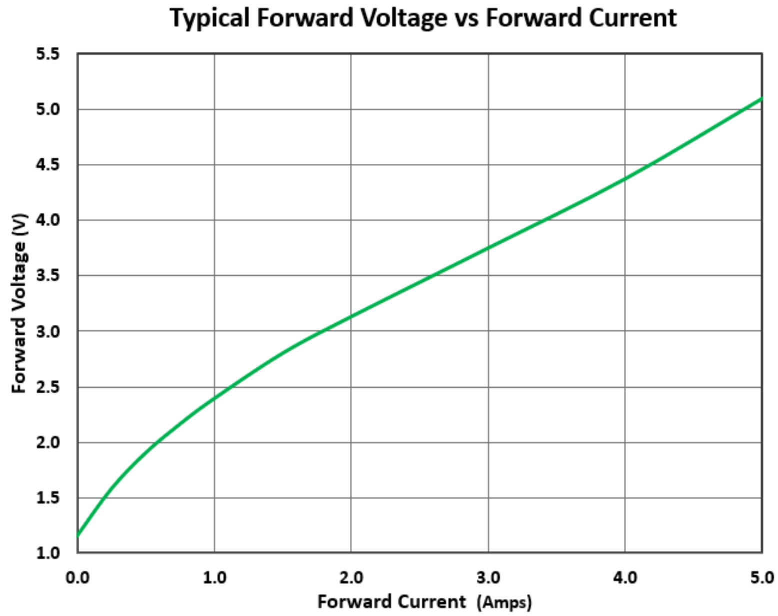
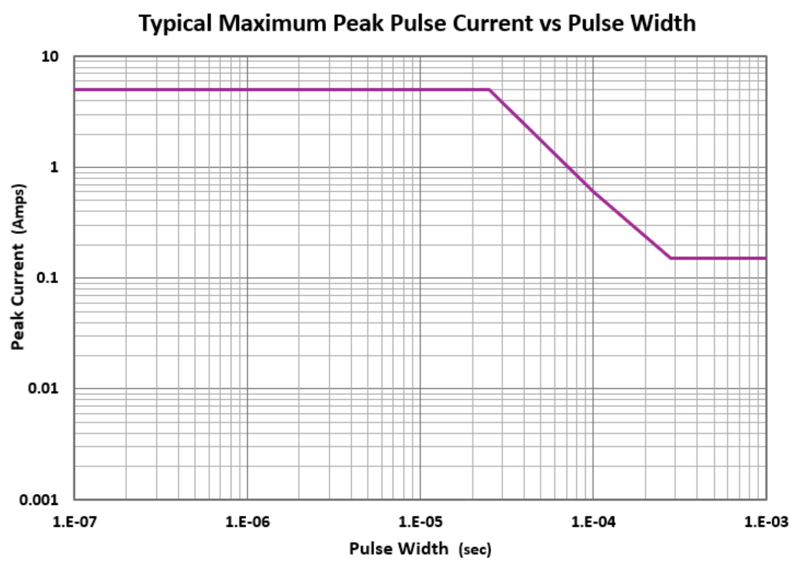
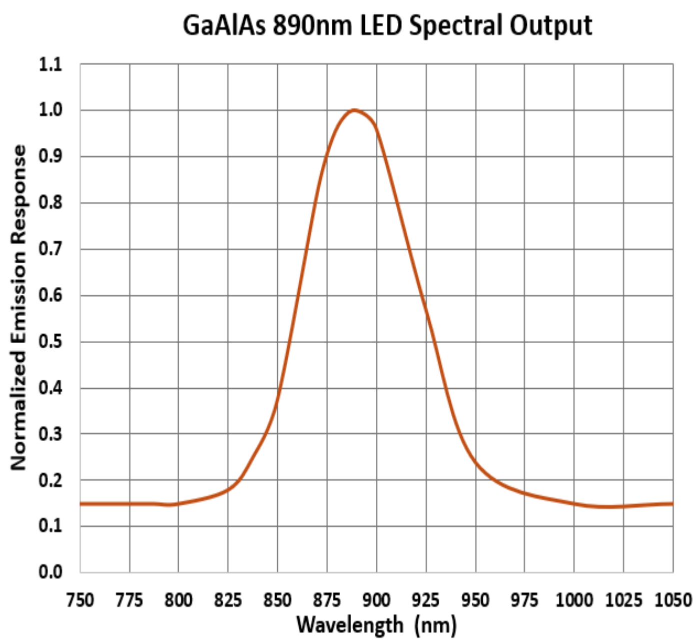
Typical Performance

OP290, OP291, OP292, OP295, OP296, OP297

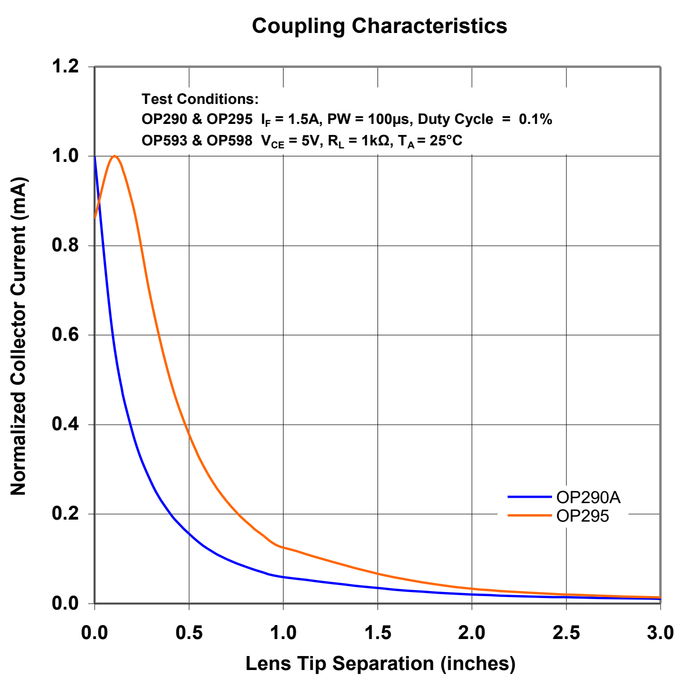


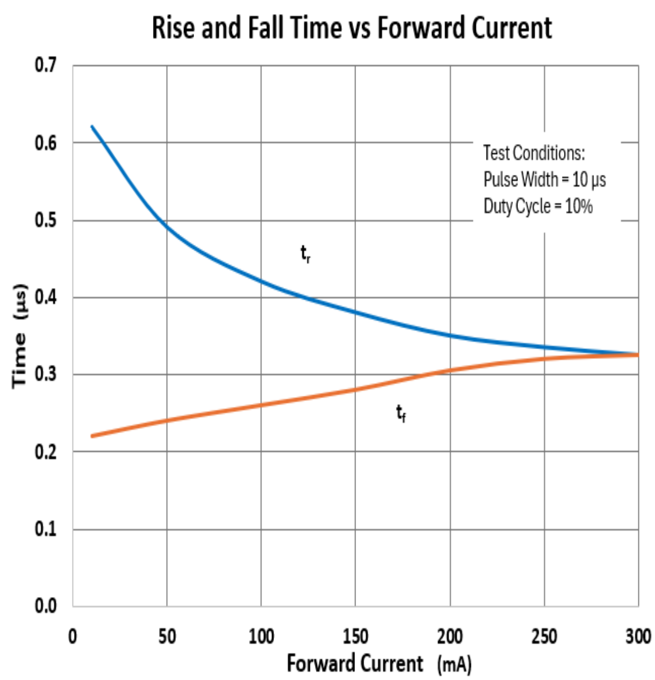


Typical Performance



OP290A/OP593 and OP295/OP598 - Coupling Characteristics





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