Agilent Technologies

Precision Optical Performance AlInGaP II LED Lamps

Technical Data

HLMP-ELxx
HLMP-EHxx
HLMP-EDxx

Features

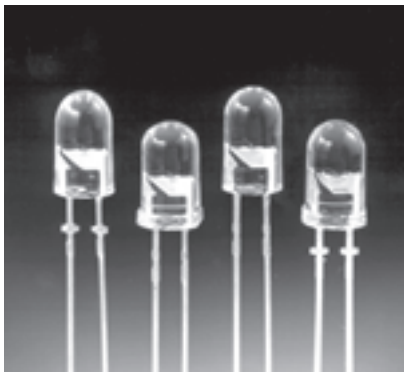
- **Well Defined Spatial Radiation Patterns**
- **Viewing Angles: 15°, 23°, 30°**
- **High Luminous Output**
- **Colors:**
  592 nm Amber
  617 nm Reddish-Orange
  630 nm Red
- **High Operating Temperature:**
  T_{JLED} = +130°C
- **Superior Resistance to Moisture**

Benefits

- **Viewing Angles Match Traffic Management Requirements**
- **Colors Meet Automotive and Traffic Signal Specifications**
- **Superior Light Output Performance in Outdoor Environments**
- **Suitable for Autoinsertion into PC Boards**

Applications

- **Traffic Management:**
  Traffic Signals
  Work Zone Warning Lights
  Variable Message Signs
- **Commercial Outdoor Advertising:**
  Signs
  Marquees
- **Automotive:**
  Exterior and Interior Lights



Description

Precision Optical Performance AlInGaP II (aluminum indium gallium phosphide) LEDs offer superior light output for excellent readability in sunlight and dependable performance. The AlInGaP II technology provides extremely stable light output over long periods of time.

These LED lamps are untinted, nondiffused, T-1 3/4 packages incorporating second generation optics which produce well defined radiation patterns at specific viewing cone angles.

These lamps are made with an advanced optical grade epoxy offering superior high temperature and high moisture resistance performance in outdoor signal and sign applications. The maximum LED junction temperature limit of +130° C enables high temperature operation in bright sunlight conditions. The epoxy contains both uv-a and uv-b inhibitors to reduce the effects of long term exposure to direct sunlight.

T-1 3/4 (5 mm) Precision Optical Performance AlInGaP II LED Lamps

Selection Guide

Typical Viewing Angle $2\theta 1/2$ (Deg.)[2]	Color and Dominant Wavelength (nm), Typ.[1]	Lamps Without Standoffs (Outline Drawing A)	Lamps With Standoffs (Outline Drawing B)	Luminous Intensity Iv (mcd) [3,4,5] @ I(f) = 20 mA	
				Min.	Max.
15°	Amber 592	HLMP-EL16-TW000	HLMP-EL18-TW000	2500	7200
		HLMP-EL16-TWR00	HLMP-EL18-TWR00	2500	7200
		HLMP-EL16-TWK00*		2500	7200
		HLMP-EL16-TWS00		2500	7200
		HLMP-EL16-TUS00		2500	4200
		HLMP-EL16-TV400**		2500	5500
		HLMP-EL16-TVU00		2500	5500
		HLMP-EL16-UX000	HLMP-EL18-UX000	3200	9300
		HLMP-EL16-UXR00	HLMP-EL18-UXR00	3200	9300
		HLMP-EL16-VW000		4200	7200
		HLMP-EL16-VWR000		4200	7200
		HLMP-EL16-VWK00*		4200	7200
		HLMP-EL16-VWS00		4200	7200
		HLMP-EL16-VX000		4200	9300
		HLMP-EL16-VXR00		4200	9300
		HLMP-EL16-VX400**		4200	9300
		HLMP-EL16-VXK00*		4200	9300
		HLMP-EL16-VXS00		4200	9300
		HLMP-EL16-VY000	HLMP-EL18-VY000	4200	12000
		HLMP-EL16-VYR00	HLMP-EL18-VYR00	4200	12000
		HLMP-EL16-VYK00*		4200	12000
		HLMP-EL16-VYS00		4200	12000
	Red-Orange 615		HLMP-EH18-TW000	2500	7200
		HLMP-EH16-UX000	HLMP-EH18-UX000	3200	9300
	Red 630	**HLMP-ED16-TW000**	HLMP-ED18-TW000	2500	7200
		HLMP-ED16-TWT00	HLMP-ED18-TWT00	2500	7200
		HLMP-ED16-UX000	HLMP-ED18-UX000	3200	9300
		HLMP-ED16-UXT00	HLMP-ED18-UXT00	3200	9300

T-1 3/4 (5 mm) Precision Optical Performance AlInGaP II Led Lamps (Continued)

Selection Guide

Typical Viewing Angle $2\theta_{1/2}$ (Deg.)[2]	Color and Dominant Wavelength (nm), Typ.[1]	Lamps Without Standoffs (Outline Drawing A)	Lamps With Standoffs (Outline Drawing B)	Luminous Intensity Iv (mcd) [3,4] @ I(f) = 20 mA	
				Min.	Max
23°	Amber 592	HLMP-EL25-QS400**		1150	2500
		HLMP-EL25-QSU00		1150	2500
		HLMP-EL25-QSK00*		1150	2500
		HLMP-EL25-QSS00		1150	2500
		HLMP-EL25-QT000		1150	3200
		HLMP-EL25-QTR00	HLMP-EL27-QTR00	1150	3200
		HLMP-EL25-RU000	HLMP-EL27-RU000	1500	4200
		HLMP-EL25-RUR00	HLMP-EL27-RUR00	1500	4200
		HLMP-EL25-RUK00*		1500	4200
		HLMP-EL25-RUS00		1500	4200
		HLMP-EL25-ST000		1900	3200
		HLMP-EL25-STR00		1900	3200
		HLMP-EL25-STK00*		1900	3200
		HLMP-EL25-STS00		1900	3200
		HLMP-EL25-SU000		1900	4200
		HLMP-EL25-SUR00		1900	4200
		HLMP-EL25-SU400**		1900	4200
		HLMP-EL25-SUU00		1900	4200
		HLMP-EL25-SUK00*		1900	4200
		HLMP-EL25-SUS00		1900	4200
		HLMP-EL25-SVK00*		1900	5500
		HLMP-EL25-SVS00		1900	5500
		HLMP-EL25-SV000	HLMP-EL27-SV000	1900	5500
		HLMP-EL25-SVR00	HLMP-EL27-SVR00	1900	5500
		HLMP-EL25-TW000	HLMP-EL27-TW000	2500	7200
		HLMP-EL25-TWR00	HLMP-EL27-TWR00	2500	7200
		HLMP-EL25-TWK00*		2500	7200
		HLMP-EL25-TWS00		2500	7200

Notes:

1. Dominant Wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is one half the on-axis intensity.
3. The luminous intensity is measured on the mechanical axis of the lamp package.
4. The optical axis is closely aligned with the package mechanical axis.
5. Tolerance for each intensity bin limit is ± 15%.

Part numbers in **bold** are recommended for new designs.
*HLMP-xLxx-xxK00 are selected to amber color bins 2 and 4 only.
**HLMP-xLxx-xx400 are selected to amber color bin 4 only.

T-1 3/4 (5 mm) Precision Optical Performance AlInGaP II Led Lamps (Continued)

Selection Guide

Typical Viewing Angle $2\theta_{1/2}$ (Deg.)[2]	Color and Dominant Wavelength (nm), Typ.[1]	Lamps Without Standoffs (Outline Drawing A)	Lamps With Standoffs (Outline Drawing B)	Luminous Intensity Iv (mcd) [3,4] @ I(f) = 20 mA	
				Min.	Max
23°	Red-Orange 615	HLMP-EH25-QT000		1150	3200
		HLMP-EH25-RU000		1500	4200
			HLMP-EH27-SV000	1900	5500
		HLMP-EH25-TW000	HLMP-EH27-TW000	2500	7200
	Red 630	HLMP-ED25-QT000		1150	3200
		HLMP-ED25-QTT00		1150	3200
		HLMP-ED25-RU000	HLMP-ED27-RU000	1500	4200
		HLMP-ED25-RUT00	HLMP-ED27-RUT00	1500	4200
		HLMP-ED25-SV000	HLMP-ED27-SV000	1900	5500
		HLMP-ED25-SVT00	HLMP-ED27-SVT00	1900	5500
		HLMP-ED25-TW000	HLMP-ED27-TW000	2500	7200
		HLMP-ED25-TWT00	HLMP-ED27-TWT00	2500	7200
30°	Amber 592	HLMP-EL31-QRS00		1150	1900
		HLMP-EL31-QS000		1150	2500
		HLMP-EL31-QSR00		1150	2500
		HLMP-EL31-QS400**		1150	2500
		HLMP-EL31-QSU00		1150	2500
		HLMP-EL31-QT000	HLMP-EL33-QT000	1150	3200
		HLMP-EL31-QTR00	HLMP-EL33-QTR00	1150	3200
		HLMP-EL31-QTK00*		1150	3200
		HLMP-EL31-QTS00		1150	3200
		HLMP-EL31-SV000	HLMP-EL33-SV000	1900	5500
		HLMP-EL31-SVR00	HLMP-EL33-SVR00	1900	5500
		HLMP-EL31-ST000		1900	3200
		HLMP-EL31-STR00		1900	3200
		HLMP-EL31-STK00*		1900	3200
		HLMP-EL31-STS00		1900	3200
		HLMP-EL31-SUK00*		1900	4200

Notes:

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**HLMP-xLxx-xx400 are selected to amber color bin 4 only.

T-1 3/4 (5 mm) Precision Optical Performance AlInGaP II Led Lamps (Continued)

Selection Guide

Typical Viewing Angle $2\theta_{1/2}$ (Deg.)[2]	Color and Dominant Wavelength (nm), Typ.[1]	Lamps Without Standoffs (Outline Drawing A)	Lamps With Standoffs (Outline Drawing B)	Luminous Intensity Iv (mcd) [3,4] @ I(f) = 20 mA	
				Min.	Max.
30°	Amber 592	HLMP-EL31-SUS00		1900	4200
		HLMP-EL31-SU400**		1900	4200
		HLMP-EL31-SUU00		1900	4200
		HLMP-EL31-SU000		1900	4200
		HLMP-EL31-SUR00		1900	4200
		HLMP-EL31-SVK00*		1900	5500
		HLMP-EL31-SVS00		1900	5500
	Red-Orange 615	HLMP-EH31-PS000		880	2500
		HLMP-EH31-QT000	HLMP-EH33-QT000	1150	3200
		HLMP-EH31-RU000	HLMP-EH33-RU000	1500	4200
		HLMP-EH31-SV000	HLMP-EH33-SV000	1900	5500
		HLMP-EH31-SU000		1900	4200
	Red 630		HLMP-ED33-QT000	1150	3200
		HLMP-ED31-QTT00	HLMP-ED33-QTT00	1150	3200
		HLMP-ED31-ST000		1900	3200
		HLMP-ED31-STT00		1900	3200
		HLMP-ED31-SU000		1900	4200
		HLMP-ED31-SUT00		1900	4200
		HLMP-ED31-RU000	HLMP-ED33-RU000	1500	4200
		HLMP-ED31-RUT00	HLMP-ED33-RUT00	1500	4200
		HLMP-ED31-SV000	HLMP-ED33-SV000	1900	5500
		HLMP-ED31-SVT00	HLMP-ED33-SVT00	1900	5500

Notes:

1. Dominant Wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.
2. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is one half the on-axis intensity.
3. The luminous intensity is measured on the mechanical axis of the lamp package.
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5. Tolerance for each intensity bin limit is ± 15%.

Part numbers in **bold** are recommended for new designs.

*HLMP-xLxx-xxK00 are selected to amber color bins 2 and 4 only.

**HLMP-xLxx-xx400 are selected to amber color bin 4 only.

Part Numbering System

HLMP- x x xx - x x x xx

Mechanical Options
00: Bulk Packaging
DD: Ammo Pack
YY: Flexi-Bin, Bulk Packaging
ZZ: Flexi-Bin; Ammo Pack

Color Bin & V_F Selections
0: No color bin limitation
4: Amber color bin 4 only
K: Amber color bins 2 and 4 only
L: Color bins 4 and 6
R: Amber color bins 1, 2, 4, and 6 with V_F max of 2.6 V
S: Amber color bins 2 and 4 with V_F max of 2.6 V
T: Red color with V_F max of 2.6 V
U: Amber color bin 4 with V_F max of 2.6 V
W: Color bins 2, 4 and 6 with V_F max of 2.6 V
Y: Color bins 4 and 6 with V_F max of 2.6 V

Maximum Intensity Bin
0: No Iv bin limitation

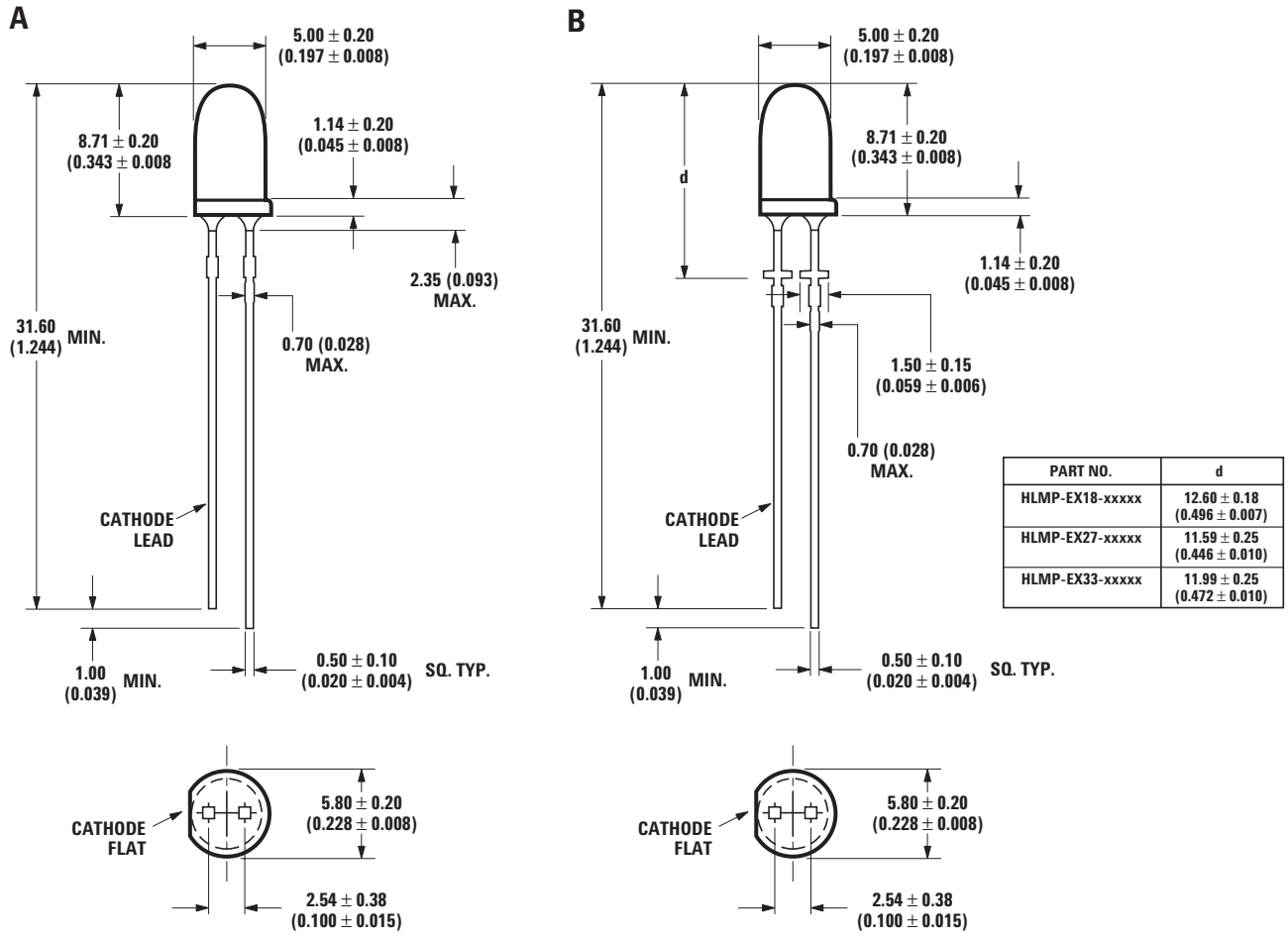
Minimum Intensity Bin

Viewing Angle and Lead Standoffs
16: 15 degree without lead standoffs
18: 15 degree with lead standoffs
25: 23 degree without lead standoffs
27: 23 degree with lead standoffs
31: 30 degree without lead standoffs
33: 30 degree with lead standoffs

Color
D: 630 nm Red
H: 615 nm Red-Orange
L: 592 nm Amber

Package
E: 5 mm Round

Package Dimensions



PART NO.	d
HLMP-EX18-xxxxx	12.60 ± 0.18 (0.496 ± 0.007)
HLMP-EX27-xxxxx	11.59 ± 0.25 (0.446 ± 0.010)
HLMP-EX33-xxxxx	11.99 ± 0.25 (0.472 ± 0.010)

Absolute Maximum Ratings at T_A = 25°C

DC Forward Current[1,2,3] ..... 50 mA
Peak Pulsed Forward Current[2,3] ..... 100 mA
Average Forward Current ..... 30 mA
Reverse Voltage (I_R = 100 μA) ..... 5 V
LED Junction Temperature ..... 130° C
Operating Temperature ..... -40° C to +100° C
Storage Temperature ..... -40° C to +120° C
Wave Solder Temperature ..... 250° C for 3 seconds
[1.59 mm (0.060 in.) below body]

Notes:

1. Derate linearly as shown in Figure 4.
2. For long term performance with minimal light output degradation, drive currents between 10 mA and 30 mA are recommended. For more information on recommended drive conditions, please refer to Application Brief I-024 (5966-3087E).
3. Please contact your sales representative about operating currents below 10 mA.

Electrical/Optical Characteristics at $T_A = 25°C$

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage Amber (λ_d = 592 nm) Red-Orange (λ_d = 617 nm) Red (λ_d = 630 nm)	V_F		2.15 2.08 2.00	2.4[1]	V	I_F = 20 mA
Reverse Voltage	V_R	5	20		V	I_R = 100 μA
Peak Wavelength Amber Red-Orange Red	λ_{PEAK}		594 623 639		nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Spectral Halfwidth	$\Delta\lambda_{1/2}$		17		nm	Wavelength Width at Spectral Distribution $^1/_2$ Power Point at I_F = 20 mA
Speed of Response	τ_s		20		ns	Exponential Time Constant, e^{-t/τ_s}
Capacitance	C		40		pF	V_F = 0, f = 1 MHz
Thermal Resistance	$R\Theta_{J\text{-}PIN}$		240		°C/W	LED Junction-to-Cathode Lead
Luminous Efficacy[2] Amber Red-Orange Red	η_v		500 235 155		lm/W	Emitted Luminous Power/Emitted Radiant Power at I_f = 20 mA

Notes:

1. For options -xxRxx, -xxSxx, -xxTxx, -xxUxx, -xxWxx, -xxYxx, max forward voltage (Vf) is 2.6 V. Refer to Vf bin table.
2. The radiant intensity, I_e, in watts per steradian, may be found from the equation $I_e = I_v/\eta_v$, where I_v is the luminous intensity in candelas and η_v is the luminous efficacy in lumens/watt.

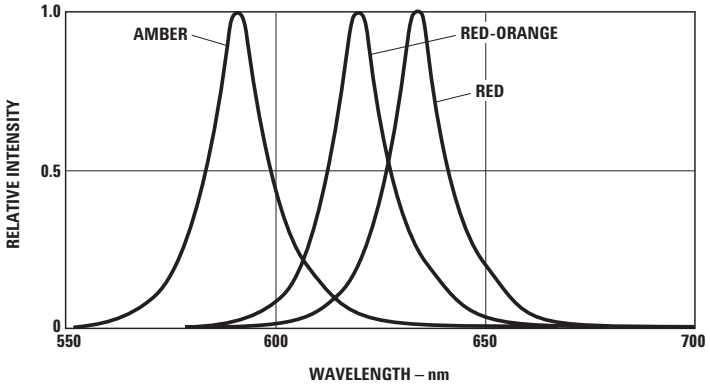


Figure 1. Relative Intensity vs. Peak Wavelength.

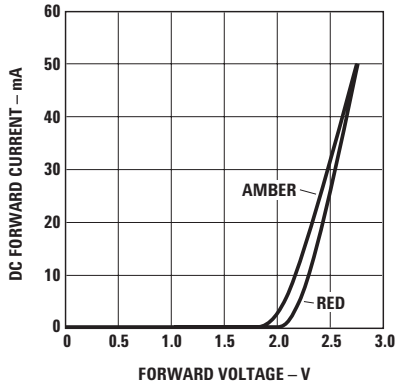


Figure 2a. Forward Current vs. Forward Voltage for Option -xxRxx, -xxSxx, -xxTxx, -xxUxx, and -xxVxx.

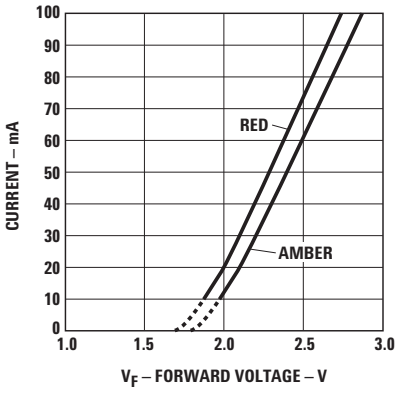


Figure 2b. Forward Current vs. Forward Voltage.

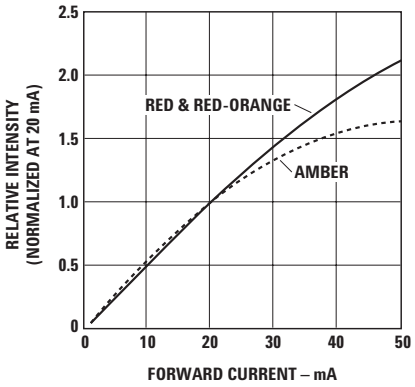


Figure 3. Relative Luminous Intensity vs. Forward Current.

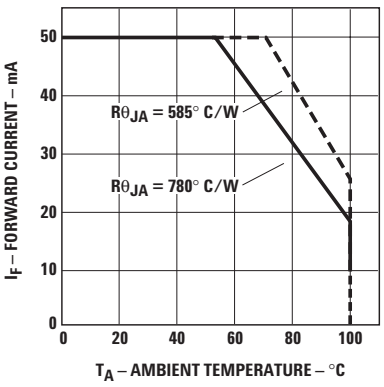


Figure 4. Maximum Forward Current vs. Ambient Temperature. Derating Based on T_{JMAX} = 130°C.

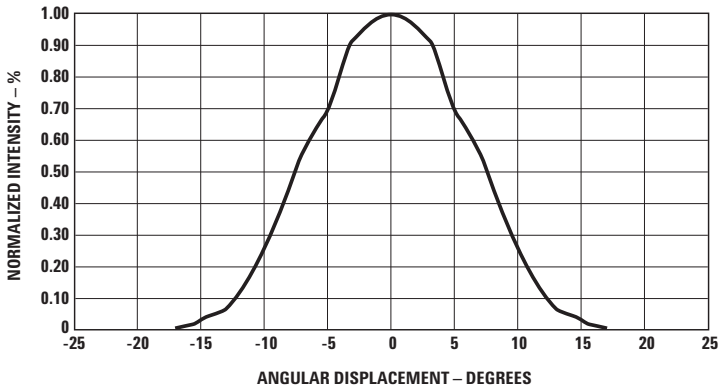


Figure 5. Representative Spatial Radiation Pattern for 15° Viewing Angle Lamps.

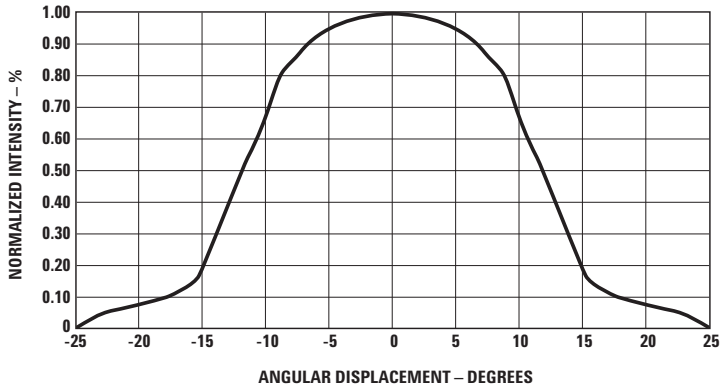


Figure 6. Representative Spatial Radiation Pattern for 24° Viewing Angle Lamps.

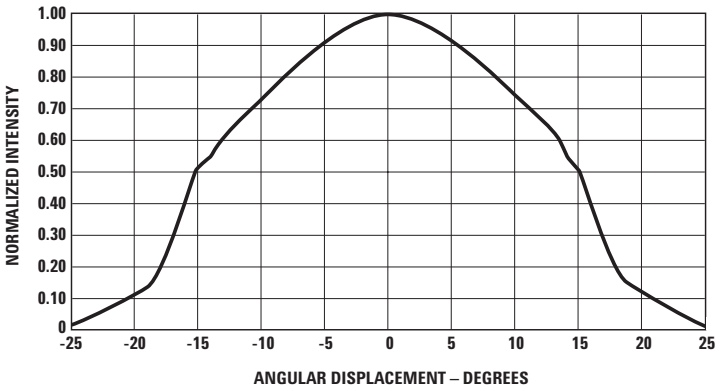


Figure 7. Representative Spatial Radiation Pattern for 30° Viewing Angle Lamps.

Intensity Bin Limits (mcd at 20 mA)

Bin Name	Min.	Max.
P	880	1150
Q	1150	1500
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300
Y	9300	12000
Z	12000	16000

Tolerance for each bin limit is ±15%.

Amber Color Bin Limits (nm at 20 mA)

Bin Name	Min.	Max.
1	584.5	587.0
2	587.0	589.5
4	589.5	592.0
6	592.0	594.5

Tolerance for each bin limit is ±0.5 nm.

Note:

1. Bin categories are established for classification of products. Products may not be available in all bin categories.
2. Vf Bin table only available for those part number with options -xxRxx, -xxSxx, -xxTxx, -xxUxx, -xxWxx, -xxYxx.

Vf Bin Table[2]

Bin Name	Min.	Max.
VA	2.0	2.2
VB	2.2	2.4
VC	2.4	2.6

Tolerance for each bin limit is ±0.05 V.

Agilent Technologies

www.agilent.com/semiconductors

For product information and a complete list of distributors, please go to our web site.

For technical assistance call:

Americas/Canada: +1 (800) 235-0312 or (916) 788-6763

Europe: +49 (0) 6441 92460

China: 10800 650 0017

Hong Kong: (+65) 6756 2394

India, Australia, New Zealand: (+65) 6755 1939

Japan: (+81 3) 3335-8152 (Domestic/International), or 0120-61-1280 (Domestic Only)

Korea: (+65) 6755 1989

Singapore, Malaysia, Vietnam, Thailand, Philippines, Indonesia: (+65) 6755 2044

Taiwan: (+65) 6755 1843

Data subject to change.

Obsoletes 5988-8601EN

June 23, 2004

5989-0661EN