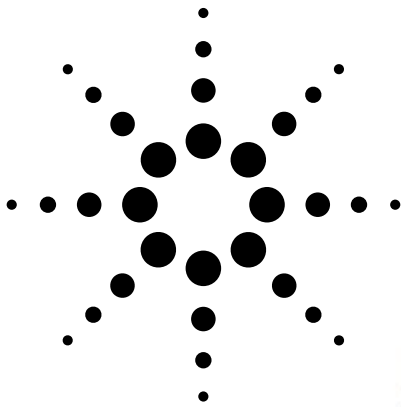


# Agilent HLMP-EDxx/EGxx/ELxx 5 mm Precision Optical Performance Best Value AlInGaP Lamps Data Sheet



## Description

These Precision Optical Performance AlInGaP and AlInGaP II LEDs provide superior light output for excellent readability in sunlight and are extremely reliable.

These LED lamps are untinted, nondiffused, T-1 3/4 packages incorporating second generation optics producing well defined spatial 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 high maximum LED junction temperature limit of +130°C enables high temperature operation in bright sunlight conditions. The package epoxy contains both uv-a and uv-b inhibitors to reduce the effects of long term exposure to direct sunlight.

## Features

- Well defined spatial radiation pattern
- Viewing angles: 6°, 15°, 23°, 30°
- High luminous output
- Two red and amber intensity levels AlInGaP (bright) and AlInGaP II (brightest)
- Colors: 626/630 nm red  
590/592 nm amber
- Superior resistance to moisture
- UV resistant epoxy

## Benefits

- Viewing angles match traffic management sign and requirements
- Colors meet automotive and pedestrian signal and specifications
- Superior performance in outdoor environments
- Suitable for autoinsertion onto PC boards

## Applications

- Traffic management:  
Traffic signals  
Work zone warning lights  
Variable message signs
- Commercial outdoor advertising:  
Signs  
Marquees
- Automotive:  
Exterior and Interior Lights



**Device Selection Guide for AlInGaP**

<b>Part Number</b>	<b>Typical Viewing Angle <math>2\theta_{1/2}</math></b>	<b>Color and Dominant Wavelength (nm), Typ.<sup>[4]</sup></b>	<b>Luminous Intensity <math>I_v</math> (mcd)<sup>[2][3]</sup> at <math>I_F = 20</math> mA Min.</b>	<b>Leads with Standoffs</b>	<b>Package Drawing</b>
HLMP-EG08-T0000	6°	Red 626	2170	No	A
HLMP-EG10-T0000	6°	Red 626	2170	Yes	B
HLMP-EG15-N0000	15°	Red 626	590	No	A
HLMP-EG17-N0000	15°	Red 626	590	Yes	B
HLMP-EG24-M0000	23°	Red 626	450	No	A
HLMP-EG26-M0000	23°	Red 626	450	Yes	B
HLMP-EG30-K0000	30°	Red 626	270	No	A
HLMP-EG32-K0000	30°	Red 626	270	Yes	B
HLMP-EL08-T0000	6°	Amber 590	2170	No	A
HLMP-EL10-T0000	6°	Amber 590	2170	Yes	B
HLMP-EL15-M0000	15°	Amber 590	450	No	A
HLMP-EL17-M0000	15°	Amber 590	450	Yes	B
HLMP-EL24-L0000	23°	Amber 590	345	No	A
HLMP-EL26-L0000	23°	Amber 590	345	Yes	B
HLMP-EL30-K0000	30°	Amber 590	270	No	A
HLMP-EL32-K0000	30°	Amber 590	270	Yes	B

## Device Selection Guide for AlInGaP II

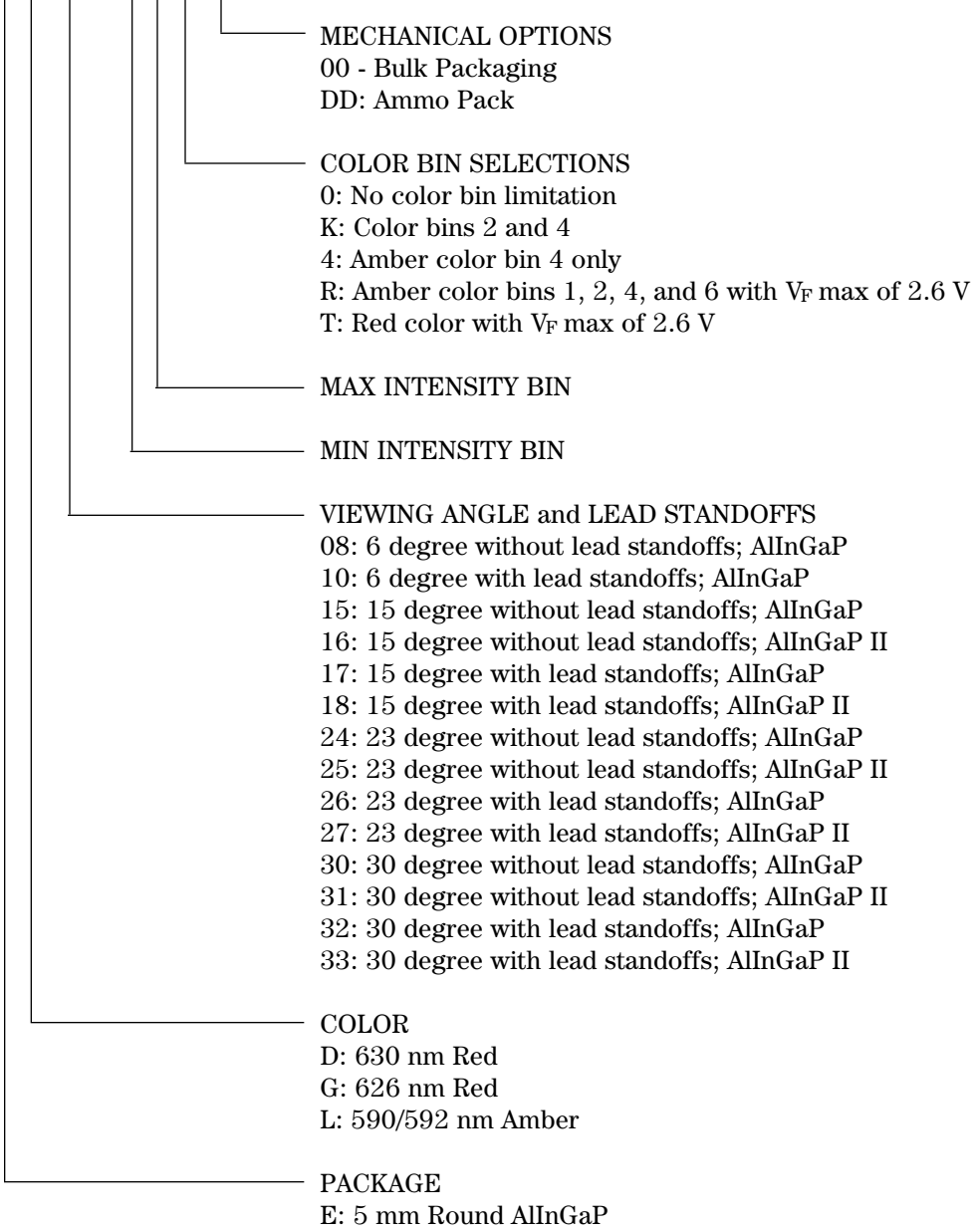
Part Number	Typical Viewing Angle $2\theta_{1/2}$	Color and Dominant Wavelength (nm), Typ. <sup>[4]</sup>	Luminous Intensity $I_v$ (mcd) <sup>[2][3]</sup> at $I_F = 20$ mA Min.	Leads with Standoffs	Package Drawing
HLMP-ED16-S0000	15°	Red 630	1650	No	A
HLMP-ED16-S0T00	15°	Red 630	1650	No	A
HLMP-ED18-S0000	15°	Red 630	1650	Yes	B
HLMP-ED18-S0T00	15°	Red 630	1650	Yes	B
HLMP-ED25-R0000	23°	Red 630	1300	No	A
HLMP-ED25-R0T00	23°	Red 630	1300	No	A
HLMP-ED27-R0000	23°	Red 630	1300	Yes	B
HLMP-ED27-R0T00	23°	Red 630	1300	Yes	B
HLMP-ED31-Q0000	30°	Red 630	1000	No	A
HLMP-ED31-Q0T00	30°	Red 630	1000	No	A
HLMP-ED33-Q0000	30°	Red 630	1000	Yes	B
HLMP-ED33-Q0T00	30°	Red 630	1000	Yes	B
HLMP-EL16-S0000	15°	Amber 592	1650	No	A
HLMP-EL16-S0R00	15°	Amber 592	1650	No	A
HLMP-EL18-S0000	15°	Amber 592	1650	Yes	B
HLMP-EL18-S0R00	15°	Amber 592	1650	Yes	B
HLMP-EL25-Q0000	23°	Amber 592	1000	No	A
HLMP-EL25-Q0R00	23°	Amber 592	1000	No	A
HLMP-EL27-Q0000	23°	Amber 592	1000	Yes	B
HLMP-EL27-Q0R00	23°	Amber 592	1000	Yes	B
HLMP-EL31-P0000	30°	Amber 592	765	No	A
HLMP-EL31-P0R00	30°	Amber 592	765	No	A
HLMP-EL33-P0000	30°	Amber 592	765	Yes	B
HLMP-EL33-P0R00	30°	Amber 592	765	Yes	B
HLMP-EL31-Q0R00	30°	Amber 592	1000	No	A

### Notes:

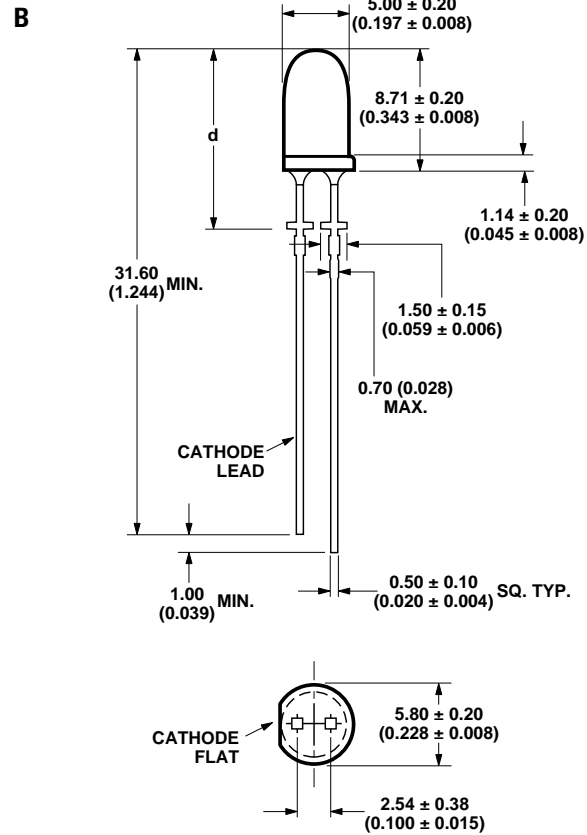
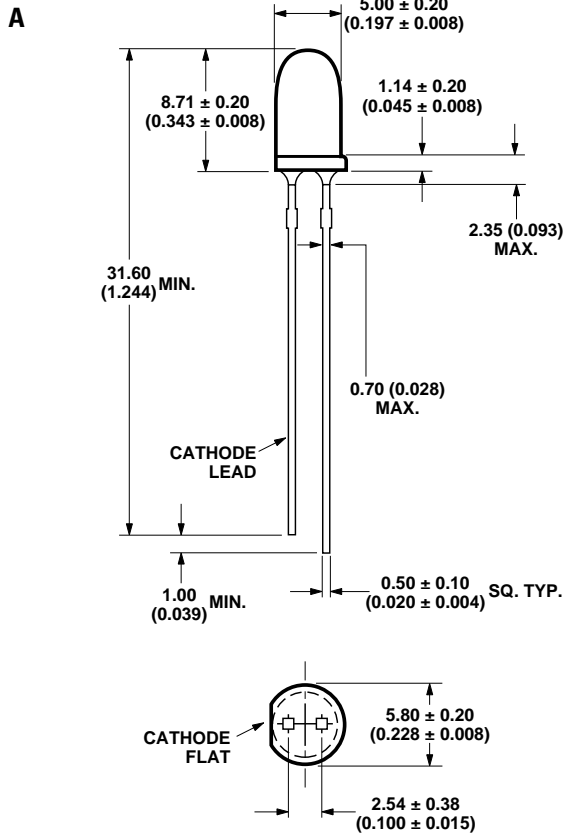
1.  $2\theta_{1/2}$  is the off-axis angle where the luminous intensity is 1/2 the on-axis intensity.
2. The luminous intensity is measured on the mechanical axis of the lamp package.
3. The optical axis is closely aligned with the package mechanical axis.
4. The dominant wavelength,  $\lambda_d$ , is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

**Part Numbering System**

**HLMP-X X X X - X X X X X**



## Package Dimensions



### Notes:

- All Dimensions are in millimeters (inches).
- Leads are mild steel, solder dipped.
- Tapers shown at top of leads (bottom of lamp package) indicate an epoxy meniscus that may extend about 1mm (0.040 in.) down the leads.
- Recommended PC board hole diameters:
  - Lamp package A without standoffs: Flush mounting at base of lamp package = 1.143/1.067 (0.044/0.042).
  - Lamp package B with standoffs: Mounting at lead standoffs = 0.965/0.889(0.038/0.035).
- For dome height above lead stand-off seating plane,  $d$ , lamp package B. See table.

Part Number	$d$
HLMP-xx10	$12.37 \pm 0.25$ (0.487 $\pm$ 0.010)
HLMP-xx17	$12.43 \pm 0.25$ (0.489 $\pm$ 0.010)
HLMP-xx26	$12.52 \pm 0.25$ (0.493 $\pm$ 0.010)
HLMP-xx32	$11.96 \pm 0.25$ (0.471 $\pm$ 0.010)
HLMP-xx18	$12.60 \pm 0.25$ (0.496 $\pm$ 0.010)
HLMP-xx27	$11.59 \pm 0.25$ (0.446 $\pm$ 0.010)
HLMP-xx33	$11.99 \pm 0.25$ (0.472 $\pm$ 0.010)

**Absolute Maximum Ratings at  $T_A = 25^\circ\text{C}$** 

<b>Parameter</b>	<b>Value</b>
DC Forward Current <sup>[1,2]</sup>	50 mA
Peak Pulsed Forward Current <sup>[2]</sup>	100 mA
Average Forward Current	30 mA
Reverse Voltage ( $I_R = 100 \mu\text{A}$ )	5 V
Power Dissipation	120 mW
LED Junction Temperature	130°C
Operating Temperature	-40°C to +100°C
Storage Temperature	-40°C to +120°C
Dip/Drag Solder Temperature	260°C for 6 secs
Through-the-Wave Preheat Temperature	145°C
Through-the-Wave Solder Temperature	245°C for 3 secs

**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, please refer to Application Brief I-024.

**Electrical/Optical Characteristics Table**

**T<sub>A</sub> = 25°C**

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage						I <sub>F</sub> = 20 mA
Amber (λ <sub>d</sub> = 590 nm)	V <sub>F</sub>		2.02	2.5		V
Red (λ <sub>d</sub> = 626 nm)			1.90	2.5		
Amber (λ <sub>d</sub> = 592 nm)			2.15	2.5 <sup>[1]</sup>		
Red (λ <sub>d</sub> = 630 nm)			2.00	2.5 <sup>[1]</sup>		
Reverse Voltage	V <sub>R</sub>	5	20		V	I <sub>R</sub> = 100 μA
Peak Wavelength						Peak of Wavelength of Spectral Distribution at I <sub>F</sub> = 20 mA
Amber (λ <sub>d</sub> = 590 nm)	λ <sub>PEAK</sub>		592		nm	
Red (λ <sub>d</sub> = 626 nm)			635			
Amber (λ <sub>d</sub> = 592 nm)			594			
Red (λ <sub>d</sub> = 630 nm)			639			
Spectral Halfwidth	Δλ <sub>1/2</sub>		17		nm	Wavelength Width at Spectral Distribution 1/2 Power Point at I <sub>F</sub> = 20 mA
Speed of Response	τ <sub>s</sub>		20		ns	Exponential Time Constant, e <sup>-t/τ<sub>s</sub></sup>
Capacitance	C		40		pF	V <sub>F</sub> = 0, f = 1 MHz
Luminous Efficacy						Emitted Luminous Power/Emitted Radiant Power at I <sub>F</sub> = 20 mA
Amber (λ <sub>d</sub> = 590 nm)	η <sub>v</sub>		480		lm/w	
Red (λ <sub>d</sub> = 626 nm)			150			
Amber (λ <sub>d</sub> = 592 nm)			500			
Red (λ <sub>d</sub> = 630 nm)			155			
Thermal Resistance	Rθ <sub>J-PIN</sub>		240		°C/W	LED Junction-to-Cathode Lead

**Notes:**

1. For options -xxRxx and -xxTxx, maximum forward voltage, V<sub>F</sub> is 2.6 V.
2. 2θ<sub>1/2</sub> is the off-axis angle where the luminous intensity is 1/2 the on-axis intensity.
3. The radiant intensity, I<sub>e</sub> in watts per steradian, may be found from the equation I<sub>e</sub> = I<sub>v</sub>/η<sub>v</sub> where I<sub>v</sub> is the luminous intensity in candelas and η<sub>v</sub> is the luminous efficacy in lumens/watt.

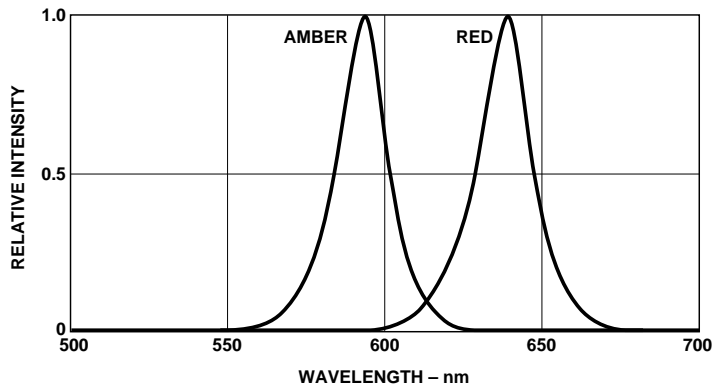


Figure 1. Relative intensity vs. wavelength.

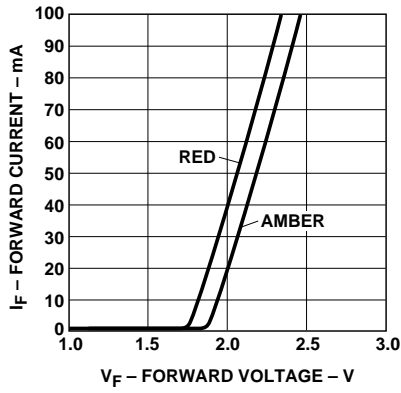


Figure 2. Forward current vs. forward voltage.

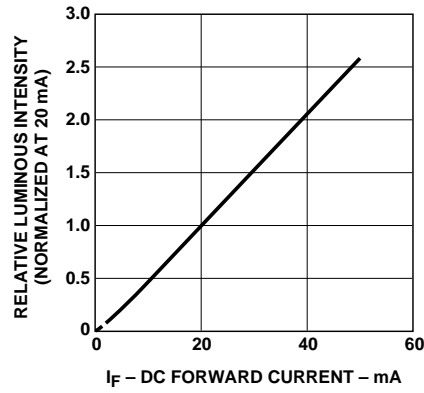


Figure 3. Relative luminous intensity vs. forward current.

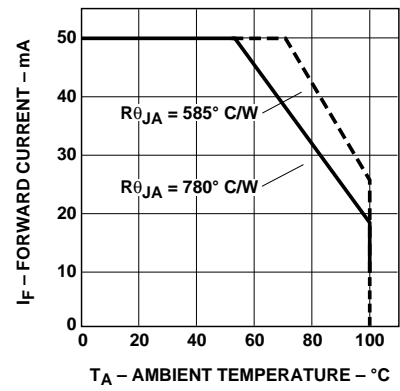


Figure 4. Maximum forward current vs. ambient temperature.

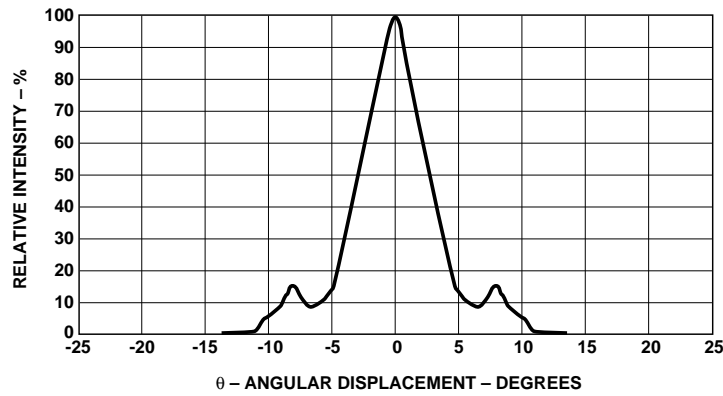


Figure 5. Representative spatial radiation pattern for 6° viewing angle lamps.

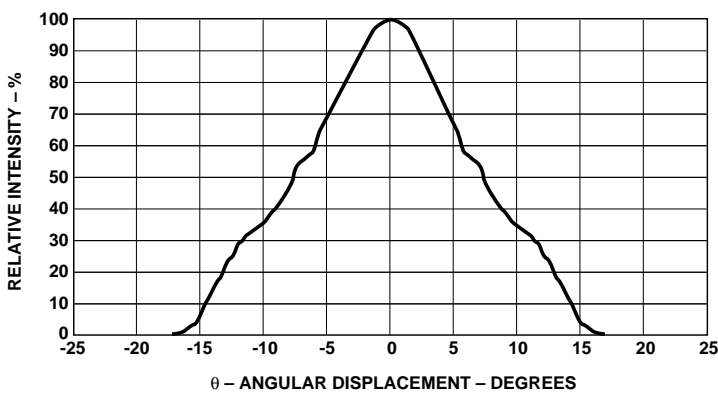


Figure 6. Representative spatial radiation pattern for 15° viewing angle lamps.



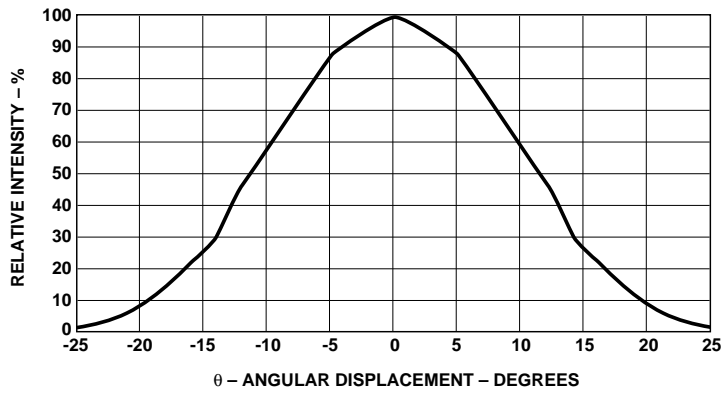


Figure 7. Representative spatial radiation pattern for 23° viewing angle lamps.

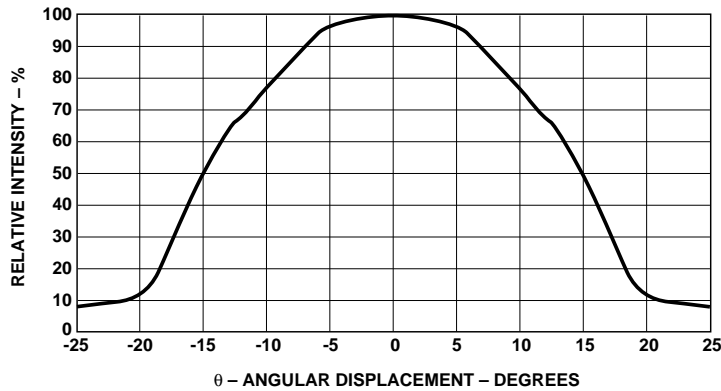


Figure 8. Representative spatial radiation pattern for 30° viewing angle lamps.

#### Intensity Bin Limits (mcd at 20 mA)

Bin ID	Min.	Max.
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150
Q	1150	1500
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500

Tolerance for each bin limit is  $\pm 15\%$ .

#### Amber Color Bin Limits (nm at 20 mA)

Bin ID	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  $\pm 0.5$  nm.

#### Note:

- Bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your local Agilent representatives for further information.

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