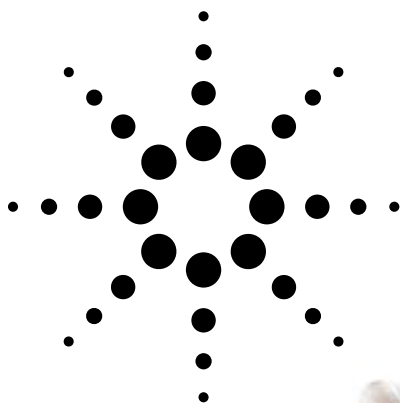


# Agilent T-1<sup>3</sup>/<sub>4</sub> (5 mm) Precision Optical Performance InGaN Blue and Green Lamps

## Data Sheet



**HLMP-CB15, HLMP-CB16, HLMP-CB30, HLMP-CB31,  
HLMP-CM15, HLMP-CM16, HLMP-CM30, HLMP-CM31**

### Description

These high intensity blue and green LEDs are based on InGaN material technology. InGaN is the most efficient and cost effective material for LEDs in the blue and green region of the spectrum. The 472 nm typical dominant wavelength for blue and 526 nm typical dominant wavelength for green are well suited to color mixing in full color signs.

These LED lamps are untinted, nondiffused, T-1<sup>3</sup>/<sub>4</sub> 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.

These lamps are available in two viewing angle options to give the designer flexibility with optical design.

### Features

- Well defined spatial radiation pattern
- Viewing angles: 15° and 30°
- High luminous output
- Colors: 472 nm Blue, 526 nm Green
- Superior resistance to moisture
- UV resistant epoxy

### Benefits

- Superior performance in outdoor environments
- Wavelengths suitable for color mixing in full color (RGB) signs

### Applications

- Commercial outdoor signs
- Automotive interior lights
- Front panel indicators
- Front panel backlighting

**CAUTION:** HLMP-CBxx and HLMP-CMxx LEDs are Class 1 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Agilent Application Note AN-1142 for additional details.



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## LED Indicators

### Device Selection Guide

| Part Number     | Typical Viewing Angle | Color and Typ. Dominant Wavelength $\lambda_d$ (nm) | Min. Luminous Intensity, $I_v$ (mcd) at 20 mA | Typical Forward Voltage (V) at 20 mA | Leads with Stand-Offs | Package Drawing |
|-----------------|-----------------------|-----------------------------------------------------|-----------------------------------------------|--------------------------------------|-----------------------|-----------------|
| HLMP-CB15-P00xx | 15°                   | Blue 472                                            | 880                                           | 3.8                                  | No                    | A               |
| HLMP-CB15-R00xx | 15°                   | Blue 472                                            | 1500                                          | 3.5                                  | No                    | A               |
| HLMP-CB15-QT0xx | 15°                   | Blue 472                                            | 1150                                          | 3.8                                  | No                    | A               |
| HLMP-CB16-P00xx | 15°                   | Blue 472                                            | 880                                           | 3.8                                  | Yes                   | B               |
| HLMP-CB16-QT0xx | 15°                   | Blue 472                                            | 1150                                          | 3.8                                  | Yes                   | B               |
| HLMP-CB30-K00xx | 30°                   | Blue 472                                            | 310                                           | 3.8                                  | No                    | A               |
| HLMP-CB30-KN0xx | 30°                   | Blue 472                                            | 310                                           | 3.8                                  | No                    | A               |
| HLMP-CB30-M00xx | 30°                   | Blue 472                                            | 520                                           | 3.8                                  | No                    | A               |
| HLMP-CB30-MQ0xx | 30°                   | Blue 472                                            | 520                                           | 3.8                                  | No                    | A               |
| HLMP-CB30-NRGxx | 30°                   | Blue 472                                            | 680                                           | 3.8                                  | No                    | A               |
| HLMP-CB31-M00xx | 30°                   | Blue 472                                            | 520                                           | 3.8                                  | Yes                   | B               |
| HLMP-CB31-M0Gxx | 30°                   | Blue 472                                            | 520                                           | 3.8                                  | Yes                   | B               |
| HLMP-CB31-NRGxx | 30°                   | Blue 472                                            | 680                                           | 3.8                                  | Yes                   | B               |
| HLMP-CM15-S00xx | 15°                   | Green 526                                           | 1900                                          | 3.8                                  | No                    | A               |
| HLMP-CM15-SV0xx | 15°                   | Green 526                                           | 1900                                          | 3.8                                  | No                    | A               |
| HLMP-CM15-W00xx | 15°                   | Green 526                                           | 5500                                          | 3.5                                  | No                    | A               |
| HLMP-CM15-VY0xx | 15°                   | Green 526                                           | 4200                                          | 3.8                                  | No                    | A               |
| HLMP-CM16-S00xx | 15°                   | Green 526                                           | 1900                                          | 3.8                                  | Yes                   | B               |
| HLMP-CM16-VY0xx | 15°                   | Green 526                                           | 4200                                          | 3.8                                  | Yes                   | B               |
| HLMP-CM30-M00xx | 30°                   | Green 526                                           | 520                                           | 3.8                                  | No                    | A               |
| HLMP-CM30-MQ0xx | 30°                   | Green 526                                           | 520                                           | 3.8                                  | No                    | A               |
| HLMP-CM30-S00xx | 30°                   | Green 526                                           | 1900                                          | 3.5                                  | No                    | A               |
| HLMP-CM30-TWAxx | 30°                   | Green 526                                           | 2500                                          | 3.8                                  | No                    | A               |
| HLMP-CM31-M00xx | 30°                   | Green 526                                           | 520                                           | 3.8                                  | Yes                   | B               |
| HLMP-CM31-TWAxx | 30°                   | Green 526                                           | 2500                                          | 3.8                                  | Yes                   | B               |

Tolerance for intensity limit is  $\pm 15\%$ .

## Part Numbering System

HLMP - X X XX - X X X XX

### Mechanical Options

00: Bulk  
DD: Ammo Pack  
YY: Flexi bin, Bulk  
ZZ: Flexi bin, Ammo Pack

### Color Bin Selection

0: Full color range  
A: Color bin 1 & 2 only  
G: Color bin 2, 3 & 4 only

### Maximum Intensity Bin

0: No maximum Iv bin limit  
Others: Refer to Intensity Bin Limit Table

### Minimum Intensity Bin

Refer to Device Selection Guide

### Viewing Angle and Standoff Options

15: 15 degree without standoff  
16: 15 degree with standoff  
30: 30 degree without standoff  
31: 30 degree with standoff

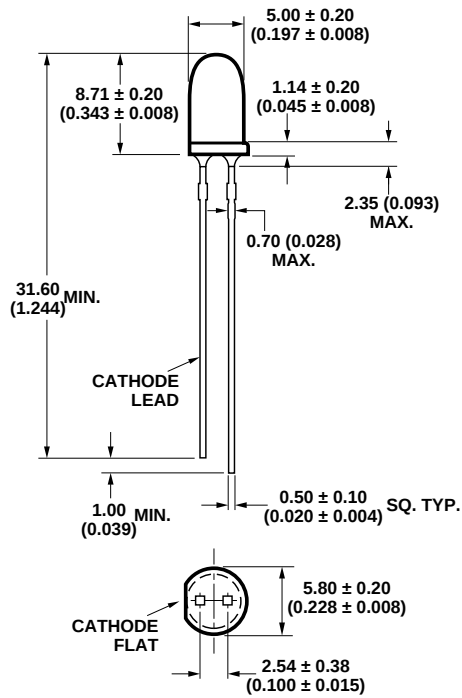
### Color

B: Blue  
M: Green

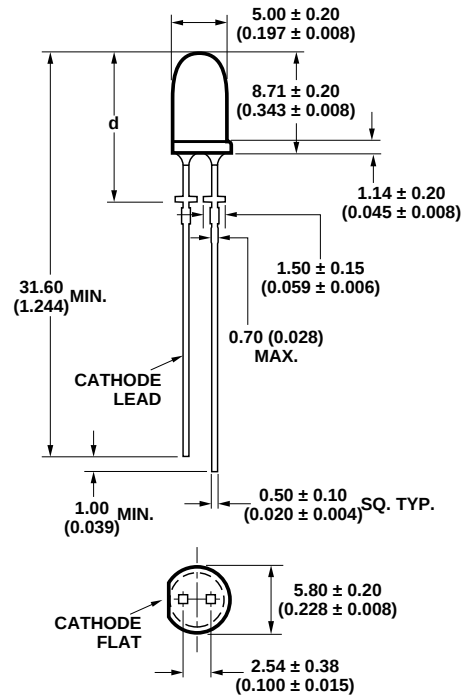
### Package

C: T-1 3/4 (5 mm) round lamp

## Package Dimensions



HLMP-Cx15 and HLMP-Cx30



HLMP-Cx16 and HLMP-Cx31

| HLMP-Cx16                                   | HLMP-Cx31                                   |
|---------------------------------------------|---------------------------------------------|
| $d = 12.60 \pm 0.25$<br>(0.496 $\pm$ 0.010) | $d = 12.22 \pm 0.50$<br>(0.481 $\pm$ 0.020) |

### Notes:

1. Dimensions in mm.
2. Tolerance  $\pm 0.1$  mm unless otherwise noted.

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

| Parameter                                    | Blue and Green      |
|----------------------------------------------|---------------------|
| DC Forward Current <sup>[1]</sup>            | 30 mA               |
| Peak Pulsed Forward Current                  | 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 Range                  | -40°C to +80°C      |
| Storage Temperature Range                    | -40°C to +100°C     |
| Soldering Temperature                        | 260°C for 5 seconds |

**Note:**

1. Derate linearly as shown in Figure 5 for temperatures above 50°C.

**Electrical/Optical Characteristics at  $T_A = 25^\circ\text{C}$** 

| Parameter                                                                                             | Symbol                  | Min. | Typ.       | Max. | Units | Test Conditions                                                      |
|-------------------------------------------------------------------------------------------------------|-------------------------|------|------------|------|-------|----------------------------------------------------------------------|
| Forward Voltage                                                                                       | $V_F$                   |      | 3.5        | 4.0  | V     | $I_F = 20\ \text{mA}$                                                |
| Reverse Voltage                                                                                       | $V_R$                   | 5    |            |      |       | $I_R = 100\ \mu\text{A}$                                             |
| Peak Wavelength<br>Blue ( $\lambda_d = 472\ \text{nm}$ )<br>Green ( $\lambda_d = 526\ \text{nm}$ )    | $\lambda_{\text{peak}}$ |      | 470<br>524 |      | nm    | Peak of Wavelength of Spectral Distribution at $I_F = 20\ \text{mA}$ |
| Spectral Halfwidth<br>Blue ( $\lambda_d = 472\ \text{nm}$ )<br>Green ( $\lambda_d = 526\ \text{nm}$ ) | $\Delta\lambda_{1/2}$   |      | 35<br>47   |      | nm    | Wavelength Width at Spectral Power Point at $I_F = 20\ \text{mA}$    |
| Capacitance                                                                                           | C                       |      | 43         |      | pF    | $V_F = 0, F = 1\ \text{MHz}$                                         |
| Luminous Efficacy<br>Blue ( $\lambda_d = 472\ \text{nm}$ )<br>Green ( $\lambda_d = 526\ \text{nm}$ )  | $\eta_v$                |      | 75<br>520  |      | lm/W  | Emitted Luminous Power/Emitted Radiant Power                         |
| Thermal Resistance                                                                                    | $R\Theta_{J-PIN}$       |      | 240        |      | °C/W  | LED Junction-to-Cathode Lead                                         |

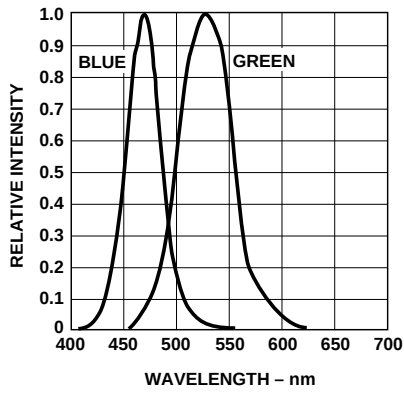


Figure 1. Relative intensity vs. wavelength.

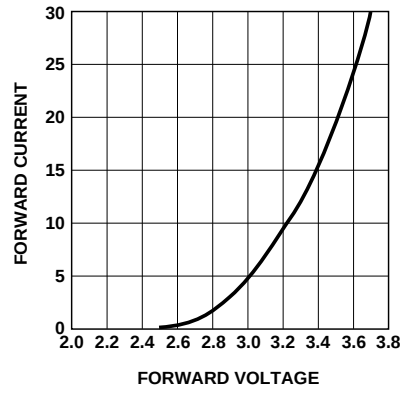


Figure 2. Forward current vs. forward voltage for devices with 3.5 V typical  $V_f$ .

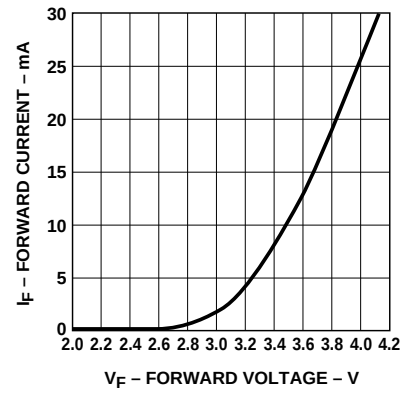


Figure 3. Forward current vs. forward voltage for devices with 3.8 V typical  $V_f$ .

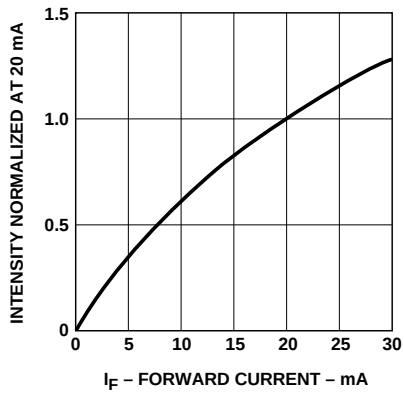


Figure 4. Relative luminous intensity vs. forward current.

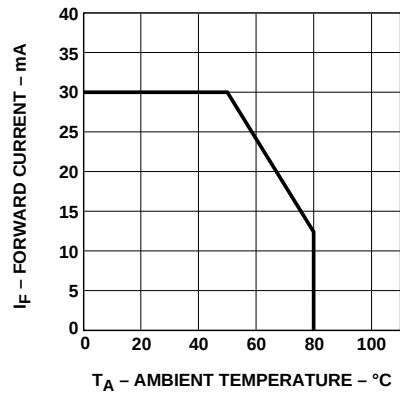


Figure 5. Maximum forward current vs. ambient temperature.

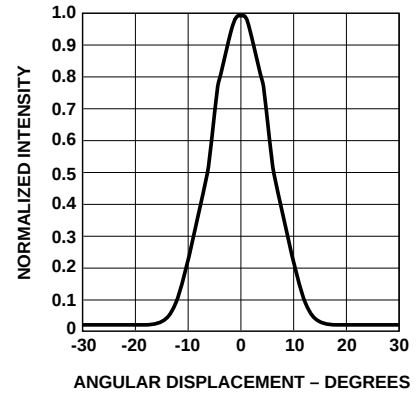


Figure 6. Spatial radiation pattern – 15° lamps.

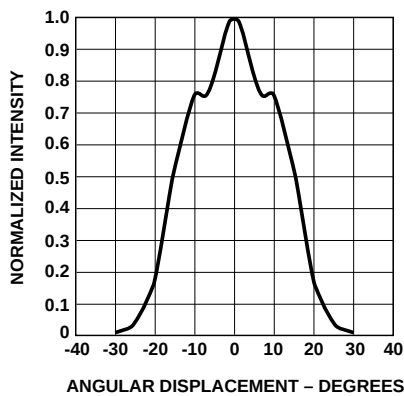


Figure 7. Spatial radiation pattern – 30° lamps.

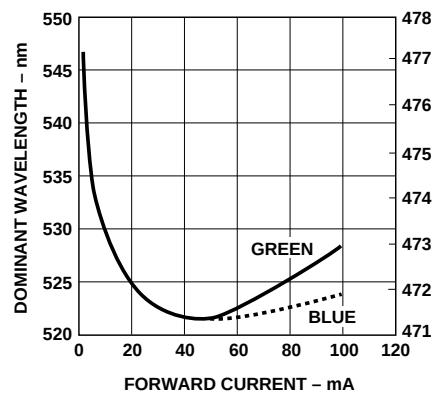


Figure 8. Color vs. forward current.

**Color Bin Limits (nm at 20 mA)**

| <b>Blue</b>   | <b>Color Range (nm)</b> |             |
|---------------|-------------------------|-------------|
| <b>Bin ID</b> | <b>Min.</b>             | <b>Max.</b> |
| 1             | 460.0                   | 464.0       |
| 2             | 464.0                   | 468.0       |
| 3             | 468.0                   | 472.0       |
| 4             | 472.0                   | 476.0       |
| 5             | 476.0                   | 480.0       |

Tolerance for each bin limit is  $\pm 0.5$  nm.

| <b>Green</b>  | <b>Color Range (nm)</b> |             |
|---------------|-------------------------|-------------|
| <b>Bin ID</b> | <b>Min.</b>             | <b>Max.</b> |
| 1             | 520.0                   | 524.0       |
| 2             | 524.0                   | 528.0       |
| 3             | 528.0                   | 532.0       |
| 4             | 532.0                   | 536.0       |
| 5             | 536.0                   | 540.0       |

Tolerance for each bin limit is  $\pm 0.5$  nm.

**Intensity Bin Limits**

| <b>Bin Name</b> | <b>Min.</b> | <b>Max.</b> |
|-----------------|-------------|-------------|
| 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        |
| W               | 5500        | 7200        |
| X               | 7200        | 9300        |
| Y               | 9300        | 12000       |
| Z               | 12000       | 16000       |

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

**Note:**

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

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