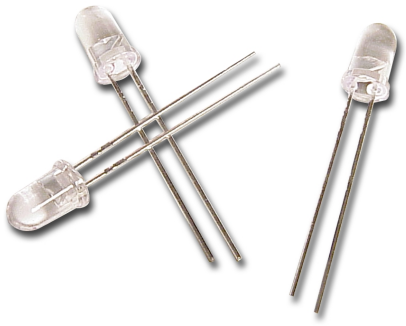
Agilent T-1 3/4 (5 mm) Precision Optical Performance InGaN Blue and Green Lamps

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 3/4 packages incorporating second generation optics which produce 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.

Device Selection Guide

Part Number	Typical Viewing Angle	Color and Typ. Dominant Wavelength λd (nm)	Min. Luminous Intensity, Iv (mcd) at 20 mA	Max. Luminous Intensity, Iv (mcd) at 20 mA	Leads with Stand-Offs	Package Drawing
HLMP-CB15-P00xx	15°	Blue 472	880	-	No	A
HLMP-CB15-QT0xx	15°	Blue 472	1150	3200	No	A
HLMP-CB15-R00xx	15°	Blue 472	1500	-	No	A
HLMP-CB15-RSCxx	15°	Blue 472	1500	2500	No	A
HLMP-CB16-P00xx	15°	Blue 472	880	-	Yes	B
HLMP-CB16-QT0xx	15°	Blue 472	1150	3200	Yes	B
HLMP-CB30-K00xx	30°	Blue 472	310	-	No	A
HLMP-CB30-M00xx	30°	Blue 472	520	-	No	A
HLMP-CB30-NPCxx	30°	Blue 472	680	1150	No	A
HLMP-CB30-NRGxx	30°	Blue 472	680	1900	No	A
HLMP-CB30-PQCxx	30°	Blue 472	880	1500	No	A
HLMP-CB31-M00xx	30°	Blue 472	520	-	Yes	B
HLMP-CB31-NRGxx	30°	Blue 472	680	1900	Yes	B
HLMP-CB31-PQCxx	30°	Blue 472	880	1500	Yes	B
HLMP-CM15-S00xx	15°	Green 526	1900	-	No	A
HLMP-CM15-VY0xx	15°	Green 526	4200	12000	No	A
HLMP-CM15-W00xx	15°	Green 526	5500	-	No	A
HLMP-CM15-WXBxx	15°	Green 526	5500	9300	No	A
HLMP-CM16-S00xx	15°	Green 526	1900	-	Yes	B
HLMP-CM16-VY0xx	15°	Green 526	4200	12000	Yes	B
HLMP-CM30-M00xx	30°	Green 526	520	-	No	A
HLMP-CM30-RSBxx	30°	Green 526	1500	2500	No	A
HLMP-CM30-S00xx	30°	Green 526	1900	-	No	A
HLMP-CM30-TUBxx	30°	Green 526	2500	4200	No	A
HLMP-CM30-TUCxx	30°	Green 526	2500	4200	No	A
HLMP-CM30-TW0xx	30°	Green 526	2500	7200	No	A
HLMP-CM30-TWAxx	30°	Green 526	2500	7200	No	A
HLMP-CM30-UVAxx	30°	Green 526	3200	5500	No	A
HLMP-CM31-M00xx	30°	Green 526	520	-	Yes	B
HLMP-CM31-TUCxx	30°	Green 526	2500	4200	Yes	B
HLMP-CM31-TW0xx	30°	Green 526	2500	7200	Yes	B
HLMP-CM31-TWAxx	30°	Green 526	2500	7200	Yes	B

Tolerance for intensity limit is ±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
B: Color bin 2 & 3 only
C: Color bin 3 & 4 only
G: Color bin 2, 3 & 4 only

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

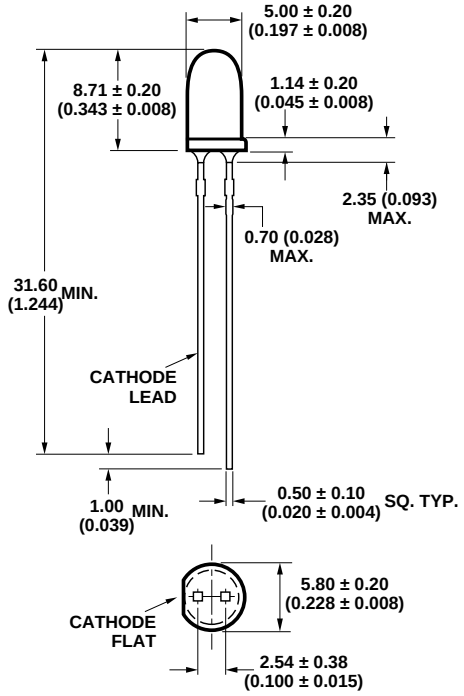
Minimum Intensity Bin
Refer to Device Selection Guide

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

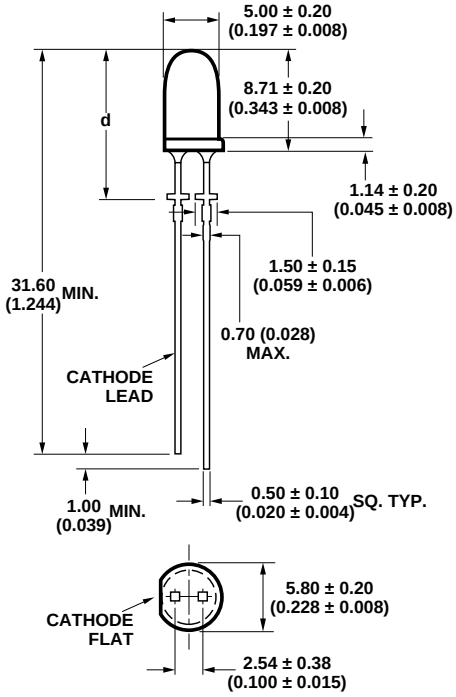
Color
B: Blue
M: Green

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 ± 0.25 (0.496 ± 0.010)	d = 12.22 ± 0.50 (0.481 ± 0.020)

Notes:

1. Dimensions in mm.
2. Tolerance ±0.1 mm unless otherwise noted.

Absolute Maximum Ratings at T_A = 25°C

Parameter	Blue and Green
DC Forward Current[1]	30 mA
Peak Pulsed Forward Current[2]	100 mA
Reverse Voltage (I_R = 100 μA)	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

Notes:
1. Derate linearly as shown in Figure 5 for temperatures above 50°C.
2. Duty factor 10%, frequency 1KHz.

Electrical / Optical Characteristics at T_A = 25°C

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage	V_F		3.8	4.0	V	I_F = 20 mA
Reverse Voltage	V_R	5				I_R = 100 μA
Peak Wavelength Blue (λ_d = 472 nm) Green (λ_d = 526 nm)	λ_{peak}		470 524		nm	Peak of Wavelength of Spectral Distribution at I_F = 20 mA
Spectral Halfwidth Blue (λ_d = 472 nm) Green (λ_d = 526 nm)	$\Delta\lambda_{1/2}$		35 47		nm	Wavelength Width at Spectral Power Point at I_F = 20 mA
Capacitance	C		43		pF	V_F = 0, F = 1 MHz
Luminous Efficacy Blue (λ_d = 472 nm) Green (λ_d = 526 nm)	η_v		75 520		lm/W	Emitted Luminous Power / Emitted Radiant Power
Thermal Resistance	$R\Theta_{J\text{-}PIN}$		240		°C/W	LED Junction-to-Cathode Lead

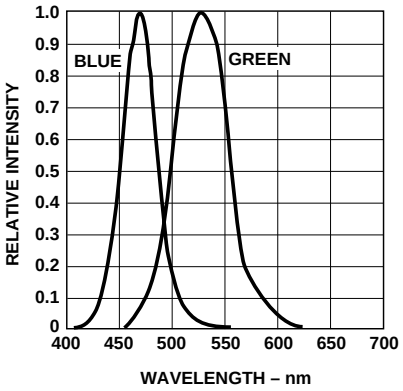


Figure 1. Relative intensity vs. wavelength.

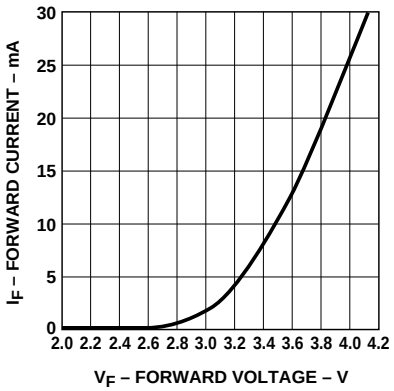


Figure 2. Forward current vs. forward voltage.

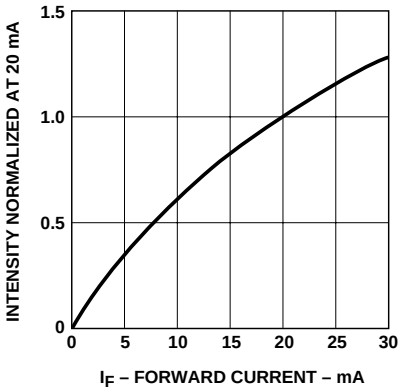


Figure 3. Relative luminous intensity vs. forward current.

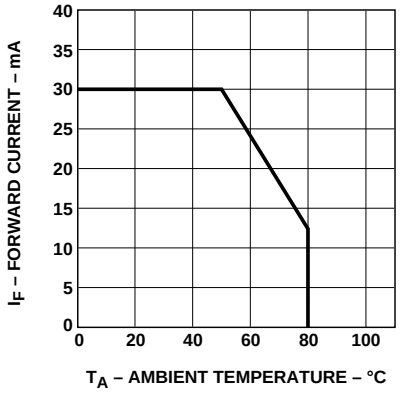


Figure 4. Maximum forward current vs. ambient temperature.

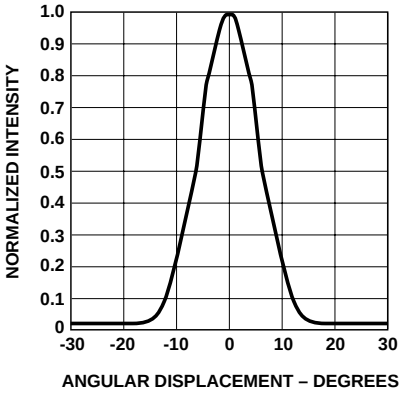


Figure 5. Spatial radiation pattern – 15° lamps.

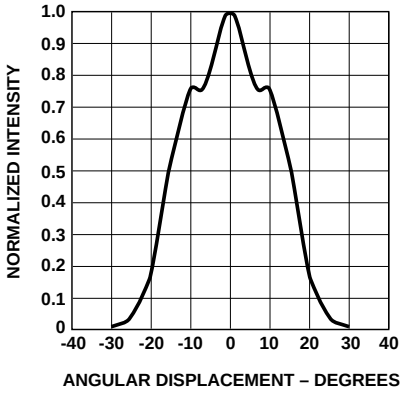


Figure 6. Spatial radiation pattern – 30° lamps.

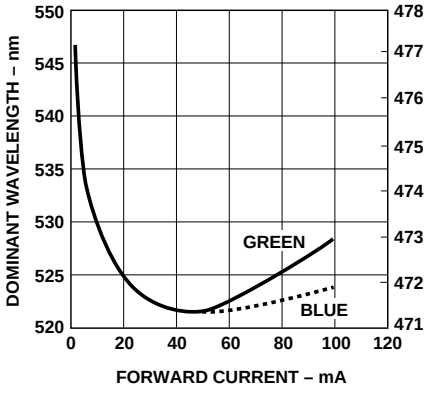


Figure 7. Color vs. forward current.

Color Bin Limits (nm at 20 mA)

Blue	Color Range (nm)	
Bin ID	**Min.**	**Max.**
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 ± 0.5 nm.

Green	Color Range (nm)	
Bin ID	**Min.**	**Max.**
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 ± 0.5 nm.

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.

Intensity Bin Limits

Bin Name	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
W	5500	7200
X	7200	9300
Y	9300	12000
Z	12000	16000

Tolerance for each intensity bin limit is ± 15%.

Precautions

Lead Forming

- The leads of an LED lamp may be preformed or cut to length prior to insertion and soldering into PC board.
- If lead forming is required before soldering, care must be taken to avoid any excessive mechanical stress induced to LED package. Otherwise, cut the leads of LED to length after soldering process at room temperature. The solder joint formed will absorb the mechanical stress of the lead cutting from traveling to the LED chip die attach and wirebond.
- It is recommended that tooling made to precisely form and cut the leads to length rather than rely upon hand operation.

Soldering Conditions

- Care must be taken during PCB assembly and soldering process to prevent damage to LED component.
- The closest LED is allowed to solder on board is 1.59 mm below the body (encapsulant epoxy) for those parts without standoff.
- Recommended soldering conditions:

	Wave Soldering	Manual Solder Dipping
Pre-heat Temperature	105 °C Max.	–
Pre-heat Time	30 sec Max.	–
Peak Temperature	250 °C Max.	260 °C Max.
Dwell Time	3 sec Max.	5 sec Max.

- Wave soldering parameter must be set and maintained according to recommended temperature and dwell time in the solder wave. Customer is advised to periodically check on the soldering profile to ensure the soldering profile used is always conforming to recommended soldering condition.
- If necessary, use fixture to hold the LED component in proper orientation with respect to the PCB during soldering process.
- Proper handling is imperative to avoid excessive thermal stresses to LED components when heated. Therefore, the soldered PCB must be allowed to cool to room temperature, 25°C, before handling.
- Special attention must be given to board fabrication, solder masking, surface plating and lead holes size and component orientation to assure solderability.
- Recommended PC board plated through hole sizes for LED component leads:

LED Component Lead Size	Diagonal	Plated Through Hole Diameter
0.457 x 0.457 mm (0.018 x 0.018 inch)	0.646 mm (0.025 inch)	0.976 to 1.078 mm (0.038 to 0.042 inch)
0.508 x 0.508 mm (0.020 x 0.020 inch)	0.718 mm (0.028 inch)	1.049 to 1.150 mm (0.041 to 0.045 inch)

Note: Refer to application note AN1027 for more information on soldering LED components.

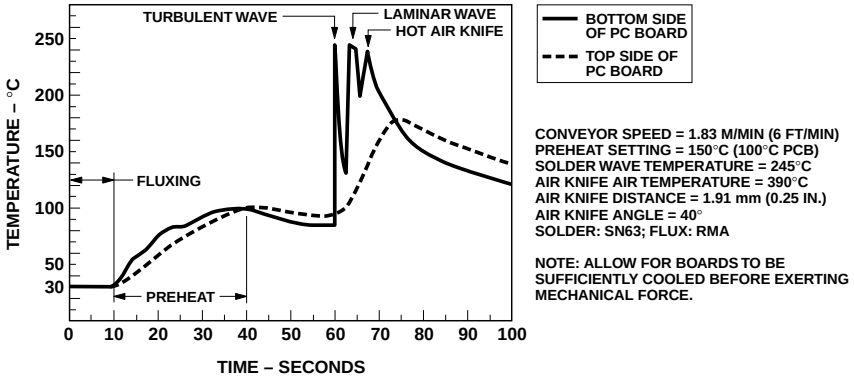


Figure 8. Recommended wave soldering profile.

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Data subject to change.

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