Data Sheet

HLMP-NW50-U0000

3-mm White Through-Hole LED Lamp

Description

The Broadcom® HLMP-NW50-U0000 is a white LED that is available in the industry-popular T1 through-hole lamp package. This LED uses high-brightness InGaN chip technology and delivers high-light output performance.

This LED has an untinted diffused epoxy body and comes with a 60-degree viewing angle. It is easy to use, making it an ideal choice for a wide variety of applications, such as status indicators in industrial and commercial segments.

This LED is available in bulk packing and supports industry-standard wave soldering processes.

Features

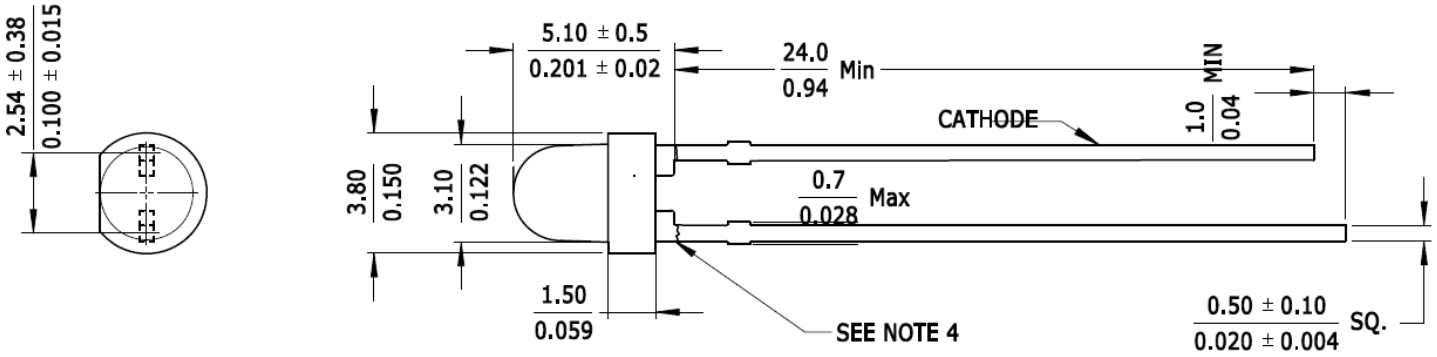
- High brightness
- Lower power consumption
- Ease of use
- Robust package design

Applications

- Status indicators
- Industrial/consumer electronics
- Home appliances

CAUTION! This LED is ESD sensitive. Observe appropriate precautions during handling and processing. Refer to Application Note 1142 for additional details.

Figure 1: Package Drawing



NOTE:

1. All dimensions are in millimeters/inches.
2. Tolerances are ±0.25 mm unless otherwise specified.
3. Lead spacing is measured where the leads emerge from the package.
4. The epoxy meniscus might extend 1 mm (0.040 inches) down the leads.
5. Leads are mild steel with tin plating.

Device Selection Guide (T_J = 25°C, I_F = 20 mA)

Part Number	Color	Package Description	Luminous Intensity, I_V (mcd) [a, b, c]			Viewing Angle, $2\theta_{½}$ (°) [d]
			Min.	Typ.	Max.	Typ.
HLMP-NW50-U0000	InGaN White	Untinted, Diffused	3200	5300	—	60

a. The luminous intensity, I_V, is measured at the mechanical axis of the package, and it is tested with a single-current pulse condition.

b. The optical axis is closely aligned with the mechanical axis of the package.

c. Tolerance is ±15%.

d. $\theta_{½}$ is the off-axis angle where the luminous intensity is half of the peak intensity.

Absolute Maximum Ratings

Parameter	HLMP-NW50-U0000	Unit
DC Forward Current [a]	20	mA
Peak Forward Current [b]	100	mA
Power Dissipation	74	mW
Operating Temperature Range	–30 to +85	°C
Storage Temperature Range	–40 to +85	°C

a. Derate linearly as shown in Figure 6.

b. Duty factor = 10%, frequency = 1 kHz.

Optical and Electrical Characteristics (T_J = 25°C, I_F = 20 mA)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage [a]	V_F	2.7	3.3	3.7	V	I_F = 20 mA
Reverse Voltage [b]	V_R	5	—	—	V	I_R = 100 µA
Chromaticity Coordinates [c]	x	—	0.28	—	—	I_F = 20 mA
	y	—	0.26	—	—	

a. The forward voltage tolerance is ±0.1V.

b. Indicates product final testing condition. Long-term reverse bias is not recommended.

c. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represents the perceived color of the device.

Part Numbering System

H L M P – N W 5 0 – | x_1 | x_2 | x_3 | x_4 | x_5 |

Code	Description	Option	
x_1	Minimum intensity bin	See the Intensity Bin Limits table.	
x_2	Maximum intensity bin	0	No maximum intensity bin limit
x_3	Color bin option	0	Full distribution
x_4x_5	Packing option	00	Bulk packaging

Bin Information

Intensity Bin Limits (CAT)

Bin ID	Luminous Intensity, I_V (mcd)	
	Min.	Max.
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300

Tolerance = ±15%

Color Bin Limits (BIN)

Rank	Chromaticity Coordinates				
A1	x	0.2700	0.2700	0.2500	0.2500
	y	0.2455	0.2780	0.2500	0.2175
A2	x	0.2700	0.2700	0.2500	0.2500
	y	0.2455	0.2130	0.1850	0.2175
B1	x	0.2700	0.2700	0.2900	0.2900
	y	0.2455	0.2780	0.3060	0.2735
B2	x	0.2700	0.2700	0.2900	0.2900
	y	0.2455	0.2130	0.2410	0.2735
C1	x	0.2900	0.3100	0.3100	0.2900
	y	0.3060	0.3355	0.3030	0.2735
C2	x	0.2900	0.3100	0.3100	0.2900
	y	0.2410	0.2705	0.3030	0.2735
D1	x	0.3100	0.3100	0.3300	0.3300
	y	0.3030	0.3355	0.3650	0.3325
D2	x	0.3100	0.3100	0.3300	0.3300
	y	0.3030	0.2705	0.3000	0.3325

Tolerance = ±0.01

Example of bin information on a reel and packaging label:

CAT : U – Intensity bin U

BIN : B2 – Color bin B2

Figure 2: Color Bin Limits with Respect to the CIE 1931 Chromaticity Diagram

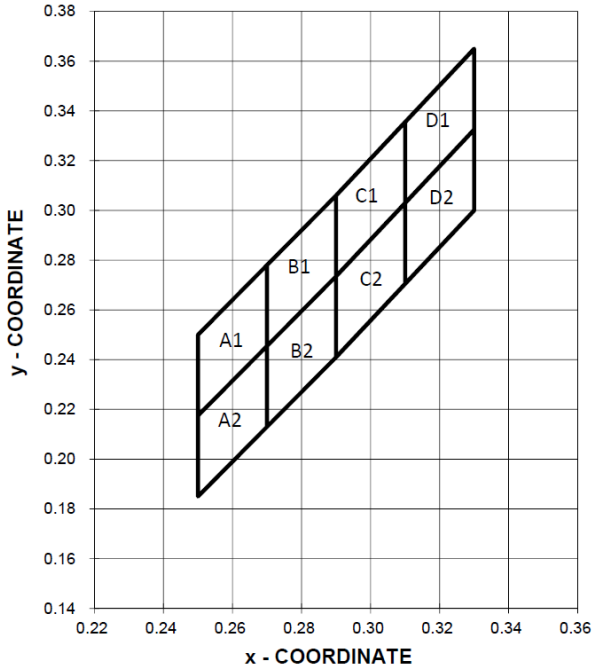


Figure 3: Spectral Power Distribution

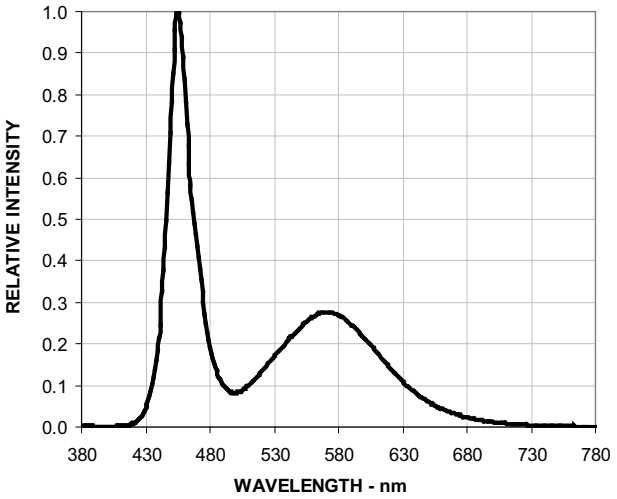


Figure 4: Forward Current vs. Forward Voltage

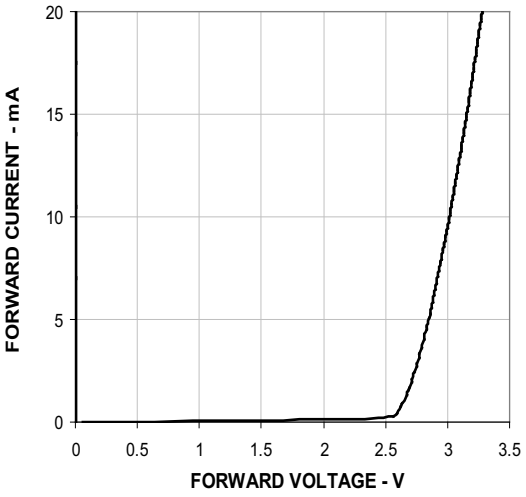


Figure 5: Relative Luminous Intensity vs. Mono-Pulse Current

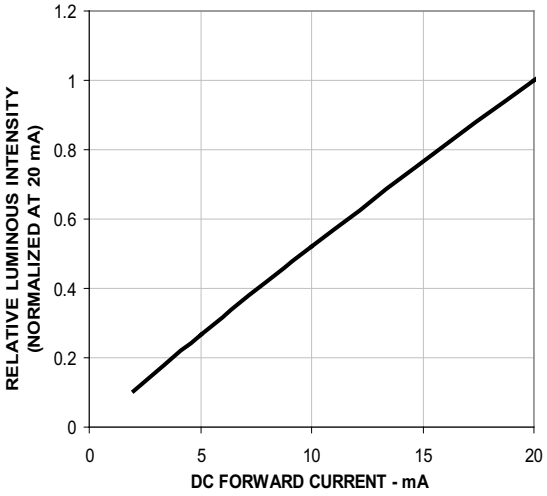


Figure 6: Maximum Forward Current vs. Ambient Temperature

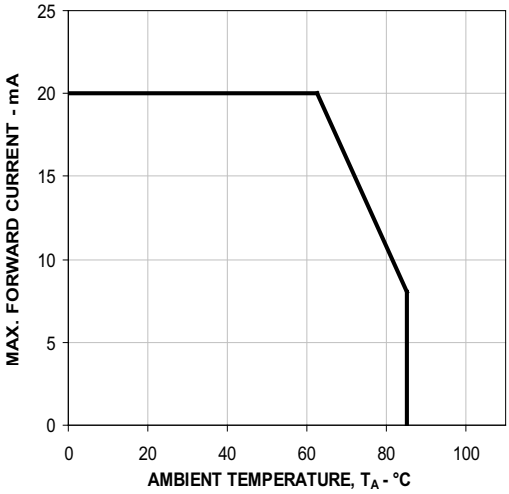
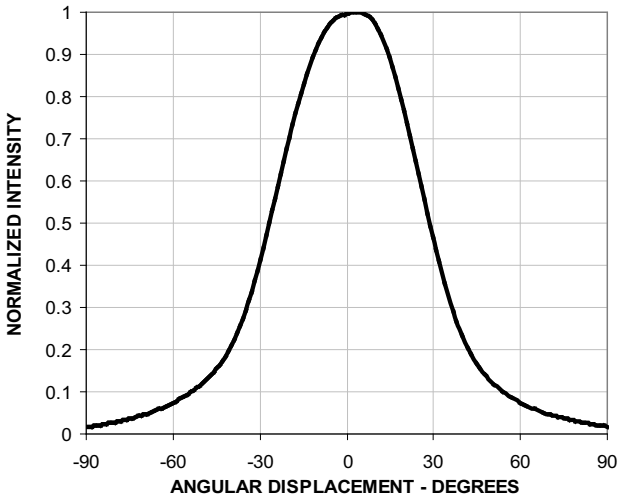


Figure 7: Radiation Pattern



Precautionary Notes

Soldering and Handling Precautions

- Set and maintain the wave soldering parameters according to the recommended temperature and dwell time. Perform a daily check on the profile to ensure that it always conforms to the recommended conditions. Exceeding these conditions will overstress the LEDs and cause premature failures.
- Use only bottom preheaters to reduce the thermal stress experienced by the LEDs.
- Recalibrate the soldering profile before loading a new type of PCB. A PCB with a different size and design (component density) will have a different heat capacity and might cause a change in the temperature experienced by the PCB if the same wave soldering setting is used.
- Do not perform wave soldering more than once.
- Any alignment fixture used during wave soldering must be loosely fitted and must not apply stress on the LEDs. Use a nonmetal material because it will absorb less heat during the wave soldering process.
- At elevated temperatures, the LEDs are more susceptible to mechanical stress. Allow the PCB to sufficiently cool to room temperature before handling. Do not apply stress to the LED when it is hot.
- Use wave soldering to solder the LED. Use hand soldering only for rework or touch-up if unavoidable, but it must be strictly controlled to following conditions:
  - Soldering iron tip temperature = 350°C maximum
  - Soldering duration = 3 seconds maximum
  - Number of cycles = 1 only
  - Power of soldering iron = 50W maximum
- For ESD-sensitive devices, apply proper ESD precautions at the soldering station. Use only an ESD-safe soldering iron.
- Do not touch the LED package body with the soldering iron except for the soldering terminals because it might cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED are affected by hand soldering.
- Keep the heat source at least 1.6 mm away from the LED body during soldering.
- Design an appropriate hole size to avoid problems during insertion or clinching (for auto-insertable devices).

Figure 8: Recommended PCB Through-Hole Size

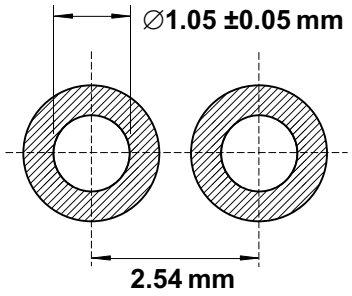
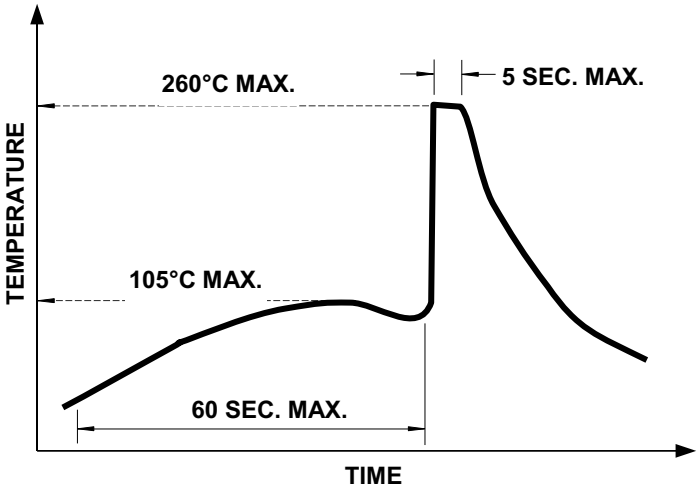


Figure 9: Recommended Wave Soldering Profile



NOTE: Refers to measurements with a thermocouple mounted at the bottom of the PCB.

Refer to Application Note 5334 for more information on soldering and handling of the through-hole LED lamp.

Lead Forming

- To preform or cut the leads prior to insertion and soldering onto PCB, use a proper tool instead of doing it manually.
- Do not bend the leads at a location less than 3 mm from the LED body.
- Do not use the base of the LED body as a fulcrum for lead bending. Secure the leads properly before bending.
- If manual lead cutting is unavoidable, cut the leads after soldering to reduce stress to the LED body.

Application Precautions

- The drive current of the LED must not exceed the maximum allowable limit across temperature as stated in this data sheet. Constant current driving is recommended to ensure consistent performance.
- Circuit design must cater to the whole range of forward voltage (V_F) of the LEDs to ensure that the intended drive current can always be achieved.
- The LED exhibits slightly different characteristics at different drive currents, which might result in a larger variation of performance (that is, intensity, wavelength, and forward voltage). Set the application current as close as possible to the test current to minimize these variations.
- The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving the LED in matrix form, ensure that the reverse bias voltage does not exceed the allowable limit of the LED.
- Avoid rapid changes in ambient temperature, especially in high-humidity environments, because they cause condensation on the LED.

Eye Safety Precautions

LEDs can pose optical hazards when in operation. Do not look directly at operating LEDs because it might be harmful to the eyes. For safety reasons, use appropriate shielding or personal protective equipment.

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