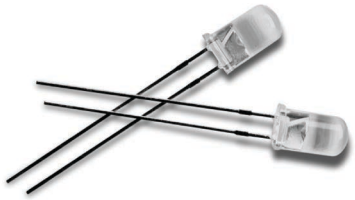
BROADCOM®

Data Sheet

HLMP-DS25/DM25/NS30/NM31

T-1¾ (5 mm), T-1 (3 mm) InGaN LED Lamps



Description

The blue HLMP-DS25 and HLMP-NS30, and green HLMP-DM25 and HLMP-NM31 LEDs are designed in an industry-standard T-1¾ and T-1 packages with clear and nondiffused optics.

These Broadcom® LED lamps are ideal for use as indicators and for general purpose lighting. Blue lamps offer color differentiation because blue is attractive and not widely available.

Features

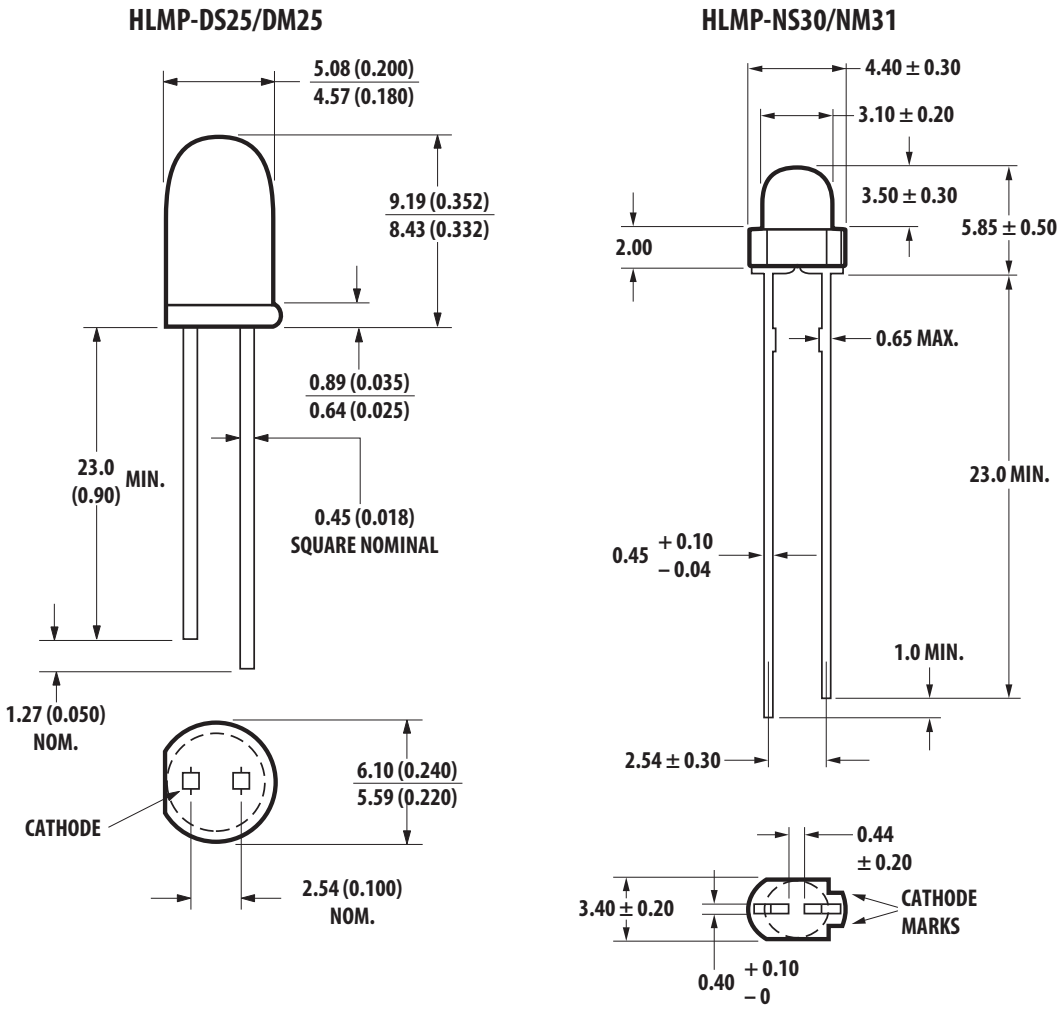
- Popular T-1¾ and T-1 diameter packages
- General purpose leads
- Reliable and rugged
- Binned for color and intensity
- Bright InGaN dice

Applications

- Status indicator
- Small message panel
- Running and decorative lights for commercial use
- Back lighting
- Consumer audio

CAUTION! Devices are Class 1C HBM ESD sensitive per JEDEC Standard. Observe appropriate precautions during handling and processing. For more information, refer to Broadcom Application Note AN-1142.

Package Dimension



NOTE:

1. All dimensions are in mm (inches).
2. Epoxy meniscus might extend 1 mm (0.040 inches) maximum down the leads

Device Selection Guide

Part Number	Color	Package Description	Luminous Intensity, I_V (mcd) at 20 mA	
			Min.	Max.
HLMP-DS25-F0000	Blue	T-1¾	110	—
HLMP-DM25-J0000	Green		240	—
HLMP-NS30-J0000	Blue	T-1	240	—
HLMP-NS30-J00DD	Blue		240	—
HLMP-NM31-R0000	Green		1500	—

Absolute Maximum Ratings at T_A = 25°C

Parameter	HLMP-DS25/DM25	HLMP-NS30/NM31	Units
Peak Pulsed Forward Current (Duty factor = 10%, Frequency = 1 kHz)	100	100	mA
DC Forward Current[a]	30	30	mA
Reverse Voltage	Not recommended for reverse bias		
Power Dissipation	116	116	mW
Junction Temperature	115	115	°C
Operating Temperature Range	–40 to +85	–40 to +85	°C
Storage Temperature Range	–40 to +100	–40 to +85	°C

a. Derate linearly as shown in Figure 4

Electrical/Optical Characteristics at T_A = 25°C

Parameter	Symbol	Part Number	Min.	Typ.	Max.	Units	Test Conditions
Luminous Intensity	I_V	HLMP-DS25	110	—	—	mcd	I_F = 20 mA
		HLMP-DM25	240				
		HLMP-NS30	240				
		HLMP-NM31	1500				
Peak Wavelength	λ_{PEAK}	HLMP-DS25	—	468	—	nm	Measurement at peak
		HLMP-DM25		520			
		HLMP-NS30		468			
		HLMP-NM31		520			
Dominant Wavelength[a]	λ_d	HLMP-DS25	—	470	—	nm	I_F = 20 mA
		HLMP-DM25		527			
		HLMP-NS30		470			
		HLMP-NM31		527			
Viewing Angle[b]	2θ½	HLMP-DS25	—	25	—	deg.	—
		HLMP-DM25		25			
		HLMP-NS30		30			
		HLMP-NM31		30			
Forward Voltage	V_F	HLMP-DS25	2.8	3.2	3.8	V	I_F = 20 mA
		HLMP-DM25					
		HLMP-NS30					
		HLMP-NM31					
Speed Response	t_s	HLMP-DS25	—	500	—	ns	—
		HLMP-DM25					
		HLMP-NS30					
		HLMP-NM31					
Capacitance	C	HLMP-DS25	—	50	—	pF	VF = 0, f = 1 MHz
		HLMP-DM25					
		HLMP-NS30					
		HLMP-NM31					
Thermal Resistance	$R\theta_{J\text{-}PIN}$	HLMP-DS25	—	260	—	°C/W	Junction to cathode lead
		HLMP-DM25		260			
		HLMP-NS30		290			
		HLMP-NM31		290			

a. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the single wavelength which defines the color of the device.

b. θ½ is the off-axis angle at which the luminous intensity is half of the axial luminous intensity.

Part Numbering System

H	L	M	P	-	x_1	x_2	x_3	x_4	-	x_5	x_6	x_7	x_8	x_9

Code	Description	Option	
x_1	Package type	D	T-1¾ (5 mm)
		N	T-1 (3 mm) auto-insertable
x_2	Color	S	Blue
		M	Green
x_3 x_4	Viewing angle	25	25°
		30/31	30°
x_5	Minimum intensity bin	See the Intensity Bin Limits table	
x_6	Maximum intensity bin	0	Open bins (no maximum I_V bin limit)
x_7	Color bin selection	0	Full range
x_8 x_9	Packaging option	00	Bulk (loose forms packaging)
		DD	Ammo pack

Bin Information

Intensity Bin Limits

Bin	Intensity Range (mcd)	
	Min.	Max.
F	110.0	140.0
G	140.0	180.0
H	180.0	240.0
J	240.0	310.0
K	310.0	400.0
L	400.0	520.0
M	520.0	680.0
N	680.0	880.0
P	880.0	1150.0
Q	1150.0	1500.0
R	1500.0	1900.0
S	1900.0	2500.0
T	2500.0	3200.0
U	3200.0	4200.0

Tolerance for each bin limit is ±15%.

Color Bin Limits Table

Color	Category	λ (nm) @ 20 mA	
		Min.	Max.
Blue	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
Green	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.

Packaging Option Matrix

Option Code	Definition
00	Bulk Packaging, minimum increment 500 pieces/bag
DD	Ammo Pack, straight leads, minimum increment 2000 pieces/pack

All categories are established for classification of products. Products may not be available in all categories. Please contact your local Broadcom representative for further clarification/information.

Figure 1: Relative Intensity vs. Wavelength

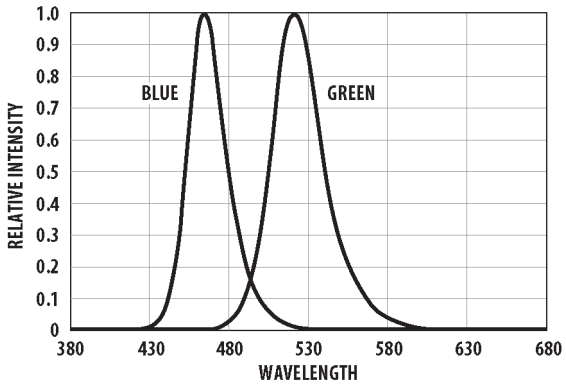


Figure 2: Forward Current vs. Forward Voltage

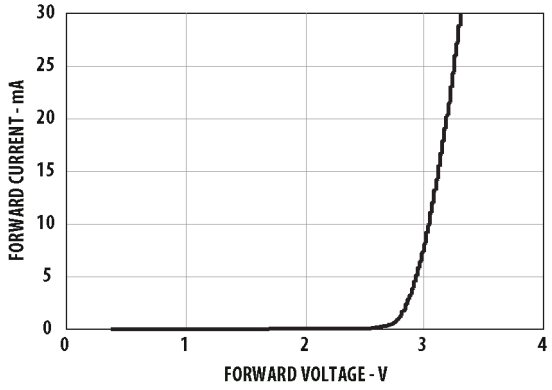


Figure 3: Relative Luminous Intensity vs. Forward Current

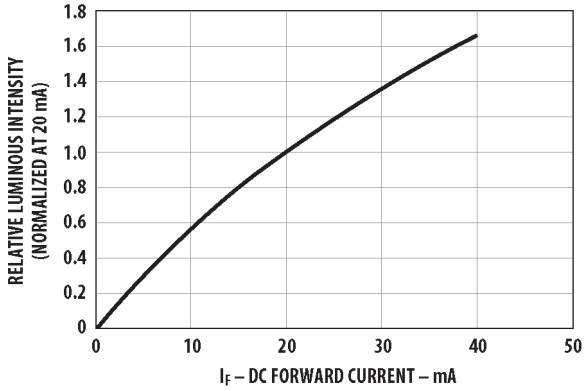


Figure 4: Maximum Forward Current vs. Ambient Temperature Based on TJ max. = 115 °C

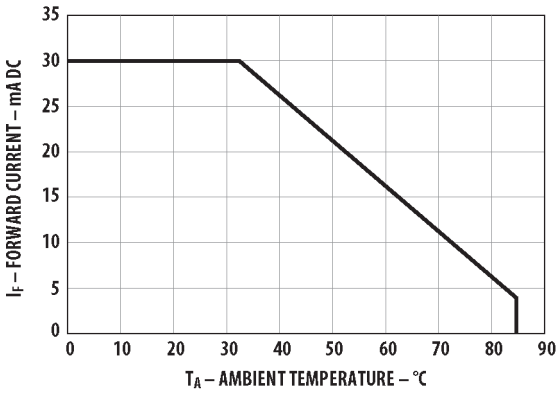


Figure 5: Relative Luminous Intensity vs. Angular Displacement for HLMP-DS25 and HLMP-DM25

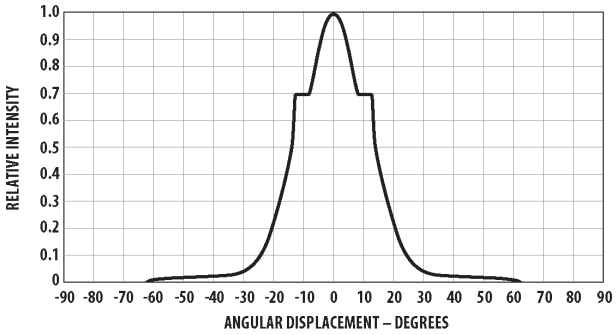
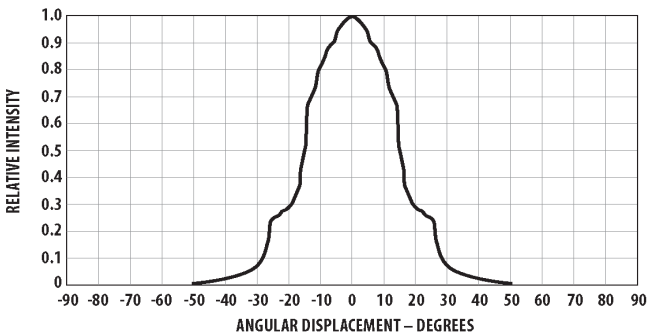


Figure 6: Relative Luminous Intensity vs. Angular Displacement for HLMP-NS30 and HLMP-NM31



Precautionary Notes

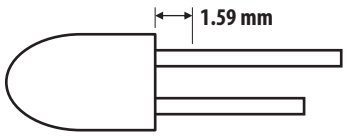
Lead Forming

- The leads of an LED lamp may be preformed or cut to length prior to insertion and soldering into PC board.
- For better control, it is recommended to use proper tool to precisely form and cut the leads to applicable length rather than doing it manually.
- If manual lead cutting is necessary, cut the leads after the soldering process. The solder connection forms a mechanical ground which prevents mechanical stress due to lead cutting from traveling into LED package. This is highly recommended for hand solder operation, as the excess lead length also acts as small heat sink.

Soldering Conditions

- Take care during the PCB assembly and soldering process to prevent damage to the LED component.
- The LED component can be effectively hand soldered to the PCB. However, it is only recommended under unavoidable circumstances such as rework. The closest manual soldering distance of the soldering heat source (soldering iron's tip) to the body is 1.59mm. Soldering the LED using soldering iron tip closer than 1.59mm might damage the LED.

Figure 7: Soldering Distance of Heat Source



- ESD precautions must be properly applied on the soldering station and personnel to prevent ESD damage to the LED component that is ESD sensitive. Refer to the Broadcom application note AN 1142 for details. The soldering iron used should have grounded tip to ensure electrostatic charge is properly grounded.
- The recommended soldering conditions follow:

Parameter	Wave Soldering[a] [b]	Manual Solder Dipping
Preheat Temperature	105°C max.	—
Preheat Time	60 seconds max.	—
Peak Temperature	250°C max.	260°C max.
Dwell Time	3 seconds max.	5 seconds max.

a. These conditions refer to measurement with thermocouple mounted at the bottom of PCB.

b. To reduce thermal stress experienced by LED, it is recommended that you use only bottom preheaters.

- Set and maintain the wave soldering parameter according to the recommended temperature and dwell time in the solder wave. Periodically check on the soldering profile to ensure the soldering profile used always conforms to the recommended soldering condition.

NOTE:

- PCBs with a different size and design (component density) have different heat mass (heat capacity). There might be a change in temperature on the board if the same wave soldering setting is used. Recalibrate the soldering profile before loading a new type of PCB.
- Take extra precaution during wave soldering to ensure that the maximum wave temperature does not exceed 250°C and that the solder contact time does not exceed 3 seconds. Over-stressing the LED during the soldering process might cause premature failure to the LED due to delamination.

- Any alignment fixture that is being applied during wave soldering should be loosely fitted and should not apply weight or force on LED. Non-metal material is recommended because it will absorb less heat during wave soldering process.

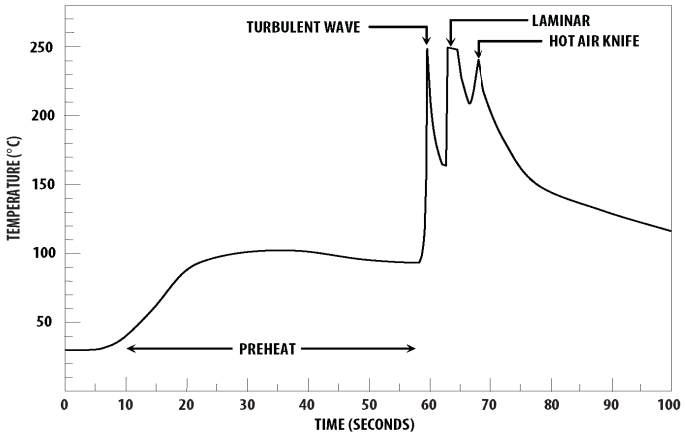
- At elevated temperatures, the LED is more susceptible to mechanical stress. Therefore, the PCB must be allowed to cool down to room temperature before handling, which includes removal of the alignment fixture or pallet.
- If the PCB board contains both through hole (TH) LED and other surface mount components, it is recommended that surface mount components be soldered on the top side of the PCB. If surface mount need to be on the bottom side, these components should be soldered using reflow soldering prior to insertion the TH LED.
- The recommended PC board plated through-hole sizes for LED component leads is as follows:

LED Component	Lead Size	Diagonal	Plated Through-Hole Diameter
Lead size (typ.)	0.45 mm × 0.45 mm (0.018 in. × 0.018 in.)	0.646 mm (0.025 in.)	0.98 mm to 1.08 mm (0.039 in. to 0.043 in.)
Dambar shear-off area (max.)	0.65 mm (0.026 in)	0.919 mm (0.036 in)	
Lead size (typ.)	0.50 mm × 0.50 mm (0.020 in. × 0.020 in.)	0.707 mm (0.028 in.)	1.05 mm to 1.15 mm (0.039 in. to 0.045 in.)
Dambar shear-off area (max.)	0.70 mm (0.028 in)	0.99 mm (0.039 in)	

- Over-sizing the PTH can lead to a twisted LED after clinching. Under sizing the PTH can cause difficulty inserting the TH LED.

NOTE: Refer to Broadcom Application Note 5334 for more information about the soldering and handling of TH LED lamps.

Figure 8: Recommended Wave Soldering Profile



Recommended solder:

- Sn63 (Leaded solder alloy)
- SAC305 (Lead-free solder alloy)

- Flux: Rosin flux
- Solder bath temperature: 245°C ± 5°C (maximum peak temperature = 250°C)
- Dwell time: 1.5 seconds to 3.0 seconds (maximum = 3 seconds)

NOTE: Allow for board to be sufficiently cooled to room temperature before you exert mechanical force.

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