

# HLMP-DS25/DM25/NS30/NM31

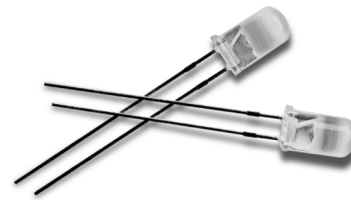
## T-1 $\frac{3}{4}$ (5 mm), T-1 (3 mm) InGaN LED Lamps



### Data Sheet



Lead (Pb) Free  
RoHS 6 fully  
compliant



### Description

The blue HLMP-DS25 and HLMP-NS30, and green HLMP-DM25 and HLMP-NM31 LEDs are designed in an industry standard T-1 $\frac{3}{4}$  and T-1 packages with clear and nondiffused optics.

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

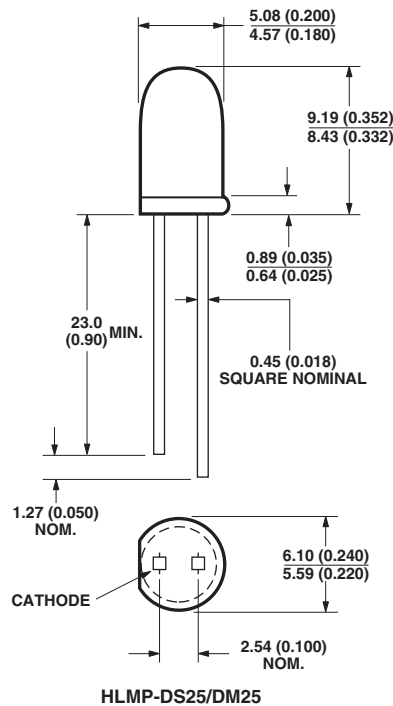
### Features

- Popular T-1 $\frac{3}{4}$  and T-1 diameter packages
- General purpose leads
- Reliable and rugged
- Binned for color and intensity
- Bright InGaN dice

### Applications

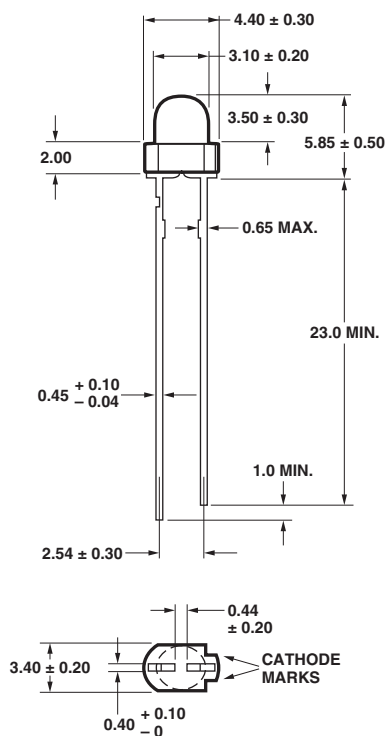
- Status indicators
- Small message panel
- Running and decorative lights for commercial use
- Back lighting
- Consumer audio

### Package Dimensions



#### NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).
2. EPOXY MENISCUS MAY EXTEND 1 mm (0.040") MAX DOWN THE LEADS.

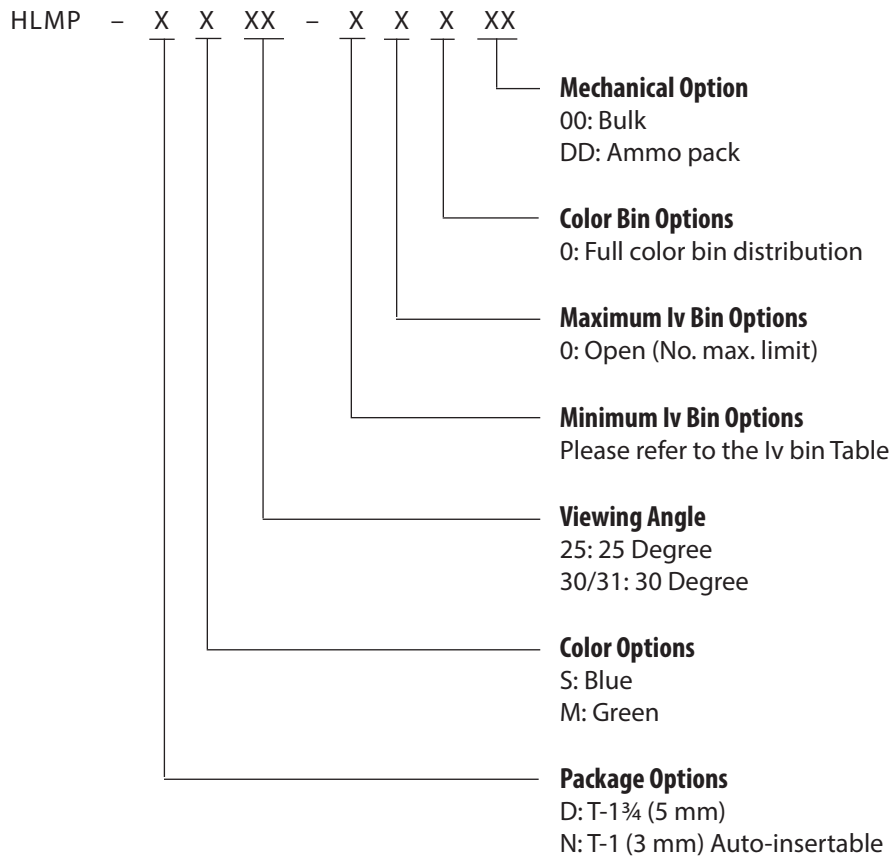


**Caution:** Devices are Class I ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.

## Selection Guide

| Package Description | Color | Part Number     | Luminous Intensity Iv (mcd) @ 20 mA |      |
|---------------------|-------|-----------------|-------------------------------------|------|
|                     |       |                 | Min.                                | Max. |
| T-1 $\frac{3}{4}$   | Blue  | HLMP-DS25-F0000 | 110.0                               | –    |
|                     | Green | HLMP-DM25-J0000 | 240.0                               | –    |
| T-1                 | Blue  | HLMP-NS30-J00xx | 240.0                               | –    |
|                     | Green | HLMP-NM31-R0000 | 1500                                | –    |

## Part Numbering System



## Absolute Maximum Ratings (T<sub>A</sub> = 25°C)

| Parameter                                  | HLMP-DS25/DM25                   | HLMP-NS30/NM31 |
|--|----------------------------------|----------------|
| Peak Pulsed Forward Current <sup>[1]</sup> | 100 mA                           | 100 mA         |
| DC Forward Current <sup>[2]</sup>          | 30 mA                            | 30 mA          |
| Reverse Voltage                            | Not recommended for reverse bias |                |
| Power dissipation                          | 116 mW                           | 116 mW         |
| LED Junction Temperature                   | 115°C                            | 115°C          |
| Operating Temperature                      | –40 to +85°C                     | –40 to +85°C   |
| Storage Temperature                        | –40 to +100°C                    | –40 to +85°C   |

Notes:

1. Duty factor = 10%, Frequency = 1 kHz.

2. Derate linearly as shown in Figure 4.

## Optical Characteristics (T<sub>A</sub> = 25°C)

| Part Number | Luminous Intensity<br>I <sub>V</sub> (mcd) @ I <sub>F</sub> = 20 mA<br>Min. | Color, Dominant<br>Wavelength λ <sub>d</sub> <sup>[1]</sup> (nm)<br>Typ. | Peak Wavelength<br>λ <sub>PEAK</sub> (nm)<br>Typ. | Viewing Angle<br>2θ <sub>1/2</sub> <sup>[2]</sup> Degrees<br>Typ. |
|-------------|---|--|---|---|
| HLMP-DS25   | 110   | 470  | 468   | 25  |
| HLMP-DM25   | 240   | 527  | 520   | 25  |
| HLMP-NS30   | 240   | 470  | 468   | 30  |
| HLMP-NM31   | 1500  | 527  | 520   | 30  |

Notes:

1. The dominant wavelength, λ<sub>d</sub>, is derived from the CIE Chromaticity Diagram and represents the single wavelength which defines the color of the device.

2. θ<sub>1/2</sub> is the off-axis angle at which the luminous intensity is half of the axial luminous intensity.

## Electrical Characteristics

| Part Number | Forward Voltage<br>V <sub>F</sub> (volts)<br>I <sub>F</sub> = 20 mA |      |      | Speed<br>Response<br>t <sub>s</sub> (ns)<br>Typ. | Capacitance<br>C (pF),<br>V <sub>F</sub> = 0, f = 1 MHz<br>Typ. | Thermal Resistance<br>Rθ <sub>J-PIN</sub> (°C/W)<br>Junction to<br>Cathode Lead |
|-------------|---|------|------|--|---|---|
|             | Min.  | Typ. | Max. |  |   |   |
| HLMP-DS25   | 2.8   | 3.2  | 3.8  | 500  | 50  | 260   |
| HLMP-DM25   | 2.8   | 3.2  | 3.8  | 500  | 50  | 260   |
| HLMP-NS30   | 2.8   | 3.2  | 3.8  | 500  | 50  | 290   |
| HLMP-NM31   | 2.8   | 3.2  | 3.8  | 500  | 50  | 290   |

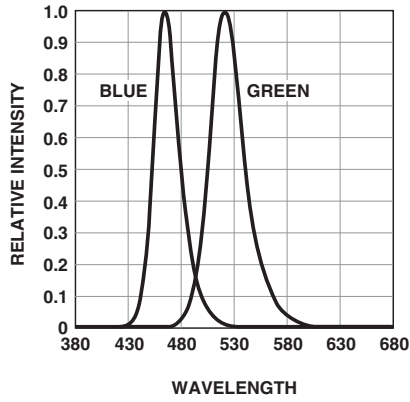


Figure 1. Relative intensity vs. wavelength.

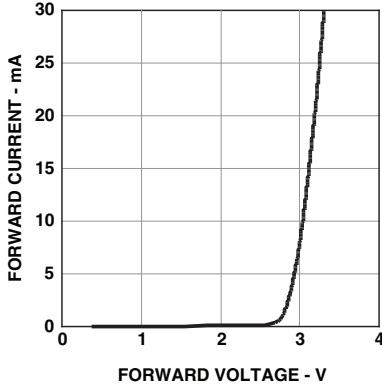


Figure 2. Forward current vs. forward voltage.

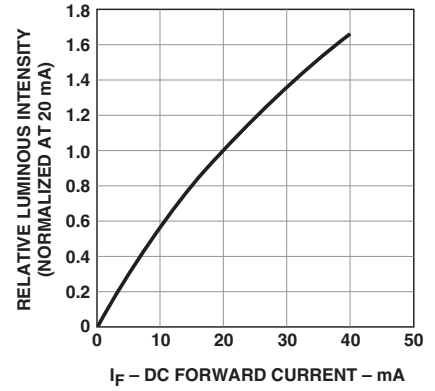


Figure 3. Relative luminous intensity vs. forward current.

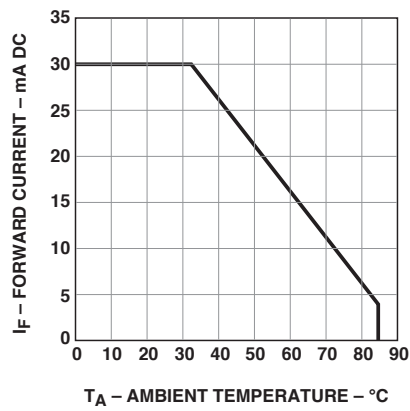


Figure 4. Maximum forward current vs. ambient temperature based on  $T_J \text{ max.} = 115^\circ\text{C}$ .

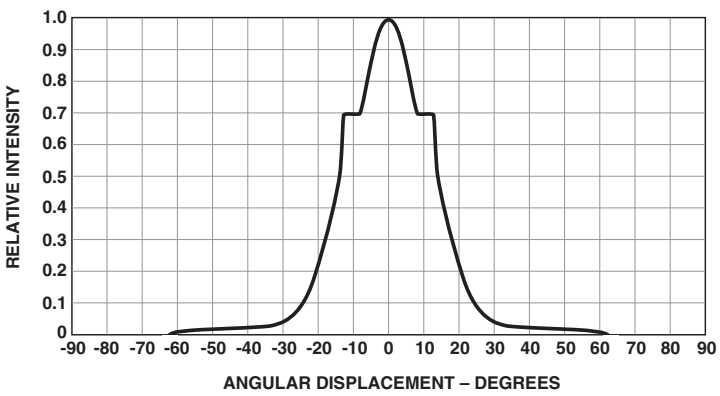


Figure 5. Relative luminous intensity vs. angular displacement for HLMP-DS25 and HLMP-DM25.

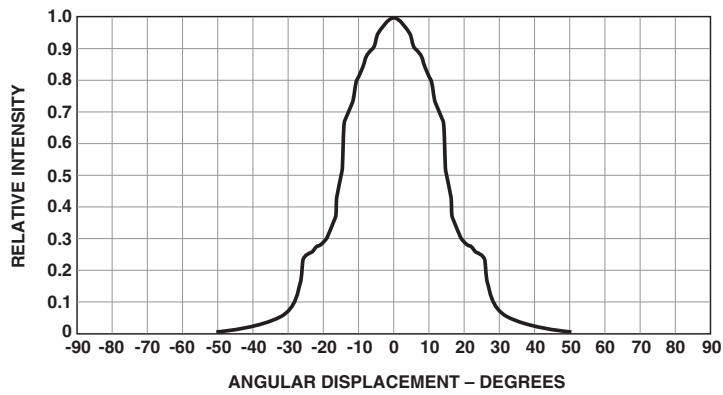


Figure 6. Relative luminous intensity vs. angular displacement for HLMP-NS30 and HLMP-NM31.

**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  |
| V   | 4200.0                | 5500.0  |
| W   | 5500.0                | 7200.0  |
| X   | 7200.0                | 9300.0  |
| Y   | 9300.0                | 12000.0 |

Tolerance for each minimum and maximum =  $\pm 15\%$ .

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

| Blue       |       |       |
|------------|-------|-------|
| nm @ 20 mA |       |       |
| 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 |

| Green      |       |       |
|------------|-------|-------|
| nm @ 20 mA |       |       |
| 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 will be  $\pm 0.5$  nm.

**Mechanical Option Matrix**

| Mechanical Option Code | Definition   |
|------------------------|--|
| O0                     | Bulk Packaging, minimum increment 500 pcs/bag            |
| DD                     | Ammo Pack, straight leads, minimum increment 2K pcs/pack |

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

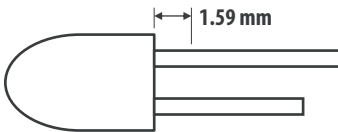
## Precautions

### Lead Forming:

- The leads of an LED lamp may be preformed or cut to length prior to insertion and soldering on 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 and Handling:

- Care must be taken during PCB assembly and soldering process to prevent damage to the LED component.
- LED component may be effectively hand soldered to 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.



- ESD precaution must be properly applied on the soldering station and personnel to prevent ESD damage to the LED component that is ESD sensitive. Do refer to Avago application note AN 1142 for details. The soldering iron used should have grounded tip to ensure electrostatic charge is properly grounded.
- Recommended soldering condition:

|                      | Wave Soldering <sup>[1],[2]</sup> | Manual Solder Dipping |
|----------------------|-----------------------------------|-----------------------|
| Pre-heat Temperature | 105°C Max.                        | –                     |
| Pre-heat Time        | 60 sec Max.                       | –                     |
| Peak Temperature     | 250°C Max.                        | 260°C Max.            |
| Dwell Time           | 3 sec Max.                        | 5 sec Max.            |

#### Notes:

1. Above conditions refers to measurement with thermocouple mounted at the bottom of PCB.
2. It is recommended to use only bottom preheaters in order to reduce thermal stress experienced by LED.

- Wave soldering parameters must be set and maintained according to the recommended temperature and dwell time. Customer is advised to perform daily check on the soldering profile to ensure that it is always conforming to recommended soldering conditions.

#### Notes:

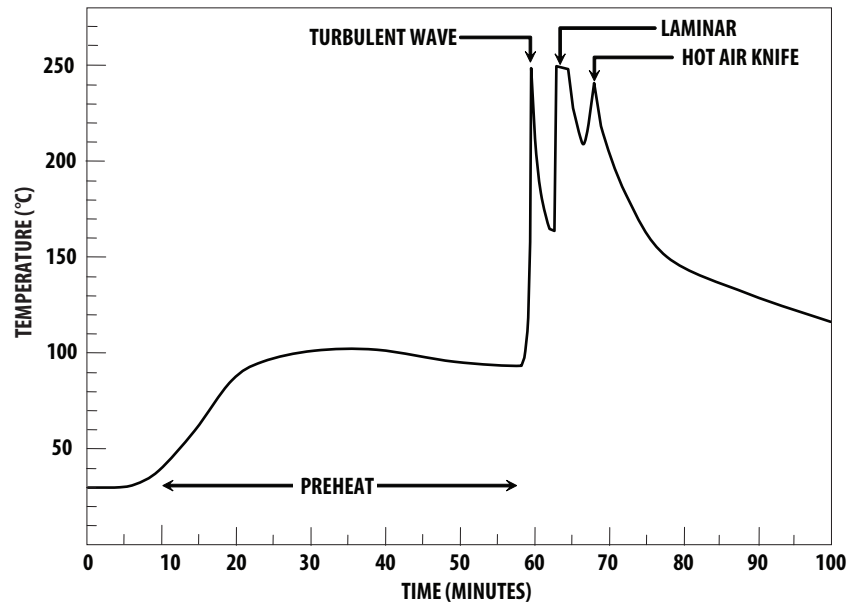
1. PCB with different size and design (component density) will have different heat mass (heat capacity). This might cause a change in temperature experienced by the board if same wave soldering setting is used. So, it is recommended to re-calibrate the soldering profile again before loading a new type of PCB.
  2. Customer is advised to take extra precaution during wave soldering to ensure that the maximum wave temperature does not exceed 250°C and the solder contact time does not exceeding 3sec. Over-stressing the LED during 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 as it will absorb less heat during wave soldering process.
  - At elevated temperature, LED is more susceptible to mechanical stress. Therefore, PCB must allowed to cool down to room temperature prior to handling, which includes removal of alignment fixture or pallet.
  - If 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.
  - Recommended PC board plated through holes (PTH) size for LED component leads:

|                              | LED Component Lead Size               | Diagonal               | Plated Through-Hole Diameter           |
|------------------------------|---------------------------------------|------------------------|--|
| Lead size (typ.)             | 0.45 × 0.45 mm<br>(0.018 × 0.018 in.) | 0.636 mm<br>(0.025 in) | 0.98 to 1.08 mm<br>(0.039 to 0.043 in) |
| Dambar shear-off area (max.) | 0.65 mm<br>(0.026 in)                 | 0.919 mm<br>(0.036 in) |  |
| Lead size (typ.)             | 0.50 × 0.50 mm<br>(0.020 × 0.020 in.) | 0.707 mm<br>(0.028 in) | 1.05 to 1.15 mm<br>(0.041 to 0.045 in) |
| Dambar shear-off area (max.) | 0.70 mm<br>(0.028 in)                 | 0.99 mm<br>(0.039 in)  |  |

- Over-sizing the PTH can lead to twisted LED after clinching. On the other hand under sizing the PTH can cause difficulty inserting the TH LED.

Refer to application note AN5334 for more information about soldering and handling of TH LED lamps.

# Example of Wave Soldering Temperature Profile for TH LED



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 sec – 3.0 sec (maximum = 3sec)

Note: Allow for board to be sufficiently cooled to room temperature before exerting mechanical force.

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## Packing Label

(i) Avago Mother Label: (Available on packaging box of ammo pack and shipping box)

|   |   |
|---|---|
| <b>Avago</b><br>TECHNOLOGIES                  |   |
| STANDARD LABEL LS0002                         |   |
| RoHS Compliant                                |   |
| e3 max temp 250C                              |   |
| (1P) Item: Part Number<br>[Barcode]           | (Q) QTY: Quantity<br>[Barcode]          |
| (1T) Lot: Lot Number<br>[Barcode]             | CAT: Intensity Bin<br>[Barcode]         |
| LPN:<br>[Barcode]                             | BIN: Color Bin                          |
| (9D)MFG Date: Manufacturing Date<br>[Barcode] |   |
| (P) Customer Item:<br>[Barcode]               |   |
| (V) Vendor ID:<br>[Barcode]                   | (9D) Date Code: Date Code<br>[Barcode]  |
| DeptID:<br>[Barcode]                          | Made In: Country of Origin<br>[Barcode] |

(ii) Avago Baby Label (Only available on bulk packaging)

|   |   |
|---|---|
| <b>Avago</b><br>TECHNOLOGIES                  |   |
| Lamps Baby Label                              |   |
| RoHS Compliant                                |   |
| e3 max temp 250C                              |   |
| (1P) PART #: Part Number<br>[Barcode]         | QUANTITY: Packing Quantity<br>[Barcode] |
| (1T) LOT #: Lot Number<br>[Barcode]           |   |
| (9D)MFG DATE: Manufacturing Date<br>[Barcode] |   |
| C/O: Country of Origin                        |   |
| Customer P/N:<br>[Barcode]                    | CAT: Intensity Bin<br>[Barcode]         |
| Supplier Code:<br>[Barcode]                   | BIN: Color Bin<br>[Barcode]             |
|   | DATECODE: Date Code<br>[Barcode]        |

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