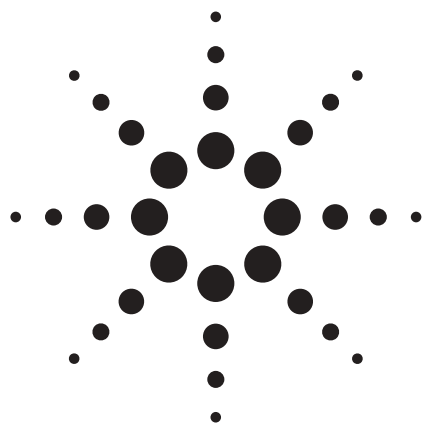




# Agilent HLMP-CWxx T-1 $\frac{3}{4}$ (5mm) Extra Bright Precision Optical Performance White LED Lamps Data Sheet

**HLMP-CW11, HLMP-CW12, HLMP-CW26, HLMP-CW27,  
HLMP-CW36, HLMP-CW37**

## Description

These high intensity white LED lamps are based on InGaN material technology. A blue LED die is coated by phosphor to produce white. The typical resulting color is described by the coordinates  $x = 0.31$ ,  $y = 0.31$  using the 1931 CIE Chromaticity Diagram.

These T-1  $\frac{3}{4}$  lamps are untinted, non-diffused, and incorporate precise optics which produce well-defined spatial radiation patterns at specific viewing cone angle.

## Features

- Well defined spatial radiation pattern
- High luminous white emission
- Viewing angle: 15°, 23° and 30°
- Standoff or non-standoff leads
- Superior resistance to moisture

## Applications

- Electronic signs and signals
- Small area illumination
- Legend backlighting
- General purpose indicators

## Benefit

- Reduced power consumption, higher reliability, and increased optical/mechanical design flexibility compared to incandescent bulbs and other alternative white light sources.

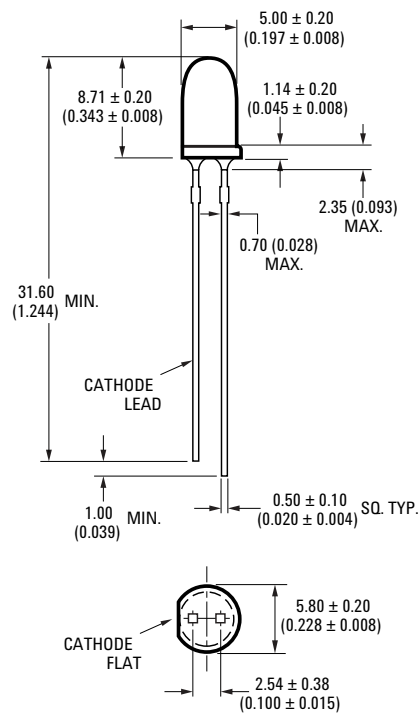
*Caution: Devices are Class 1 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.*



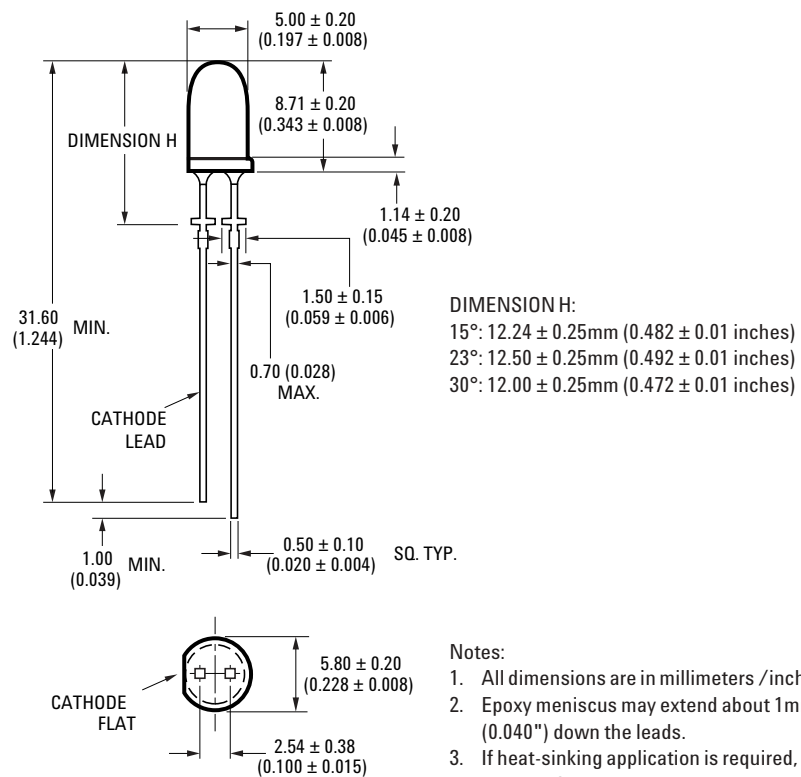
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## Package Dimensions

### Package Dimension A



### Package Dimension B



#### Notes:

1. All dimensions are in millimeters /inches.
2. Epoxy meniscus may extend about 1mm (0.040") down the leads.
3. If heat-sinking application is required, the terminal for heat sink is anode.

## Part Numbering System

H L M P - CW XX - X X X XX

### Mechanical Option

- 00: Bulk
- DD: Ammo Pack Straight Leads

### Color Bin Options

- 0: Full color bin distribution
- B: Color bin 2 & 3 only

### Maximum Intensity Bin

- 0: No maximum intensity bin limit
- Others: Refer to Device Selection Guide

### Minimum Intensity Bin

- Refer to Device Selection Guide

### Viewing Angle and Standoff Option

- 11: 15° without standoff
- 12: 15° with standoff
- 26: 23° without standoff
- 27: 23° with standoff
- 36: 30° without standoff
- 37: 30° with standoff

## Device Selection Guide

| Part Number            | Typical Viewing Angle, $2\theta_{1/2}$ (Degree) | Intensity (mcd) at 20 mA |              | Standoff   | Package Dimension |
|------------------------|-------------------------------------------------|--------------------------|--------------|------------|-------------------|
|                        |                                                 | Min.                     | Max.         |            |                   |
| HLMP-CW11-WZ0xx        | 15                                              | 5500                     | 16000        | No         | A                 |
| <b>HLMP-CW11-X10xx</b> | <b>15</b>                                       | <b>7200</b>              | <b>21000</b> | <b>No</b>  | <b>A</b>          |
| HLMP-CW11-XY0xx        | 15                                              | 7200                     | 12000        | No         | A                 |
| <b>HLMP-CW11-YZ0xx</b> | <b>15</b>                                       | <b>9300</b>              | <b>16000</b> | <b>No</b>  | <b>A</b>          |
| HLMP-CW12-WZ0xx        | 15                                              | 5500                     | 16000        | Yes        | B                 |
| <b>HLMP-CW12-X10xx</b> | <b>15</b>                                       | <b>7200</b>              | <b>21000</b> | <b>Yes</b> | <b>B</b>          |
| HLMP-CW12-XY0xx        | 15                                              | 7200                     | 12000        | Yes        | B                 |
| HLMP-CW12-XYBxx        | 15                                              | 7200                     | 12000        | Yes        | B                 |
| <b>HLMP-CW12-YZ0xx</b> | <b>15</b>                                       | <b>9300</b>              | <b>16000</b> | <b>Yes</b> | <b>B</b>          |
| <b>HLMP-CW12-YZBxx</b> | <b>15</b>                                       | <b>9300</b>              | <b>16000</b> | <b>Yes</b> | <b>B</b>          |
| HLMP-CW26-UX0xx        | 23                                              | 3200                     | 9300         | No         | A                 |
| HLMP-CW26-VW0xx        | 23                                              | 4200                     | 7200         | No         | A                 |
| <b>HLMP-CW26-VY0xx</b> | <b>23</b>                                       | <b>4200</b>              | <b>12000</b> | <b>No</b>  | <b>A</b>          |
| <b>HLMP-CW26-WX0xx</b> | <b>23</b>                                       | <b>5500</b>              | <b>9300</b>  | <b>No</b>  | <b>A</b>          |
| HLMP-CW27-UX0xx        | 23                                              | 3200                     | 9300         | Yes        | B                 |
| HLMP-CW27-UX2xx        | 23                                              | 3200                     | 9300         | Yes        | B                 |
| HLMP-CW27-VW0xx        | 23                                              | 4200                     | 7200         | Yes        | B                 |
| <b>HLMP-CW27-VY0xx</b> | <b>23</b>                                       | <b>4200</b>              | <b>12000</b> | <b>Yes</b> | <b>B</b>          |
| <b>HLMP-CW27-WX0xx</b> | <b>23</b>                                       | <b>5500</b>              | <b>9300</b>  | <b>Yes</b> | <b>B</b>          |
| HLMP-CW36-TW0xx        | 30                                              | 2500                     | 7200         | No         | A                 |
| HLMP-CW36-UV0xx        | 30                                              | 3200                     | 5500         | No         | A                 |
| HLMP-CW36-UVBxx        | 30                                              | 3200                     | 5500         | No         | A                 |
| <b>HLMP-CW36-VW0xx</b> | <b>30</b>                                       | <b>4200</b>              | <b>7200</b>  | <b>No</b>  | <b>A</b>          |
| <b>HLMP-CW36-VWBxx</b> | <b>30</b>                                       | <b>4200</b>              | <b>7200</b>  | <b>No</b>  | <b>A</b>          |
| HLMP-CW37-TW0xx        | 30                                              | 2500                     | 7200         | Yes        | B                 |
| HLMP-CW37-UV0xx        | 30                                              | 3200                     | 5500         | Yes        | B                 |
| HLMP-CW37-UVBxx        | 30                                              | 3200                     | 5500         | Yes        | B                 |
| <b>HLMP-CW37-VW0xx</b> | <b>30</b>                                       | <b>4200</b>              | <b>7200</b>  | <b>Yes</b> | <b>B</b>          |
| <b>HLMP-CW37-VWBxx</b> | <b>30</b>                                       | <b>4200</b>              | <b>7200</b>  | <b>Yes</b> | <b>B</b>          |

### Notes:

1. Tolerance for luminous intensity measurement is +/- 15%
2. The luminous intensity is measured on the mechanical axis of the lamp package.
3. The optical axis is closely aligned with the package mechanical axis.
4. LED light output is bright enough to cause injuries to the eyes. Precautions must be taken to prevent looking directly at the LED without proper safety equipment.
5.  $2\theta_{1/2}$  is the off-axis angle where the luminous intensity is  $\frac{1}{2}$  the on axis intensity.
6. Part numbers in **BOLD** are recommended for new designs.

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

| Parameters                                 | Value       | Unit               |
|--------------------------------------------|-------------|--------------------|
| DC forward current <sup>[1]</sup>          | 30          | mA                 |
| Peak pulsed forward current <sup>[2]</sup> | 100         | mA                 |
| Power dissipation                          | 105         | mW                 |
| LED junction temperature                   | 110         | $^{\circ}\text{C}$ |
| Operating temperature range                | -40 to +85  | $^{\circ}\text{C}$ |
| Storage temperature range                  | -40 to +100 | $^{\circ}\text{C}$ |

Notes:

1. Derate linearly as shown in figure 2.
2. Duty factor 10%, frequency 1KHz

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

| Parameters                              | Symbol            | Min | Typ  | Max | Units                       | Test Condition                |
|-----------------------------------------|-------------------|-----|------|-----|-----------------------------|-------------------------------|
| Forward voltage                         | $V_F$             |     | 3.2  | 4.0 | V                           | $I_F = 20\text{ mA}$          |
| Reverse Voltage <sup>[1]</sup>          | $V_R$             | 5.0 |      |     | V                           | $I_R = 10\text{ }\mu\text{A}$ |
| Thermal resistance                      | $R\theta_{J-PIN}$ |     | 240  |     | $^{\circ}\text{C}/\text{W}$ | LED Junction to anode lead    |
| Chromaticity Coordinates <sup>[2]</sup> | X                 |     | 0.31 |     |                             | $I_F = 20\text{ mA}$          |
|                                         | Y                 |     | 0.31 |     |                             |                               |
| Capacitance                             | C                 |     | 70   |     |                             | $V_F=0, f=1\text{MHz}$        |

Notes:

1. The reverse voltage of the product is equivalent to the forward voltage of the protective chip at  $I_R = 10\text{ }\mu\text{A}$
2. The chromaticity coordinates are derived from the CIE 1931 Chromaticity Diagram and represent the perceived color of the device.

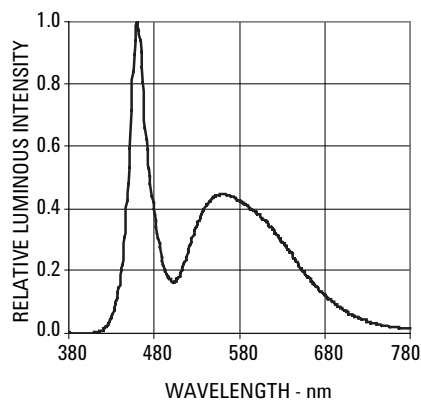


Figure 1. Relative Intensity vs. Wavelength

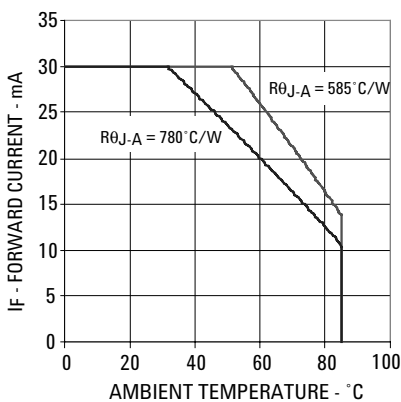


Figure 2. Forward Current vs. Ambient Temperature

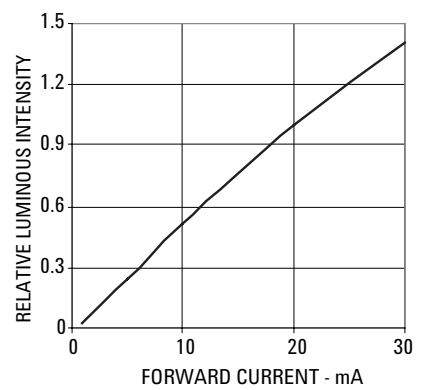
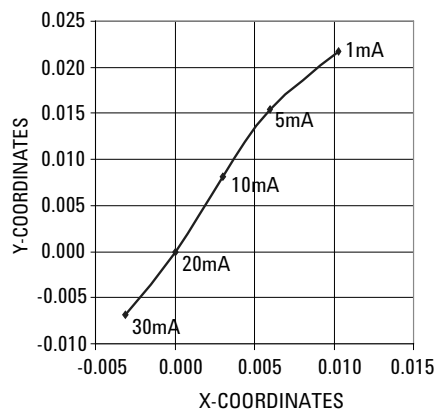
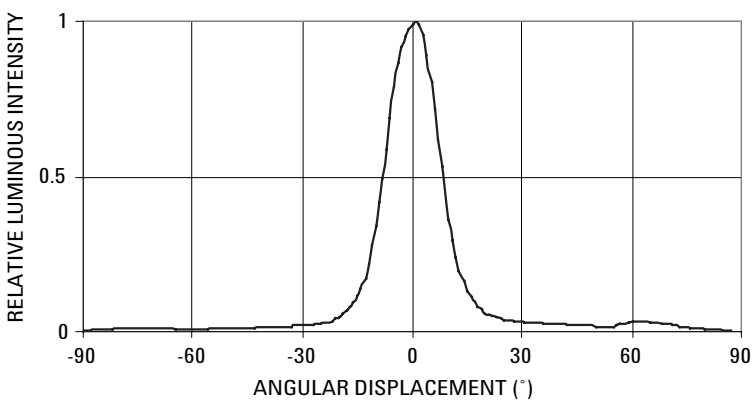


Figure 3. Relative Intensity versus DC Forward Current

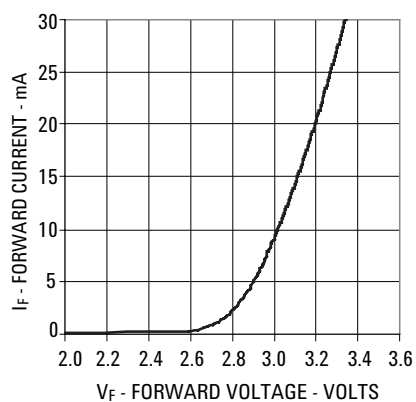


**Figure 4. Chromaticity shift vs. Current**

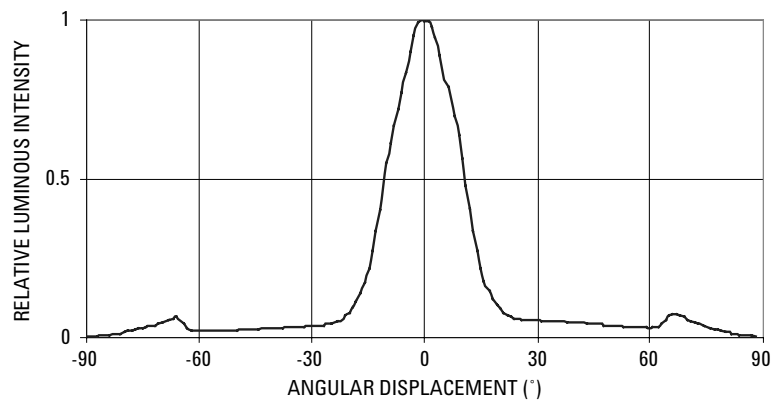
\*Note: (x,y) values @ 20mA reference to (0,0)



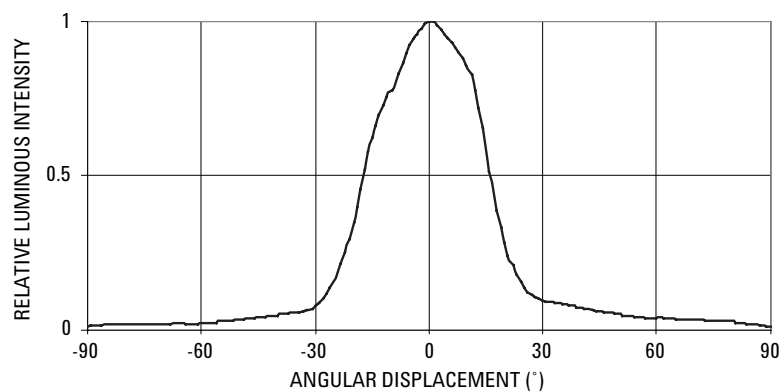
**Figure 6. Spatial Radiation Pattern for CW1x**



**Figure 5. Forward Current vs. Forward Voltage**



**Figure 7. Spatial Radiation Pattern for CW2x**



**Figure 8. Spatial Radiation Pattern for CW3x**

**Intensity Bin Limit Table**

| Bin | Intensity (mcd) at 20 mA |       |
|-----|--------------------------|-------|
|     | Min                      | Max   |
| 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 |
| 1   | 16000                    | 21000 |

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

**Color Bin Limit Table**

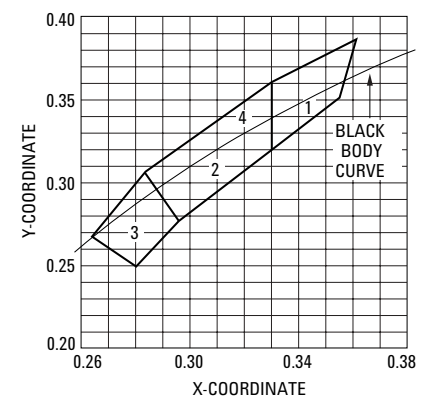
| Rank | Limits (Chromaticity Coordinates) |       |       |       |       |
|------|-----------------------------------|-------|-------|-------|-------|
|      |                                   |       |       |       |       |
| 1    | X                                 | 0.330 | 0.330 | 0.356 | 0.361 |
|      | Y                                 | 0.360 | 0.318 | 0.351 | 0.385 |
| 2    | X                                 | 0.287 | 0.296 | 0.330 | 0.330 |
|      | Y                                 | 0.295 | 0.276 | 0.318 | 0.339 |
| 3    | X                                 | 0.264 | 0.280 | 0.296 | 0.283 |
|      | Y                                 | 0.267 | 0.248 | 0.276 | 0.305 |
| 4    | X                                 | 0.283 | 0.287 | 0.330 | 0.330 |
|      | Y                                 | 0.305 | 0.295 | 0.339 | 0.360 |

Tolerance for each bin limit is  $\pm 0.01$

Note:

- Bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your Agilent representative for information on currently available bins.

**Color Bin Limits with Respect to CIE 1931 Chromaticity Diagram**



## 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 Condition:

- 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 1.59mm below the body (encapsulant epoxy) for those parts without standoff.
- Recommended soldering condition:

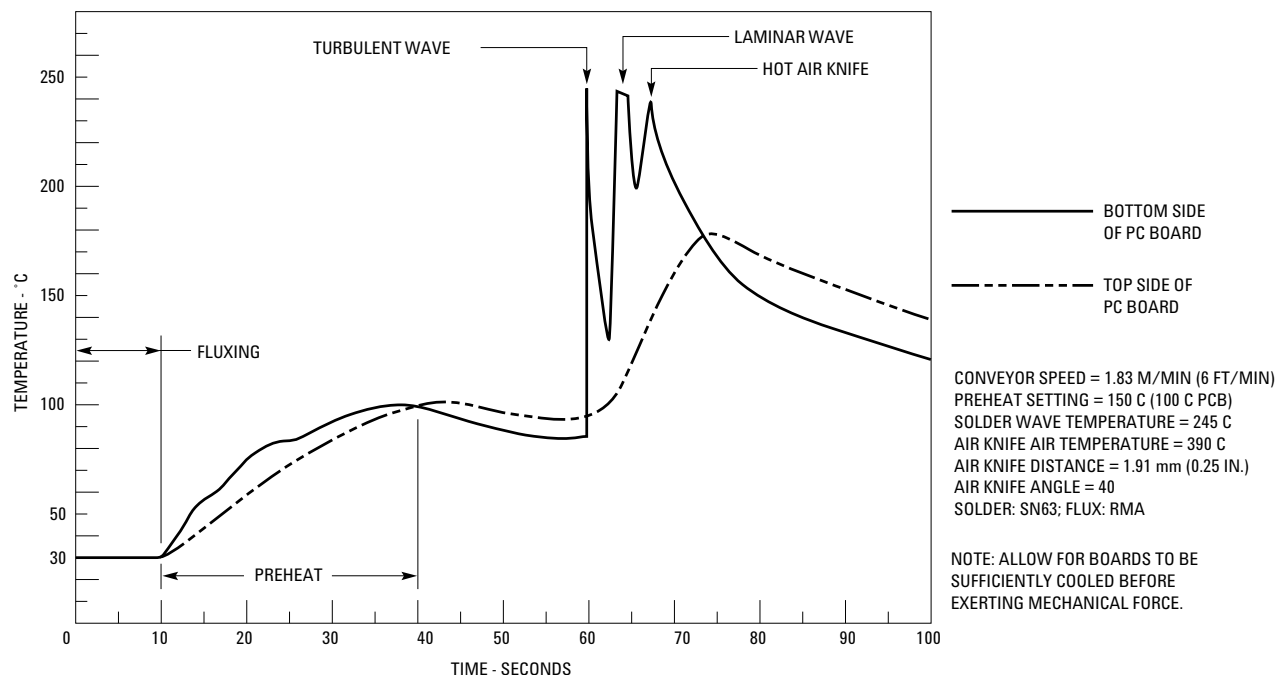
|                      | Wave Soldering | Manual Solder Dipping |
|----------------------|----------------|-----------------------|
| Pre-heat temperature | 105 °C Max.    | —                     |
| Preheat time         | 30 sec Max     | —                     |
| Peak temperature     | 250 °C Max.    | 260 °C Max.           |
| Dwell time           | 3 sec Max.     | 5 sec Max             |

- Wave soldering parameter must be set and maintain 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 holes size for LED component leads.

| LED component lead size                | Diagonal                 | Plated through hole diameter               |
|----------------------------------------|--------------------------|--------------------------------------------|
| 0.457 x 0.457mm<br>(0.018 x 0.018inch) | 0.646 mm<br>(0.025 inch) | 0.976 to 1.078 mm<br>(0.038 to 0.042 inch) |
| 0.508 x 0.508mm<br>(0.020 x 0.020inch) | 0.718 mm<br>(0.028 inch) | 1.049 to 1.150mm<br>(0.041 to 0.045 inch)  |

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

## Recommended Wave Soldering Profile



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