

# HLMP-WL02, HLMP-WG02

## High Intensity AlInGaP LED Lamps



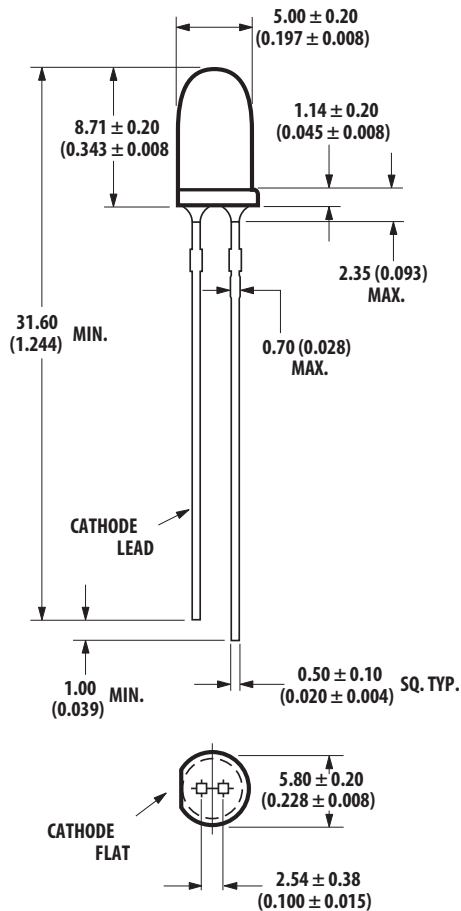
### Data Sheet



#### Description

This 5 mm LED lamps is specially designed for applications requiring higher levels of intensity than is achieved with a standard lamp. The 5 mm lamp is available with 65 degree viewing angle.

#### Package Dimensions



#### Features

- T-1 3/4 (5 mm) General Purpose LED Lamps
- AlInGaP SunPower Intensity
- High Light Output
- Tinted Diffused Lens
- Amber and Red
- Available on Tape and Reel

#### Applications

- General Purpose
- Consumer Goods
- Indicator Lights

#### Device Selection Guide

T-1 3/4 (5 mm) Lamp		Luminous Intensity Min. mcd, I <sub>f</sub> @ 20 mA	Viewing Angle 2θ <sub>1/2</sub> (Degrees)
Color	Part Number		
Amber	HLMP-WL02	35	65
Red	HLMP-WG02	26	65

#### Notes:

1. Dominant Wavelength, λ<sub>d</sub>, is derived from the CIE Chromaticity Diagram, and represents the color of the lamp.
2. θ<sub>1/2</sub> is the off-axis angle where the luminous intensity is one half the on-axis intensity.
3. The luminous intensity is measured on the mechanical axis of the lamp package.
4. The optical axis is closely aligned with the package mechanical axis.

## Absolute Maximum Ratings at $T_A = 25^\circ\text{C}$

Parameter	5 mm
DC Forward Current <sup>[1,2,3]</sup>	50 mA
Peak Pulsed Forward Current	70 mA
Average Forward Current	30 mA
Reverse Voltage ( $I_R = 100 \mu\text{A}$ )	5 V
LED Junction Temperature	130°C
Operating Temperature	-40°C to + 100°C
Storage Temperature	-40°C to + 100°C

Notes:

1. Derate linearly as shown in Figure 4.
2. For long term performance with minimal light output degradation, drive currents between 10 and 30 mA are recommended.
3. Please contact your Avago Technologies sales representative about operating currents below 10 mA.

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

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage Amber ( $\lambda_d = 590 \text{ nm}$ ) Red ( $\lambda_d = 626 \text{ nm}$ )	$V_F$		2.02 1.90	2.4	V	$I_F = 20 \text{ mA}$
Reverse Voltage	$V_R$	5	20		V	$I_R = 100 \mu\text{A}$
Peak Wavelength Amber Red	$\lambda_{\text{PEAK}}$		592 635		nm	Peak of Wavelength of Spectral Distribution at $I_F = 20 \text{ mA}$
Spectral Halfwidth	$\Delta\lambda_{1/2}$		17		nm	Wavelength Width at Spectral Distribution $1/2$ Power point at $I_F = 20 \text{ mA}$
Speed of Response	$\tau_s$		20		ns	Exponential Time Constant, $e^{-t/\tau_s}$
Capacitance	C		40		pF	$V_F = 0, f = 1 \text{ MHz}$
Thermal Resistance	$R\theta_{\text{J-PIN}}$		240		°C/W	LED Junction-to-Cathode Lead
Luminous Efficacy <sup>[1]</sup> Amber Red	$\eta_v$		500 155		lm/W	Emitted Luminous Power/Emitted Radiant Power

Note:

1. The radiant intensity,  $I_e$ , in watts per steradian, may be found from the equation  $I_e = I_v/\eta_v$ , where  $I_v$  is the luminous intensity in candelas and  $\eta_v$  is the luminous efficacy in lumens/watt.

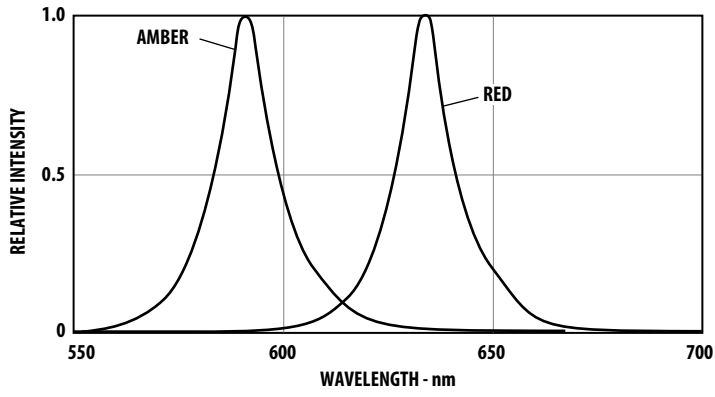


Figure 1. Relative Intensity vs. Peak Wavelength.

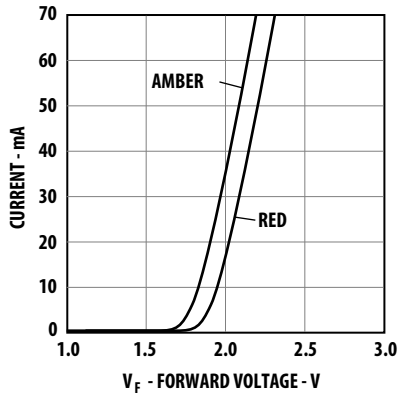


Figure 2. Forward Current vs. Forward Voltage.

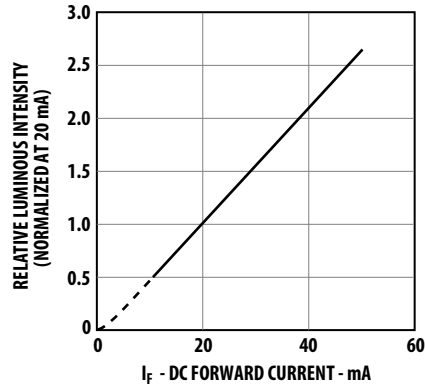


Figure 3. Relative Luminous Intensity vs. Forward Current.

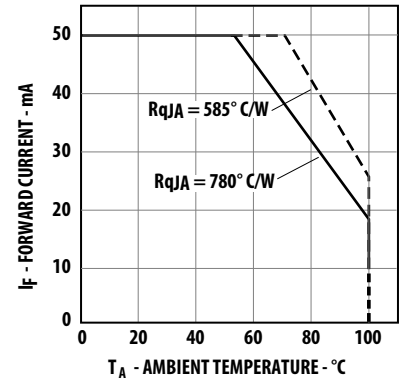


Figure 4. Maximum Forward Current vs. Ambient Temperature. Derating Based on  $T_{jMAX} = 130^{\circ}C$ .

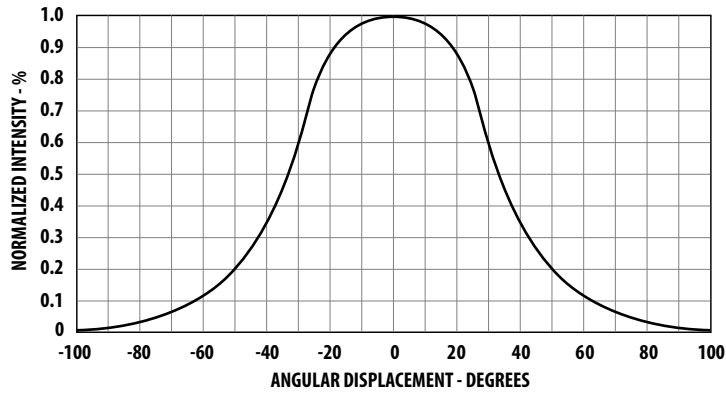


Figure 5. Representative Spatial Radiation Pattern for  $65^{\circ}$

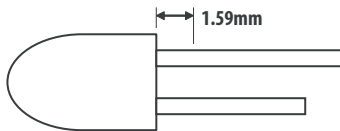
**Precautions:**

**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 [1,2]	Manual Solder Dipping
Pre-heat temperature	105 °C Max.	-
Preheat time	60 sec Max	-
Peak temperature	250 °C Max.	260 °C Max.
Dwell time	3 sec Max.	5 sec Max

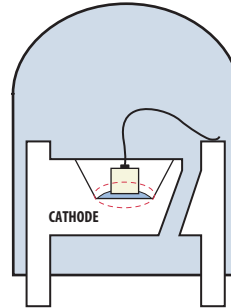
Note:

- 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.

Note:

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. Avago Technologies' high brightness LED are using high efficiency LED die with single wire bond as shown below. 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.

**Avago Technologies LED configuration**



**AlInGaP Device**

Note: Electrical connection between bottom surface of LED die and the lead frame is achieved through conductive paste.

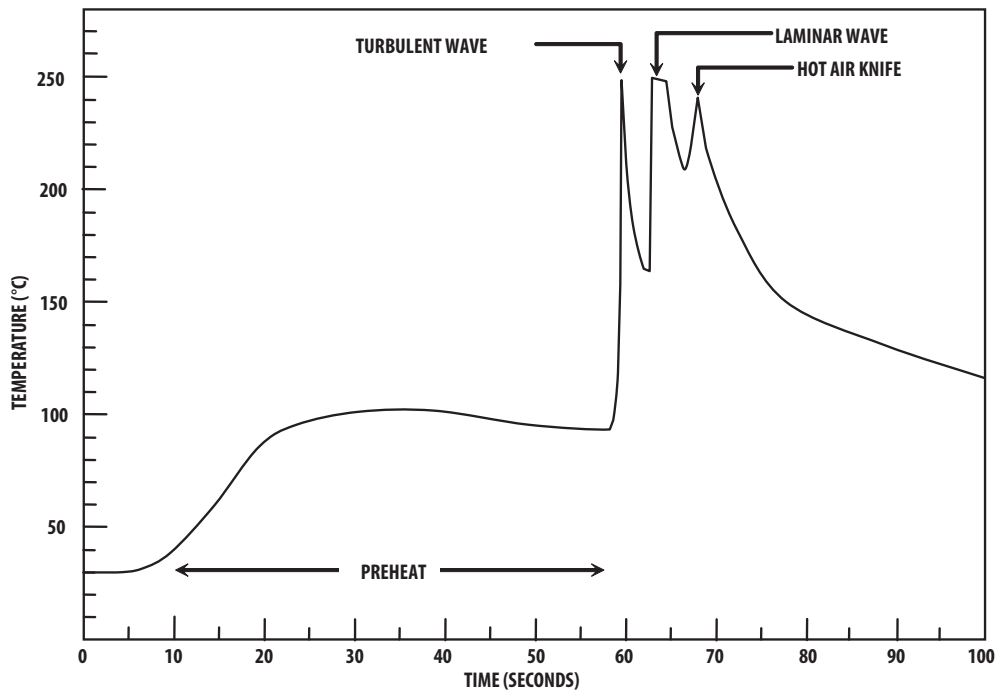
- Any alignment fixture that is being applied during wave soldering should be loosely fitted and should not apply weight or force on LED. Non metal material is recommended as it will absorb less heat during wave soldering process.
- At elevated temperature, LED is more susceptible to mechanical stress. 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
0.45 x 0.45 mm (0.018x 0.018 inch)	0.636 mm (0.025 inch)	0.98 to 1.08 mm (0.039 to 0.043 inch)
0.50 x 0.50 mm (0.020x 0.020 inch)	0.707 mm (0.028 inch)	1.05 to 1.15 mm (0.041 to 0.045 inch)

- 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 high brightness 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.











Figure 6. Recommended wave soldering profile

### Packaging Label:

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

<b>AVAGO</b> TECHNOLOGIES	
(1P) Item: Part Number	STANDARD LABEL LS0002
	RoHS Compliant
(1T) Lot: Lot Number	e3 max temp 250C
	(Q) QTY: Quantity
LPN:	
	CAT: Intensity Bin
(9D)MFG Date: Manufacturing Date	
	BIN: Refer to below information
<hr/>	
(P) Customer Item:	
(V) Vendor ID:	(9D) Date Code: Date Code
DeptID:	Made In: Country of Origin

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

		RoHS Compliant e3 max temp 250C
<b>Lamps Baby Label</b>		
(1P) PART #: Part Number		
		
(1T) LOT #: Lot Number		
		
(9D)MFG DATE: Manufacturing Date	QUANTITY: Packing Quantity	
		
C/O: Country of Origin		
Customer P/N:	CAT: Intensity Bin	
		
Supplier Code:	BIN: Refer to below information	
		
	DATECODE: Date Code	
		

**Acronyms and Definition:**

BIN:

(i) Color bin only or VF bin only

(Applicable for part number with color bins but without VF bin OR part number with VF bins and no color bin)

OR

(ii) Color bin incorporated with VF Bin

(Applicable for part number that have both color bin and VF bin)

Example:

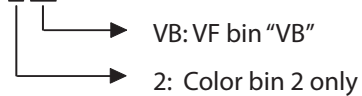
(i) Color bin only or VF bin only

BIN: 2 (represent color bin 2 only)

BIN: VB (represent VF bin "VB" only)

(ii) Color bin incorporate with VF Bin

BIN: 2VB



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