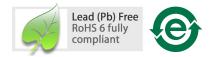
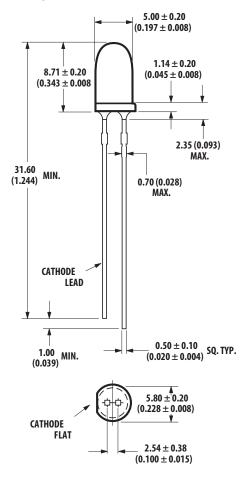
Data Sheet



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 ¾ (5 mm) Lamp		Luminous	Viewing	
Color	Part Number	<pre>Intensity Min. mcd, If @ 20 mA</pre>	Angle 20½ (Degrees)	
Amber	HLMP-WL02	35	65	
Red	HLMP-WG02	26	65	

Notes:

 Dominant Wavelength, λd, is derived from the CIE Chromaticity Diagram, and represents the color of the lamp.

2. $\theta_{1/2}$ 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 $T_A = 25^{\circ}C$

Parameter	5 mm
DC Forward Current ^[1,2,3]	50 mA
Peak Pulsed Forward Current	70 mA
Average Forward Current	30 mA
Reverse Voltage ($I_R = 100 \ \mu A$)	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.

Parameter	Symbol	Min.	Тур.	Max.	Units	Test Conditions
Forward Voltage	V _F				V	$I_{\rm F} = 20 {\rm mA}$
Amber ($\lambda_d = 590 \text{ nm}$)			2.02	2.4		
Red ($\lambda_d = 626 \text{ nm}$)			1.90			
Reverse Voltage	V _R	5	20		V	I _R = 100 μA
Peak Wavelength	λρεακ				nm	Peak of Wavelength of Spectral
Amber			592			Distribution at $I_F = 20 \text{ mA}$
Red			635			
Spectral Halfwidth	$\Delta\lambda^{1/2}$		17		nm	Wavelength Width at Spectral Distri
						bution $\frac{1}{2}$ Power point at I _F = 20 mA
Speed of Response	τ_{s}		20		ns	Exponential Time Constant, $e^{-t/\tau s}$
Capacitance	С		40		pF	$V_F = 0$, f = 1 MHz
Thermal Resistance	Rθj-pin		240		°C/W	LED Junction-to-Cathode Lead
Luminous Efficacy ^[1]	ηv				lm/W	Emitted Luminous Power/Emitted
Amber			500			RadiantPower
Red			155			

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

Note:

1. The radiant intensity, le, in watts per steridian, may be found from the equation le = lv/ηv, where lv is the luminous intensity in candelas and ηv is the luminous efficacy in lumens/watt.

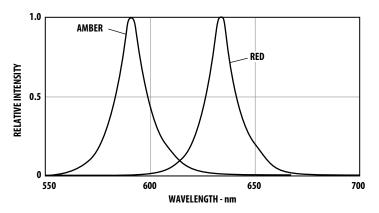


Figure 1. Relative Intensity vs. Peak Wavelength.

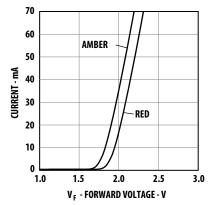
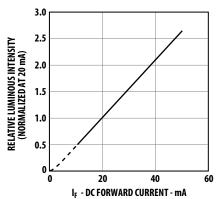


Figure 2. Forward Current vs. Forward Voltage.



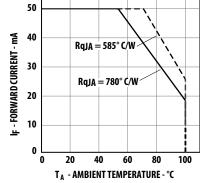


Figure 3. Relative Luminous Intensity vs. Forward Current.

Figure 4. Maximum Forward Current vs. Ambient Temperature. Derating Based on T_JMAX = 130°C.

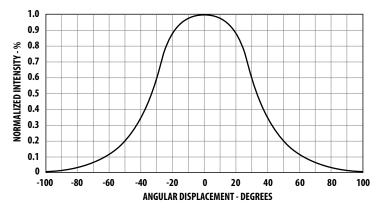


Figure 5. Representative Spatial Radiation Pattern for 65°

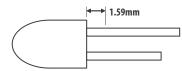
Precautions:

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

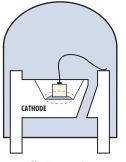
Note:

- 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:

- 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



AllnGaP Device

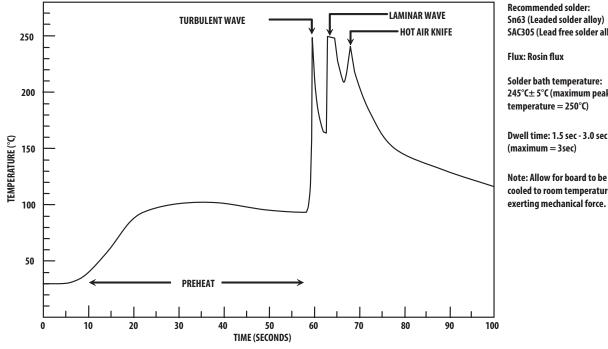
Note: Electrical connection between bottom surface of LED die and the lead frame is achieved through conductive paste.

- 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	0.636 mm	0.98 to 1.08 mm
(0.018x 0.018 inch)	(0.025 inch)	(0.039 to 0.043 inch)
0.50 x 0.50 mm	0.707 mm	1.05 to 1.15 mm
(0.020x 0.020 inch)	(0.028 inch)	(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

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

Figure 6. Recommended wave soldering profile

Packaging Label:

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

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

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

Lamps Baby Label	RoHS Compliant e3 max temp 250C	
(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



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