HLMP-4100/4101

T-1$^3/_4$ (5 mm) Double Heterojunction
AlGaAs Very High Intensity Red LED Lamps

Data Sheet

Description

These solid state LED lamps utilize newly developed double heterojunction (DH) AlGaAs/GaAs material technology. This LED material has outstanding light output efficiency over a wide range of drive currents. The lamp package has a tapered lens designed to concentrate the luminous flux into a narrow radiation pattern to achieve a very high intensity. The LED color is deep red at the dominant wavelength of 637 nanometers. These lamps may be DC or pulse driven to achieve desired light output.

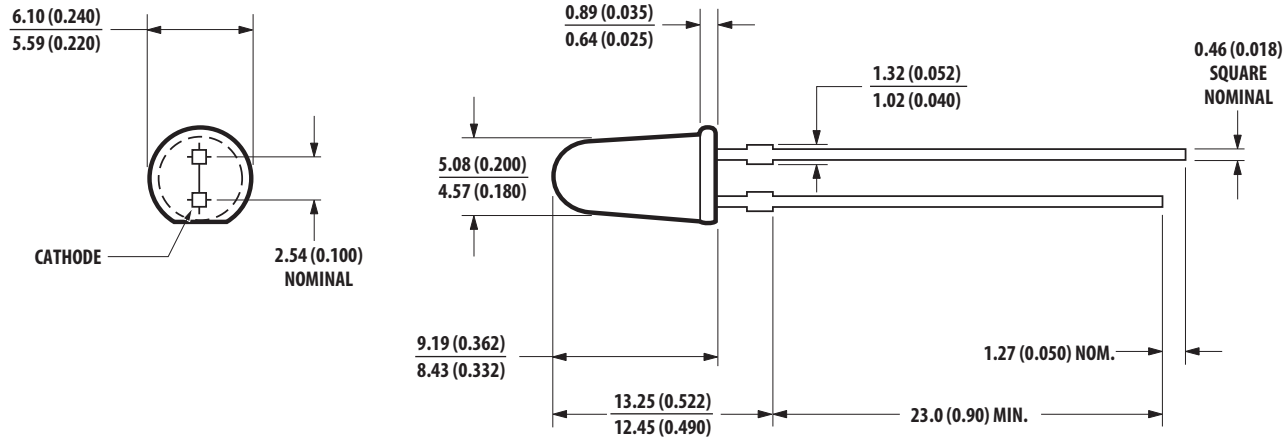
Features

- 1000 mcd at 20 mA
- Very high intensity at low drive currents
- Narrow viewing angle
- Outstanding material efficiency
- Low forward voltage
- CMOS/MOS compatible
- TTL compatible
- Deep red color

Applications

- Bright ambient lighting conditions
- Emitter/detector and signaling applications
- General use

Package Dimensions



Selection Guide

	Luminous Intensity Iv (mcd) at 20 mA			$2\theta_{1/2}$ [1]
Device HLMP-	**Min.**	**Typ.**	**Max.**	**Degree**
4100	500.0	750.0	–	8
4101	700.0	1000.0	–	8
4101-ST0xx	1400.0	2700.0	4000.0	8

Note:
1. $\theta 1/2$ is the angle from optical centerline where the luminous intensity is $1/2$ the optical centerline value.

Part Numbering System

HLMX - 4 1 XX - X X X XX

Mechanical Option
00: Bulk

Color Bin Options
0: Full color bin distribution

Maximum Iv Bin Options
0: Open (No. max. limit)
Others: Please refer to the Iv bin Table

Minimum Iv Bin Options
Please refer to the Iv bin Table

Brightness Level
00: Lower brightness
01: Higher brightness

Notes:
1. '0' indicates no maximum intensity limit.
2. '0' indicates full color distribution.

Absolute Maximum Ratings at $T_A = 25°C$

Parameter	Maximum Rating	Units
Peak Forward Current[1, 2]	300	mA
Average Forward Current[2]	20	mA
DC Current[3]	30	mA
Power Dissipation	87	mW
Reverse Voltage (I_R = 100 μA)	5	V
Transient Forward Current (10 μs Pulse)[4]	500	mA
Operating Temperature Range	-20 to +100	°C
Storage Temperature Range	-40 to +100	°C

Notes:
1. Maximum I_{PEAK} at f = 1 kHz, DF = 6.7%.
2. Refer to Figure 6 to establish pulsed operating conditions.
3. Derate linerally as shown in Figure 5.
4. The transient peak current is the maximum non-recurring peak current the device can withstand without damaging the LED die and wire bonds. It is not recommended that the device be operated at peak currents beyond the Absolute Maximum Peak Forward Current.

Electrical/Optical Characteristics at $T_A = 25°C$

Symbol	Description	Min.	Typ.	Max.	Units	Test Conditions
V_F	Forward Voltage		1.8	2.42	V	20 mA
V_R	Reverse Breakdown Voltage	5.0	15.0		V	I_R = 100 μA
λ_{PEAK}	Peak Wavelength		650		nm	Measurement at Peak
λ_d	Dominant Wavelength		642		nm	Note 1
$\Delta\lambda_{1/2}$	Spectral Line Halfwidth		20		nm	
τ_s	Speed of Response		30		ns	Exponential Time Constant, $e^{-t/2}$
C	Capacitance		30		pF	V_F = 0; f = 1 MHz
θ_{Jc}	Thermal Resistance		220		°C/W	Junction to Cathode Lead
η_V	Luminous Efficacy		80		l m/W	Note 2

Notes:
1. The dominant wavelength, λ_d, is derived from the CIE chromaticity diagram and represents the color of the device.
2. The radiant intensity, I_e, in watts per steradian, may be found from the equation $I_e = I_v/\eta_v$, where Iv is the luminous intensity in candelas and η_v is luminous efficacy in lumens/watt.
3. The approximate total luminous flux output within a cone angle of 2θ about the optical axis, $\phi_v(2\theta)$, may be obtained from the following formula: $\phi_v(2\theta) = [\phi_v(\theta)/I_v(0)]I_v$; Where: $\phi_v(\theta)/I_v(0)$ is obtained from Figure 7.

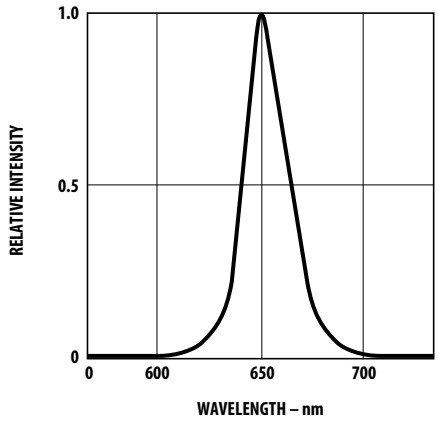


Figure 1. Relative intensity vs. wavelength.

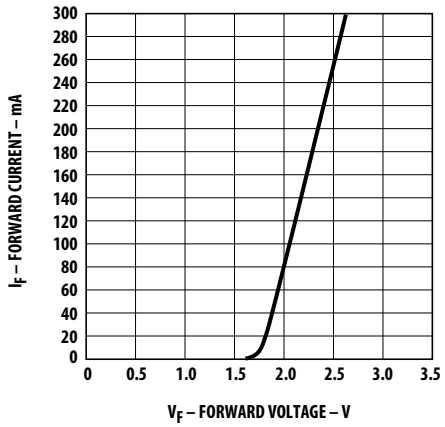


Figure 2. Forward current vs. forward voltage.

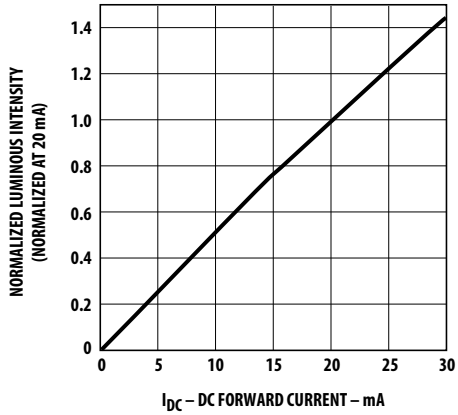


Figure 3. Relative luminous intensity vs. dc forward current.

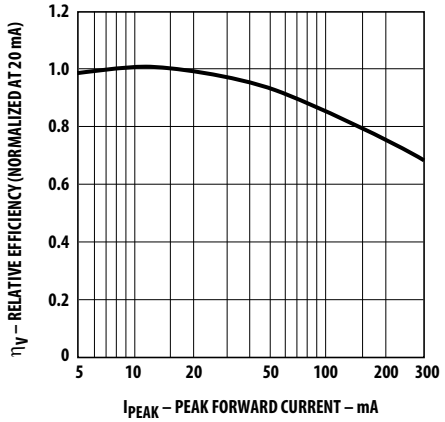


Figure 4. Relative efficiency vs. peak forward current.

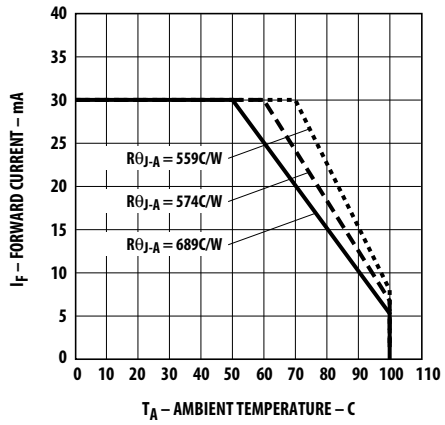


Figure 5. Maximum forward dc current vs. ambient temperature derating based on T_J MAX. = 110°C.

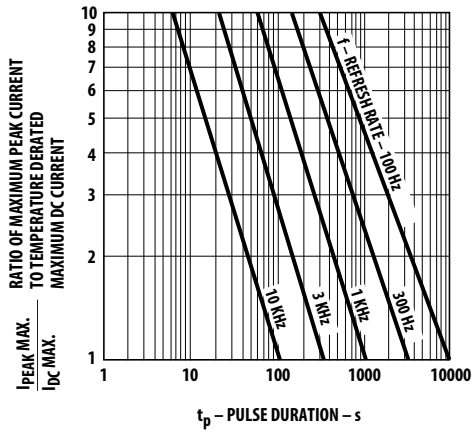


Figure 6. Maximum tolerable peak current vs. peak duration (I_{PEAK} MAX. determined from temperature derated I_{DC} MAX.).

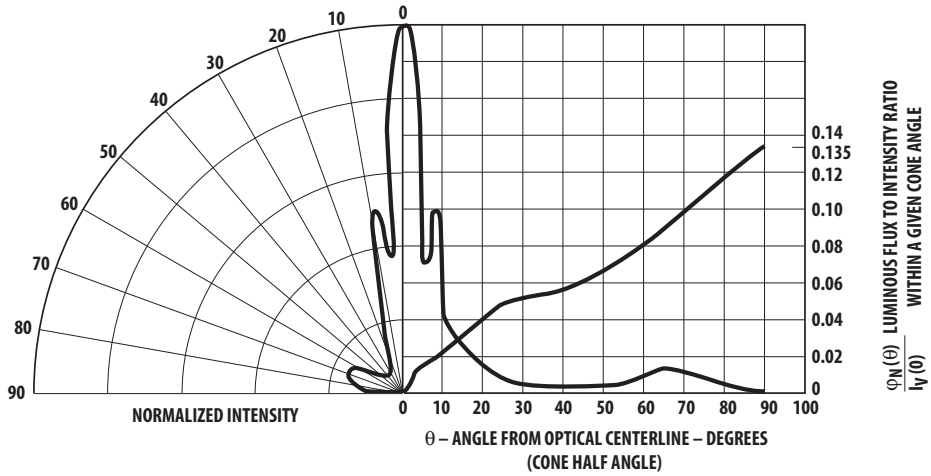


Figure 7. Relative luminous intensity vs. angular displacement.

Intensity Bin Limits

		Intensity Range (mcd)	
Color	**Bin**	**Min.**	**Max.**
Red	P	540.0	850.0
	Q	850.0	1200.0
	R	1200.0	1700.0
	S	1700.0	2400.0
	T	2400.0	3400.0
	U	3400.0	4900.0
	V	4900.0	7100.0
	W	7100.0	10200.0
	X	10200.0	14800.0
	Y	14800.0	21400.0
	Z	21400.0	30900.0

Maximum tolerance for each bin limit is ±18%.

Mechanical Option Matrix

Mechanical Option Code	Definition
00	Bulk Packaging, minimum increment 500 pcs/bag

Note:
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 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 Conditions

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

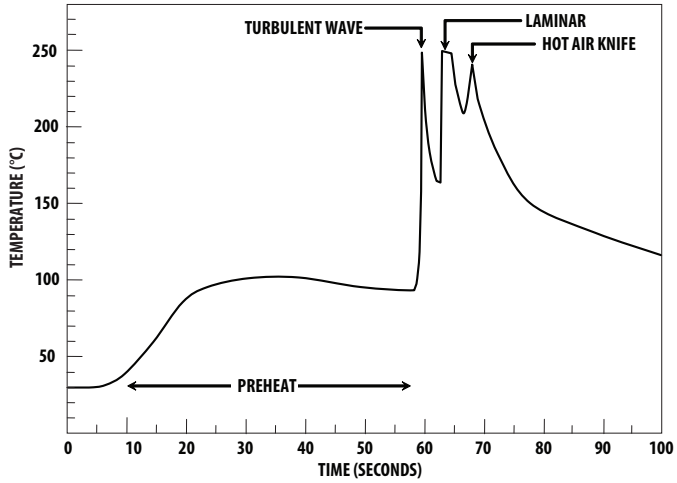
	Wave Soldering	Manual Solder Dipping
Pre-heat Temperature	105°C Max.	–
Pre-heat Time	60 sec Max.	–
Peak Temperature	250°C Max.	260°C Max.
Dwell Time	3 sec Max.	5 sec Max.

Note:s
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 parameter must be set and maintained 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 hole sizes for LED component leads:

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

Note: For more information on soldering LED components, refer to application note AN1027.



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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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 8. Recommended wave soldering profile.

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

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