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HLMP-S100, HLMP-S201, HLMP-S301, HLMP-S400, HLMP-S401, HLMP-S501

2 mm x 5 mm Rectangular LED Lamps

Data Sheet



Description

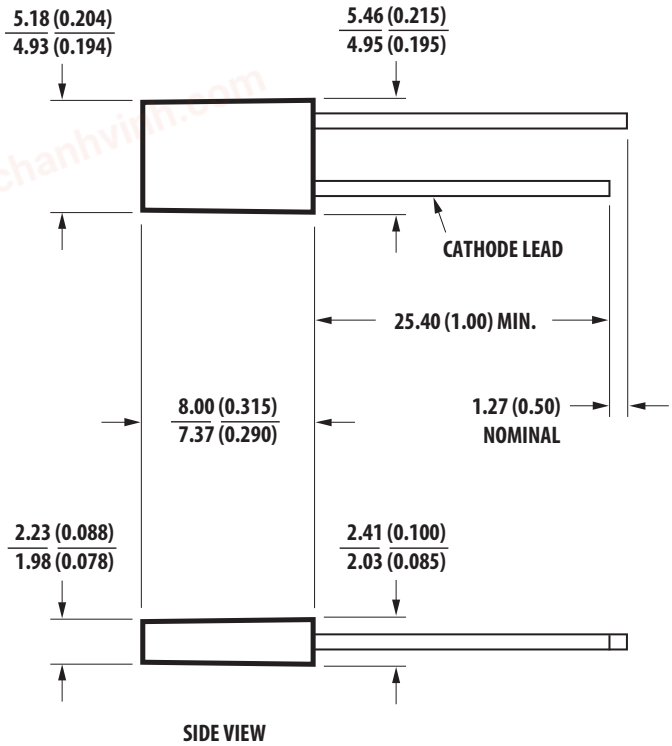
The HLMP-S100, -S201, -S301, -S400, -S401, -S501, are epoxy encapsulated lamps in rectangular packages which are easily stacked in arrays or used for discrete front panel indicators. Contrast and light uniformity are enhanced by a special epoxy diffusion and tinting process.

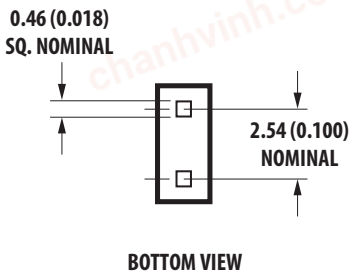
The HLMP-S100 uses double heterojunction (DH) absorbing substrate (AS) aluminum gallium arsenide (AlGaAs) LEDs to produce outstanding light output over a wide range of drive currents.

Features

- Rectangular light emitting surface
- Excellent for flush mounting on panels
- Choice of five bright colors
- Long life: solid state reliability
- Excellent uniformity of light output

Package Dimensions





NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).
2. AN EPOXY MENISCUS MAY EXTEND ABOUT 1 mm (0.040") DOWN THE LEADS.
3. THERE IS A MXIMUM 1 TAPER FROM BASE TO THE TOP OF LAMP.

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Selection Guide

		Luminous Intensity Iv (mcd) at 20 mA [1]		
Color	**Part Number**	**Min.**	**Typ.**	**Max.**
AlGaAs Red	HLMP-S100	3.8	7.5	–
HER	HLMP-S201	3.8	7.5	–
	HLMP-S201-D00xx	2.4	3.5	–
Orange	HLMP-S400	2.4	3.5	–
	HLMP-S401	3.8	7.5	–
Yellow	HLMP-S301	2.5	4.0	–
	HLMP-S301-B00xx	1.6	2.1	–
	HLMP-S301-C00xx	2.5	4.0	–
Green	HLMP-S501	4.7	8.0	–
	HLMP-S501-C00xx	2.9	4.0	–
	HLMP-S501-D00xx	4.7	8.0	–

Note 1. Maximum tolerance for each bin limit is ± 18%.

Part Numbering System

HLMP - S x xx - x x x xx

Mechanical Option
00: Bulk
02: Tape & Reel, Straight Leads

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: Less Brightness
01: Higher Brightness

Color Options
1: AlGaAs Red
2: GaP HER
3: GaP Yellow
4: GaP Orange
5: GaP Green

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

Sym.	Description	Device HLMP-	Min.	Typ.	Max.	Units	Test Conditions
$2\theta_{1/2}$	Included Angle Between Half Luminous Intensity Points	All		110		Deg.	$I_F = 20$ mA See Note 1
λ_{PEAK}	Peak Wavelength	AlGaAs Red High Efficiency Red Orange Yellow Green		645 635 600 583 565		nm	Measurement at Peak
λ_d	Dominant Wavelength	AlGaAs Red High Efficiency Red Orange Yellow Green		637 626 602 585 569		nm	See Note 2 Time const, $e^{-t/\tau s}$
τ_s	Speed of Response	AlGaAs Red High Efficiency Red Orange Yellow Green		30 90 280 90 500		ns	
C	Capacitance	AlGaAs Red High Efficiency Red Orange Yellow Green		30 11 4 15 18		pF	$V_F = 0$; f = 1 MHz
$R\theta_{J\text{-}PIN}$	Thermal Resistance	All		260		°C/W	Junction to Cathode Lead at Seating Plane
V_F	Forward Voltage	AlGaAs Red HER/Orange Yellow Green	1.6 1.5 1.5 1.5	1.8 1.9 2.1 2.2	2.2 2.6 2.6 3.0	V	$I_F = 20$ mA
V_R	Reverse Breakdown Voltage	All	5.0			V	$I_R = 100$ mA
η_V	Luminous Efficacy	AlGaAs Red High Efficiency Red Orange Yellow Green		80 145 380 500 595		lumens/ watt	See Note 3

Notes:
1. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
2. The dominant wavelength, λ_d, is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.
3. Radiant intensity, I_e, in watts/steradian, may be found from the equation $I_e = I_v/\eta_v$, where I_v is the luminous intensity in candelas and η_v is the luminous efficacy in lumens/watt.

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Absolute Maximum Ratings at $T_A = 25°C$

Parameter	AlGaAs Red	High Efficiency Red/Orange	Green/Yellow	Units
Peak Forward Current	300	90	60	mA
Average Forward Current[1]	20	25	20	mA
DC Current[2]	30	30	20	mA
Transient Forward Current[3]	500	500	500	mA
(10 μsec Pulse)				
LED Junction Temperature	110	110	110	°C
Operating Temperature Range	-20 to +100	-40 to +100	-40 to +100	°C
Storage Temperature Range	-40 to +100	-40 to +100	-40 to +100	°C

Notes:
1. See Figure 5 to establish pulsed operating conditions.
2. For AlGaAs Red, Red, Orange, and Green series derate linearly from 50°C at 0.5 mA/°C. For Yellow series derate linearly from 50°C at 0.34 mA/°C.
3. The transient peak current is the maximum non-recurring peak current that can be applied to the device without damaging the LED die and wire bond. It is not recommended that the device be operated at peak currents beyond the peak forward current listed in the Absolute Maximum Ratings.

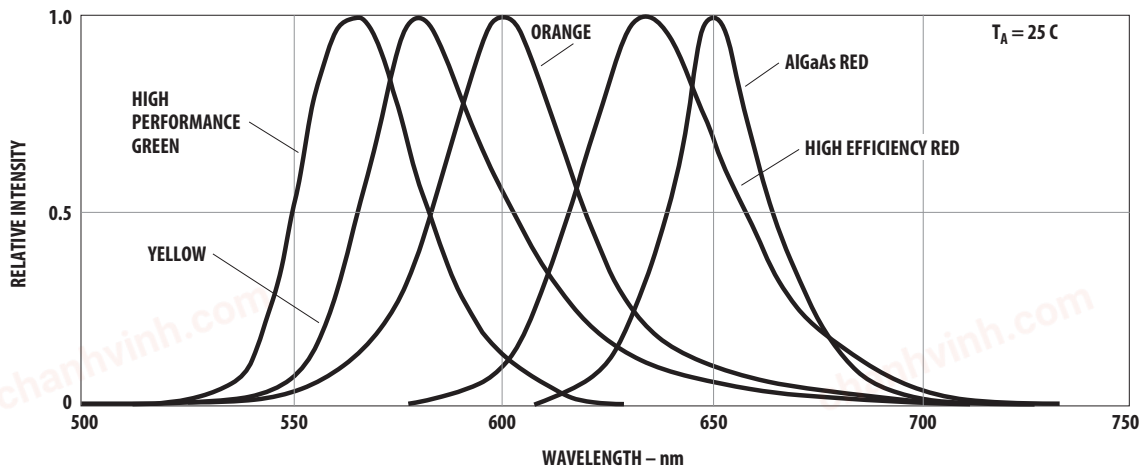


Figure 1. Relative intensity vs. wavelength.

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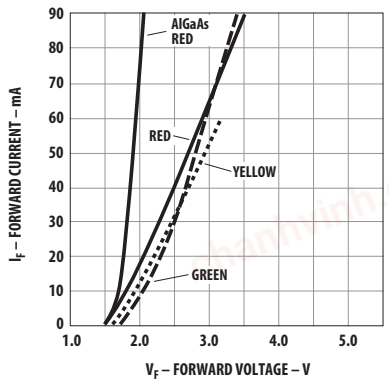


Figure 2. Forward current vs. forward voltage characteristics. V_F (300 mA) for AlGaAs Red = 2.6 volts typical.

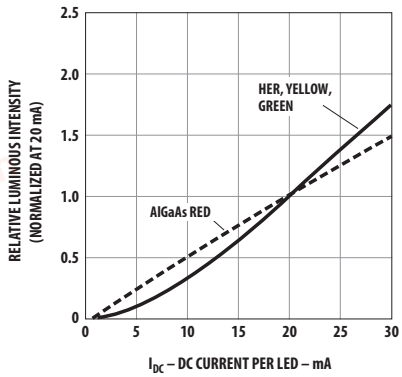


Figure 3. Relative luminous intensity vs. DC forward current.

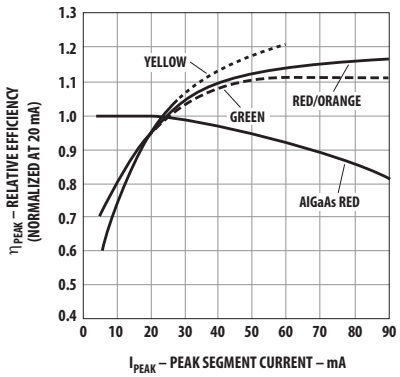
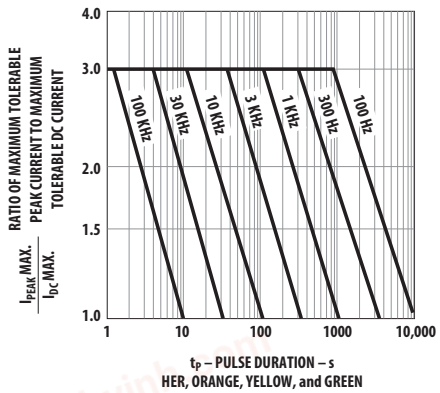


Figure 4. Relative efficiency (luminous intensity per unit current) vs. LED peak current. ηv (300 mA) for AlGaAs Red = 0.7.



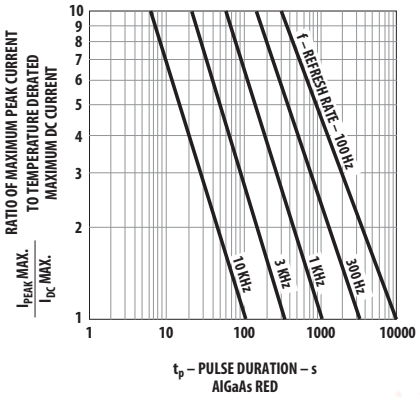


Figure 5. Maximum tolerable peak current vs. peak duration. (I_{PEAK} MAX determined from temperature derated I_{DC} MAX).

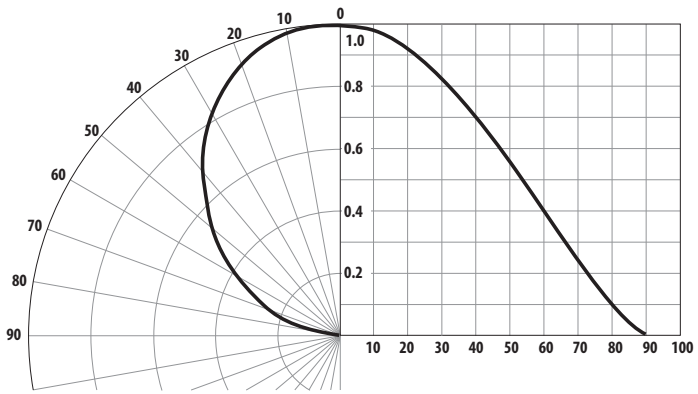


Figure 6. Relative luminous intensity vs. angular displacement.

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Intensity Bin Limits

Color	Bin	Intensity Range (mcd) Min.	Max.
Red/Orange	D	2.4	3.8
	E	3.8	6.1
	F	6.1	9.7
	G	9.7	15.5
	H	15.5	24.8
	I	24.8	39.6
	J	39.6	63.4
	K	63.4	101.5
	L	101.5	162.4
	M	162.4	234.6
	N	234.6	340.0
	O	340.0	540.0
	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
Yellow	B	1.6	2.5
	C	2.5	4.0
	D	4.0	6.5
	E	6.5	10.3
	F	10.3	16.6
	G	16.6	26.5
	H	26.5	42.3
	I	42.3	67.7
	J	67.7	108.2
	K	108.2	173.2
	L	173.2	250.0
	M	250.0	360.0
	N	360.0	510.0
	O	510.0	800.0
	P	800.0	1250.0
	Q	1250.0	1800.0
	R	1800.0	2900.0
	S	2900.0	4700.0
	T	4700.0	7200.0
	U	7200.0	11700.0
	V	11700.0	18000.0
	W	18000.0	27000.0

Intensity Bin Limits, continued

Color	Bin	Intensity Range (mcd) Min.	Max.
Green	A	1.1	1.8
	B	1.8	2.9
	C	2.9	4.7
	D	4.7	7.6
	E	7.6	12.0
	F	12.0	19.1
	G	19.1	30.7
	H	30.7	49.1
	I	49.1	78.5
	J	78.5	125.7
	K	125.7	201.1
	L	201.1	289.0
	M	289.0	417.0
	N	417.0	680.0
	O	680.0	1100.0
	P	1100.0	1800.0
	Q	1800.0	2700.0
	R	2700.0	4300.0
	S	4300.0	6800.0
	T	6800.0	10800.0
	U	10800.0	16000.0
	V	16000.0	25000.0
	W	25000.0	40000.0

Maximum tolerance for each bin limit is ±18%.

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Color Categories

		Lambda (nm)	
Color	**Category #**	**Min.**	**Max.**
Green	6	561.5	564.5
	5	564.5	567.5
	4	567.5	570.5
	3	570.5	573.5
	2	573.5	576.5
Yellow	1	582.0	584.5
	3	584.5	587.0
	2	587.0	589.5
	4	589.5	592.0
	5	592.0	593.0
Orange	1	597.0	599.5
	2	599.5	602.0
	3	602.0	604.5
	4	604.5	607.5
	5	607.5	610.5
	6	610.5	613.5
	7	613.5	616.5
	8	616.5	619.5

Tolerance for each bin limit is ±0.5 nm.

Mechanical Option Matrix

Mechanical Option Code	Definition
00	Bulk Packaging, minimum increment 500 pcs/bag
02	Tape & Reel, straight leads, minimum increment 1300 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.

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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	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 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
0.457 x 0.457 mm (0.018 x 0.018 inch)	0.646 mm (0.025 inch)	0.976 to 1.078 mm (0.038 to 0.042 inch)
0.508 x 0.508 mm (0.020 x 0.020 inch)	0.718 mm (0.028 inch)	1.049 to 1.150 mm (0.041 to 0.045 inch)

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

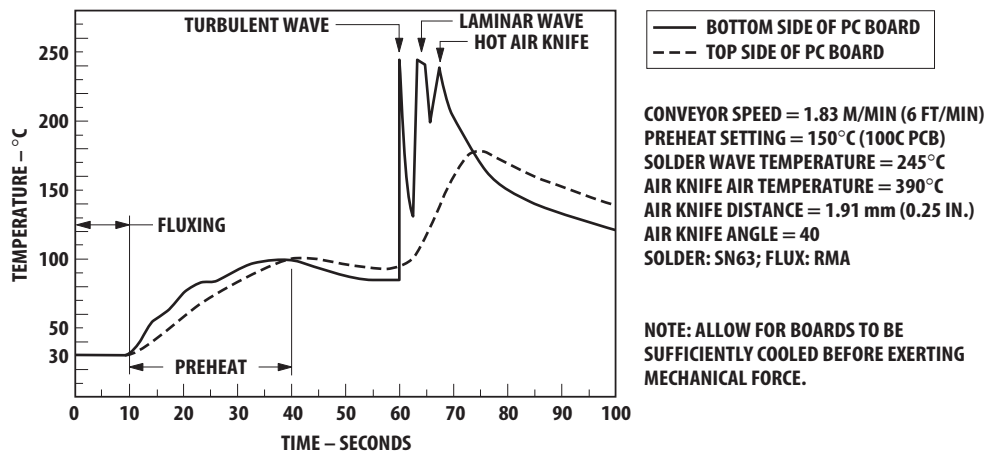


Figure 7. Recommended wave soldering profile.

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