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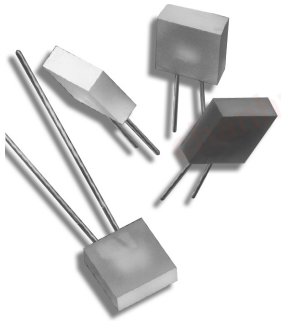
HLMP-R100, HLMP-0301, HLMP-0401, HLMP-0504

2.5 mm x 7.6 mm Rectangular LED Lamps

Data Sheet



Description

The HLMP-R100, -0301, -0401, -0504 are solid state lamps encapsulated in a radial lead rectangular epoxy package. They utilize a tinted, diffused epoxy to provide high on-off contrast and a flat high intensity emitting surface. Borderless package design allows creation of uninterrupted light emitting areas.

The HLMP-R100 uses a double heterojunction (DH) absorbing substrate (AS) aluminum gallium arsenide (AlGaAs) red LED chip in a light red epoxy package. This combination produces outstanding light output over a wide range of drive currents.

The HLMP-0301 has a high efficiency red GaAsP on GaP LED chip in a light red epoxy package.

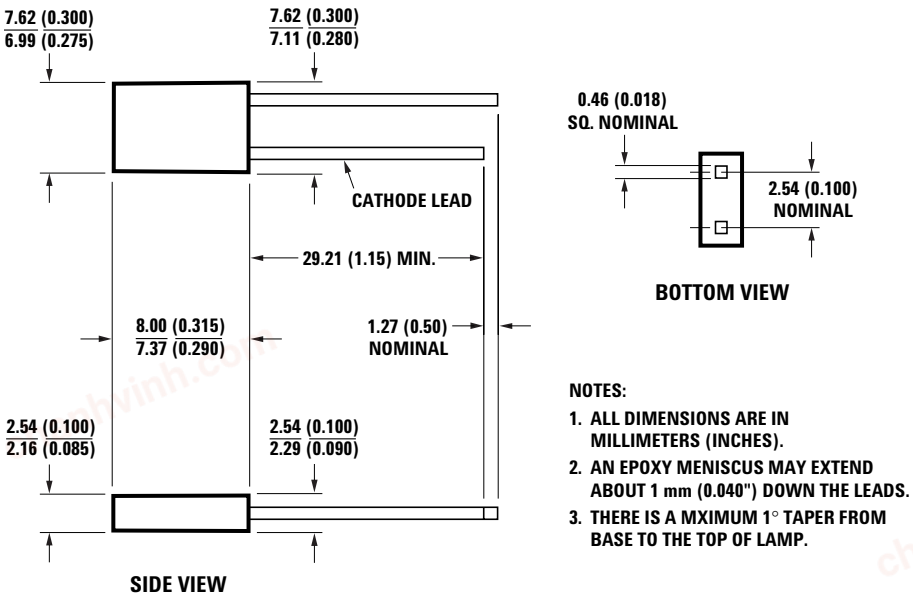
The HLMP-0401 provides a yellow GaAsP on GaP LED chip in a yellow epoxy package.

The HLMP-0504 provides a green GaP LED chip in a green epoxy package.

Features

- Rectangular light emitting surface
- Flat high sterance emitting surface
- Stackable on 2.54 mm (0.100 inch) centers
- Ideal as flush mounted panel indicators
- Ideal for backlighting legends
- Long life: solid state reliability
- Choice of 4 bright colors
  - DH AS AlGaAs Red
  - High Efficiency Red
  - Yellow
  - High Performance Green
- IC compatible/low current requirements

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

Color	Part Number	Luminous Intensity Iv (mcd) at 20 mA	
		Min.	Typ.
DH AlGaAs Red	HLMP-R100	2.1	–
	HLMP-R100-FG0xx	5.4	17.2
Red	HLMP-0301	2.1	–
	HLMP-0301-C00xx	1.3	–
	HLMP-0301-DECxx	2.1	6.8
	HLMP-0301-CD0xx	1.3	4.2
Yellow	HLMP-0401	3.6	–
	HLMP-0401-B00xx	1.4	–
	HLMP-0401-D00xx	3.6	–
	HLMP-0401-CD0xx	2.2	7.2
	HLMP-0401-DEBxx	3.6	11.4
Green	HLMP-0504	2.6	–
	HLMP-0504-B00xx	1.6	–
	HLMP-0504-DECxx	4.2	13.4
	HLMP-0504-CD0xx	2.6	8.4
	HLMP-0504-C00xx	2.6	–

Part Numbering System

HLMP - x x xx - x x x xx

Mechanical Options
00: Bulk
01: Tape & Reel, Crimped Leads
02: Tape & Reel, Straight Leads
DD: Ammo Pack, Straight Leads

Color Bin Options
0: Full Color Bin Distribution
B: Color Bins 2 & 3 only
C: Color Bins 3 & 4 only

Maximum Iv Bin Options
0: Open (No Maximum Limit)
Others: Please refer to the Iv Bin Table

Minimum Iv Bin Options
Please refer to the Iv Bin Table

Color Options
1. As AlGaAs Red
3. High Efficiency Red
4. Yellow
5. Green

Package Options
R,0: Rectangular 2.5 mm x 7.6 mm

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Absolute Maximum Ratings at $T_A = 25°C$

Parameter	HLMP-R100	HLMP-0301	HLMP-0401	HLMP-0504	Units
Peak Forward Current	300	90	60	90	mA
Average Forward Current[1]	20	25	20	25	mA
DC Current[2]	30	30	20	30	mA
Power Dissipation	87	135	85	135	mW
Reverse Voltage (I_R = 100 µA)	5	5	5	5	V
Transient Forward Current[3] (10 µs Pulse)	500	500	500	500	mA
Operating Temperature Range	-20 to +100	-40 to +100	-40 to +100	-20 to +100	°C
Storage Temperature Range	-40 to +100	-40 to +100	-40 to +100	-40 to +100	

Notes:
1. See Figure 5 to establish pulsed operating conditions.
2. For AlGaAs Red, Red, and Green Series derate linearly from 50°C at 0.5 mA/°C. For Yellow Series derate linearly from 50°C at 0.2 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 wirebond. It is not recommended that the device be operated at peak current beyond the peak forward current listed in the Absolute Maximum Ratings.

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

		HLMP-R100			HLMP-0301			HLMP-0401			HLMP-0504				
Sym.	**Description**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Units**	**Test Conditions**
$2\theta_{1/2}$	Included Angle Between Half Luminous Intensity Points		100			100			100			100		Deg.	Note 1. Fig. 6
λ_P	Peak Wavelength		645			635			583			565		nm	Measure-ment at Peak
λ_d	Dominant Wavelength		637			626			585			569		nm	Note 2.
$\Delta\lambda_{1/2}$	Spectral Line Halfwidth		20			40			36			28		nm	
τ_s	Speed of Response		30			90			90			500		ns	
C	Capacitance		30			16			18			18		pF	$V_F = 0$; f = 1 MHz
$R\theta_{J\text{-}PIN}$	Thermal Resistance		260			260			260			260		°C/W	Junction to Cathode Lead
V_F	Forward Voltage		1.8	2.2		1.9	2.6		2.1	2.6		2.2	3.0	V	$I_F = 20$ mA Figure 2.
V_R	Reverse Breakdown Voltage	5.0			5.0			5.0			5.0			V	$I_R = 100\ \mu A$
η_v	Luminous Efficacy		80			145			500			595		lm/W	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.

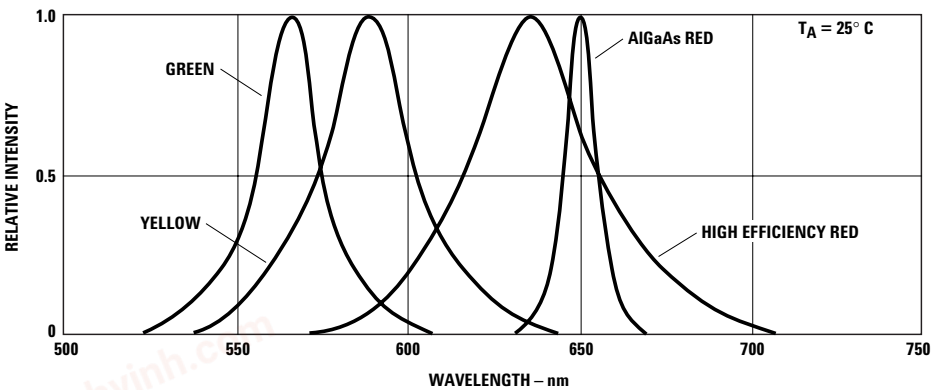

Figure 1. Relative intensity vs. wavelength.

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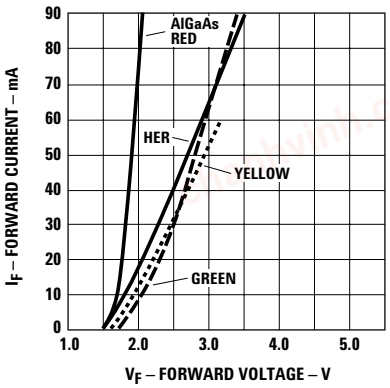


Figure 2. Forward current vs. forward voltage. V_F (300 mA) for AlGaAs Red = 2.6 volts typical.

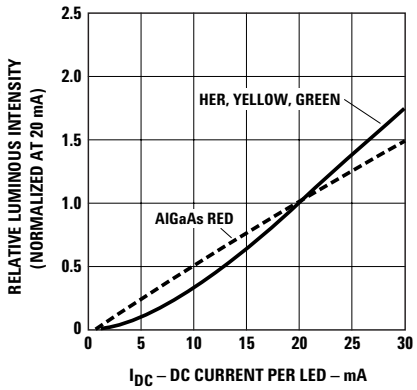


Figure 3. Relative luminous intensity vs. forward current.

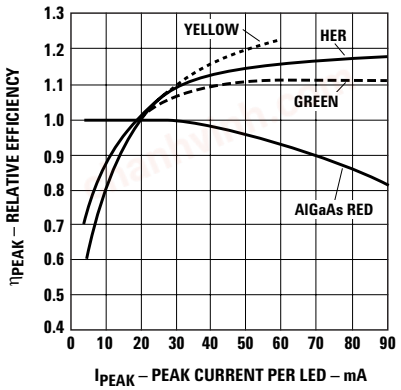
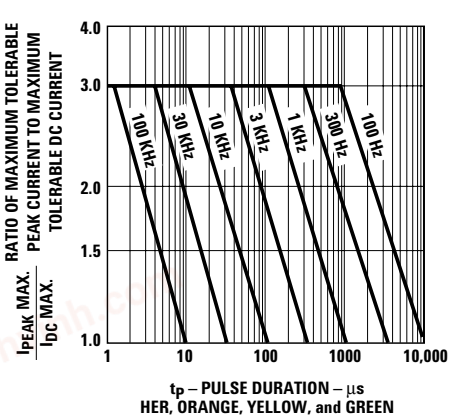


Figure 4. Relative efficiency (luminous intensity per unit current) vs. peak current. η_V (300 mA) for AlGaAs Red = 0.7.



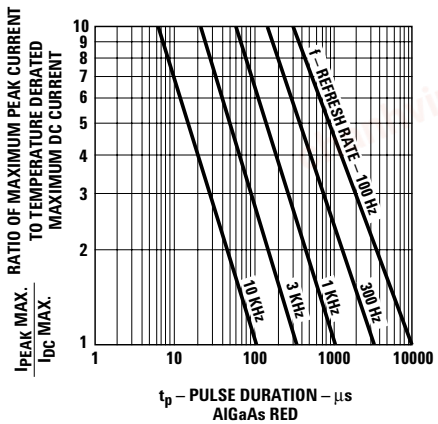


Figure 5. Maximum tolerable peak current vs. peak duration (I_{PEAK} MAX determined from temperature derated I_{DC} MAX).

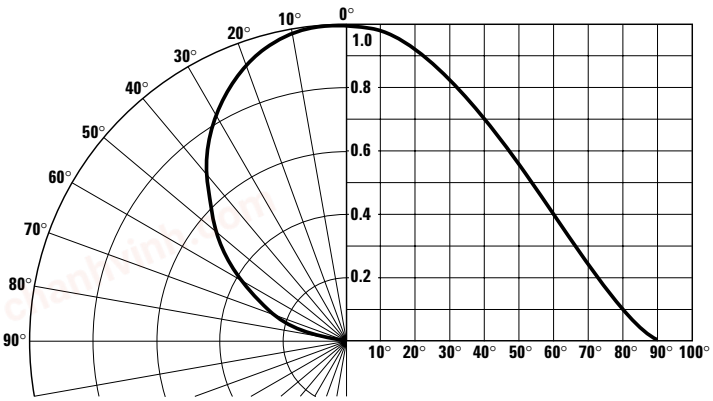


Figure 6. Relative luminous intensity vs. angular displacement.

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Intensity Bin Limits

Color	Bin	Intensity Range (mcd) Min.	Max.
Red	C	0.5	2.4
	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

Maximum tolerance for each bin limit is ±18%.

Intensity Bin Limits, continued

Color	Bin	Intensity Range (mcd) Min.	Max.
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
Green	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

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Color Categories

Color	Category#	Lambda (nm) 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

Tolerance for each bin limit is ±0.5 nm.

Mechanical Option Matrix

Mechanical Option Code	Definition
00	Bulk Packaging, minimum increment 500 pcs/bag
01	Tape & Reel, crimped leads, minimum increment 1300 pcs/bag
02	Tape & Reel, straight leads, minimum increment 1300 pcs/bag
DD	Ammo Pack, straight leads with minimum increment 2K/pack

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.

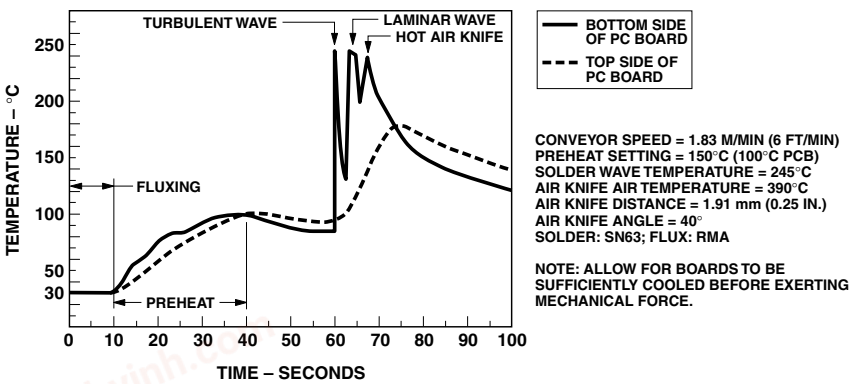

Figure 7. Recommended wave soldering profile.

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