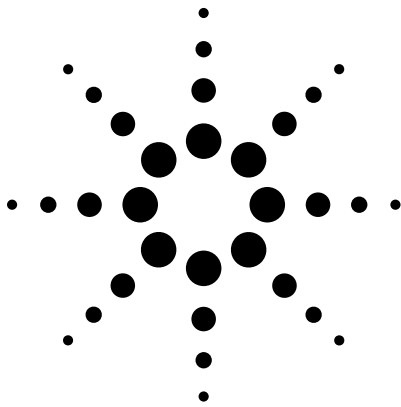


# Agilent 2 mm x 5 mm Rectangular LED Lamps

## Data Sheet



**HLMP-S100, HLMP-S201, HLMP-S301,  
HLMP-S400, HLMP-S401, HLMP-S501, HLMP-S600**

### Features

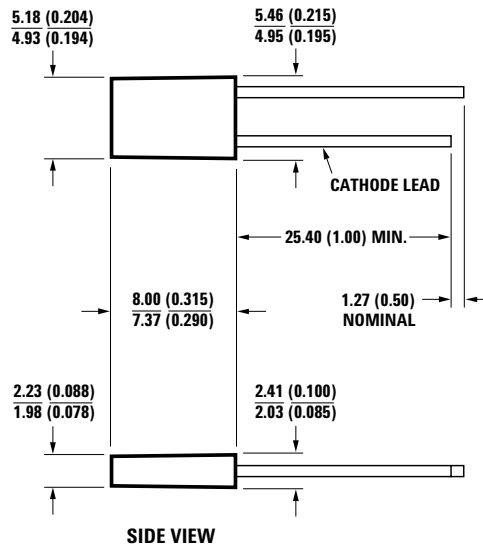
- Rectangular light emitting surface
- Excellent for flush mounting on panels
- Choice of five bright colors
- Long life: solid state reliability
- Excellent uniformity of light output

### Description

The HLMP-S100, -S201, -S301, -S400, -S401, -S501, -S600 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.

### 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 MAXIMUM 1° TAPER FROM BASE TO THE TOP OF LAMP.



## Selection Guide

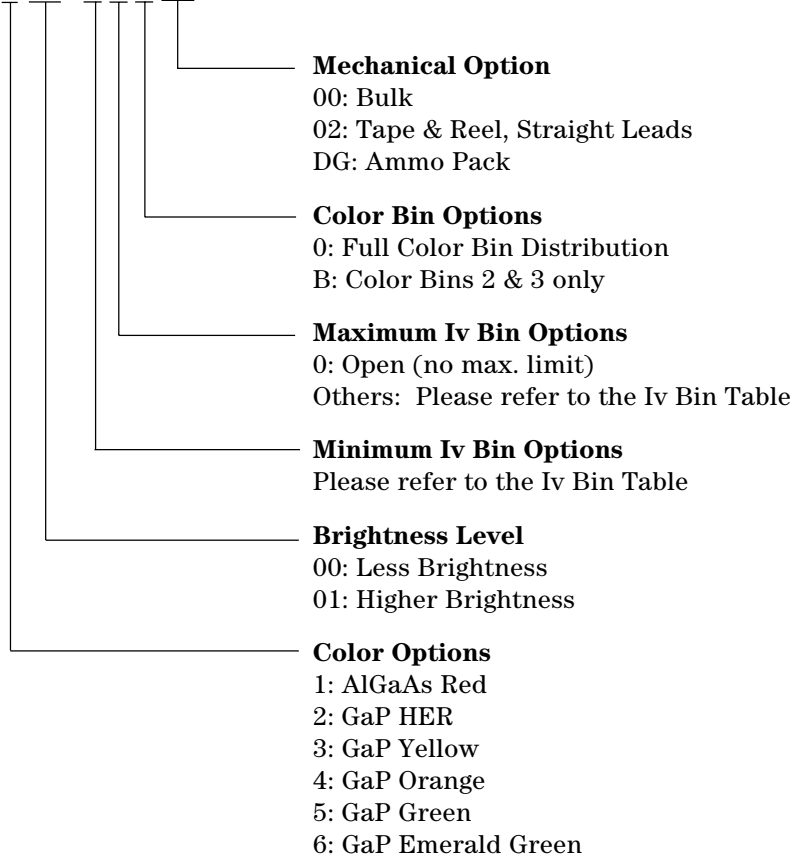
Color	Part Number	Luminous Intensity I <sub>v</sub> (mcd) at 20 mA		
		Min.	Typ.	Max.
AlGaAs Red	HLMP-S100	3.4	7.5	–
HER	HLMP-S201			
	HLMP-S201-D00xx	2.1	3.5	–
	HLMP-S201-E00xx	3.4	7.5	–
	HLMP-S201-EF0xx	3.4	7.5	10.8
Orange	HLMP-S400	2.1	3.5	–
	HLMP-S401	3.4	7.5	–
Yellow	HLMP-S301			
	HLMP-S301-B00xx	1.4	2.1	–
	HLMP-S301-C00xx	2.2	4.0	–
	HLMP-S301-CDBxx	2.2	4.0	7.2
Green	HLMP-S501			
	HLMP-S501-C00xx	2.6	4.0	–
	HLMP-S501-D00xx	4.2	8.0	–
	HLMP-S501-DE0xx	4.2	8.0	13.4
Emerald Green <sup>[1]</sup>	HLMP-S600-A00xx	1.0	3.0	–

### Note:

1. Please refer to Application Note 1061 for information comparing standard green and emerald green light output degradation.

## Part Numbering System

HLMP - S x xx - x x x xx



**Electrical/Optical Characteristics at T<sub>A</sub> = 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 <sub>F</sub> = 20 mA See Note 1
$\lambda_{PEAK}$	Peak Wavelength	AlGaAs Red		645		nm	Measurement at Peak
		High Efficiency Red		635			
		Orange		600			
		Yellow		583			
		Green		565			
		Emerald Green		558			
$\lambda_d$	Dominant Wavelength	AlGaAs Red		637		nm	See Note 2 Time const, e <sup>-t/<math>\tau_s</math></sup>
		High Efficiency Red		626			
		Orange		602			
		Yellow		585			
		Green		569			
		Emerald Green		560			
$\tau_s$	Speed of Response	AlGaAs Red		30		ns	
		High Efficiency Red		90			
		Orange		280			
		Yellow		90			
		Green		500			
		Emerald Green		3100			
C	Capacitance	AlGaAs Red		30		pF	V <sub>F</sub> = 0; f = 1 MHz
		High Efficiency Red		11			
		Orange		4			
		Yellow		15			
		Green		18			
		Emerald Green		35			
R $\theta_{J-PIN}$	Thermal Resistance	All		260		°C/W	Junction to Cathode Lead at Seating Plane
V <sub>F</sub>	Forward Voltage	AlGaAs Red	1.6	1.8	2.2	V	I <sub>F</sub> = 20 mA
		HER/Orange	1.5	1.9	2.6		
		Yellow	1.5	2.1	2.6		
		Green/Emerald Green	1.5	2.2	3.0		
V <sub>R</sub>	Reverse Breakdown Voltage	All	5.0			V	I <sub>R</sub> = 100 mA
$\eta_V$	Luminous Efficacy	AlGaAs Red		80		lumens/ watt	See Note 3
		High Efficiency Red		145			
		Orange		380			
		Yellow		500			
		Green		595			
		Emerald Green		656			

**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,  $\lambda_d$ , is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.
3. Radiant intensity, I<sub>e</sub>, in watts/steradian, may be found from the equation I<sub>e</sub> = I<sub>v</sub>/ $\eta_V$ , where I<sub>v</sub> is the luminous intensity in candelas and  $\eta_V$  is the luminous efficacy in lumens/watt.
4. Please refer to Application Note 1061 for information comparing standard green and emerald green light output degradation.

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

Parameter	AlGaAs Red	High Efficiency Red/ Orange	Yellow	Green/ Emerald Green	Units
Peak Forward Current	300	90	60	90	mA
Average Forward Current <sup>[1]</sup>	20	25	20	25	mA
DC Current <sup>[2]</sup>	30	30	20	30	mA
Transient Forward Current <sup>[3]</sup> (10 $\mu\text{sec}$ Pulse)	500				mA
LED Junction Temperature	110	110	110	110	$^\circ\text{C}$
Operating Temperature Range	-20 to +100	-55 to +100	-55 to +100	-20 to +100	$^\circ\text{C}$
Storage Temperature Range	-55 to +100			-55 to +100	
Wave Soldering Temperature [1.59 mm (0.063 in.) from Body]	250 $^\circ\text{C}$ for 3 seconds				
Solder Dipping Temperature [1.59 mm (0.063 in.) from Body]	260 $^\circ\text{C}$ for 5 seconds				

#### Notes:

1. See Figure 5 to establish pulsed operating conditions.
2. For AlGaAs Red, Red, Orange, and Green series derate linearly from 50 $^\circ\text{C}$  at 0.5 mA/ $^\circ\text{C}$ . For Yellow series derate linearly from 50 $^\circ\text{C}$  at 0.34 mA/ $^\circ\text{C}$ .
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.

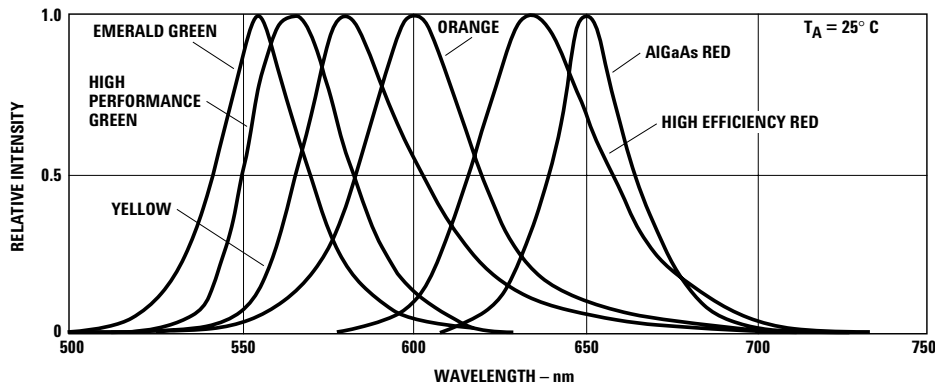


Figure 1. Relative intensity vs. wavelength.

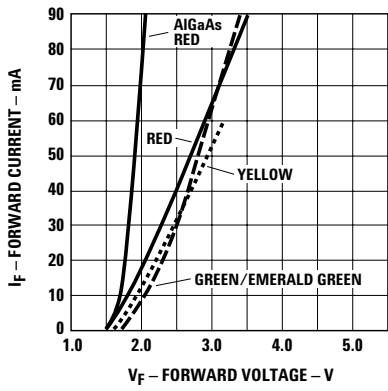


Figure 2. Forward current vs. forward voltage characteristics.  $V_F$  (300 mA) for AlGaAs Red = 2.6 volts typical.

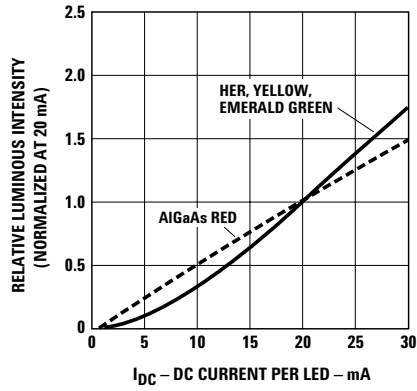


Figure 3. Relative luminous intensity vs. DC forward current.

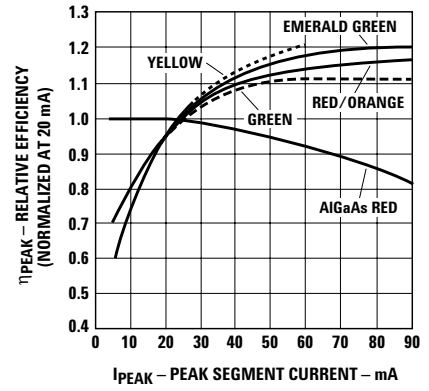


Figure 4. Relative efficiency (luminous intensity per unit current) vs. LED peak current.  $\eta_V$  (300 mA) for AlGaAs Red = 0.7.

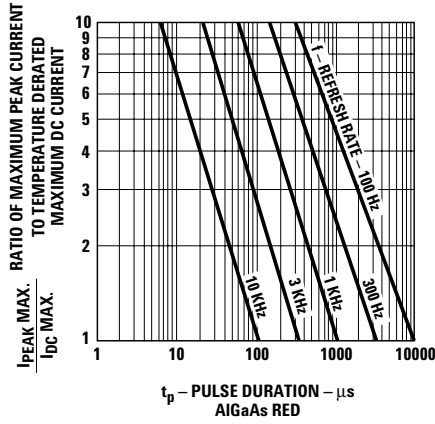
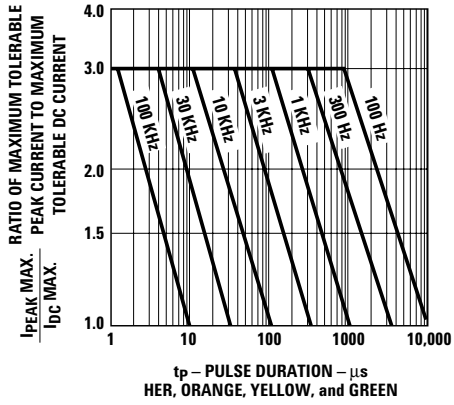


Figure 5. Maximum tolerable peak current vs. peak duration. ( $I_{PEAK MAX}$  determined from temperature derated  $I_{DC MAX}$ ).

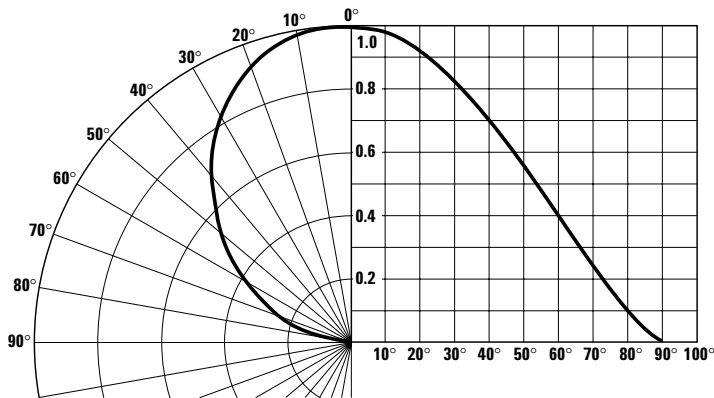


Figure 6. Relative luminous intensity vs. angular displacement.

**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/ Emerald 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  $\pm 18\%$ .

## Color Categories

Color	Category #	Lambda (nm)	
		Min.	Max.
Emerald Green	9	552.5	555.5
	8	555.5	558.5
	7	558.5	561.5
	6	561.5	564.5
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  $\pm 0.5$  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
DG	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 Agilent representative for further clarification/information.

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Obsoletes 5988-4202EN

June 8, 2005

5989-3268EN



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