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

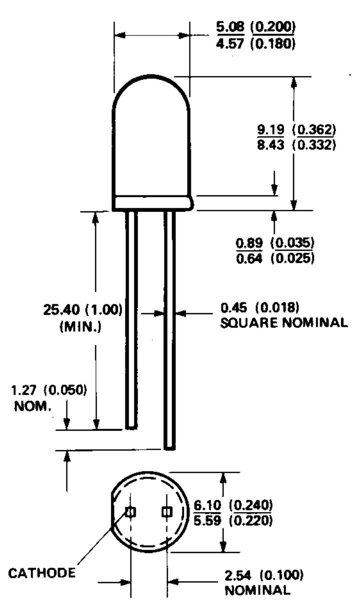
HLMP-D101 / D105, HLMP-K101 / K105

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 color is deep red at the dominant wavelength of 637 nanometres. These lamps may be DC or pulse driven to achieve desired light output.

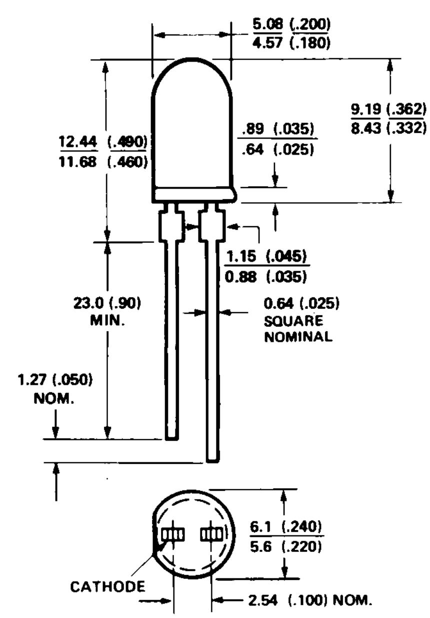
Features
- Exceptional brightness
- Wide viewing angle
- Outstanding material efficiency
- Low forward voltage
- CMOS / MOS compatible
- TTL compatible
- Deep red color

Applications
- Bright ambient lighting conditions
- Moving message panels
- Portable equipment
- General use

Package Dimensions



A



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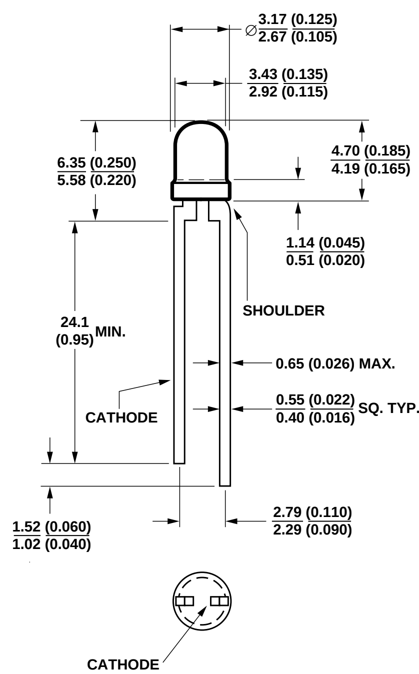

C

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES (INCHES).
2. AN EPOXY MINISCUS MAY EXTEND ABOUT 1 mm (0.040") DOWN THE LEADS.

Selection Guide

Package Description	Device HLMP-	Luminous Intensity Iv (mcd) at 20 mA Min.	Typ.	Max.	$2\theta_{1/2}$[1] Degree	Package Outline
T-1 3/4 Red Tinted Diffused	D101	35.2	70.0	–	65	A
	D101-J00xx	35.2	70.0	–	65	A
	D101-JK0xx	35.2	70.0	112.8	65	A
T-1 3/4 Red Untinted Non-diffused	D105	138.0	240.0	–	24	B
	D105-M00xx	138.0	240.0	–	24	B
	D105-NO0xx	200.0	290.0	580.0	24	B
T-1 Red Tinted Diffused	K101	22.0	45.0	–	60	C
	K101-100xx	22.0	45.0	–	60	C
	K101-IJ0xx	22.0	45.0	70.4	60	C
T-1 Red Untinted Non-diffused	K105	35.2	65.0	–	45	C
	K105-J00xx	35.2	65.0	–	45	C
	K105-KL0xx	56.4	110.0	180.4	45	C

Note:
1. $\theta_{1/2}$ is the off axis angle from lamp centerline where the luminous intensity is 1/2 the on-axis value.

Part Numbering System

HLMP - x x xx - x x x xx

Mechanical Option
00: Bulk
01: Tape & Reel, Crimped Leads
02: Tape & Reel, Straight Leads
A1: Right Angle Housing, Uneven Leads, T1
A2: Right Angle Housing, Even Leads, T1
B1: Right Angle Housing, Uneven Leads, T-1 3/4
B2: Right Angle Housing, Even Leads, T-1 3/4
DD, UQ: Ammo Pack

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

Lens Type
01: Tinted, Diffused
05: Untinted, Nondiffused

Color Options
1: AlGaAs Red

Package Options
D: T-1 3/4
K: T-1

Absolute Maximum Ratings at $T_A = 25°C$

Parameter	Value
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
LED Junction Temperature	110°C
Operating Temperature Range	-20 to +100°C
Storage Temperature Range	-55 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 linearly 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.	Unit	Test Condition
V_F	Forward Voltage		1.8	2.2	V	I_F = 20 mA
V_R	Reverse Breakdown Voltage	5.0	15.0		V	I_R = 100 μA
λ_p	Peak Wavelength		645		nm	Measurement at Peak
λ_d	Dominant Wavelength		637		nm	Note 1
$\Delta\lambda 1/2$	Spectral Line Halfwidth		20		nm	
τ_S	Speed of Response		30		ns	Exponential Time Constant, e^{-t}/T_S
C	Capacitance		30		pF	V_F = 0, f = 1 MHz
$R\theta_{J\text{-}PIN}$	Thermal Resistance		260[3] 210[4] 290[5]		°C/W	Junction to Cathode Lead
η_V	Luminous Efficacy		80		lm/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 I_V is the luminous intensity in candelas and η_V is luminous efficacy in lumens/watt.
3. HLMP-D101.
4. HLMP-D105.
5. HLMP-K101/-K105.

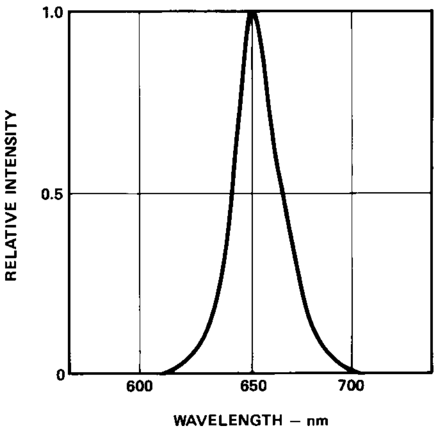

Figure 1. Relative intensity vs. wavelength.

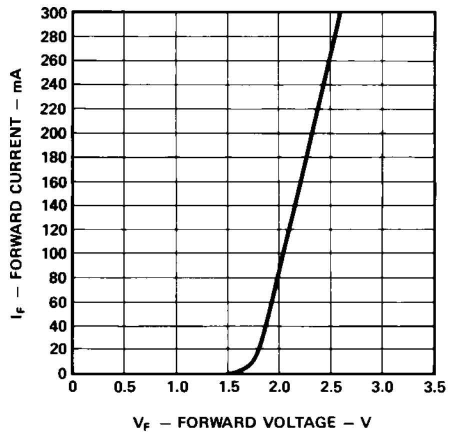

Figure 2. Forward current vs. forward voltage.

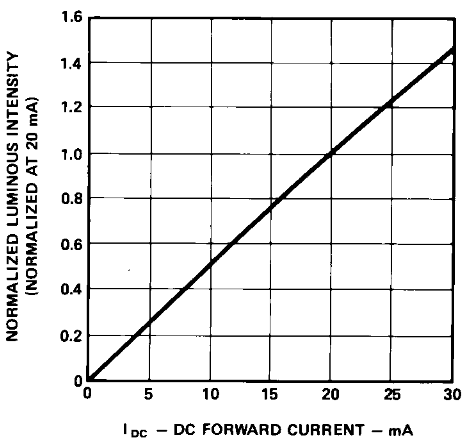

Figure 3. Relative luminous intensity vs. dc forward current.

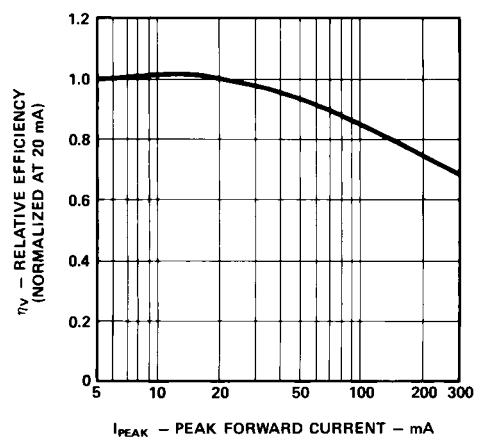

Figure 4. Relative efficiency vs. peak forward current.

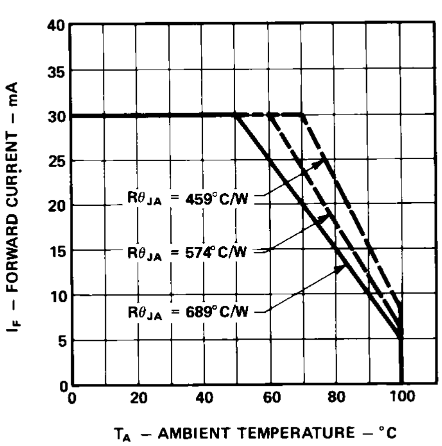

Figure 5. Maximum forward dc current vs. ambient temperature. Derating based on T_J MAX. = 110°C.

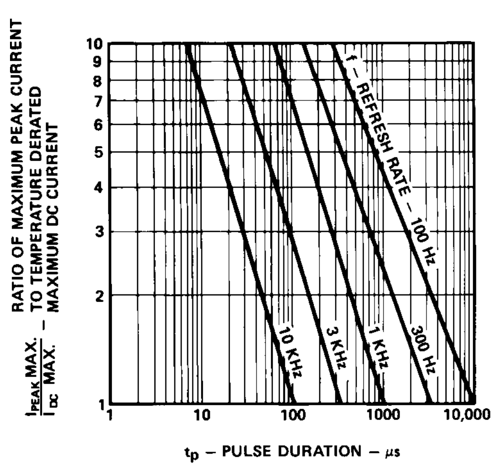

Figure 6. Maximum tolerable peak current vs. peak duration (I_{PEAK} MAX. determined from temperature derated I_{DC} MAX.).

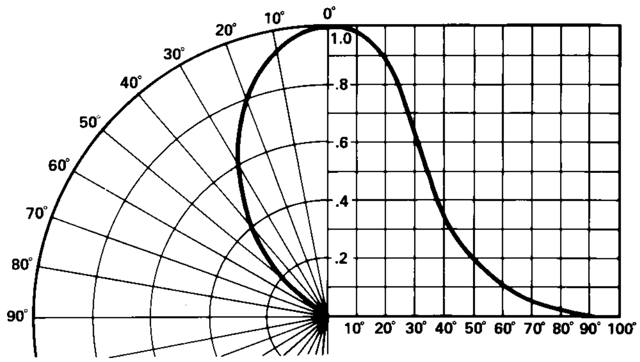

Figure 7. Relative luminous intensity vs. angular displacement.
HLMP-D101.

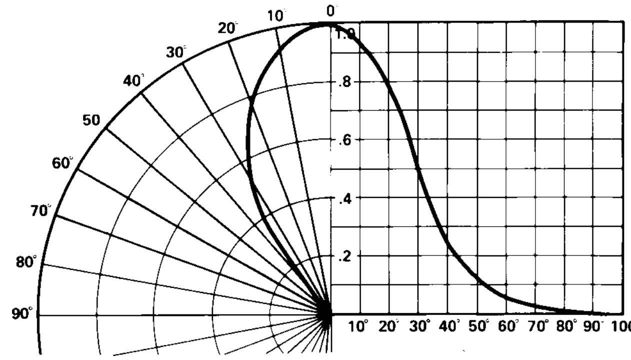

Figure 8. Relative luminous intensity vs. angular displacement.
HLMP-K101.

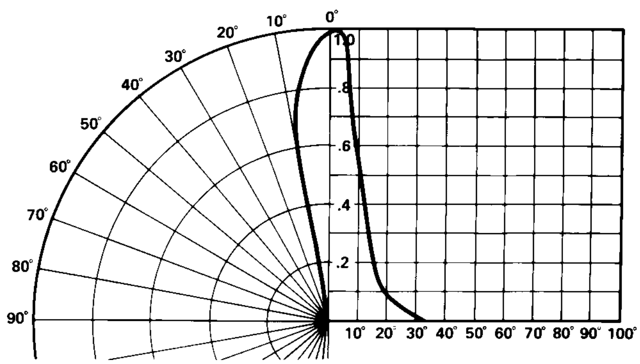

Figure 9. Relative luminous intensity vs. angular displacement.
HLMP-D105.

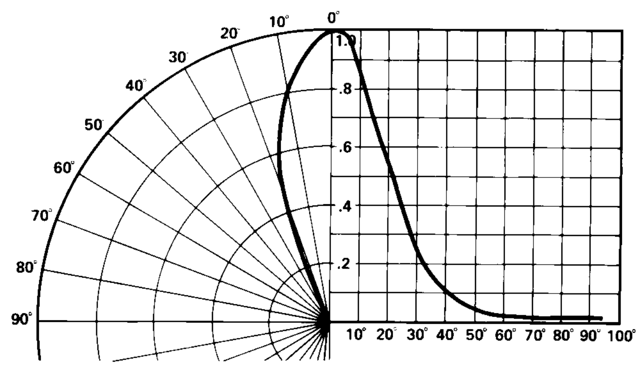

Figure 10. Relative luminous intensity vs. angular displacement.
HLMP-K105.

Intensity Bin Limits

Color	Bin	Intensity Range (mcd) Min.	Max.
Red	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%.

Mechanical Option Matrix

Mechanical Option Code	Definition
00	Bulk Packaging, minimum increment 500 pcs/bag
01	Tape & Reel, crimped leads, minimum increment 1300 pcs (T-1 3/4)/1800 pcs (T-1)
02	Tape & Reel, straight leads, minimum increment 1300 pcs (T-1 3/4)/1800 pcs (T-1)
A1	Right Angle Housing, uneven leads, minimum increment 500 pcs/bag
A2	Right Angle Housing, even leads, minimum increment 500 pcs/bag
B1	Right Angle Housing, uneven leads, minimum increment 500 pcs/bag
B2	Right Angle Housing, even leads, minimum increment 500 pcs/bag
DD	Ammo Pack, straight leads in 2K increment
UQ	Ammo Pack, horizontal leads in 2K increment

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.

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.

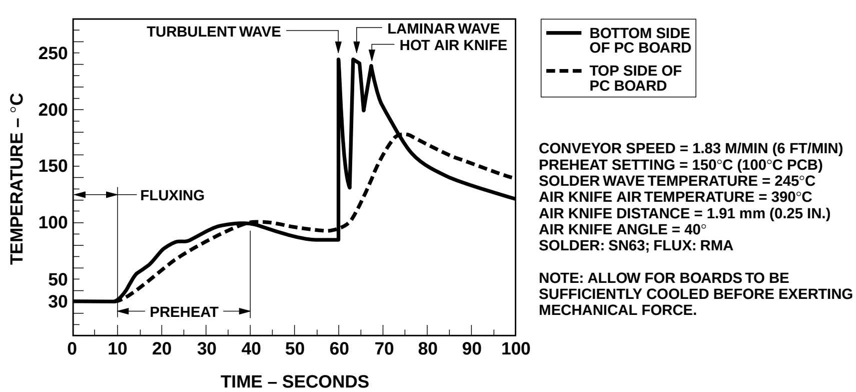

Figure 11. Recommended wave soldering profile.

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Data subject to change.

Obsoletes 5988-2230EN
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Agilent Technologies