HEWLETT® PACKARD

T-1 3/4 (5 mm), T-1 (3 mm), High Performance AlInGaP LED Lamps

Technical Data

SunPower Series
HLMA-CX00 Series
HLMA-DX00 Series
HLMA-KX00 Series
HLMT-CX00 Series
HLMT-DX00 Series

Features

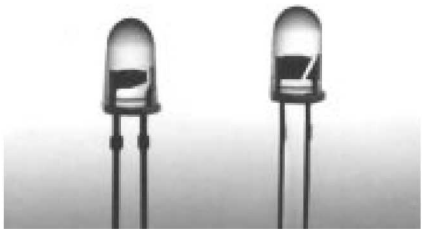
- **Outstanding LED Material Efficiency**
- **High Light Output over a Wide Range of Currents**
- **Low Electrical Power Dissipation**
- **CMOS/MOS Compatible**
- **Colors: 590/592 nm Amber, 615/617 nm and 622 nm Reddish-Orange**
- **Variety of Packages Available**

Applications

- **Outdoor Message Boards**
- **Safety Lighting Equipment**
- **Signaling Applications**
- **Emitter for Emitter/ Detector Applications**
- **Changeable Message Signs**
- **Portable Equipment**
- **Medical Equipment**
- **Automotive Lighting**
- **Alternative to Incandescent Lamps**

Description

These untinted, non-diffused, solid state lamps utilize the latest absorbing/transparent substrate aluminum indium gallium phosphide (AS/TS AlInGaP) LED technology. These materials have a very high luminous efficiency, capable of producing high light output over a wide range of drive currents. In addition, these LED lamps are at wavelengths ranging from amber to reddish orange and at viewing angles ranging from 7 to 45 degrees.



Optical Characteristics at T_A = 25°C

TS-AlInGaP T-1 3/4

Part Number HLMT-	Luminous Intensity I_V (mcd) @ 20 mA[1] Min.	Typ.	Peak Wavelength λ_{peak} (nm) Typ.	Color, Dominant Wavelength λ_d[2] (nm) Typ.	Viewing Angle $2\theta_{1/2}$ Degrees[3] Typ.	Luminous Efficacy η_v (lm/w)	Package Drawing
CL00[1]	2600	8300	594	592	8	480	A
CH00[1]	2900	9000	623	617	8	263	
DL00[4]	450	1500	594	592	24	480	B
DH00[4]	500	1800	623	617	24	263	

Notes:
1. The luminous intensity, I_V, is measured at the peak of the spatial radiation pattern which may not be aligned with the mechanical axis of the lamp package.
2. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
4. The luminous intensity, I_v, is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.

AS-AlInGaP T-1 3/4

Part Number HLMA-	Luminous Intensity I_V (mcd) @ 20 mA[1] Min.	Typ.	Peak Wavelength λ_{peak} (nm) Typ.	Color, Dominant Wavelength λ_d[2] (nm) Typ.	Viewing Angle $2\theta_{1/2}$ Degrees[3] Typ.	Luminous Efficacy η_v (lm/w)	Package Drawing
CL00[1]	1000	3500	592	590	7	480	A
CH00[1]	1000	3500	621	615	7	263	
DL00[4]	300	800	592	590	24	480	B
DH00[4]	290	600	621	615	24	263	
DG00[4]	290	500	630	622	24	197	

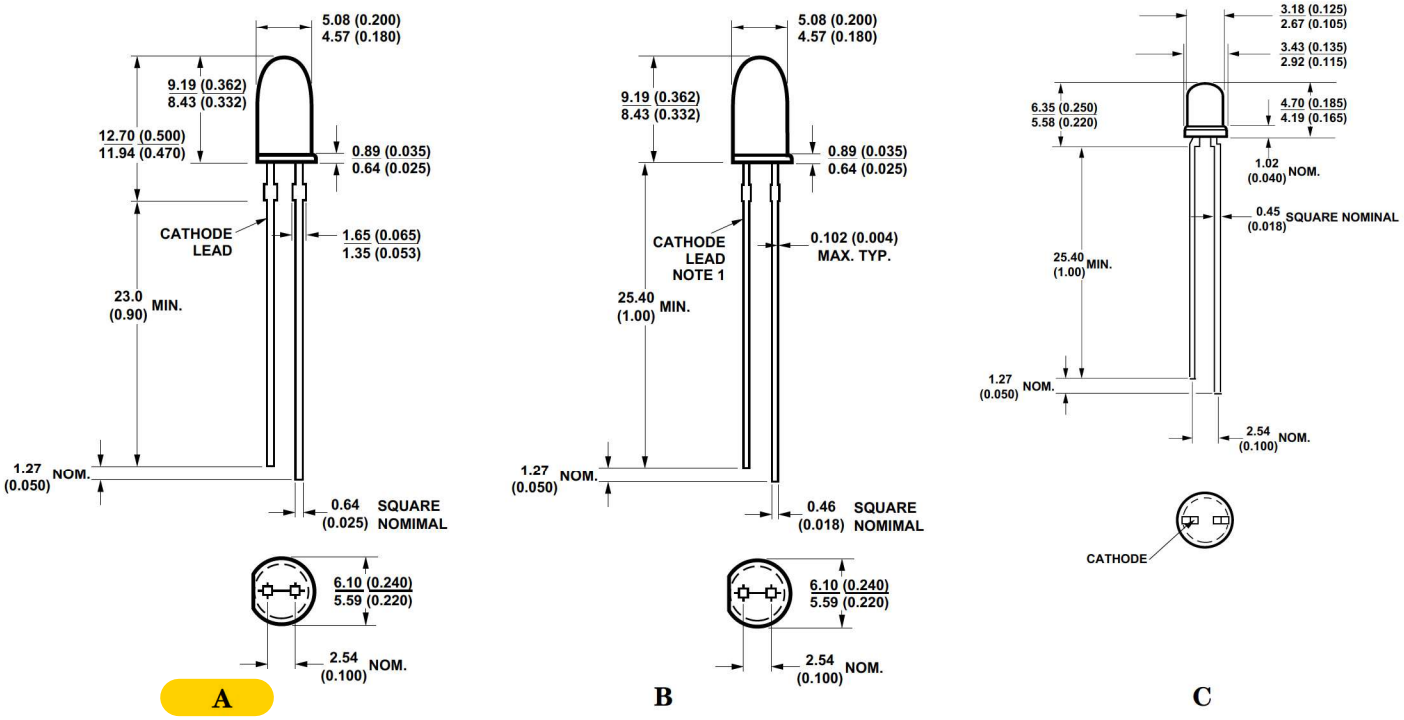
Notes:
1. The luminous intensity, I_V, is measured at the peak of the spatial radiation pattern which may not be aligned with the mechanical axis of the lamp package.
2. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
4. The luminous intensity, I_v, is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.

AS-AlInGaP T-1

Part Number HLMA-	Luminous Intensity I_V (mcd) @ 20 mA[1] Min.	Typ.	Peak Wavelength λ_{peak} (nm) Typ.	Color, Dominant Wavelength λ_d[2] (nm) Typ.	Viewing Angle $2\theta_{1/2}$ Degrees[3] Typ.	Luminous Efficacy η_v (lm/w)	Package Drawing
KL00	35	200	592	590	45	480	C
KH00	35	200	621	615	45	263	

Notes:
1. The luminous intensity, I_v, is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. $\theta_{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.

Package Dimensions



NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).
2. THE LEADS ARE MILD STEEL, SOLDER DIPPED.
3. AN EPOXY MENISCUS MAY EXTEND ABOUT 1 MM (0.040") DOWN THE LEADS, UNLESS OTHERWISE NOTED.

Electrical Characteristics at T_A = 25°C

TS-AlInGaP T-1¾

Part Number HLMT-	Forward Voltage V_F (Volts) @ I_F = 20 mA Typ.	Forward Voltage V_F (Volts) @ I_F = 20 mA Max.	Reverse Breakdown V_R (Volts) @ I_R = 100 µA Min.	Reverse Breakdown V_R (Volts) @ I_R = 100 µA Typ.	Capacitance C (pF) V_F = 0, f = 1 MHz Typ.	Thermal Resistance $R\theta_{J\text{-}PIN}$ (°C/W)	Speed of Response τ_s (ns) Time Constant $e^{-t/\tau s}$ Typ.
CL00	2.0	2.4	5	25	70	210	13
CH00	2.0	2.4	5	25	70	210	13
DL00	2.0	2.4	5	25	70	260	13
DH00	2.0	2.4	5	25	70	260	13

AS-AlInGaP T-1¾

Part Number HLMA-	Forward Voltage V_F (Volts) @ I_F = 20 mA Typ.	Forward Voltage V_F (Volts) @ I_F = 20 mA Max.	Reverse Breakdown V_R (Volts) @ I_R = 100 µA Min.	Reverse Breakdown V_R (Volts) @ I_R = 100 µA Typ.	Capacitance C (pF) V_F = 0, f = 1 MHz Typ.	Thermal Resistance $R\theta_{J\text{-}PIN}$ (°C/W)	Speed of Response τ_s (ns) Time Constant $e^{-t/\tau s}$ Typ.
CL00	1.9	2.4	5	25	40	210	13
CH00	1.9	2.4	5	25	40	210	13
DL00	1.9	2.4	5	25	40	260	13
DH00	1.9	2.4	5	25	40	260	13
DG00	1.9	2.4	5	25	40	260	13

AS-AlInGaP T-1

Part Number HLMA-	Forward Voltage V_F (Volts) @ I_F = 20 mA Typ.	Forward Voltage V_F (Volts) @ I_F = 20 mA Max.	Reverse Breakdown V_R (Volts) @ I_R = 100 µA Min.	Reverse Breakdown V_R (Volts) @ I_R = 100 µA Typ.	Capacitance C (pF) V_F = 0, f = 1 MHz Typ.	Thermal Resistance $R\theta_{J\text{-}PIN}$ (°C/W)	Speed of Response τ_s (ns) Time Constant $e^{-t/\tau s}$ Typ.
KL00	1.9	2.4	5	25	40	290	13
KH00	1.9	2.4	5	25	40	290	13

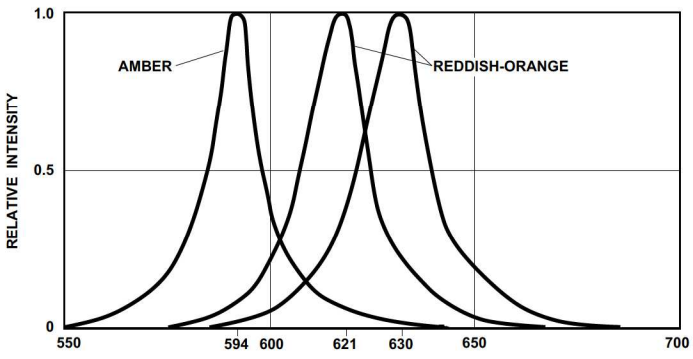


Figure 1. Relative Intensity vs. Wavelength.

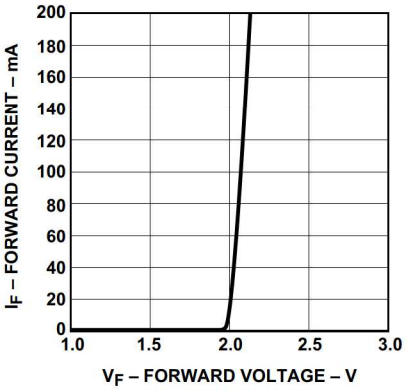


Figure 2a. Forward Current vs. Forward Voltage, AS-AlInGaP.

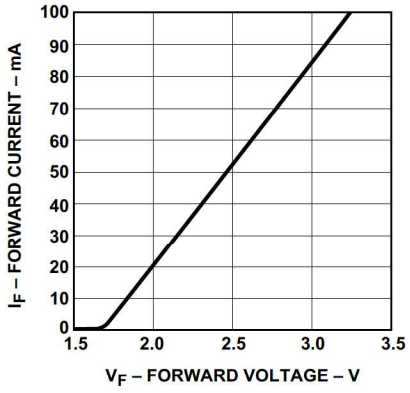


Figure 2b. Forward Current vs. Forward Voltage, TS-AlInGaP.

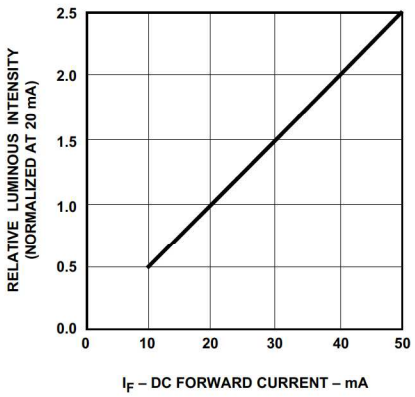


Figure 3. Relative Luminous Intensity vs. Forward Current. Derating Based on T_JMAX.

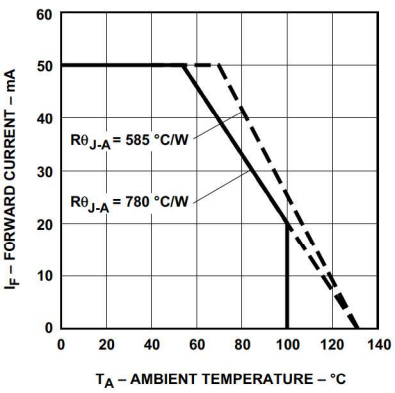


Figure 4a. Maximum DC Current vs. Ambient Temperature for AS T-1 3/4 Lamps. Derating Based on T_JMAX = 130°C.

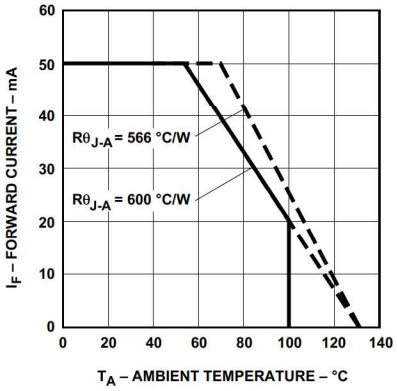


Figure 4b. Maximum DC Current vs. Ambient Temperature for TS T-1 3/4 Lamps. Derating Based on T_JMAX = 130°C.

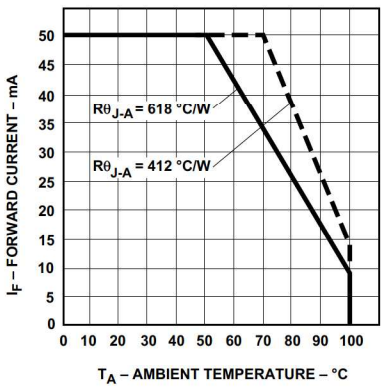


Figure 4c. Maximum Forward Current vs. Ambient Temperature for T-1 Lamps. Derating Based on T_JMax = 110 °C.

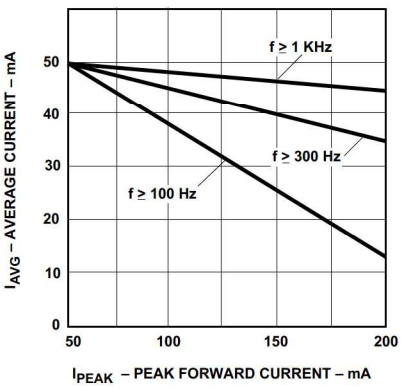


Figure 5. Maximum Average Current vs. Peak Forward Current.

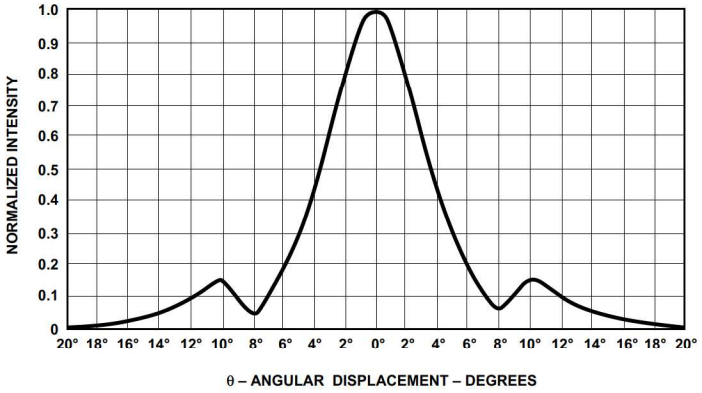


Figure 6. Normalized Luminous Intensity vs. Angular Displacement, HLMT-CH00/CL00.

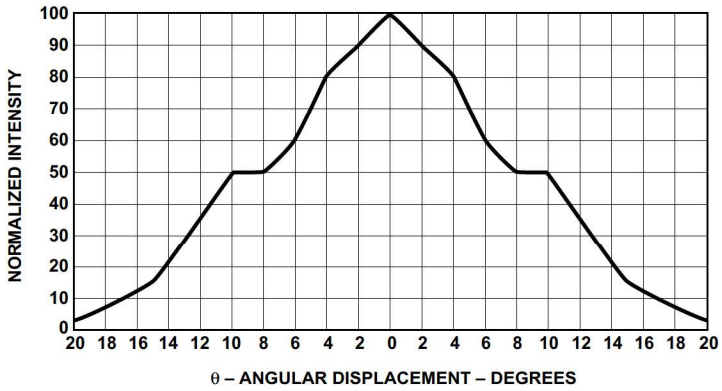


Figure 7. Normalized Luminous Intensity vs. Angular Displacement, HLMA-DG00/-DH00/-DL00.

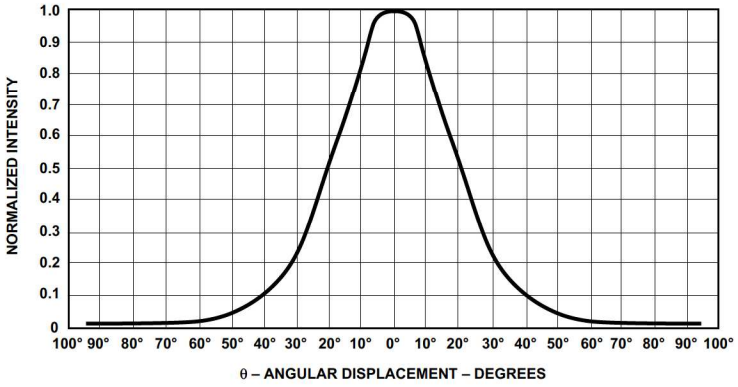


Figure 8. Normalized Luminous Intensity vs. Angular Displacement, HLMA-KH00/-KL00.