

T-1^{3/4} Super Ultra-Bright LED Lamps

Technical Data

HLMP-8115 **HLMP-8109**
HLMP-8205 **HLMP-8209**
HLMP-8305 **HLMP-8309**
HLMP-8405 **HLMP-8409**
HLMP-8505 **HLMP-8509**
HLMP-8605

Features

- **Very High Intensity**
- **Narrow and Medium Viewing Angles**
- **Untinted, Nondiffused Lens**
- **Choice of Five Colors**
- **Sturdy Leads with Seating Plane Tabs**

Description

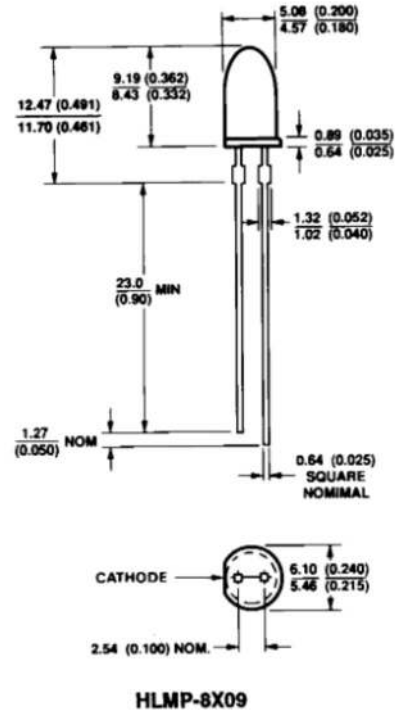
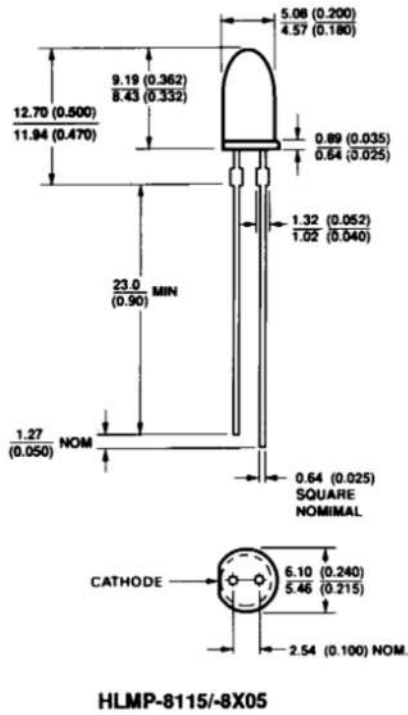
These untinted, nondiffused solid state lamps are designed with special internal optics to give a very high luminous intensity within a well defined viewing angle. The LED materials used within these devices is specifically grown to assure the high light output performance these lamps provide.



Device Selection Guide

| LED Color | Part Number | Typical Luminous Intensity (mcd @ 20 mA dc) | 2θ ^{1/2} Viewing Angle |
|------------------------|-------------|--|------------------------------------|
| DH AS AlGaAs | HLMP-8115 | 1000 | 10° |
| | HLMP-8109 | 500 | 20° |
| High Efficiency Red | HLMP-8205 | 350 | 10° |
| | HLMP-8209 | 260 | 20° |
| Yellow | HLMP-8305 | 350 | 10° |
| | HLMP-8309 | 260 | 20° |
| Orange | HLMP-8405 | 350 | 10° |
| | HLMP-8409 | 260 | 20° |
| High Performance Green | HLMP-8505 | 400 | 10° |
| | HLMP-8509 | 300 | 20° |
| Emerald Green | HLMP-8605 | 75 | 10° |

Package Dimensions



- NOTES:**
1. ALL DIMENSIONS ARE IN MILLIMETRES (INCHES).
 2. THE LEADS ARE MILD STEEL, SOLDER DIPPED.
 3. AN EPOXY MENISCUS MAY EXTEND ABOUT 1 mm (0.040") DOWN THE LEADS.

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

| Parameter | DH AS AlGaAs Red | High Efficiency Red and Orange | Yellow | High Performance Green/Emerald Green | Units |
|--|------------------------------------|--------------------------------------|--------|--|------------------|
| DC Forward Current ^[1] | 30 | 30 | 20 | 30 | mA |
| Peak Forward Current ^[2] | 300 | 90 | 60 | 90 | mA |
| Average Forward Current ^[2] | 20 | 25 | 20 | 25 | mA |
| Transient Forward Current ^[3] (10 μs Pulse) | 500 | 500 | 500 | 500 | mA |
| Reverse Voltage ($I_R = 100 \mu\text{A}$) | 5 | 5 | 5 | 5 | V |
| LED Junction Temperature | 110 | 110 | 110 | 110 | $^\circ\text{C}$ |
| Operating Temperature Range | -20 to +100 | -55 to +100 | | -20 to +100 | $^\circ\text{C}$ |
| Storage Temperature Range | -55 to +100 | | | | $^\circ\text{C}$ |
| Lead Soldering Temperature [1.6 mm (0.063 in.) from body] | 260 $^\circ\text{C}$ for 5 seconds | | | | |

Notes:

1. See Figure 5 for maximum current derating vs. ambient temperature.
2. See Figure 6 for maximum peak current vs. pulse duration and allowable duty factor.
3. The transient peak current is the maximum non-recurring peak current the device can withstand without damaging the LED die and wire bond. Do not operate these lamps at peak currents above the Absolute Maximum Peak Forward Current.

Electrical/Optical Characteristics $T_A = 25^\circ\text{C}$

DH AS AlGaAs HLMP-8115/8109

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---------------------------|------------|-------------|------|--------------------|--------------------------------|
| Luminous Intensity HLMP-8115 HLMP-8109 | I_v | 500 200 | 1000 500 | | mcd | $I_F = 20 \text{ mA}$ |
| Forward Voltage | V_F | | 1.8 | 2.2 | V | $I_F = 20 \text{ mA}$ |
| Reverse Breakdown Voltage | V_R | 5.0 | 15.0 | | V | $I_R = 100 \mu\text{A}$ |
| Included Angle Between Half Intensity Points HLMP-8115 HLMP-8109 | $2\theta_{1/2}$ | | 10 20 | | Deg. | |
| Total Luminous Flux | ϕ_d | | 120 | | mlm | $I_F = 20 \text{ mA}$ |
| Peak Wavelength | λ_{PEAK} | | 645 | | nm | Measured at Peak |
| Dominant Wavelength ^[1] | λ_d | | 637 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 20 | | nm | |
| Speed of Response | τ_s | | 30 | | ns | Time Constant, e^{-t/τ_s} |
| Capacitance | C | | 30 | | pF | $V_F = 0, f = 1 \text{ MHz}$ |
| Thermal Resistance | $R\theta_{\text{J-LEAD}}$ | | 210 | | $^\circ\text{C/W}$ | LED Junction-to-Cathode Lead |
| Luminous Efficacy ^[2] | η_v | | 80 | | lm/W | |

High Efficiency Red HLMP-8205/8209

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---------------------------|-----------|------------|------|--------------------|------------------------------|
| Luminous Intensity HLMP-8205 HLMP-8209 | I_v | 200 90 | 350 260 | | mcd | $I_F = 20 \text{ mA}$ |
| Forward Voltage | V_F | | 1.9 | 2.6 | V | $I_F = 20 \text{ mA}$ |
| Reverse Breakdown Voltage | V_R | 5.0 | 30.0 | | V | $I_R = 100 \mu\text{A}$ |
| Included Angle Between Half Intensity Points HLMP-8205 HLMP-8209 | $2\theta_{1/2}$ | | 10 20 | | Deg. | |
| Total Luminous Flux | ϕ_v | | 45 | | mlm | $I_F = 20 \text{ mA}$ |
| Peak Wavelength | λ_{PEAK} | | 635 | | nm | Measured at Peak |
| Dominant Wavelength ^[1] | λ_d | | 626 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 40 | | nm | |
| Speed of Response | τ_s | | 90 | | ns | |
| Capacitance | C | | 11 | | pF | $V_F = 0, f = 1 \text{ MHz}$ |
| Thermal Resistance | $R\theta_{\text{J-LEAD}}$ | | 210 | | $^\circ\text{C/W}$ | LED Junction-to-Cathode Lead |
| Luminous Efficacy ^[2] | η_v | | 145 | | lm/W | |

Yellow HLMP-8305/8309

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---------------------------|-----------|------------|------|-------|------------------------------|
| Luminous Intensity HLMP-8305 HLMP-8309 | I_v | 212 96 | 350 260 | | mcd | $I_F = 20 \text{ mA}$ |
| Forward Voltage | V_F | | 2.1 | 2.6 | V | $I_F = 20 \text{ mA}$ |
| Reverse Breakdown Voltage | V_R | 5.0 | 30.0 | | V | $I_R = 100 \mu\text{A}$ |
| Included Angle Between Half Intensity Points HLMP-8305 HLMP-8309 | $2\theta_{1/2}$ | | 10 20 | | Deg. | |
| Total Luminous Flux | ϕ_v | | 45 | | mlm | $I_F = 20 \text{ mA}$ |
| Peak Wavelength | λ_{PEAK} | | 583 | | nm | Measured at Peak |
| Dominant Wavelength ^[1] | λ_d | | 585 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 36 | | nm | |
| Speed of Response | τ_s | | 90 | | ns | |
| Capacitance | C | | 15 | | pF | $V_F = 0, f = 1 \text{ MHz}$ |
| Thermal Resistance | $R\theta_{\text{J-LEAD}}$ | | 210 | | °C/W | LED Junction-to-Cathode Lead |
| Luminous Efficacy ^[2] | η_v | | 500 | | lm/W | |

Orange HLMP-8405/8409

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---------------------------|-----------|------------|------|-------|------------------------------|
| Luminous Intensity HLMP-8405 HLMP-8409 | I_v | 200 90 | 350 260 | | mcd | $I_F = 20 \text{ mA}$ |
| Forward Voltage | V_F | | 1.9 | 2.6 | V | $I_F = 20 \text{ mA}$ |
| Reverse Breakdown Voltage | V_R | 5.0 | 30.0 | | V | $I_R = 100 \mu\text{A}$ |
| Included Angle Between Half Intensity Points HLMP-8405 HLMP-8409 | $2\theta_{1/2}$ | | 10 20 | | Deg. | |
| Total Luminous Flux | ϕ_v | | 45 | | mlm | $I_F = 20 \text{ mA}$ |
| Peak Wavelength | λ_{PEAK} | | 600 | | nm | Measured at Peak |
| Dominant Wavelength ^[1] | λ_d | | 602 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 40 | | nm | |
| Speed of Response | τ_s | | 280 | | ns | |
| Capacitance | C | | 4 | | pF | $V_F = 0, f = 1 \text{ MHz}$ |
| Thermal Resistance | $R\theta_{\text{J-LEAD}}$ | | 210 | | °C/W | LED Junction-to-Cathode Lead |
| Luminous Efficacy ^[2] | η_v | | 380 | | lm/W | |

High Performance Green HLMP-8505/8509

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|---|---------------------------|------------|------------|------|----------------------|------------------------------|
| Luminous Intensity HLMP-8505 HLMP-8509 | I_v | 170 111 | 400 300 | | mcd | $I_F = 20 \text{ mA}$ |
| Forward Voltage | V_F | | 2.2 | 3.0 | V | $I_F = 20 \text{ mA}$ |
| Reverse Breakdown Voltage | V_R | 5.0 | 30 | | V | $I_R = 100 \mu\text{A}$ |
| Included Angle Between Half Intensity Points HLMP-8505 HLMP-8509 | $2\theta_{1/2}$ | | 10 20 | | Deg. | |
| Total Luminous Flux | ϕ_v | | 115 | | mlm | $I_F = 20 \text{ mA}$ |
| Peak Wavelength | λ_{PEAK} | | 568 | | nm | Measured at Peak |
| Dominant Wavelength ^[1] | λ_d | | 570 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 28 | | nm | |
| Speed of Response | τ_s | | 260 | | ns | |
| Capacitance | C | | 18 | | pF | $V_F = 0, f = 1 \text{ MHz}$ |
| Thermal Resistance | $R\theta_{\text{J-LEAD}}$ | | 210 | | $^{\circ}\text{C/W}$ | LED Junction-to-Cathode Lead |
| Luminous Efficacy ^[2] | η_v | | 595 | | lm/W | |

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 the luminous efficacy in lumens/watt.

Emerald Green HLMP-8605^[1]

| Parameter | Symbol | Min. | Typ. | Max. | Units | Test Conditions |
|--|---------------------------|------|------|------|----------------------|------------------------------|
| Luminous Intensity HLMP-8605 | I_v | 69 | 75 | | mcd | $I_F = 20 \text{ mA}$ |
| Forward Voltage | V_F | | 2.2 | 3.0 | V | $I_F = 20 \text{ mA}$ |
| Reverse Breakdown Voltage | V_R | 5.0 | 30 | | V | $I_R = 100 \mu\text{A}$ |
| Included Angle Between Half Intensity Points HLMP-8605 | $2\theta_{1/2}$ | | 10 | | Deg. | |
| Peak Wavelength | λ_{PEAK} | | 558 | | nm | Measured at Peak |
| Dominant Wavelength ^[2] | λ_d | | 560 | | nm | |
| Spectral Line Half Width | $\Delta\lambda_{1/2}$ | | 24 | | nm | |
| Speed of Response | τ_s | | 3100 | | ns | |
| Capacitance | C | | 35 | | pF | $V_F = 0, f = 1 \text{ MHz}$ |
| Thermal Resistance | $R\theta_{\text{J-LEAD}}$ | | 210 | | $^{\circ}\text{C/W}$ | LED Junction-to-Cathode Lead |
| Luminous Efficacy ^[3] | η_v | | 656 | | lm/W | |

Notes:

1. Please refer to Application Note 1061 for information comparing standard green and emerald green light output degradation.
2. The dominant wavelength, λ_d , is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. 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 the luminous efficacy in lumens/watt.

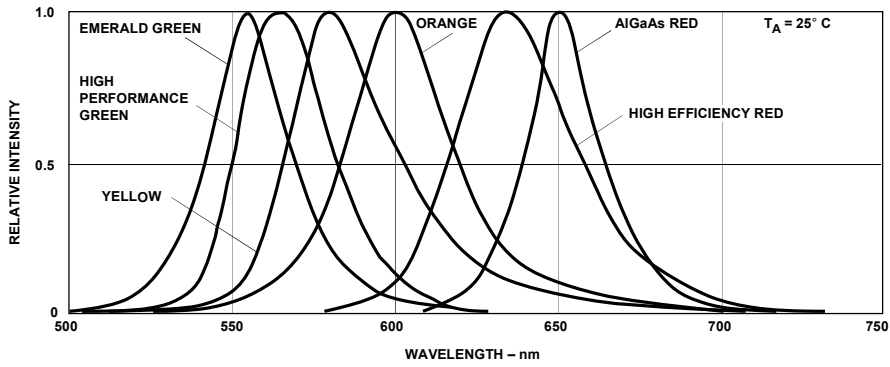


Figure 1. Relative Intensity vs. Wavelength.

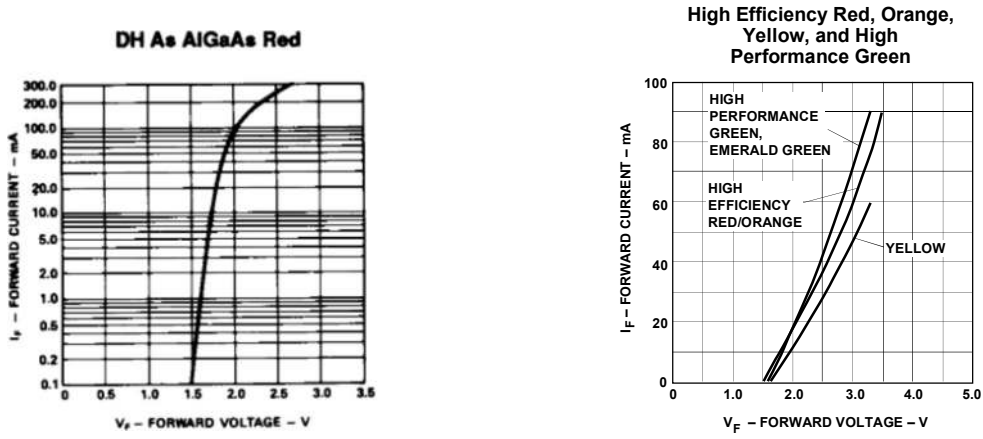


Figure 2. Forward Current vs. Forward Voltage (Non-Resistor Lamp).

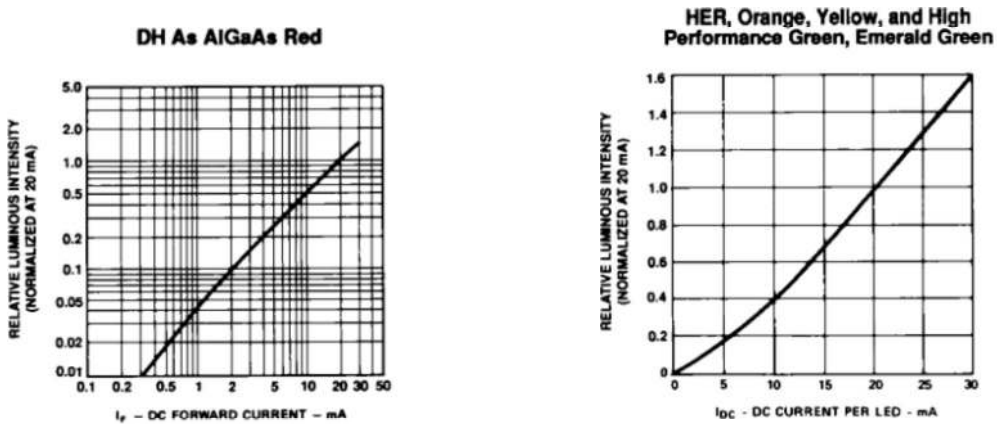


Figure 3. Relative Luminous Intensity vs. Forward Current.

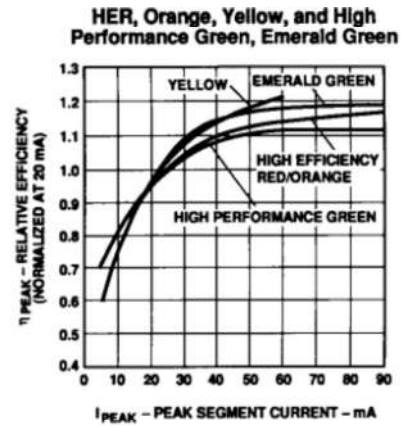
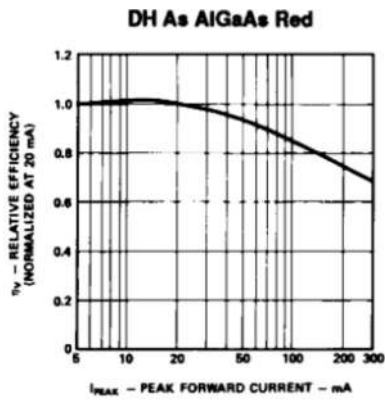


Figure 4. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current.

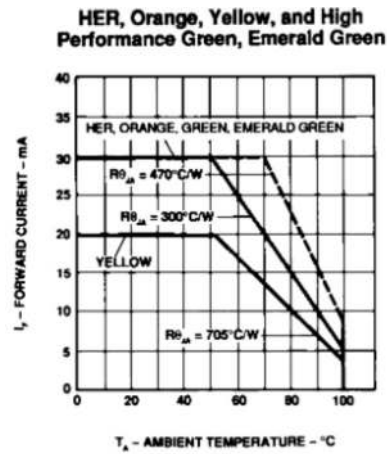
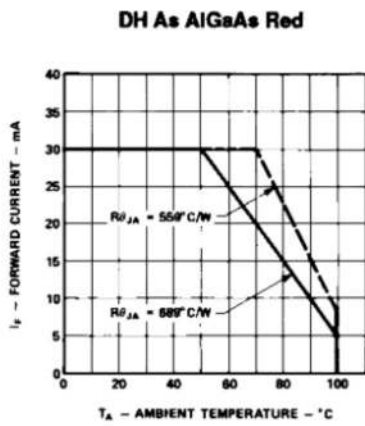


Figure 5. Maximum Forward dc Current vs. Ambient Temperature. Derating Based on T_J MAX = 110°C.

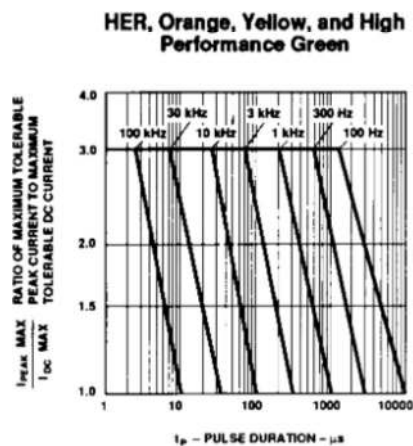
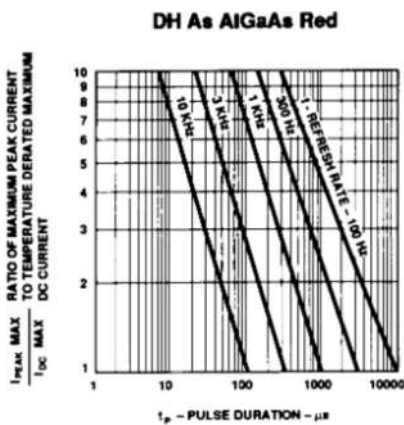


Figure 6. Maximum Tolerable Peak Current vs. Pulse Duration. (I_{DC} MAX as per MAX Ratings).

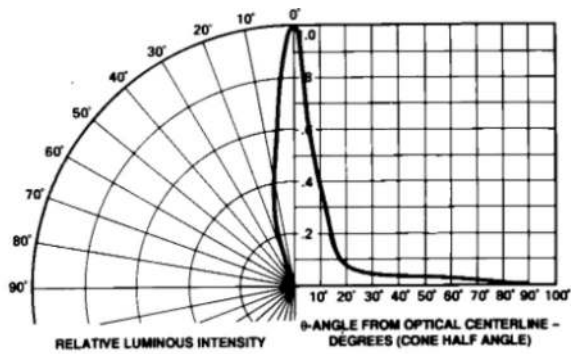


Figure 7. Relative Luminous Intensity vs. Angular Displacement. HLMP-8115/-8X05.

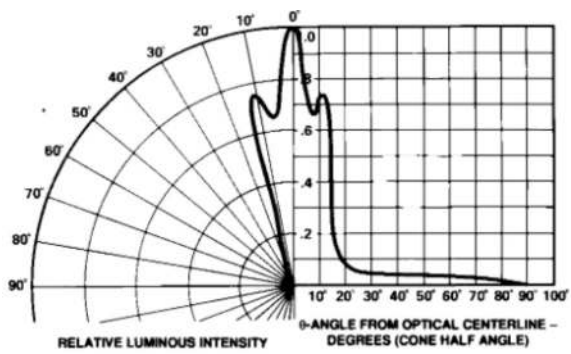


Figure 8. Relative Luminous Intensity vs. Angular Displacement. HLMP-8X09.

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