
Subminiature High Performance TS AlGaAs Red LED Lamps

Technical Data

**HLMP-P106/P156
HLMP-Q10X/Q15X**

Features

- **Subminiature Flat Top Package**
Ideal for Backlighting and Light Piping Applications
- **Subminiature Dome Package**
Diffused Dome for Wide Viewing Angle
Non-diffused Dome for High Brightness
- **Wide Range of Drive Currents**
500 μ A to 50 mA
- **Ideal for Space Limited Applications**
- **Axial Leads**
- **Available with lead configurations for Surface Mount and Through Hole PC Board Mounting**

Description

Flat Top Package

The HLMP-PXXX Series flat top lamps use an untinted, non-diffused, truncated lens to provide a wide radiation pattern that is necessary for use in backlighting applications. The flat top lamps are also ideal for use as emitters in light pipe applications.

Dome Packages

The HLMP-QXXX Series dome lamps, for use as indicators, use a tinted, diffused lens to provide a wide viewing angle with high on-off contrast ratio. High brightness lamps use an untinted, nondiffused lens to provide a high luminous intensity within a narrow radiation pattern.

Lead Configurations

All of these devices are made by encapsulating LED chips on axial lead frames to form molded epoxy subminiature lamp packages. A variety of package configuration options is available. These include special surface mount lead configurations, gull wing, yoke lead, or Z-bend. Right angle lead bends at 2.54 mm (0.100 inch) and 5.08 mm (0.200 inch) center spacing are available for through hole mounting. For more information refer to Standard SMT and Through Hole Lead Bend Options for Subminiature LED Lamps data sheet.



Technology

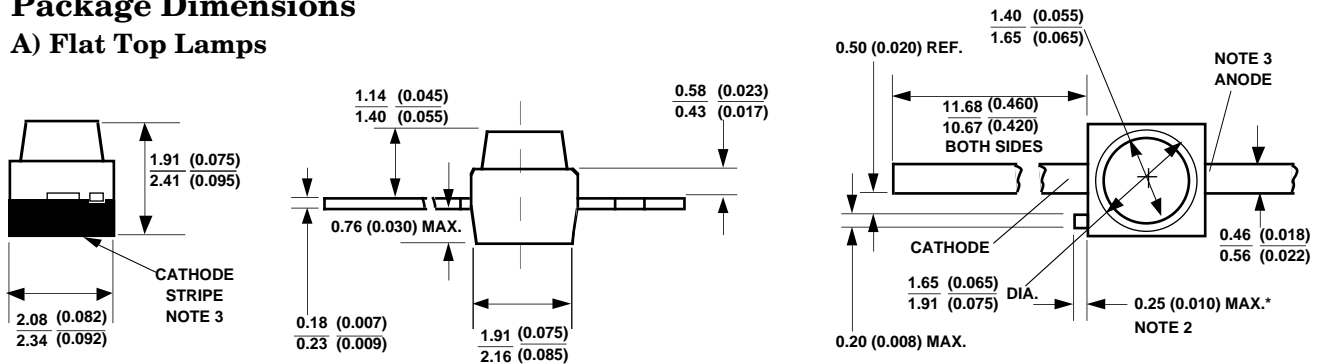
These subminiature solid state lamps utilize a highly optimized LED material technology, transparent substrate aluminum gallium arsenide (TS AlGaAs). This LED technology has a very high luminous efficiency, capable of producing high light output over a wide range of drive currents (500 μ A to 50 mA). The color is deep red at a dominant wavelength of 644 nm deep red. TS AlGaAs is a flip-chip LED technology, die attached to the anode lead and wire bonded to the cathode lead. Available viewing angles are 75°, 35°, and 15°.

Device Selection Guide

| Package Description | Viewing Angle $2 \theta_{1/2}$ | Deep Red $R_d = 644 \text{ nm}$ | Typical I_v $I_f = 500 \mu\text{A}$ | Typical I_v $I_f = 20 \text{ mA}$ | Package Outline |
|---|-----------------------------------|------------------------------------|--|--|-----------------|
| Domed, Diffused Tinted, Standard Current | 35 | HLMP-Q102 | | 160 | B |
| Domed, Diffused Tinted, Low Current | 35 | HLMP-Q152 | 2 | | B |
| Domed, Nondiffused Untinted, Standard Current | 15 | HLMP-Q106 | | 530 | B |
| Domed, Nondiffused Untinted, Low Current | 15 | HLMP-Q156 | 7 | | B |
| Flat Top, Nondiffused, Untinted, Standard Current | 75 | HLMP-P106 | | 130 | A |
| Flat Top, Nondiffused Untinted, Low Current | 75 | HLMP-P156 | 2 | | A |

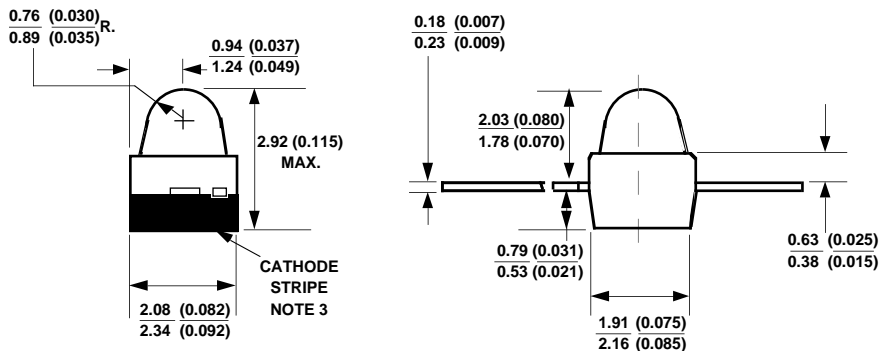
Package Dimensions

A) Flat Top Lamps



* REFER TO FIGURE 1 FOR DESIGN CONCERNS.

B) Diffused and Nondiffused Dome Lamps



NOTES:

- ALL DIMENSIONS ARE IN MILLIMETRES (INCHES).
- PROTRUDING SUPPORT TAB IS CONNECTED TO ANODE LEAD.
- LEAD POLARITY FOR THESE TS AlGaAs SUBMINIATURE LAMPS IS OPPOSITE TO THE LEAD POLARITY OF SUBMINIATURE LAMPS USING OTHER LED TECHNOLOGIES.

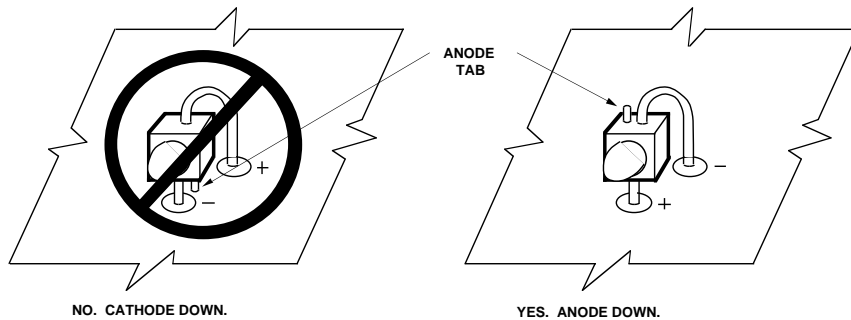


Figure 1. Proper Right Angle Mounting to a PC Board to Prevent Protruding Anode Tab from Shorting to Cathode Connection.

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

| | |
|---|--|
| Peak Forward Current ^[2] | 300 mA |
| Average Forward Current (@ $I_{PEAK} = 300 \text{ mA}$) ^[1,2] | 30 mA |
| DC Forward Current ^[3] | 50 mA |
| Power Dissipation | 100 mW |
| Reverse Voltage ($I_R = 100 \mu\text{A}$) | 5 V |
| Transient Forward Current (10 μs Pulse) ^[4] | 500 mA |
| Operating Temperature Range | -55 to +100°C |
| Storage Temperature Range | -55 to +100°C |
| LED Junction Temperature | 110°C |
| Lead Soldering Temperature | |
| [1.6 mm (0.063 in.) from body] | 260°C for 5 seconds |
| Reflow Soldering Temperatures | |
| Convective IR | 235°C Peak, above 183°C for 90 seconds |
| Vapor Phase | 215°C for 3 minutes |

Notes:

1. Maximum I_{AVG} at $f = 1 \text{ kHz}$, $DF = 10\%$.
2. Refer to Figure 7 to establish pulsed operating conditions.
3. Derate linearly as shown in Figure 6.
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 above the Absolute Maximum Peak Forward Current.

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

| Part Number HLMP- | Luminous Intensity I_V (mcd) @ 20 mA ^[1] | | Total Flux ϕ_V (mlm) @ 20 mA ^[2] Typ. | Peak Wavelength λ_{peak} (nm) Typ. | Color, Dominant Wavelength λ_d ^[3] (nm) Typ. | Viewing Angle $2\theta^{1/2}$ Degrees ^[4] Typ. | Luminous Efficacy η_V ^[5] (lm/w) |
|----------------------|---|------|--|---|---|--|--|
| | Min. | Typ. | | | | | |
| Q106 | 56 | 530 | 280 | 654 | 644 | 15 | 85 |
| Q102 | 22 | 160 | - | 654 | 644 | 35 | 85 |
| P106 | 22 | 130 | 280 | 654 | 644 | 75 | 85 |

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

| Part Number (Low Current) HLMP- | Luminous Intensity I_V (mcd) @ 0.5 mA ^[1] | | Total Flux ϕ_V (mlm) @ 0.5 mA ^[2] Typ. | Peak Wavelength λ_{peak} (nm) Typ. | Color, Dominant Wavelength λ_d ^[3] (nm) Typ. | Viewing Angle $2\theta^{1/2}$ Degrees ^[4] Typ. | Luminous Efficacy η_V ^[5] (lm/w) |
|---------------------------------------|--|------|---|---|---|--|--|
| | Min. | Typ. | | | | | |
| Q156 | 2.1 | 7 | 10.5 | 654 | 644 | 15 | 85 |
| Q152 | 1.3 | 2 | - | 654 | 644 | 35 | 85 |
| P156 | 0.6 | 2 | 10.5 | 654 | 644 | 75 | 85 |

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. ϕ_V is the total luminous flux output as measured with an integrating sphere.
3. The dominant wavelength, λ_d , is derived from the CIE Chromaticity Diagram and represents the color of the device.
4. $\theta^{1/2}$ is the off-axis angle where the luminous intensity is 1/2 the peak intensity.
5. Radiant intensity, I_V , in watts/steradian, may be calculated from the equation $I_V = I_V/\eta_V$, where I_V is the luminous intensity in candelas and η_V is the luminous efficacy in lumens/watt.

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

| Part Number HLMP- | Forward Voltage V_F (Volts) @ $I_F = 20\text{ mA}$ | | Reverse Breakdown V_R (Volts) @ $I_R = 100\ \mu\text{A}$ | | Capacitance C (pF) $V_F = 0$, $f = 1\text{ MHz}$ Typ. | Thermal Resistance $R_{\theta\text{J-PIN}}$ ($^\circ\text{C/W}$) | Speed of Response τ_s (ns) Time Constant e^{-t/τ_s} Typ. |
|----------------------|--|------|--|------|--|--|--|
| | Typ. | Max. | Min. | Typ. | | | |
| Q106 | 1.9 | 2.4 | 5 | 20 | 20 | 170 | 45 |
| Q102 | 1.9 | 2.4 | 5 | 20 | 20 | 170 | 45 |
| P106 | 1.9 | 2.4 | 5 | 20 | 20 | 170 | 45 |

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

| Part Number (Low Current) HLMP- | Forward Voltage V_F (Volts) @ $I_F = 0.5\text{ mA}$ | | Reverse Breakdown V_R (Volts) @ $I_R = 100\ \mu\text{A}$ | | Capacitance C (pF) $V_F = 0$, $f = 1\text{ MHz}$ Typ. | Thermal Resistance $R_{\theta\text{J-PIN}}$ ($^\circ\text{C/W}$) | Speed of Response τ_s (ns) Time Constant e^{-t/τ_s} Typ. |
|---------------------------------------|---|------|--|------|--|--|--|
| | Typ. | Max. | Min. | Typ. | | | |
| Q156 | 1.6 | 1.9 | 5 | 20 | 20 | 170 | 45 |
| Q152 | 1.6 | 1.9 | 5 | 20 | 20 | 170 | 45 |
| P156 | 1.6 | 1.9 | 5 | 20 | 20 | 170 | 45 |

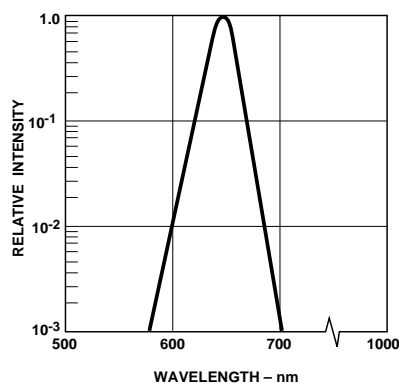


Figure 2. Relative Intensity vs. Wavelength.

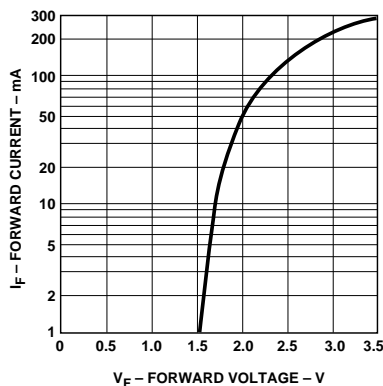


Figure 3. Forward Current vs. Forward Voltage.

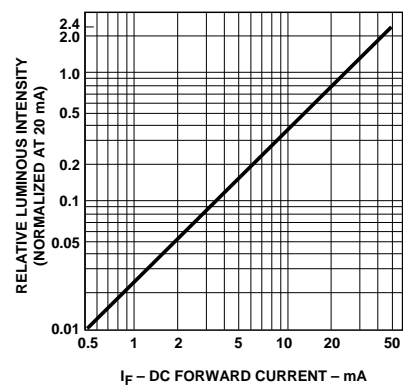


Figure 4. Relative Luminous Intensity vs. DC Forward Current.

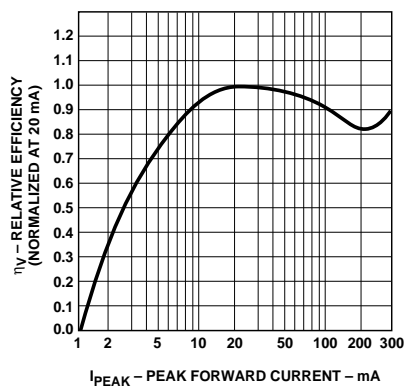


Figure 5. Relative Efficiency vs. Peak Forward Current.

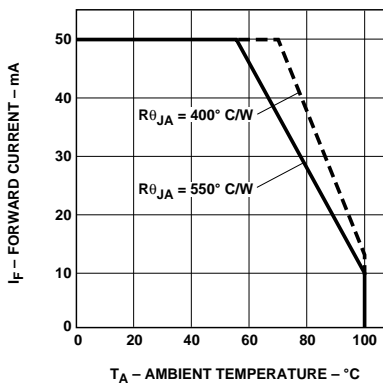


Figure 6. Maximum Forward DC Current vs. Ambient Temperature. Derating Based on $T_{j\text{MAX}} = 110^\circ\text{C}$.

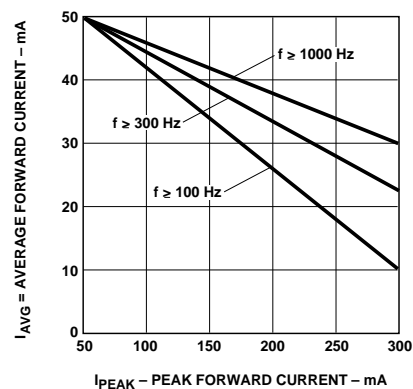


Figure 7. Maximum Average Current vs. Peak Forward Current.

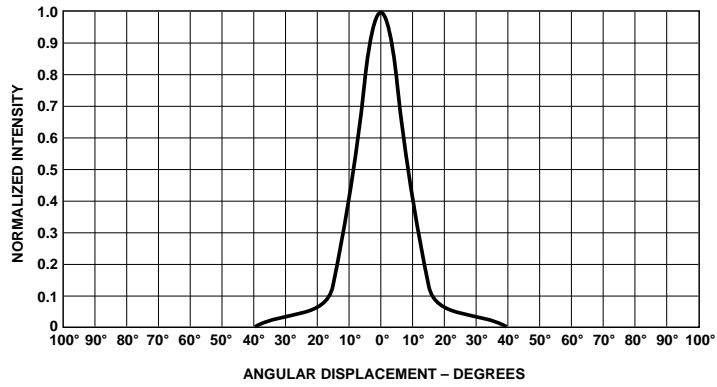


Figure 8. HLMP-Q106/Q156.

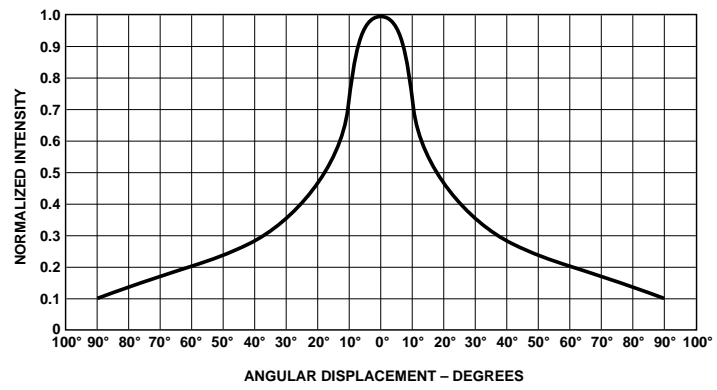


Figure 9. HLMP-Q102/Q152

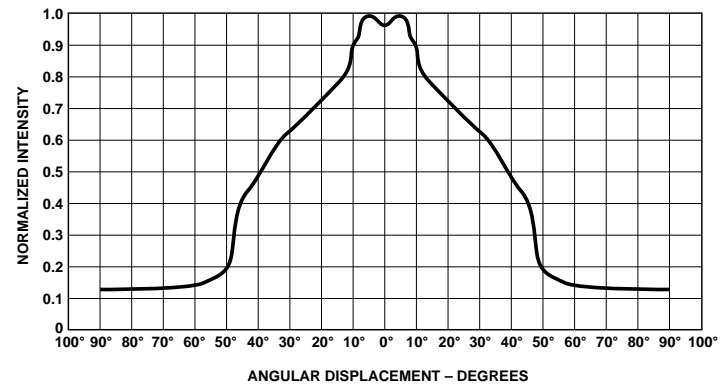


Figure 10. HLMP-P106/P156.