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# Subminiature LED Lamps

## Technical Data

**HLMP-PXXX Series**  
**HLMP-QXXX Series**  
**HLMP-6XXX Series**  
**HLMP-70XX Series**

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### Features

- **Subminiature Flat Top Package**  
Ideal for Backlighting and Light Piping Applications
- **Subminiature Dome Package**  
Diffused Dome for Wide Viewing Angle  
Nondiffused Dome for High Brightness
- **TTL and LSTTL Compatible 5 Volt Resistor Lamps**
- **Available in Six Colors**
- **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-6XXX Series dome lamps for use as indicators use a tinted, diffused lens to provide a wide viewing angle with a high on-off contrast ratio. High brightness lamps use an untinted, nondiffused lens to provide a high luminous intensity within a narrow radiation pattern.

#### Resistor Lamps

The HLMP-6XXX Series 5 volt subminiature lamps with built in current limiting resistors are for use in applications where space is at a premium.

#### 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.

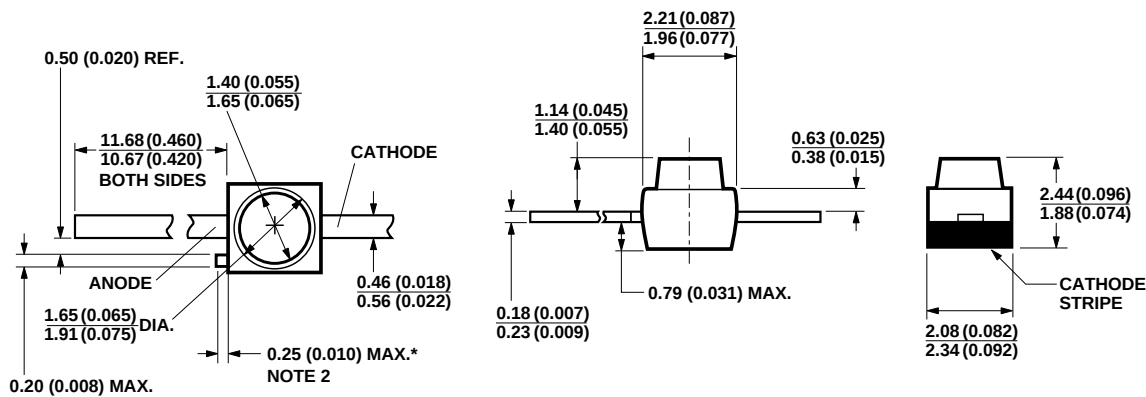
## Device Selection Guide

### Part Number: HLMP-XXXX

| Standard Red | DHAS AlGaAs Red | High Efficiency Red | Orange | Yellow | High Perf. Green | Emerald Green | Device Description <sup>[1]</sup>      | Device Outline Drawing |
|--------------|-----------------|---------------------|--------|--------|------------------|---------------|----------------------------------------|------------------------|
|              | P105            | P205                | P405   | P305   | P505             | P605          | Untinted, Nondiffused, Flat Top        | A                      |
|              | P102            | P202                | P402   | P302   | P502             |               | Untinted, Diffused, Flat Top           | B                      |
| 6000/6001    | Q101            | 6300                | Q400   | 6400   | 6500             | Q600          | Tinted, Diffused                       |                        |
|              | Q105            | 6305                |        | 6405   | 6505             |               | Untinted, Nondiffused, High Brightness |                        |
|              | Q150            | 7000                |        | 7019   | 7040             |               | Tinted, Diffused, Low Current          | B                      |
|              | Q155            |                     |        |        |                  |               | Nondiffused, Low Current               |                        |
|              |                 | 6600                |        | 6700   | 6800             |               | Tinted, Diffused, Resistor, 5 V, 10 mA |                        |
|              |                 | 6620                |        | 6720   | 6820             |               | Diffused, Resistor, 5 V, 4 mA          |                        |

## Package Dimensions

### (A) Flat Top Lamps



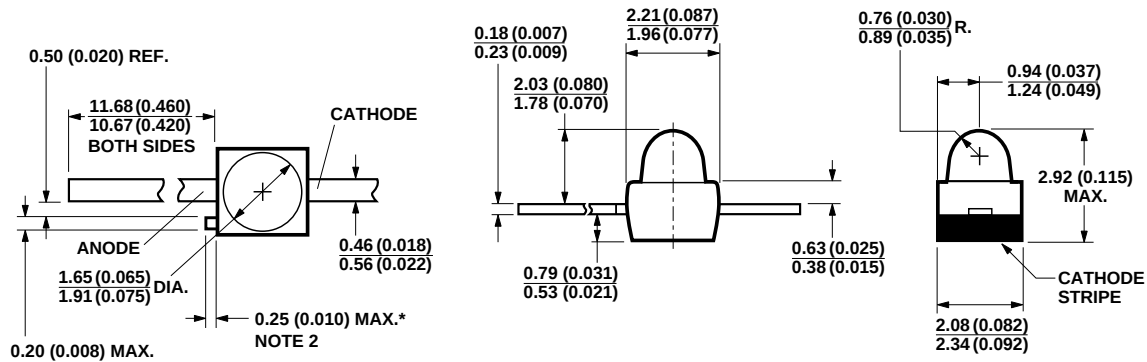
#### NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (INCHES).
2. PROTRUDING SUPPORT TAB IS CONNECTED TO CATHODE LEAD.

\* REFER TO FIGURE 1 FOR DESIGN CONCERNS.

## Package Dimensions (cont.)

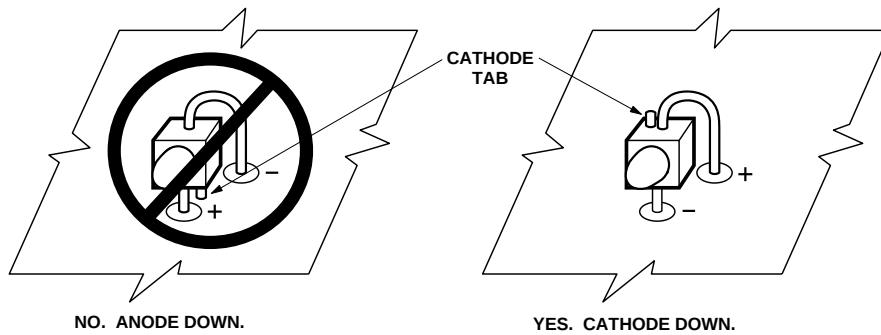
### (B) Diffused and Nondiffused



#### NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES (INCHES).
2. PROTRUDING SUPPORT TAB IS CONNECTED TO CATHODE LEAD.

\* REFER TO FIGURE 1 FOR DESIGN CONCERNS.



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

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

| Parameter                                                                          | Standard Red         | DHAS AlGaAs Red | High Eff. Red | Orange | Yellow | High Perf. Green | Emerald Green | Units |
|------------------------------------------------------------------------------------|----------------------|-----------------|---------------|--------|--------|------------------|---------------|-------|
| DC Forward Current <sup>[1]</sup>                                                  | 50                   | 30              | 30            | 30     | 20     | 30               | 30            | mA    |
| Peak Forward Current <sup>[2]</sup>                                                | 1000                 | 300             | 90            | 90     | 60     | 90               | 90            | mA    |
| DC Forward Voltage (Resistor Lamps Only)                                           |                      |                 | 6             |        | 6      | 6                | 6             | V     |
| Reverse Voltage (I <sub>R</sub> = 100 μA)                                          | 5                    | 5               | 5             | 5      | 5      | 5                | 5             | V     |
| Transient Forward Current <sup>[3]</sup> (10 μs Pulse)                             | 2000                 | 500             | 500           | 500    | 500    | 500              | 500           | mA    |
| Operating Temperature Range: Non-Resistor Lamps                                    | -55 to +100          | -40 to +100     | -55 to +100   |        |        | -40 to +100      | -20 to +100   | °C    |
| Resistor Lamps                                                                     |                      |                 | -40 to +85    |        |        | -20 to +85       |               |       |
| Storage Temperature Range                                                          | -55 to +100          |                 |               |        |        |                  |               | °C    |
| For Thru Hole Devices<br>Wave Soldering Temperature [1.6 mm (0.063 in.) from body] | 260°C for 5 Seconds  |                 |               |        |        |                  |               |       |
| For Surface Mount Devices:<br>Convective IR                                        | 235°C for 90 Seconds |                 |               |        |        |                  |               |       |
| Vapor Phase                                                                        | 215°C for 3 Minutes  |                 |               |        |        |                  |               |       |

#### Notes:

1. See Figure 5 for current derating vs. ambient temperature. Derating is not applicable to resistor lamps.
2. Refer to Figure 6 showing Max. Tolerable Peak Current vs. Pulse Duration to establish pulsed operating conditions.
3. The transient peak current is the maximum non-recurring peak current the device can withstand without failure. Do not operate these lamps at this high current.

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

### Standard Red

| Device<br>HLMP- | Parameter                                                   | Symbol                   | Min. | Typ. | Max. | Units              | Test Conditions                |
|-----------------|-------------------------------------------------------------|--------------------------|------|------|------|--------------------|--------------------------------|
| 6000            | Luminous Intensity <sup>[1]</sup>                           | $I_v$                    | 0.5  | 1.2  |      | mcd                | $I_F = 10\text{ mA}$           |
| 6001            |                                                             |                          | 1.3  | 3.2  |      |                    |                                |
| All             | Forward Voltage                                             | $V_F$                    | 1.4  | 1.6  | 2.0  | V                  | $I_F = 10\text{ mA}$           |
|                 | Reverse Breakdown Voltage                                   | $V_R$                    | 5.0  | 12.0 |      | V                  | $I_R = 100\text{ }\mu\text{A}$ |
| P005            | Included Angle Between Half Intensity Points <sup>[2]</sup> | $2\theta_{1/2}$          |      | 125  |      | Deg.               |                                |
| All Others      |                                                             |                          |      | 90   |      |                    |                                |
| All             | Peak Wavelength                                             | $\lambda_{\text{PEAK}}$  |      | 655  |      | nm                 |                                |
|                 | Dominant Wavelength <sup>[3]</sup>                          | $\lambda_d$              |      | 640  |      | nm                 |                                |
|                 | Spectral Line Half Width                                    | $\Delta\lambda_{1/2}$    |      | 24   |      | nm                 |                                |
|                 | Speed of Response                                           | $\tau_s$                 |      | 15   |      | ns                 |                                |
|                 | Capacitance                                                 | C                        |      | 100  |      | pF                 | $V_F = 0; f = 1\text{ MHz}$    |
|                 | Thermal Resistance                                          | $R\theta_{\text{J-PIN}}$ |      | 170  |      | $^\circ\text{C/W}$ | Junction-to-Cathode Lead       |
|                 | Luminous Efficacy <sup>[4]</sup>                            | $\eta_v$                 |      | 65   |      | lm/W               |                                |

**DHAS AlGaAs Red**

| <b>Device<br/>HLMP-</b> | <b>Parameter</b>                                            | <b>Symbol</b>            | <b>Min.</b> | <b>Typ.</b> | <b>Max.</b> | <b>Units</b>         | <b>Test Conditions</b>                     |
|-------------------------|-------------------------------------------------------------|--------------------------|-------------|-------------|-------------|----------------------|--------------------------------------------|
| P102                    | Luminous Intensity                                          | $I_v$                    | 4.0         | 20.0        |             | mcd                  | $I_F = 20 \text{ mA}$                      |
| P105                    |                                                             |                          | 8.6         | 30.0        |             |                      |                                            |
| Q101                    |                                                             |                          | 22.0        | 45.0        |             |                      |                                            |
| Q105                    |                                                             |                          | 100         | 200         |             |                      | $I_F = 1 \text{ mA}$                       |
| Q150                    |                                                             |                          | 1.0         | 1.8         |             |                      |                                            |
| Q155                    |                                                             |                          | 2.0         | 4.0         |             |                      |                                            |
| Q101                    | Forward Voltage                                             | $V_F$                    |             | 1.8         | 2.2         | V                    | $I_F = 20 \text{ mA}$                      |
| P205/P505<br>Q101/Q105  |                                                             |                          |             | 1.8         | 2.2         |                      | $I_F = 1 \text{ mA}$                       |
| Q150/Q155               |                                                             |                          |             | 1.6         | 1.8         |                      |                                            |
| All                     | Reverse Breakdown Voltage                                   | $V_R$                    | 5.0         | 15.0        |             | V                    | $I_R = 100 \text{ } \mu\text{A}$           |
| P105                    | Included Angle Between Half Intensity Points <sup>[2]</sup> | $2\theta^{1/2}$          |             | 125         |             | Deg.                 |                                            |
| Q101/Q150               |                                                             |                          |             | 90          |             |                      |                                            |
| Q105/Q155               |                                                             |                          |             | 28          |             |                      |                                            |
| All                     | Peak Wavelength                                             | $\lambda_{\text{PEAK}}$  |             | 645         |             | nm                   | Measured at Peak                           |
|                         | Dominant Wavelength <sup>[3]</sup>                          | $\lambda_d$              |             | 637         |             | nm                   |                                            |
|                         | Spectral Line Half Width                                    | $\Delta\lambda_{1/2}$    |             | 20          |             | nm                   |                                            |
|                         | Speed of Response                                           | $\tau_s$                 |             | 30          |             | ns                   | Exponential Time Constant; $e^{-t/\tau_s}$ |
|                         | Capacitance                                                 | C                        |             | 30          |             | pF                   | $V_F = 0$ ; $f = 1 \text{ MHz}$            |
|                         | Thermal Resistance                                          | $R\theta_{\text{J-PIN}}$ |             | 170         |             | $^{\circ}\text{C/W}$ | Junction-to Cathode Lead                   |
|                         | Luminous Efficacy <sup>[4]</sup>                            | $\eta_v$                 |             | 80          |             | lm/W                 |                                            |

**High Efficiency Red**

| Device<br>HLMP- | Parameter                                                      | Symbol                   | Min. | Typ. | Max. | Units | Test Conditions              |
|-----------------|----------------------------------------------------------------|--------------------------|------|------|------|-------|------------------------------|
| P202            | Luminous Intensity <sup>[1]</sup>                              | $I_v$                    | 1.0  | 5.0  |      | mcd   | $I_F = 10 \text{ mA}$        |
| P205            |                                                                |                          | 1.0  | 8.0  |      |       |                              |
| 6300            |                                                                |                          | 1.0  | 10.0 |      |       |                              |
| 6305            |                                                                |                          | 16.0 | 24.0 |      |       |                              |
| 7000            |                                                                |                          | 0.4  | 1.0  |      |       | $I_F = 2 \text{ mA}$         |
| 6600            |                                                                |                          | 1.3  | 5.0  |      |       | $V_F = 5.0 \text{ Volts}$    |
| 6620            |                                                                |                          | 0.8  | 2.0  |      |       |                              |
| 6653 to<br>6658 |                                                                |                          | 1.0  | 3.0  |      |       | $I_F = 10 \text{ mA}$        |
| All             | Forward Voltage<br>(Nonresistor Lamps)                         | $V_F$                    | 1.5  | 1.8  | 3.0  | V     | $I_F = 10 \text{ mA}$        |
| 6600            | Forward Current<br>(Resistor Lamps)                            | $I_F$                    |      | 9.6  | 13.0 | mA    | $V_F = 5.0 \text{ V}$        |
| 6620            |                                                                |                          |      | 3.5  | 5.0  |       |                              |
| All             | Reverse Breakdown<br>Voltage                                   | $V_R$                    | 5.0  | 30.0 |      | V     | $I_R = 100 \mu\text{A}$      |
| P205            | Included Angle Between<br>Half Intensity Points <sup>[2]</sup> | $2\theta^{1/2}$          |      | 125  |      | Deg.  |                              |
| 6305            |                                                                |                          |      | 28   |      |       |                              |
| All<br>Diffused |                                                                |                          |      | 90   |      |       |                              |
| All             | Peak Wavelength                                                | $\lambda_{\text{PEAK}}$  |      | 635  |      | nm    | Measured at Peak             |
|                 | Dominant Wavelength <sup>[3]</sup>                             | $\lambda_d$              |      | 626  |      | nm    |                              |
|                 | Spectral Line Half Width                                       | $\Delta\lambda_{1/2}$    |      | 40   |      | nm    |                              |
|                 | Speed of Response                                              | $\tau_s$                 |      | 90   |      | ns    |                              |
|                 | Capacitance                                                    | C                        |      | 11   |      | pF    | $V_F = 0; f = 1 \text{ MHz}$ |
|                 | Thermal Resistance                                             | $R\theta_{\text{J-PIN}}$ |      | 170  |      | °C/W  | Junction-to-Cathode<br>Lead  |
|                 | Luminous Efficacy <sup>[4]</sup>                               | $\eta_v$                 |      | 145  |      | lm/W  |                              |

**Orange**

| <b>Device<br/>HLMP-</b> | <b>Parameter</b>                                            | <b>Symbol</b>            | <b>Min.</b> | <b>Typ.</b> | <b>Max.</b> | <b>Units</b> | <b>Test Conditions</b>           |
|-------------------------|-------------------------------------------------------------|--------------------------|-------------|-------------|-------------|--------------|----------------------------------|
| P402                    | Luminous Intensity                                          | $I_v$                    | 1.0         | 4.0         |             | mcd          | $I_F = 10 \text{ mA}$            |
| P405                    |                                                             |                          | 1.0         | 6           |             |              |                                  |
| Q400                    |                                                             |                          | 1.0         | 8           |             |              |                                  |
| All                     | Forward Voltage                                             | $V_F$                    | 1.5         | 1.9         | 3.0         | V            | $I_F = 10 \text{ mA}$            |
|                         | Reverse Breakdown Voltage                                   | $V_R$                    | 5.0         | 30.0        |             | V            | $I_R = 100 \text{ } \mu\text{A}$ |
| P405                    | Included Angle Between Half Intensity Points <sup>[2]</sup> | $2\theta_{1/2}$          |             | 125         |             | Deg.         |                                  |
| Q400                    |                                                             |                          |             | 90          |             |              |                                  |
| All                     | Peak Wavelength                                             | $\lambda_{\text{PEAK}}$  |             | 600         |             | nm           |                                  |
|                         | Dominant Wavelength <sup>[3]</sup>                          | $\lambda_d$              |             | 602         |             | nm           | Measured at Peak                 |
|                         | Spectral Line Half Width                                    | $\Delta\lambda_{1/2}$    |             | 40          |             | nm           |                                  |
|                         | Speed of Response                                           | $\tau_s$                 |             | 260         |             | ns           |                                  |
|                         | Capacitance                                                 | C                        |             | 4           |             | pF           | $V_F = 0; f = 1 \text{ MHz}$     |
|                         | Thermal Resistance                                          | $R\theta_{\text{J-PIN}}$ |             | 170         |             | °C/W         | Junction-to-Cathode Lead         |
|                         | Luminous Efficacy <sup>[4]</sup>                            | $\eta_v$                 |             | 380         |             | lm/W         |                                  |

**Yellow**

| Device<br>HLMP- | Parameter                                                      | Symbol                   | Min. | Typ. | Max. | Units | Test Conditions              |
|-----------------|----------------------------------------------------------------|--------------------------|------|------|------|-------|------------------------------|
| P302            | Luminous Intensity <sup>[1]</sup>                              | $I_v$                    | 1.0  | 3.0  |      | mcd   | $I_F = 10 \text{ mA}$        |
| P305            |                                                                |                          | 1.0  | 4.0  |      |       |                              |
| 6400            |                                                                |                          | 1.0  | 9.0  |      |       |                              |
| 6405            |                                                                |                          | 3.6  | 20   |      |       | $I_F = 2 \text{ mA}$         |
| 7019            |                                                                |                          | 0.4  | 0.6  |      |       |                              |
| 6700            |                                                                |                          | 1.4  | 5.0  |      |       | $V_F = 5.0 \text{ Volts}$    |
| 6720            |                                                                |                          | 0.9  | 2.0  |      |       |                              |
| 6753 to<br>6758 |                                                                |                          | 1.0  | 3.0  |      |       | $I_F = 10 \text{ mA}$        |
| All             | Forward Voltage<br>(Nonresistor Lamps)                         | $V_F$                    |      | 2.0  | 2.4  | V     | $I_F = 10 \text{ mA}$        |
| 6700            | Forward Current<br>(Resistor Lamps)                            | $I_F$                    |      | 9.6  | 13.0 | mA    | $V_F = 5.0 \text{ V}$        |
| 6720            |                                                                |                          |      | 3.5  | 5.0  |       |                              |
| All             | Reverse Breakdown<br>Voltage                                   | $V_R$                    | 5.0  | 50.0 |      | V     |                              |
| P305            | Included Angle Between<br>Half Intensity Points <sup>[2]</sup> | $2\theta^{1/2}$          |      | 125  |      | Deg.  |                              |
| 6405            |                                                                |                          |      | 28   |      |       |                              |
| All<br>Diffused |                                                                |                          |      | 90   |      |       |                              |
| All             | Peak Wavelength                                                | $\lambda_{\text{PEAK}}$  |      | 583  |      | nm    | Measured at Peak             |
|                 | Dominant Wavelength <sup>[3]</sup>                             | $\lambda_d$              |      | 585  |      | nm    |                              |
|                 | Spectral Line Half Width                                       | $\Delta\lambda_{1/2}$    |      | 36   |      | nm    |                              |
|                 | Speed of Response                                              | $\tau_s$                 |      | 90   |      | ns    |                              |
|                 | Capacitance                                                    | C                        |      | 15   |      | pF    | $V_F = 0; f = 1 \text{ MHz}$ |
|                 | Thermal Resistance                                             | $R\theta_{\text{J-PIN}}$ |      | 170  |      | °C/W  | Junction-to-Cathode<br>Lead  |
|                 | Luminous Efficacy <sup>[4]</sup>                               | $\eta_v$                 |      | 500  |      | lm/W  |                              |

### High Performance Green

| Device<br>HLMP- | Parameter                                                      | Symbol                   | Min. | Typ. | Max. | Units | Test Conditions              |
|-----------------|----------------------------------------------------------------|--------------------------|------|------|------|-------|------------------------------|
| P502            | Luminous Intensity <sup>[1]</sup>                              | $I_v$                    | 1.0  | 3.0  |      | mcd   | $I_F = 10 \text{ mA}$        |
| P505            |                                                                |                          | 4    | 6.0  |      |       |                              |
| 6500            |                                                                |                          | 1.0  | 7.0  |      |       |                              |
| 6505            |                                                                |                          | 25   | 50.0 |      |       |                              |
| 7040            |                                                                |                          | 0.4  | 0.6  |      |       | $I_F = 2 \text{ mA}$         |
| 6800            |                                                                |                          | 1.6  | 5.0  |      |       | $V_F = 5.0 \text{ Volts}$    |
| 6820            |                                                                |                          | 0.8  | 2.0  |      |       | $I_F = 10 \text{ mA}$        |
| 6853 to<br>6858 |                                                                |                          | 1.0  | 3.0  |      |       |                              |
| All             | Forward Voltage<br>(Nonresistor Lamps)                         | $V_F$                    |      | 2.1  | 2.7  | V     | $I_F = 10 \text{ mA}$        |
| 6800            | Forward Current<br>(Resistor Lamps)                            | $I_F$                    |      | 9.6  | 13.0 | mA    | $V_F = 5.0 \text{ V}$        |
| 6820            |                                                                |                          |      | 3.5  | 5.0  |       |                              |
| All             | Reverse Breakdown<br>Voltage                                   | $V_R$                    | 5.0  | 50.0 |      | V     | $I_R = 100 \mu\text{A}$      |
| P505            | Included Angle Between<br>Half Intensity Points <sup>[2]</sup> | $2\theta^{1/2}$          |      | 125  |      | Deg.  |                              |
| 6505            |                                                                |                          |      | 28   |      |       |                              |
| All<br>Diffused |                                                                |                          |      | 90   |      |       |                              |
| All             | Peak Wavelength                                                | $\lambda_{\text{PEAK}}$  |      | 565  |      | nm    |                              |
|                 | Dominant Wavelength <sup>[3]</sup>                             | $\lambda_d$              |      | 569  |      | nm    |                              |
|                 | Spectral Line Half Width                                       | $\Delta\lambda_{1/2}$    |      | 28   |      | nm    |                              |
|                 | Speed of Response                                              | $\tau_s$                 |      | 500  |      | ns    |                              |
|                 | Capacitance                                                    | C                        |      | 18   |      | pF    | $V_F = 0; f = 1 \text{ MHz}$ |
|                 | Thermal Resistance                                             | $R\theta_{\text{J-PIN}}$ |      | 170  |      | °C/W  | Junction-to-Cathode<br>Lead  |
|                 | Luminous Efficacy <sup>[4]</sup>                               | $\eta_v$                 |      | 595  |      | lm/W  |                              |

#### Notes:

1. The luminous intensity for arrays is tested to assure a 2.1 to 1.0 matching between elements. The average luminous intensity for an array determines its light output category bin. Arrays are binned for luminous intensity to allow  $I_v$  matching between arrays.
2.  $\theta^{1/2}$  is the off-axis angle where the luminous intensity is half the on-axis value.
3. Dominant wavelength,  $\lambda_d$ , is derived from the CIE Chromaticity Diagram and represents the single wavelength that defines the color of the device.
4. Radiant intensity,  $I_e$ , in watts/steradian, may be calculated from the equation  $I_e = I_v / \eta_v$ , where  $I_v$  is the luminous intensity in candelas and  $\eta_v$  is the luminous efficacy in lumens/watt.

**Emerald Green<sup>[1]</sup>**

| Device<br>HLMP- | Parameter                                                   | Symbol                  | Min. | Typ. | Max. | Units | Test Conditions                 |
|-----------------|-------------------------------------------------------------|-------------------------|------|------|------|-------|---------------------------------|
| P605            | Luminous Intensity                                          | $I_v$                   | 1.0  | 1.5  |      | mcd   | $I_F = 10 \text{ mA}$           |
| Q600            |                                                             |                         | 1.0  | 1.5  |      |       |                                 |
|                 | Forward Voltage                                             | $V_F$                   |      | 2.2  | 3.0  | V     | $I_F = 10 \text{ mA}$           |
|                 | Reverse Breakdown Voltage                                   | $V_R$                   | 5.0  |      |      | V     | $I_R = 100 \mu\text{A}$         |
| P605            | Included Angle Between Half Intensity Points <sup>[2]</sup> | $2\theta^{1/2}$         |      | 125  |      | Deg.  |                                 |
| Q600            |                                                             |                         |      | 90   |      |       |                                 |
| P605/<br>Q600   | Peak Wavelength                                             | $\lambda_{\text{PEAK}}$ |      | 558  |      | nm    |                                 |
|                 | Dominant Wavelength <sup>[3]</sup>                          | $\lambda_d$             |      | 560  |      | nm    | Measured at Peak                |
|                 | Spectral Line Half Width                                    | $\Delta\lambda_{1/2}$   |      | 24   |      | nm    |                                 |
|                 | Speed of Response                                           | $\tau_s$                |      | 3100 |      | ns    |                                 |
|                 | Capacitance                                                 | C                       |      | 35   |      | pF    | $V_F = 0$ ; $f = 1 \text{ MHz}$ |
|                 | Thermal Resistance                                          | $R\theta_{J-PIN}$       |      | 170  |      | °C/W  | Junction-to-Cathode Lead        |
|                 | Luminous Efficacy <sup>[4]</sup>                            | $\eta_v$                |      | 656  |      | lm/W  |                                 |

**Note:**

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

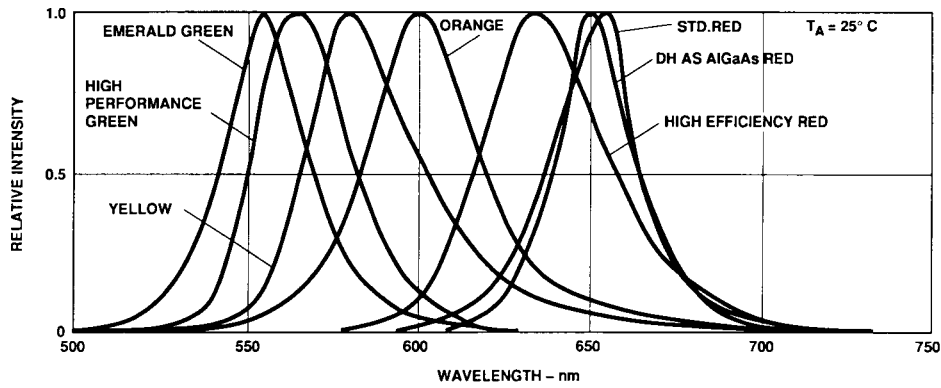


Figure 1. Relative Intensity vs. Wavelength.

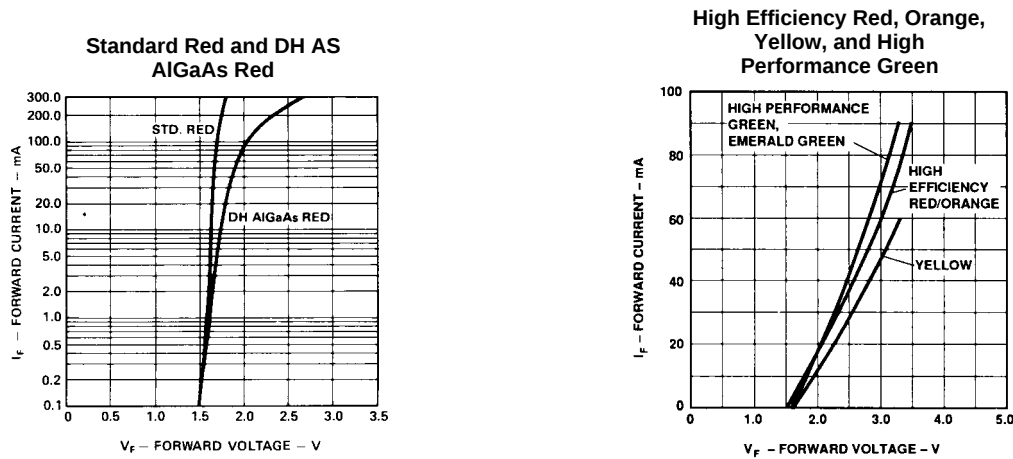


Figure 2. Forward Current vs. Forward Voltage. (Non-Resistor Lamp)

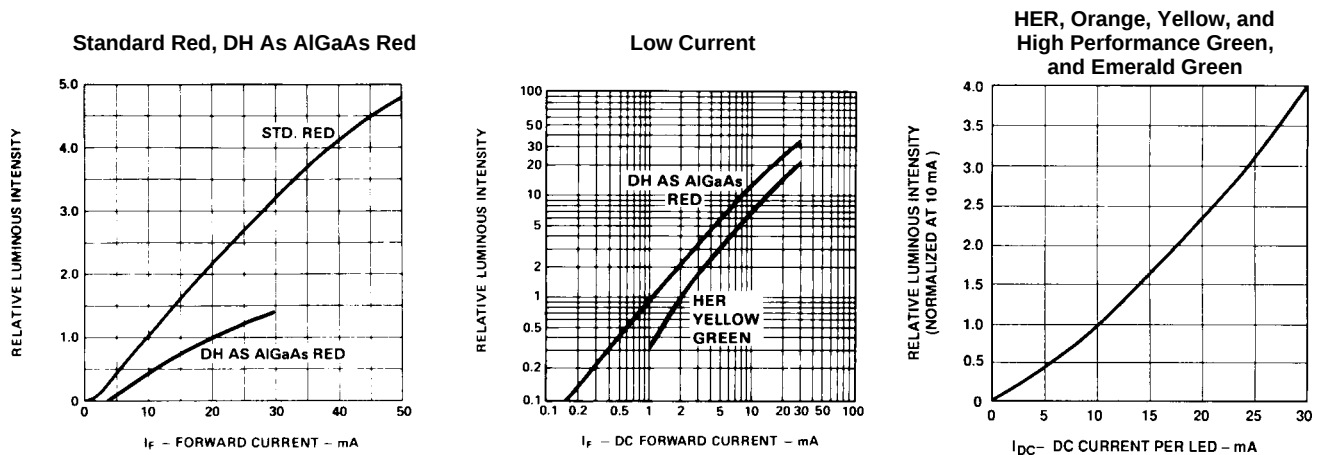


Figure 3. Relative Luminous Intensity vs. Forward Current. (Non-Resistor Lamp)

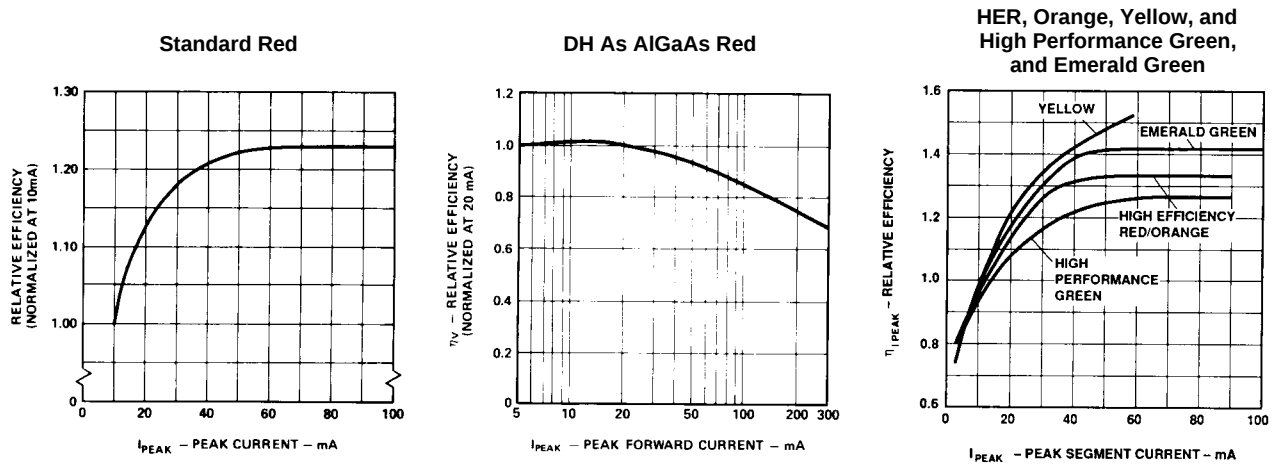


Figure 4. Relative Efficiency (Luminous Intensity per Unit Current) vs. Peak Current (Non-Resistor Lamps).

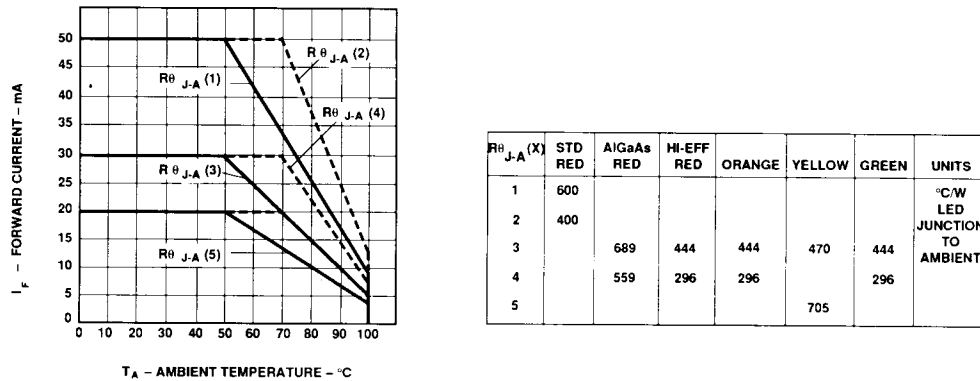


Figure 5. Maximum Forward dc Current vs. Ambient Temperature. Derating Based on  $T_J \text{ MAX} = 110^\circ\text{C}$  (Non-Resistor Lamps).

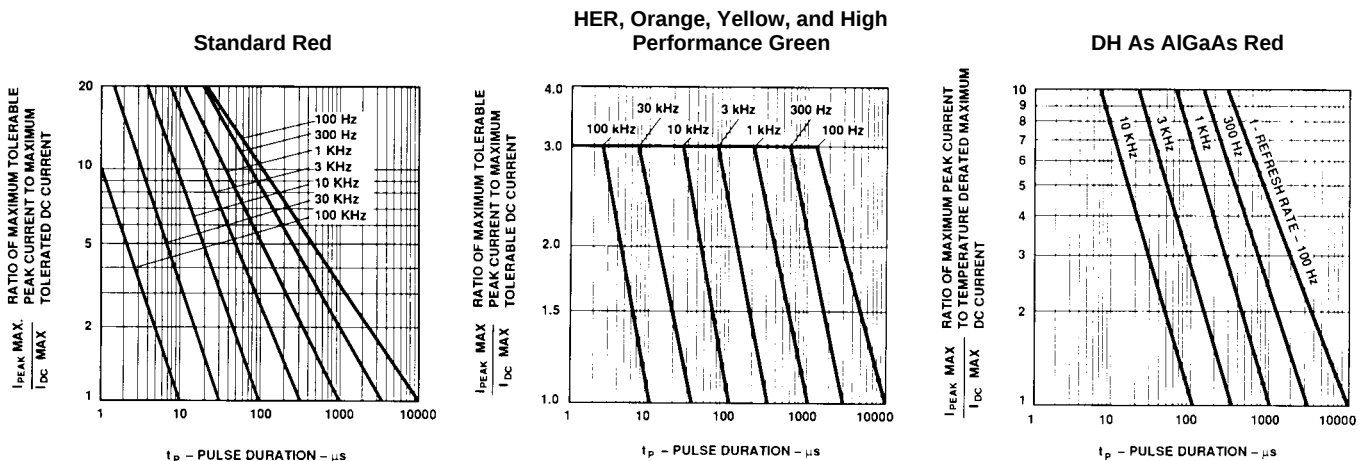


Figure 6. Maximum Tolerable Peak Current vs. Pulse Duration. ( $I_{DC} \text{ MAX}$  as per MAX Ratings) (Non-Resistor Lamps).

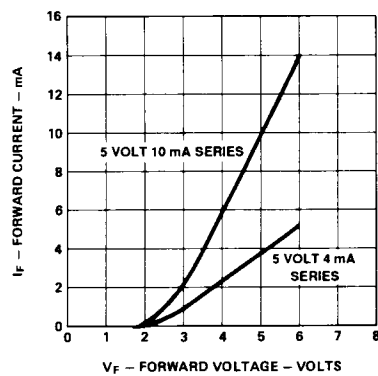


Figure 7. Resistor Lamp Forward Current vs. Forward Voltage.

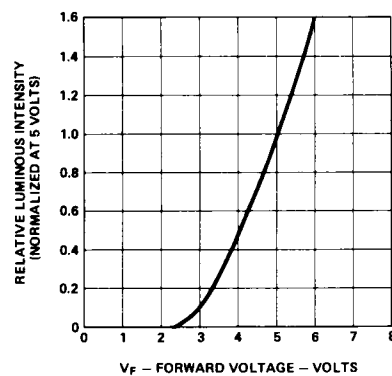


Figure 8. Resistor Lamp Luminous Intensity vs. Forward Voltage.

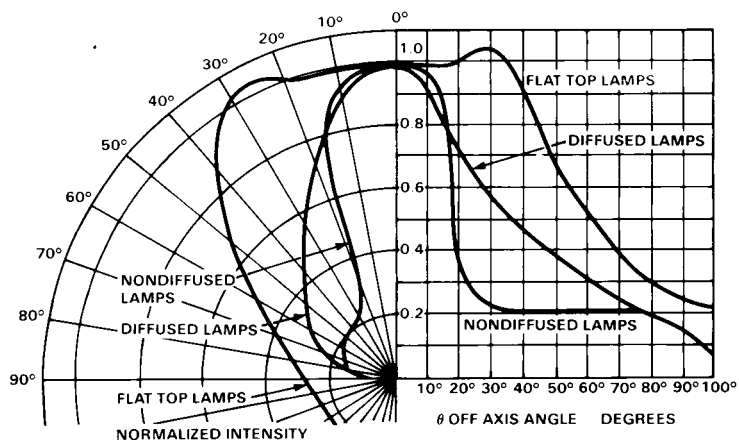


Figure 9. Relative Intensity vs. Angular Displacement.





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Obsoletes 5964-9350E (4/96)

5968-2537E (2/99)