

# T-1<sup>3</sup>/<sub>4</sub> (5 mm), T-1 (3 mm), 5 Volt, 12 Volt, Integrated Resistor LED Lamps

## Technical Data

HLMP-1600, HLMP-1601  
HLMP-1620, HLMP-1621  
HLMP-1640, HLMP-1641  
HLMP-3600, HLMP-3601  
HLMP-3650, HLMP-3651  
HLMP-3680, HLMP-3681

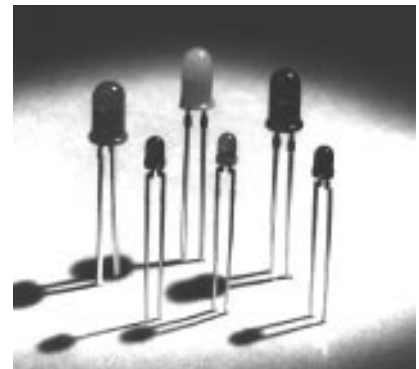
### Features

- **Integral Current Limiting Resistor**
- **TTL Compatible**  
Requires no External Current Limiter with 5 Volt/12 Volt Supply
- **Cost Effective**  
Saves Space and Resistor Cost
- **Wide Viewing Angle**
- **Available in All Colors**  
Red, High Efficiency Red, Yellow, and High Performance Green in T-1 and T-1<sup>3</sup>/<sub>4</sub> Packages

### Description

The 5 volt and 12 volt series lamps contain an integral current limiting resistor in series with the LED. This allows the lamp to be driven from a 5 volt/12 volt source without an external current limiter. The red LEDs are made from GaAsP on a GaAs substrate. The High Efficiency Red and Yellow devices use GaAsP on a GaP substrate.

The green devices use GaP on a GaP substrate. The diffused lamps provide a wide off-axis viewing angle.



The T-1<sup>3</sup>/<sub>4</sub> lamps are provided with sturdy leads suitable for wire wrap applications. The T-1<sup>3</sup>/<sub>4</sub> lamps may be front panel mounted by using the HLMP-0103 clip and ring.

### Package Dimensions

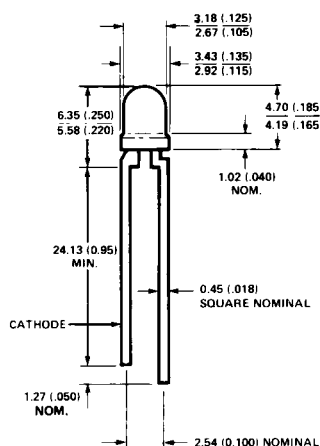


Figure A. T-1 Package.

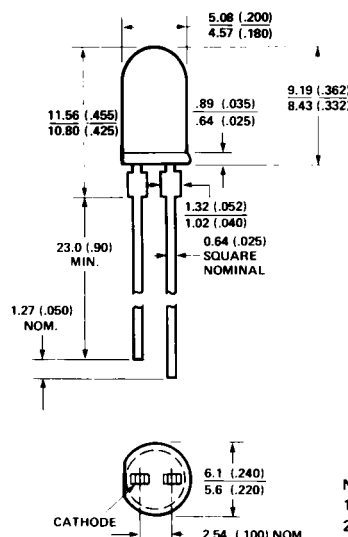


Figure B. T-1<sup>3</sup>/<sub>4</sub> Package.

NOTES:  
1. ALL DIMENSIONS ARE IN MILLIMETRES (INCHES).  
2. AN EPOXY MENISCUS MAY EXTEND ABOUT 1mm (.040") DOWN THE LEADS.

## Selection Guide

| Color                  | Part Number<br>HLMP- | Package                            | Operating Voltage | I <sub>v</sub> mcd |      | 2θ <sup>1/2</sup> [1] | Package Outline |
|------------------------|----------------------|------------------------------------|-------------------|--------------------|------|-----------------------|-----------------|
|                        |                      |                                    |                   | Min.               | Typ. |                       |                 |
| High Efficiency Red    | 1600                 | T-1 Tinted Diffused                | 5                 | 2.1                | 8.0  | 60°                   | A               |
|                        | 1601                 |                                    | 12                |                    |      |                       |                 |
|                        | 3600                 | T-1 <sup>3/4</sup> Tinted Diffused | 5                 |                    |      | 60°                   | B               |
|                        | 3601                 |                                    | 12                |                    |      |                       |                 |
| Yellow                 | 1620                 | T-1 Tinted Diffused                | 5                 | 2.2                | 8.0  | 60°                   | A               |
|                        | 1621                 |                                    | 12                |                    |      |                       |                 |
|                        | 3650                 | T-1 <sup>3/4</sup> Tinted Diffused | 5                 |                    |      | 60°                   | B               |
|                        | 3651                 |                                    | 12                |                    |      |                       |                 |
| High Performance Green | 1640                 | T-1 Tinted Diffused                | 5                 | 1.6                | 8.0  | 60°                   | A               |
|                        | 1641                 |                                    | 12                |                    |      |                       |                 |
|                        | 3680                 | T-1 <sup>3/4</sup> Tinted Diffused | 5                 |                    |      | 60°                   | B               |
|                        | 3681                 |                                    | 12                |                    |      |                       |                 |

**Note:**

1. θ<sub>1/2</sub> is the off-axis angle at which the luminous intensity is 1/2 the axial luminous intensity.

## Absolute Maximum Ratings at T<sub>A</sub> = 25°C

|                                            | Red/HER/<br>Yellow<br>5 Volt Lamps | Red/HER/<br>Yellow<br>12 Volt Lamps | Green<br>5 Volt Lamps    | Green<br>12 Volt Lamps  |
|--------------------------------------------|------------------------------------|-------------------------------------|--------------------------|-------------------------|
| DC Forward Voltage (T <sub>A</sub> = 25°C) | 7.5 Volts <sup>[2]</sup>           | 15 Volts <sup>[3]</sup>             | 7.5 Volts <sup>[2]</sup> | 15 Volts <sup>[3]</sup> |
| Reverse Voltage (I <sub>R</sub> = 100 μA)  | 5 Volts                            | 5 Volts                             | 5 Volts                  | 5 Volts                 |
| Operating Temperature Range                | -40°C to 85°C                      | -40°C to 85°C                       | -20°C to 85°C            | -20°C to 85°C           |
| Storage Temperature Range                  | -55°C to 100°C                     | -55°C to 100°C                      | -55°C to 100°C           | -55°C to 100°C          |
| Lead Soldering Temperature                 | 260°C for 5 seconds                |                                     |                          |                         |

**Notes:**

2. Derate from T<sub>A</sub> = 50°C at 0.071 V/°C, see Figure 3.

3. Derate from T<sub>A</sub> = 50°C at 0.086 V/°C, see Figure 4.

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

| Symbol                | Description                     | High Efficiency Red |      |      | Yellow |      |      | Green |      |      | Unit               | Test Condition                    |
|-----------------------|---------------------------------|---------------------|------|------|--------|------|------|-------|------|------|--------------------|-----------------------------------|
|                       |                                 | Min.                | Typ. | Max. | Min.   | Typ. | Max. | Min.  | Typ. | Max. |                    |                                   |
| $\lambda_p$           | Peak Wavelength                 |                     | 635  |      |        | 583  |      |       | 565  |      | nm                 |                                   |
| $\lambda_d$           | Dominant Wavelength             |                     | 626  |      |        | 585  |      |       | 569  |      | nm                 | Note 4                            |
| $\Delta\lambda^{1/2}$ | Spectral Line Halfwidth         |                     | 40   |      |        | 36   |      |       | 28   |      | nm                 |                                   |
| $R\theta_{J-PIN}$     | Thermal Resistance              |                     | 290  |      |        | 290  |      |       | 290  |      | $^\circ\text{C/W}$ | Junction to Cathode Lead (Note 6) |
| $R\theta_{J-PIN}$     | Thermal Resistance              |                     | 210  |      |        | 210  |      |       | 210  |      | $^\circ\text{C/W}$ | Junction to Cathode Lead (Note 7) |
| $I_F$                 | Forward Current<br>12 V Devices |                     | 13   | 20   |        | 13   | 20   |       | 13   | 20   | mA                 | $V_F = 12\text{ V}$               |
| $I_F$                 | Forward Current<br>5 V Devices  |                     | 10   | 15   |        | 10   | 15   |       | 10   | 15   | mA                 | $V_F = 5\text{ V}$                |
| $\eta_V$              | Luminous Efficacy               |                     | 145  |      |        | 500  |      |       | 595  |      | lumen/Watt         | Note 2                            |
| $V_R$                 | Reverse Breakdown Voltage       | 5.0                 |      |      | 5.0    |      |      | 5.0   |      |      | V                  | $I_R = 100\text{ }\mu\text{A}$    |

### Notes:

- The dominant wavelength,  $\lambda_d$ , is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.
- Radiant intensity,  $I_e$ , in watts/steradian, may be found 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.
- For Figure A package type.
- For Figure B package type.

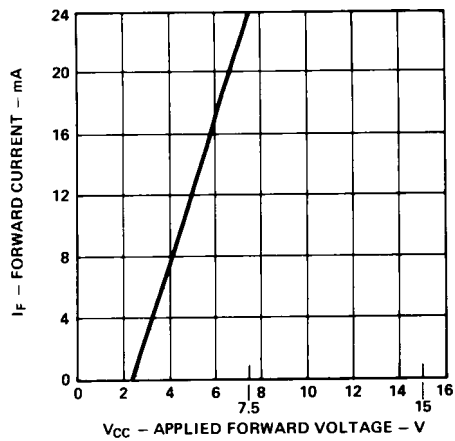


Figure 1. Forward Current vs. Applied Forward Voltage. 5 Volt Devices.

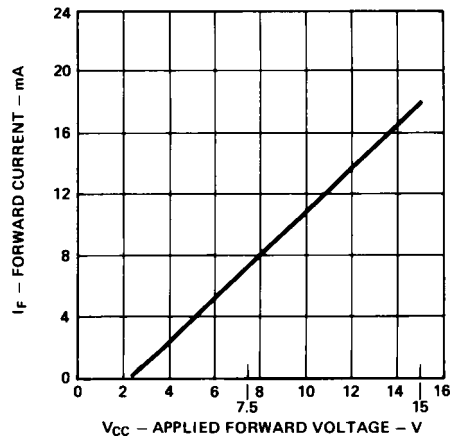


Figure 2. Forward Current vs. Applied Forward Voltage. 12 Volt Devices.

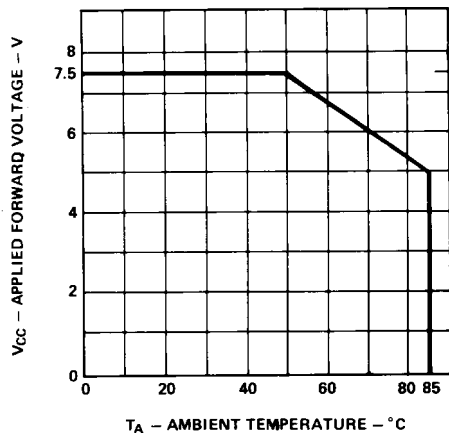


Figure 3. Maximum Allowed Applied Forward Voltage vs. Ambient Temperature  $R\theta_{JA} = 175^{\circ}\text{C/W}$ . 5 Volt Devices.

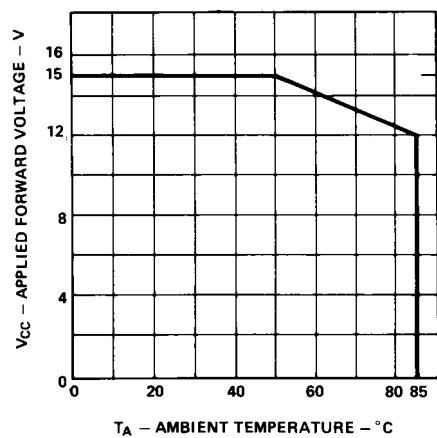


Figure 4. Maximum Allowed Applied Forward Voltage vs. Ambient Temperature  $R\theta_{JA} = 175^{\circ}\text{C/W}$ . 12 Volt Devices.

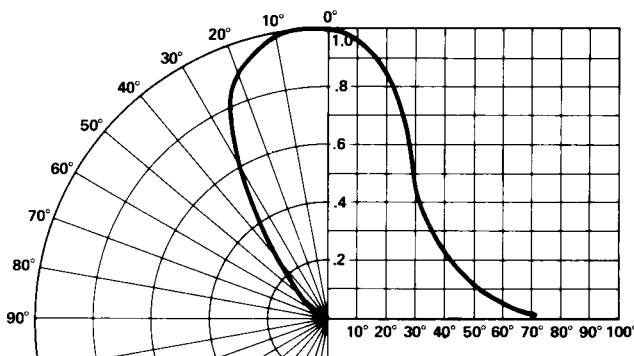


Figure 4. Relative Luminous Intensity vs. Angular Displacement for T-1 Package.

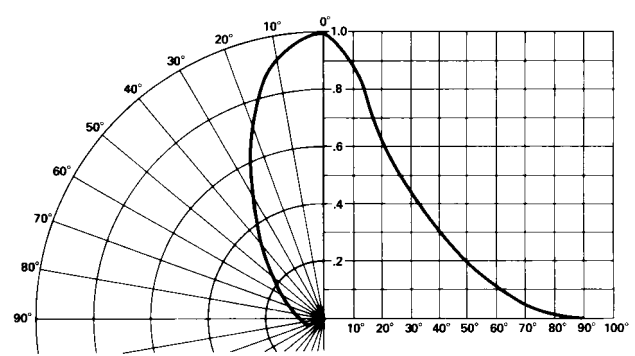


Figure 5. Relative Luminous Intensity vs. Angular Displacement for T-1<sup>3/4</sup> Package.

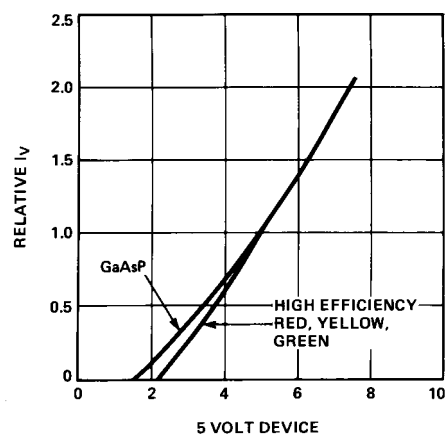


Figure 6. Relative Luminous Intensity vs. Applied Forward Voltage. 5 Volt Devices.

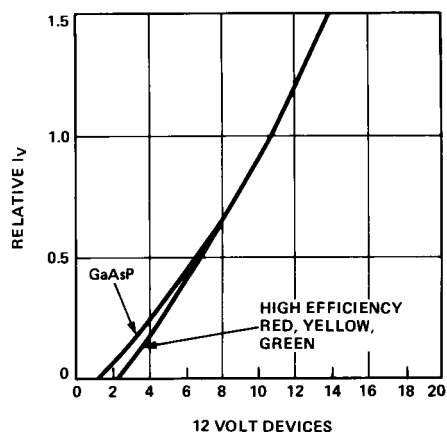


Figure 7. Relative Luminous Intensity vs. Applied Forward Voltage. 12 Volt Devices.