

# 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**

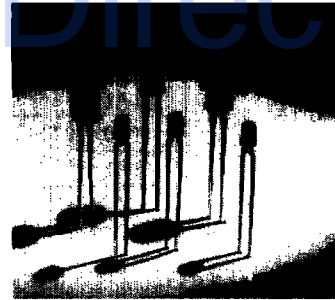
### Features

- **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

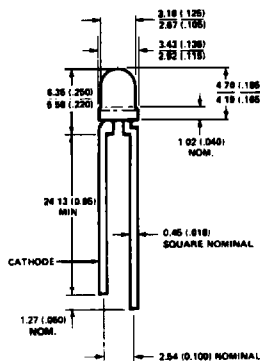


Figure A. T-1 Package.

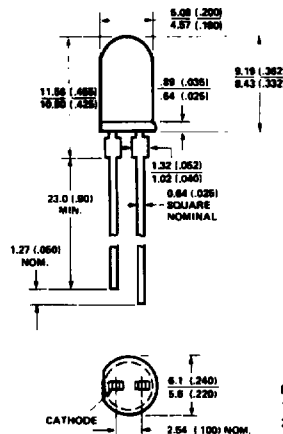


Figure B. T-1<sup>3</sup>/<sub>4</sub> Package.

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 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/ Yellow 5 Volt Lamps	Red/HER/ Yellow 12 Volt Lamps	Green 5 Volt Lamps	Green 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		$^\circ\text{C}/\text{W}$	Junction to Cathode Lead (Note 6)
$R\theta_{J-PIN}$	Thermal Resistance		210			210			210		$^\circ\text{C}/\text{W}$	Junction to Cathode Lead (Note 7)
$I_F$	Forward Current 12 V Devices		13	20		13	20		13	20	mA	$V_F = 12\text{ V}$
$I_F$	Forward Current 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	$I_R = 100\ \mu\text{A}$

**Notes:**

4. The dominant wavelength,  $\lambda_d$ , is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.
5. 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.
6. For Figure A package type.
7. For Figure B package type.

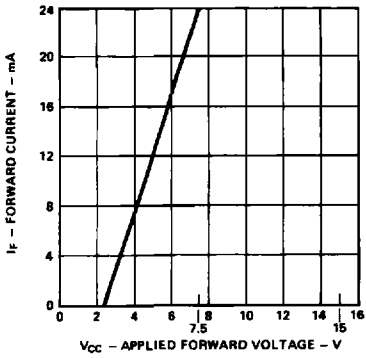


Figure 1. Forward Current vs. Applied Forward Voltage. 5 Volt Devices.

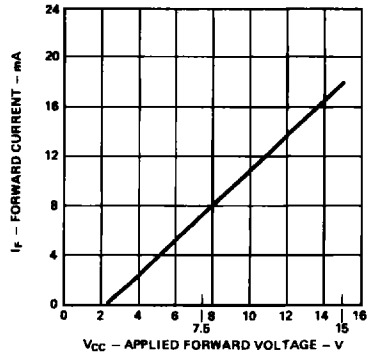


Figure 2. Forward Current vs. Applied Forward Voltage. 12 Volt Devices.

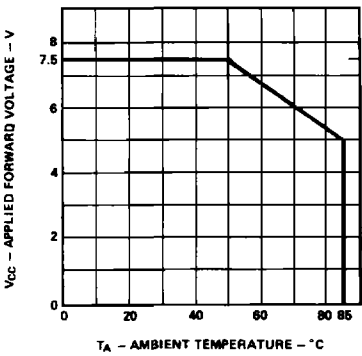


Figure 3. Maximum Allowed Applied Forward Voltage vs. Ambient Temperature  $R\theta_{JA} = 175^\circ\text{C}/\text{W}$ . 5 Volt Devices.

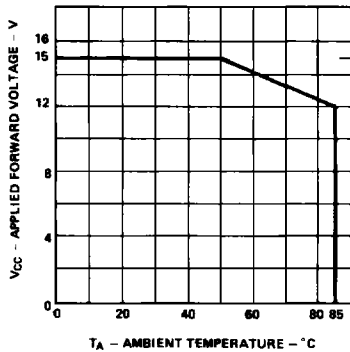


Figure 4. Maximum Allowed Applied Forward Voltage vs. Ambient Temperature  $R\theta_{JA} = 175^\circ\text{C}/\text{W}$ . 12 Volt Devices.

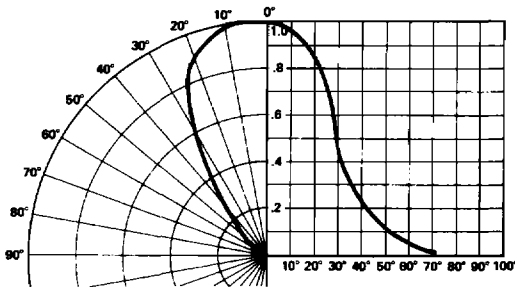


Figure 4. Relative Luminous Intensity vs. Angular Displacement for T-1 Package.

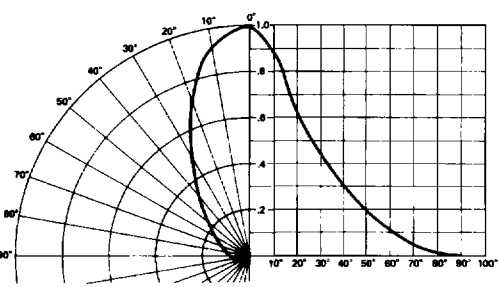


Figure 5. Relative Luminous Intensity vs. Angular Displacement for T-1<sup>3/4</sup> Package.

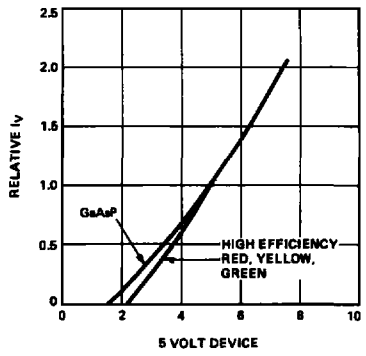


Figure 6. Relative Luminous Intensity vs. Applied Forward Voltage. 5 Volt Devices.

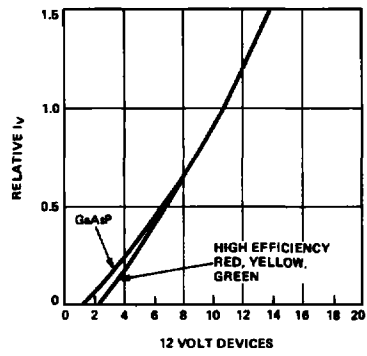


Figure 7. Relative Luminous Intensity vs. Applied Forward Voltage. 12 Volt Devices.