HLMP-1600

T-1$^3/_4$ (5 mm), T-1 (3 mm), 5 Volt, 12 Volt, Integrated Resistor LED Lamps

Data Sheet

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

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$^3/_4$ lamps are provided with sturdy leads suitable for wire wrap applications. The T-1$^3/_4$ lamps may be front panel mounted by using the HLMP-0103 clip and ring.

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-13/4 packages

Package Dimensions

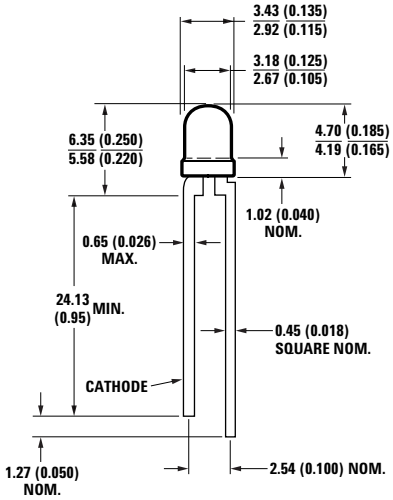

Figure A. T-1 package.

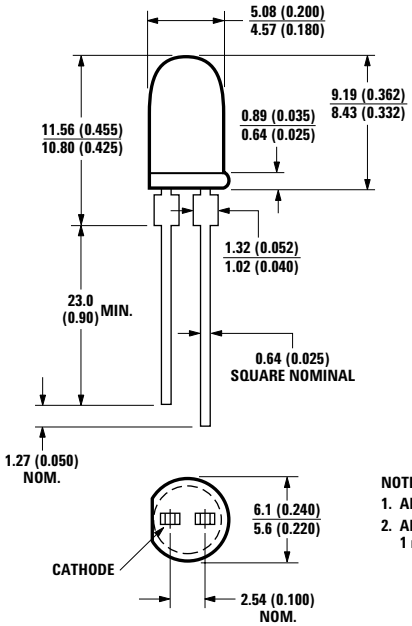

Figure B. T-1$^3/_4$ package.

NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETERS (INCHES).
2. AN EPOXY MENISCUS MAY EXTEND ABOUT 1 mm (0.040") DOWN THE LEADS.

Selection Guide

Color	Package Description	Package Outline	$2\theta_{1/2}$[1]	Operating Voltage (V)	Part Number HLMP-	Luminous Intensity Iv (mcd)	
						Min.	Max.
Red	T-1 Tinted Diffused	A	60	5	1600	2.1	-
					1600-D00xx	2.1	-
			60	12	1601	2.1	-
					1601-D00xx	2.1	-
					1601-GH0xx	8.6	27.6
	T-1 3/4 Tinted Diffused	B	60	5	3600	2.1	-
					3600-D00xx	2.1	-
			60	12	3601	2.1	-
					3601-D00xx	2.1	-
Yellow	T-1 Tinted Diffused	A	60	5	1620	2.2	-
					1620-C00xx	2.2	-
					1620-C0Bxx	2.2	-
					1620-EFBxx	3.4	10.8
			60	12	1621	2.2	-
					1621-C00xx	2.2	-
	T-1 3/4 Tinted Diffused	B	60	5	3650	2.2	-
					3650-C00xx	2.2	-
			60	12	3651	2.2	-
					3651-C00xx	2.2	-
Green	T-1 Tinted Diffused	A	60	5	1640	1.6	-
					1640-B00xx	1.6	-
					1640-B0Dxx	1.6	-
					1640-DE0xx	4.2	13.4
			60	12	1641	1.6	-
					1641-B00xx	1.6	
	T-1 3/4 Tinted Diffused	B	60	5	3680	1.6	-
					3680-B00xx	1.6	-
			60	12	3681	1.6	-
					3681-B00xx	1.6	-

Note:
1. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is 1/2 the axial luminous intensity.

Part Numbering System

HLMX-X 6 X X X X X XX

Mechanical Option
00: Bulk
01: Tape & Reel, Crimped Leads
02: Tape & Reel, Straight Leads
A1,B1: Right Angle Housing, Uneven Leads
A2,B2: Right Angle Housing, Even Leads

Color Bin Options
0: Full color bin distribution
B: Color bin 2&3 only
D: Color bin 4&5 only

Maximum Iv Bin Options
0: Open (No. max. limit)
Others: Please refer to the Iv bin Table

Minimum Iv Bin Options
Please refer to the Iv bin Table

Operating Voltage
0: 5 V
1: 12 V

Color Options
0: GaP HER
2,5: GaP Yellow
4,8: GaP Green

Package Options
3: T-1 3/4 (5 mm)
1: T-1 (3 mm)

Absolute Maximum Ratings at $T_A = 25°C$

	Red/HER/Yellow 5 Volt Lamps	Red/HER/Yellow 12 Volt Lamps	Green 5 Volt Lamps	Green 12 Volt Lamps
DC Forward Voltage (TA = 25°C)	7.5 Volts[2]	15 Volts[3]	7.5 Volts[2]	15 Volts[3]
Reverse Voltage (IR = 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	-40°C to 100°C	-40°C to 100°C	-40°C to 100°C	-40°C to 100°C

Notes:
2. Derate from $T_A = 50°C$ at 0.071 V/°C, see Figure 3.
3. Derate from $T_A = 50°C$ at 0.086 V/°C, see Figure 4.

Electrical/Optical Characteristics at $T_A = 25°C$

		High Efficiency Red			Yellow			Green				
Symbol	**Description**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Min.**	**Typ.**	**Max.**	**Unit**	**Test Condition**
λ_P	Peak Wavelength		635			583			565		nm	
λ_d	Dominant Wavelength		626			585			569		nm	Note 4
$\Delta\lambda^1/_2$	Spectral Line Halfwidth		40			36			28		nm	
$R\theta_{J\text{-}PIN}$	Thermal Resistance		290			290			290		°C/W	Junction to Cathode Lead (Note 6)
$R\theta_{J\text{-}PIN}$	Thermal Resistance		210			210			210		°C/W	Junction to Cathode Lead (Note 7)
I_F	Forward Current 12 V Devices		13	20		13	20		13	20	mA	$V_F = 12$ V
I_F	Forward Current 5 V Devices		10	15		10	15		10	15	mA	$V_F = 5$ V
η_V	Luminous Efficacy		145			500			595		lumen / Watt	Note 2
V_R	Reverse Breakdown Voltage	5.0			5.0			5.0			V	$I_R = 100\ \mu A$

Notes:

4. The dominant wavelength, λ_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 η_V is the luminous efficacy in lumens/Watt.
6. For Figure A package type.
7. For Figure B package type.

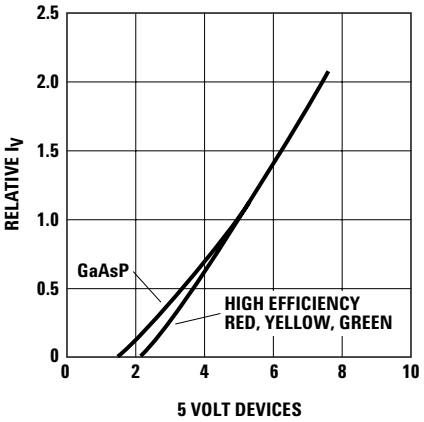

Figure 7. Relative luminous intensity vs. applied forward voltage. 5 volt devices.

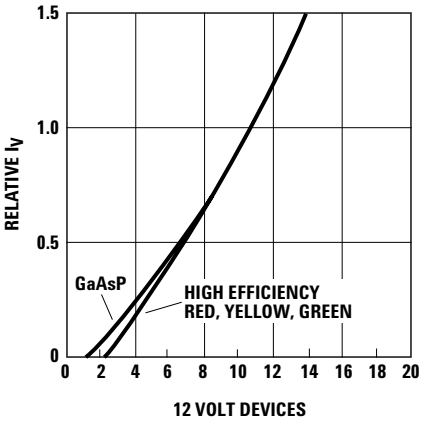

Figure 8. Relative luminous intensity vs. applied forward voltage. 12 volt devices.

Intensity Bin Limit

Color	Bin	Intensity Range (mcd)	
		Min.	Max.
Red	D	2.4	3.8
	E	3.8	6.1
	F	6.1	9.7
	G	9.7	15.5
	H	15.5	24.8
	I	24.8	39.6
	J	39.6	63.4
	K	63.4	101.5
	L	101.5	162.4
	M	162.4	234.6
	N	234.6	340.0
	O	340.0	540.0
	P	540.0	850.0
	Q	850.0	1200.0
	R	1200.0	1700.0
	S	1700.0	2400.0
	T	2400.0	3400.0
	U	3400.0	4900.0
	V	4900.0	7100.0
	W	7100.0	10200.0
	X	10200.0	14800.0
	Y	14800.0	21400.0
	Z	21400.0	30900.0

Maximum tolerance for each bin limit is ±18%.

Intensity Bin Limit (Con't)

Color	Bin	Intensity Range (mcd)	
		Min.	Max.
Yellow	C	2.5	4.0
	D	4.0	6.5
	E	6.5	10.3
	F	10.3	16.6
	G	16.6	26.5
	H	26.5	42.3
	I	42.3	67.7
	J	67.7	108.2
	K	108.2	173.2
	L	173.2	250.0
	M	250.0	360.0
	N	360.0	510.0
	O	510.0	800.0
	P	800.0	1250.0
	Q	1250.0	1800.0
	R	1800.0	2900.0
	S	2900.0	4700.0
	T	4700.0	7200.0
	U	7200.0	11700.0
	V	11700.0	18000.0
	W	18000.0	27000.0
	Y	14800.0	21400.0
	Z	21400.0	30900.0

Intensity Bin Limit (Con't)

Color	Bin	Intensity Range (mcd)	
		Min.	Max.
Green	B	1.8	2.9
	C	2.9	4.7
	D	4.7	7.6
	E	7.6	12.0
	F	12.0	19.1
	G	19.1	30.7
	H	30.7	49.1
	I	49.1	78.5
	J	78.5	125.7
	K	125.7	201.1
	L	201.1	289.0
	M	289.0	417.0
	N	417.0	680.0
	O	680.0	1100.0
	P	1100.0	1800.0
	Q	1800.0	2700.0
	R	2700.0	4300.0
	S	4300.0	6800.0
	T	6800.0	10800.0
	U	10800.0	16000.0
	V	16000.0	25000.0
	W	25000.0	40000.0
	Z	21400.0	30900.0

Color Categories

Color	Cat #	Lambda (nm)	
		Min.	Max.
Green	6	561.5	564.5
	5	564.5	567.5
	4	567.5	570.5
	3	570.5	573.5
	2	573.5	576.5
	1	582.0	584.5
	3	584.5	587.0
Yellow	2	587.0	589.5
	4	589.5	592.0
	5	592.0	593.0

Tolerance for each bin limit is ±0.5 nm.

Mechanical Option Matrix

Mechanical Option Code	Definition
00	Bulk Packaging, minimum increment 500 pcs/bag
01	Tape & Reel, crimped leads, minimum increment 1300 pcs/bag
02	Tape & Reel, straight leads, minimum increment 1300 pcs/bag
A1	T-1, Right Angle Housing, uneven leads, minimum increment 500 pcs/bag
A2	T-1, Right Angle Housing, even leads, minimum increment 500 pcs/bag
B1	T-1$^{3}/_{4}$ Angle Housing, uneven lead, minimum increment 500 pcs/bag
B2	T-1$^{3}/_{4}$ Angle Housing, even leads, minimum increment 500 pcs/bag

Note: All categories are established for classification of products. Products may not be available in all categories. Please contact your local Avago representative for further clarification/information.