HLMP-40xx, HLMP-08xx

T-1 3/4, 2 mm x 5 mm Rectangular Bicolor LED Lamps

Description

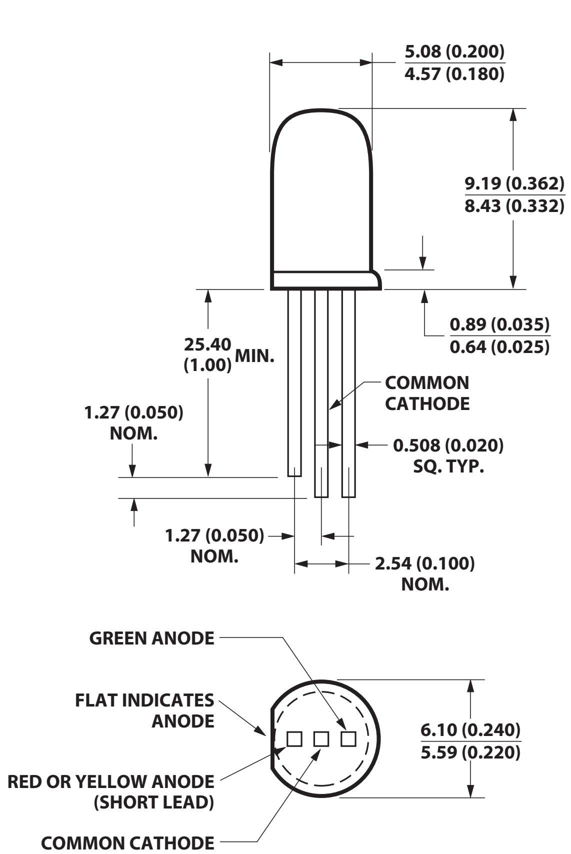
The T-1 3/4 HLMP-40xx and 2 mm by 5 mm rectangular HLMP-08xx are three leaded bicolor light sources designed for a variety of applications where dual state illumination is required in the same package. There are two LED chips, mounted on a central common cathode lead for maximum on-axis viewability. Colors between the two chips can be generated by independently pulse width modulating the LED chips.

Features

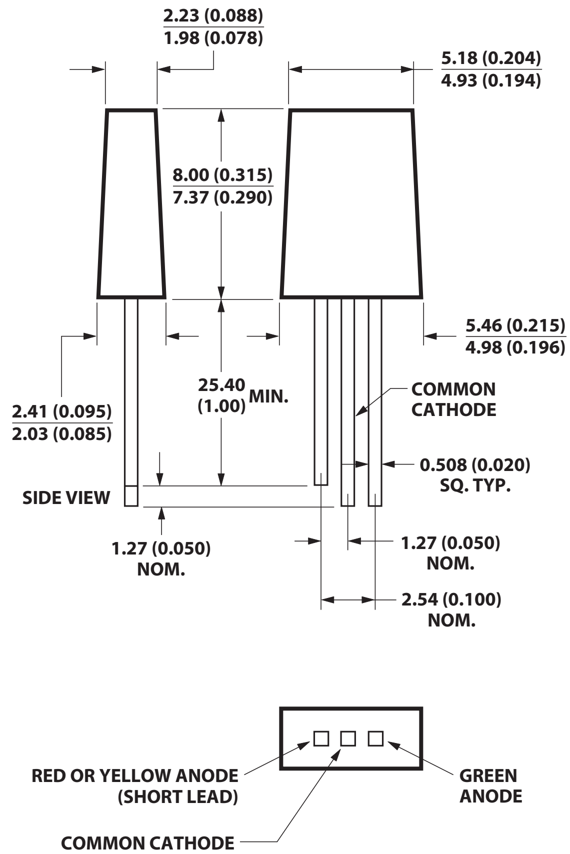
- Two color operation
- Three leads with one common cathode
- Option of straight or spread leads configuration

Package Dimensions

HLMP-40xx Straight Leads



HLMP-08xx Straight Leads



Device Selection Guide

Package	Part Number	Color	Package Lens	Min. Luminous Intensity Iv (mcd)			
				Green	Red	Yellow	I_F (mA)
T-1 3/4	HLMP-4000	Green/Red	Non tinted, diffused	4.2	2.1		10
	HLMP-4000#xxx			4.2	2.1		10
	HLMP-4015	Green/Yellow	Non tinted, non-diffused	20.0		20.0	20
Rectangular	HLMP-0800	Green/Red	Non tinted, diffused	2.6	2.1		20
	HLMP-0805	Green/Yellow	Non tinted, diffused	2.6		14	20

Absolute Maximum Ratings at T_A = 25°C

Parameter	Red/Green	Yellow/Green	Unit
Peak Forward Current	90	60	mA
Average Forward Current[a b]	25	20	mA
DC Current[b]	30	20	mA
Power Dissipation[c]	135	135	mW
Operating Temperature Range	–20 to +100	–20 to +100	°C
Storage Temperature Range	–40 to +100	–40 to +100	°C
Reverse Voltage (I_R = 100 µA)	5	5	V

a. See Figure 5 to establish pulsed operating conditions.

b. The combined simultaneous current must not exceed the maximum.

c. The combined simultaneous current must not exceed the maximum.

Electrical/Optical Characteristics at T_A = 25°C

		Red			Green			Yellow				
Sym.	Parameter	Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.	Unit	Test Conditions
λ_P	Peak Wavelength	—	632	—	—	570	—	—	590	—	nm	20 mA
λ_d	Dominant Wavelength[a]	—	626	—	—	569	—	—	589	—	nm	20 mA
τ_s	Speed of Response	—	90	—	—	260	—	—	90	—	ns	
C	Capacitance	—	11	—	—	18	—	—	15	—	pF	V_F = 0; f = 1 MHz
V_F	Forward Voltage	—	2.0	2.6	—	2.1	3.0	—	2.0	2.6	V	I_F = 20 mA, Figure 2
V_R	Reverse Voltage	5	—	—	5	—	—	5	—	—	V	I_R = 100 µA
$R\theta_{J-PIN}$	Thermal Resistance	—	210	—	—	210	—	—	210	—	°C/W	Junction to Cathode Lead
$2\theta_{1/2}$	Included Angle Between Half Luminous Intensity Points[b]											
	HLMP-40xx	—	65	—	—	65	—	—	65	—	Deg.	20 mA
	HLMP-08xx	—	100	—	—	100	—	—	100	—		20 mA
η_v	Luminous Efficacy[c]	—	180	—	—	640	—	—	500	—	lm/W	Emitted Luminous Flux/ Emitted Radiant Flux

a. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the single wavelength which defines the color of the device.

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

c. Radiant intensity, Ie, in watts steradian, may be found from the equation Ie = Iv/hV, where Iv is the luminous intensity in candelas and h V is the luminous efficacy in lumens/watt.

Part Numbering System

H	L	M	P	-	x_1	x_2	x_3	x_4	#	x_5	x_6	x_7

Code	Description	Option	
x_1 x_2	Package Type	40	T-1 3/4 (5 mm)
		08	Rectangular 2 mm x 5 mm
x_3 x_4	Color	00	Red/Green
		05	Yellow/Green
		15	Yellow/Green
x_5 x_6 x_7	Packaging Options	002	Tape and Reel, Straight Leads
		010	Right Angle Housing, Even Leads

Packaging Option Matrix

Packaging Option Code	Definition
002	Tape and Reel, straight leads, minimum increment 1300 pieces/reel
010	Right Angle Housing, even leads, minimum increment 500 pcs/bag

Figure 1: Relative intensity vs. wavelength

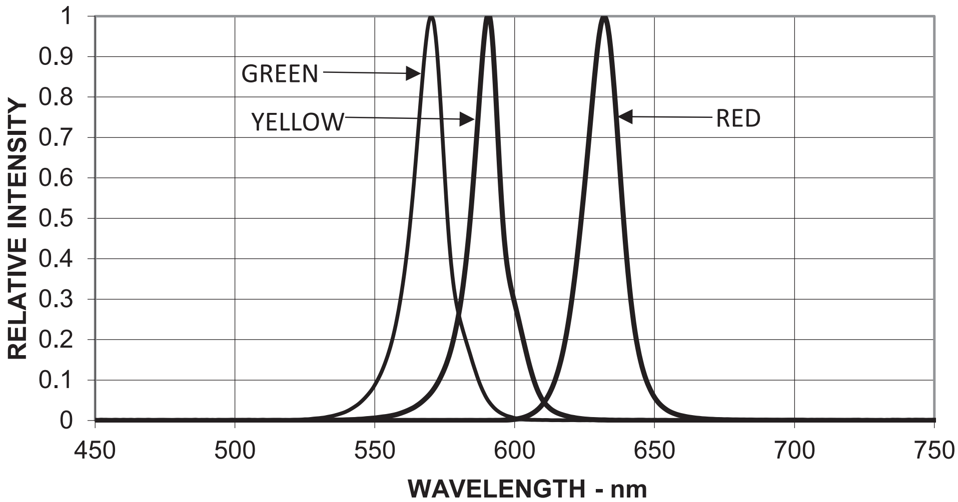


Figure 2: Forward current vs. forward voltage characteristics

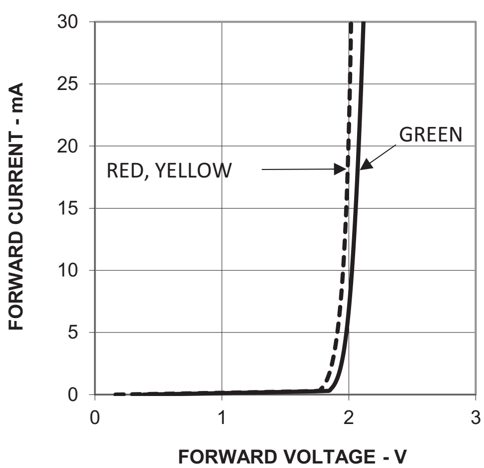


Figure 3: Relative luminous intensity vs. DC forward current (HLMP-4015, HLMP-08xx)

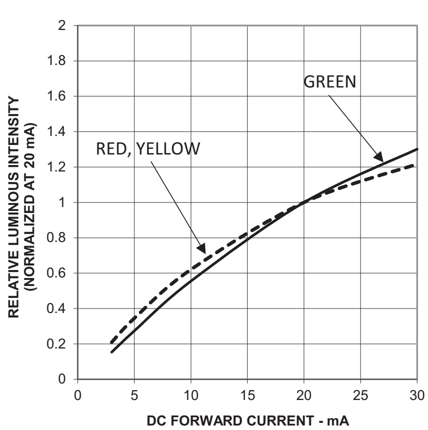


Figure 4: Relative luminous intensity vs DC forward current (HLMP-4000)

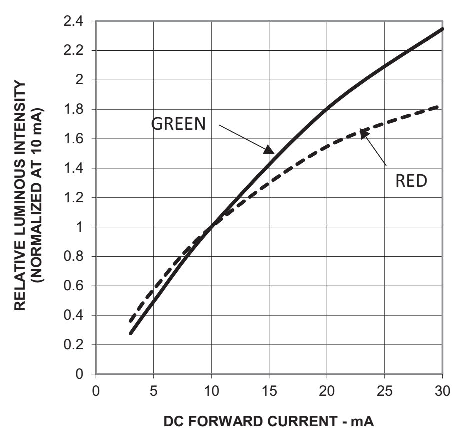


Figure 5: Maximum tolerable peak current vs. pulse duration (IDC Max. as per maximum ratings)

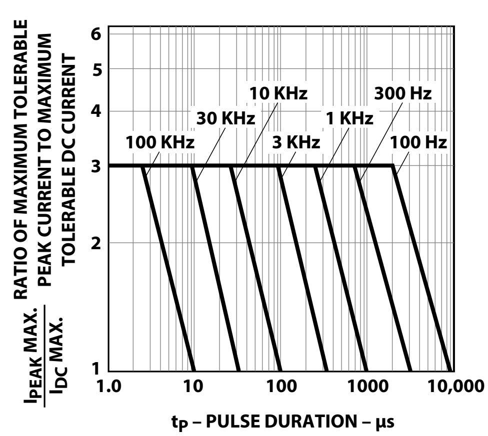


Figure 6: Relative luminous intensity vs. angular displacement for HLMP-40xx

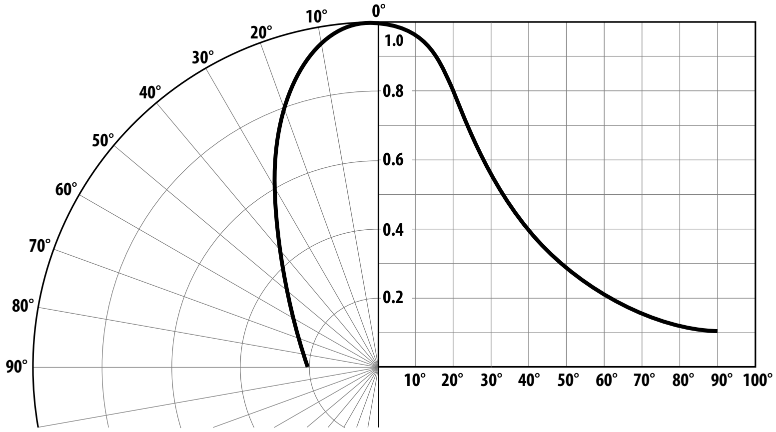
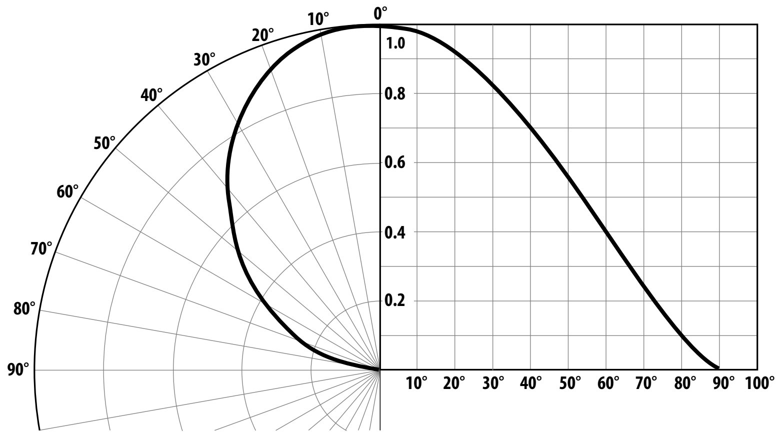


Figure 7: Relative luminous intensity vs. angular displacement for HLMP-08xx



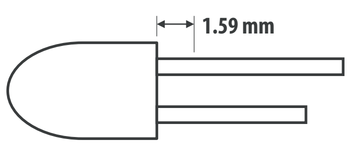
Precautions

Lead Forming

- The leads of an LED lamp may be preformed or cut to length prior to insertion and soldering on PC board.
- For better control, use the proper tool to precisely form and cut the leads to applicable length rather than doing it manually.
- If manual lead cutting is necessary, cut the leads after the soldering process. The solder connection forms a mechanical ground that prevents mechanical stress due to lead cutting from traveling into LED package. Use this method for the hand soldering operation, because the excess lead length also acts as small heat sink.

Soldering and Handling

- Take care during the PCB assembly and soldering process to prevent damage to the LED component.
- LED component may be effectively hand soldered to PCB. However, do this under unavoidable circumstances, such as rework. The closest manual soldering distance of the soldering heat source (soldering iron's tip) to the body is 1.59 mm. Soldering the LED using soldering iron tip closer than 1.59 mm might damage the LED.



- Apply ESD precautions on the soldering station and personnel to prevent ESD damage to the LED component that is ESD sensitive. Refer to Broadcom application note AN 1142 for details. The soldering iron used must have a grounded tip to ensure electrostatic charge is properly grounded.
- Recommended soldering condition.

Wave Soldering[a, b]	Manual Solder Dipping	
Pre-heat Temperature	105°C max.	—
Pre-heat Time	60s max.	—
Peak Temperature	250°C max.	260°C max.
Dwell Time	3s max.	5s max.

a. The preceding conditions refer to measurement with a thermocouple mounted at the bottom of the PCB.

b. Use only bottom pre-heaters to reduce thermal stress experienced by LED.

- Set and maintain wave soldering parameters according to the recommended temperature and dwell time. Perform daily checks on the soldering profile to ensure that it always conforms to the recommended soldering conditions.

NOTE: PCBs with different size and design (component density) will have a different heat mass (heat capacity). This might cause a change in temperature experienced by the board if the same wave soldering setting is used. Therefore, recalibrate the soldering profile again before loading a new type of PCB.

NOTE: Take extra precautions during wave soldering to ensure that the maximum wave temperature does not exceed 250°C and the solder contact time does not exceed 3s. Over-stressing the LED during the soldering process might cause premature failure to the LED due to delamination.

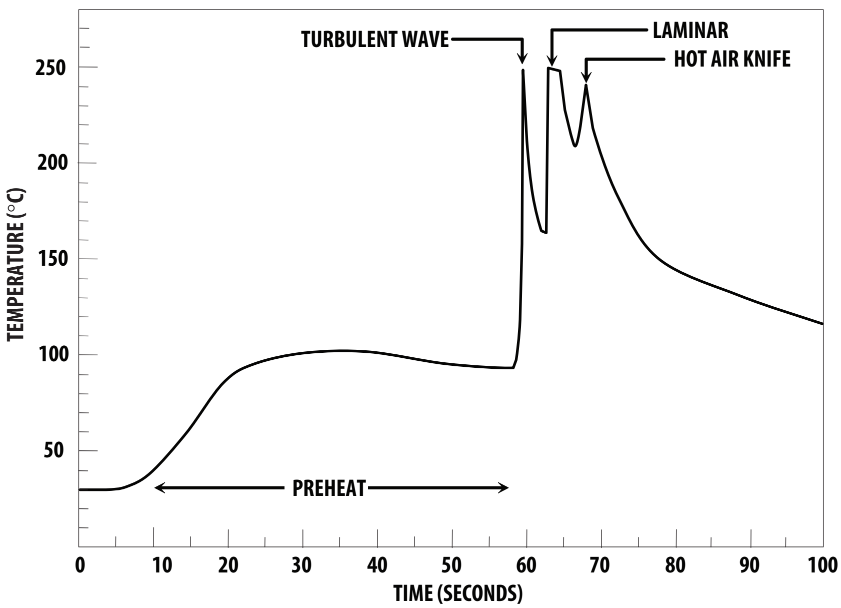
- Loosely fit any alignment fixture that is being applied during wave soldering and do not apply weight or force on the LED. Use nonmetal material because it absorbs less heat during the wave soldering process.
- At elevated temperature, LED is more susceptible to mechanical stress. Therefore, allow the PCB to cool down to room temperature prior to handling, which includes removal of alignment fixture or pallet.
- If PCB board contains both through-hole (TH) LED and other surface-mount components, solder surface-mount components on the top side of the PCB. If the surface mount must be on the bottom side, solder these components using reflow soldering prior to the insertion of the TH LED.
- The recommended PC board plated through holes (PTH) size for LED component leads follows.

	LED Component Lead Size	Diagonal	Plated Through-Hole Diameter
Lead size (typ.)	0.45 × 0.45 mm (0.018 × 0.018 in.)	0.636 mm (0.025 in.)	0.98 to 1.08 mm (0.039 to 0.043 in.)
Dambar shear-off area (max.)	0.65 mm (0.026 in.)	0.919 mm (0.036 in.)	
Lead size (typ.)	0.50 × 0.50 mm (0.020 × 0.020 in.)	0.707 mm (0.028 in.)	1.05 to 1.15 mm (0.041 to 0.045 in.)
Dambar shear-off area (max.)	0.70 mm (0.028 in.)	0.99 mm (0.039 in.)	

NOTE: Refer to application note AN1027 for more information on soldering LED components.

- Over-sizing the PTH can lead to twisted LED after clinching. On the other hand under sizing the PTH can cause difficulty inserting the TH LED.

Figure 8: Example of Wave Soldering Temperature Profile for TH LED



Recommended solder:
Sn63 (Leaded solder alloy)
SAC305 (Lead-free solder alloy)

Flux: Rosin flux

Solder bath temperature:
245°C ± 5 °C (maximum peak temperature = 250°C)

Dwell time: 1.5s – 3.0s (maximum = 3 seconds)

Note: Allow for board to be sufficiently cooled to room temperature before you exert mechanical force.

Disclaimer:

Broadcom's products are not specifically designed, manufactured, or authorized for sale as parts, components, or assemblies for the planning, construction, maintenance, or direct operation of a nuclear facility or for use in medical devices or applications. The customer is solely responsible, and waives all rights to make claims against Broadcom or its suppliers, for all loss, damage, expense, or liability in connection with such use.

Broadcom reserves the right to make changes without further notice to any products or data herein to improve reliability, function, or design. Information furnished by Broadcom is believed to be accurate and reliable. However, Broadcom does not assume any liability arising out of the application or use of this information, nor the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.

BROADCOM®

Lead (Pb) Free
RoHS Compliant