HLMP-331x, HLMP-341x, HLMP-351x Series

T-1 3/4 (5 mm) High Intensity LED Lamps

Data Sheet

Description

This family of T-1 3/4 nondiffused LED lamps is specially designed for applications requiring higher on-axis intensity than is achievable with a standard lamp. The light generated is focused to a narrow beam to achieve this effect.

Features

- High intensity
- Choice of 3 bright colors
  - High Efficiency Red
  - Yellow
  - High Performance Green
- Popular T-1 3/4 diameter package
- Selected minimum intensities
- Narrow viewing angle
- General purpose leads
- Reliable and rugged
- Available on tape and reel

Selection Guide

Color	Part Number	Luminous Intensity Iv (mcd) @ 10 mA Min.	Max.
Red	HLMP-3316	22.00	-
	HLMP-3316-I00xx	22.0	-
Yellow	HLMP-3416	14.7	-
Green	HLMP-3519	10.6	-
	HLMP-3519-F00xx	10.6	-

Part Numbering System

HLMP - 3x1x - xxxxxx

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

Color Bin Options
0: Full Color Bin Distribution

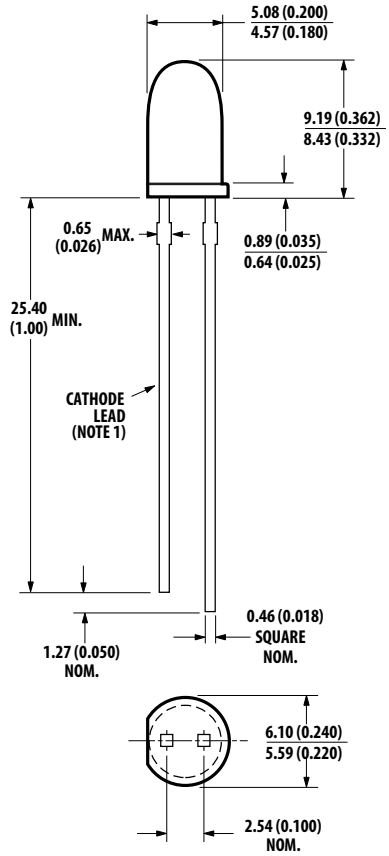
Maximum Iv Bin Options
0: Open (no max. limit)
Others: Please refer to the Iv Bin Table

Minimum Iv Bin Options
Please refer to the Iv Bin Table

Brightness Level
6, 9: Higher Brightness

Color Options
3: GaP HER
4: GaP Yellow
5: GaP Green

Package Dimensions



Notes:
1. All dimensions are in millimeters (inches).
2. An epoxy meniscus may extend about 1 mm (0.40") down the leads.
3. For PCB hole recommendations, see the Precautions section.

Electrical Characteristics at $T_A = 25°C$

Symbol	Description	Device HLMP-	Min.	Typ.	Max.	Units	Test Conditions
I_V	Luminous Intensity	3316	22	60.0		mcd	I_F = 10 mA (Figure 3)
		3416	14.7	50.0		mcd	I_F = 10 mA (Figure 8)
		3519	10.6	70.0		mcd	I_F = 10 mA (Figure 13)
$2\theta^1/_2$	Including Angle Between Half Luminous Intensity Points	3316		35		Deg.	I_F = 10 mA See Note 1 (Figure 6)
		3416		35		Deg.	I_F = 10 mA See Note 1 (Figure 11)
		3519		24		Deg.	I_F = 10 mA See Note 1 (Figure 16)
λ_{PEAK}	Peak Wavelength	331X 341X 351X		635 583 565		nm	Measurement at Peak (Figure 1)
$\Delta\lambda_{1/2}$	Spectral Line Halfwidth	331X 341X 351X		40 36 28		nm	
λ_d	Dominant Wavelength	331X 341X 351X		626 585 569		nm	See Note 2 (Figure 1)
τ_s	Speed of Response	331X 341X 351X		90 90 500		ns	
C	Capacitance	331X 341X 351X		11 15 18		pF	V_F = 0; f = 1 MHz
$R\theta_{J\text{-}PIN}$	Thermal Resistance	331X 341X 351X		260		°C/W	Junction to Cathode Lead
V_F	Forward Voltage	331X 341X 351X		1.9 2.0 2.1	2.4 2.4 2.7	V	I_F = 10 mA (Figure 2) I_F = 10 mA (Figure 7) I_F = 10 mA (Figure 12)
V_R	Reverse Breakdown Volt.	All	5.0			V	I_R = 100 µA
η_V	Luminous Efficacy	331X 341X 351X		145 500 595		$\frac{\text{lumens}}{\text{Watt}}$	See Note 3

Notes:

1. $\theta_{1/2}$ is the off-axis angle at which the luminous intensity is half the axial luminous intensity.
2. The dominant wavelength, λ_d, is derived from the CIE chromaticity diagram and represents the single wavelength which defines the color of the device.
3. 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.

Absolute Maximum Ratings at $T_A = 25°C$

Parameter	331X Series	341X Series	351X Series	Units
Peak Forward Current	90	60	90	mA
Average Forward Current[1]	25	20	25	mA
DC Current[2]	30	20	30	mA
Power Dissipation[3]	135	85	135	mW
Reverse Voltage (I_R = 100 µA)	5	5	5	V
Transient Forward Current[4] (10 µsec Pulse)	500	500	500	mA
LED Junction Temperature	110	110	110	°C
Operating Temperature Range	-40 to +100	-40 to +100	-20 to +100	°C
Storage Temperature Range	-40 to +100	-40 to +100	-40 to +100	°C

Notes:

1. See Figure 5 (Red), 10 (Yellow), or 15 (Green) to establish pulsed operating conditions.
2. For Red and Green series derate linearly from 50°C at 0.5 mA/°C. For Yellow series derate linearly from 50°C at 0.2 mA/°C.
3. For Red and Green series derate power linearly from 25°C at 1.8 mW/°C. For Yellow series derate power linearly from 50°C at 1.6 mW/°C.
4. The transient peak current is the maximum non-recurring peak current that can be applied to the device without damaging the LED die and wirebond. It is not recommended that the device be operated at peak currents beyond the peak forward current listed in the Absolute Maximum Ratings.

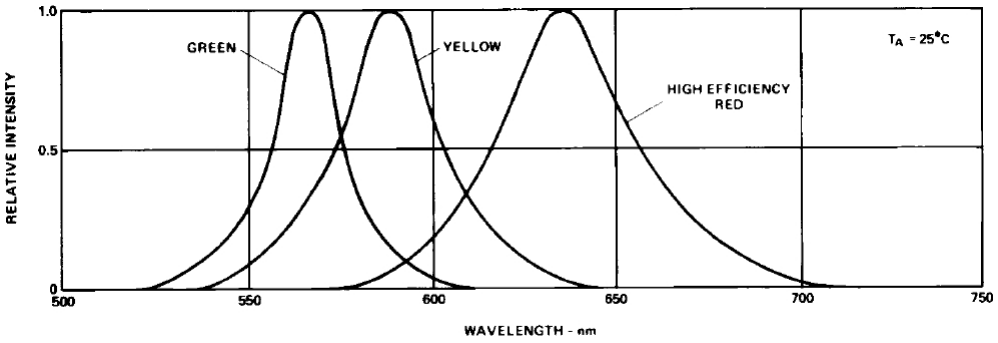


Figure 1. Relative intensity vs. wavelength.

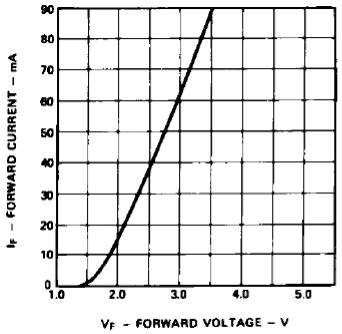


Figure 2. Forward current vs. forward voltage characteristics.

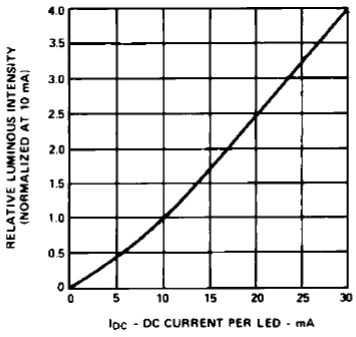


Figure 3. Relative luminous intensity vs. DC forward current.

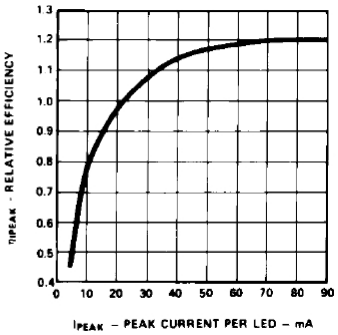


Figure 4. Relative efficiency (luminous intensity per unit current) vs. peak LED current.

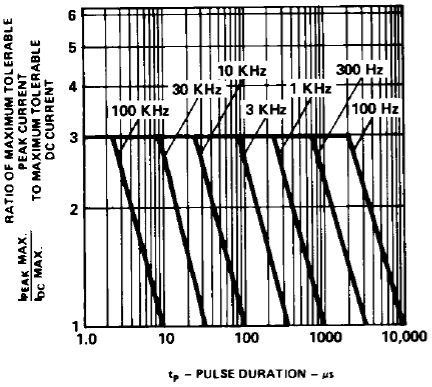


Figure 5. Maximum tolerable peak current vs. pulse duration (I_{DC} MAX as per MAX ratings).

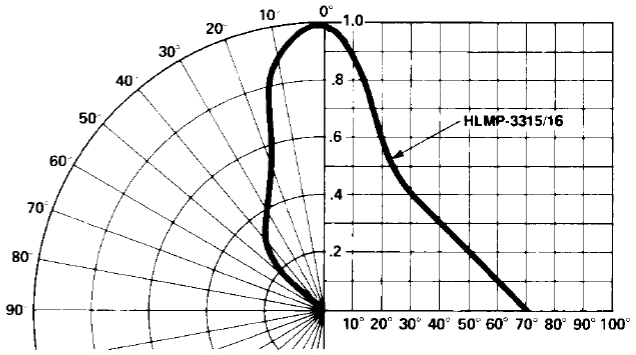


Figure 6. Relative luminous intensity vs. angular displacement.

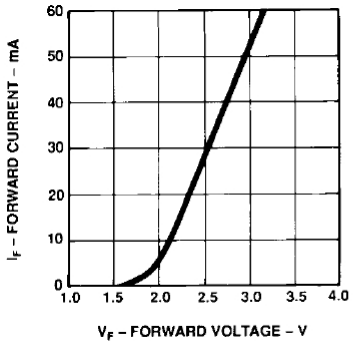


Figure 7. Forward current vs. forward voltage characteristics.

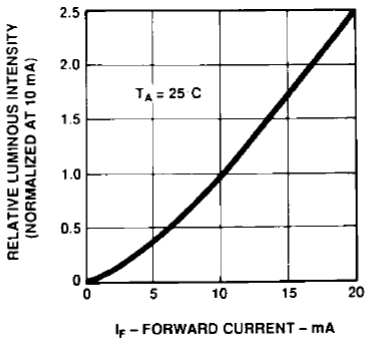


Figure 8. Relative luminous intensity vs. DC forward current.

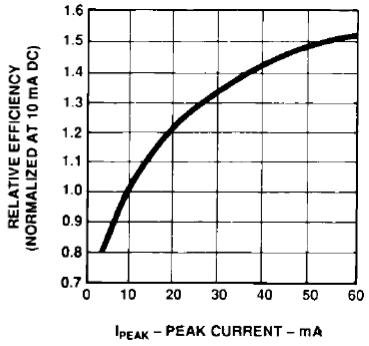


Figure 9. Relative efficiency (luminous intensity per unit current) vs. peak current.

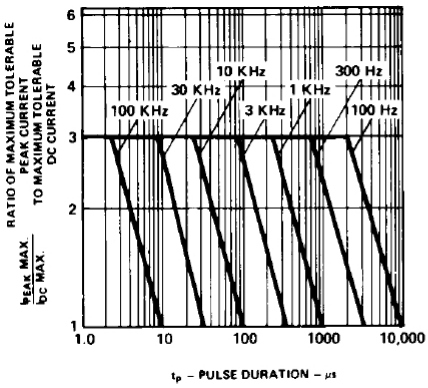


Figure 10. Maximum tolerable peak current vs. pulse duration (I_{DC} MAX as per MAX ratings).

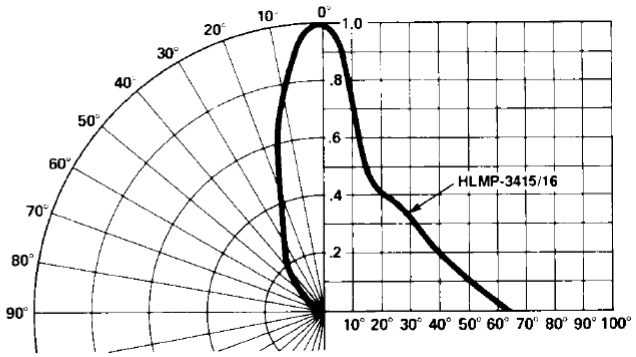


Figure 11. Relative luminous intensity vs. angular displacement.

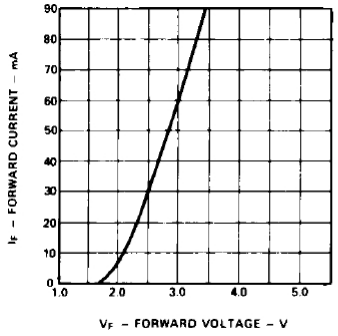


Figure 12. Forward current vs. forward voltage characteristics.

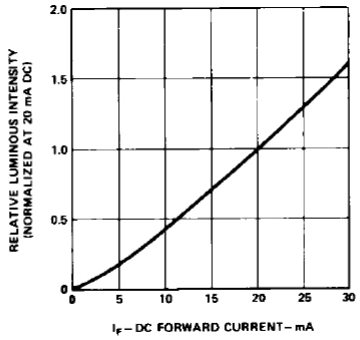


Figure 13. Relative luminous intensity vs. DC forward current.

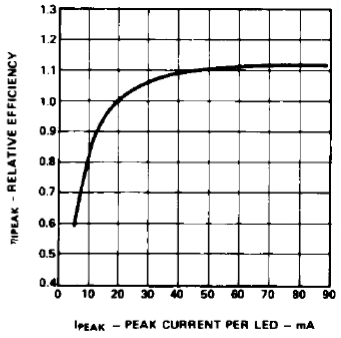


Figure 14. Relative efficiency (luminous intensity per unit current) vs. peak LED current.

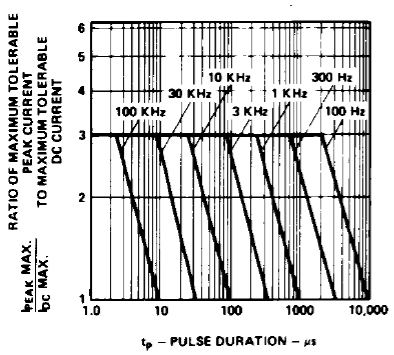


Figure 15. Maximum tolerable peak current vs. pulse duration (I_{DC} MAX as per MAX ratings).

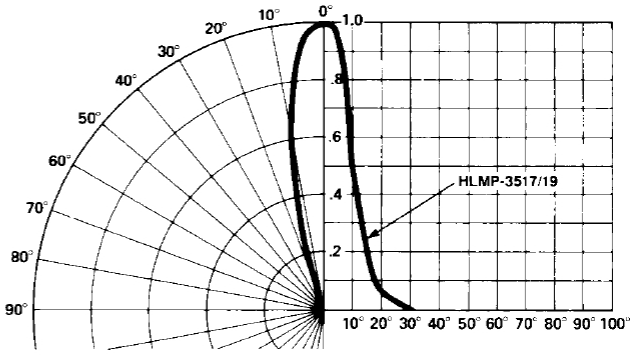


Figure 16. Relative luminous intensity vs. angular displacement. T-1$^3/_4$ lamp.

Table 2. Intensity Bin Limit

Color	Bin	Intensity Range (mcd)	
		Min.	Max.
Red	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

Table 2. (Cont'd)

Color	Bin	Intensity Range (mcd)	
		Min.	Max.
Yellow	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

Table 2. (Cont'd)

Color	Bin	Intensity Range (mcd)	
		Min.	Max.
Green	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

Maximum tolerance for each bin limit is ±18%.

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
Yellow	1	582.0	584.5
	3	584.5	587.0
	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
B1	Right Angle Housing, uneven leads, minimum increment 500 pcs/bag
B2	Right 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.

Precautions

Lead Forming

- The leads of an LED lamp may be preformed or cut to length prior to insertion and soldering into PC board.
- If lead forming is required before soldering, care must be taken to avoid any excessive mechanical stress induced to LED package. Otherwise, cut the leads of LED to length after soldering process at room temperature. The solder joint formed will absorb the mechanical stress of the lead cutting from traveling to the LED chip die attach and wirebond.
- It is recommended that tooling made to precisely form and cut the leads to length rather than rely upon hand operation.

Soldering Conditions

- Care must be taken during PCB assembly and soldering process to prevent damage to LED component.
- The closest LED is allowed to solder on board is 1.59 mm below the body (encapsulant epoxy) for those parts without standoff.
- Recommended soldering conditions:

	Wave Soldering	Manual Solder Dipping
Pre-heat Temperature	105 °C Max.	–
Pre-heat Time	30 sec Max.	–
Peak Temperature	250 °C Max.	260 °C Max.
Dwell Time	3 sec Max.	5 sec Max.

- Wave soldering parameter must be set and maintained according to recommended temperature and dwell time in the solder wave. Customer is advised to periodically check on the soldering profile to ensure the soldering profile used is always conforming to recommended soldering condition.
- If necessary, use fixture to hold the LED component in proper orientation with respect to the PCB during soldering process.
- Proper handling is imperative to avoid excessive thermal stresses to LED components when heated. Therefore, the soldered PCB must be allowed to cool to room temperature, 25°C, before handling.
- Special attention must be given to board fabrication, solder masking, surface plating and lead holes size and component orientation to assure solderability.
- Recommended PC board plated through hole sizes for LED component leads:

	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.

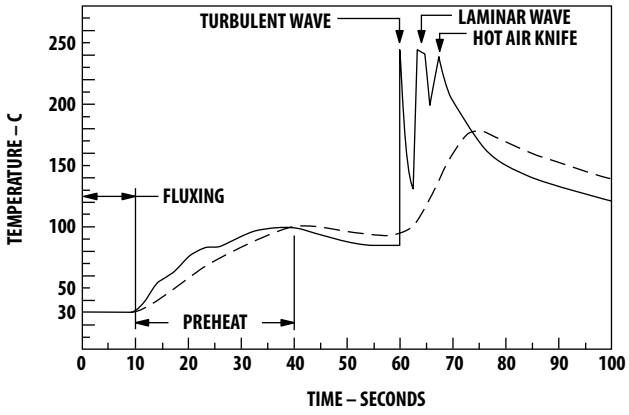


Figure 17. Recommended wave soldering profile.

BOTTOM SIDE OF PC BOARD
TOP SIDE OF PC BOARD

CONVEYOR SPEED = 1.83 M/MIN (6 FT/MIN)
PREHEAT SETTING = 150C (100C PCB)
SOLDER WAVE TEMPERATURE = 245C
AIR KNIFE AIR TEMPERATURE = 390C
AIR KNIFE DISTANCE = 1.91 mm (0.25 IN.)
AIR KNIFE ANGLE = 40
SOLDER: SN63; FLUX: RMA

NOTE: ALLOW FOR BOARDS TO BE SUFFICIENTLY COOLED BEFORE EXERTING MECHANICAL FORCE.

For product information and a complete list of distributors, please go to our website: **www.avagotech.com**

AV02-1023EN - July 24, 2013