HLMP-N305, HLMP-NG0x, HLMP-NL06

T-1 (3 mm) Auto Insertable LED Lamps

Data Sheet

Description

This family of 3 mm LED Lamps is capable of withstanding automatic insertion and wave soldering processes.

Designed with a thick epoxy flange and soft leadframe material, it is ideal for clinch and cut operations.

Applications

- General purpose
- High volume manufacturing

Features

- T-1 (3 mm) auto-insertable package
- High brightness light output
- Tinted non-diffused lens
- Wide viewing angle
- Available colors: Red, Amber and Yellow
- Available with straight or formed lead tape and reel options

Device Selection Guide

High Brightness Lamps

Part Number	Color	Package lens	Luminous Intensity, Min. Iv @ 20 mA	Viewing Angle, $2\theta_{1/2}$	Package Drawing
HLMP-NG05	AlInGaP Red	Micro-tinted	90.2	45°	A
HLMP-NG07	AlInGaP Red	Micro-tinted	90.2	60°	B
HLMP-NL06	AlInGaP Amber	Micro-tinted	96.2	60°	B

High Efficiency Lamps

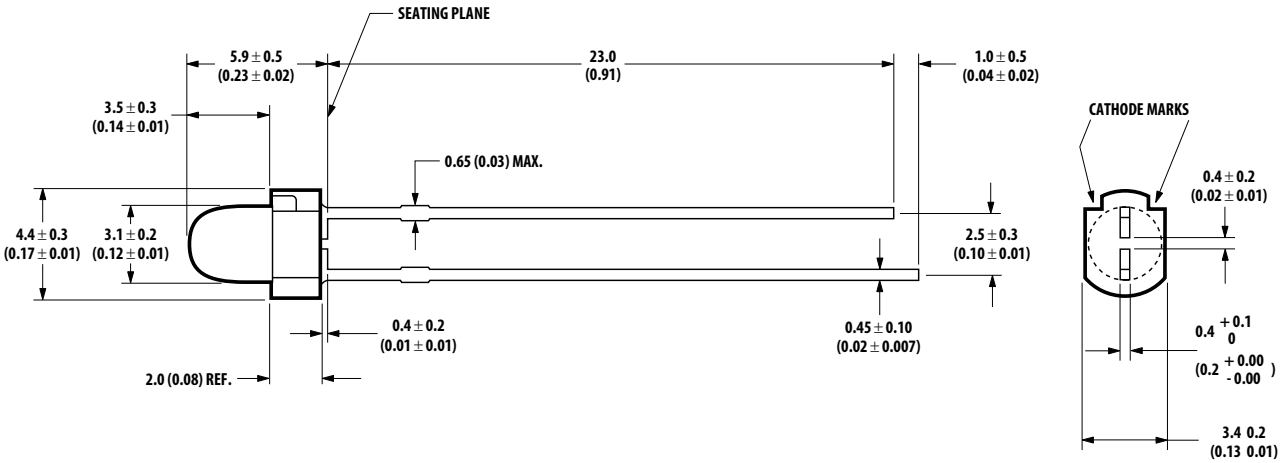
Part Number	Color	Package lens	Luminous Intensity, Min. Iv @ 10 mA	Viewing Angle, $2\theta_{1/2}$	Package Drawing
HLMP-N305	GaP Yellow	Tinted	14.7	45°	A

Note:

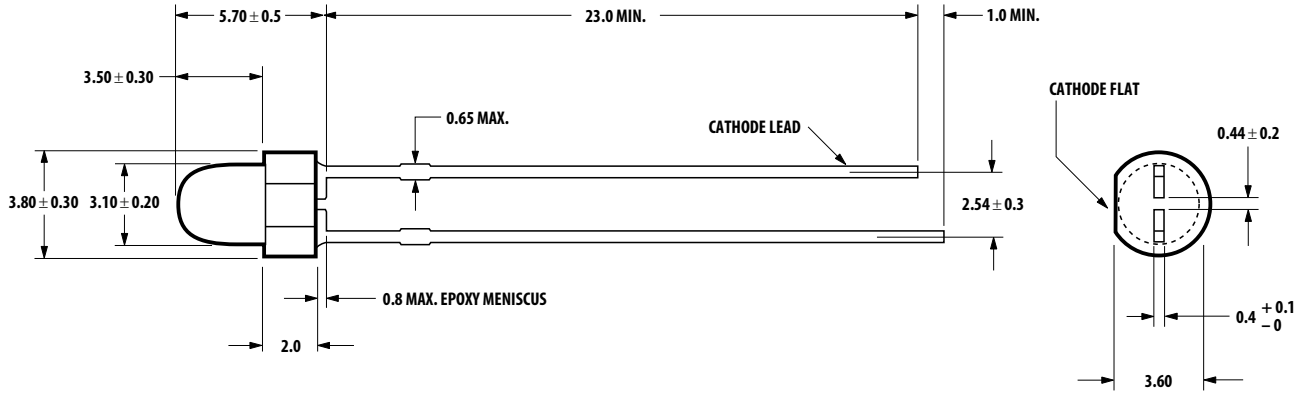
1. $2\theta^1/_2$ is the off axis angle where the luminous intensity is $^1/_2$ the on axis intensity.

Package Dimensions

Package Drawing "A"



Package Drawing "B"



Notes:
1. All dimensions are in millimeters (inches).
2. Leads are mild steel with tin plating.
3. Epoxy meniscus of 0.8 mm (0.03 in.) Maximum may extend to the leads.
4. For PCB hole recommendations, see the Precautions section.

Part Numbering System

HLMP - N x xx # xxx

Mechanical Option
002: Tape & Reel, Straight Leads

Viewing Angle Options
05: 45 Degree
06, 07: 60 Degree

Color Options
3: GaP Yellow
G: AlInGaP Red
L: AlInGaP Amber

Absolute Maximum Ratings at $T_A = 25\ ^oC$

Parameter	Yellow	AlInGaP Amber & Red	Units
DC Forward Current[1]	20	30[2,3]	mA
Reverse Voltage (Ir = 100 µA)	5		V
Junction Temperature, T_{jmax}	110		°C
Storage Temperature Range	-40 to +85		°C
Operating Temperature Range	-20 to +85	-40 to +85	°C

Notes:
1. See Figure 4 for maximum current derating vs. ambient temperature.
2. Suggested minimum DC current: 10 mA.
3. Maximum Peak Pulsed Forward Current: 50 mA, 30 mA average.

Electrical Characteristics at $T_A = 25^oC$

	Forward Voltage Vf (Volts)			Capacitance C (pF), Vf = 0, f = 1 MHz	Thermal Resistance $R\theta_{J\text{-}PIN}$	Speed of Response τ_s (ns) Time Constant e^{-t/τ_s}
Part Number	Typ.	Max.	If (mA)	Typ.	(°C/W)	Typ.
HLMP-N305	2.00	2.6	10	15	290	90
HLMP-NL06[1]	2.02	2.4	20	40	240	20
HLMP-NG0x[1]	1.90	2.4	20	40	240	20

Note:
1. Please contact your Avago Sales Representative about operating currents below 10 mA.

Optical Characteristics at $T_A = 25\ ^oC$

	Luminous Intensity [1]		Typ. Peak	Typ. Dominant Wavelength [2]	Typ. Spectral Half Width	Luminous Efficacy [3]
Part Number	Min. (mcd)	I_f (mA)	Wavelength (nm)	(nm)	(nm)	(lm/W)
HLMP-NG05	90.2	20	635	626	17	150
HLMP-NG07	90.2	20	635	626	17	150
HLMP-NL06	96.2	20	592	590	17	480
HLMP-N305	14.7	10	583	585	36	500

Notes:
1. The luminous intensity, Iv, is measured at the mechanical axis of the lamp package. The actual peak of the spatial radiation pattern may not be aligned with this axis.
2. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the device.
3. The radiant intensity, Ie, in watts per steradian, may be found from the equation $Ie = Iv/\eta_v$, where Iv is the luminous intensity in candelas and η_v is the luminous efficacy in lumens/watt.

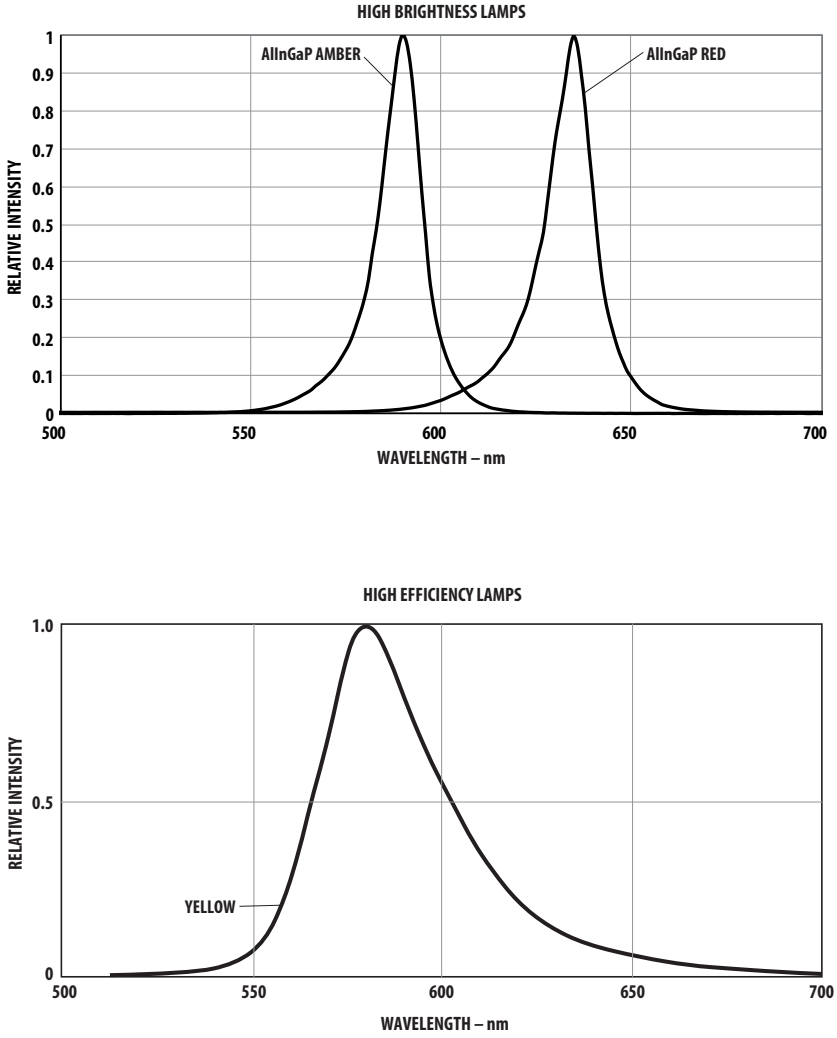


Figure 1. Relative intensity vs. peak wavelength.

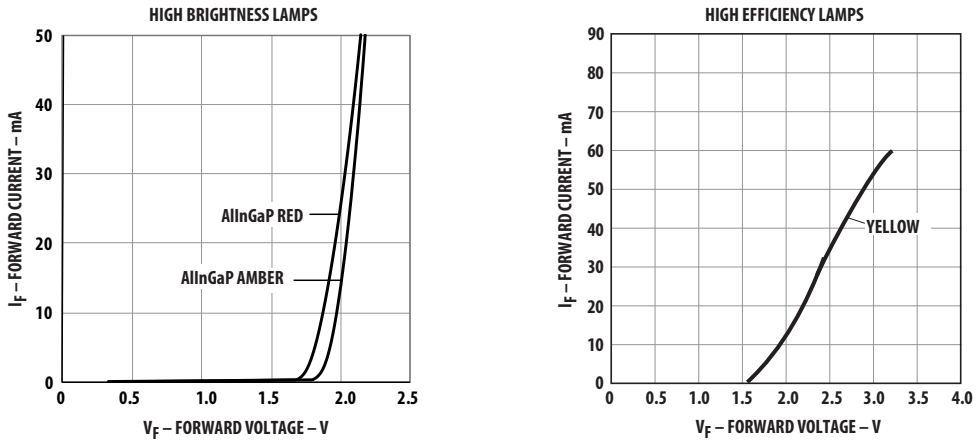


Figure 2. Forward current vs. forward voltage.

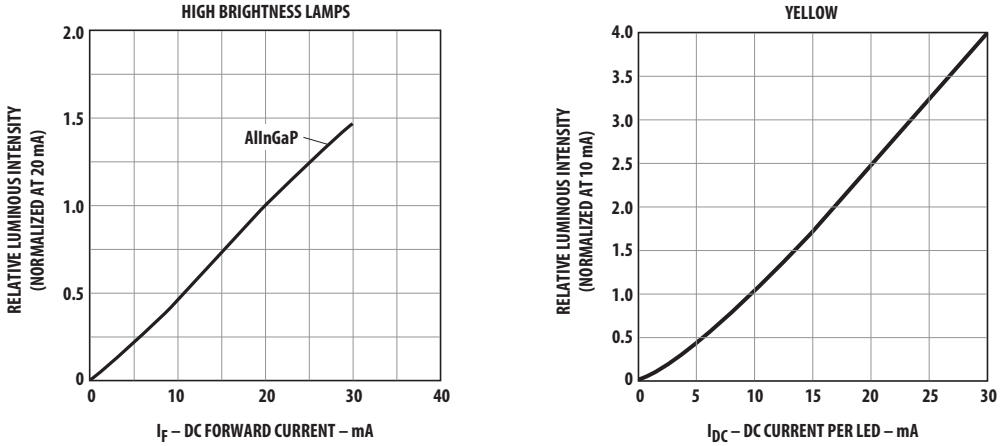


Figure 3. Relative luminous intensity vs. forward current.

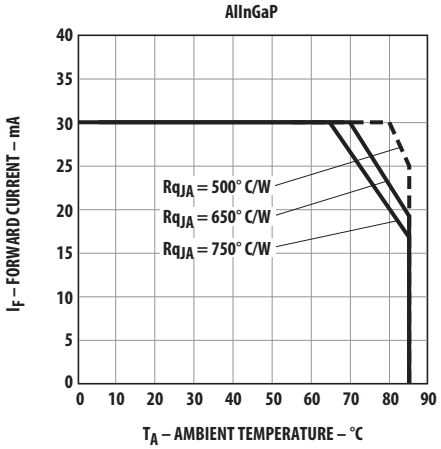


Figure 4. Maximum forward DC current vs. ambient temperature.

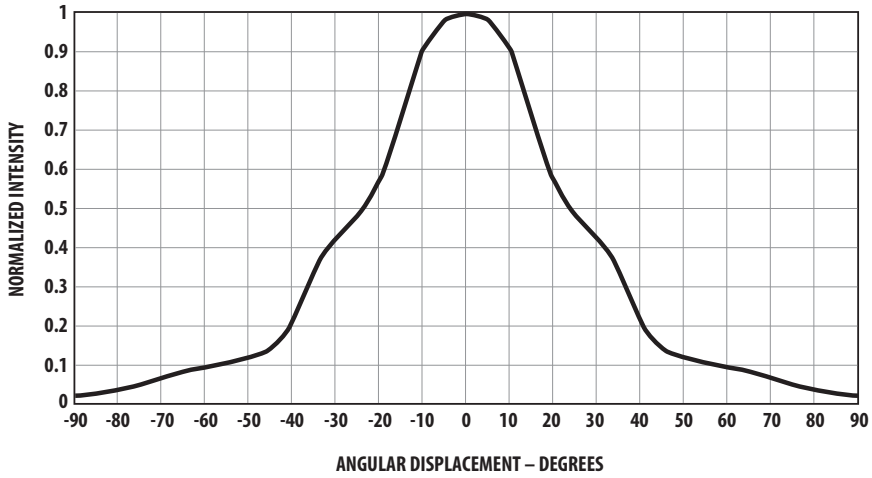


Figure 5. Representative spatial radiation pattern for 45° viewing angle.

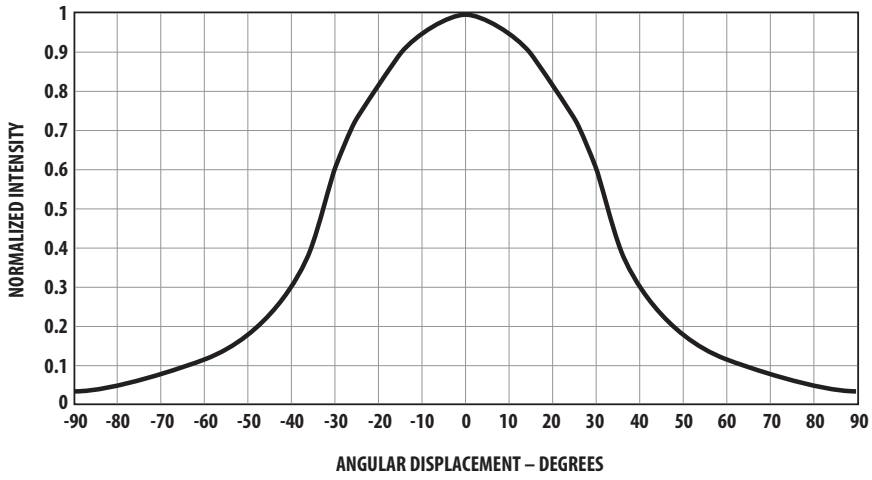


Figure 6. Representative spatial radiation pattern for 60° viewing angle.

Intensity Bin Limits

Color	Bin	Intensity Range (mcd) Min.	Max.
	H	13.8	27.6
	I	22.0	44.0
	J	35.2	70.4
	K	56.4	112.8
	L	90.2	180.4
	M	138.0	276.0
	N	200.0	400.0
	O	290.0	580.0
Red/Orange	P	500.0	1000.0
/Red-Orange	Q	700.0	1400.0
	R	1000.0	2000.0
	S	1400.0	2800.0
	T	2000.0	4000.0
	U	2900.0	5800.0
	V	4200.0	8400.0
	W	6000.0	12000.0
	X	8700.0	17400.0
	Y	12600.0	25200.0
	Z	18200.0	36400.0
	G	14.7	29.4
	H	23.5	47.0
	I	37.6	75.2
	J	60.1	120.2
	K	96.2	192.4
	L	147.0	294.0
	M	212.0	424.0
Yellow/Amber	N	300.0	600.0
	O	450.0	900.0
	P	700.0	1400.0
	Q	1000.0	2000.0
	R	1600.0	3200.0
	S	2600.0	5200.0
	T	4000.0	8000.0
	U	6500.0	13000.0
	V	10000.0	20000.0
	W	16000.0	30000.0

Maximum tolerance for each bin limit is ±18%.

Amber Color Bin Limits

(nm at 20 mA)

Bin Name	Min.	Max.
1	584.5	587.0
2	587.0	589.5
4	589.5	592.0
6	592.0	594.5

Tolerance for each bin limit is ±0.5 nm.

Color Categories

Color	Category #	Lambda (nm) Min.	Max.
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.

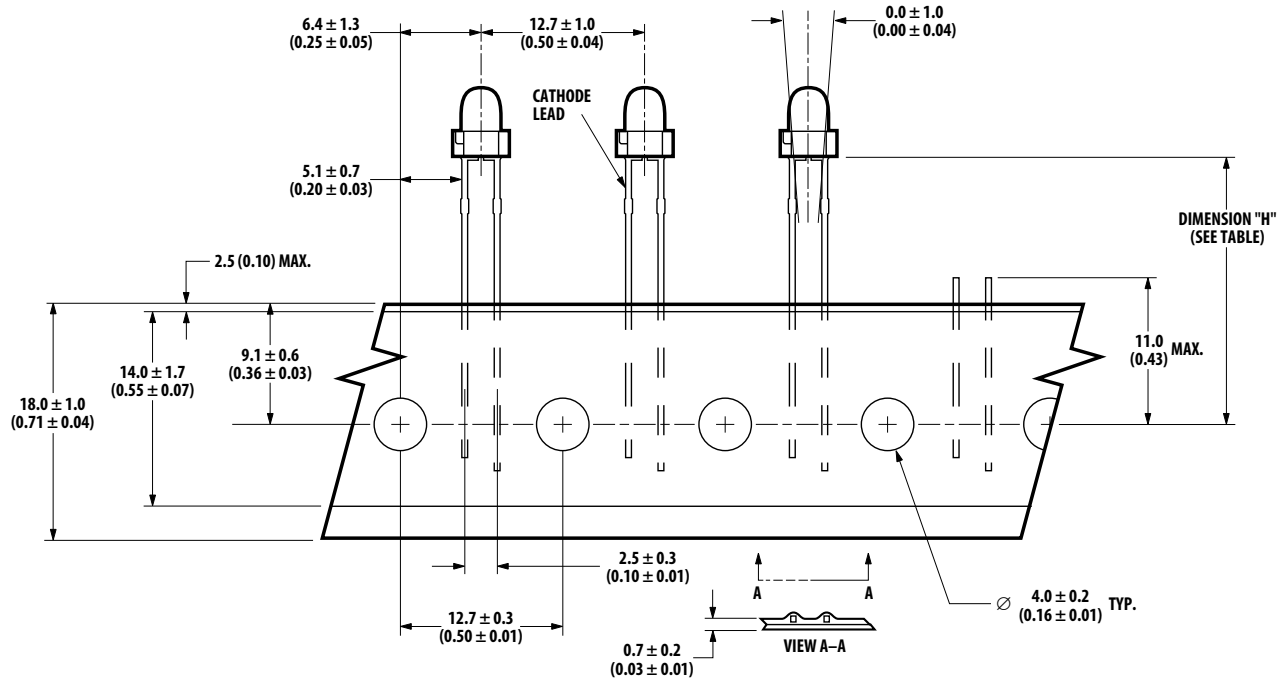
Taping Options

	Straight Lead		
Option	**#002**	**#2CA**	**#2CD**
Dimension "B"	–	–	–
Dimension "H"	20.5 ± 1.0 (0.81 ± 0.04)	18.0 ± 1.0 (0.71 ± 0.04)	20.5 ± 1.0 (0.81 ± 0.04)

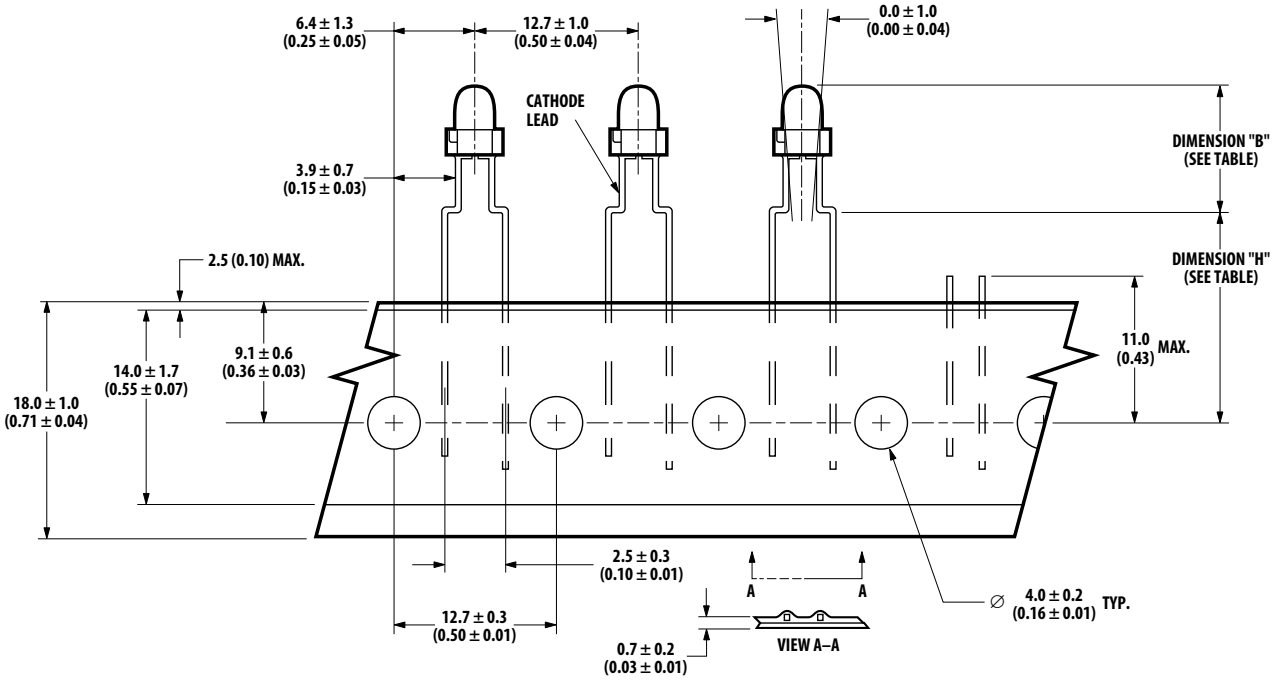
	Formed Lead						
Option	**#2UK**	**#2UL**	**#2UM**	**#2UN**	**#2UP**	**#2UQ**	**#2UR**
Dimension "B"	12.0 ± 1.0 (0.47 ± 0.04)	9.0 ± 1.0 (0.35 ± 0.04)	10.0 ± 1.0 (0.39 ± 0.04)	11.0 ± 1.0 (0.43 ± 0.04)	13.0 ± 1.0 (0.51 ± 0.04)	14.0 ± 1.0 (0.55 ± 0.04)	15.0 ± 1.0 (0.59 ± 0.04)
Dimension "H"				16.0 ± 1.0 (0.63 ± 0.04)			

Units: mm (inches)

Tape Outline Drawing



Straight Lead



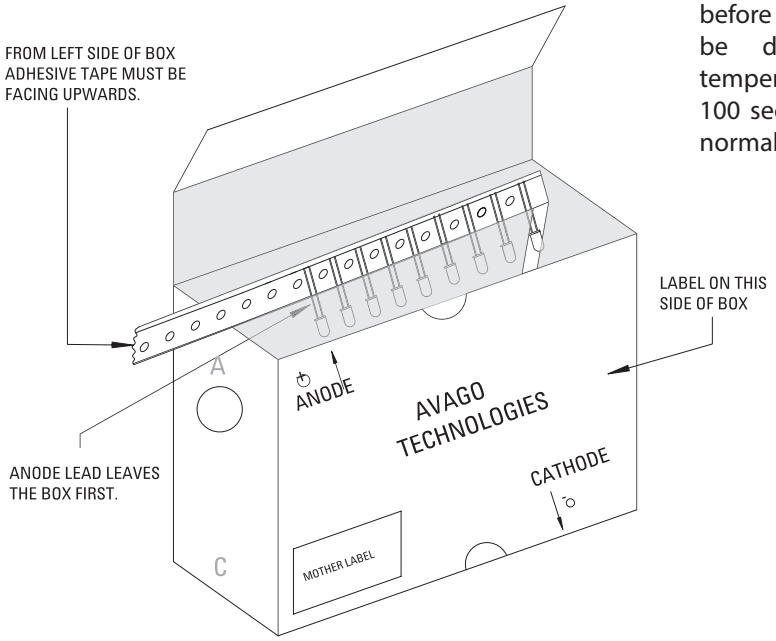
Formed Lead

Note: Dimension in mm (inches).

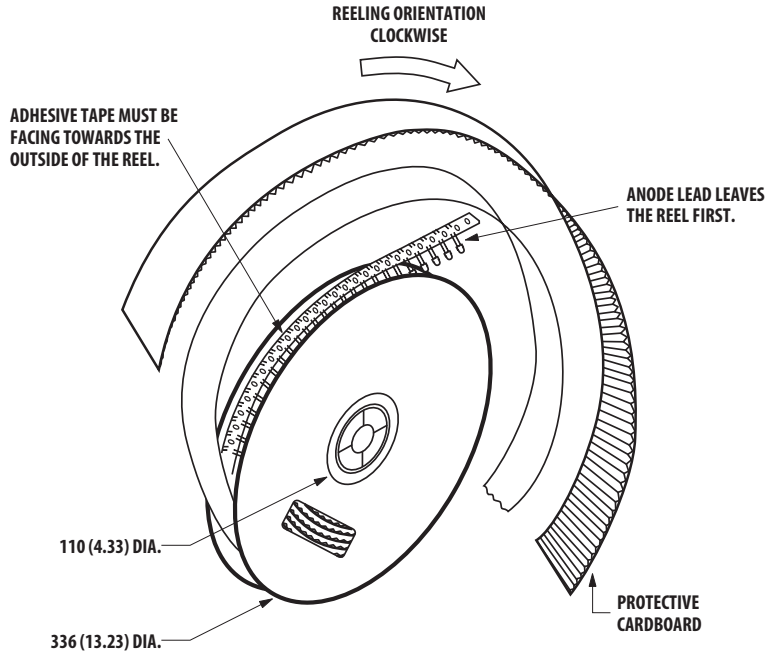
Package Options

Lead Option	Ammo Pack (1000 pcs.)	Tape & Reel (2000 pcs.)
Straight Lead	#2C —	#002
Formed Lead	#2U —	–

AMMO PACK (for All options except #002)



TAPE & REEL (for option #002 only)



DIMENSIONS IN MILLIMETERS (INCHES).

Recommended Assembly Condition

- A single-sided phenolic printed circuit board (PCB) is preferred. Double-sided PCB and other materials may cause greater lead stress. Recommended through-hole diameter is 0.98 to 1.08 mm. Leadlength below the PCB should be 1.5 to 2.0 mm, and the clinching angle (angle between the lead and PCB) should be 30 ±10 degrees.
- If SMT devices and an adhesive are used on the same pcb as these lamps, the adhesive should be cured before the lamps are auto-inserted. If curing must be done after lamp insertion, the cure temperature and time should not exceed 140°C, 100 seconds. This is the temperature of the surface normal to the IR source.

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	Dipping	Manual Solder
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.

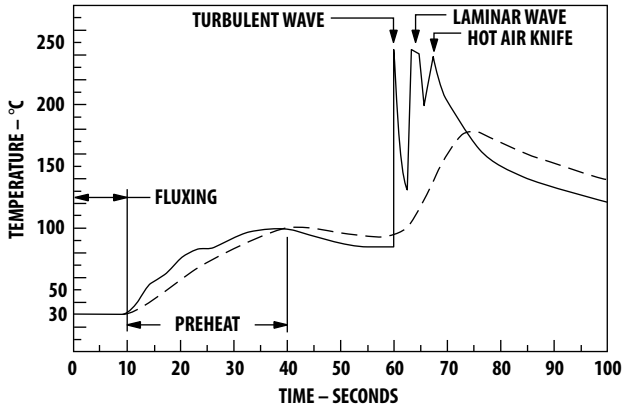


Figure 7. Recommended wave soldering profile.

- 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.

BOTTOM SIDE OF PC BOARD
TOP SIDE OF PC BOARD

CONVEYOR SPEED = 1.83 M/MIN (6 FT/MIN)
PREHEAT SETTING = 150°C (100°C PCB)
SOLDER WAVE TEMPERATURE = 245°C
AIR KNIFE AIR TEMPERATURE = 390°C
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**

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