BROADCOM®

Data Sheet

HLMP-ED1W/ED1Y/ED3W/ED3Y

5-mm High Brightness AlInGaP Red LED Lamp

Description

These Broadcom® high brightness AlInGaP LEDs provide superior light output for excellent readability in sunlight and are extremely reliable. AlInGaP LED technology provides stable light output over long periods of time. Precision optical performance lamps use the aluminum indium gallium phosphide (AlInGaP) technology.

These LED lamps are untinted. T-1¾ packages incorporating second generation optics produce well-defined spatial radiation patterns at specific viewing cone angles.

These lamps are made with an advanced optical grade epoxy, which offers superior high temperature and high moisture resistance performance in outdoor sign and signal applications. The epoxy contains a UV inhibitor to reduce the effect of long term exposure to direct sunlight.

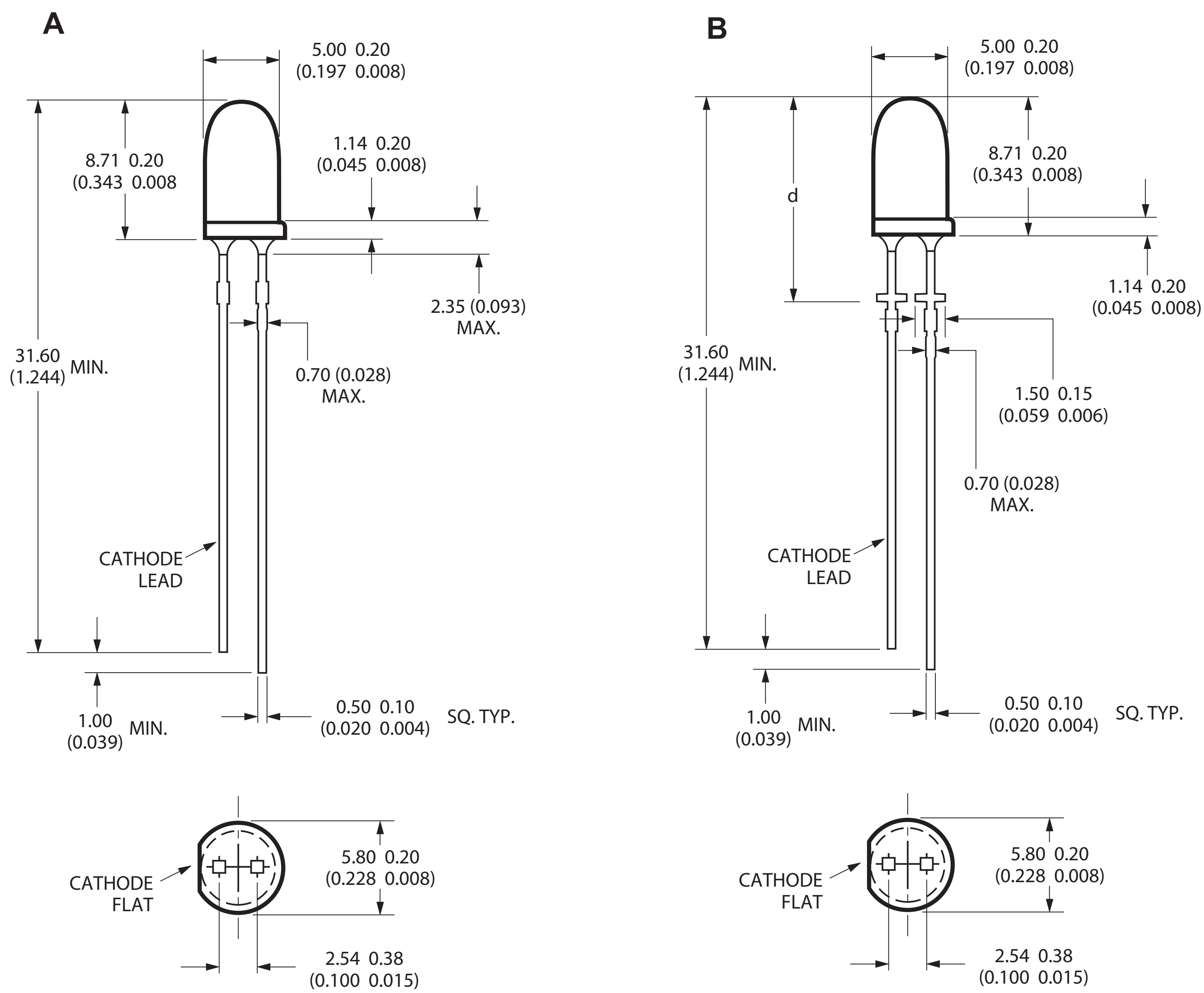
Features

- Well-defined spatial radiation pattern
- High brightness material
- Color: 630nm red
- Superior resistance to moisture
- Package options: Stand-off and non stand-off
- Viewing angles: 15° and 30°

Applications

- Traffic management
  - Traffic signals
  - Pedestrian signals
  - Work zone warning lights
  - Variable message signs
- Solar power signs
- Commercial outdoor advertising
  - Signs
  - Marquees

Figure 1: Package Drawing



Part Number	d
HLMP-ED1Y-xxxxx	12.60 mm ± 0.18 mm (0.496in. ± 0.007 in.)
HLMP-ED3Y-xxxxx	11.99 mm ± 0.25 mm (0.472 in. ± 0.010 in.)

NOTE:

1. All dimensions are in millimeters (mm).
2. Epoxy meniscus is 1.21 mm maximum.
3. Leads are mild steel with tin plating.

Device Selection Guide (T_J = 25°C, I_F = 20mA)

Part Number	Color and Dominant Wavelength, λ_d (nm)[a]	Luminous Intensity, I_V (mcd)[b, c, d]		Standoff	Typical Viewing Angle (°)
	Typ.	Min.	Max.		
HLMP-ED1W-WZ000	Red 630	5500	16000	No	15
HLMP-ED1W-WZ0DD	Red 630	5500	16000	No	15
HLMP-ED1Y-WZ000	Red 630	5500	16000	Yes	15
HLMP-ED3W-UV000	Red 630	3200	5500	No	30
HLMP-ED3W-UV0DD	Red 630	3200	5500	No	30
HLMP-ED3Y-UV0DD	Red 630	3200	5500	Yes	30

a. The dominant wavelength, λ_d, is derived from CIE Chromaticity Diagram, and represents the color of the LED lamp.

b. The luminous intensity, I_V is measured at the mechanical axis of the package and it is tested with a single current pulse condition.

c. The optical axis is closely aligned with the mechanical axis of the package.

d. Tolerance is ± 15%.

Absolute Maximum Ratings

Parameters	Red	Units
DC Forward Current[a]	50	mA
Peak Forward Current[b]	100	mA
Power Dissipation	125	mW
LED Junction Temperature	130	°C
Operating Temperature Range	–40 to +100	°C
Storage Temperature Range	–40 to +100	°C

a. Derate linearly as shown in Figure 5.

b. Duty factor = 30%, frequency = 1 kHz.

Optical and Electrical Characteristics (T_J = 25°C, I_F = 20mA)

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Forward Voltage[a]	V_F	1.8	2.2	2.4	V	I_F = 20 mA
Reverse Voltage	V_R	5	—	—	V	I_R = 100 µA
Dominant Wavelength[b]	λ_d	622	630	634	nm	I_F = 20 mA
Peak Wavelength	λ_{PEAK}	—	639	—	nm	I_F = 20 mA
Spectral Halfwidth	$\Delta\lambda_{1/2}$	—	15	—	nm	Wavelength width at Spectral Distribution ½ Power Point at I_F = 20 mA
Thermal Resistance	$R_{\theta J\text{-}P}$	—	240	—	°C/W	LED Junction-to-Pin
Luminous Efficacy[c]	η_V	—	155	—	lm/W	Emitted Luminous Power/ Emitted Radiant Power

a. Forward voltage tolerance is ± 0.05V.

b. The dominant wavelength, λ_d is derived from the CIE Chromaticity Diagram and represents the perceived color of the device.

c. The radiant intensity, I_e in watts per 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.

Part Numbering System

H	L	M	P	-	x_1	x_2	x_3	x_4	-	x_5	x_6	x_7	x_8	x_9

Code	Description	Option	
x_1	Package Type	E	5-mm AlInGaP round
x_2	Color	D	Red 630 nm
x_3 x_4	Viewing Angle and Lead Stand-off	1W	15° without lead stand-off
		1Y	15° with lead stand-off
		3W	30° without lead stand-off
		3Y	30° with lead stand-off
x_5	Minimum Intensity Bin	Refer to Intensity Bin Limits (CAT) table	
x_6	Maximum Intensity Bin		
x_7	Color Bin Option	0	Full distribution
x_8 x_9	Packing Option	DD	Ammopack

Bin Information

Intensity Bin Limits (CAT)

Bin ID	Luminous Intensity, I_V (mcd)	
	Min.	Max.
U	3200	4200
V	4200	5500
W	5500	7200
X	7200	9300
Y	9300	12000
Z	12000	16000

Tolerance = ±15%

Forward Voltage Bin Limits (V_F)

Bin ID	Forward Voltage, V_F (V)	
	Min.	Max.
VD	1.8	2.0
VA	2.0	2.2
VB	2.2	2.4
VC	2.4	2.5

Tolerance = ± 0.05V.

Color Bin Limits (BIN)

Bin ID	Dominant Wavelength, λ_d (nm)	
	Min.	Max.
—	622	634

Tolerance = ±0.5 nm.

Example of bin information on reel and packaging label:

CAT : W	–	Intensity bin W
BIN : VA	–	V_F bin VA

Figure 2: Spectral Power Distribution

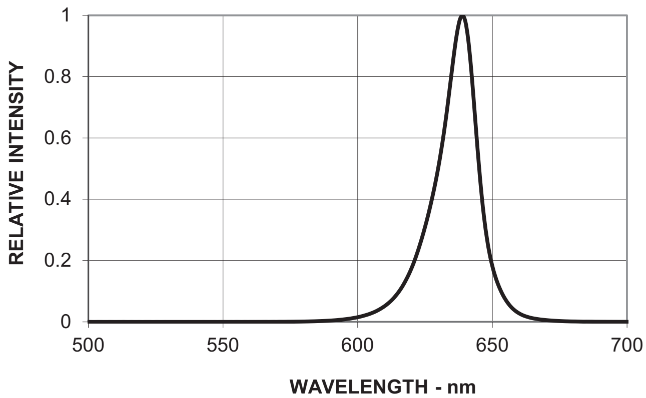


Figure 3: Forward Current vs. Forward Voltage

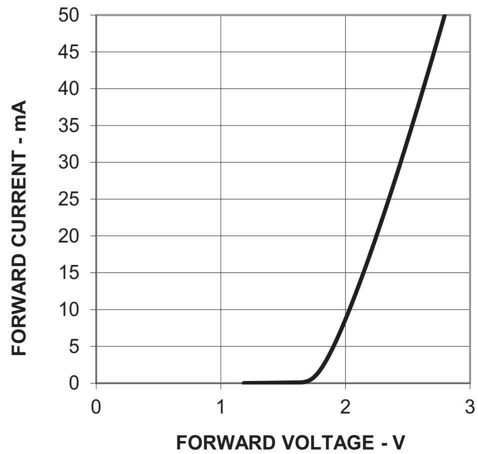


Figure 4: Relative Luminous Intensity vs. Mono Pulse Current

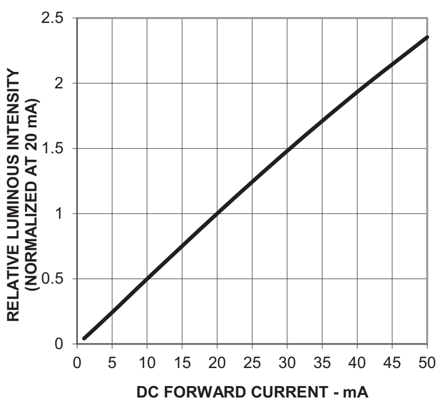


Figure 5: Maximum Forward Current vs. Ambient Temperature

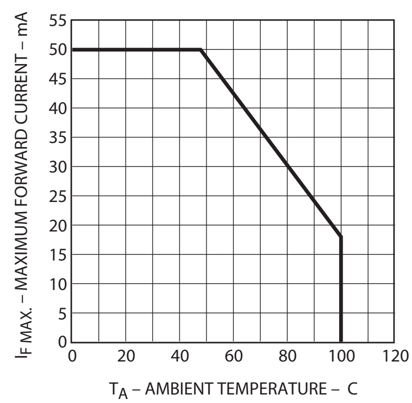


Figure 6: Radiation Pattern for 15° Viewing Angle Lamp

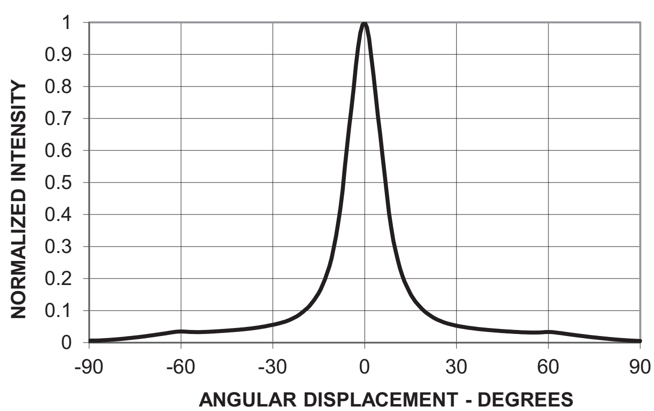


Figure 7: Radiation Pattern for 30° Viewing Angle Lamp

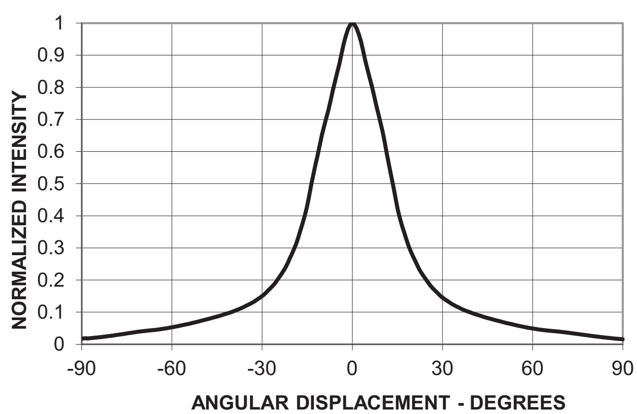


Figure 8: Relative Light Output vs. Junction Temperature

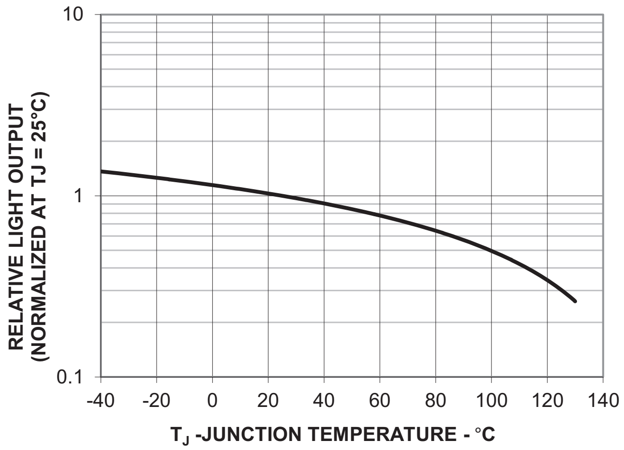


Figure 9: Forward Voltage Shift vs. Junction Temperature

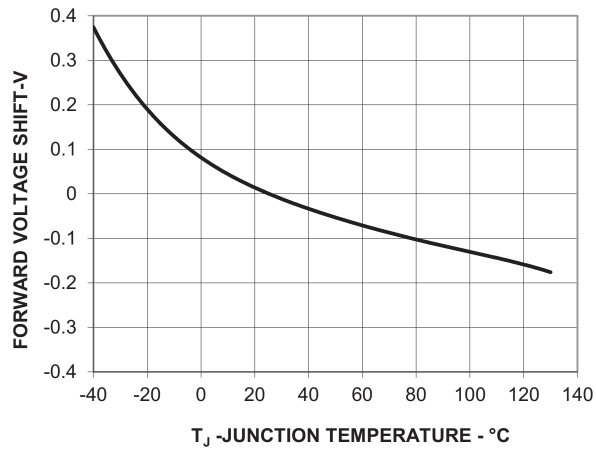
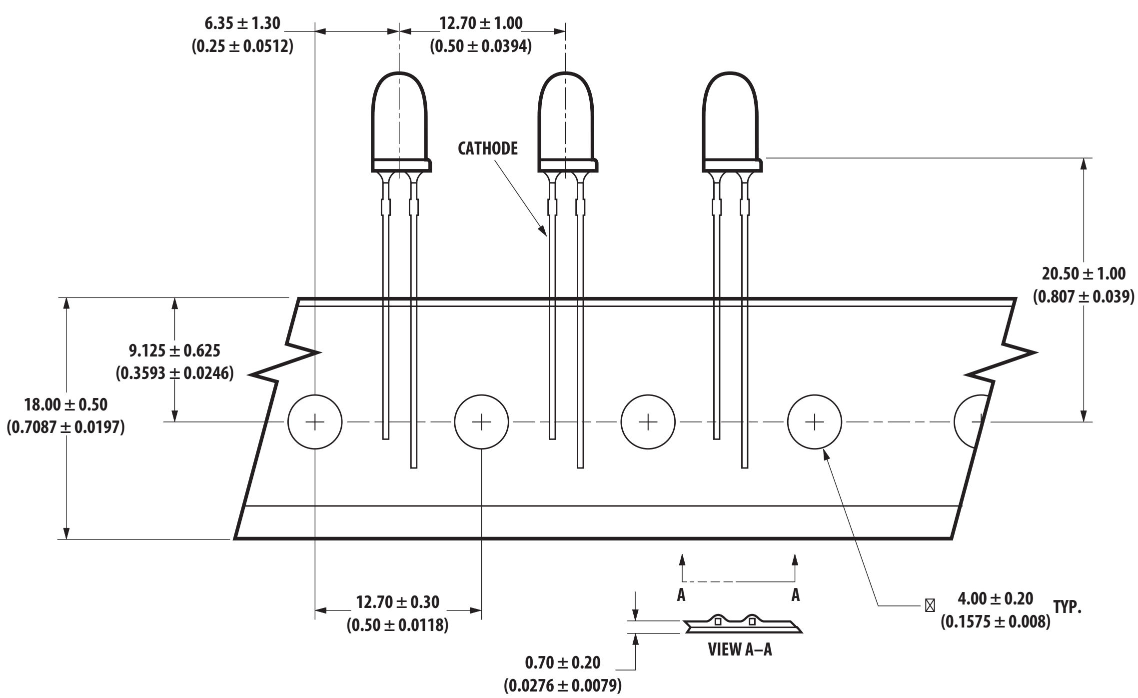


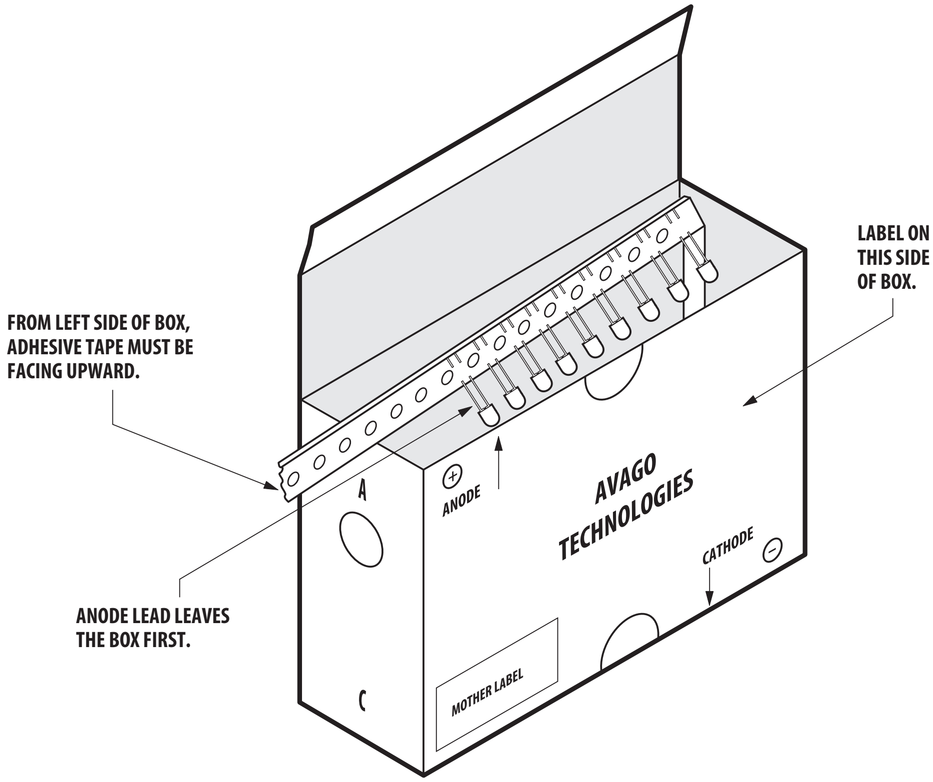
Figure 10: Tape Outline Drawing for Packaging Option DD



ALL DIMENSIONS IN MILLIMETERS (INCHES).

NOTE: THE AMMO-PACKS DRAWING IS APPLICABLE FOR PACKAGING OPTION -DD & -ZZ AND REGARDLESS OF STANDOFF OR NON-STANDOFF.

Figure 11: Packaging Box for Ammo Packs



NOTE: THE DIMENSION FOR AMMO PACK IS APPLICABLE FOR THE DEVICE WITH STANDOFF AND WITHOUT STANDOFF.

Precautionary Notes

Soldering and Handling Precautions

- Set and maintain the wave soldering parameters according to the recommended temperature and dwell time. Perform daily checks on the profile to ensure that it is always conforming to the recommended conditions. Exceeding these conditions will over-stress the LEDs and cause premature failures.
- Use only bottom preheaters to reduce thermal stress experienced by the LEDs.
- Recalibrate the soldering profile before loading a new type of PCB. PCBs with different sizes and designs (component density) will have different heat capacity and might cause a change in temperature experienced by the PCB if the same wave soldering setting is used.
- Do not perform wave soldering more than once.
- Any alignment fixture used during wave soldering must be loosely fitted and must not apply stress on the LEDs. Use non-metal material as it will absorb less heat during the wave soldering process.
- At elevated temperatures, the LEDs are more susceptible to mechanical stress. Allow the PCB to be sufficiently cooled to room temperature before handling. Do not apply stress to the LED when it is hot.
- Use wave soldering to solder the LED. Use hand soldering only for rework or touch up if unavoidable, but it must be strictly controlled to following conditions:
  - Soldering iron tip temperature = 315°C maximum.
  - Soldering duration = 2 seconds maximum.
  - Number of cycle = 1 only
  - Power of soldering iron = 50W maximum.
- For ESD-sensitive devices, apply proper ESD precautions at the soldering station. Use only an ESD-safe soldering iron.
- Do not touch the LED package body with the soldering iron except for the soldering terminals as it may cause damage to the LED.
- Confirm beforehand whether the functionality and performance of the LED is affected by soldering with hand soldering.
- Keep the heat source at least 1.6 mm away from the LED body during soldering.
- Design an appropriate hole size to avoid problems during insertion or clinching (for auto-insertable devices).

Figure 12: Recommended PCB Through Hole Size

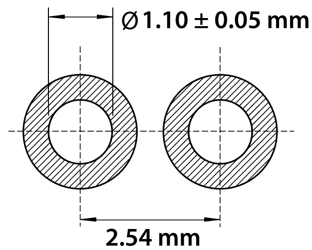
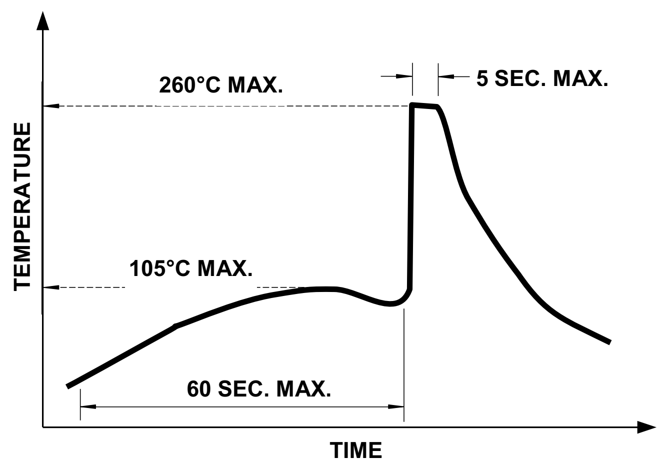


Figure 13: Recommended Wave Soldering Profile



NOTE: Refers to measurements with thermocouple mounted at the bottom of the PCB.

Refer to Application Note AN 5334 for more information on soldering and handling of TH LED lamp.

Lead Forming

- To pre-form or cut the leads prior to insertion and soldering onto PCB, use the proper tool instead of doing it manually.
- Do not bend the leads at location less than 3 mm from the LED body.
- Do not use the base of the LED body as fulcrum for lead bending. Secure the leads properly before bending.
- If manual lead cutting is unavoidable, cut the leads after soldering to reduce stress to the LED body.

Application Precautions

- The drive current of the LED must not exceed the maximum allowable limit across temperature as stated in the data sheet. Constant current driving is recommended to ensure consistent performance.
- Circuit design must cater to the entire range of forward voltage (V_F) of the LEDs to ensure that the intended drive current can always be achieved.
- The LED exhibits slightly different characteristics at different drive currents, which may result in a larger variation of performance (such as intensity, wavelength, and forward voltage). Set the application current as close as possible to the test current to minimize these variations.
- The LED is not intended for reverse bias. Use other appropriate components for such purposes. When driving the LED in matrix form, ensure that the reverse bias voltage does not exceed the allowable limit of the LED.
- Avoid rapid change in ambient temperatures, especially in high-humidity environments, because they cause condensation on the LED.

Eye Safety Precautions

LEDs may pose optical hazards when in operation. Do not look directly at operating LEDs because it might be harmful to the eyes. For safety reasons, use appropriate shielding or personal protective equipment.

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