Agilent HLMP-AD85, HLMP-AD87, HLMP-AM86, HLMP-AM87, HLMP-AB86, HLMP-AB87 5mm Mini Oval Precision Optical Performance Red, Blue and Green LEDs.

Data Sheet

Description

These Precision Optical Performance Oval LEDs are specifically designed for full color/video and passenger information signs. The oval shaped radiation pattern and high luminous intensity ensure these devices are excellent for wide field of view outdoor applications where a wide viewing angle and readability in sunlight are essential. These lamps have very smooth, matched radiation patterns ensuring consistent color mixing in full color applications, message uniformity across the viewing angle of the sign. High efficiency LED material is used in these lamps: Aluminium Indium Gallium Phosphide (AlInGaP) for red and Indium Gallium Nitride (InGaN) for blue and green. Each lamp is made with an advance optical grade epoxy offering superior high temperature and high moisture resistance in outdoor applications.

Features

- **Well defined spatial radiation pattern**
- **High brightness material**
- **Available in red, green and blue color.**
- **Superior resistance to moisture**

Benefits

- **Viewing angle designed for wide field of view applications**
- **Superior performance for outdoor environments.**

Applications

- **Full color signs**
- **Commercial outdoor advertising**

Caution: InGaN devices are Class I ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Application Note AN-1142 for additional details.

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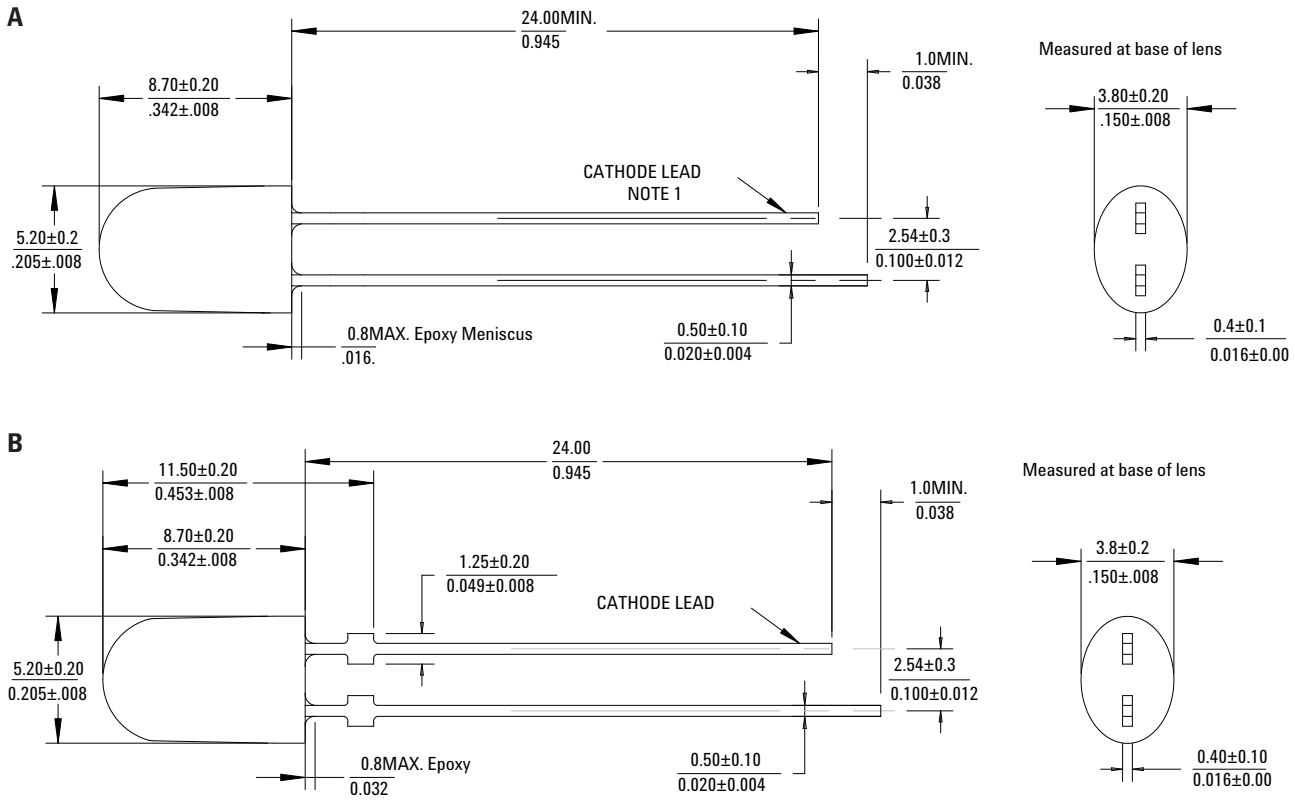
Package Dimensions



NOTES:
Dimensions in Millimeters (Inches)
For Blue and Green if heat-sinking application is required, the terminal for heat sink is anode.

Device Selection Guide

Part Number	Color	Typ. Dominant Wavelength λd (nm)	Luminous Intensity Iv (cd) at 20mA		Lens Type	Standoffs	Package Drawing
			Min.	Max.			
HLMP-AD85-RU0xx	Red	630	1.50	4.20	Tinted, diffused	No	A
HLMP-AD87-RU0xx	Red	630	1.50	4.20	Tinted, diffused	Yes	B
HLMP-AM86-TW0xx	Green	525	2.50	7.20	Tinted, diffused	No	A
HLMP-AM87-TW0xx	Green	525	2.50	7.20	Tinted, diffused	Yes	B
HLMP-AB86-MQ0xx	Blue	470	0.52	1.50	Tinted, diffused	No	A
HLMP-AB87-MQ0xx	Blue	470	0.52	1.50	Tinted, diffused	Yes	B

Notes:
1. Tolerance for luminous intensity measurement is ±15%
2. The luminous intensity is measured on the mechanical axis of the lamp package.
3. The optical axis is closely aligned with the package mechanical axis.
4. The dominant wavelength λ_d is derived from the Chromaticity Diagram and represents the color of the lamp.
5. LED light output is bright enough to cause injuries to the eyes. Precautions must be taken to prevent looking directly at the LED without proper safety equipment.

Part Numbering System

HLMP - x x 8x - x x x xx

Mechanical Option
00: Bulk
DD: Ammo Pack
ZZ: Flexi-Bin, Ammo pack

Color Bin Options
0: Full color bin distribution

Maximum Intensity Bin
Refer to Device Selection Guide

Minimum Intensity Bin
Refer to Device Selection Guide

Color
B: Blue 470nm
M: Green 525nm
D: Red 630nm

Package
A: 5mm Mini Oval

Absolute Maximum Rating at T_A = 25°C

Parameters	Blue and Green	Red	Unit
DC forward current [1]	30	50	mA
Peak pulsed forward current	100 [2]	100 [3]	mA
Power dissipation	116	120	mW
LED junction temperature	130	130	°C
Operating temperature range	-40 to +85	-40 to +100	°C
Storage temperature range	-40 to +100	-40 to +120	°C

Notes:
1. Derate linearly as shown in figure 3 and figure 7.
2. Duty factor 10%, frequency 1KHz.
3. Duty factor 30%, frequency 1KHz.

Electrical/Optical Characteristics T_A = 25°C

		Value				
Parameters	**Symbol**	**Min.**	**Typ.**	**Max.**	**Units**	**Test Condition**
Forward voltage	V_F				V	I_F = 20 mA
Red			2.20	2.40		
Green			3.2	3.85		
Blue			3.3	3.85		
Reverse Voltage [1]	V_R				V	
Red		5.0				I_R = 100 μA
Green		5.0				I_R = 10 μA
Blue		5.0				I_R = 10 μA
Thermal resistance [2]	$R\theta_{J\text{-}PIN}$		240		°C/W	
Dominant wavelength [3,4]					nm	I_F = 20 mA
Red	λ_d	622	630	634		
Green		520	525	540		
Blue		460	470	480		
Peak wavelength					nm	Peak of wavelength of spectral
Red	λ_{PEAK}		639			distribution at IF = 20 mA
Green			516			
Blue			464			
Spectral half width					nm	Wavelength width at spectral
Red	$\Delta\lambda_{1/2}$		17			distribution power point at IF =
Green			32			20 mA
Blue			23			
Luminous Efficacy [5]	ηv				lm/W	Emitted luminous
Red			155			power/Emitted radiant power
Green			484			
Blue			74			

Notes:

1. The reverse voltage of blue and green is equivalent to the forward voltage of the protective chip at I_R = 10 μA.
   The reverse voltage of red is equivalent to the forward voltage of the protective chip at I_R = 100μA.
2. For AlInGaP Red, the thermal resistance applied to LED junction to cathode lead. For InGaN Blue and Green, the thermal resistance applied to LED junction to anode lead.
3. The dominant wavelength λ_d is derived from the Chromaticity Diagram and represents the color of the lamp.
4. Tolerance for each color bin limit is ±0.5 nm
5. The radiant intensity, Ie in watts/steradian, may be found from the equation Ie = Iv/η_v, where Iv is the luminous intensity in candelas and η_v is the luminous efficacy in lumens/watt.

AlInGaP Red 630nm

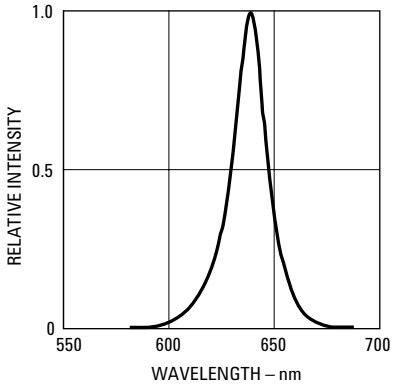


Figure 1. Relative intensity vs. wavelength

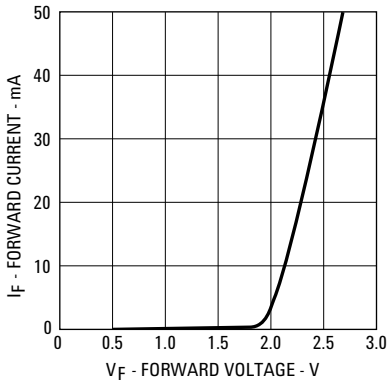


Figure 2. Forward current vs. forward voltage

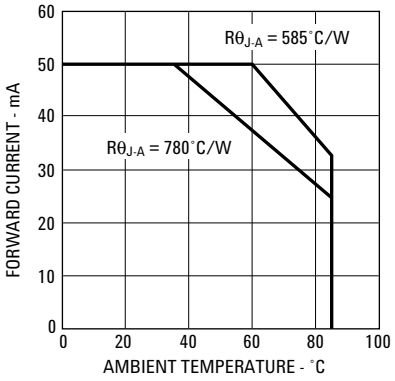


Figure 3. Forward current vs. ambient temperature

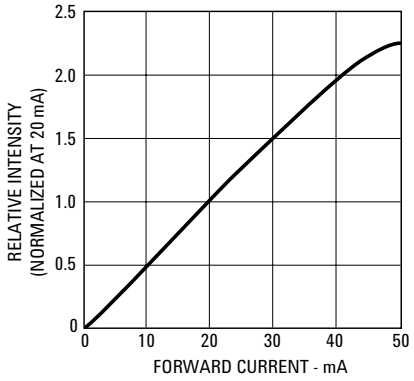


Figure 4. Relative luminous intensity vs. forward current

InGaN Blue and Green

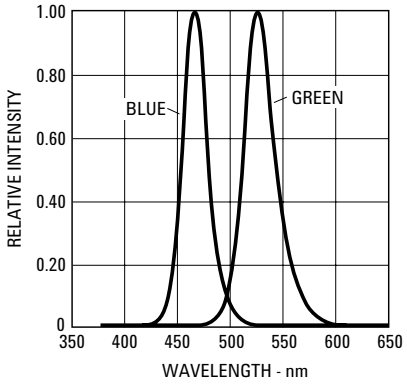


Figure 5. Relative Intensity vs. Wavelength

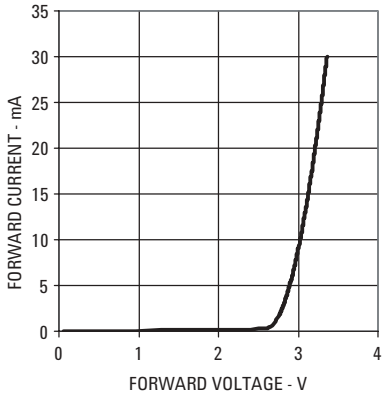


Figure 6. Forward current vs. forward voltage.

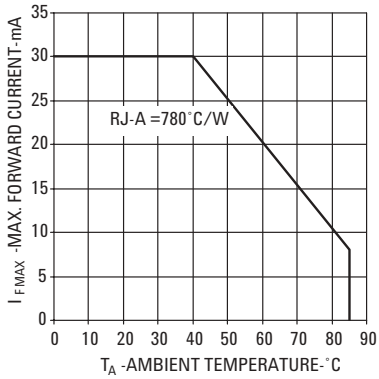


Figure 7. Forward Current vs. Ambient Temperature.

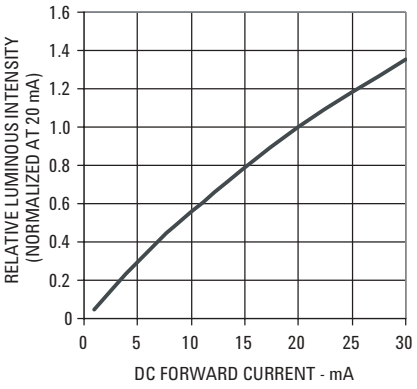


Figure 8. Relative intensity vs. forward current

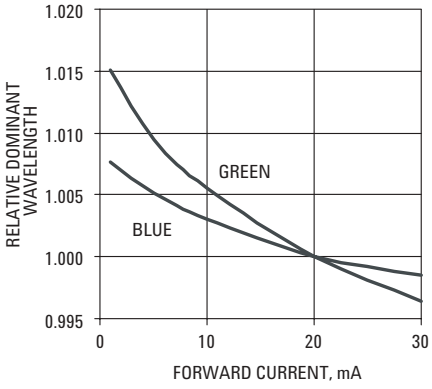


Figure 9.Relative dominant wavelength vs. DC forward current

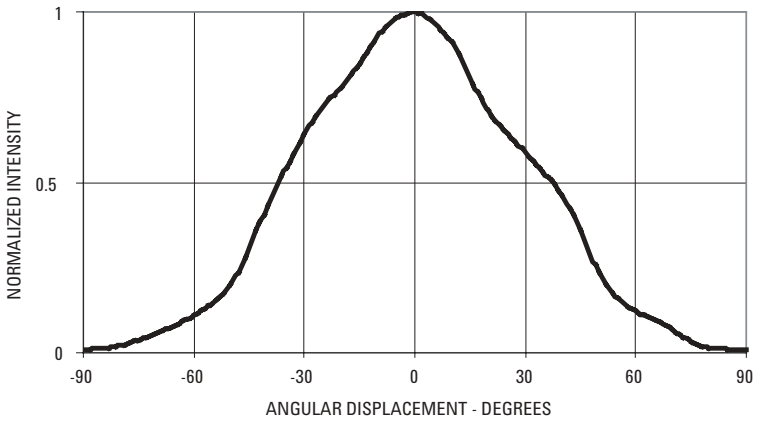


Figure 10. Spatial radiation pattern for RGB – major axis

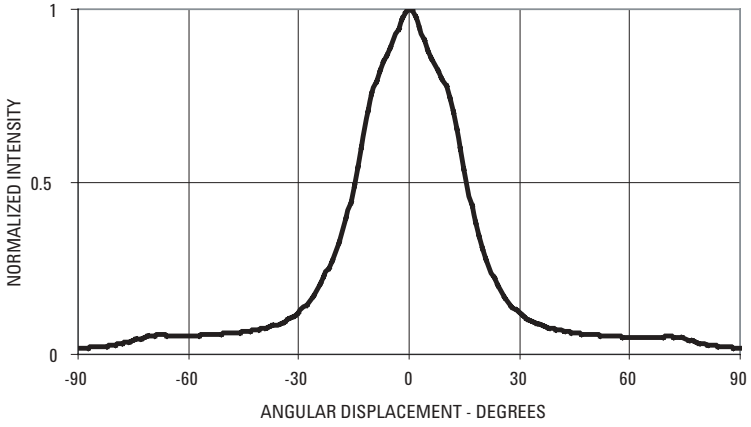


Figure 11. Spatial radiation pattern for RGB – minor axis

Intensity Bin Limit Table

	Intensity (mcd) at 20 mA	
Bin	**Min**	**Max**
M	520	680
N	680	880
P	880	1150
Q	1150	1500
R	1500	1900
S	1900	2500
T	2500	3200
U	3200	4200
V	4200	5500
W	5500	7200

Tolerance for each bin limit is ± 15%

Blue Color Bin Table

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
1	460.0	464.0	0.1440	0.0297	0.1766	0.0966
			0.1818	0.0904	0.1374	0.0374
2	464.0	468.0	0.1374	0.0374	0.1699	0.1062
			0.1766	0.0966	0.1291	0.0495
3	468.0	472.0	0.1291	0.0495	0.1616	0.1209
			0.1699	0.1062	0.1187	0.0671
4	472.0	476.0	0.1187	0.0671	0.1517	0.1423
			0.1616	0.1209	0.1063	0.0945
5	476.0	480.0	0.1063	0.0945	0.1397	0.1728
			0.1517	0.1423	0.0913	0.1327

Tolerance for each bin limit is ±0.5 nm

Green Color Bin Table

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
1	520.0	524.0	0.0743	0.8338	0.1856	0.6556
			0.1650	0.6586	0.1060	0.8292
2	524.0	528.0	0.1060	0.8292	0.2068	0.6463
			0.1856	0.6556	0.1387	0.8148
3	528.0	532.0	0.1387	0.8148	0.2273	0.6344
			0.2068	0.6463	0.1702	0.7965
4	532.0	536.0	0.1702	0.7965	0.2469	0.6213
			0.2273	0.6344	0.2003	0.7764
5	536.0	540.0	0.2003	0.7764	0.2659	0.6070
			0.2469	0.6213	0.2296	0.7543

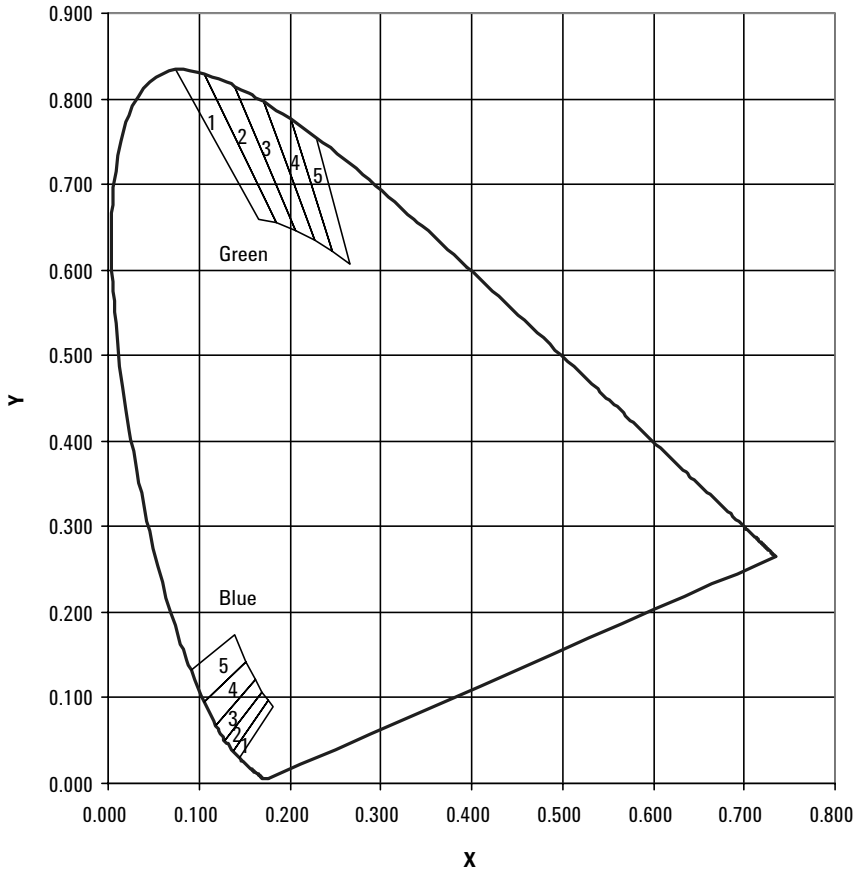
Tolerance for each bin limit is ±0.5 nm

Red Color Bin Table

Bin	Min Dom	Max Dom	Xmin	Ymin	Xmax	Ymax
	622	634	0.6904	0.3094	0.6945	0.2888
			0.6726	0.3106	0.7135	0.2865

Tolerance for each bin limit is ± 0.5 nm

CIE 1931 - Chromaticity Diagram



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 Condition:

- 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 1.59mm below the body (encapsulant epoxy) for those parts without standoff.
- Recommended soldering condition:

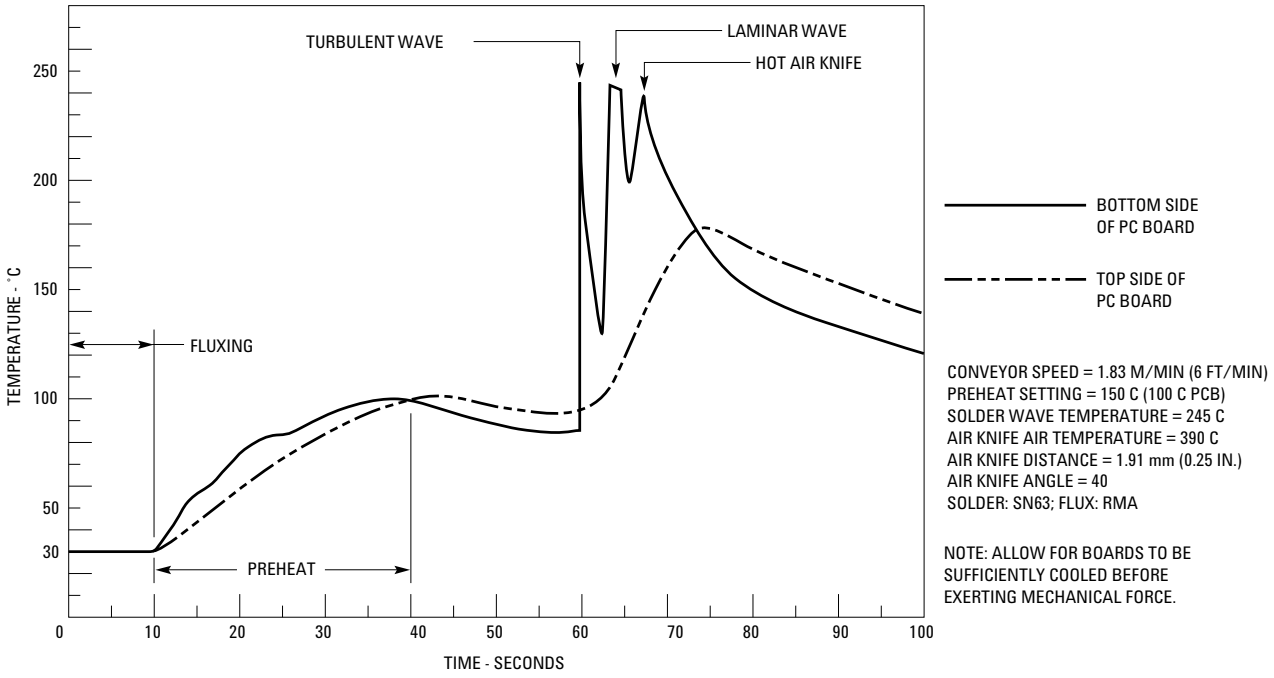
	Wave Soldering	Manual Solder Dipping
Pre-heat temperature	105 °C Max.	–
Preheat time	30 sec Max	–
Peak temperature	250 °C Max.	260 °C Max.
Dwell time	3 sec Max.	5 sec Max

- Wave soldering parameter must be set and maintain 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 holes size for LED component leads.

LED component ead size	Diagonal	Plated through hole diameter
0.457 x 0.457mm (0.018 x 0.018inch)	0.646 mm (0.025 inch)	0.976 to 1.078 mm (0.038 to 0.042 inch)
0.508 x 0.508mm (0.020 x 0.020inch)	0.718 mm (0.028 inch)	1.049 to 1.150mm (0.041 to 0.045 inch)

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

Recommended Wave Soldering Profile



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Data subject to change.

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