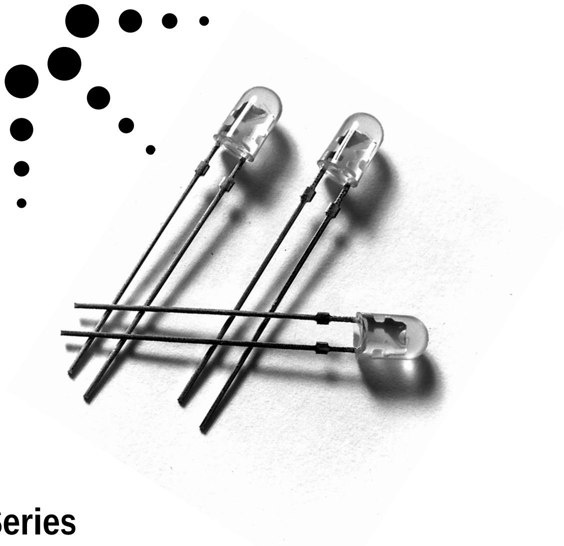
Agilent 4 mm Super Oval Precision Optical Performance AlInGaP and InGaN LEDs

Data Sheet



SunPower Series

Agilent HLMP-RG10, HLMP-SG10, HLMP-RL10, HLMP-SL10, HLMP-RD11, HLMP-SD11, HLMP-RL11, HLMP-SL11, HLMP-RM11, HLMP-SM11, HLMP-RB11, HLMP-SB11

Description

These Precision Optical Performance Oval LEDs are specifically designed for Full Color/Video and Passenger Information signs. The oval shaped radiation pattern (60° x 120°) and high luminous intensity ensure that 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 materials are used in these lamps: Aluminum Indium Gallium Phosphide (AlInGaP) for Red and Amber color and Indium Gallium Nitride (InGaN) for Blue and Green. There are two families of red and amber lamps, AlInGaP and the higher performance AlInGaP II. Each lamp is made with an advanced optical grade epoxy offering superior high temperature and high moisture resistance in outdoor applications. The package epoxy contains both uv-a and uv-b inhibitors to reduce the effects of long term exposure to direct sunlight.

Designers can select parallel (where the axis of the leads is parallel to the wide axis of the oval radiation pattern) or perpendicular orientation. Both lamps are available in tinted version.

Features

- **Well defined spatial radiation pattern**
- **Viewing angle:**
  major axis 120°
  minor axis 60°
- **High luminous output**
- **Two red and amber intensity levels**
  AlInGaP (bright) and
  AlInGaP II (brightest)
- **Colors**
  626 / 630 nm red
  590 / 592 nm amber
  526 nm green
  470 nm blue
- **Superior resistance to moisture**
- **UV resistant epoxy**

Benefits

- **Viewing angle designed for wide field of view applications**
- **Superior performance for outdoor environments**
- **Radiation pattern matched for red, green, and blue for full color sign**

Applications

- **Full color signs**

CAUTION: *The Blue and Green LEDs are Class 1 ESD sensitive. Please observe appropriate precautions during handling and processing. Refer to Agilent Technologies Application Note AN-1142 for additional details.*

Agilent Technologies

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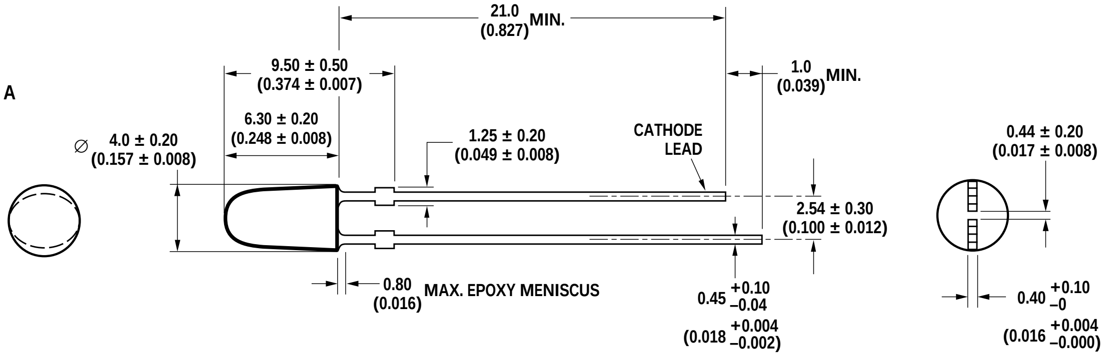
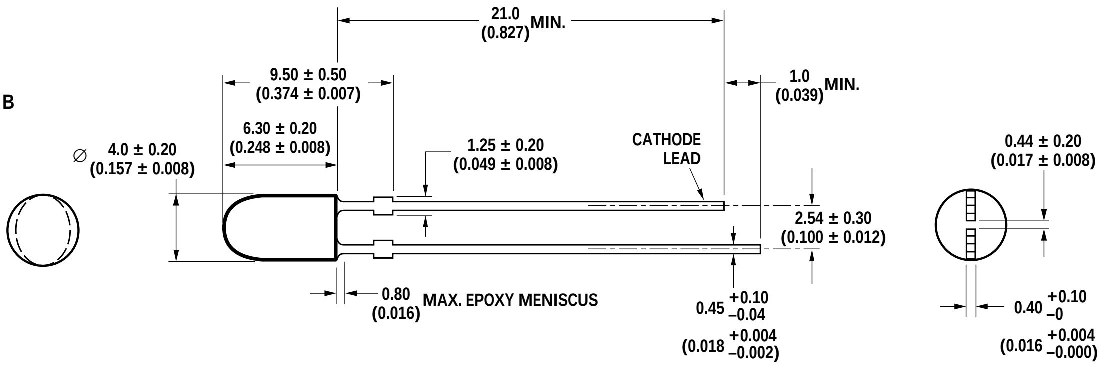
Package Dimensions

A



B



DIMENSIONS ARE IN MILLIMETERS (INCHES).

Device Selection Guide for AlInGaP

Part Number	Color and Dominant Wavelength λ_d (nm) Typ.	Luminous Intensity I_V (mcd) at 20 mA Min.	Max.	Leads with Stand-Offs	Leadframe Orientation	Package Drawing
HLMP-SG10-JM000	Red 626	240	680	Yes	Perpendicular	A
HLMP-RG10-JM000	Red 626	240	680	Yes	Parallel	B
HLMP-SL10-LP0xx	Amber 590	400	1150	Yes	Perpendicular	A
HLMP-RL10-LP0xx	Amber 590	400	1150	Yes	Parallel	B

Notes:
1. The luminous intensity is measured on the mechanical axis of the lamp package.
2. The optical axis is closely aligned with the package mechanical axis.
3. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

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Device Selection Guide for AlInGaP II

Part Number	Color and Dominant Wavelength λ_d (nm) Typ.	Luminous Intensity I_V (mcd) at 20 mA Min.	Max.	Leads with Stand-Offs	Leadframe Orientation	Package Drawing
HLMP-RD11-J0000	Red 630	240	-	Yes	Parallel	B
HLMP-RD11-LP000	Red 630	400	1150	Yes	Parallel	B
HLMP-RD11-LPT00	Red 630	400	1150	Yes	Parallel	B
HLMP-RL11-H0000	Amber 592	180	-	Yes	Parallel	B
HLMP-RL11-LP000	Amber 592	400	1150	Yes	Parallel	B
HLMP-RL11-LPRxx	Amber 592	400	1150	Yes	Parallel	B
HLMP-SD11-J0000	Red 630	240	-	Yes	Perpendicular	A
HLMP-SD11-LP000	Red 630	400	1150	Yes	Perpendicular	A
HLMP-SD11-LPT00	Red 630	400	1150	Yes	Perpendicular	A
HLMP-SD11-MN0xx	Red 630	520	880	Yes	Perpendicular	A
HLMP-SD11-MNTxx	Red 630	520	880	Yes	Perpendicular	A
HLMP-SL11-H0000	Amber 592	180	-	Yes	Perpendicular	A
HLMP-SL11-HL0xx	Amber 592	180	520	Yes	Perpendicular	A
HLMP-SL11-KN0xx	Amber 592	310	880	Yes	Perpendicular	A
HLMP-SL11-LP0xx	Amber 592	400	1150	Yes	Perpendicular	A
HLMP-SL11-LPRxx	Amber 592	400	1150	Yes	Perpendicular	A

Notes:
1. The luminous intensity is measured on the mechanical axis of the lamp package.
2. The optical axis is closely aligned with the package mechanical axis.
3. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

Device Selection Guide for InGaN

Part Number	Color and Dominant Wavelength λ_d (nm) Typ.	Luminous Intensity I_V (mcd) at 20 mA Min.	Max.	Leads with Stand-Offs	Leadframe Orientation	Package Drawing
HLMP-SM11-LP0xx	Green 526	400	1150	Yes	Perpendicular	A
HLMP-RM11-H00xx	Green 526	180	-	Yes	Parallel	B
HLMP-RM11-M00xx	Green 526	520	-	Yes	Parallel	B
HLMP-SB11-H00xx	Blue 470	180	-	Yes	Perpendicular	A
HLMP-RB11-D00xx	Blue 470	65	-	Yes	Parallel	B
HLMP-RB11-H00xx	Blue 470	180	-	Yes	Parallel	B

Notes:
4. The luminous intensity is measured on the mechanical axis of the lamp package.
5. The optical axis is closely aligned with the package mechanical axis.
6. The dominant wavelength, λ_d, is derived from the CIE Chromaticity Diagram and represents the color of the lamp.

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Part Numbering System

HLMP - x x xx - x x x xx

Mechanical Options
00: Bulk Packaging
DD: Ammo Pack
YY: Flexi-Bin; Bulk Packaging
ZZ: Flexi-Bin; Ammo Pack

Color Bin & V_F Selections
0: No Color Bin Limitation
R: Amber Color Bins 1, 2, 4, and 6 with V_F Maximum of 2.6 V
T: Red Color with V_F Maximum of 2.6 V

Maximum Intensity Bin
0: No Iv Bin Limitation

Minimum Intensity Bin

Refer to Device Selection Guide

Color
B: 470 nm Blue
D: 630 nm Red
G: 626 nm Red
L: 590/592 nm Amber
M: 526 nm Green

Package
R: 4 mm 60° x 120° Oval, Parallel
S: 4 mm 60° x 120° Oval, Perpendicular

Absolute Maximum Ratings

T_A = 25°C

Parameter	Blue and Green	Amber and Red
DC Forward Current[1]	30 mA	50 mA
Peak Pulsed Forward Current	100 mA	100 mA
Average Forward Current	30 mA	30 mA
Reverse Voltage (I_R = 100 µA)	5 V	5 V
Power Dissipation	120 mW	120 mW
LED Junction Temperature	130°C	130°C
Operating Temperature Range	–40°C to +80°C	–40°C to +100°C
Storage Temperature Range	–40°C to +100°C	–40°C to +120°C

Note:
1. Derate linearly as shown in Figures 6 and 7.

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Electrical / Optical Characteristics

$T_A = 25°C$

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Typical Viewing Angle[1]	$2\theta_{1/2}$				deg	
Major			120			
Minor			60			
Forward Voltage	V_F				V	$I_F = 20$ mA
Red ($\lambda_d = 626$ nm)			1.9	2.4		
Red ($\lambda_d = 630$ nm)			2.0	2.4[2]		
Amber ($\lambda_d = 590$ nm)			2.02	2.4		
Amber ($\lambda_d = 592$ nm)			2.15	2.4[2]		
Blue ($\lambda_d = 470$ nm)			3.5	4.0		
Green ($\lambda_d = 526$ nm)			3.5	4.0		
Reverse Voltage	V_R				V	$I_R = 100\ \mu A$
Amber and Red		5	20			
Blue and Green		5	–			
Peak Wavelength	λ_{PEAK}				nm	Peak of Wavelength of Spectral Distribution at $I_F = 20$ mA
Red ($\lambda_d = 626$ nm)			635			
Red ($\lambda_d = 630$ nm)			639			
Amber ($\lambda_d = 590$ nm)			592			
Amber ($\lambda_d = 592$ nm)			594			

LED Indicators

Parameter	Symbol	Min.	Typ.	Max.	Units	Test Conditions
Blue ($\lambda_d = 470$ nm)			467			
Green ($\lambda_d = 526$ nm)			524			
Spectral Halfwidth	$\Delta\lambda_{1/2}$				nm	Wavelength Width at Spectral Distribution 1/2 Power Point at $I_F = 20$ mA
Red ($\lambda_d = 626/630$ nm)			17			
Amber ($\lambda_d = 590/592$ nm)			17			
Blue ($\lambda_d = 470$ nm)			20			
Green ($\lambda_d = 526$ nm)			35			
Capacitance	C				pF	$V_F = 0$, F = 1 MHz
All Colors			40			
Thermal Resistance	$R\theta_{J\text{-}PIN}$				°C/W	LED Junction-to-Cathode Lead
All Colors			240			
Luminous Efficacy[3]	η_v				lm/W	Emitted Luminous Power / Emitted Radiant Power
Red ($\lambda_d = 626$ nm)			150			
Red ($\lambda_d = 630$ nm)			155			
Amber ($\lambda_d = 590$ nm)			480			
Amber ($\lambda_d = 592$ nm)			500			
Blue ($\lambda_d = 470$ nm)			70			
Green ($\lambda_d = 526$ nm)			540			

Notes:
1. $2\theta_{1/2}$ is the off-axis angle where the luminous intensity is the on-axis intensity.
2. For options -xxRxx, -xxTxx, and -xxVxx, maximum forward voltage, V_F, is 2.6 V. Please refer to V_F Bin Table below.
3. 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.

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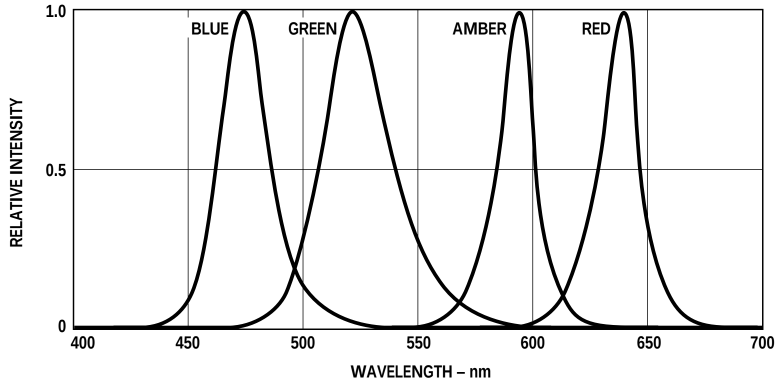

Figure 1. Relative intensity vs. wavelength.

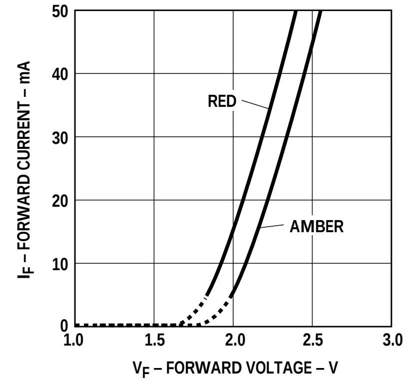

Figure 2. Amber, Red forward current vs. forward voltage.

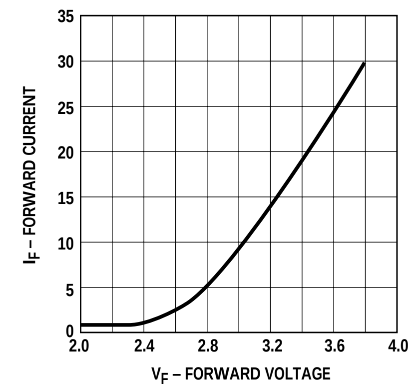

Figure 3. Blue, Green forward current vs. forward voltage.

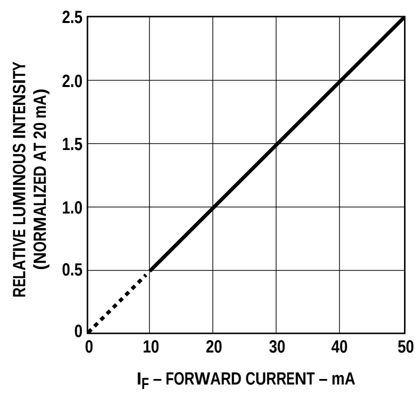

Figure 4. Amber, Red relative luminous intensity vs. forward current.

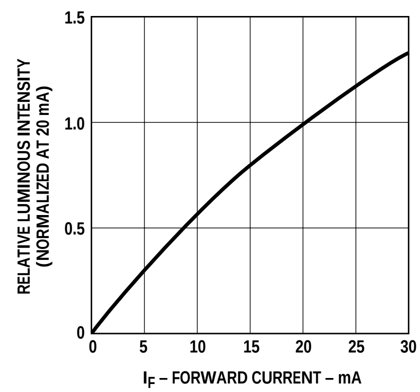

Figure 5. Blue, Green relative luminous intensity vs. forward current.

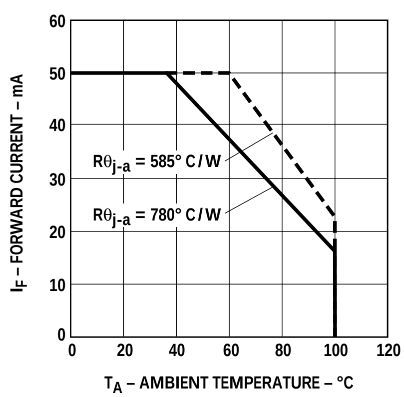

Figure 6. Amber, Red maximum forward current vs. ambient temperature.

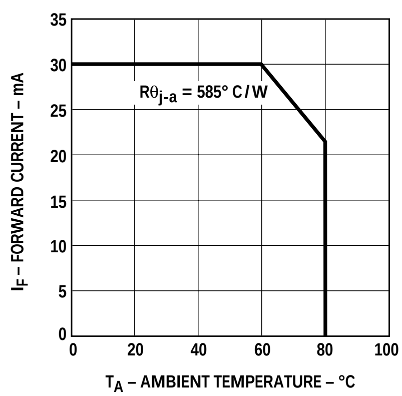

Figure 7. Blue, Green maximum forward current vs. ambient temperature.

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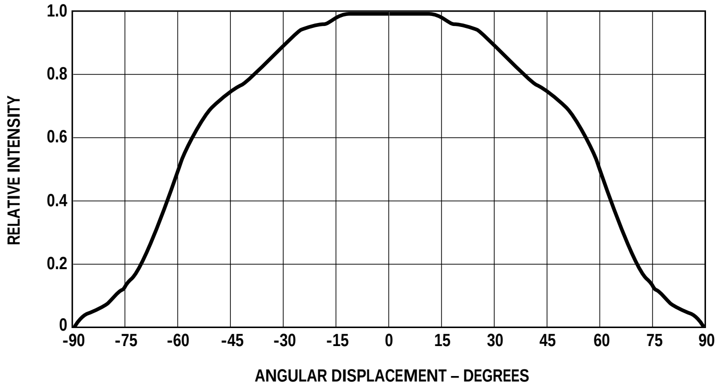

Figure 8a. Representative spatial radiation pattern for major axis.

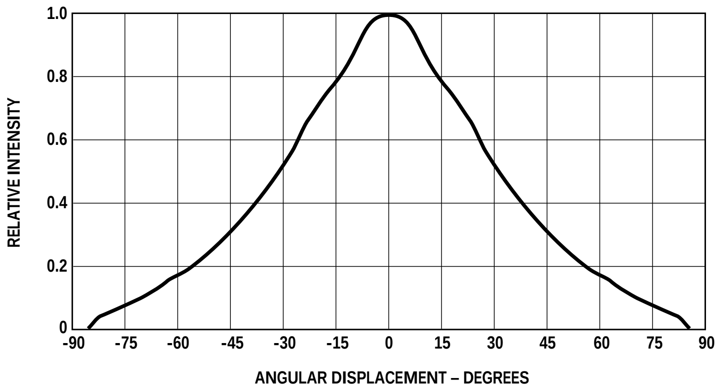

Figure 8b. Representative spatial radiation pattern for minor axis.

Intensity Bin Limits
(mcd at 20 mA)

Bin Name	Min.	Max.
D	65	85
E	85	110
F	110	140
G	140	180
H	180	240
J	240	310
K	310	400
L	400	520
M	520	680
N	680	880
P	880	1150

Tolerance for each bin limit is ± 15%.

VF Bin Table[2]

Bin Name	Min.	Max.
VA	2.0	2.2
VB	2.2	2.4
VC	2.4	2.6

Tolerance for each bin is ± 0.05 V.

Note:

1. Bin categories are established for classification of products. Products may not be available in all bin categories.

Color Bin Limits
(nm at 20 mA)

Blue	Color Range (nm)	
Bin	**Min.**	**Max.**
1	460.0	464.0
2	464.0	468.0
3	468.0	472.0
4	472.0	476.0
5	476.0	480.0

Tolerance for each bin limit is ± 0.5 nm.

Green	Color Range (nm)	
Bin ID	**Min.**	**Max.**
1	520.0	524.0
2	524.0	528.0
3	528.0	532.0
4	532.0	536.0
5	536.0	540.0

Tolerance for each bin limit is ± 0.5 nm.

Amber	Color Range (nm)	
Bin ID	**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.

Note:

1. All bin categories are established for classification of products. Products may not be available in all bin categories. Please contact your Agilent representatives for further information.

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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
0.457 x 0.457 mm (0.018 x 0.018 inch)	0.646 mm (0.025 inch)	0.976 to 1.078 mm (0.038 to 0.042 inch)
0.508 x 0.508 mm (0.020 x 0.020 inch)	0.718 mm (0.028 inch)	1.049 to 1.150 mm (0.041 to 0.045 inch)

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

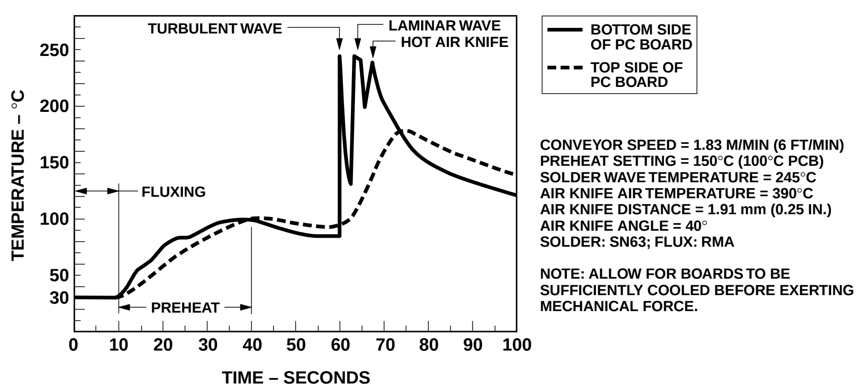

Figure 9. Recommended wave soldering profile.

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