

Agilent HLMP-Cxxx T-1³/₄ (5 mm) Super Bright Precision Optical Performance InGaN LED Lamps Data Sheet

**HLMP-CB18, HLMP-CB19, HLMP-CM18, HLMP-CM19, HLMP-CE18,
HLMP-CE19, HLMP-CB28, HLMP-CB29, HLMP-CM28, HLMP-CM29,
HLMP-CE28, HLMP-CE29, HLMP-CB38, HLMP-CB39, HLMP-CM38,
HLMP-CM39, HLMP-CE38, HLMP-CE39**

Description

These Super Bright Precision Optical Performance LED lamps are based on flip chip InGaN material, which is the brightest and most efficient technology for LEDs in the blue, green, and cyan region of the spectrum. The 470 nm typical dominant wavelength for blue and 530 nm typical wavelength for green is well suited to color mixing in full color signs. The 500 nm typical dominant wavelength for cyan is suitable for traffic signal application.

These LED lamps are untinted, non-diffused, T-1³/₄ packages incorporating second

generation optics which produce well-defined spatial radiation patterns at specific viewing cone angles.

These lamps are made with advanced optical grade epoxy, offering superior temperature and moisture resistance in outdoor signal and sign applications. The high maximum LED junction temperature limit of +130°C enables high temperature operation in bright sunlight conditions. The package epoxy contains both UV-a and UV-b inhibitors to reduce the effects of long-term exposure to direct sunlight.

Features

- Well defined spatial radiation pattern
- High luminous output
- Available in blue, green and cyan color
- Viewing angle: 15°, 23° and 30°
- Standoff or non-standoff leads
- Superior resistance to moisture
- New InGaN flip chip die technology with protective diode
- ESD class 3

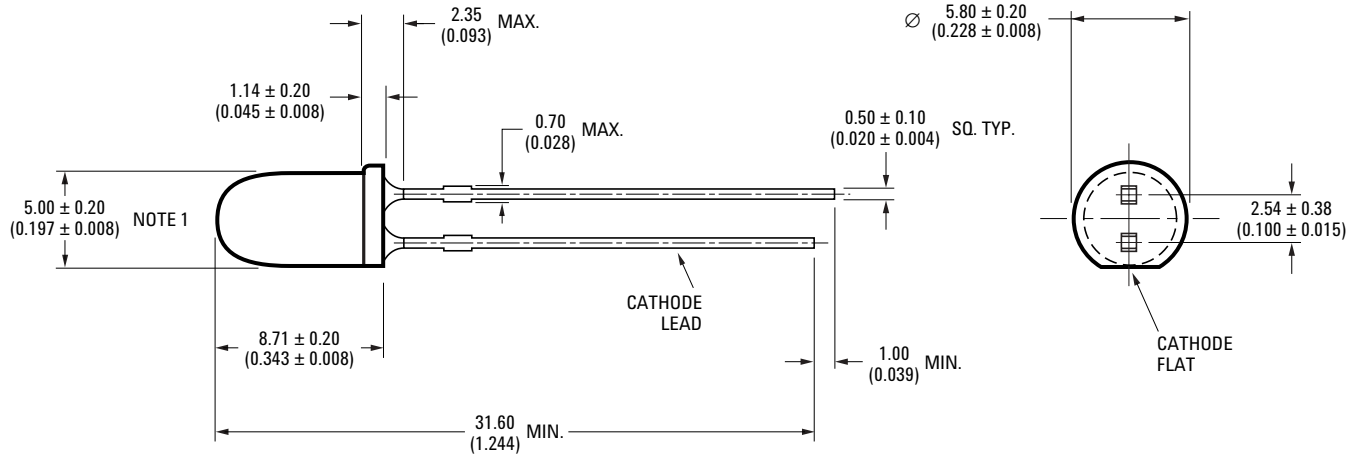
Applications

- Traffic signals
- Commercial outdoor advertising
- Front panel backlighting
- Front panel indicators

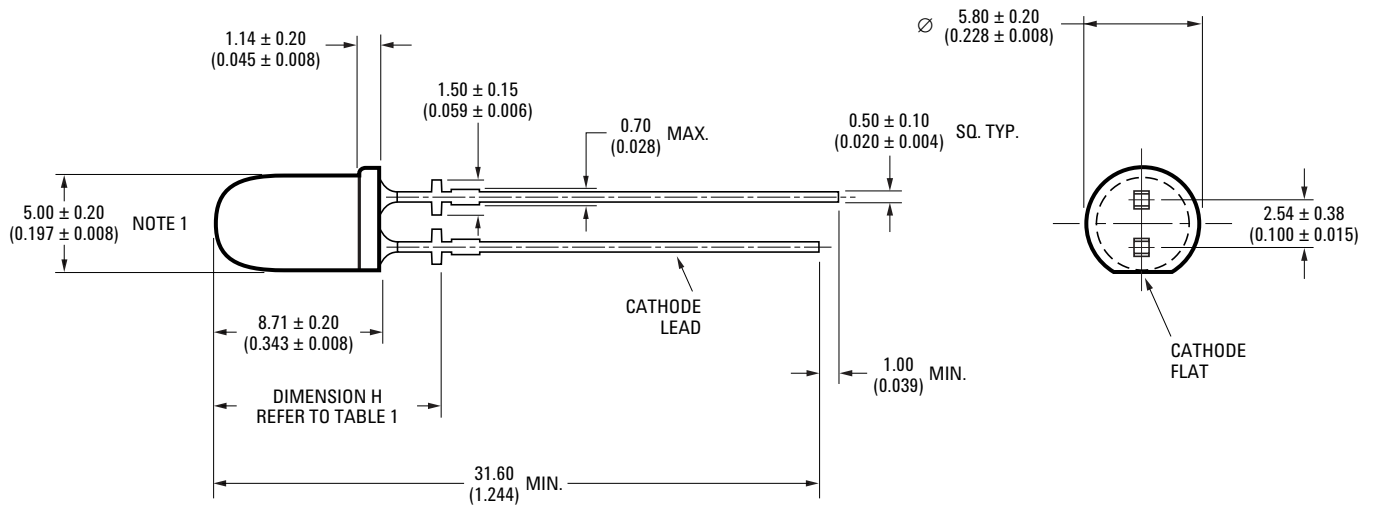


Package Dimensions

PACKAGE DIMENSION A



PACKAGE DIMENSION B



NOTES:

- 1. MEASURED JUST ABOVE FLANGE.
- 2. DIMENSIONS IN MILLIMETERS (INCHES).

DIMENSION H:	
23 & 30 DEGREE	= 12.67 ± 0.25 mm (0.499 ± 0.01 INCH)
15 DEGREE	= 12.93 ± 0.25 mm (0.509 ± 0.01 INCH)

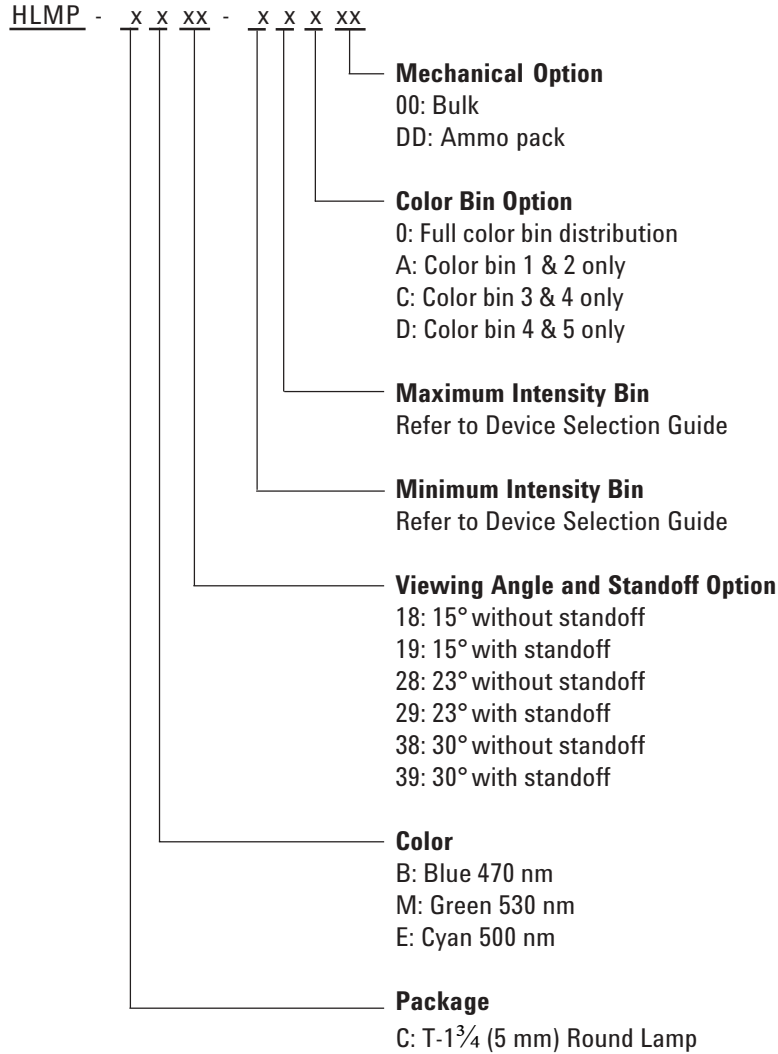
Device Selection Guide

Part Number	Color	Typical Viewing Angle (Degree)	Intensity (cd) at 20 mA			Standoff	Package Dimension
			Minimum	Typ.ical	Maximum		
HLMP-CB18-TW0xx	Blue	15	2.50	3.50	7.20	No	A
HLMP-CB19-TW0xx	Blue	15	2.50	3.50	7.20	Yes	B
HLMP-CM18-X10xx	Green	15	7.20	12.0	21.0	No	A
HLMP-CM19-X10xx	Green	15	7.20	12.0	21.0	Yes	B
HLMP-CE18-WZ0xx	Cyan	15	5.50	11.8	16.0	No	A
HLMP-CE19-WZ0xx	Cyan	15	5.50	11.8	16.0	Yes	B
HLMP-CB28-RU0xx	Blue	23	1.50	2.40	4.20	No	A
HLMP-CB29-RU0xx	Blue	23	1.50	2.40	4.20	Yes	B
HLMP-CM28-WZ0xx	Green	23	5.50	9.30	16.0	No	A
HLMP-CM29-WZ0xx	Green	23	5.50	9.30	16.0	Yes	B
HLMP-CE28-VY0xx	Cyan	23	4.20	7.40	12.0	No	A
HLMP-CE29-VY0xx	Cyan	23	4.20	7.40	12.0	Yes	B
HLMP-CB38-QT0xx	Blue	30	1.15	1.50	3.20	No	A
HLMP-CB39-QT0xx	Blue	30	1.15	1.50	3.20	Yes	B
HLMP-CM38-UX0xx	Green	30	3.20	5.00	9.30	No	A
HLMP-CM39-UX0xx	Green	30	3.20	5.00	9.30	Yes	B
HLMP-CE38-TW0xx	Cyan	30	2.50	3.90	7.20	No	A
HLMP-CE39-TW0xx	Cyan	30	2.50	3.90	7.20	Yes	B
HLMP-CB18-UVAxx	Blue	15	3.20	-	5.50	No	A
HLMP-CB28-STDxx	Blue	23	1.90	-	3.20	No	A
HLMP-CB38-QRAxx	Blue	30	1.15	-	1.90	No	A
HLMP-CB39-RSDxx	Blue	30	1.50	-	2.50	Yes	B
HLMP-CM18-YZCxx	Green	15	9.30	-	16.0	No	A
HLMP-CM28-WXCxx	Green	23	5.50	-	9.30	No	A
HLMP-CM38-UVCxx	Green	30	3.20	-	5.50	No	A
HLMP-CM39-UVCxx	Green	30	3.20	-	5.50	Yes	B
HLMP-CM39-WXDxx	Green	30	5.50	-	9.30	Yes	B

Notes:

1. Tolerance for luminous intensity measurement is $\pm 15\%$.
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. 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.

Ordering Information



Absolute Maximum Ratings at T_A = 25°C

Parameter	Value	Unit
DC Forward Current ^[1]	30	mA
Peak Pulsed Forward Current ^[2]	100	mA
Average Forward Current	30	mA
Power Dissipation	120	mW
LED Junction Temperature	130	°C
Operating Temperature Range	-40 to +85	°C
Storage Temperature Range	-40 to +100	°C

Notes:

1. Derate linearly as shown in Figure 3.
2. Duty factor 30%, 1KHz.

Electrical Characteristics at $T_A = 25^\circ\text{C}$

Parameters	Symbol	Blue			Green			Cyan			Units	Test Condition
		Min.	Typ.	Max.	Min.	Typ.	Max.	Min.	Typ.	Max.		
Forward Voltage	V_F	3.4	4.0		3.2	4.0		3.3	4.0	V	$I_F = 20 \text{ mA}$	
Capacitance	C	53			53			53		pF	$V_F = 0, f = 1 \text{ MHz}$	
Reverse Voltage ^[2]	V_R	0.6			0.6			0.6		V	$I_R = 10 \mu\text{A}$	
Thermal Resistance	$R\theta_{J-PIN}$	240			240			240		$^\circ\text{C/W}$	LED Junction to cathode lead	
Dominant Wavelength ^[3]	λ_d	460	470	480	520	530	540	490	500	510	nm	$I_F = 20 \text{ mA}$
Peak Wavelength	λ_{PEAK}	466			523			495			nm	Peak of wavelength of spectral distribution at $I_F = 20 \text{ mA}$
Spectral Half Width	$\Delta\lambda_{1/2}$	21			30			26				Wavelength width at spectral distribution power point at $I_F = 20 \text{ mA}$
Luminous Efficacy ^[4]	η_v	62			588			220		lm/W	Emitted luminous power/Emitted radiant power	

Notes:

- $2\theta_{1/2}$ is the off-axis angle where the luminous intensity is $\frac{1}{2}$ the on axis intensity.
- The reverse voltage of the product is equivalent to the forward voltage of the protective chip at $I_R = 10 \mu\text{A}$.
- The dominant wavelength, λ_d , is derived from the Chromaticity Diagram and represents the color of the lamp.
- The 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.

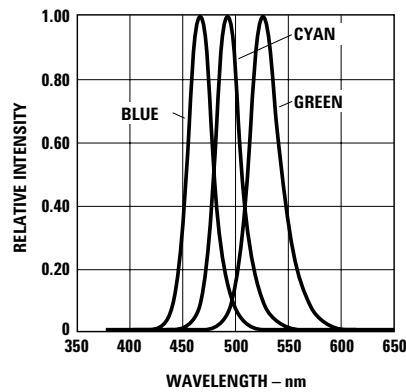


Figure 1. Relative intensity vs. wavelength.

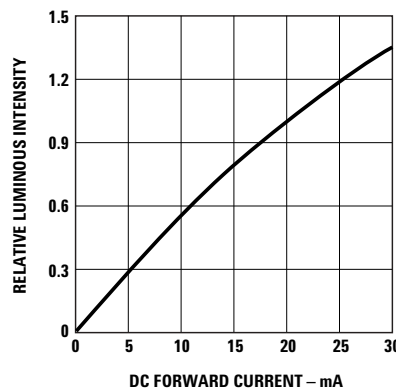


Figure 2. Relative luminous intensity vs. forward current.

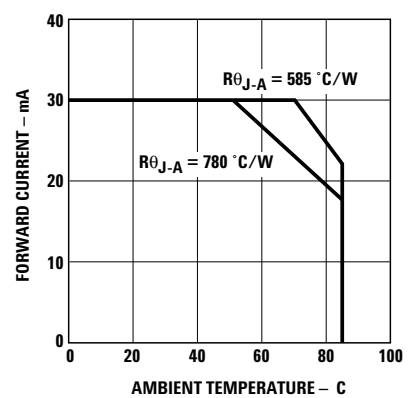


Figure 3. Forward current vs. ambient temperature.

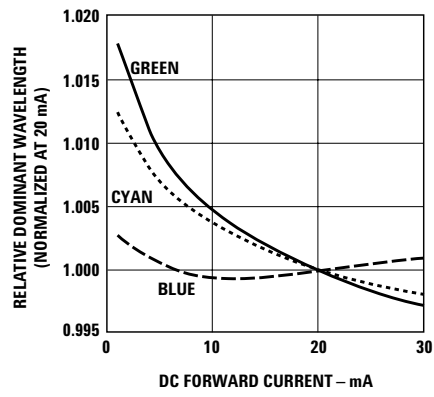
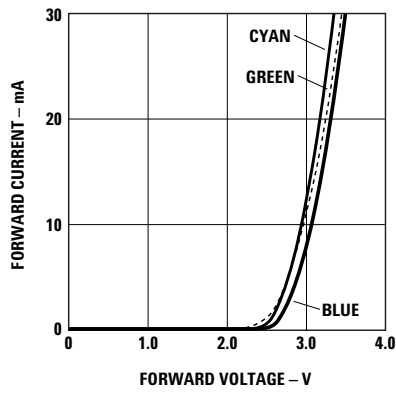


Figure 4. Forward current vs. forward voltage. Figure 5. Relative dominant wavelength vs DC forward current.

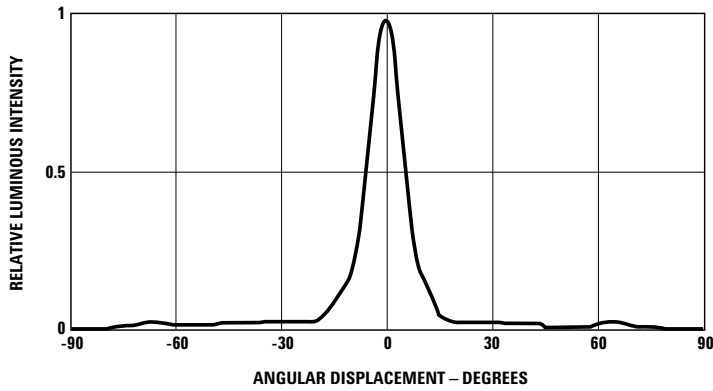


Figure 6. Spatial radiation pattern – 15 degree lamps.

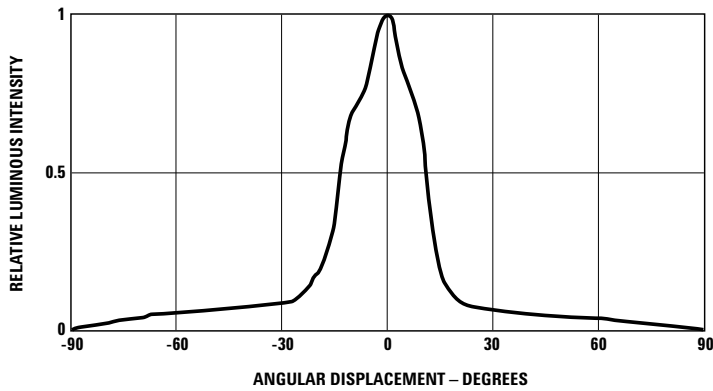


Figure 7. Spatial radiation pattern – 23 degree lamps.

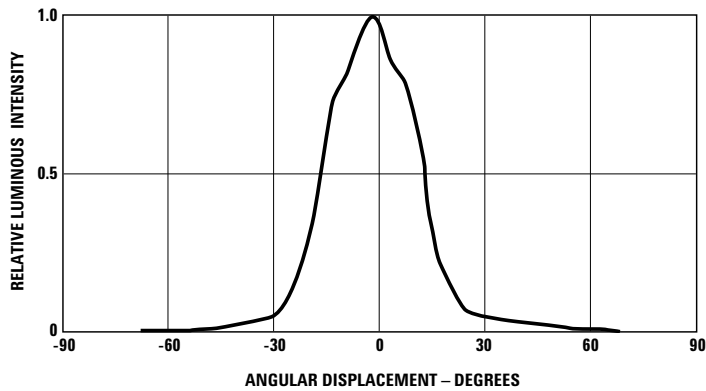


Figure 8. Spatial radiation pattern – 30 degree lamps.

Intensity Bin Limit Table

Bin	Intensity (mcd) at 20 mA	
	Min	Max
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
X	7200	9300
Y	9300	12000
Z	12000	16000
1	16000	21000

Tolerance for each bin limit is $\pm 15\%$.

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.

Cyan Color Bin Table

Bin	Min Dom	Max Dom	Xmin.	Ymin.	Xmax.	Ymax.
1	490.0	495.0	0.0454	0.2945	0.1164	0.3889
			0.1318	0.3060	0.0235	0.4127
2	495.0	500.0	0.0345	0.4127	0.1057	0.4769
			0.1164	0.3899	0.0082	0.5384
3	500.0	505.0	0.0082	0.5384	0.1207	0.5584
			0.1057	0.4769	0.0039	0.6548
4	505.0	510.0	0.0039	0.6548	0.1097	0.6251
			0.1027	0.5584	0.0139	0.7502
7	498.0	503.0	0.0132	0.4882	0.1028	0.5273
			0.1092	0.4417	0.0040	0.6104
8	503.0	508.0	0.0040	0.6104	0.1056	0.6007
			0.1028	0.5273	0.0080	0.7153

Tolerance for each bin limit is ± 0.5 nm.

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:

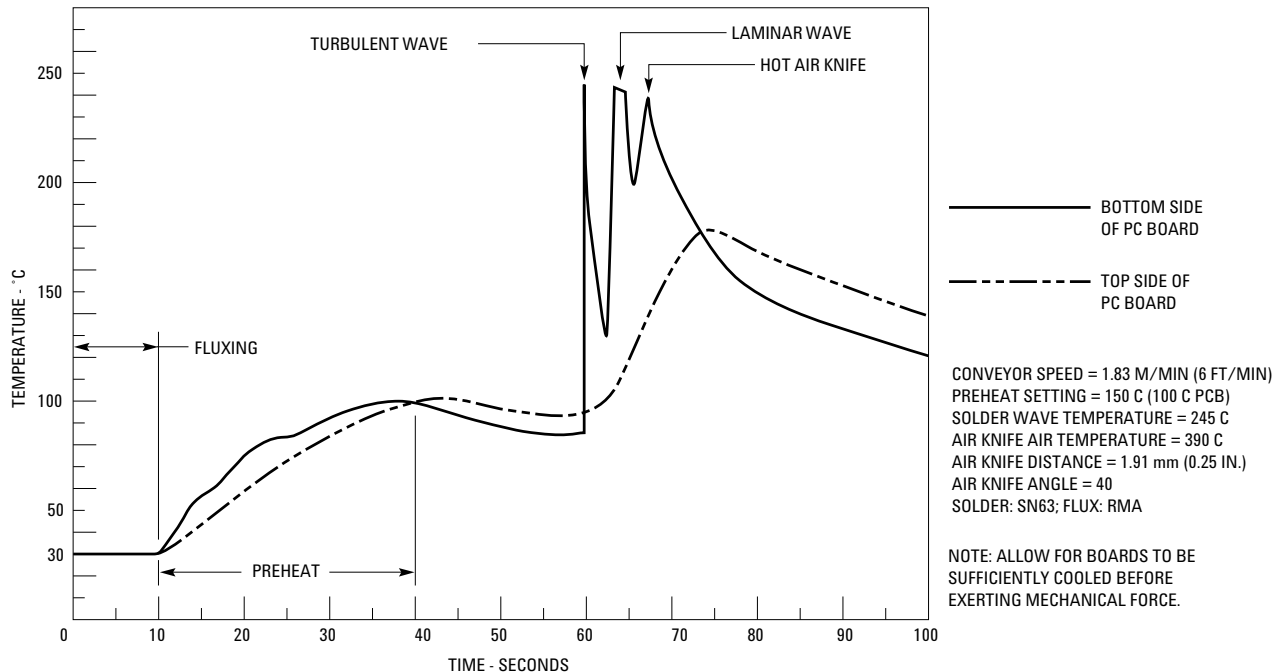
	Wave Soldering	Manual Solder Dipping
Pre-heat temperature	105 °C Max.	–
Preheat time	30 sec Max	–
Peak temperature	250 °C Max.	260 °C Max.
Dwell time	3 sec Max.	5 sec Max

- 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 lead 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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