

Lamina Radial Heat Sinks

New!

Lamina LED Light Sources

As the market leader in the development and manufacture of super-bright LED arrays, Lamina brings solid state lighting to applications which until now were only possible with traditional lighting sources.

Lamina's LED arrays are manufactured by combining high brightness LEDs from industry-leading LED manufacturers with Lamina's proprietary packaging technology, multilayer Low Temperature Co-Fired Ceramic on Metal (LTCC-M). LTCC-M is a breakthrough in thermal performance for LED packaging technology, a key factor in determining LED life and reliability. Unmatched thermal performance coupled with package interconnectivity allows Lamina to densely cluster multiple LEDs to achieve exceptionally high luminous intensity in very small footprints. Lamina's LED light sources are available in white, RGB and monochrome, from 1W to 100W, and also in custom packages up to 1000W.

Lamina LED Light sources provide:

- **HIGH LUMINOUS FLUX IN SMALL FOOTPRINT**
- **SUPERIOR THERMAL PERFORMANCE FOR IMPROVED RELIABILITY**
- **LONG LIFE AND HIGH LUMEN MAINTENANCE**
- **SUSTAINABLE DESIGN – ROHS COMPLIANT**
- **CUSTOM SIZES AND SHAPES AVAILABLE**

Radial Heat Sinks

Lamina, working in cooperation with ThermaFlo (www.ThermaFlo.com), developed a selection of radial heat sinks to enable easy and rapid prototyping of designs with Lamina's light engines. These heat sinks have been designed to maximize the thermal performance of high brightness LED light sources while allowing design flexibility.

Lamina heat sinks are:

- **DESIGNED FOR OPTIMAL THERMAL PERFORMANCE WITH LAMINA'S BL-2000, BL-3000 AND NEW BL-4000 FAMILY OF LIGHT ENGINES**
- **RADIAL SHAPE FOR DESIGN FLEXIBILITY**
- **DRILLED AND TAPPED FOR EASE OF ASSEMBLY**
- **ANODIZED FOR ENHANCED THERMAL PERFORMANCE**
- **DESIGNED FOR A WIDE RANGE OF MOUNTING OPTIONS**



LAMINA LED LIGHT SOURCE TYPICAL APPLICATIONS

ARCHITECTURAL LIGHTING

- DECORATIVE AND ACCENT
- COVE AND UNDER-SHELF
- GARDEN AND PATHWAY
- STEP LIGHTS

ARCHITAINMENT

LCD BACKLIGHTING

SIGNAGE & CHANNEL LETTERS

SIGNALS

- AIRFIELD TAXIWAY
- TRAFFIC
- SECURITY
- BEACONS
- RAIL

MACHINE VISION

MEDICAL

Assembly Recommendations

Lamina's BL Series LED light sources are designed for attachment to heat sinks using screws with thermal grease in the joint or by using conductive epoxy. All Lamina heat sinks are drilled and tapped to accept the recommended fasteners. More information on recommended attachment methods can be found in Lamina's Connection Guide for Lamina's LED Light sources at www.LaminaCeramics.com.

Heat Sink Selection

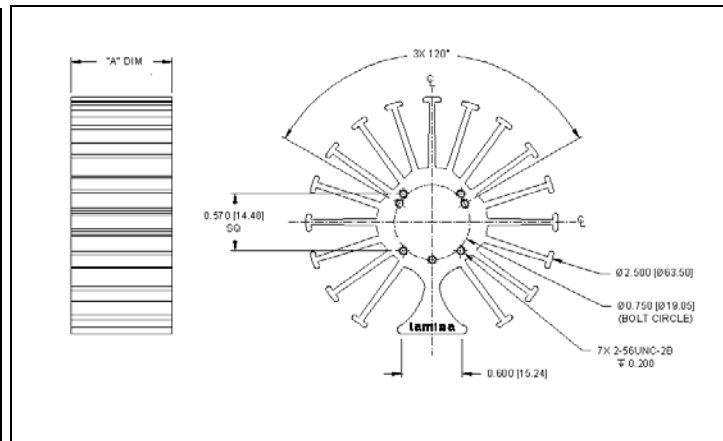
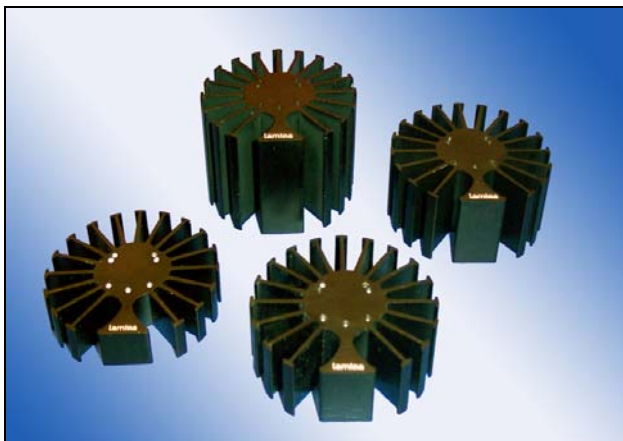
Lamina's LED arrays must be operated to maintain LED die junction temperatures at or below maximum rated temperatures. Lamina's LED arrays provide very efficient transfer of heat from the individual LED die to the heat sink. Additionally, a heat sink must be selected with sufficient cooling capacity to maintain the LED die junction below the maximum rated temperature.

Lamina's heat sinks have been sized for Lamina's standard products, and to accommodate a range of desired operating conditions. Proper heat sink sizing is determined by a number of factors, including those listed below:

- **POWER DISSIPATED (WATTS)** – DETERMINED BY THE LIGHT ENGINE PART NUMBER AND ASSOCIATED DRIVE PARAMETERS CHOSEN FOR OPERATING THE LED LIGHT SOURCE.
- **AMBIENT CONDITIONS** – AMBIENT TEMPERATURE CONDITIONS, FREE OR FORCED CONVECTION OF AIR, ETC.
- **THERMAL PATH** – THERMAL INTERFACE MATERIAL, LIGHT ENGINE ATTACHMENT METHOD, AND SURFACE AREA AND CONDUCTIVITY OF FIXTURE HOUSING THE HEAT SINK.
- **DESIRED LIFETIME AND LUMEN MAINTENANCE** – LOWER LED JUNCTION TEMPERATURES RESULT IN LONGER LIFETIMES AND HIGHER LIGHT OUTPUT OVER LIFE. INCREASING HEAT SINK SIZE WILL GENERALLY HELP TO LOWER LED OPERATING TEMPERATURES.
- **DESIRED LIGHT OUTPUT** – LED LUMINOUS OUTPUT IS RATED AT AN LED DIE JUNCTION TEMPERATURE OF 25°C. HOWEVER, IN ALL BUT A VERY FEW APPLICATIONS, WHICH ARE VERY COLD, LEDs OPERATE WELL ABOVE 25C. ELEVATED LED JUNCTION TEMPERATURES RESULT IN LOWER FLUX LEVELS. RED AND AMBER ARE MORE AFFECTED THAN BLUE, GREEN AND WHITE. INCREASING HEAT SINK SIZE WILL GENERALLY HELP TO LOWER LED OPERATING TEMPERATURES AND RESULT IN HIGHER LIGHT OUTPUT.

BL-2000 and BL-4000 Heat Sinks

Mechanical Specifications



To see how you can realize all these design benefits, to request a sample, or to speak with an engineer about your design, contact Lamina at 800.808.5822 or 609.265.1401 or visit www.laminaceramics.com.

Lamina's BL-2000 / BL-4000 heat sinks come in four different thicknesses ("A" Dimension), from 0.5" (13mm) to 1.5" (38mm) thick. Table 1 lists the applicable sizes for Lamina's standard BL-2000 and BL-4000 products.

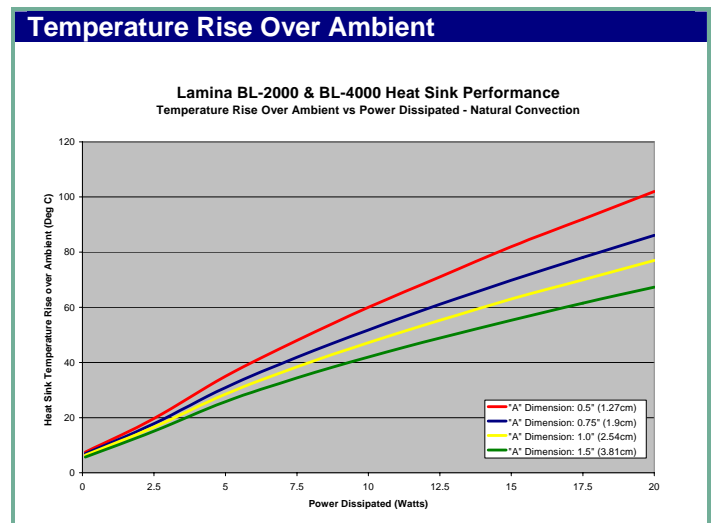
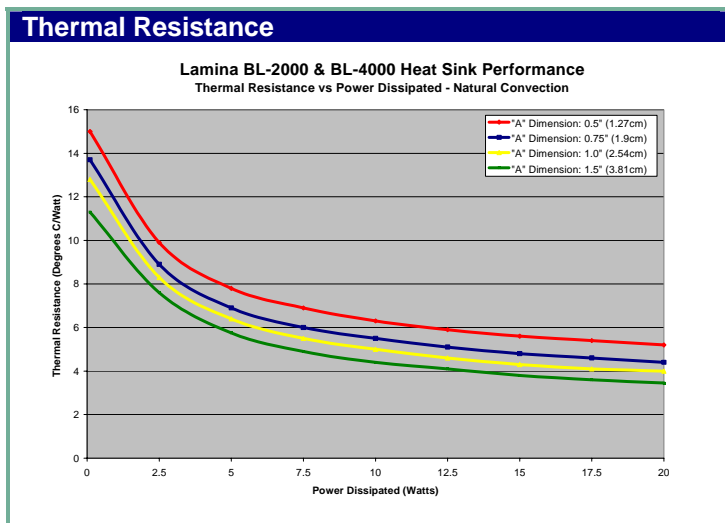
Table 1: BL-2000 and BL-4000 Applicable heat sinks

| Technical Data | | | | |
|-----------------------|---------------|---------------------------------------|--------------------|--|
| Heat Sink Part Number | "A" Dimension | BL-2000 White, RGB, RGB+, Blue, Green | BL-2000 Red, Amber | BL-4000 White, Red, Amber, Blue, Green, RGB+ |
| 800-0345-3 | 0.5" (1.27cm) | X | NA | X |
| 800-0345-2 | 0.75" (1.9cm) | X | NA | X |
| 800-0345-1 | 1.0" (2.54cm) | X | X | X |
| 800-0345-5 | 1.5" (3.81cm) | X | X | X |

Note: Applicable heat sinks when operated at rated LED light source power, 25°C ambient and unrestricted convection.

BL-2000 and BL-4000 Heat Sink Performance

The heat sink thermal resistance and temperature rise over ambient temperature for the desired input power (Power Dissipated) can be determined using the charts below.



The LED junction temperature is then determined by the following formula:

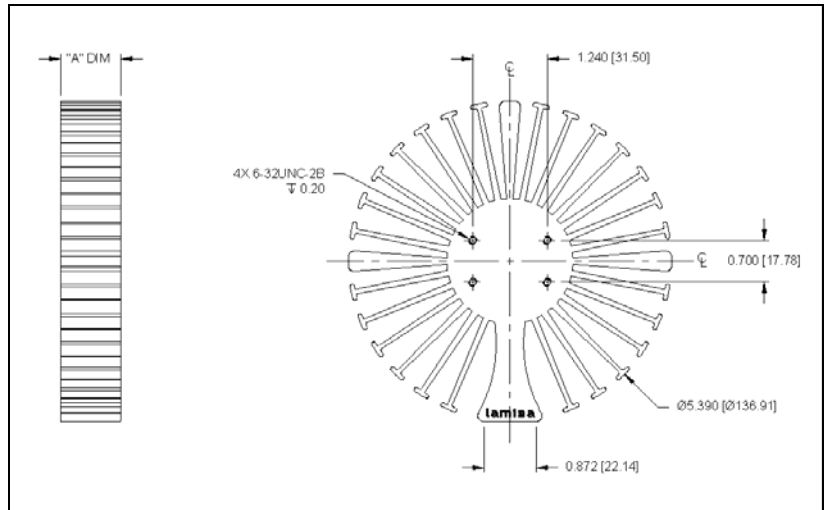
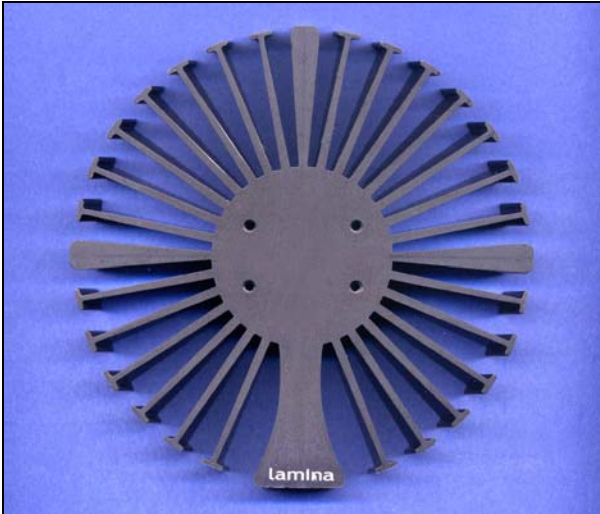
$$T_j \text{ (LED Junction)} = T_{\text{Light Engine Rise}} + T_{\text{Interface Rise}} + T_{\text{Heat sink Rise}} + T_{\text{Ambient}}$$

The thermal interface temperature rise is minimal for most common operating conditions when Lamina's LED light sources are screwed down and thermal grease is used as the thermal interface material. Be sure to select a heat sink that maintains desired LED die junction temperature, and does not exceed maximum rated temperatures. The maximum rated LED die junction temperatures can be found on the respective Product Data Sheets.

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BL-3000 Heat Sinks

Mechanical Specifications



Lamina's BL-3000 heat sinks are designed for all but Red and Amber BL-3000 LED light sources under natural convection conditions. For the higher wattage Red and Amber light sources additional forced convection is necessary. Additional convection can be achieved by attaching a CPU style fan to the back of the heat sink, connecting the fan to the paddles of the heat sink. Table 2 lists the applicable thicknesses for Lamina's standard products. Lamina application specialists can provide additional information on suitable fans and attachment methods.

Table 2: BL-3000 Applicable heat sinks

| Technical Data | | | |
|--|---------------|----------------------------------|--------------------|
| Lamina Heat Sink Part Number | "A" Dimension | BL-3000 White, RGB+, Blue, Green | BL-3000 Red, Amber |
| 800-0346-1 | 1.0" (2.54cm) | X | NA |
| Note: Applicable heat sinks when operated at rated LED light source power, 25°C ambient and unrestricted convection. | | | |

BL-3000 Heat Sink Performance

The heat sink thermal resistance and temperature rise over ambient for the desired input power (Power Dissipated) can be determined using the charts below. The LED junction temperature is then determined by the following formula:

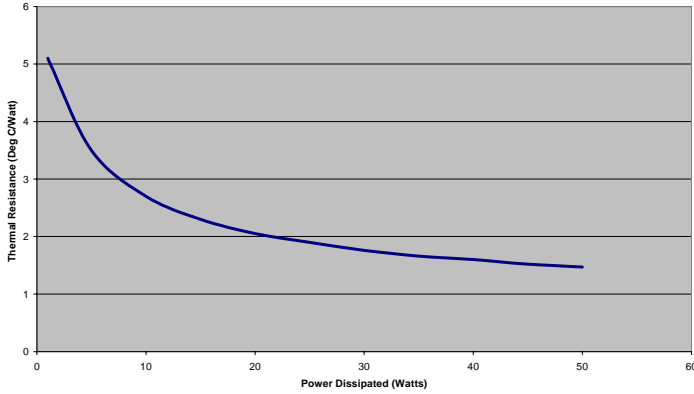
$$T_{j \text{ (LED Junction)}} = T_{\text{Light Engine Rise}} + T_{\text{Interface Rise}} + T_{\text{Heat sink Rise}} + T_{\text{Ambient}}$$

The thermal interface temperature rise is insignificant for most common operating conditions when light engines are screwed down and thermal grease is used as the thermal interface material. Be sure to select a heat sink that maintains desired LED die junction temperature and does not exceed maximum rated temperatures. The maximum rated LED die junction temperatures can be found on the respective Product Data Sheets.

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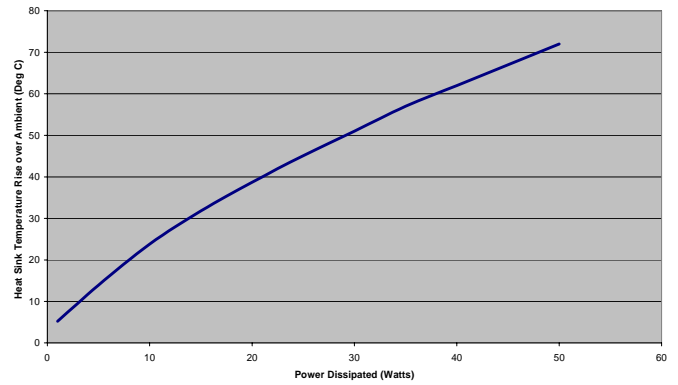
Thermal Resistance

Lamina BL-3000 Heat Sink Performance
Thermal Resistance vs Power Dissipated - Natural Convection



Temperature Rise Over Ambient

Lamina BL-3000 Heat Sink Performance
Temperature Rise Over Ambient vs Power Dissipated - Natural Convection



Lamina's heat sinks are available through select distributors. Please visit Lamina's website, www.LaminaCeramics.com, for more information on Lamina's LED light sources and Lamina's worldwide distribution network.

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