

Industry:
Consumer
Application:
High End Lighting

Introduction

- A household named consumer product company sought Aavid, Thermal division of Boyd Corporation, to analyze and design the thermal solution for two of their LED based lamp products. This company requested Aavid's support throughout the product development process until a functional thermal solution was realized and could be presented at their Summit Meeting for board approval.

The Challenge

- The table lamp consists of 20 LEDs each dissipating about 0.64W (12.8W total). Aavid must determine where these LEDs will be mounted on a ring shaped flex pcb in two arrays. The Lamp base will be die cast and will house the power supply (ballast) which may dissipate an additional 2-3W.
- The desk lamp consists of 4 high luminous LEDs each could dissipate up to 4.5W; however total dissipation from the 4 LEDs does not exceed 10W at any time. These LEDs may be mounted to a PCB or metal depending on the thermal solution. Aavid's job will be to figure out how to spread and transport the heat down into the spine and ultimately to the base.
- Both thermal solutions must be functional, manufacturable, and not impact the existing industrial design of the lamps by the time of their Summit Meeting in three months.

The Solution

- Aavid followed its process to find the best thermal solution within the design constraints:
 - Baseline Thermal Modeling and Analysis: LED packages based on their data sheets, Flex PCB was based on its copper stack-up, All plastic layers, sheet metal layers and air-gap in between surface, All significant heat generating components, including the ballast, and Base simulations were carried out (as is) in a natural convection environment at the specified ambient
 - Thermal Design and Optimization Exploration: Adding heat spreaders beneath LEDs to avoid concentrated heat sources, Spreading the heat uniformly over the available metal components, Maximize natural convection from exposed surfaces, Add vent holes or channels for table light as necessary, Design heat pipe and/or sink solution where necessary.
 - Prototype Solution Design: Assist in design and manufacture working prototype in time for the customer's board meeting for presentation.

The Deliverables/Results

- Aavid presented baseline simulation results, flow and temperature contour plots and specific guidelines/recommendations on airflow, ventilation, conduction to sheet metal, conduction layers and thicknesses, thermal interface materials, and vent holes, for both Table and Desk lamp products.
- Aavid developed a CAD database suitable for prototype of the thermal solutions for both products and then completed a manufactured prototype in time for the Summit. Also at this meeting the client was ensured a sound functional solution while maintaining the integrity of the design's intent.
- After the board's approval at the Summit, this company has successfully launched both products into the marketplace with the support of Aavid.

