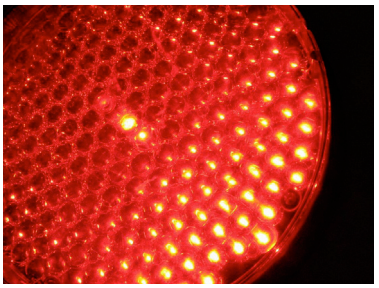
LED Lighting

THERMAL ANALYSIS & DESIGN SERVICES FOR THE LED LIGHTING INDUSTRY



As the use of LEDs becomes more and more popular for illumination where incandescent lights are used commonly, their power consumption continues to increase, since more demand is placed on the LED for higher light output. High-power LEDs, often employed in arrays, require thermal management similar to other semiconductor devices and boards that are commonly seen in different electronics market sectors. However, the largest exception is the fact that space available for any thermal management solution is typically on the backside of the LED array, where as in a typical PCB, both sides of the board are often available for thermal management solutions.

High temperatures not only degrade an LED's expected life, but also result in lower or non-uniform light output. The short-term effects are color shift and reduced light output, while the long-term effects are accelerated lumen depreciation and thus diminished lifespan. Many of the street traffic lights are daily reminders of how a poorly thermally managed LED light array can be adversely impacted by heat. As seen in many LED traffic lights, the central LEDs are burnt out which corresponds to the hottest points on the LED's PCB.

ATS provides comprehensive LED thermal management analyses and design services. ATS entrance to LED thermal management started with its office in Europe in early 2000 where LEDs were beginning to gain traction in Europe. ATS has worked with LED lighting companies in diverse industries spanning from automotive, consumer, entertainment, agricultural and military – just to list a few. As the result, ATS has developed a unique set of expertise and perspective on LED thermal management and has equipped its engineers and laboratories with the right tool sets to address this problem domain.

"ATS is a company with vast expertise in thermal management design and manufacturing. ATS already has a range of products specifically for LED cooling. They understand the heat-related challenges presented by LEDs, as well as the cost and performance demands of the consumer marketplace." - Lemnis Lighting

CASE STUDIES

A global LED manufacturer approached ATS for help cooling an LED that was overheating. Their current heat sink, designed for a 6W LED in a vertical orientation, had a thermal resistance (R_{Hs}) of 9°C/W and a maximum heat sink temperature rise (ΔT_{hs-a}) of 64°C at ambient temperature. ATS analyzed the cooling options, factoring in the position of the light and how they might optimize the design to bring greater improvements and add a required margin for possible ambient temperature spikes. Using CFD simulations, ATS identified the issue and created a new design, factoring in the position of the light and added additional surface features to optimize the airflow through the fin structure and maximize radiation heat transfer from the heat sink. After the prototype was fabricated through ATS's manufacturing services, extensive tests were performed which showed a 33% improvement in the LED's performance. The heat sink's thermal resistance was lowered from 9 to 6.2°C/W and its maximum temperature rise was lowered from 64.0 to 37.1°C.

Osram-Sylvania, approached ATS for help in designing a cooling solution for their DRAGONstick® LED lighting product line. Widely used in architectural lighting, OSRAM DRAGONstick® lights feature six or twelve LEDs mounted on a metal board, delivering 120-300 lumens, for applications such as shelf lighting, refrigerators/freezers and display cases. During laboratory testing, the OSRAM DRAGONstick® reached a temperature of 64.9°C above ambient. ATS designed, tested and manufactured a new heat sink line, incorporating ATS' maxiFLOW™ flared fin technology. The temperature of the LED was reduced by 53%, for a steady state operation of 30.4°C above ambient.

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