

Thermal Management and Heat Transfer Analysis of High-Power Light-Emitting Diode Packages

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Effective thermal management of the high-power LEDs is complicated since a standard LED structure has to rely primarily on natural convection cooling as well as heat conduction. In this talk, we address some of the design issues and the technical approaches for thermal management and the heat transfer characteristics of the high-power LED package. To analyze the temperature distribution and thermal stress in the high power LED package, the finite element method (FEM) was used as a function of input current and heat slug geometry for a thermal design. The temperature of high power LED package increased with the input current. Particularly, silicon encapsulant and epoxy resin showed a higher temperature distribution due to heat burden. Also, the temperature distribution was affected by package design. By increasing the area and volume of heat slug, an efficient cooling was obtained. Especially Cu-coated package showed the best heat dissipation. The thermal stress in the high power LED package was also discussed.