

고출력 GaN-based LED의 열적 설계 및 패키징

신무환

명지대학교 세라믹공학과 반도체 재료.소자 연구실
(mwshin@mju.ac.kr)

Research activity in the III-V nitrides materials system has increased markedly in the past several years ever since high-brightness blue light-emitting diodes (LEDs) became commercially available. Despite of excellent optical properties of the GaN, however, inherently poor thermal property of the sapphire used as a substrate material in these devices may lead to thermal degradation of devices, especially during their high power operation. Therefore, dependable thermal analysis and packaging schemes of GaN-based LEDs are necessary for solid lighting applications under high power operation. In this paper, emphasis will be placed upon thermal design of GaN-based LEDs. Thermal measurements of LEDs on chip and packaging scale were performed using the liquid crystal thermographic technology and micro thermocouples for different bias conditions. By a series of optical arrangement, hot spots with specific transition temperatures were obtained with increasing input power. Thermal design of LEDs was made using the finite element method and analytical unit temperature profile approach with optimal boundary conditions. The experimental results were compared to the simulated data and the results agree well enough for the establishment of dependable prediction of thermal behavior in these devices. The paper will present a more detailed understanding of the thermal analysis of the GaN-based blue and white LEDs for high power applications.

M. W. Shin; Tel 031-330-6465; Fax:031-330-6457