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COMPARISON BETWEEN VERTICAL-STAND PACKAGING AND PLANAR-MOUNTED PACKAGING FOR GaN ON GaN LED

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ABSTRACT- Due to the fact that light extraction efficiency of white InGaN LEDs grown on GaN substrate is low as a result from total internal reflection phenomena, therefore flip chip, chip shaping and roughening p-GaN have been proposed. However, these methods are inefficient to extract the light as the GaN substrate surface is bonded to the package in the planar mounting configuration, causing absorption losses occur along optical path. In this present work, vertical-stand packaging for LED on GaN substrate is proposed as an alternative. The light extraction efficiency of the LED is compared to the one using planar-mounted packaging. It was found that the luminous efficacy and the external quantum efficiency of the vertical packed-LED is improved by 10% and 33%, respectively with respect to the planar-packed LED. This is because the extraction of light of the LED with the vertical-stand packaging is contributed from all sides of the LED, whereas, the light extraction for the LED with the planar-mounted packaging is only coming from the top and the side-walls of the LED.

Keywords: GaN on GaN LED, vertical-stand packaging, planar-mounted packaging, light extraction efficiency.