

## PWSOI-2

### **EVALUATION OF CURRENT AND TEMPERATURE EFFECTS ON HIGH POWER LIGHT-EMITTING DIODE EFFICIENCIES**

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Luminous efficacy is one of the major characteristics used to qualify and compare different light sources. For high power light-emitting diodes (LEDs) however, efficacy values provided by manufacturers are often subject of discussion. Indeed, different operating conditions met in industrial laboratory environments and practical applications result in large differences between production specifications and real LED performance, compromising a successful implementation. Especially the use of continuous high drive currents affects the LED flux and efficiency in practical applications. At a constant junction temperature the diode efficiency decreases for high currents, an effect generally known as the efficiency droop. Furthermore, these high currents cause an important power loss due to the internal series resistance of the diode package. This effect induces an additional increase in temperature, which in turn influences the LED efficiency in a negative way. In this paper, the influence of high currents and temperatures on the luminous flux is measured with a custom made integrating sphere. During these measurements, the LED input current and junction temperature are varied independently by use of a LED mount incorporating a Peltier element. Experimental results are used to characterize and model the large discrepancies between specifications of LEDs and their field behaviour.

Keywords: light-emitting diode efficiency, current and temperature effects, integrating sphere