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器件驱动与控制

大功率LED效率特性分析与驱动方案设计

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摘要： 考察了大功率LED量子效率衰落问题的研究进展并检测和比较了当前市场不同产品的大功率LED性能,随着LED效率-电流特性的逐渐改善,其最高效率所对应驱动电流开始超过额定电流。由此提出LED的矩形波脉冲驱动策略,驱动电路中MOS晶体管栅极由低频 (200~800 Hz) 矩形脉冲调制高频 (~40 kHz)脉冲产生的间歇式PWM脉冲串来控制,在输出端滤除高频成分后得到接近于矩形波的低频脉冲电流输出。在调节驱动电路的电流工作点以达到负载LED最高发光效率工作点同时,约束输出脉冲峰值电流与占空比以保证LED驱动电流的平均值恒定。

关键词： 大功率LED 脉冲驱动 效率衰落 极值效率 LED背光源

Efficiency Characteristic Analysis and Driving Scheme Design of Power LEDs

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Abstract: Development of the research on power LEDs' quantum efficiency droop was investigated. Several LED products with different performance of high power operation were compared. Due to the improvement of the LEDs' efficiency dependence on the driving current, their operating current corresponding to the maximum efficiency are exceeding their rating values. Under this circumstance, a driving strategy by rectangular pulse is proposed. In the driving circuit, the MOSFET's gate was controlled by an intermittent waveform of PWM pulse series which is generated by modulating the rectangular pulses at lower frequency (200~800 Hz) on those at higher frequency (~40 kHz), whereby an approximately rectangular waveform at the lower frequency of the current pulses can be obtained by filtering the high frequency components. The peak current and duty ratio of the output drive to the loaded LED were correlated to maintain the constant drive current in average while the operating current was regulated to reach the maximum efficiency of the loaded LED.

Keywords: high power LED pulse drive efficiency droop maximum efficiency LED backlight source

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