

DESIGN AND IMPLEMENTATION OF HIGH PERFORMANCE STAND-ALONE PHOTOVOLTAIC LIGHTING SYSTEM

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ABSTRACT

This paper presents a novel high-performance standalone photovoltaic (PV) lighting system which can provide functional illumination based on high power White LEDs. An improved incremental conductance Maximum Power Point Tracking (MPPT) method is proposed in PV system to maximize the photovoltaic array output power, irrespective of the temperature and irradiation conditions and of the load electrical characteristics. A novel strategy to charge the battery is designed from the analyses and comparison results. In order to provide a steady-state operating environment for high power White LEDs, a specially designed LED drive module is implemented. Further more, a self-adapting dimming control is designed to maintain a stable indoor illuminance. Experimental results show the performance of the proposed photovoltaic lighting system.

KEYWORDS: Photovoltaic High-Intensity-Discharge Street Lighting System, Single-Ended Primary Inductance Converter, Maximum Power Point Tracking, Battery Charging, Electronic Ballast, Power Factor Correction.