Automatika ›
Journal for Control, Measurement, Electronics, Computing and Communications
Volume 53, 2012 - Issue 2: Special Issue on DC-DC Conversion and Active Rectifying

Original scientific paper

An Overview of the AC-DC and DC-DC Converters for LED Lighting Applications

Pregled AC-DC i DC-DC pretvarača za primjene u LED rasvjeti

Asst. Prof. Manuel Arias, Ph.D. , Aitor Vázquez, M.Sc. & Prof. Javier Sebastián, Ph.D.

Pages 156-172 | Received 29 Dec 2011, Accepted 04 Apr 2012, Published online: 20 Jan 2017

Cite this article https://doi.org/10.7305/automatika.53-2.154

References Citations Metrics Reprints & Permissions

View PDF Share

Abstract

High-Brightness Light Emitting Diodes (HB-LEDs) are considered the future trend in lighting not only due to their high efficiency and high reliability, but also due to their other outstanding characteristics: chromatic variety, shock and vibration resistance, etc. Nevertheless, they need the development of new power supplies especially designed for boosting and taking advantage of their aforementioned characteristics. Besides, their behaviour is completely different from the rest of lighting devices and, consequently, it should be also taken into account in the design of the converters used to drive them. As a result, many well-known topologies have been optimized or

redesigned in order to be used in LED—lighting applications and many new topologies have come up in the recent years with the same purpose.

In this paper, the main HB-LED characteristics will be explained, highlighting how they influence the design of their power supplies. After, the main topologies will be presented from the simplest to the most complex ones, analysing their advantages and disadvantages.

Svjetleće diode s visokom razinom svjetline (HB-LED) smatraju se budućim trendom u rasvjeti zahvaljujući ne samo visokom stupnju efikasnosti i pouz-danosti, nego i njihovim izvanrednim svojstvima: raznolikost boja, otpornost na udarce i vibracije i sl. Ipak, s ciljem potpunog iskorištenja prethodno spomenutih svojstava, potrebno je razviti nove, posebno osmišljene izvore napajanja. Osim toga, ponašanje im se posve razlikuje od ostalih tipova rasvjete što je potrebno uzeti u obzir pri projektiranju pretvarača za njihovo napajanje. Kao posljedica toga, mnoge su poznate topologije pretvarača optimirane ili preoblikovane posebno za primjenu u LED rasvjeti, a zadnjih nekoliko godina mnoge nove su se tek pojavile.

U ovom članku objašnjena su osnovna HB-LED svojstva naglašavajući njihov utjecaj na razvoj izvora napajanja. Uz to, prikazane su osnovne topologije, od najjednostavnijih do najsloženijih, ujedno analizirajući prednosti i nedostatke pojedinih.

Key words:

AC-DC converters DC-DC converters LED Lighting

Ključne riječi:

AC-DC pretvarači DC-DC pretvarači LED rasvjeta

Additional information

Notes on contributors

Manuel Arias

Manuel Arias Pérez de Azpeitia was born in Oviedo, Spain, in 1980. He received the M. Sc. degree in electrical engineering from the University of Oviedo, Gijón, Spain in 2005 and the Ph. D. degree in the same university in 2010. Since February 2005, he has been a Researcher in the Deparment of Electrical and Electronic Engineering, University of Oviedo, developing electronic systems for UPSs and electronic switching power supplies. Since February 2007, he has also been an Assistant Professor of electronics in the same University. His research interests include DC-DC converters, AC-DC converters and LED lighting.

Aitor Vázquez

Aitor Vázquez was born in Oviedo, Spain, in 1984. He received the M.Sc. degree in telecommunication engineering from the University of Oviedo in 2009. He became a member of Power Supply System Group in 2010, where he is currently working toward the Ph.D. degree. His research interests include multiple input and output DC/DC conversion, power-factor corrector AC/DC converters and energy recovery systems.

Javier Sebastián

Javier Sebastián was born in Madrid, Spain, in 1958. He received the M.Sc. degree from the Polytechnic University of Madrid, Madrid, in 1981 and the Ph.D. degree from the Universidad de Oviedo, Gijón, Spain, in 1985. He was an Assistant Professor and an Associate Professor at both the Polytechnic University of Madrid and the Universidad de Oviedo. Since 1992, he has been with the Universidad de Oviedo, where he is currently a Professor. His research interests are switching-mode power supplies, modeling of DC-to-DC converters, low-output-voltage DC-to-DC converters, and high-power-factor rectifiers.