A Survey On Advance Approach for Power Efficient LED Driver For LED String using DC-DC Converter

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ABSTRACT

Current generation DC source use everywhere instead of AC because of Power consumption and leakage current. So in this Project work on hybrid passive filter base cascade DC-DC converter which design with capacitor less. So we design converter to drive DC LED string with minimum power consumption and also work on load balancing mechanism, Design module and analysis on MATLAB (SIMULINK) & work on other parameters like power consumption loss and energy also work on the design is based on the utilization of the internal capacitance of the LED to replace the smoothing capacitor.

LED lighting systems usually have many LEDs for better illumination that can reach multiple tens of LEDs. Such configuration can be utilized to enlarge the total internal capacitance and hence minimize the output ripple.

Keywords :- *LED Driver, DC-DC Converter, MATLAB(SIMULINK), Efficiency*

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1. INTRODUCTION:

LED Driver is one type of electrical device which is used to regulate the power of an LED or LED strings. LED driver responds to the changing needs of LEDs by providing constant quantity of power to the LEDs as its electrical properties which is changing with the temperature. We can also say that the LED driver is a self contained power supply having the output that are matched to the electrical characteristics of the LEDs. LED drivers can also offer dimming by means of PWM circuits and it may have more than single channel for separate control of different LED array. LED driver can also be used to maintain the constant power level of LEDs. The electrical properties of LED change throughout the temperature increases or decreases. If we are not using proper driver the LED may become hot and gives unstable and poor performance or failure occurs.

The Light-emitting diode (LED) technology promising some benefits of high efficiency, long lifetime and small size, and the most important feature is the generation of green lighting source because of the environmental friendliness [1]. The driving voltage and current for LED panels are vary widely according to the number of LED devices. They can be connected in series as well as parallel for the LED driver. The number of LED in series can be increased to reduce the number of channels in the driver [2].

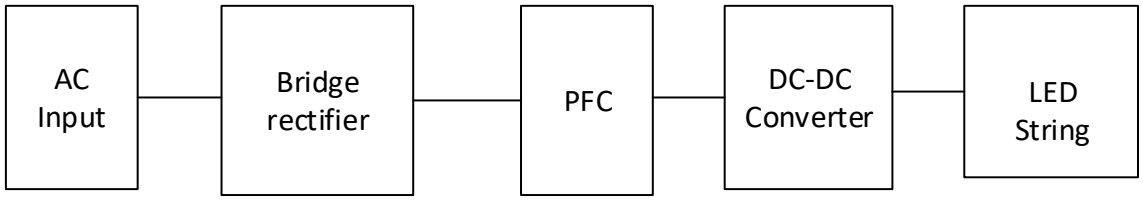

Fig. 1 General Block diagram of LED Driver

The above block diagram shows the general configuration of the LED driver where the AC input is applied to the bridge rectifier which is rectified and the rectified output is given to the PFC which is used to maintain a high power factor. This is important issue because a load with a low power factor draws more current than a load with a high power factor for the same amount of power. The DC-DC converter is used to regulate the output voltage and the regulated voltage is given to the LED string.

2. LITERATURE REVIEW:

2.1 Multi-Channel Partial Power DC-DC Converter for Current Balancing of LED strings

- In this paper a multichannel current balancing driver is proposed which is based on partial power DC-DC converter architecture. Performs current balancing handling only a portion of the total power delivered by the source ,reaching an increased efficiency. Due to the modularity of the architecture, it allows the parallel connection of as many strings as required to use for high power application. Simulations are performed in order to evaluate the converter performance. DC-DC converter used to balance the currents in the LED strings, which is made to ensure an uniform light distribution and operate under failure conditions. It can leads to reduction in conversion losses and high efficiency.

2.2 Auto Tracking DC/DC converter for Adaptive LED Driving System

- Developed a universal architecture for driving multi-power LED panels with the ability to automatically track the output voltage. Continuously monitoring of the LED level also makes it possible to use buck conversion to automatically generate the optimal voltage for the multiple LED panels in series. An FPGA Controller is used to monitor the voltage of the LED string and compute the ideal PWM duty cycle for the voltage converter, based on finite-state machine. LED dimming is realized using digital as well as analog approaches by reducing the current rather than using PWM method in order to prolong the lifespan of the LEDs. This system can be used to drive universal LED panels under various current and voltages without the need of any adjustment.

2.3 Duty-Ratio-Control-Aided LLC Converter for Current Balancing of Two Channel LED Driver

- DRCA LLC converter for current balancing of two-channel LED driver is proposed with the high power density and high efficiency. The Aid of duty ratio control of LLC the proposed driver does not require any additional component. Total output current can be controlled with the frequency modulation and the duty ratio control is added to obtain current balancing of each LED channel.

2.4 High Performance Multiple String LED Driver with Flexible and Wide Range PWM Dimming

- The main objective in driving multiple LED strings include achieving uniform current control and high performance PWM dimming for all strings. This work proposed a new multiple string LED driver to achieve not only current balance, but also flexible and wide range PWM dimming ratio for each string .Compact single-inductor multiple output topology is used to achieve both high efficiency and high performance dimming.

2.5 High Reliability Converter for LED Torch

- Proposed a novel eight-output LED driver which contains a two-output isolated dc-dc converter and two passive current balance circuits connected with output of the converter By controlling the switches, value of output voltage and number of output channel are determined, therefore the illumination is adjustable, and can be used as flash light, camping light and emergency light. Adjusting any one LED current can control current through the other three channels due to passive current balancing. High efficiency is obtained because of ZVS turned on of switches. Low cost and small size are achieved because comparing with conventional 2- output isolated DC-DC converter, this topology used one less active switch and only two magnetic components.

2.6 A New Control Method of Balancing Inductor Current for Interleaved Parallel Bi-directional DC-DC Converter

- In this paper, a new control method based on model predictive control (MPC) theory proposed for interleaved parallel bi-directional DC-DC converter, one can also apply this in the Stand-alone photovoltaic energy storage system. According to the equivalent circuit model of the converter under different switching states the prediction model is established. The switching state in the next sampling period is determined by minimizing the cost function, which reduces the switching transition between charging/discharging for battery and balances the two inductor currents. Good static/dynamic performances and current sharing have been achieved by using the proposed method.

3. COMPARATIVE TABLE:

Table -1: Comparative Table

Paper Title	Methods/Techniques	Summary
High Performance Multiple String LED Driver with Flexible and wide Range PWM Dimming Capability	Compact single inductor multiple output topology is adopted in the driver, accompanied by synchronous integrator and variable dimming frequency	High efficiency, high performance dimming, minimize power loss
Duty-Ratio-Control-Aided LLC Converter for Current Balancing of Two-Channel LED Driver	Current balancing done by using linear regulators, switch mode current regulators, and passive components.	High Power density, High Efficiency
Auto-Tracking DC/DC Converter for Adaptive LED Driving System	Novel auto-tracking system used for driving multiple-power LED panel with the ability to automatically track the output voltage. FPGA controller is used to monitor the voltage of the LED string.	Reduce the effect of device aging, provides dimming using analog or digital controls

High Reliability Converter for LED Torch	Novel eight-output LED driver contains a two-output isolated DC-DC converter and two passive current balance circuits are used	Low cost, small size, high efficiency
Multi-channel partial power DC-DC converter for current balancing of LED string	By using multi-channel current balancing driver the performs the current balancing handling only a portion of the total power delivered by the source	Reduce the conversion losses and high efficiency
Power Quality improvement using CSC converter for high power LED Driver	Canonical switching cell converter is used for power quality improvement and also for high brightness LED module PWM technique used for current control for current control of LED driver	Low cost and better regulation

4. CONCLUSION:

The proposed work aims at reduction of power loss and thereby increasing the efficiency and can get the ripple free output and also we will try to improve the over- all life time of the system. For this the capacitor-less DC-DC converter based LED driver is proposed by using this method we will try to improve the quality of the existing system through our project work.

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