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A Prototype for Double Output Load System of Bridgeless AC-DC Rectifier in Single Switch Control

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Abstract: In power factor correction field is most important for the electrical and electronics applications, particularly the active PFC topology is involving this PFC correction applications, in beginning the diode bridge rectifier acts that process, but power factor cannot achieved .So, the researchers following active PFC correction topology of DC-DC converter commonly need in this process namely CUK converter, the bridgeless topology in the DCM method and double output load systems operating in the single switch control for low power output systems, this load systems are operating in low power, one is LED another one a simple DC motor, however in this paper the power factor achieved nearly unity. The hardware implementation will achieve for low power applications.

Keywords: Power Factor Correction (PFC), Light Emitting Diode (LED), Discontinuous Conduction Mode (DCM),

I. INTRODUCTION

The most of the industries or electronic applications, the power factor is very important for equipments. In lighting field, the LED is very popular for load system which used by the power electronic field’s researchers. Commonly the LED is head resist; many type of the LED will be introduced by the industries [1]. Another one is DC motor is used in the most of the application, this paper type of motor can introduced for low power applications. Many power supply manufacturing companies focused to bridgeless topology for Power factor correction, and bridgeless boost to reduce the common mode noise [2]. The diode bridge rectifier is a non linear load and bulky capacitor is discontinuous charging, for this reasons the researchers used bridgeless schemes [3]. Output capacitor ripple current is high and also degrade the efficiency in this topology [4]. The power factor correction is basic fundamental for SMPS, it can be reduced the voltage and current distortion and also reducing the losses, it has several converters such as buck, CUK, SEPIC, buck boostetc [5].

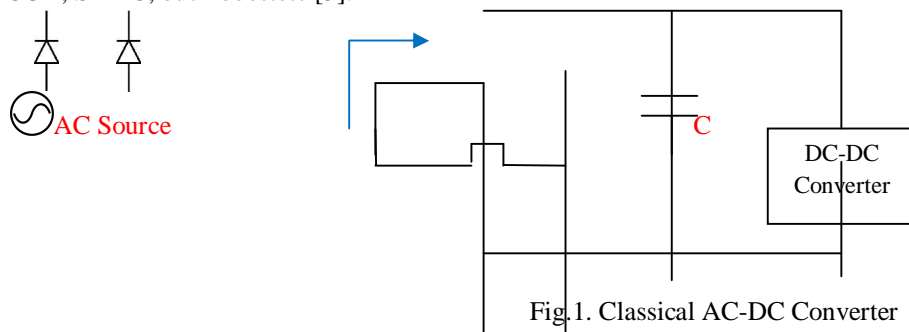


Fig.1. Classical AC-DC Converter

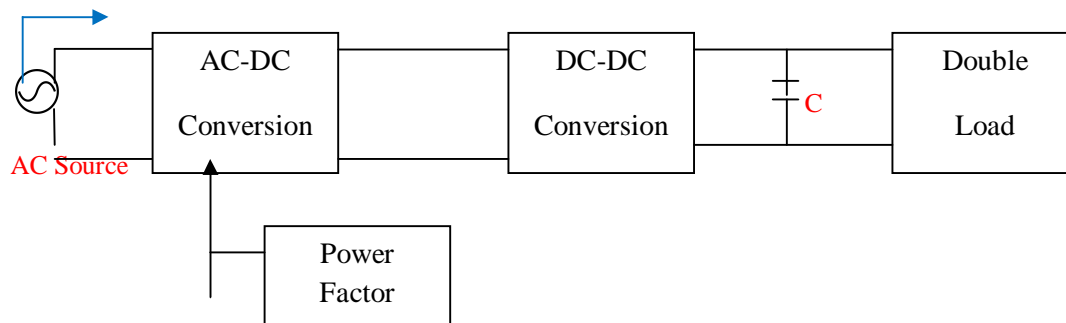


Fig.2. Proposed Bridgeless AC-DC rectifier

The classical boost bridgeless scheme is generally utilized converter for its usage, it have simple circuit, and have simple control structure[8],[9], high efficiency also achieved, EMI and conduction losses are reduced [6],[7], but input voltage can stepped up process only, so this type of converter may not be using for low power application[10].For this reason the bridgeless CUK PFC topology is introduced in this paper, in this topology conduction losses and noise emission are reduced [11]. Maximum number of the semiconductor devices requirements are avoided in [12], [13]. The important problems of power factor correction issues are find out in [14]. The startup inrush current problems are solved by this CUK converter topology thatit strongly protection against high inrush current [15],[16].

II. A PROTOTYPE BRIDGELESS CUK PFC RECTIFIER SYSTEM:

The bridgeless CUK rectifier will be achieved in the hardware, In this prototype usually achieved Power factor, efficiency, that can be performed load side because in this paper particularly focused low power applications, in which high input voltage step down by DC-DC converter that can performed step up/step down, these converter is namely CUK. This type of converter commonly used in the power factor correction field, that easily flexible. Sothis prototype two loads operated by low power. If high loads are in system, defiantly the power factor will affect or some of heat will produce the equipments, for this reason low power loads are involved this prototype. The circuit diagram of the hardware is given in the below. In this circuit diagram one switch handled two loads, one is simple DC motor another one is the LED, this is very simple, low cost and operating ways are very easy to handlers. That will be application for home and minimum power usage areas, because now a day maximum electrical and electronics home power applications work done and needs low power, for this rason we are try simple model of this hardware implementation.

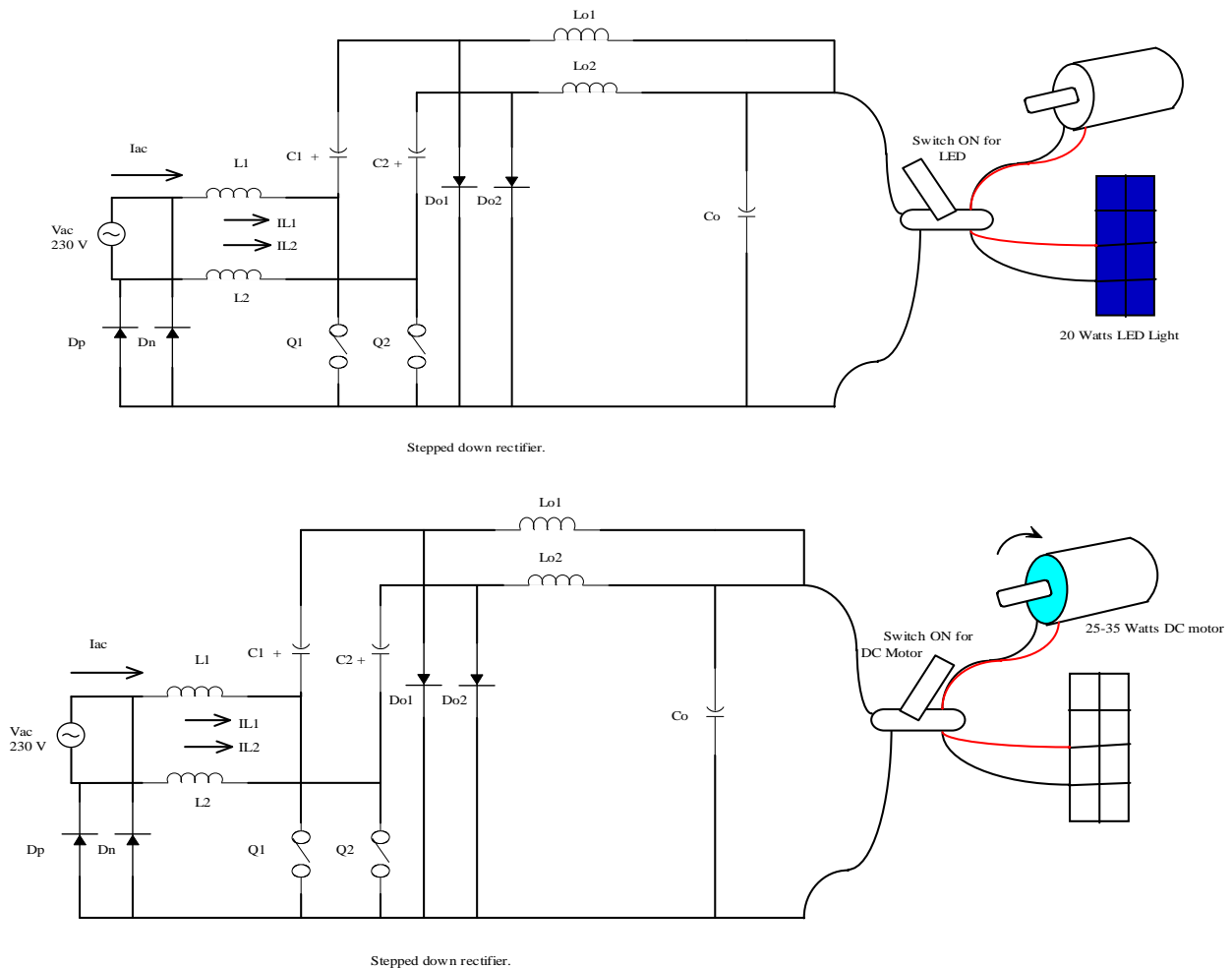


Fig.3. Proposed bridgeless CUK for LED & DC load

These are the double load single switch control, in which single switch controlled the two loads and switch will be act double side when switch will act in one side, the LED light is ON; similarly switch is act another side, the DC motor will be ON.

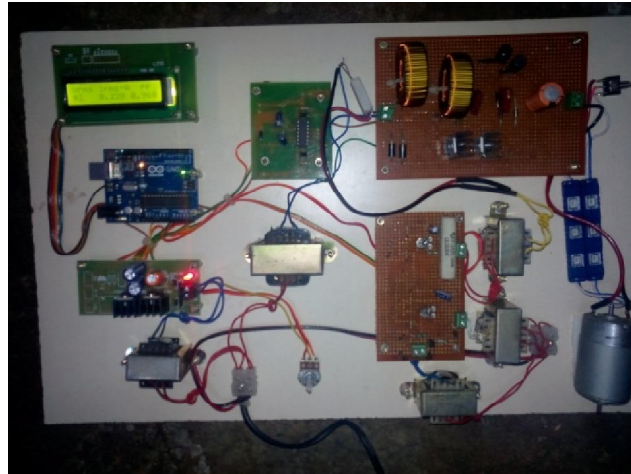


Fig.4. Hardware diagram for CUK configuration.

In the hardware system, microcontroller acts as a isolation between the converter circuit and control systems, MOSFETs are used to trigger the PWM signals. The microcontroller controls the internal diodes. The atmega 328 processor is used for the PWM generation and LED and DC motor is connecting for the output loads. And power factor is achieve almost 0.9 – 0.95 and also improve the efficiency. The hardware system is given in th below.

III. RESULT AND DISCUSION

Voltage and current waveform shown in the figure 6

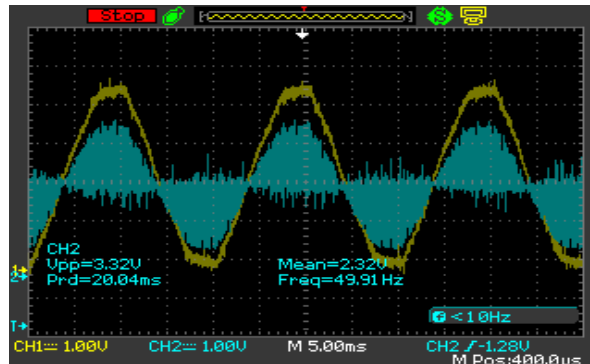


Fig. 5. Voltage and current wave forms of the proposed converter

Represents the input voltage and current wave forms of the proposed converter with a voltage and current in phase during the power conversion

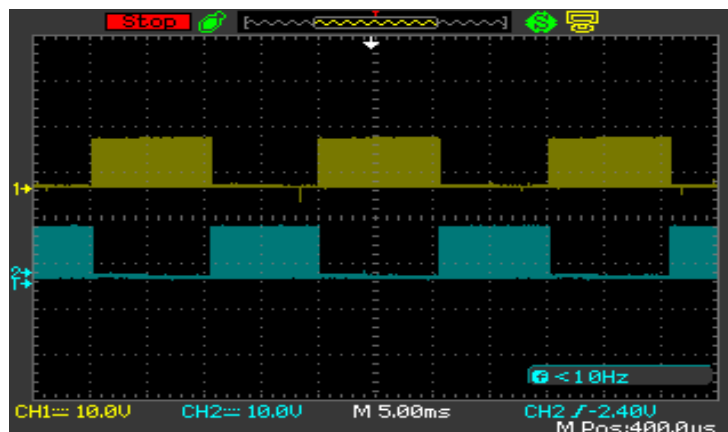


Fig.6. Switching signals of the MOSFETS S1,S2

Switching signals of the MOSFETS S1,S2 which are alternate in phase used to convert the ac power to dc. During the positive half cycle of the input voltage the gating signal is applied to switch Q1.

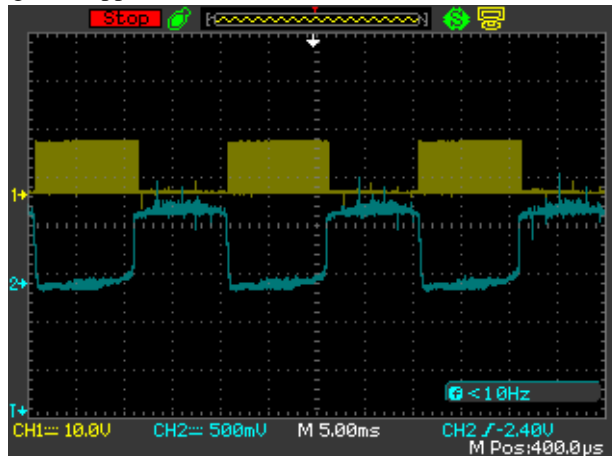


Fig.7. Represents the reference and the trigger PWM generation

Represents the reference and the trigger PWM generation is shown in the figure 16. During the negative half cycle of the input voltage the gating signal is applied to switch Q2.

IV. CONCLUSION

Finally the AC-DC rectifier hardware gives almost good power factor and high efficiency and double output load system successfully controlled by the single switch, in which process for low power application that used in the home application. So from this experiment we know that, in future researchers implement and design the maximum of new topologies are may be introduce.

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