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Design and Implementation of Versatile Universal Converter

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Abstract – *The conversion, control, and conditioning of electrical power are the focus of the electrical engineering discipline known as power electronics. The universal converter, which facilitates effective electrical energy transfer between various electrical system types, is one of the crucial parts of power electronics. The many types of universal converters, the requirements, design process, performance analysis, and applications are all covered in detail in this paper's complete study of the design and execution of a universal converter. All types of power conversions are included in a universal converter. Step-up and step-down conversions are also mentioned, as well as universal conversions such as rectifier (also known as AC-DC), inverter (also known as DC-AC), DC-DC converter, and AC-AC operations.*

Keywords- AC-DC, DC-AC, DC-DC, AC-AC, Rectifier, Inverter, Step-up, Step-down.

I – INTRODUCTION

The effective conversion and conditioning of electrical power is required for a wide range of applications, making power electronics a crucial component of electrical engineering. A vital part of power electronics, the universal converter permits the transfer of electrical energy between various electrical systems. Efficiency, power density, reliability, and cost all to be carefully taken into account while designing and implementing a flexible universal converter. The many types of universal converters, the design process, performance analysis, and applications are all covered in detail in this thesis' thorough investigation of the design and execution of a universal converter. The universal converter is an essential part of power electronics because it makes it easier to move electrical energy between various electrical systems. Efficiency, power density, reliability, and cost must all be carefully taken into account while designing and implementing a universal converter. The many types of universal converters, requirements, design methodology, performance analysis, and applications are all covered in detail in this paper's in-depth investigation of the design and execution of a universal converter.

II -SYSTEM DESIGN

A microcontroller, inductor, MOSFET's, capacitor, diode, PCB makes up the entire proposed system. Six MOSFET's are used for performing desired operation, which are DC supply operations and AC supply operations. The microcontroller, resistances, capacitor, diodes are mounted on the PCB board. The microcontroller collects the input and determines which type of is given and process the data and sends the input supply towards the MOSFET's for output. Depending upon the input source and requirements we can obtain AC or DC output. We can obtain the output at the MOSFET end. The system's circuit diagram in mentioned in fig.1.

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Circuit Diagram

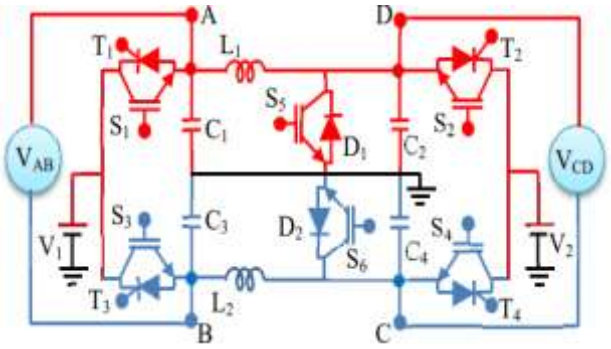


Fig. 1: Circuit Diagram of Proposed Model

Simulation

Simulation is designed and performed in PROTEUS.

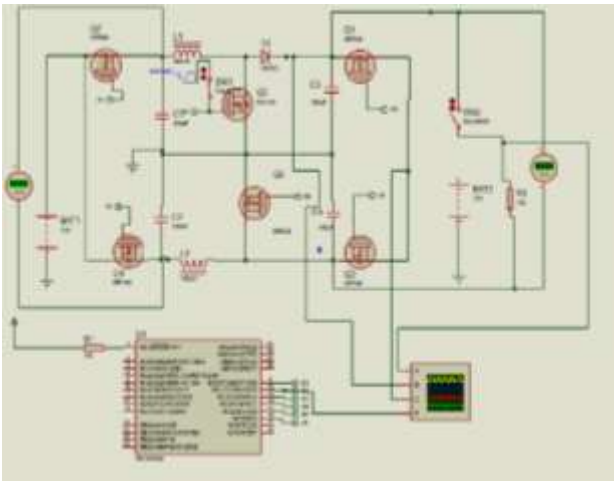
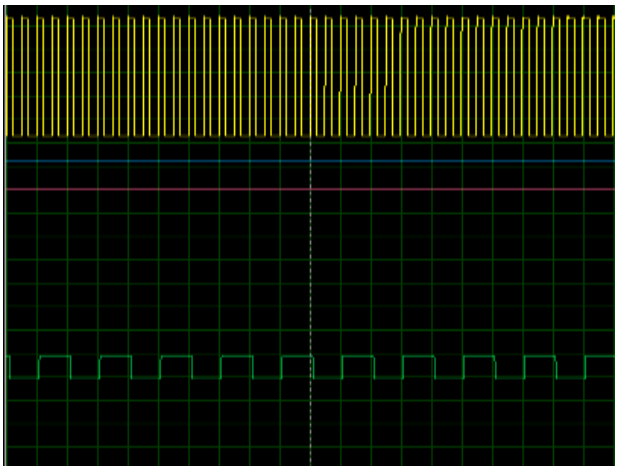
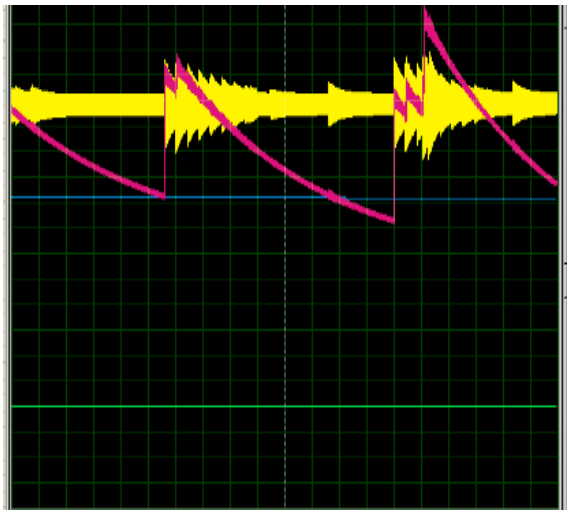


Fig 2: Simulation of Proposed Model

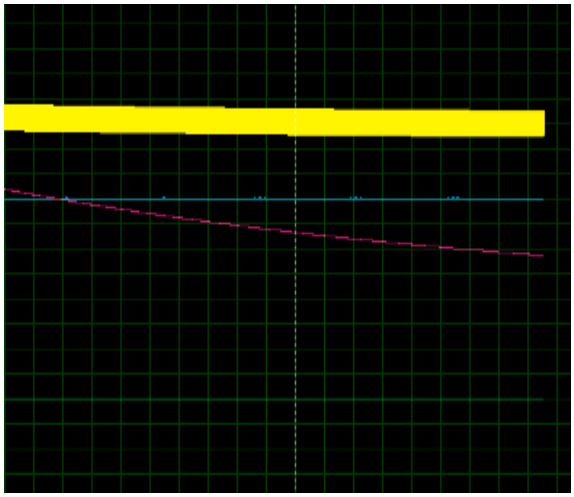
Simulation Result



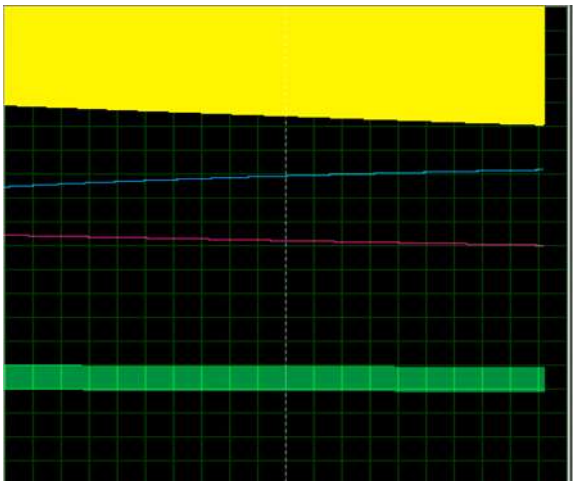
3.1 DC-AC Mode



3.2 DC-DC Boost Mode Graph



3.3 DC-DC Buck Mode Graph



3.4 AC-DC Mode Graph

Fig 3: Simulation Graphs of Proposed Model

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HARDWARE IMPLEMENTATION

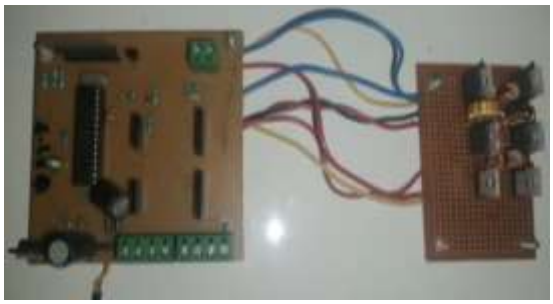

Fig 4 Universal Converter Proposed Model

HARDWARE RESULTS

Figure 4.12 Hardware Experimental

RESULT

Upon providing the input we can get the desired output from the MOSFET'S end. Different connections give different output. Also, power supply source is also one the important deciding factor for the obtained output. Hence a universal converter can be created and used to satisfy the demands of high efficiency, power density, dependability, and affordability. The converter's performance analysis demonstrates that it can handle large power levels and work effectively over a variety of input and output voltages and frequencies.

CONCLUSION

It is a challenging task to design and implement a universal converter for power electronics applications, and various criteria, such as efficiency, power density, reliability, and cost-effectiveness, must be carefully taken into account. The many types of universal converters, the design process, performance analysis, and applications are all covered in detail in this thesis' thorough investigation of the design and execution of a universal converter. The study's findings demonstrate that the universal converter can be created and used.

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