

HIGHER TECHNICAL INSTITUTE

**ELECTRICAL ENGINEERING
DEPARTMENT**

DIPLOMA PROJECT

**CONSTRUCTION AND ANALYSIS OF
A DC-TO-DC STEP DOWN CONVERTER**

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INTRODUCTION

Ever since the discovery of electricity more than 200 years ago, engineers have been creating new inventions to perform work and to process information for the benefit of mankind. All these inventions require electric power in order to operate, but the characteristics of the power required are often different from those that are available. Therefore, power conversion and control are required. Such power conversion and control functions form the basis of what is known as the field of power electronics. In essence, the power electronics engineer must match the characteristics of the source of electrical energy to the requirements of the electrical or electronic devices, which it will power.

For many years, the only means of accomplishing a power conversion function was through rotating machinery, and a tremendous amount of research went into developing new and better "commutation" techniques.

It was not until the discovery of semiconductors, the invention of the transistor, and ultimately the invention of the thyristor in 1957, that the field of power electronics reached its full potential. Since that time, new components and new circuit techniques have been complementing each other and enabling a very rapid advance in the state of the art of power electronics. With these advances, the field of power electronics has been able to keep pace with the needs of other evolving technologies.

Our society has benefited greatly from this evolution of power electronics technology. Most of the electronic gadgets we have in our homes would not be as small or lightweight if it had not been for advances in this field.

In other areas, today's society is benefiting from improved efficiency and precise control of modern electric motors. This has been a key factor in the recent progress in robotics and other forms of factory automation, which has led to increased productivity and quality. In addition, power electronics technology has led to significant advances in electric locomotion, with many modern subway and railway systems being installed throughout the world.

A lot of converters exist that can facilitate all kind of different power conversion. The main converters are the dc to dc converters, dc to ac converters and the ac to dc converters. In this project we will investigate only the dc to dc converters and specifically the dc to dc step down converter.

Chapter 1 is as an introduction to dc to dc converters. The main operation of the converter is discussed and different types of converters are shown.

Chapter 2 deals with the most popular semiconductor used in dc to dc conversion.

Chapter 3 covers the operation and analysis of the dc to dc step down converter. The operation of the step down converter is discussed and then analyzed with Fourier series. Also the operation of the control circuit and specifically the LM3524D IC is discussed.

In Chapter 4 the steps of the construction of the dc to dc step down converter are explained.

Chapter 5 deals with the experimental and theoretical results. It covers the experiments which were carried out, results and graphs as well as an introduction to two programs MathCad and Pspice.

Chapter 6 is the conclusion of the project. Thoughts and conclusion are discussed in this chapter.

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Appendix 1 Equipment used and pictures

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Regulating Pulse Width Modulator**

Appendix 3 IGBT IRG4PC40W

Appendix 4 ULTRA-FAST HIGH VOLTAGE DIODE