

**MIDDLE EAST TECHNICAL UNIVERSITY**

**DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING**

**EE 464- Hardware Project – 2023 Spring**

**Simulation Report**

**Isolated DC-DC Battery Charger**

**Peaky Converters**

Çağlar Umut Özten

Onur Toprak

# Introduction

Due to a variety of applications, including portable electronics and renewable energy systems, there is a constant need in modern power electronics for DC-DC converters that are dependable and efficient. The goal of this project is to design and build an isolated DC-DC converter that satisfies tight requirements for power efficiency, output voltage stability, and input voltage range.   
  
 This converter's goal is to convert an input voltage between 20 and 40 volts into a steady 12 volt output with a maximum power output of 60 watts. Additionally, the converter must have outstanding line and load regulation, with variances of no more than 3% across a range of input voltages and load circumstances, and the output voltage ripple should be kept to a maximum of 3%.

## Key Project Requirements:

**Closed-Loop Control:** A closed-loop control system is essential for maintaining precise regulation of the output voltage under changing input and load conditions. This ensures stability and reliability in various operating scenarios.

**Self-Powered Control Circuits:** The project restricts the use of external power supplies for control circuits, emphasizing the need for a self-powered solution that derives its operational energy from the main power source.

**Magnetic Design:**

## Additional Objectives:

Beyond meeting the basic specifications, additional project goals may involve enhancing the converter's efficiency, achieving a compact design, and exploring advanced techniques like soft switching to minimize switching losses and improve overall performance.

## Challenges and Opportunities:

Designing an efficient isolated DC-DC converter requires addressing challenges related to component selection, circuit layout, magnetic design (transformers and inductors), and control strategy. Balancing performance with factors like cost, size, and complexity presents opportunities for innovation and optimization throughout the design process.

Throughout this report, procedure of the DC-DC Isolated Converter will be explained. Step by step, examination of the topology selection, magnetic design and controller will be carried. After checking results with simulations, component selection and further consideratioons will be done.

# Topology Selection

# Analytical Calculations

# Magnetic Design

# Closed Loop Controller

# Simulations

# Component Selection

# Further Considerations

## Efficency

## Ripple

# Conclusion