

Development of a multilevel GaN converter for electric vehicle

Degree programme : BSc in Electrical Engineering and Information Technology | Specialisation : Industrial Automation and Control
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The objective of this project is the development of a multilevel NPC converter with GaN technology. This converter is designed for electric vehicles and handles a power of 15kW

Project context and goal

This project takes place in the context of a wider project carried out in cooperation with Volvo cars to investigate converter solutions for electric vehicles based on wide band gap semiconductors. The goal is to develop a prototype of neutral point clamped (NPC) converter based on GaN technology and to investigate it experimentally.

Required objectives

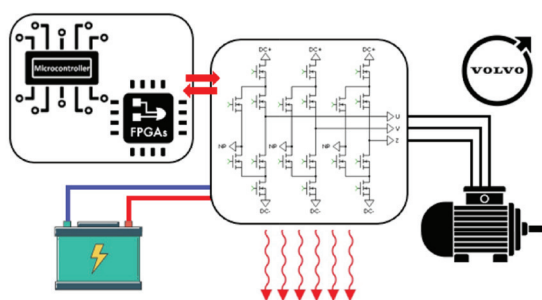
- Study and simulation of the converter
- Choice of components
- Electrical diagram realisation and circuit layout
- Commissioning of the prototype
- Measurement of inverter efficiency

Results obtained

Analysis of the control system: Using the Plescs programme, different modulation scheme were compared. The dead time generation that is necessary for the operation of the real converter was also simulated.

Choice of Components: The choice of each component in this project was based on technical characteristics and market availability.

Electrical circuit design: Based on the application notes of the components, the circuit diagram of this inverter was drawn. The circuit diagram was divided with netclasses, these netclasses define the different electrical powers in the circuit and serve as the basis for the rules to be applied in the PCB design process.



System Overview

Placement of components: The arrangement of the components on the PCB was decided according to the application notes of the components, the rules based on netclasses and trying to minimise switching loops and create a small PCB.

Track design: The design of all tracks was done taking into account the power to be carried, the application notes of the components, and the rules based on netclasses.

Problems encountered

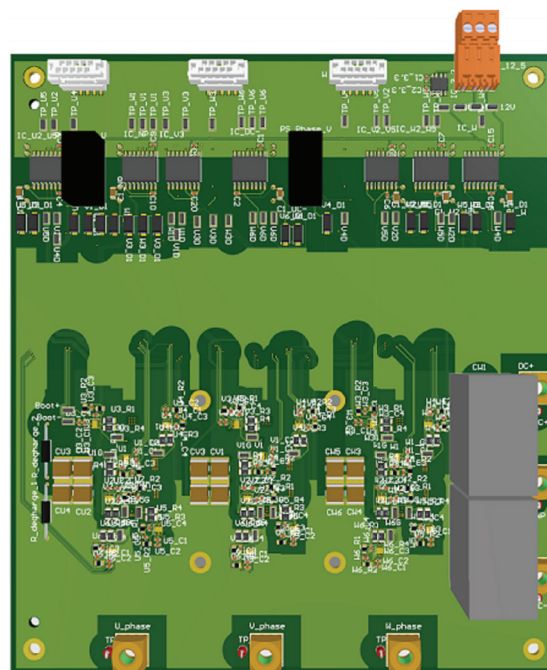
The company in charge of the PCB manufacturing made a production error, which caused a considerable delay in the work and made impossible achieving all targets in time.

Concluding considerations

All the objectives completed were done according to specific criteria. The PCB production error wasted a lot of my time and compromised the practical analysis of the PCB.



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PCB result