

Bachelor's/Master's Thesis

Comparison of Gallium-Nitride (GaN) Based Power Semiconductor Switches

Wide bandgap (WBG) semiconductor switches based on gallium nitride (GaN) are a key technology for further improving power electronic converter circuits due to their ability to operate at high switching speeds. The potential benefits of GaN-based power electronic converters include higher power density and higher efficiency, making them an attractive option for a wide range of applications such as electric vehicles, renewable energy systems, and data centers. Since GaN switches are not built like conventional MOSFETs on the basis of silicon (Si) or silicon carbide (SiC), various manufacturers have developed different methods of producing them, resulting in significant performance variations and unique requirements for gate drivers.

In the first step of this thesis, an overview of available components will be gained and their advantages and disadvantages examined. Subsequently, suitable gate driver variants will be investigated for the different component variants, and selected GaN transistors and gate-driver combinations will be experimentally evaluated. Depending on the state of their study program, possible applicants for this thesis can either pursue it as a Bachelor's or Master's thesis, as the scope and depth of the research can be adapted accordingly. Working language: German or English



Research Questions

- What are the different types of GaN transistors available, and how do their performance characteristics differ?
- What gate drive methods are suitable for the various GaN transistor types?

Tasks

- Literature and internet research on different transistors and driver types.
- Theoretical study and comparison of the components identified on the basis of their datasheet values.
- Experimental verification of selected suitable transistor and driver combinations.

Contact

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