

Master Thesis

Double-Pulse-Test for SiC MOSFETs

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Description

Silicon Carbide (SiC) MOSFETs are becoming increasingly important in power electronics due to their superior high-frequency, high-efficiency, and high-temperature performance. The Double Pulse Test (DPT) is a widely used method for evaluating the dynamic characteristics of power switching devices, such as switching losses, parasitic inductance effects, and switching times. Through DPT, the behavior of SiC MOSFETs during turn-on and turn-off transients can be precisely measured, providing essential insights for their design and optimization in practical applications. The objective of this thesis is to design and implement a SiC MOSFET-based double pulse test platform that offers a reliable means of evaluating the dynamic performance of SiC MOSFETs.

Tasks

- **Requirements Analysis and Test Platform Design:** Research existing DPT platforms and techniques, and identify the specific testing needs for SiC MOSFETs, including testing conditions (e.g., voltage, current, temperature range) and measurement parameters (e.g., switching losses, parasitic effects). Based on these requirements, design the architecture and functional modules of the test platform.
- **Test Circuit Design and Implementation:** Design and implement the complete test circuit, including the driver circuit, power loop, load circuit, and measurement circuit, according to the principles of DPT. Pay special attention to high-frequency, high-current circuit design to ensure test accuracy and safety.
- **Data Acquisition and Processing System Development:** Develop a data acquisition and processing system capable of accurately capturing the voltage and current waveforms of SiC MOSFETs during turn-on and turn-off events. The system should also process and analyze the data to calculate switching losses, evaluate current spikes, and perform other relevant analyses.
- **Platform Debugging and Test Validation:** Debug the designed double pulse test platform, verify its functionality and performance, and conduct tests to evaluate the dynamic characteristics of SiC MOSFETs under various conditions. Analyze the test results and provide suggestions for further optimization.

Prerequisites

List the requirements.

- **Fundamentals of Power Electronics:** Understanding of the basic concepts in power electronics, especially the operation principles, dynamic characteristics, and loss mechanisms of power semiconductor devices such as MOSFETs and IGBTs.
- **Circuit Design and Simulation:** Basic skills in analog and power circuit design, with the ability to use circuit simulation tools (e.g., PSpice, LTspice) for circuit design and performance evaluation.
- **Testing and Measurement Techniques:** Familiarity with basic electrical testing and measurement techniques, including the use of oscilloscopes, power meters, signal generators, and other equipment for test data collection and analysis.

Contact and further information

- Please attach your CV and the latest study transcript to the application

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