

ECE SEMINAR



Mr. Zhicheng Guo

PhD Candidate,

University of Texas at Austin

March 6th, 11:00 AM to 12:00 PM

Location: SEH 1270

**Novel Solid-State Transformer Technologies for
Next Generation Energy Conversion**

ABSTRACT

The Solid-state Transformer (SST) is a power electronics interface between the medium voltage grid and renewables, distributed energy storage, EV, and DC or AC loads. In contrast to a conventional low-frequency transformer, the power electronic converter stages of the SST enable full-range control of the terminal voltages and currents and hence of the active and reactive power flows. The key technologies of the medium voltage SST include the high/medium-frequency magnetic design, intelligent SiC/GaN power devices and reliability.

In this talk, I will introduce my investigation of the key technologies of medium-voltage solid-state transformer. First, for high/medium-frequency magnetic, a transformer optimization methodology is proposed to select the best design for different specifications. A novel insulation/cooling technology is developed to achieve both superior insulation and thermal performance. Next, I will present my design of SiC intelligent power modules (IPM). 3.6 kV/400A SiC half-bridge IPM utilize SuperMOS and intelligent packaging technologies to achieve compact and low-cost design. In addition, I will also talk about my research about characterization of partial discharge (PD) under modern power electronics system contributes to MV applications reliability investigation and insulation design. I will conclude the topic by looking into future challenges and opportunities for medium-voltage solid-state transformers.

I will also talk about my future plans for a career at the George Washington University which include research topics, funding agency, collaboration, teaching, and service.

BIOGRAPHY

Zhicheng Guo is a Ph.D. candidate in the Department of Electrical and Computer Engineering at the University of Texas at Austin. Currently, He is a research assistant at the Semiconductor Power Electronics Center. Zhicheng Guo is the recipient of 2022 The Transformer Association (TTA) Scholarship Award, 4 times Cockrell School of Engineering Scholarship, the University of Texas at Austin. He serves as member of the IEEE standard committee P3105 working group, and reviewer of multiple IEEE journals and technical conferences.

His research interests include Solid-state transformer, high-frequency magnetic, WBG intelligent power module, 60 Hz/HF partial discharge, and insulation design of modern power electronics systems. His research vision is to investigate power electronics technologies in the application of renewable energy, electrifying transportation, and EV/charging infrastructure.