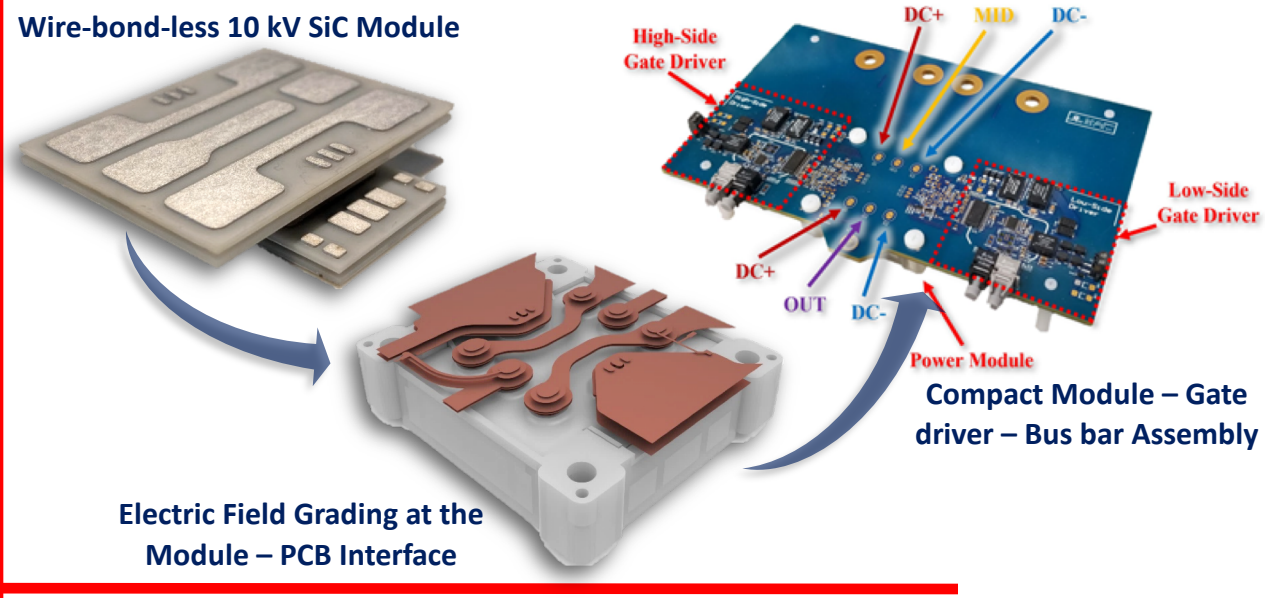
Project Title: Prototyping and Evaluation of High-Speed 10 kV SiC MOSFET Power Modules with High Scalability and System-Integration Solutions

Objectives: To evaluate the scalability, system integration, and reliability of a wire-bond-less 10 kV silicon carbide MOSFET power module.

Task No. BP5-3.20 (MIP2)
PI: Christina DiMarino
Email: dimaricm@vt.edu
Phone: (914) 263 - 2730



WBG Technology Impact

1. Higher power density, faster switching, increased efficiency, and improved reliability compared to 6.5 kV Si IGBT modules.
2. Applications: medium-voltage drives, MVDC naval platforms, large-scale wind and solar, and advanced distribution systems
3. Timeframe for commercialization: 2022 – 2024
4. 10x higher power density than 6.5 kV Si IGBT modules by eliminating wire bonds, avoiding creepage requirements, and grading the electric fields internal and external to the module; 8x lower switching loss than 6.5 kV Si IGBT.

Accomplishments/Outcomes

- Prototyped module with semi-functional 10 kV SiC MOSFETs.
- Sintered DBA substrates for reliability evaluation.
- Tested partial discharge inception voltage (PDIV) of gate driver and bus bar PCB. PDIV exceeds 10 kV rms.
- Tested PDIV of PCB–module assembly. PDIV exceeds 8 kV rms.
- Assembled testbed for switching the 10 kV SiC MOSFET module.
- Verified gate driver up to 2.6 kV, 15 A with 4 kV silicon IGBT.