Kevin Bai Personal Info

- **UTK Associate Professor in power electronics**
- **Research Interests: Wideband gap power electronics, power electronics for electric transportations**
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2020-2021 Research Projects

1. Packaging A Top-cooled 650V/>150A GaN Power Module with Insulated Thermal Pads and Gate-Drive Circuit (PowerAmerica)
2. GaN 800V Module with Double Sided Cooling in a 3L Half Bridge Configuration (Volkswagen)
3. A High-Efficiency, High-Power-Density Integrated DC/DC with OBC Using SiC and GaN Devices for Electric Vehicles (Hella)
4. A Smart and Highly Compact Power Electronics Box to Provide Universal Charging Technologies (OBC, Wireless and DC Fast Charging) along with DCDC (Magna)
5. Using FPGA to Control Six-phase PMSM Fed by SiC Inverters (Mercedes Benz)
6. Smart, Compact, Efficient 500kW DC Extreme Fast Charger (ARPA-E)

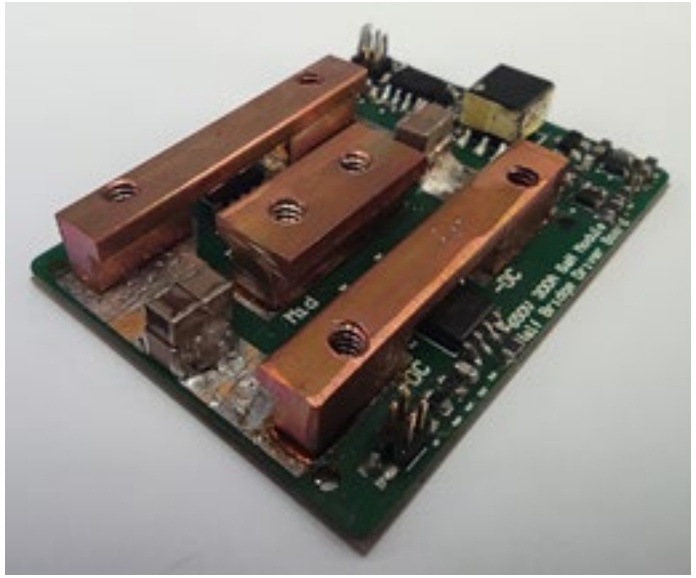
Packaging A Top-cooled 650V/>150A GaN Power Module with Insulated Thermal Pads and Gate-Drive Circuit

Project Objectives

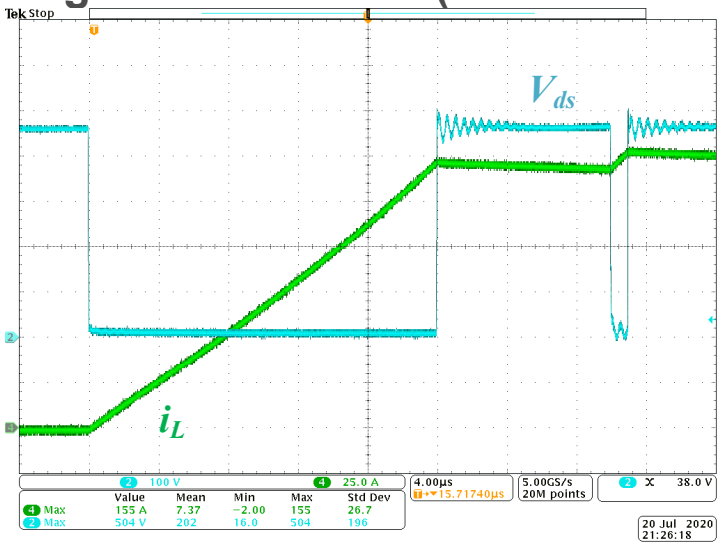
- To package a high voltage and high current GaN power module for motor drive and EV chargers;
- To reduce the thermal resistance thereby prohibiting potential thermal runaway;
- To integrate the gate drivers and power supply for parasitics reduction and convenient assembly.

Recent Achievements

- Tested such power module at 450V/150A;
- IP disclosure to PowerAmerica yielded further collaboration with PowerAmerica members (Mercedes Benz) on GaN based inverter design for EV applications;
- Launched a new graduate course (ECE-692 Power Electronics Packaging) in UTK through leveraging the project outcome.



Packaged GaN Module (45*33*9.6 mm^3)



Double pulse test done @ 450V/150A

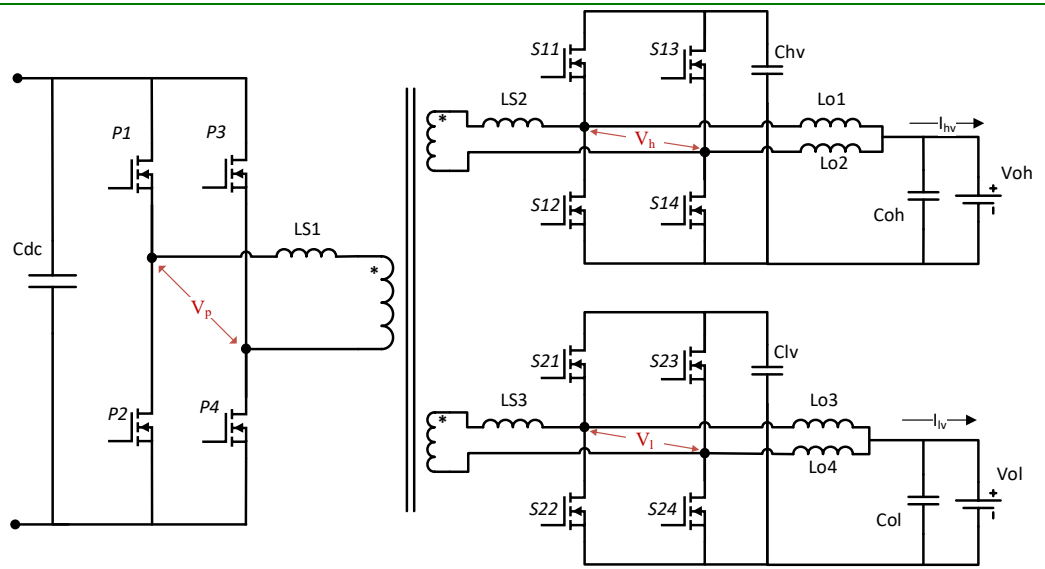
A High-Efficiency, High-Power-Density Integrated DC/DC with OBC Using SiC and GaN Devices for Electric Vehicles

Project Objectives

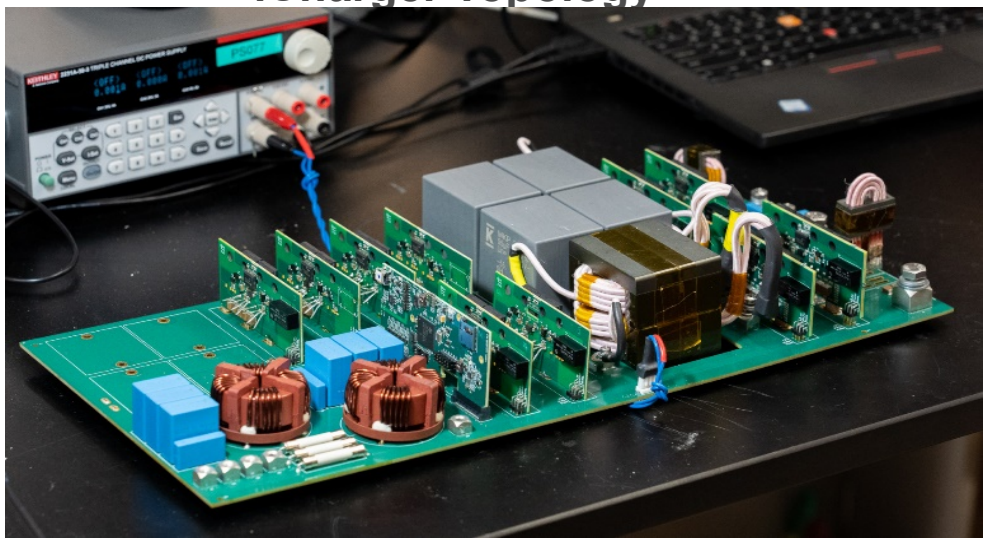
- To integrate a DCDC converter with EV on-board charger thereby saving the size and cost;
- To use wide-bandgap devices aiming at higher efficiency;
- To explore new magnetics solutions (transformer) in EV applications.

Recent Achievements

- Tested such iCharger at 11kW for OBC mode and 3.5kW for DCDC;
- Developed a novel control algorithm allowing the power to flow freely among power grid, HV battery and LV battery;
- Licensed the IP to Hella through UTRF.



iCharger Topology



Prototyped iCharger (11kW OBC+3.5kW DCDC)