3-Level GaN-Based Vehicle Traction Boost Converter

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2020 CURENT NSF/DOE Site Visit and Industry Conference
Virtual
Nov. 2020
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Background and motivation:
• Electric vehicles are expected to transition to an 800 V dc link for its motor drive for increased efficiency over traditional ≤ 600 V systems.
• GaN devices offer higher efficiency than Si or SiC for this application, but are only available in ratings up to 650 V.

Technical approach:
• 10 kW small scale model is being designed
• 3-level approach is necessary to not exceed device voltage rating
• Unique challenge results from such high power and high voltage in a GaN-based converter

Conclusion:
• Design focus will be on a practical, modular design with higher power density than traditional silicon solutions.
• Higher bus voltage will improve overall system power density.
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- Objective is to explore the unique challenges of constructing a high power, high voltage 3 level boost converter for an automotive application using GaN switching devices.
- Goal is 200 V input, 800 V 10 kW output at 98% efficiency, operable over entire automotive temperature range.
- Converter will be liquid-cooled for maximum cooling efficacy in high ambient temperature automotive environment.
Acknowledgements

This work was partially supported by the ERC Program of the National Science Foundation and DOE under NSF Award Number EEC-1041877 and the CURENT Industry Partnership Program.

Other US government and industrial sponsors of CURENT research are also gratefully acknowledged.